ENGINE

CONTENTS

E11AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E11CA--

Items	6G72-SOHC	6G72-DOHC
Number of cylinder and arrangement	6, V-type	6, V-type
Total displacement cc (cu.in.)	2,972 (181.4)	2,972 (181.4)
Bore × Stroke mm (in.)	91.1 × 76	91.1 × 76
Compression ratio	10.0	10.0
Firing order	1-2-3-4-5-6	1-2-3-4-5-6
Combustion chamber	Compact type	Pentroof type
Lash adjuster	Equipped	Equipped

SERVICE SPECIFICATIONS

E11CB--

Items	6G72-SOHC	6G72-DOHC
Standard value		
Drive belt deflection mm (in.)		
Alternator and power steering oil pump		
When checked	6.0–9.0 (0.24–0.35)	–
When a new belt is installed	4.0–5.0 (0.16–0.20)	–
When used belt is installed	6.0–8.0 (0.24–0.31)	–
Air conditioner compressor		
When checked	7.5–9.5 (0.30–0.37)	–
When a new belt is installed	6.5–7.0 (0.26–0.28)	–
When used belt is installed	7.5–8.5 (0.30–0.34)	–
Alternator*1 or alternator and air conditioner compressor*2		
When checked	–	4.0–5.5 (0.16–0.22)
When a new belt is installed	–	3.5–4.0 (0.14–0.16)
When used belt is installed	–	4.0–5.0 (0.16–0.20)
Power steering oil pump		
When checked	–	9.0–11.0 (0.35–0.43)*3 or 9.5–13.5 (0.37–0.53)*4
When a new belt is installed	–	7.0–8.5 (0.28–0.33)*3 or 7.5–9.0 (0.30–0.35)*4
When used belt is installed	–	9.0–11.0 (0.35–0.43)*3 or 10.5–12.5 (0.41–0.49)*4

NOTE
(1) The *1 symbol is applicable to models without air conditioner
(2) The *2 symbol is applicable to models with air conditioner
(3) The *3 symbol is applicable to vehicles built up to October, 1991
(4) The *4 symbol is applicable to vehicles built from November, 1991

Items	6G72–SOHC	6G72–DOHC
Timing belt tension torque Nm (kgm, ft.lbs.)	—	10 (1.0, 7.2)
Auto tensioner rod protrusion mm (in.)	—	3.8–4.5 (0.15–0.18)
Ignition timing	5° BTDC ± 2°	5° BTDC ± 2°*5 or 5° BTDC ± 3°*6
Engine Idle speed r/min.	700 ± 100	700 ± 100
CO concentration and HC concentration at idle		
CO concentration %	0.5 or less	0.5 or less
HC concentration ppm	100 or less	100 or less
Intake manifold vacuum mmHg (in.Hg)	Approx. 515 (20)	Approx. 520 (20)
Limit		
Engine compression pressure kPa (kg/cm², psi)	min. 1050 (10.5, 149)	min. 980 (9.8, 139)
Engine compression pressure difference between each cylinder kPa (kg/cm², psi)	max. 100 (1.0, 14)	max. 100 (1.0, 14)

NOTE
(1) The *5 symbol is applicable to vehicles built up to November, 1992
(2) The *6 symbol is applicable to vehicles built from December, 1992

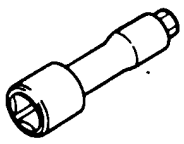
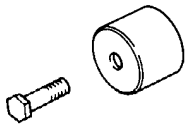
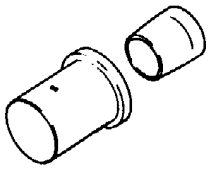
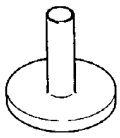
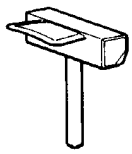
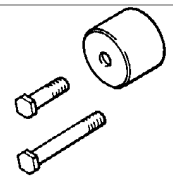
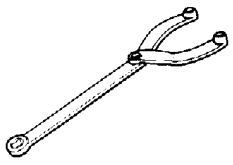
SEALANTS

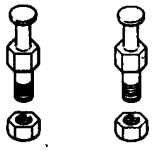
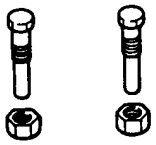
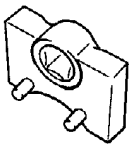
E11CE--

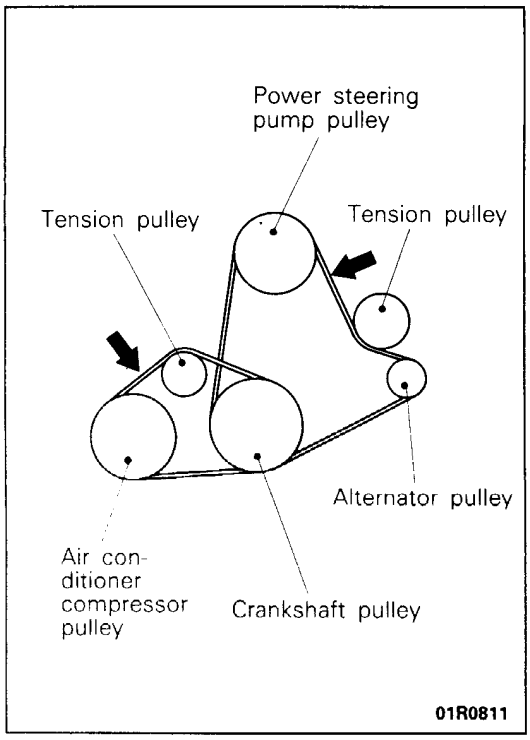
Items	Specified sealants	Characteristics
Rocker cover and camshaft bearing cap seal	3M ATD Part No. 8660 or equivalent	Semi-drying sealant
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent	

SPECIAL TOOLS

E11DA--

Tool	Number	Name	Use
	MD998051	Cylinder head bolt wrench	Loosening and tightening of cylinder head bolt
	MD998713	Camshaft oil seal installer	Installation of camshaft oil seal <SOHC>
	MD998717	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MD998718	Crankshaft rear oil seal installer	Installation of crankshaft rear oil seal
	MD998727	Oil pan remover	Removal of oil pan <SOHC, DOHC built up to October, 1992>
	MD998761	Camshaft oil seal installer	Installation of camshaft oil seal <DOHC>
	MB990767	End yoke holder	Supporting the sprocket and shaft pulley when attaching or detaching them
	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. <SOHC>

Tool	Number	Name	Use
	MD998719	Crankshaft pulley holder	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 <SOHC>
	MD998754	Crankshaft pulley holder	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 <DOHC>
	MD998767	Socket wrench	Adjustment of timing belt <DOHC>
	MB990968	Torque wrench	Adjustment of timing belt <DOHC>
	MD998769	Crankshaft pulley spacer	Used if the crankshaft needs to be rotated to attach the timing belt etc. <DOHC>



SERVICE ADJUSTMENT PROCEDURES <SOHC>

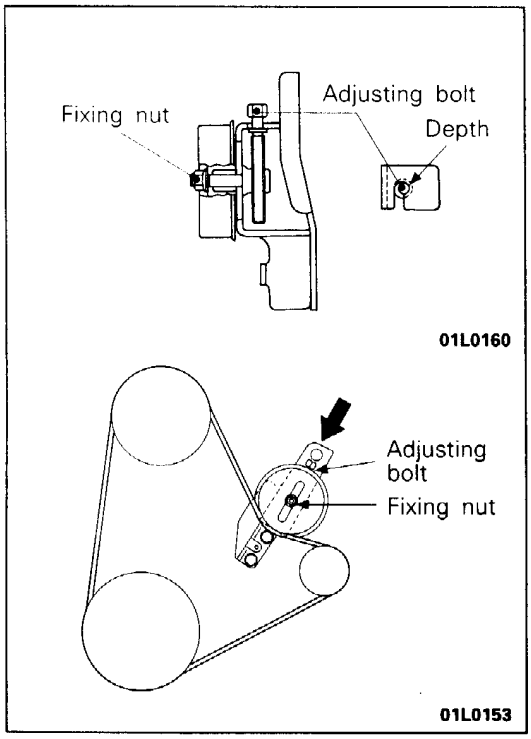
DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

E11FQBA

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

Standard value: mm (in.)

Items	Check value	Adjustment value	
		New belt	Used belt
For alternator and P/S pump	6.0–9.0 (0.24–0.35)	4.0–5.0 (0.16–0.20)	6.0–8.0 (0.24–0.31)
For A/C compressor	7.5–9.5 (0.30–0.37)	6.5–7.0 (0.26–0.28)	7.5–8.5 (0.30–0.34)



ALTERNATOR AND POWER STEERING PUMP DRIVE BELT TENSION ADJUSTMENT

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

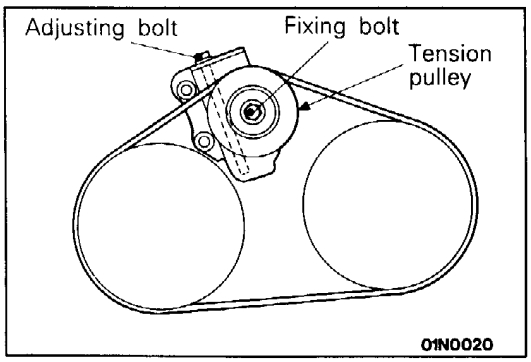
Caution
Put the adjusting bolt into the recess at the far depth of the elongated hole on the tension bracket.

(3) Tighten the fixing nut.

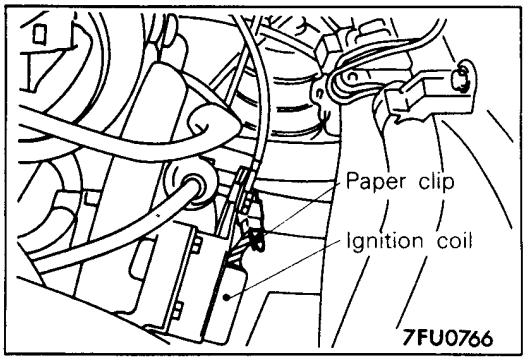
Tightening torque: 50 Nm (5 kgm, 36 ft.lbs.)

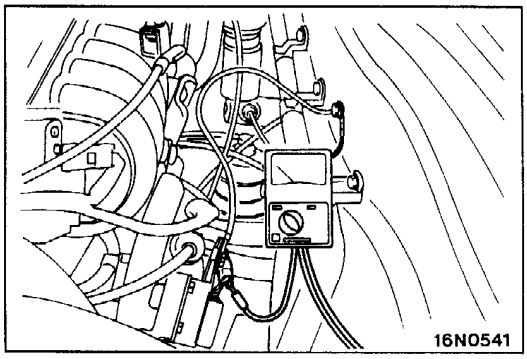
(4) Run the engine one time or more.
(5) Check the deflection or belt tension. Readjust, if necessary.

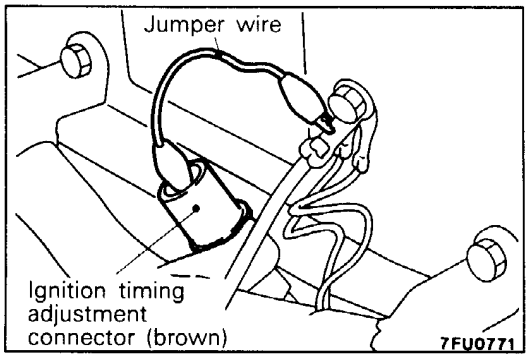
Caution
Before checking, turn the engine one time or more.

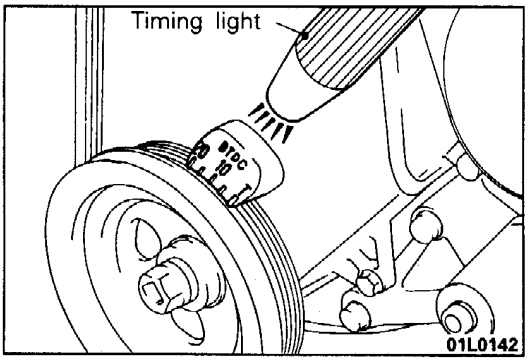


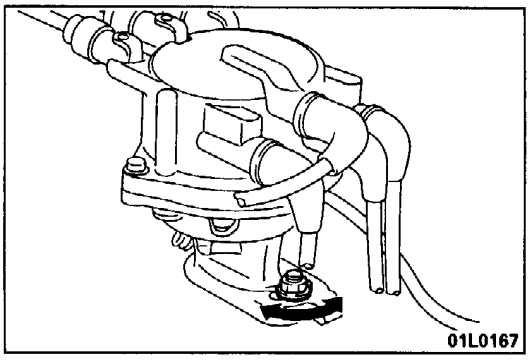
AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION ADJUSTMENT











IGNITION TIMING INSPECTION AND ADJUSTMENT

E11FUBA

(1) Before inspection and adjustment set vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicles with A/T)
- Steering wheel: Straight forward position.

(2) Insert a paper clip from harness side into the 3-pin connector between the primary side of the ignition coil and the tachometer.

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

NOTE
Do not use the Multi-use tester.
If tested with the Multi-use tester connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.

(4) Set up a timing light.

(5) Start the engine and run at idle.

(6) Check that engine idle speed is within the standard value.

Standard value: 700± 100 r/min.

(7) Turn the ignition switch to OFF.

(8) Remove the waterproof connector from the ignition timing adjustment connector (brown).

(9) Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

NOTE
Grounding this terminal sets the engine to the basic ignition timing.

(10) Start the engine and run it at idle.

(11) Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC± 2°

(12) If not within the standard value, loosen distributor fixing nut and adjust by rotating distributor body.

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

(13) Tighten mounting nut after adjusting.

(14)Stop the engine, remove the jumper wire 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 15° BTDC at higher altitudes.

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

NOTE
Sealing tape is attached to all vehicles when new.

IDLE SPEED INSPECTION E11FXCR

(1) Before inspection and adjustment set vehicles in the following condition.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicles with A/T)
- Steering wheel: Straight forward position

(2) Check the ignition timing. Adjust if necessary.

Standard value: 5° BTDC±2°

(3) After turning the ignition switch to OFF, connect the multi-use tester to the diagnosis connector (white).
(4) Start the engine and run it at idle.
(5) Run the engine at idle for 2 minutes.
(6) Check the idle speed. Select item No. 38 and take a reading of the idle speed.

Curb idle speed: 700±100 r/min.

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

(7) If there is a deviation from 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 vehicles in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 2°
3. After turning the ignition switch to OFF, connect the multi-use tester (MUT) to the diagnosis connector (white).
4. Start the engine and run it at 2,500 rpm 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 there is a deviation from the standard value, check the following items:
   - Diagnosis output
   - Closed-loop control (When the closed-loop 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
   Replace 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.

NOTES

COMPRESSION PRESSURE INSPECTION E11FGBM

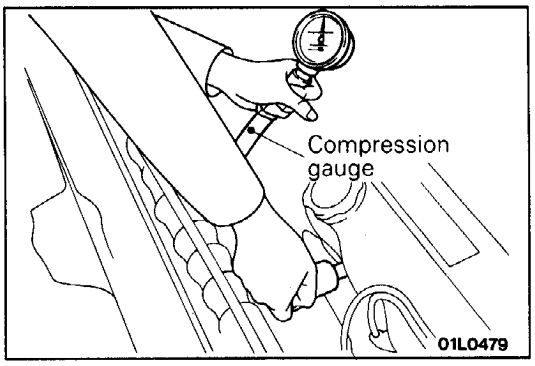
(1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicle with A/T)
- Steering wheel: Straight foward position

(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 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.**



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

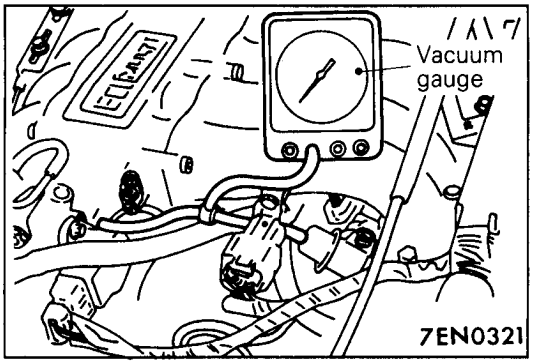
Limit: min. 1,050 kPa (10.5kg/cm², 149 psi.)

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

Limit: max. 100 kPa (1.0 kg/cm², 14 psi)

(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.

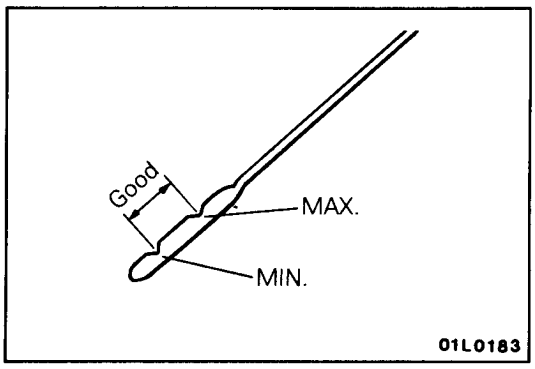
NOTE
This will erase the problem code resulting from the distributor connector being disconnected.

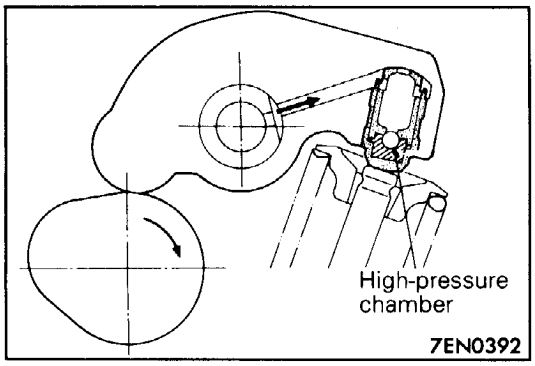


MANIFOLD VACUUM INSPECTION E11FWAS

(1) Start the engine and allow it to warm up until the temperature of the coolant reaches 80 to 95°C (176 to 205°F).
(2) Connect a tachometer.
(3) Attach a three-way union to the vacuum hose between the fuel pressure regulator and the air intake plenum, and connect a vacuum gauge.
(4) Start the engine and check that idle speed is within specification. The read off the vacuum gauge.
Standard value: Approx. 515 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 MPI system.
Vacuum gauge reading decreases irregularly.	• Idle mixture concentration too lean.	• Check MPI system.
Vacuum gauge pointer decreases about 30–160 mmHg (1.18–6.30 in.Hg) intermittently.	• Burned, warped or pitted valves.	• Install new valves.
Vacuum gauge pointer suddenly decreases about 250 mmHg (9.84 in.Hg) from standard value and then returns.	• Blown cylinder head gasket.	• Install new cylinder head gasket.





LASH ADJUSTERS CHECK E11FBAF1

NOTE
Soon after the engine is started or while it is running, abnormal noise (clattering) which may be attributed to the adjuster sounds but does not stop. In this case, check the following.

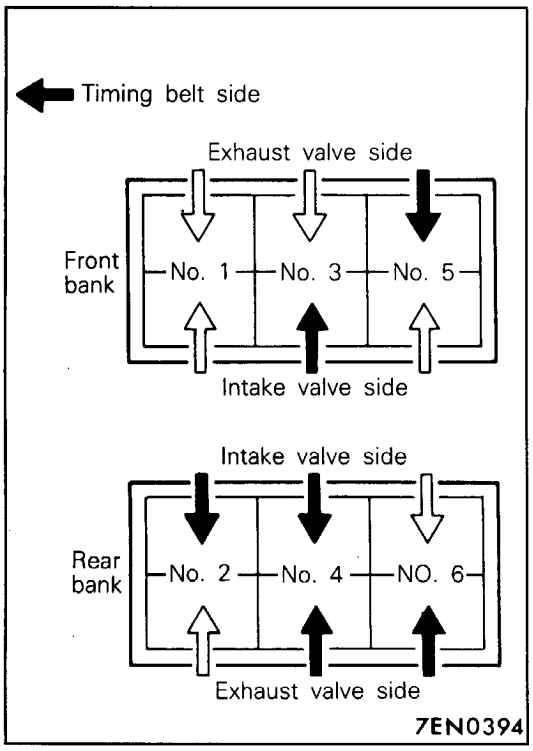
(1) Check the engine oil, and refill or replace oil if necessary.

NOTE
1. If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
2. If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
3. Air and oil can not be separated easily in the deteriorated oil, and the amount of air mixed in the oil increases.

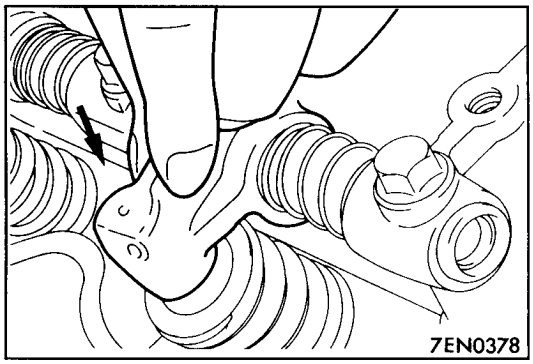
If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which occurs when the valve clearance is improperly adjusted to the excessively large.
However, it will return to the normal if the air entrapped in the adjuster is released in this case.

(2) Start the engine, and slowly race* it several times (10 times or less).
If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
* Gradually increase the engine speed from the idle speed to 3,000 r/min. (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

NOTE
1. If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the 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 lash adjuster, air sometimes enters the high-pressure chamber.

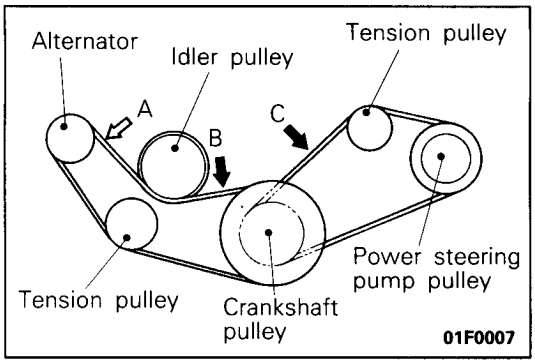


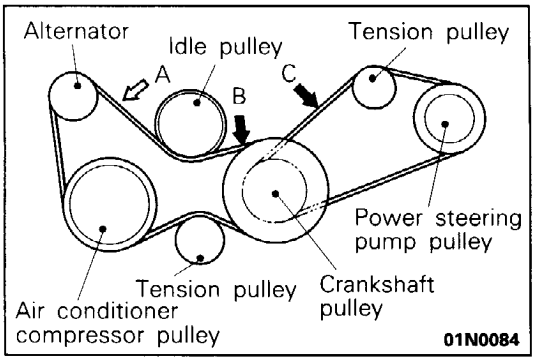
(3) If any abnormal noise is not eliminated by racing, check the lash adjuster.
① Stop the engine.
② Set the engine so that cylinder No. 1 is positioned at the top dead centre of the compression.
③ Press the rocker arm at the area indicated by the ⇦ arrow mark to check whether the rocker arm is lowered or not.
④ Slowly turn the crankshaft 360 degrees clockwise.
⑤ In the same procedure as Step ③, check the rocker arm at the area indicated by the ⬅ arrow mark.

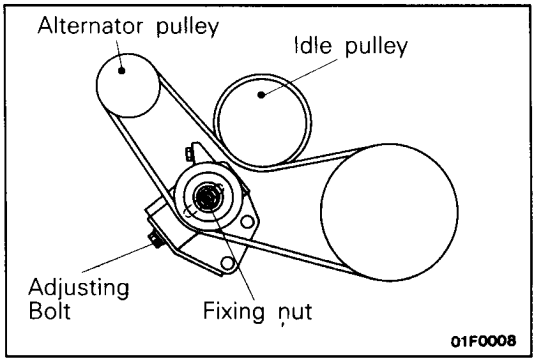


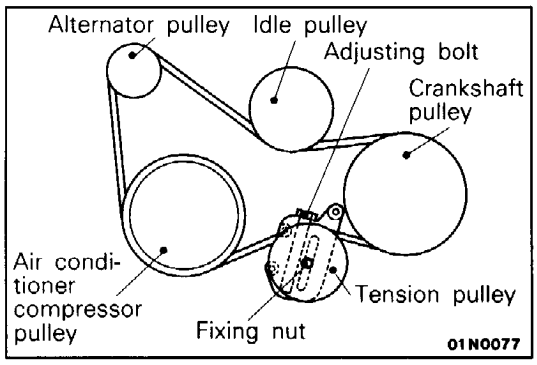
⑥ If the rocker arm is lowered when it is pressed, replace the lash adjuster.
When the lash adjuster is replaced, bleed air from all adjusters and assemble them. Recheck them following Steps ① to ⑤.
Moreover, if it is felt to be so hard that the rocker arm is not lowered when it is pressed, the lash adjuster is normal. Check for other causes of the abnormality.

NOTE
For the air bleeding procedure of the lash adjuster, refer to the engine workshop manual.









SERVICE ADJUSTMENT PROCEDURES <DOHC>

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

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

Standard value:

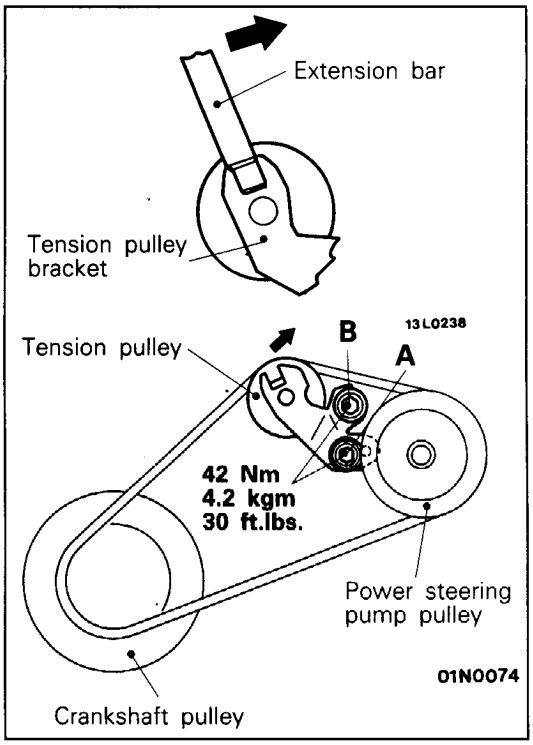
mm (in.)

Items		Check value	Adjustment value	
			New belt	Used belt
For alternator or alternator and A/C compressor	A or B	4.0–5.5 (0.16–0.22)	3.5–4.0 (0.14–0.16)	4.0–5.0 (0.16–0.20)
P/S pump	C	9.0–11.0*1 (0.35–0.43) or 9.5–13.5*2 (0.37–0.53)	7–8.5*1 (0.28–0.33) or 7.5–9.0*2 (0.30–0.35)	9.0–11.0*1 (0.35–0.43) or 10.5–12.5*2 (0.41–0.49)

NOTE
*1 : Vehicles built up to October, 1991
*2 : Vehicles built from November, 1991

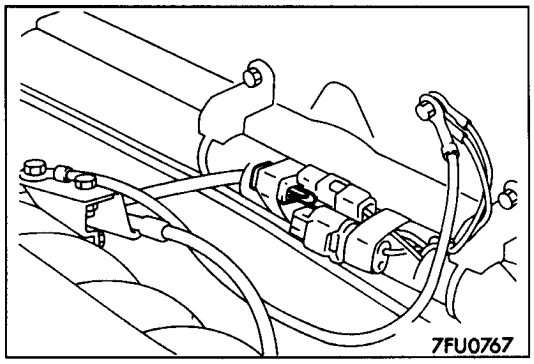
ALTERNATOR DRIVE BELT TENSION ADJUSTMENT <DOHC> <Vehicle without air conditioner>

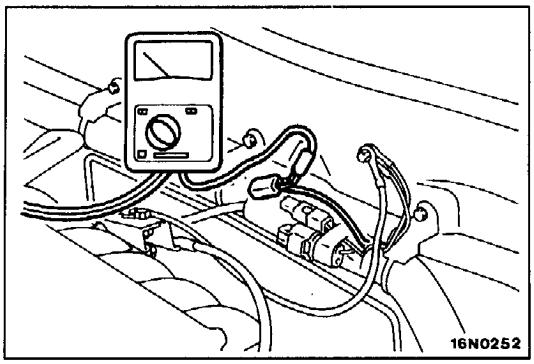
ALTERNATOR AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION ADJUSTMENT <DOHC> <Vehicle with air conditioner>



POWER STEERING PUMP DRIVE BELT TENSION ADJUSTMENT

(1) Insert an extension bar [insertion depth 12.7 mm (0.5 in.)], etc. into the opening at the end of the tension pulley bracket.
(2) Use straight handle box wrench to loosen the tension pulley fixing bolts in the order of A and B.
(3) Move the extension bar installed to the tension pulley in the direction of arrow to adjust the belt tension.
(4) Use straight handle box wrench to tighten the tension pulley fixing bolts in the order of A and B.
(5) Give the crankshaft one turn or more in normal direction (clockwise) to run in the belt.
(6) Check the belt deflection. Readjust, if necessary.





IGNITION TIMING INSPECTION AND ADJUSTMENT <Vehicles built up to November, 1992>

E11FUBB

(1) Before inspection and adjustment set vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicles with A/T)
- Steering wheel: Straight forward position

(2) Insert a paper clip into the 1-pin connector (blue) as shown in the illustration.

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

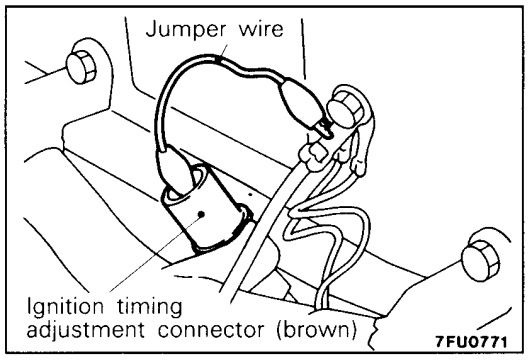
NOTE
Do not use the Multi-use tester.
If tested with the Multi-use tester connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.

(4) Set the timing light.
(5) Start the engine and run at idle.
(6) Check that engine idle speed is within the standard value.

Standard value: 700± 100 r/min.

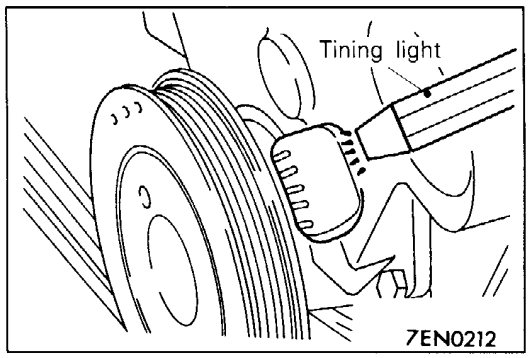
NOTE
The engine speed indicated is a third of actual speed. In other words, the reading of the tachometer times 3 is actual speed.

(7) Turn the ignition switch to OFF.



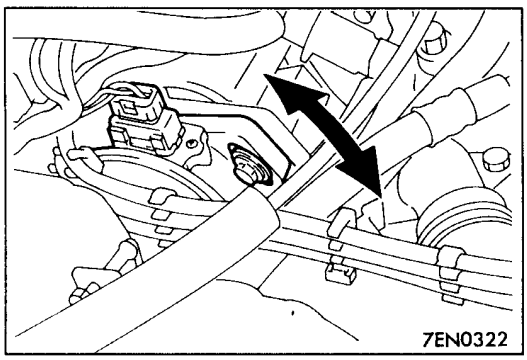
(8) Remove the waterproof connector from the ignition timing adjustment connector (brown).
(9) Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

NOTE
Grounding this terminal sets the engine to the basic ignition timing.



(10)Start the engine and run at idle.
(11)Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC±2°



(12)If there is a deviation from the standard value, loosen holding nut of the crankshaft angle sensor, and then rotate the crankshaft angle sensor to adjust.

NOTE
The ignition timing is advanced when the crankshaft angle sensor itself is turned clockwise direction, and is retarded when turned anticlockwise direction.

(13)After adjustment, tighten the nut.

Caution
Be careful; when tightening the nut, that the crankshaft-angle sensor does not move.

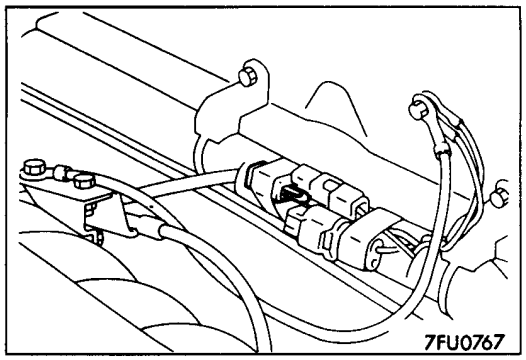
(14)Stop the engine, remove the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
(15)Start the engine and check that ignition timing is at the standard value.

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 15° BTDC at higher altitudes.

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

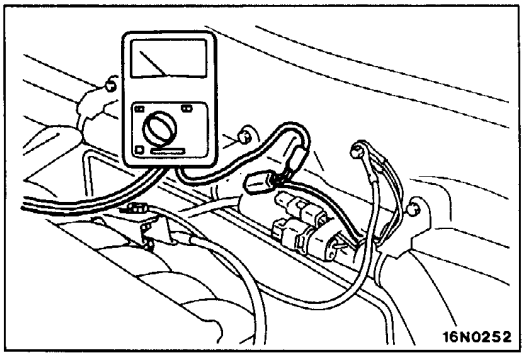
NOTE
Sealing tape is attached to all vehicles when new.



IGNITION TIMING INSPECTION <Vehicles built from December, 1992> E11FUBB

(1) Before inspection and adjustment set vehicle in the following condition.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicles with A/T)
- Steering wheel: Straight forward position

(2) Insert a paper clip into the 1-pin connector (blue) as shown in the illustration.



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

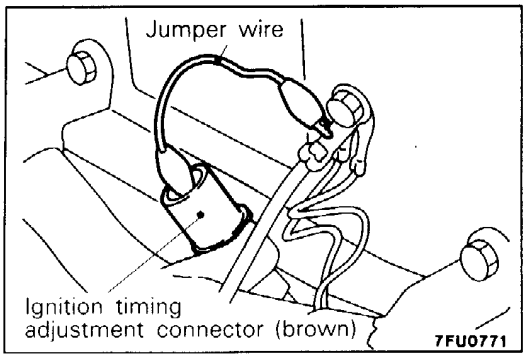
NOTE
Do not use the Multi-use tester.
If tested with the Multi-use tester connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.

(4) Set the timing light.
(5) Start the engine and run at idle.
(6) Check that engine idle speed is within the standard value.

Standard value: 700± 100 r/min.

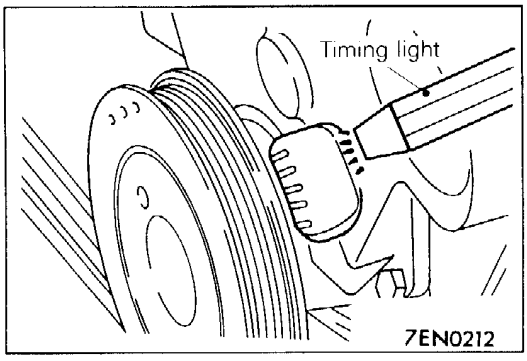
NOTE
The engine speed indicated is a third of actual speed. In other words, the reading of the tachometer times 3 is actual speed.

(7) Turn the ignition switch to OFF.



(8) Remove the waterproof connector from the ignition timing adjustment connector (brown).
(9) Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

NOTE
Grounding this terminal sets the engine to the basic ignition timing.



(10) Start the engine and run at idle.
(11) Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC ± 3°

(12) If there is a deviation from the standard value, refer to GROUP 13 – On Vehicle Inspection of MPI Components and check the crank angle sensor.

(13) Stop the engine, remove the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
(14) 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 15° BTDC at higher altitudes.

IDLE SPEED INSPECTION E11FXCS

(1) Before inspection and adjustment set vehicles in the following condition.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicles with A/T)

(2) Check the ignition timing. (Refer to P.11-13.)

Standard value:
Vehicles built up to November, 1992 5° BTDC ± 2°
Vehicles built from December, 1992 5° BTDC ± 3°

(3) After turning the ignition switch to OFF, connect the multi-use tester to the diagnosis connector (white).
(4) Start the engine and run it at idle.
(5) Run the engine at idle for 2 minutes.
(6) Check the idle speed. Select item no.38 and take a reading of the idle speed.

Curb idle speed: 700± 100 r/min.

NOTE
1. The idle speed is adjusted automatically by the idle speed control (ISC) system.
2. The engine speed indicated is a third of actual speed. In other words, the reading of the tachometer times 3 is actual speed.

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

IDLE MIXTURE INSPECTION

Refer to P.11-8-1, for information concerning inspection procedures.

Basic ignition timing:
Vehicles built up to November, 1992 5°BTDC ± 2°
Vehicles built from December, 1992 5°BTDC ± 3°

COMPRESSION PRESSURE INSPECTION E11FGBN

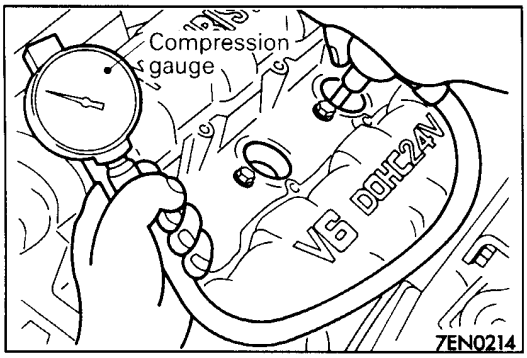
(1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and all accessories: OFF
- Transmission: Neutral (P range on vehicle with A/T)

(2) Disconnect the spark plug cables.
(3) Remove all of the spark plugs.
(4) Disconnect the crank angle sensor 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 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.**



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

Limit: min. 980 kPa (9.8 kg/cm², 139 psi.)

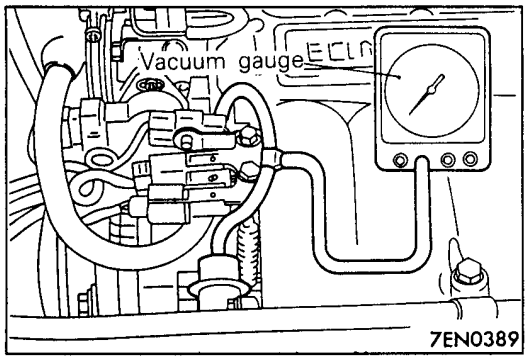
(8) Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: max. 100 kPa (1.0 kg/cm², 14 psi.)

(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 crank angle sensor 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 problem code resulting from the crank angle sensor connector being disconnected.



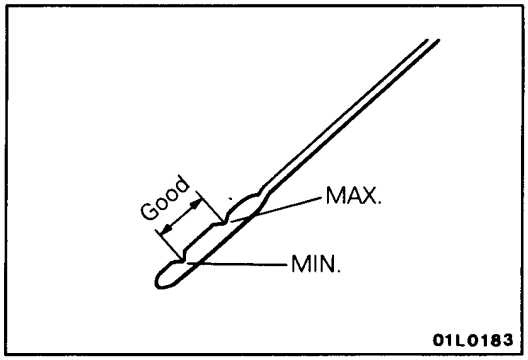
MANIFOLD VACUUM INSPECTION E11FWAT

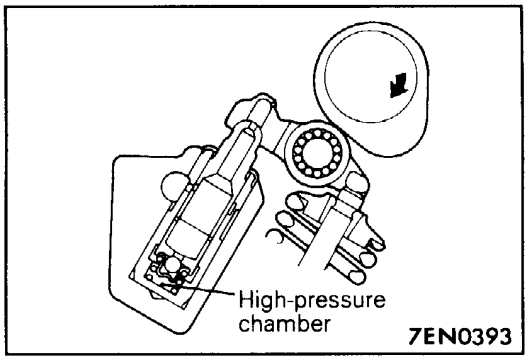
(1) Start the engine and allow it to warm up until the temperature of the coolant reaches 80 to 95°C (176 to 205°F).
(2) Connect a tachometer.
(3) Attach a three-way union to the vacuum hose between the fuel pressure regulator and the air intake plenum, and connect a vacuum gauge.
(4) Start the engine and check that idle speed is within specification. Then read off the vacuum gauge.

Standard value: Approx. 520 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 MPI system.
Vacuum gauge reading decreaes irregularly.	• Idle mixture concentration too lean.	• Check MPI system.
Vacuum gauge pointer decreases about 30–160 mmHg (1.18–6.30 in.Hg) intermittently.	• Burned, warped or pitted valves.	• Install new valves.
Vacuum gauge pointer suddenly decreases about 250 mmHg (9.84 in.Hg) from standard value and then returns.	• Blown cylinder head gasket.	• Install new cylinder head gasket.





LASH ADJUSTERS CHECK

E11FBAF2

NOTE
Soon after the engine is started or while it is running, abnormal noise (clattering) which may be attributed to the adjuster sounds but does not stop. In this case, check the following.

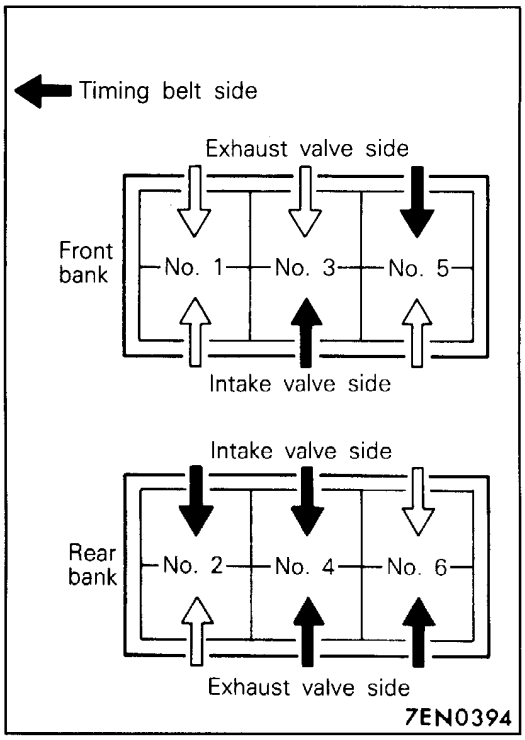
(1) Check the engine oil, and refill or replace oil if necessary.

NOTE
1. If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
2. If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
3. Air and oil can not be separated easily in the deteriorated oil, and the amount of air mixed in the oil increases.

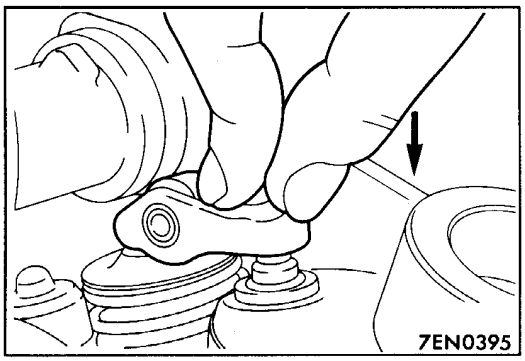
If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which occurs when the valve clearance is improperly adjusted to be excessively large.
However, it will return to be normal if the air entrapped in the adjuster is released in this case.

(2) Start the engine, and slowly race* it several times (10 times or less).
If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
* Gradually increase the engine speed from the idle speed to 3,000 r/min. (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

NOTE
1. If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the 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 lash adjuster, air sometimes enters the high-pressure chamber.



(3) If any abnormal noise is not eliminated by racing, check the lash adjuster.
① Stop the engine.
② Set the engine so that cylinder No. 1 is positioned at the top dead centre of the compression.
③ Press the rocker arm at the area indicated by the ⇦ arrow mark to check whether the rocker arm is lowered or not.
④ Slowly turn the crankshaft 360 degrees clockwise.
⑤ In the same procedure as Step ③, check the rocker arm at the area indicated by the ⬅ arrow mark.



⑥ If the rocker arm is lowered when it is pressed, replace the lash adjuster.
When the lash adjuster is replaced, bleed air from all adjusters and assemble them. Recheck them following Steps ① to ⑤.
Moreover, if it is felt to be so hard that the rocker arm is not lowered when it is pressed, the lash adjuster is normal. Check for other causes of the abnormality.

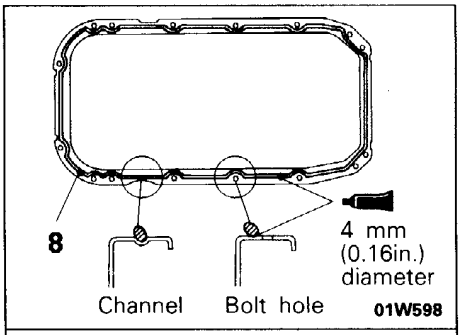
NOTE
For the air bleeding procedure of the lash adjuster, refer to the engine workshop manual.

OIL PAN

E11KA–

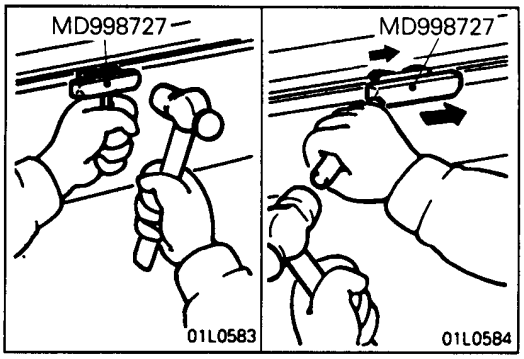
REMOVAL AND INSTALLATION
<DOHC built up to October, 1992 and SOHC>

Pre-removal and Post-installation Operation
(1) Draining and Supplying of Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)
(2) Removal and Installation of Oil Level Gauge
(3) Removal and Installation of Under Cover
(4) Removal and Installation of Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Muffler.)



Sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

Removal steps
1. Right member <4WS>
2. Left member
3. Harness connector
4. Starter
5. Roll stopper stay
6. Transmission stay
7. Bell housing cover
8. Engine oil level sensor
◀■▶ ▶◀ 9. Oil pan



SERVICE POINTS OF REMOVAL E11K8BI

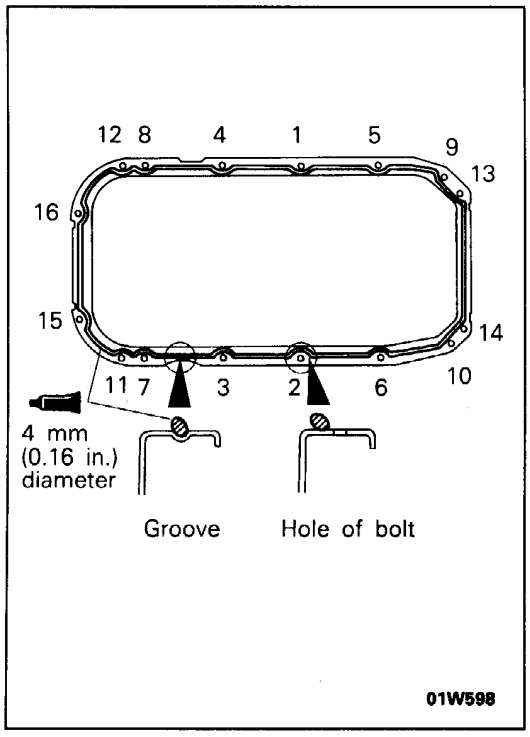
9. REMOVAL OF OIL PAN

(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 E11KEAA

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



SERVICE POINTS OF INSTALLATION E11KDBI

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

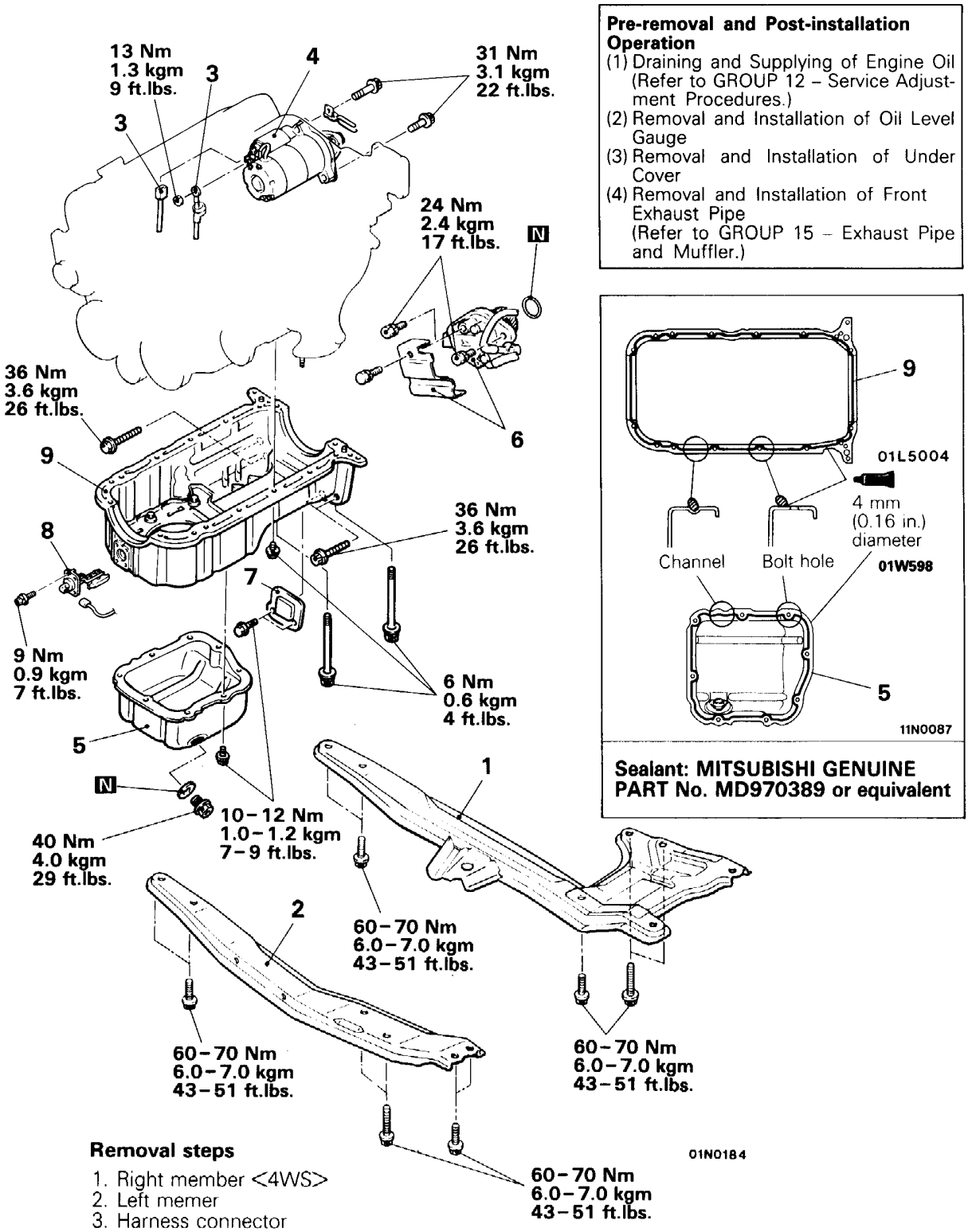
NOTE
The sealant should be applied in a continuous bead approximately 4 mm (0.16 in.) in diameter.

(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 (left).**
2. **After installing the oil pan, wait at least 30 minutes before starting the engine.**

REMOVAL AND INSTALLATION
<DOHC built from November, 1992>

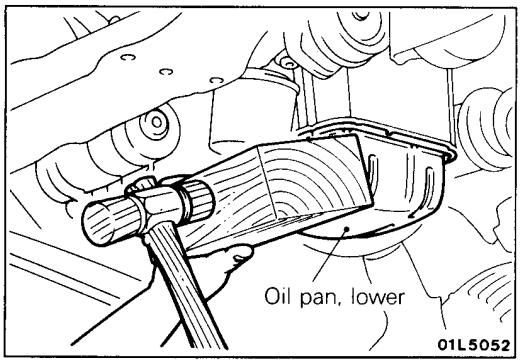
E11KA-A



Pre-removal and Post-installation Operation
(1) Draining and Supplying of Engine Oil (Refer to GROUP 12 – Service Adjustment Procedures.)
(2) Removal and Installation of Oil Level Gauge
(3) Removal and Installation of Under Cover
(4) Removal and Installation of Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe and Muffler.)

Sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

Removal steps
1. Right member <4WS>
2. Left memer
3. Harness connector
4. Starter
5. Oil pan, lower
6. Rear oil pump <4WS>
7. Cover
8. Engine oil level sensor
9. Oil pan, upper



SERVICE POINTS OF REMOVAL

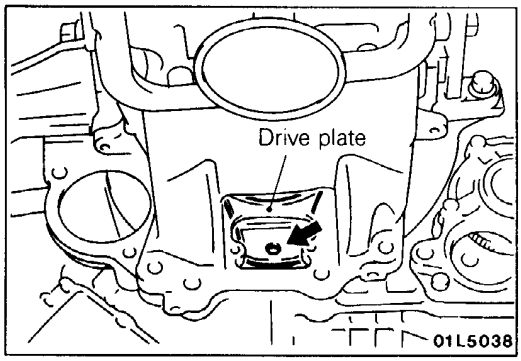
5. REMOVAL OF OIL PAN, LOWER

(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 (MD998723) can damage the oil pan, upper (aluminum made).

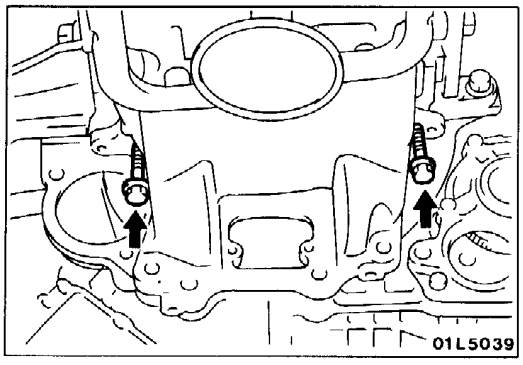
6. REMOVAL OF REAR OIL PUMP <4WS>

(1) Remove the oil pump with hose attached from the transmission.
(2) Place the oil pump somewhere so it will not be in the way while working.



9. REMOVAL OF OIL PAN, UPPER

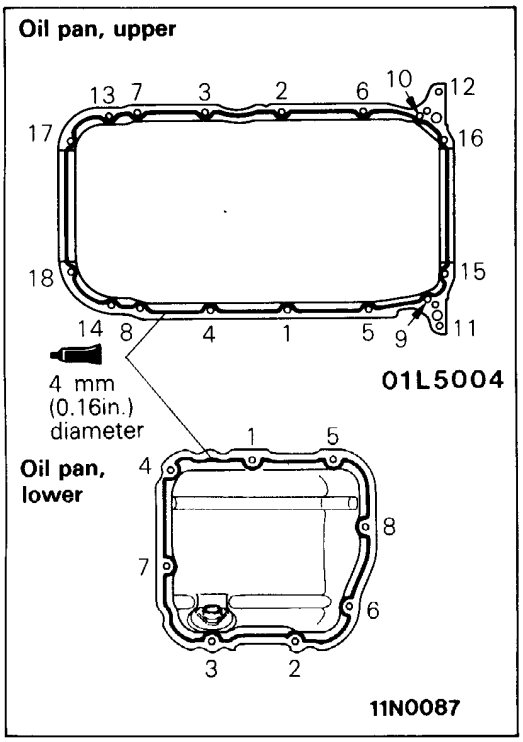
(1) For vehicles with A/T, rotate the drive plate to the position shown in the figure to prevent the oil pan from interfering with the drive plate when removing the oil pan, upper, and remove the drive plate attaching bolt.
(2) Remove the oil pan, upper installation bolt.

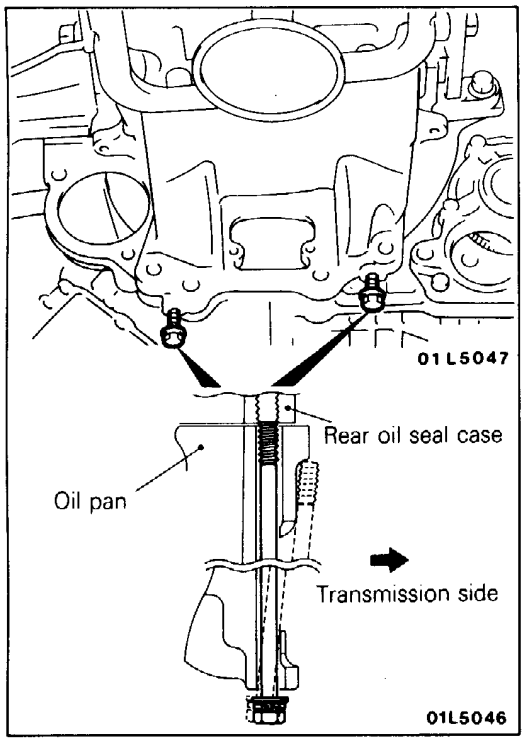


(3) Install the bolt [bolt diameter x length: 10 x 38 mm (0.39 x 1.50 in.)] that links the oil pan, upper with the transmission in the hole of the oil pan, upper as shown in the figure and tighten the bolt to remove the oil pan, upper.

INSPECTION E11KEAA1

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





SERVICE POINTS OF INSTALLATION E11KDBI1

9. INSTALLATION OF OIL PAN, UPPER/5. 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 (left).

Caution
1. **Put the bolt in the oil pan, upper installation hole as shown in the figure not to be slanted and tighten it fully in the rear oil seal case.**
2. **After installing the oil pan, wait at least 30 minutes before starting the engine.**

(6) For vehicles with A/T, tighten the attaching bolt of the removed drive plate.

Tightening torque:
46 – 53 Nm (4.6 – 5.3 kgm, 33 – 38 ft.lbs.)

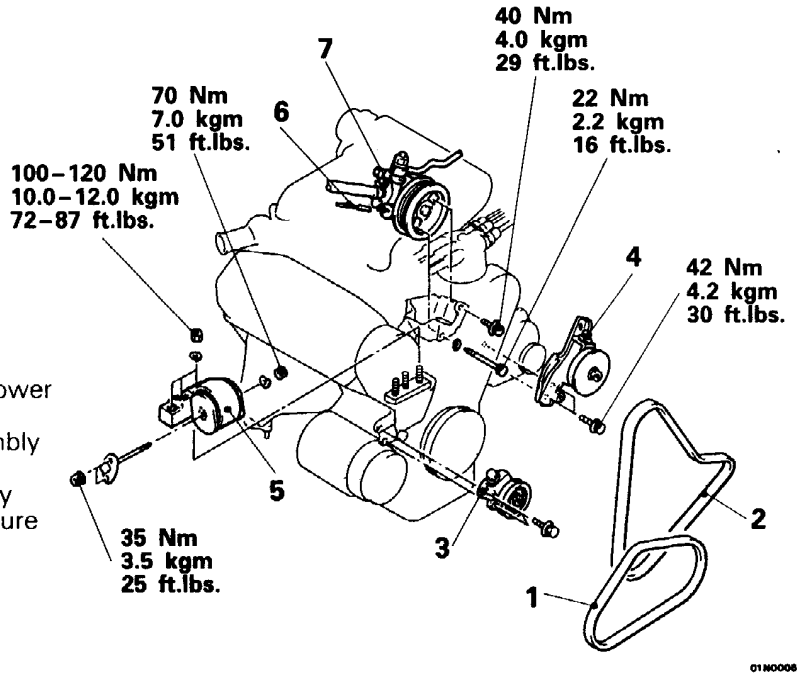
NOTES

TIMING BELT <SOHC>

REMOVAL AND INSTALLATION

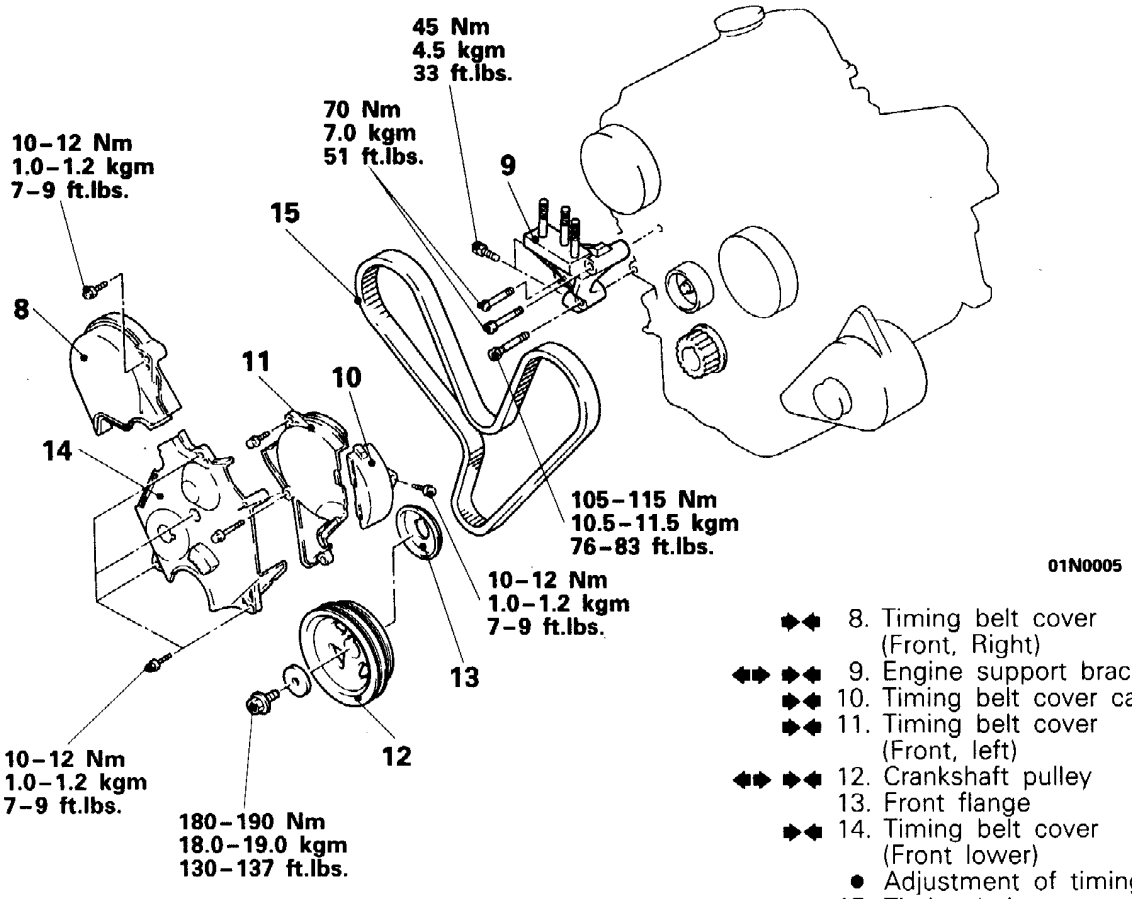
Pre-removal Operation
(1) Removal of Under Cover (LH)
(2) Jack up the engine transmission assembly until there is no weight on the engine mount insulator.
(3) Removal of Headlamp Washer Tank

Post-installation Operation
(1) Installation of Headlamp Washer Tank
(2) Installation of Under Cover (LH)



Removal steps

- V-belt tension adjustment (Refer to P.11-6.)
1. V-ribbed belt (Air conditioner)
2. V-ribbed belt (Alternator and power steering pump)
3. Tensioner pulley bracket assembly
4. Tensioner pulley assembly
◆◆ 5. Engine mount bracket assembly
6. Power steering oil pump pressure switch connector
◆◆ ◆◆ 7. Power steering oil pump



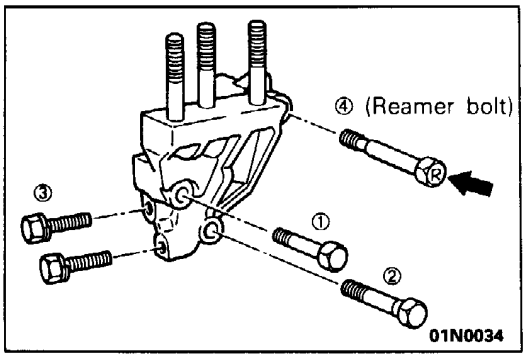
◆◆ 8. Timing belt cover (Front, Right)
◆◆ ◆◆ 9. Engine support bracket
◆◆ 10. Timing belt cover cap
◆◆ 11. Timing belt cover (Front, left)
◆◆ ◆◆ 12. Crankshaft pulley
13. Front flange
◆◆ 14. Timing belt cover (Front lower)
● Adjustment of timing belt tension
◆◆ ◆◆ 15. Timing belt

SERVICE POINTS OF REMOVAL E11GBFC

7. DISCONNECTION OF POWER STEERING OIL PUMP

Disconnect the oil pump (with the hose attached).

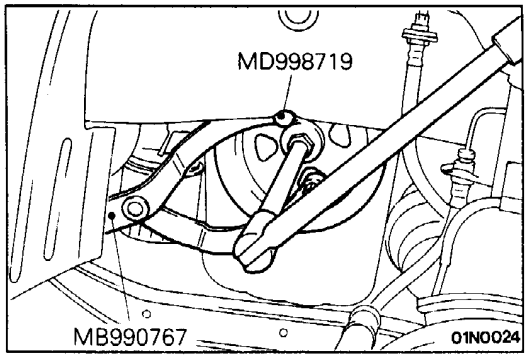
NOTE
Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.



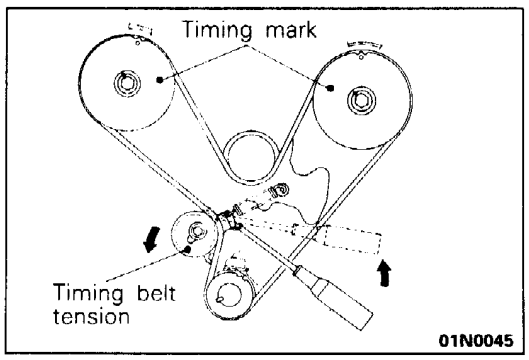
9. REMOVAL OF ENGINE SUPPORT BRACKET

Remove the engine support bracket in the numbered sequence shown in the illustration.
Spraying lubricant, slowly remove the bolt (reamer bolt) indicated by the arrow.

Caution
Keep in mind that the reamer bolt is sometimes heat seized on the engine support bracket.

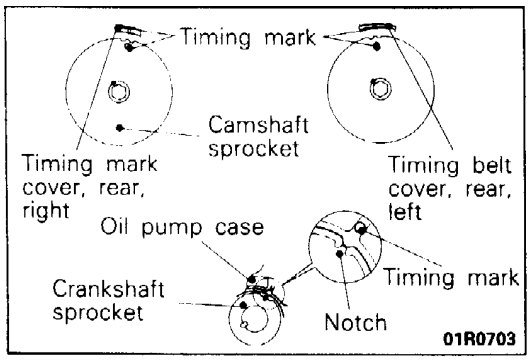


12. REMOVAL OF CRANKSHAFT PULLEY



15. REMOVAL OF TIMING BELT

(1) Align the timing marks.
(2) Loosen the timing belt tensioner bolt. Use a screwdriver to fully turn the timing belt tensioner anticlockwise along the oblong hole, and then tighten the tensioner bolt.
(3) If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).
(4) Remove the timing belt.

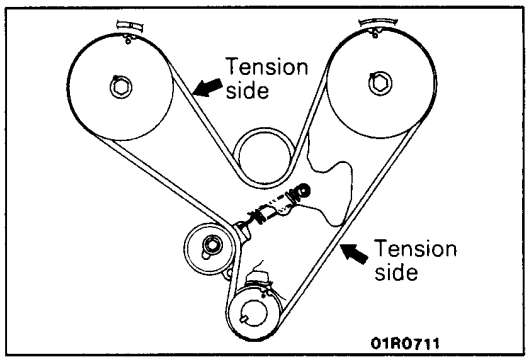


SERVICE POINTS OF INSTALLATION E11GDFC

15. INSTALLATION OF TIMING BELT

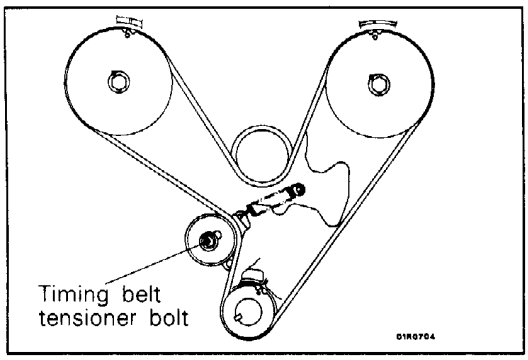
(1) Check that the timing marks of the camshaft sprocket and the crankshaft sprocket are all aligned.

NOTE
In this condition, the No. 1 piston is at top dead centre of the compression.



(2) Install the timing belt, while making sure that the tension side of the belt is not slackened.

NOTE
If the timing belt is re-used, install so that the arrow marked on it at the time of removal is pointing in the direction of rotation (right turn).

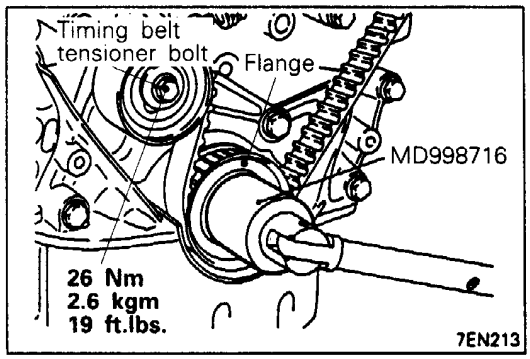


- **ADJUSTMENT OF TIMING BELT TENSION**

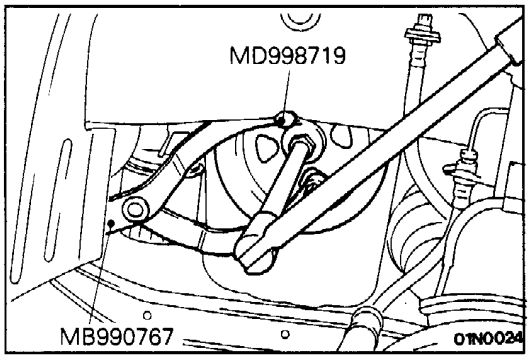
(1) Loosen the timing belt tensioner bolt 1-2 turns to apply tension to the timing belt by the force of the tensioner spring.

Caution
As the purpose of this procedure is to apply the proper amount of tension to the timing belt, be sure not to rotate the crankshaft in the opposite direction (left turn), or place pressure on the belt to check the amount of tension.

(2) Install the flange and the special tool, and turn the crankshaft in the correct direction (clockwise direction) two turns.
(3) Realign the timing marks of each sprocket.
(4) Tighten the timing belt tensioner bolt to the specified torque.



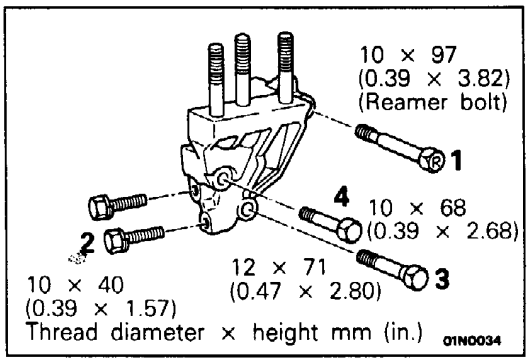
12. INSTALLATION OF CRANKSHAFT PULLEY

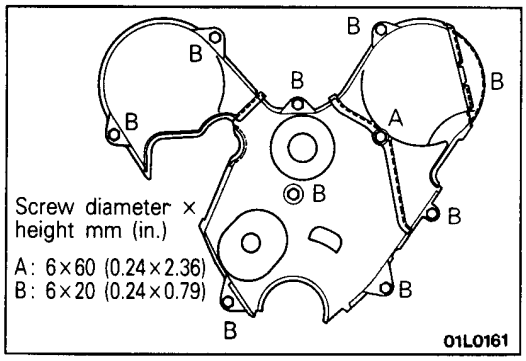


9. INSTALLATION OF ENGINE SUPPORT BRACKET

Since the mounting bolts of engine support bracket are different in size depending on location, insert them in numbered sequence.

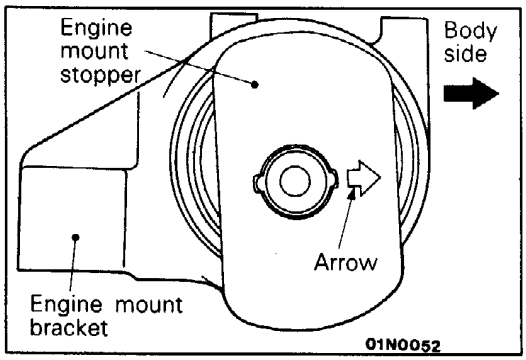
Caution
When installing the reamer bolt, tighten it, slowly spraying lubricant on the reamer area.





14. INSTALLATION OF TIMING BELT COVER (FRONT LOWER)/11. TIMING BELT COVER (FRONT LEFT)/10. TIMING BELT COVER CAP/8. TIMING BELT COVER (FRONT RIGHT)

The dimensions of the installation bolts for the timing covers differ according to the installation location, so be sure not to install the bolts in the incorrect locations.



5. INSTALLATION OF ENGINE MOUNT BRACKET ASSEMBLY

Attach the engine mount bracket stopper so that the arrow faces in the direction as shown in the illustration

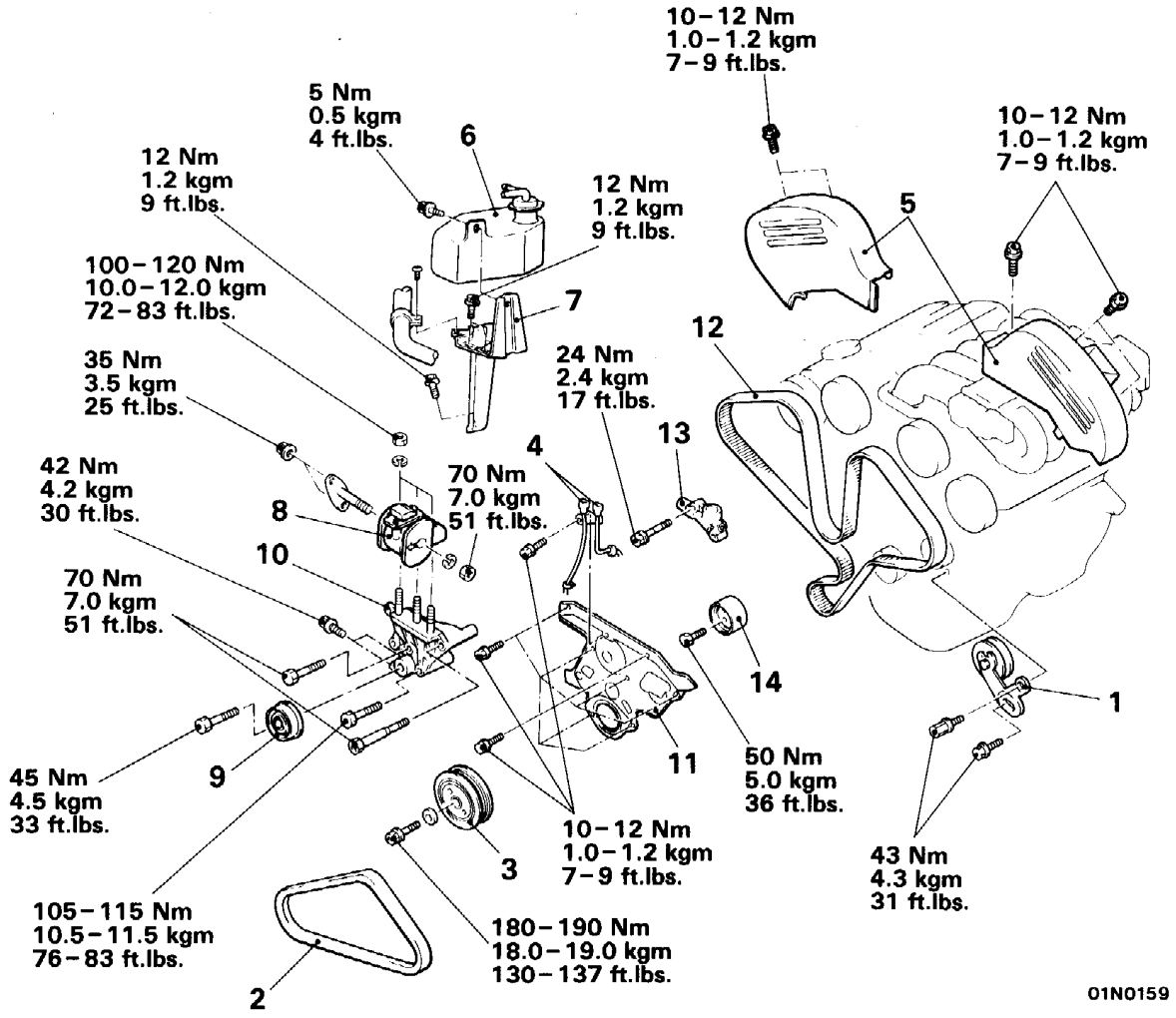
TIMING BELT <DOHC>

N09KA-B

REMOVAL AND INSTALLATION

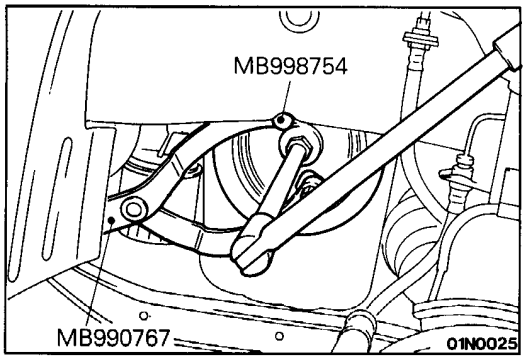
Pre-removal Operation
(1) Jack up the engine transmission assembly until there is no weight on the engine mount insulator.
(2) Removal of Under Cover (LH)
(3) Removal of Headlamp Washer Tank
(4) Removal of Alternator
(Refer to GROUP 16 – Alternator.)

Post-installation Operation
(1) Installation of Alternator
(Refer to GROUP 16 – Alternator.)
(2) Installation of Headlamp Washer Tank
(3) Installation of Under Cover (LH)
(4) Adjustment of Drive Belt Tension
(Refer to P.11-12.)



Removal steps

1. Tensioner pulley
2. Drive belt (Power steering)
◆◆▶◆ 3. Crankshaft pulley
4. Camshaft position sensor connector and crank angle sensor connector
<Vehicles built from November, 1992>
5. Timing belt upper cover
6. Condense tank
<Vehicle with ABS or headlamp washer>
7. Condense tank bracket
<Vehicle with ABS or headlamp washer>
8. Engine mount bracket assembly
9. Idler pulley
◆◆▶◆ 10. Engine support bracket
▶◆ 11. Timing belt lower cover
● Adjustment of timing belt tension
◆◆▶◆ 12. Timing belt
▶◆ 13. Auto tensioner
14. Tension pulley

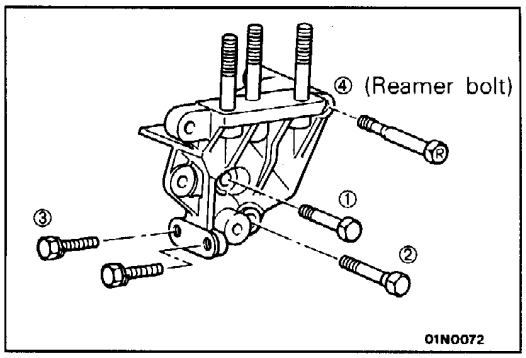


SERVICE POINTS OF REMOVAL

3. REMOVAL OF CRANKSHAFT PULLEY

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

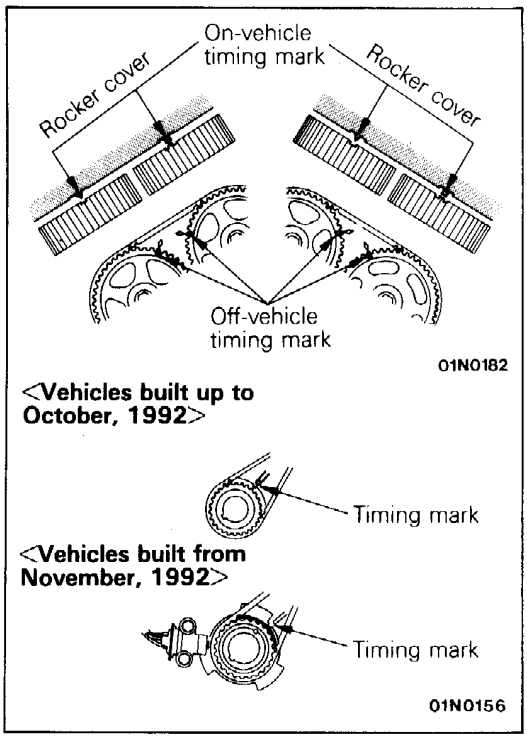
Caution
Use only the specified special tools, or a damaged pulley damper could result.



10. REMOVAL OF ENGINE SUPPORT BRACKET

Remove the engine support bracket in the numbered sequence shown in the illustration.
Spraying lubricant, slowly remove the bolt (reamer bolt) indicated by the arrow.

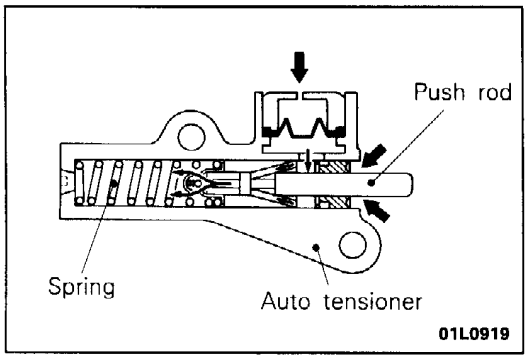
Caution
Keep in mind that the reamer bolt is sometimes heat seized on the engine support bracket.



12. REMOVAL OF TIMING BELT

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

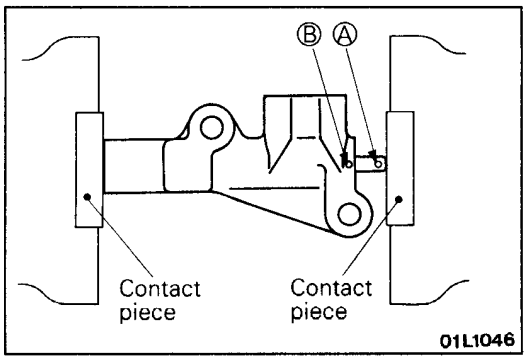
Caution
1. **Make a mark on the back of the timing belt indicating the direction of rotation so it may be reassembled in the same direction if it is to be reused.**
2. **The cam of the front bank camshaft lifts the valve by means of the rocker arm, the spring force of the valve will easily turn the sprocket,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

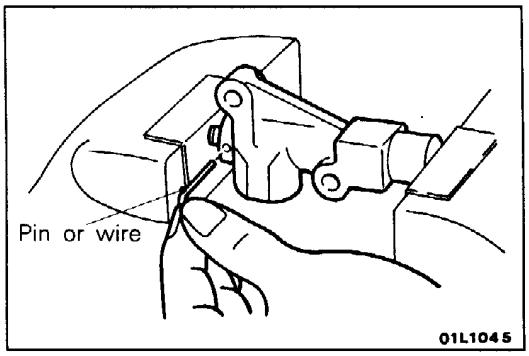


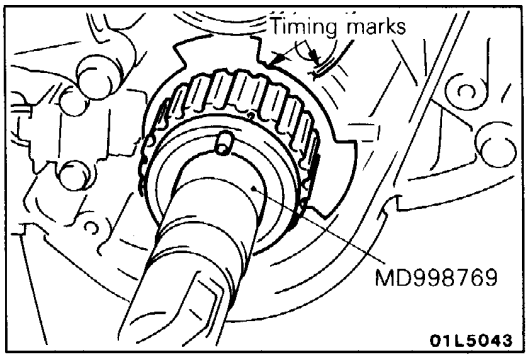
INSPECTION

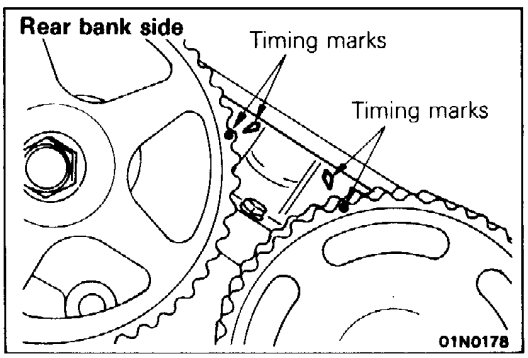
AUTO TENSIONER

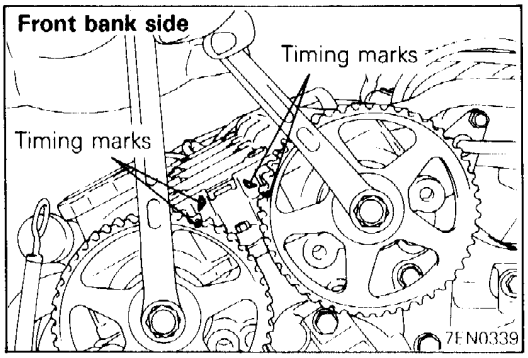
- Check the auto tensioner for possible leaks.
- Check the push rod for cracks.











SERVICE POINTS OF INSTALLATION E11GDBCa

13. INSTALLATION OF AUTO TENSIONER

(1) Using a press or vise, compress the push rod of the auto tensioner as slowly as possible and align pin hole A of the push rod and pin hole B of the tensioner cylinder.

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

(2) Insert a wire with a diameter of 1.4 mm (0.05 in.) into the aligned pin 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".

(3) Install the tensioner to engine.

12. INSTALLATION OF TIMING BELT

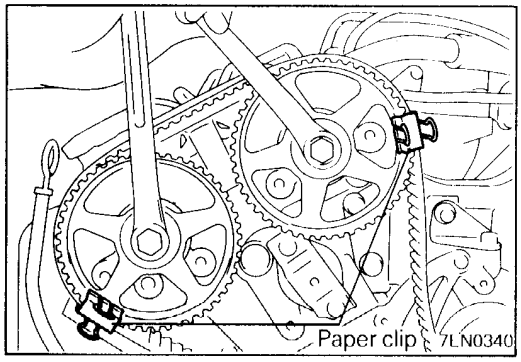
(1) Install the crankshaft pulley and turn the crankshaft sprocket timing mark forward 3 teeth to move the piston slightly past No.1 cylinder top dead centre.

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 rear bank side camshaft sprocket.

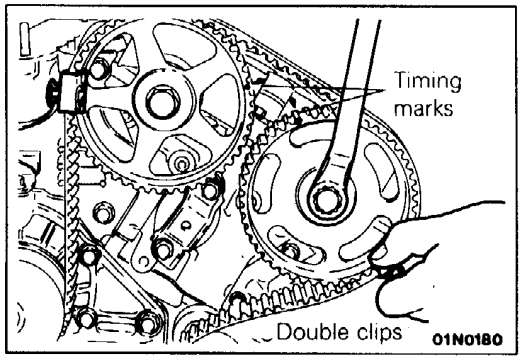
(3) Align the timing mark of the front bank side camshaft sprocket and support it not to rotate with a closed wrench.

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

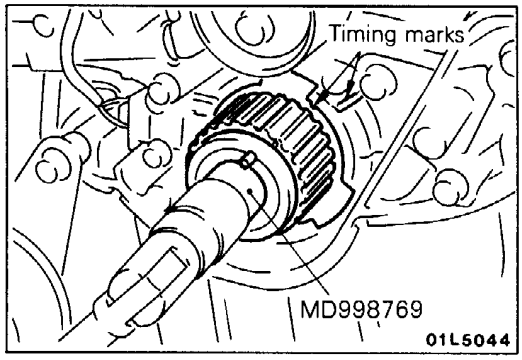


(4) Check that the camshaft sprocket timing mark of the front bank side is aligned and clamp timing belt with double clips.

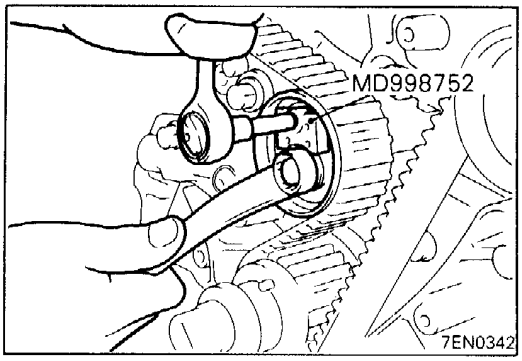
Caution
If the timing belt is reused, install so that the arrow marked on it at the time of removal is pointing in the clockwise direction.



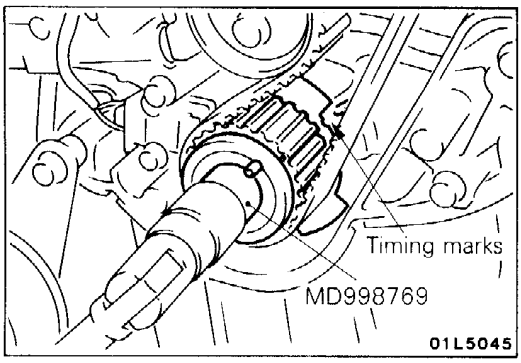
(5) Set the timing belt onto the water pump pulley.
(6) Check that the camshaft sprocket timing mark of the rear bank side is aligned and clamp the timing belt with double clips.
(7) Set the timing belt onto the idler pulley.



(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.

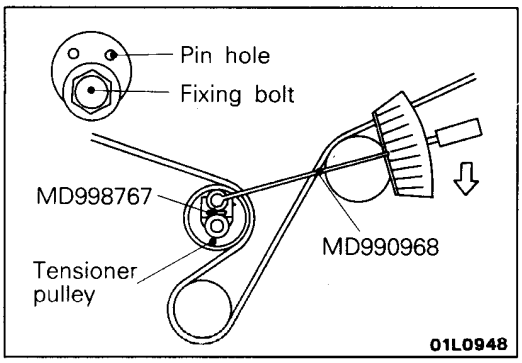


(11) Place the tensioner pulley pin hole so that it is towards the top. Press the tensioner pulley onto the timing belt, and provisionally tighten the fixing bolt.
(12) Align the crankshaft sprocket timing marks.
(13) Check that each of the sprocket timing mark is aligned.
(14) Remove the 4 double clips.



- **ADJUSTMENT OF TIMING BELT TENSION**

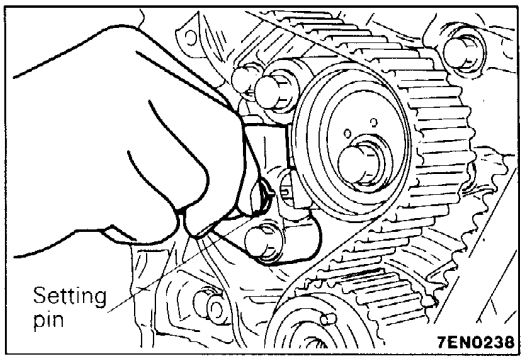
(1) After turning the crankshaft a 1/4 turn anticlockwise, turn it clockwise to the position where the timing marks are aligned.



(2) Next, loosen the center bolt of the tensioner pulley and using the special tool and a torque wrench, apply tension to the timing belt as shown in the illustration; then tighten the center bolt at the specified torque.

Caution
When tightening the bolt, ensure that the tensioner pulley shaft doesn't rotate with the bolt.

Specified torque: 10 Nm (1.0 kgm, 7.2 ft.lbs.) [tensional torque]

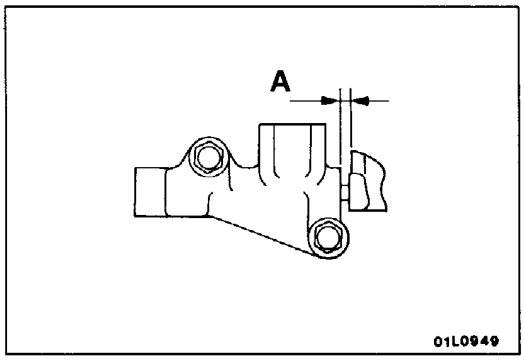


(3) Pull out the auto tensioner setting pin. At this time, check that the setting pin can be pulled out easily. Turn the crankshaft clockwise 2 turns, and after leaving it in this position for 5 minutes or more, check again that the auto tensioner setting pin can be pulled or inserted easily.

NOTE
If the setting pin cannot be easily inserted, then it is satisfactory if the auto tensioner rod projection amount is within the standard value.

Standard value (A): 3.8–4.5 mm (0.15–0.18 in.)

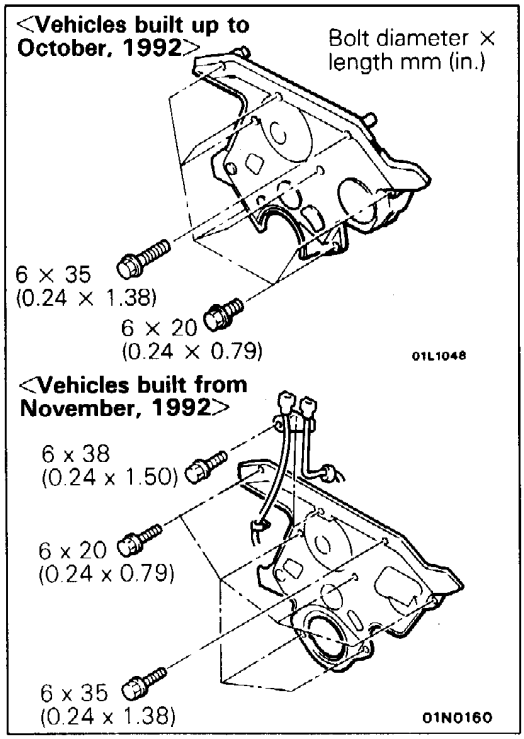
If it is outside the standard value, repeat the operations in steps 1. to 3.

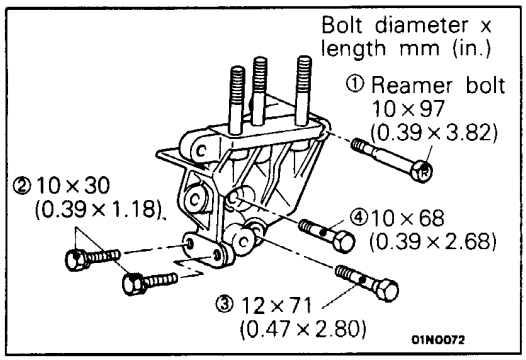


(4) Check again that each of the sprocket timing marks is aligned.

11. INSTALLATION OF TIMING BELT LOWER COVER

The dimensions of the mounting bolts are different, so do be sure to install them correctly.

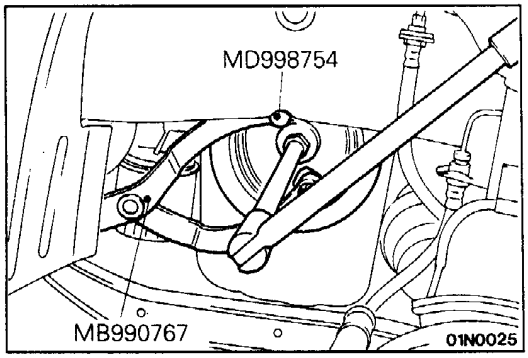




9. INSTALLATION OF ENGINE SUPPORT BRACKET

Since the engine support bracket mounting bolts differ in size depending on their locations, install them in the numbered sequence shown in the figure.

Caution
When installing the reamer bolt, tighten it slowly while spraying lubricant on the reamer area.



4. INSTALLATION OF CRANKSHAFT PULLEY

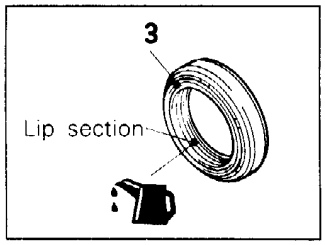
Caution
Use only the specified special tools, otherwise the pulley damper could be damaged.

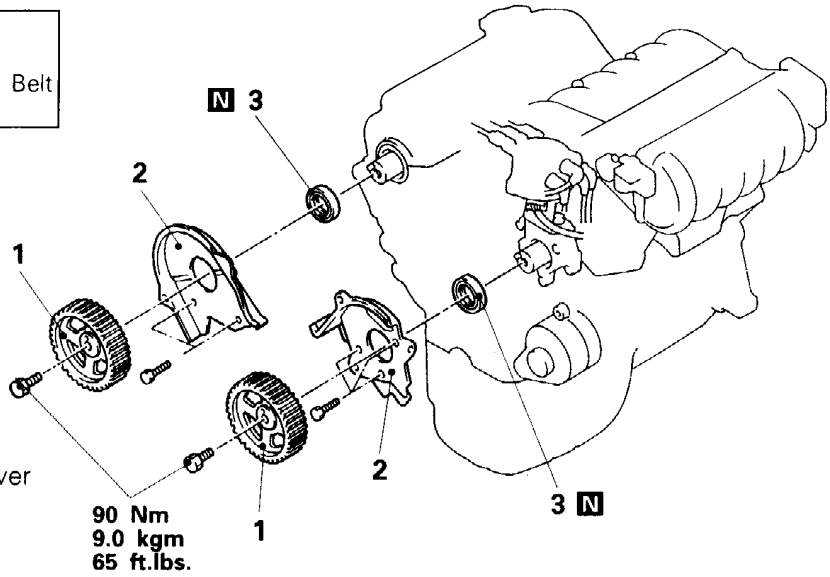
CAMSHAFT OIL SEALS <SOHC>

E11VA–

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation of Timing Belt (Refer to P.11-20.)

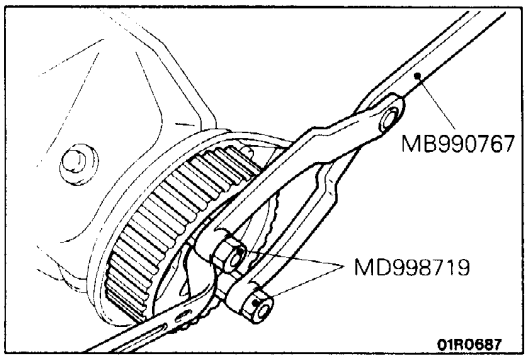




Removal steps

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

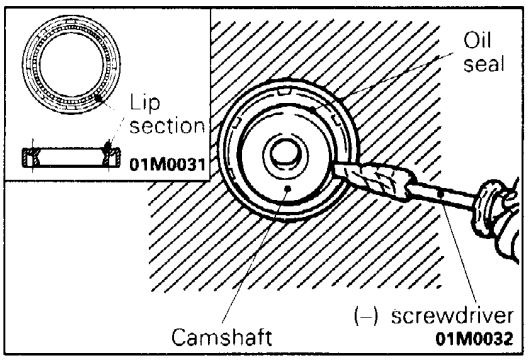
01N0047



SERVICE POINTS OF REMOVAL

E11VBAA

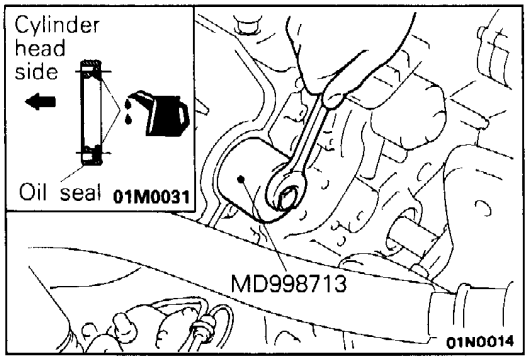
1. REMOVAL OF CAMSHAFT SPROCKET



3. REMOVAL OF CAMSHAFT OIL SEAL

(1) Make a notch in the oil seal lip section with a knife, etc.
(2) Cover the end of a (–) screwdriver with a rag and insert into the notched section of the oil seal, and lever out the oil seal to remove it.

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



SERVICE POINTS OF INSTALLATION

E11VCAA

3. INSTALLATION OF CAMSHAFT OIL SEAL

(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Press fitting the oil seal into the cylinder head.

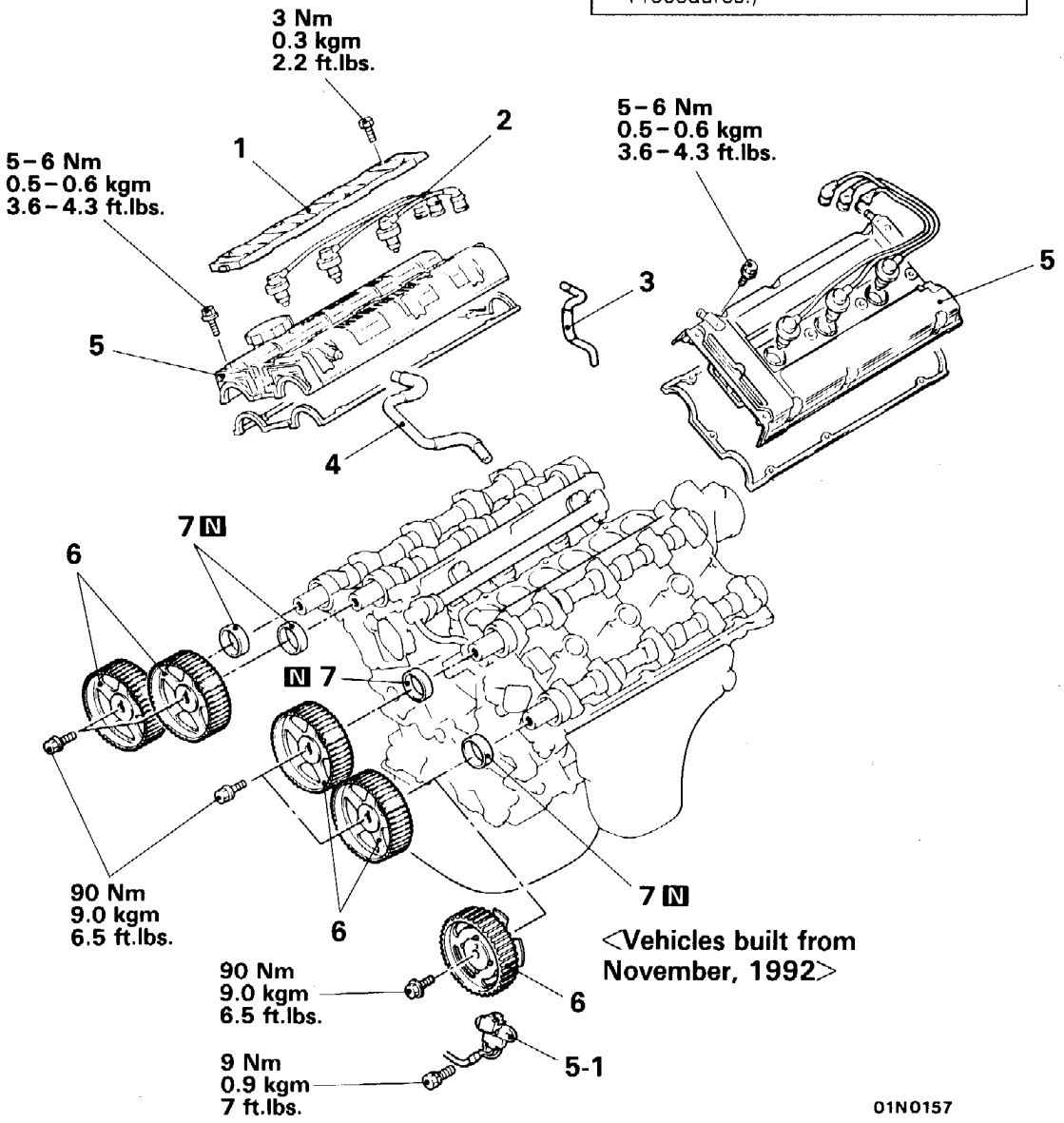
CAMSHAFT OIL SEALS <DOHC>

E11VA--

REMOVAL AND INSTALLATION

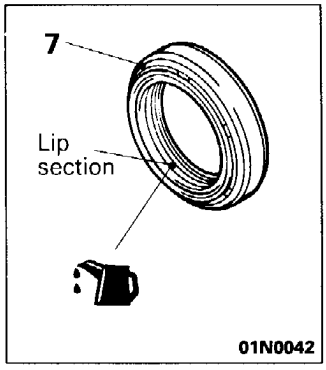
Pre-removal Operation
(1) Removal of Air Intake Plenum
(2) Removal of Timing Belt (Refer to P.11-24.)

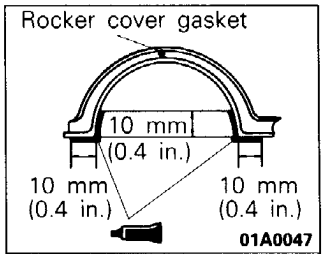
Post-installation Operation
(1) Installation of Timing Belt (Refer to P.11-24.)
(2) Installation of Air Intake Plenum
(3) Accelerator Cable Adjustment (Refer to GROUP 13 – Service Adjustment Procedures.)



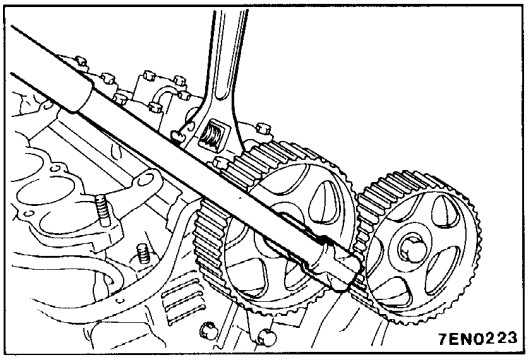
Removal steps

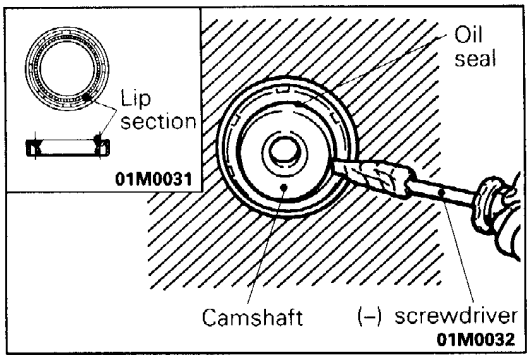
1. Centre cover
2. Spark plug cable
3. PCV hose
4. Blow-by hose
5. Rocker cover
5-1. Camshaft position sensor
6. Camshaft sprocket
7. Camshaft oil seal

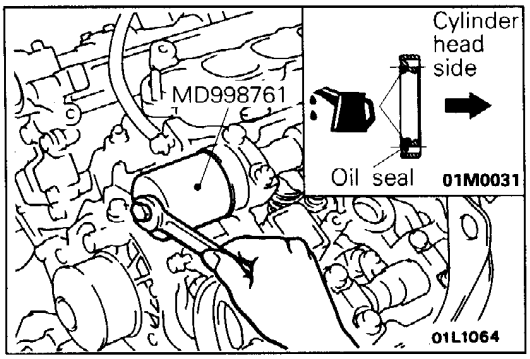


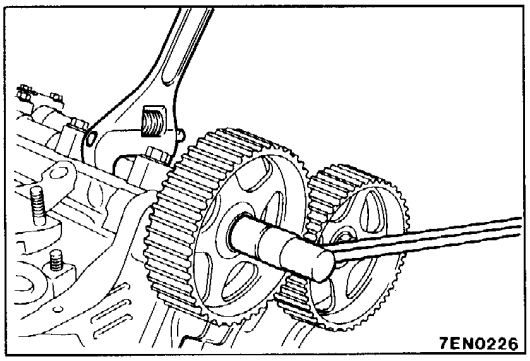


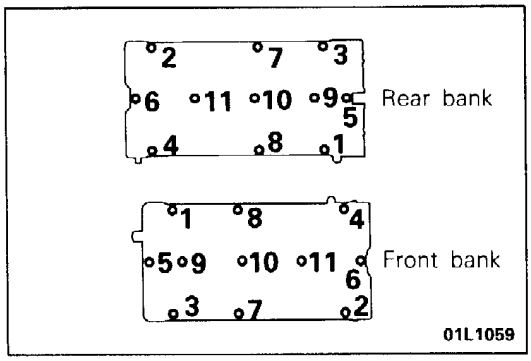
Sealant: 3M ATD Part No. 8660 or equivalent











SERVICE POINTS OF REMOVAL

6. REMOVAL OF CAMSHAFT SPROCKET

(1) Hold the hexagonal section of the camshaft with a wrench, etc., and loosen the camshaft sprocket bolt.

Caution
As the sprocket could become damaged, do not apply the wrench to the camshaft sprocket.

7. REMOVAL OF CAMSHAFT OIL SEAL

(1) Make a notch in the oil seal lip section with a knife, etc.
(2) Cover the end of a (–) screwdriver with a rag and insert into the notched section of the oil seal, and lever out the oil seal to remove it.

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

SERVICE POINTS OF INSTALLATION

7. INSTALLATION OF CAMSHAFT OIL SEAL

(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Press fitting the oil seal into the cylinder head.

6. INSTALLATION OF CAMSHAFT SPROCKET

Hold the hexagonal section of the camshaft with a wrench, etc., and tighten the camshaft sprocket bolt.

Caution
Do not apply the wrench to the camshaft sprocket, as the sprocket could become damaged.

5. INSTALLATION OF ROCKER COVER

Tighten the rocker cover bolts in the order shown in the illustration.

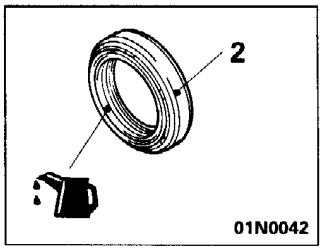
NOTE
(1) Only No. 5 bolt in the rear bank differs from other bolts in length:
Rear Bank No. 5 Bolt ..... 20 mm (0.79 in.)
All other Bolts ..... 10 mm (0.39 in.)
(2) Bolts are colour coded for the front and rear banks as follows:
Front bank ..... Black
Rear bank ..... Green
(3) When the rocker cover gasket has been replaced, tighten bolts in this order and then, retighten bolts 1 to 6 to 4 Nm (0.4 kgm, 2.9 ft.lbs.).

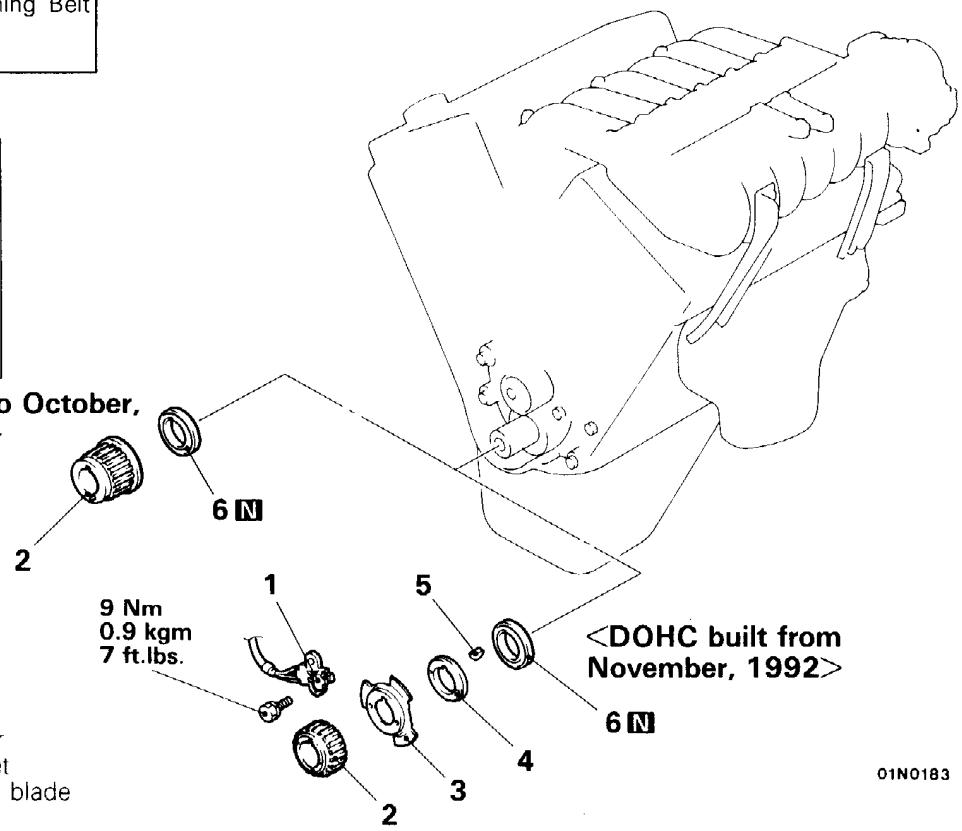
PWGE9004

CRANKSHAFT FRONT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation of Timing Belt
SOHC: Refer to P.11-20.
DOHC: Refer to P.11-24.

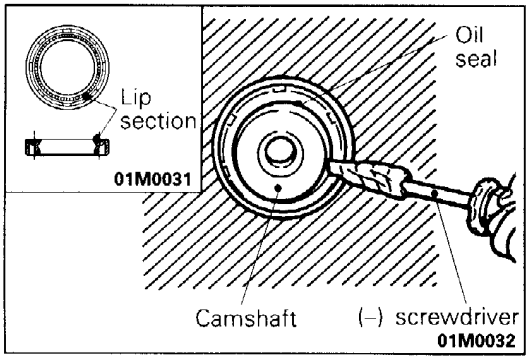


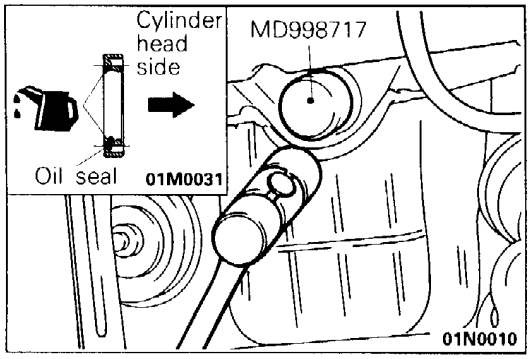


Removal steps

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

◆◆ ◆◆ 6. Crankshaft front oil seal





SERVICE POINTS OF REMOVAL

6. REMOVAL OF CRANKSHAFT FRONT OIL SEAL

(1) Make a notch in the oil seal lip section with a knife, etc.
(2) Cover the end of a (–) screwdriver with a rag and insert into the notched section of the oil seal, and lever out the oil seal to remove it.

Caution
Be careful not to damage the crankshaft and the oil pump case.

SERVICE POINTS OF INSTALLATION

6. INSTALLATION OF CRANKSHAFT FRONT OIL SEAL

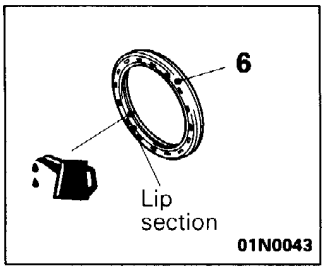
(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Tap the oil seal into the cylinder block.

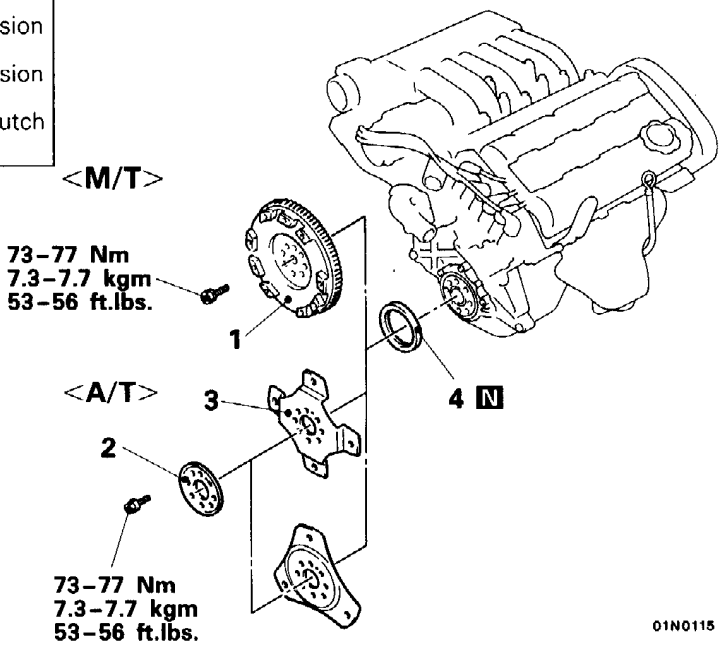
CRANKSHAFT REAR OIL SEAL

E11VA--

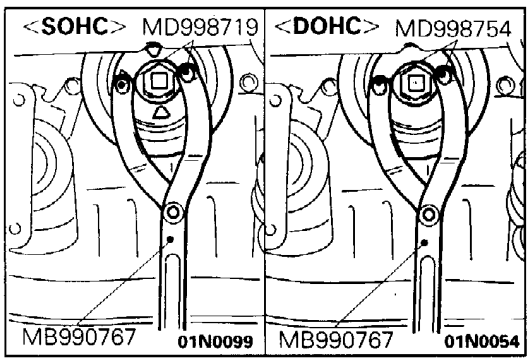
REMOVAL AND INSTALLATION

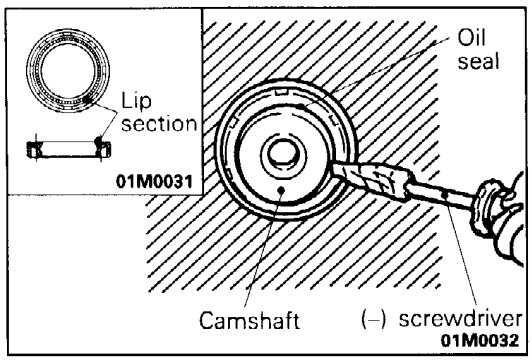
Pre-removal and Post-installation Operation
(1) Removal and Installation of Transmission Assembly
Refer to GROUP 22 – Transmission assembly <M/T>
Refer to GROUP 23 – Transmission assembly <A/T>
(2) Removal and Installation of Clutch Cover and Clutch Disc <M/T>





Removal steps
1. Flywheel <M/T>
2. Adaptor plate <A/T>
3. Drive plate <A/T>
4. Crankshaft rear oil seal





SERVICE POINTS OF REMOVAL

E11VBAB

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

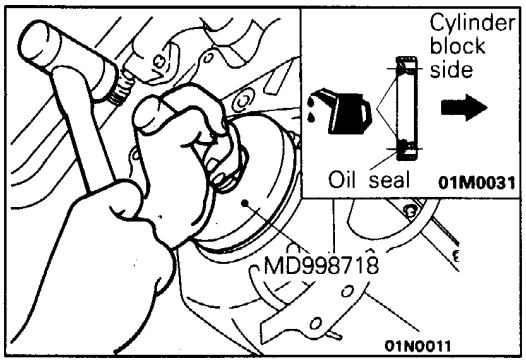
Stop the crankshaft pulley from turning, and remove the flywheel or the adaptor plate and the drive plate.

Caution
Use only the specified special tools, otherwise the crankshaft pulley damper could be damaged.

4. REMOVAL OF CRANKSHAFT REAR OIL SEAL

(1) Make a notch in the lip section of the oil seal with a knife, etc.
(2) Cover the end of (–) screwdriver with a rag, and insert into the notched section of the oil seal, and lever out the oil seal to remove it.

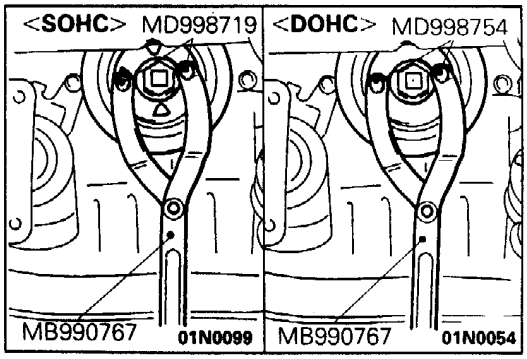
Caution
Be careful not to damage the crankshaft and the oil seal case.



SERVICE POINTS OF INSTALLATION

4. INSTALLATION OF CRANKSHAFT REAR OIL SEAL

(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Tap the oil seal into the cylinder block.



3. INSTALLATION OF DRIVE PLATE/2. ADAPTOR PLATE <A/T>/1. FLY-WHEEL <M/T>

Stop the crankshaft pulley from turning, and install the flywheel or the drive plate and the adaptor plate.

Caution
Use only the specified special tools, because the crankshaft pulley damper can be damaged.

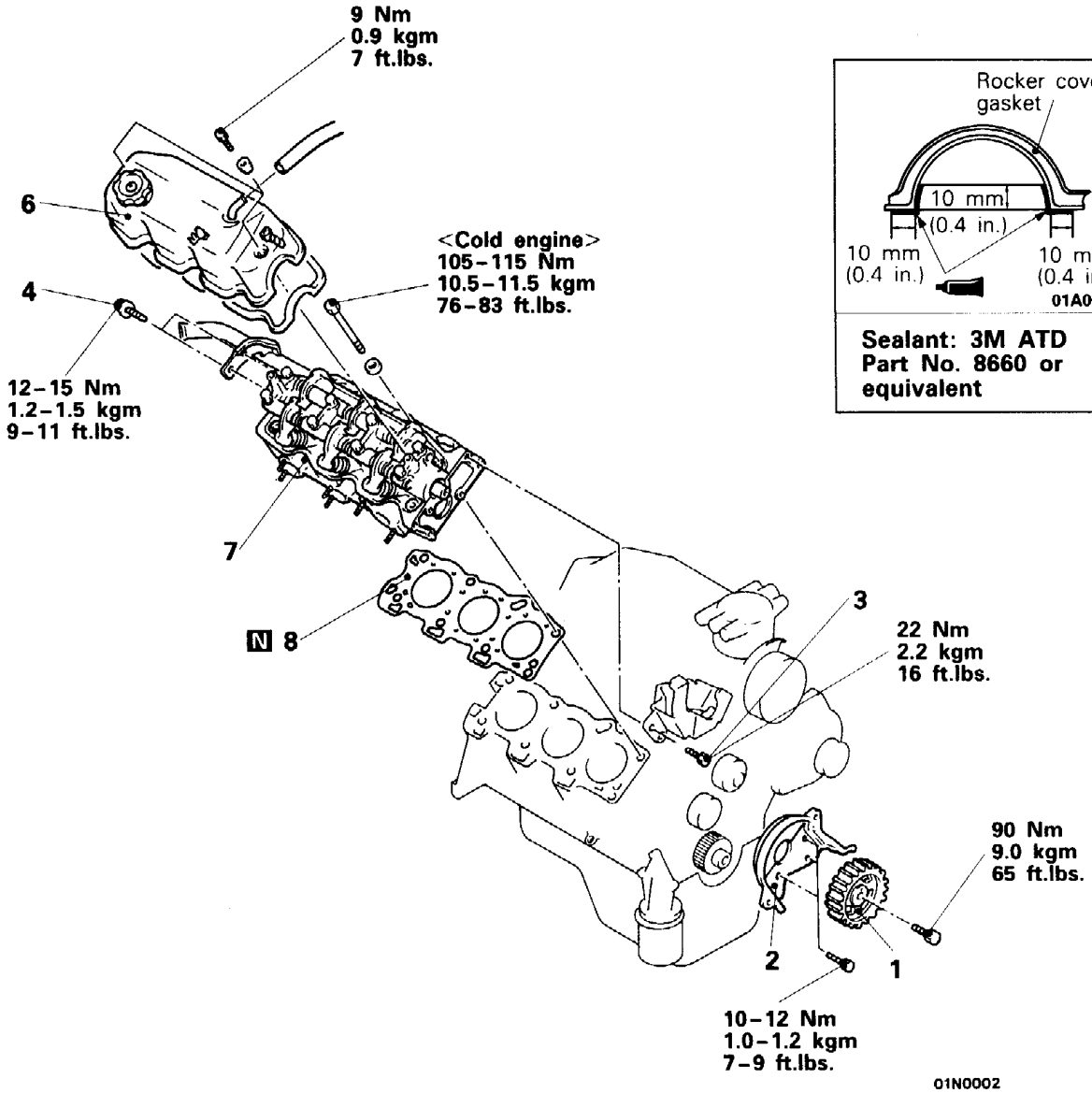
CYLINDER HEAD GASKET <SOHC>

E11JA--

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Removal of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)
(2) Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(3) Removal of Air Intake Plenum
(4) Removal of Intake Manifold
(5) Removal of Timing Belt (Refer to P.11-20.)

<Front Bank>

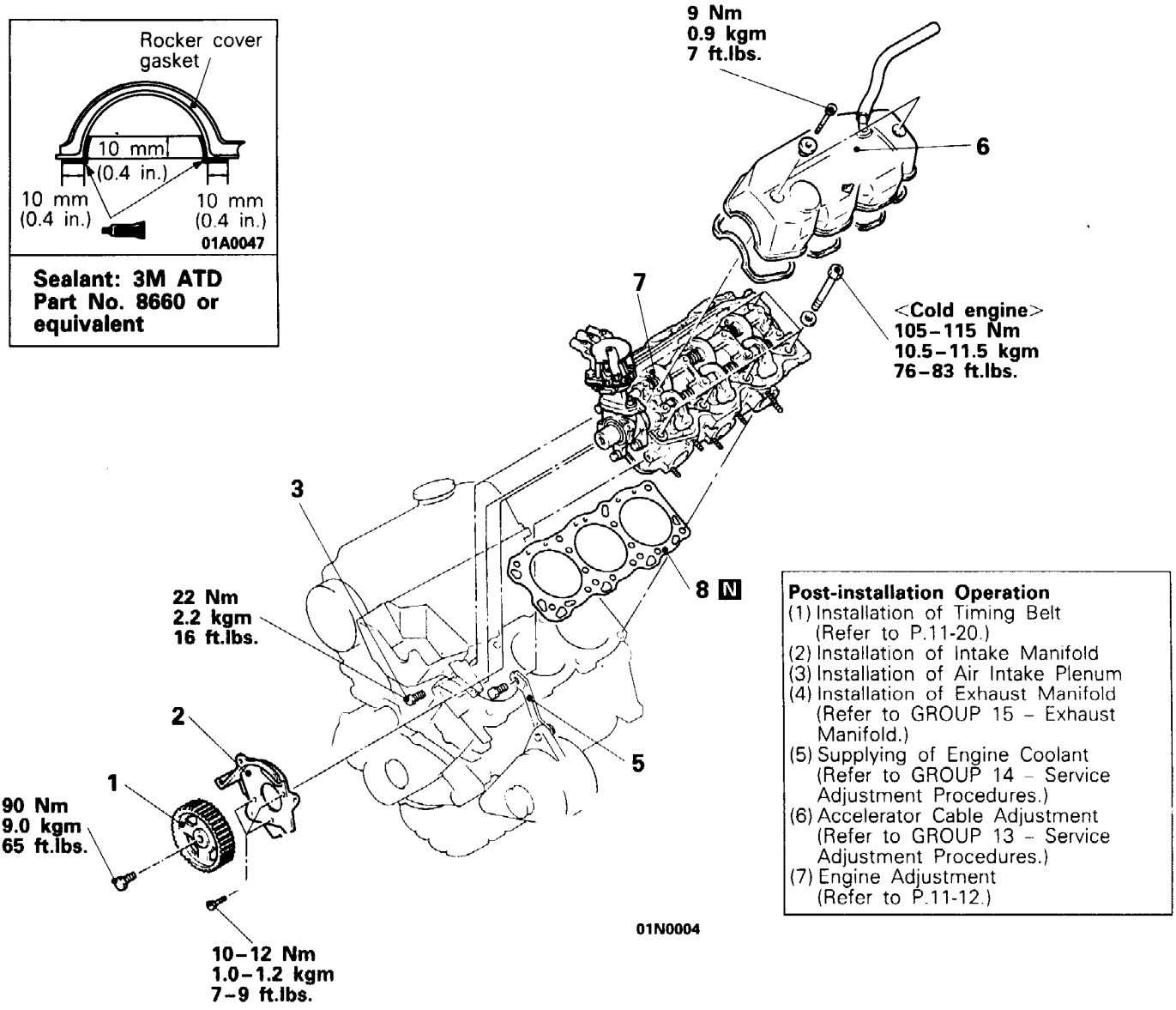


Sealant: 3M ATD Part No. 8660 or equivalent

Removal steps

◆◆ ◆◆ 1. Camshaft sprocket
2. Timing belt rear cover
3. Power steering oil pump bracket mounting bolt
4. Water inlet pipe mounting bolt
6. Rocket cover
◆◆ ◆◆ 7. Cylinder head assembly
◆◆ 8. Cylinder head gasket

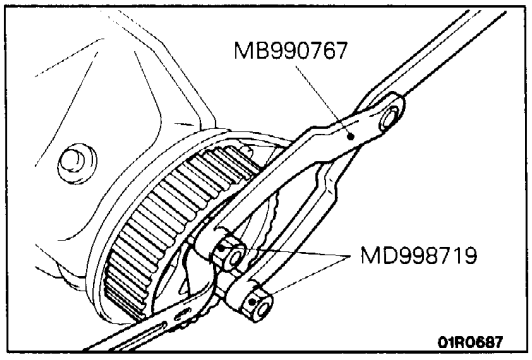
<Rear Bank>



Post-installation Operation
(1) Installation of Timing Belt (Refer to P.11-20.)
(2) Installation of Intake Manifold
(3) Installation of Air Intake Plenum
(4) Installation of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)
(5) Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(6) Accelerator Cable Adjustment (Refer to GROUP 13 – Service Adjustment Procedures.)
(7) Engine Adjustment (Refer to P.11-12.)

Removal steps

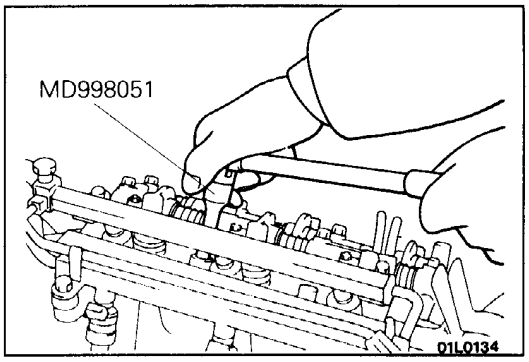
◆◆ ◆◆ 1. Camshaft sprocket
2. Timing belt rear cover
3. Connection for power steering pump bracket
5. Connection for alternator brace
6. Rocker cover
◆◆ ◆◆ 7. Cylinder head assembly
◆◆ 8. Cylinder head gasket



SERVICE POINTS OF REMOVAL

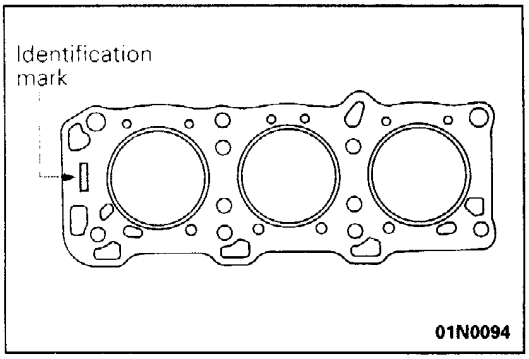
E11JBCE

1. REMOVAL OF CAMSHAFT SPROCKET



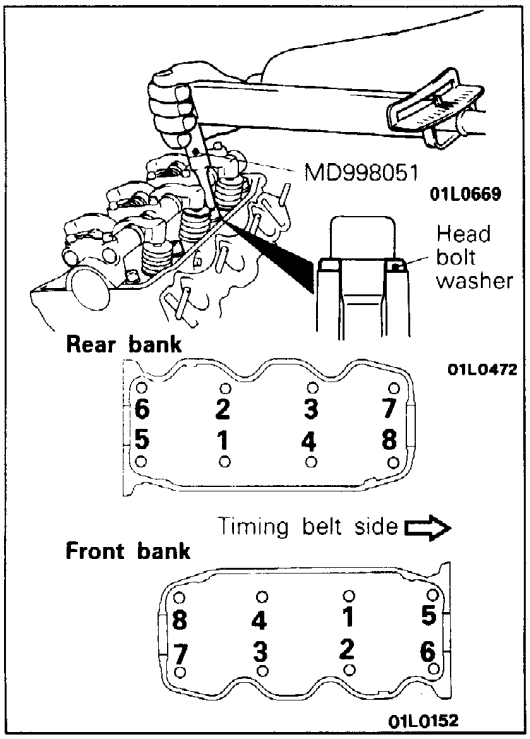
7. REMOVAL OF CYLINDER HEAD ASSEMBLY

SERVICE POINTS OF INSTALLATION E11JDCQ



8. INSTALLATION OF CYLINDER HEAD GASKET

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



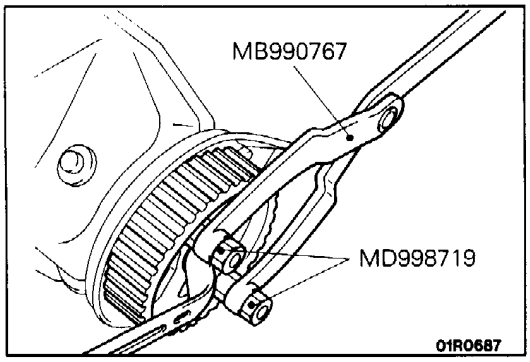
7. INSTALLATION OF CYLINDER HEAD ASSEMBLY

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

Caution
Take care that no foreign material gets into the coolant passages or oil passages.

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

Caution
Install the head bolt washers with shear droop upward as shown in the illustration.



1. INSTALLATION OF CAMSHAFT SPROCKET

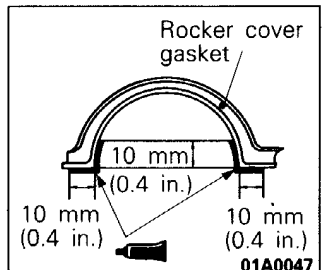
CYLINDER HEAD GASKET <DOHC>

E11JA--

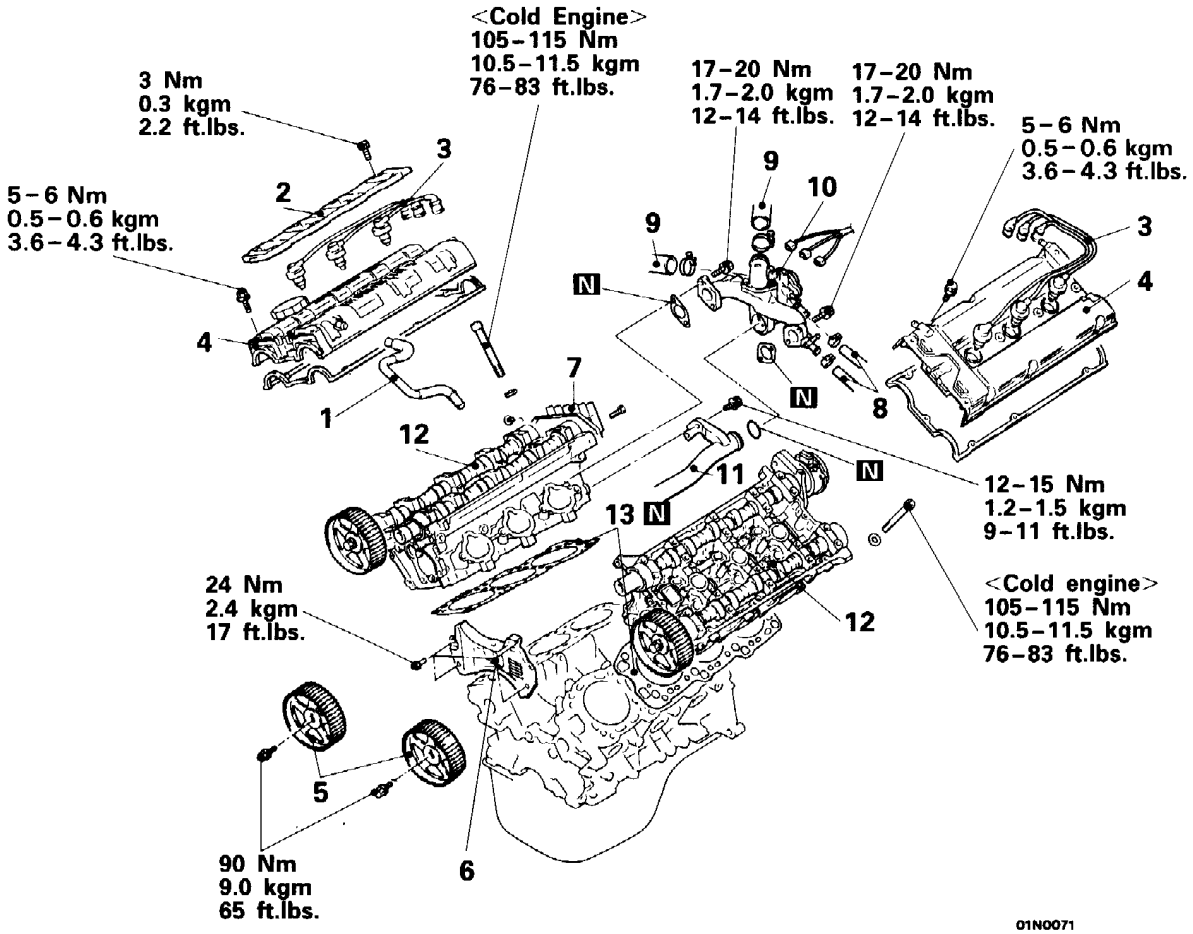
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Removal of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)
(2) Draining of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(3) Removal of Air Intake Plenum
(4) Removal of Intake Manifold (Refer to GROUP 15 – Intake Manifold.)
(5) Removal of Timing Belt (Refer to P.11-24.)

Post-installation Operation
(1) Installation of Timing Belt (Refer to P.11-24.)
(2) Installation of Intake Manifold (Refer to GROUP 15 – Intake Manifold.)
(3) Installation of Air Intake Plenum
(4) Installation of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)
(5) Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(6) Accelerator Cable Adjustment (Refer to GROUP 13 – Service Adjustment Procedures.)
(7) Engine Adjustment (Refer to P.11-12.)

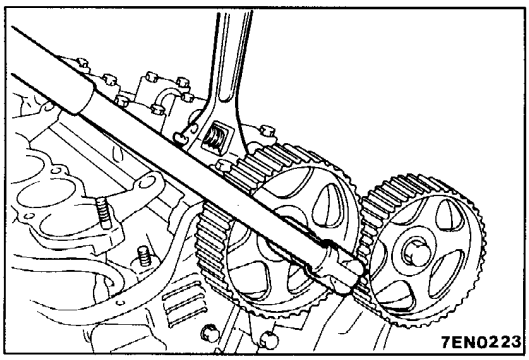


Sealant: 3M ATD Part No. 8660 or equivalent



Removal steps

1. Blow-by hose
2. Center cover
3. Spark plug cable
4. Rocker cover
5. Intake camshaft sprocket
6. Timing belt rear cover (centre)
7. Ignition coil assembly
8. Heater hose connection
9. Radiator hose connection
10. Thermostat housing
11. Water inlet pipe connection
12. Cylinder head assembly
13. Cylinder head gasket



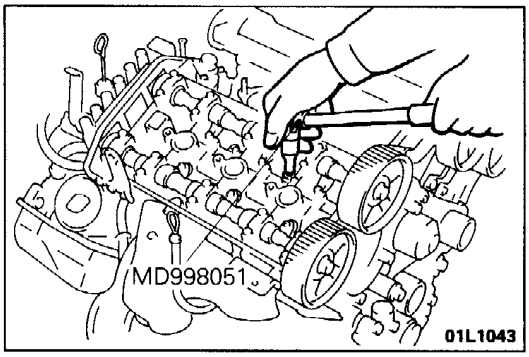
SERVICE POINTS OF REMOVAL E11JBCE

5. REMOVAL OF INTAKE CAMSHAFT SPROCKET

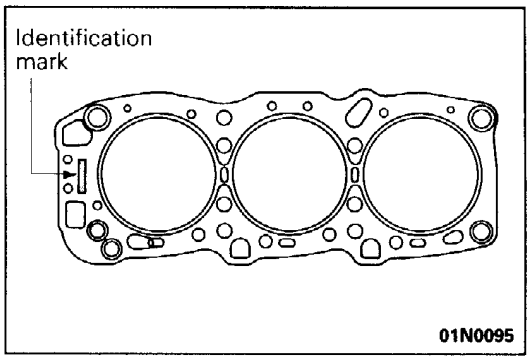
(1) Using a wrench, hold the camshaft at its hexagon and remove the camshaft sprocket bolt.

Caution
Locking the camshaft sprocket with a tool damages the sprocket.

(2) Remove the camshaft sprockets.



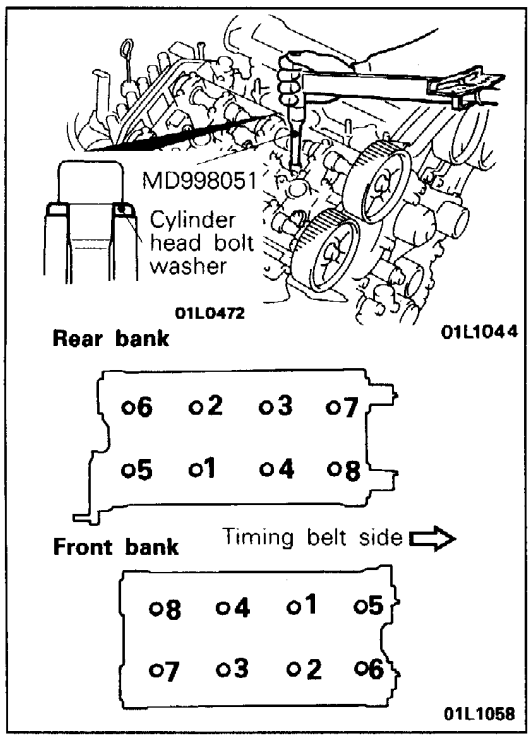
12. REMOVAL CYLINDER HEAD ASSEMBLY



SERVICE POINTS OF INSTALLATION E11JDC0

13. INSTALLATION OF CYLINDER HEAD GASKET

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



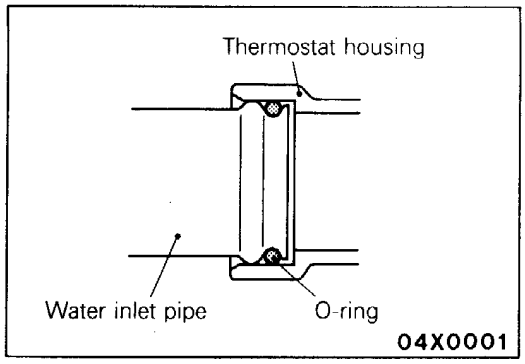
12. INSTALLATION OF CYLINDER HEAD ASSEMBLY

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

Caution
Take care that no foreign material gets into the cylinder, coolant passages or oil passages.

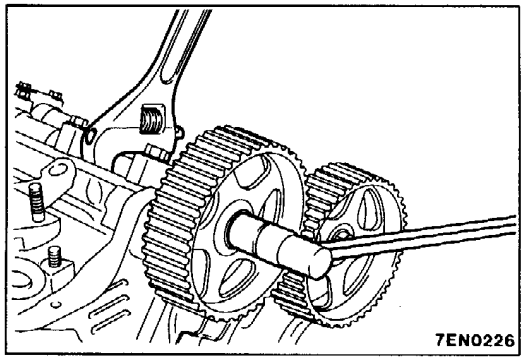
(2) Using the special tool and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. (in two or three cycles)

Caution
Install the head bolt washers with shear droop upward as shown in the illustration.



10. INSTALLATION OF THERMOSTAT HOUSING

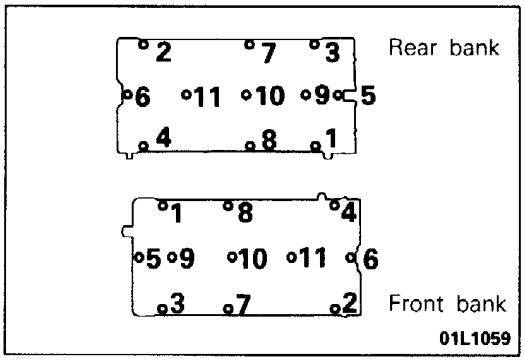
Wet the O-ring outer circumference of the water inlet pipe or the inner surface of the thermostat housing with water and install the thermostat housing.



5. INSTALLATION OF INTAKE CAMSHAFT SPROCKET

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

Caution
Locking the camshaft sprocket with a tool damages the sprocket.



4. INSTALLATION OF ROCKER COVER

Tighten the rocker cover bolts in the order shown in the illustration.

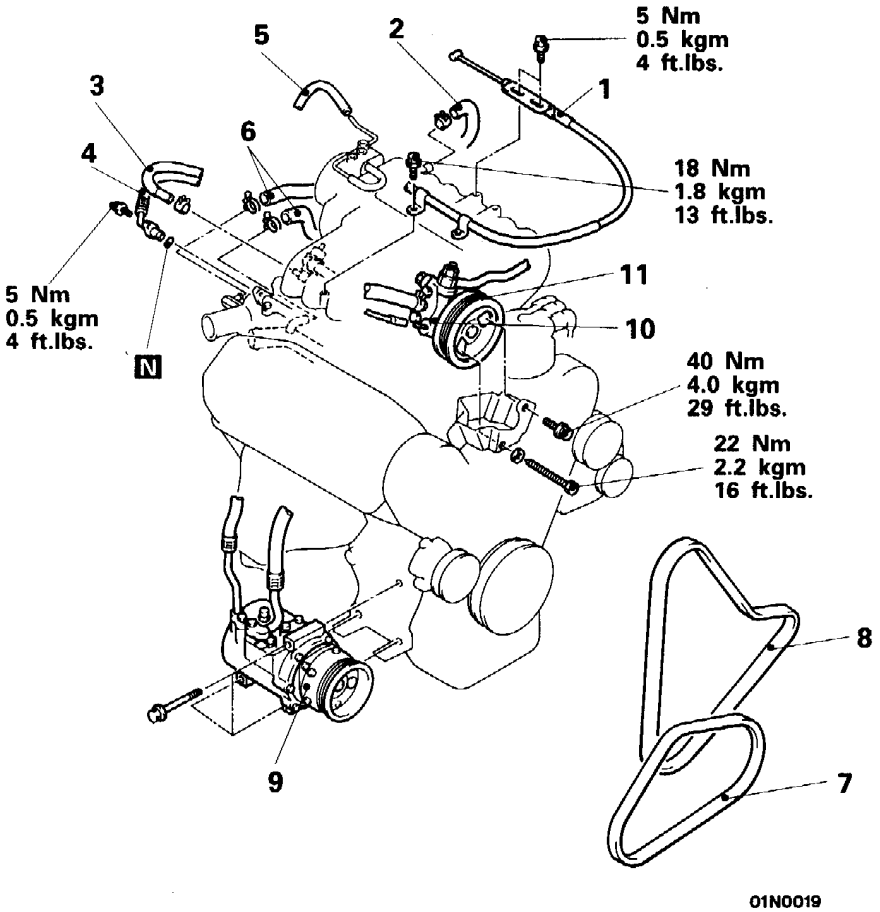
NOTE
(1) Only No. 5 bolt in the rear bank differs from other bolts in length.
Rear Bank No. 5 Bolt ..... 20 mm (0.79 in.)
All other Bolts ..... 10 mm (0.39 in.)
(2) Bolts are colour-coded for the front and rear banks as follows:
Front bank ..... Black
Rear bank ..... Green
(3) When the rocker cover gasket has been replaced, tighten bolts in this order, and then retighten bolts 1 to 6 to 4 Nm (0.4 kgm, 2.9 ft.lbs.).

ENGINE ASSEMBLY <SOHC>

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Removal of Hood
(Refer to GROUP 42 – Front Hood.)
(2) Removal of Headlamp Washer Tank
(3) Removal of Radiator Assembly
(Refer to GROUP 14 – Radiator.)
(4) Removal of Front Exhaust Pipe
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(5) Removal of Transmission Assembly
(Refer to GROUP 22, 23 – Transmission Assembly.)

Post-installation Operation
(1) Installation of Transmission Assembly
(Refer to GROUP 22, 23 – Transmission Assembly.)
(2) Installation of Front Exhaust Pipe
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Installation of Radiator Assembly
(Refer to GROUP 14 – Radiator.)
(4) Installation of Headlamp Washer Tank
(5) Accelerator Cable Adjustment
(Refer to GROUP 13 – Service Adjustment Procedures.)
(6) Installation of Hood
(Refer to GROUP 42 – Front Hood.)



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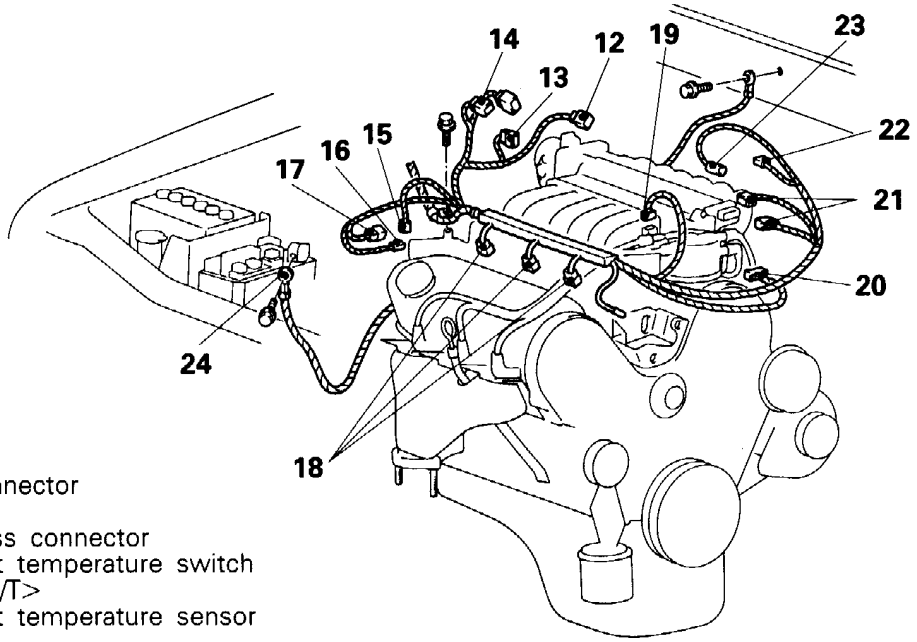
Removal steps

1. Accelerator cable connection
2. Brake booster vacuum hose connection
3. Fuel return hose connection
4. Fuel high-pressure hose connection
5. Purge hose connection
6. Heater hose connection

● V-belt tension adjustment (Refer to P.11-20.)
7. V-ribbed belt (Air conditioner compressor)
8. V-ribbed belt (Alternator and power steering pump)
◆◆ 9. Air conditioner compressor
10. Power steering switch connector
◆◆ 11. Power steering pump



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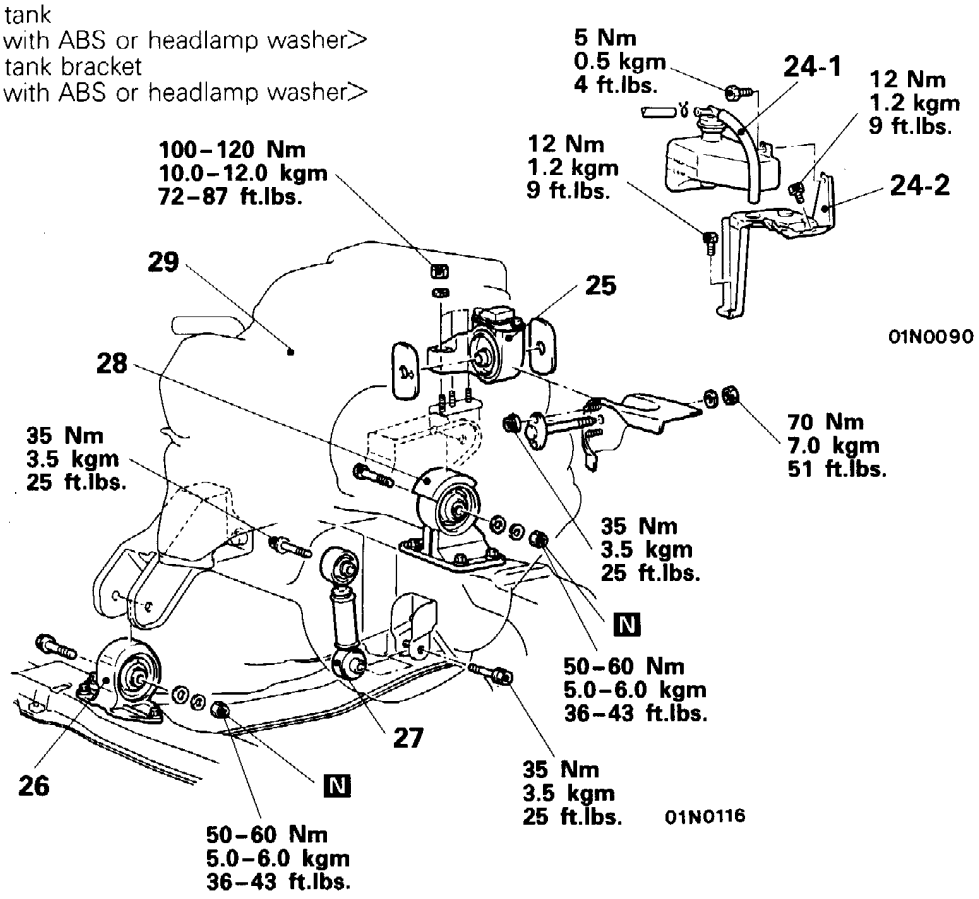
12. ISC motor connector
13. TPS connector
14. Injector harness connector
15. Engine coolant temperature switch connector <M/T>
16. Engine coolant temperature sensor connector
17. Engine coolant temperature gauge unit connector
18. Injector connector
19. Power transistor connector
20. Distributor connector
21. Variable induction motor connector
22. Condenser connector
23. Ignition coil connector
24. Alternator harness connection
24-1. Condense tank <Vehicles with ABS or headlamp washer>
24-2. Condense tank bracket <Vehicles with ABS or headlamp washer>

◆◆ ◆◆ 25. Engine mount bracket assembly
26. Front roll stopper and engine assembly
27. Engine damper
28. Rear roll stopper and engine assembly
◆◆ ◆◆ 29. Engine assembly



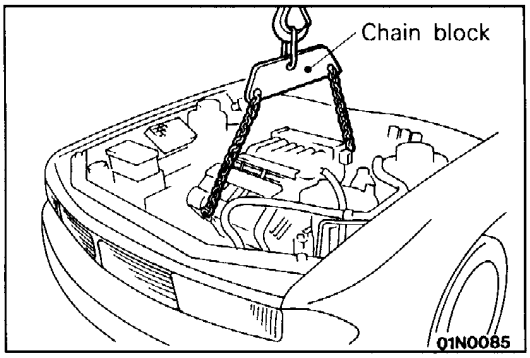
SERVICE POINTS OF REMOVAL E11TBAH

9. REMOVAL OF AIR CONDITIONER COMPRESSOR

(1) Remove the compressor from the compressor bracket with hose attached.
(2) Secure the compressor using wire so that it will not be in the way while working.

11. REMOVAL OF POWER STEERING PUMP

(1) Remove the pump with hose attached from the bracket.
(2) Secure the pump using wire so that it will not be in the way while working.

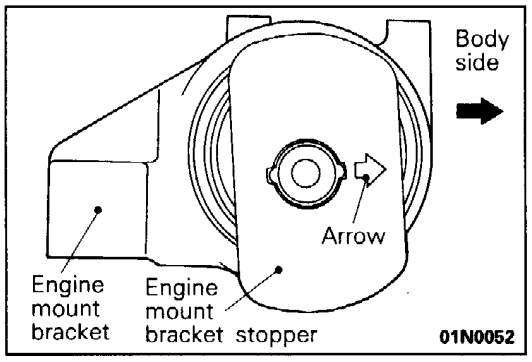


25. REMOVAL OF ENGINE MOUNT BRACKET ASSEMBLY

(1) When lifting up the engine, remove the distributor cap to prevent the wires from contacting and causing damage.
(2) Attach wire or similar material to the engine hook, and then suspend to the extent that there is no slackness in the wire.
(3) Remove the mounting bolt and nut of the engine mount bracket assembly.

29. REMOVAL OF ENGINE ASSEMBLY

(1) Check that all cables, hoses and 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 REMOVAL E11TDAI

29. INSTALLATION OF ENGINE ASSEMBLY

Install the engine assembly, and check that the harnesses, pipes and hoses are not catched.

25. INSTALLATION OF ENGINE MOUNT BRACKET ASSEMBLY

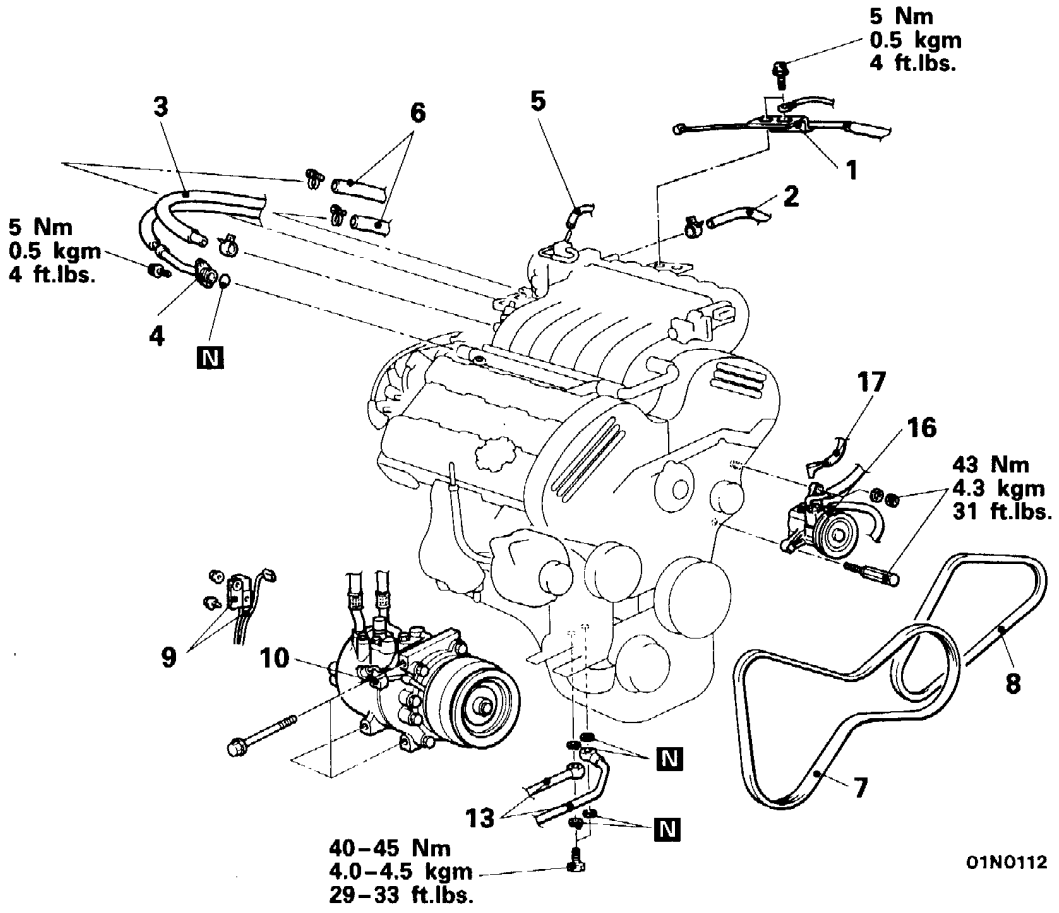
Install so that the arrow of the engine mount bracket stopper is facing the direction shown in the figure.

ENGINE ASSEMBLY <DOHC>

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Removal of Hood
(Refer to GROUP 42 – Front Hood.)
(2) Removal of Headlamp Washer Tank
(3) Removal of Radiator Assembly
(Refer to GROUP 14 – Radiator.)
(4) Removal of Front Exhaust Pipe
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(5) Removal of Transmission Assembly
(Refer to GROUP 22, 23 – Transmission Assembly.)

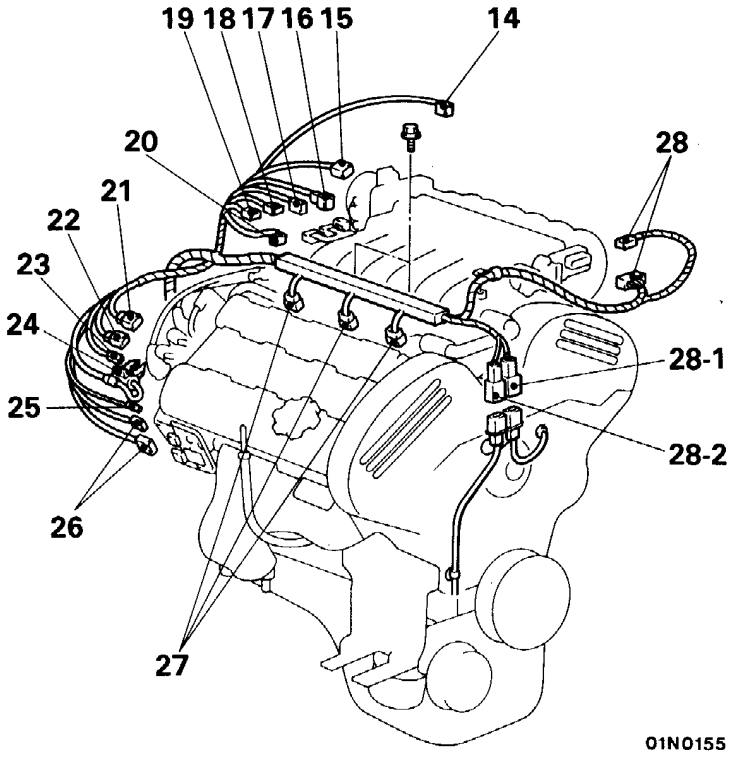
Post-installation Operation
(1) Installation of Transmission Assembly
(Refer to GROUP 22, 23 – Transmission Assembly.)
(2) Installation of Front Exhaust Pipe
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Installation of Radiator Assembly
(Refer to GROUP 14 – Radiator.)
(4) Installation of Headlamp Washer Tank
(5) Accelerator Cable Adjustment
(Refer to GROUP 13 – Service Adjustment Procedures.)
(6) Installation of Hood
(Refer to GROUP 42 – Front Hood.)



Removal steps

1. Accelerator cable connection
2. Brake booster vacuum hose connection
3. Fuel return hose connection
4. Fuel high-pressure hose connection
5. Purge hose connection
6. Heater hose connection
- V-belt tension adjustment (Refer to P.11-24.)
7. V-ribbed belt (Alternator and air conditioner compressor)
8. V belt (Power steering pump)
9. Alternator harness connector
10. Air conditioner compressor
11. Power steering pump
12. Power steering oil pressure switch connector
13. Engine oil cooler hose connection

14. APS connector <Vehicles with traction control system>
15. ISC motor connector
16. TPS connector
17. Power steering switch and oil pressure switch connector
18. Injector harness connector
19. Knock sensor connector
20. Crank angle sensor connector <Vehicles built up to October, 1992>
21. Engine coolant temperature switch connector
22. Engine coolant temperature gauge unit connector
23. Engine coolant temperature sensor connector
24. Condenser
25. Ignition coil connector
26. Power transistor connector
27. Injector connector
28. Variable induction motor connector
28-1. Camshaft position sensor connector <Vehicles built from November, 1992>
28-2. Crank angle sensor connector <Vehicles built from November, 1992>
29. Condense tank <Vehicles with ABS or headlamp washer>
30. Condense tank bracket <Vehicles with ABS or headlamp washer>
◆◆ ▶◀ 31. Engine mount bracket assembly
32. Front roll stopper and engine assembly
33. Engine damper
34. Rear roll stopper and engine assembly
◆◆ ▶◀ 35. Engine assembly



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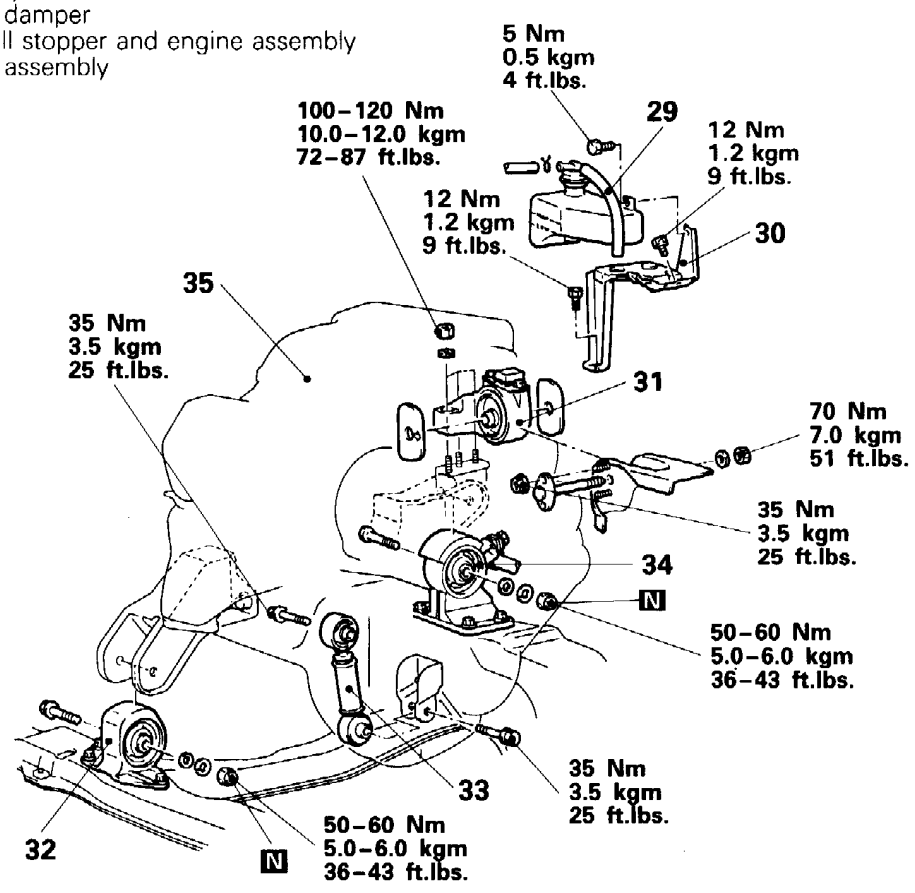

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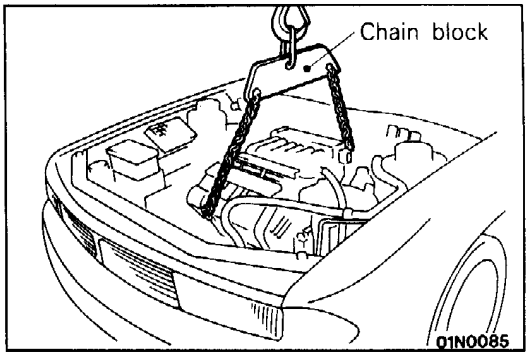
SERVICE POINTS OF REMOVAL E11TBAI

10. REMOVAL OF AIR CONDITIONER COMPRESSOR

(1) Remove the compressor with hose attached from the compressor bracket.
(2) Secure the compressor with wire so that it will not be in the way while working.

11. REMOVAL OF POWER STEERING PUMP

(1) Remove the oil pump with hose attached from the bracket.
(2) Place the oil pump somewhere so it will not be in the way while working.

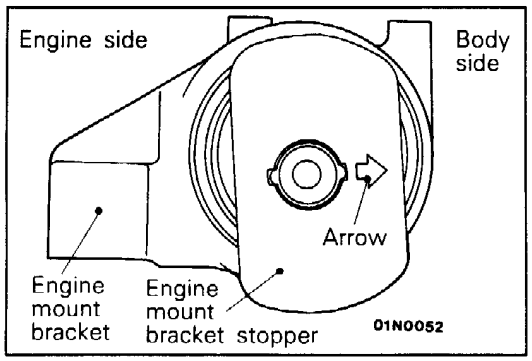


31. REMOVAL OF ENGINE MOUNT BRACKET ASSEMBLY

(1) Attach wire or similar material to the engine hook, and then suspend by using a chain block or similar so that there is no slacking in the wire.
(2) Remove the mounting nut and bolt of the engine mount bracket assembly.

35. REMOVAL OF ENGINE ASSEMBLY

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



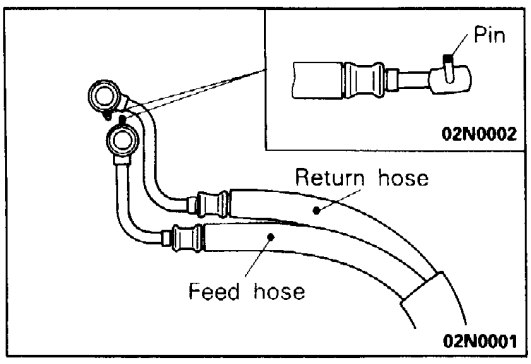
SERVICE POINTS OF INSTALLATION

35. INSTALLATION OF ENGINE ASSEMBLY

Install the engine assembly, and check that the harnesses, pipes and hoses are not catched.

31. INSTALLATION OF ENGINE MOUNT BRACKET ASSEMBLY

Install so that the arrow of the engine mount bracket stopper is facing the direction shown in the figure.



13. INSTALLATION OF ENGINE OIL COOLER HOSE

Install by inserting the eye joint pin into the hole in the oil filter bracket as shown in the figure.