RX-7
Factory Service Material

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1993 Factory Service Manual
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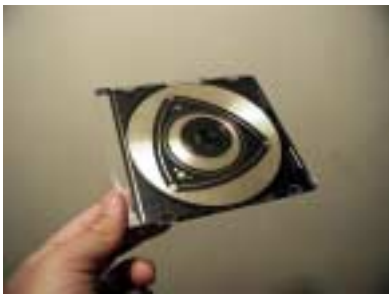
1987 Printed Microfiche of all parts*
1988 Printed Microfiche of all parts*

The $10 donation is used to offset the tremendous amount of time it takes to make everything available.



* These works are currently in process and may or not be readily available upon request. They will be hosted on the same link above and for download

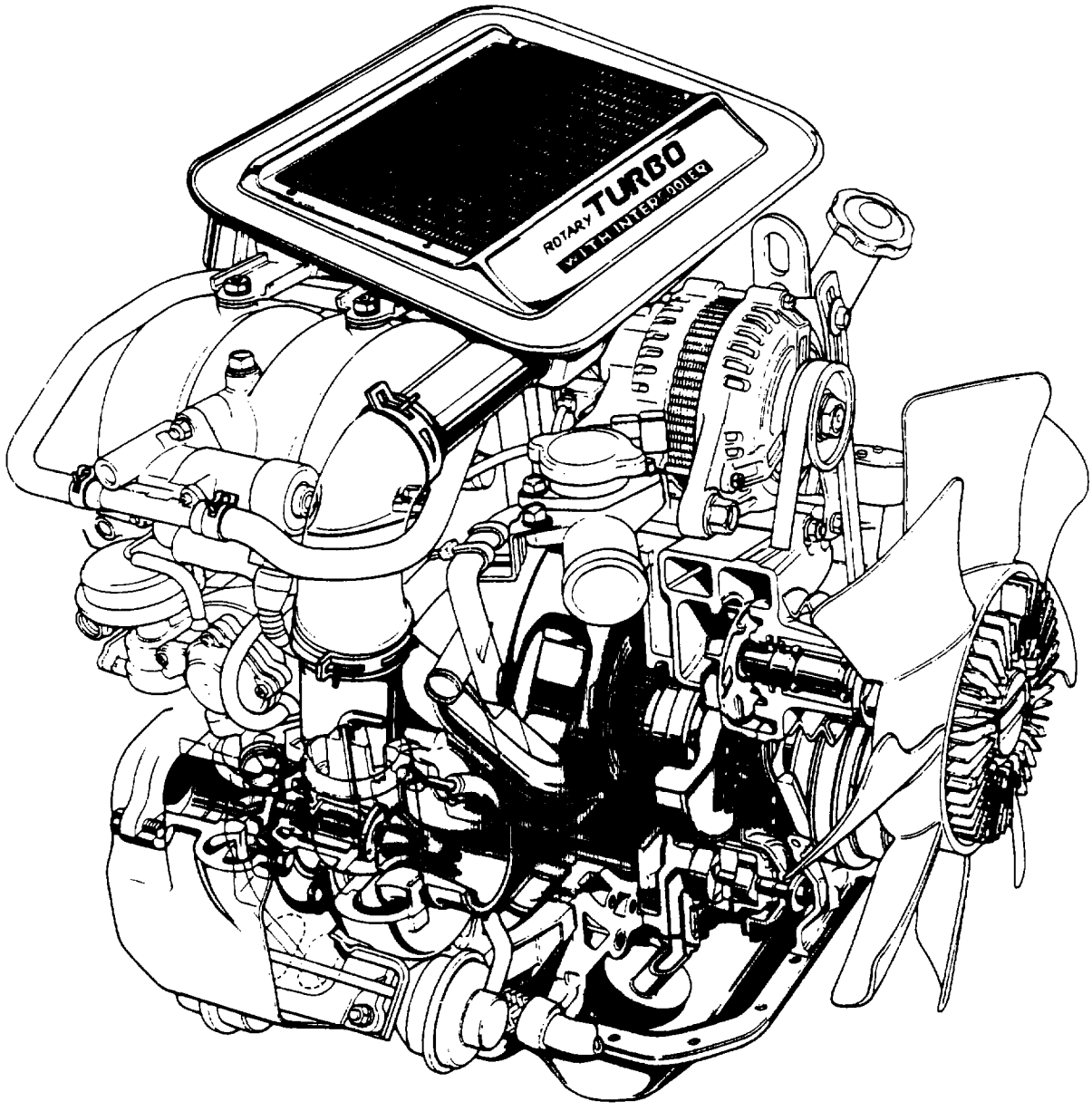
ENGINE

77U01X-101

OUTLINE

STRUCTURAL VIEW

TURBO



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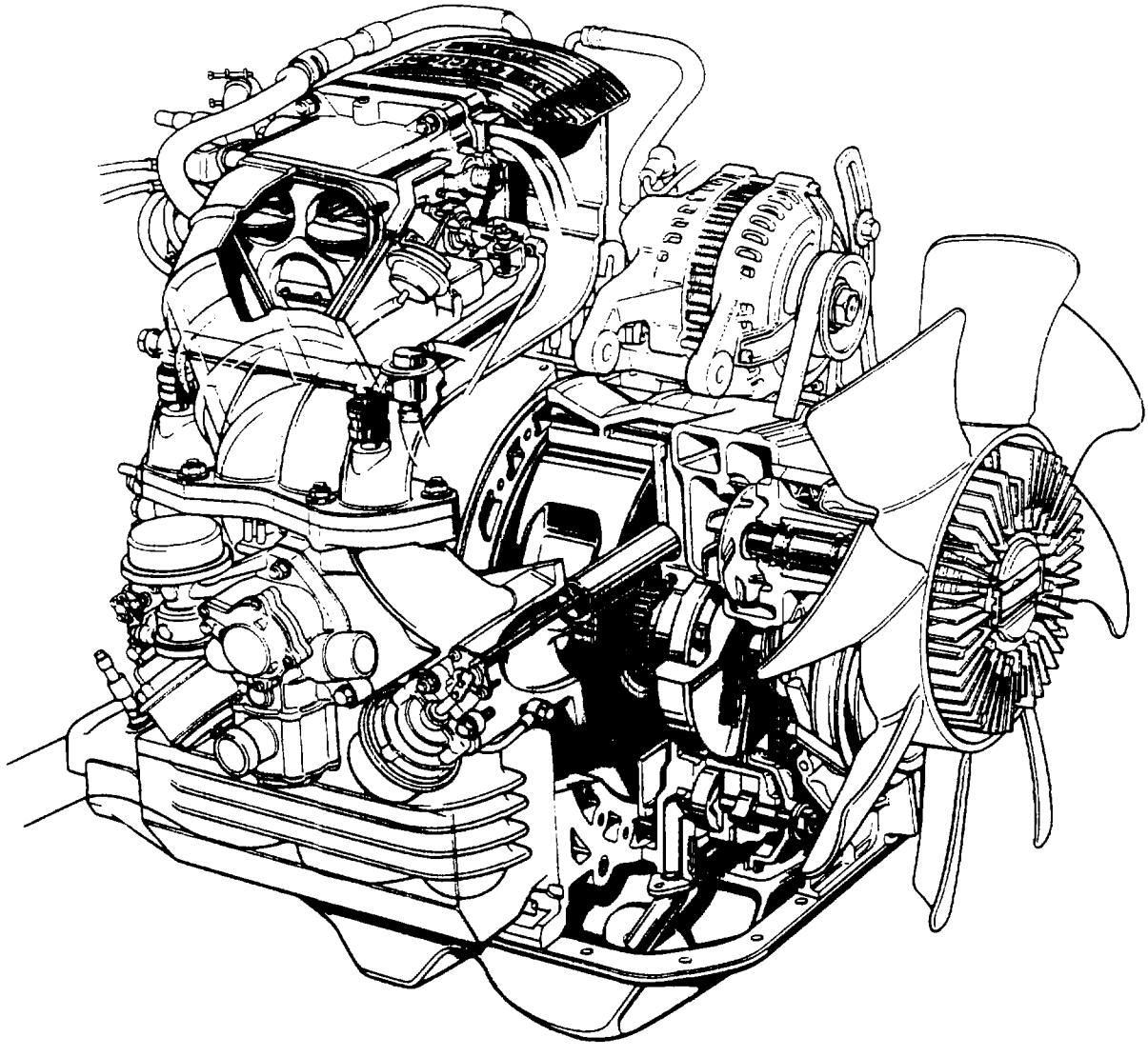
NON-TURBO



77UC1X-102

1 TROUBLESHOOTING GUIDE

SPECIFICATIONS

Items \ Model				Turbo	Non-Turbo
Engine type				Rotary engine	
Displacement cc (cu in)				654 x 2 (40.0 x 2)	
Number of cylinders and arrangement				2 rotors, longitudinal	
Combustion chamber type				Bathtub	
Compression ratio				8.5 : 1	9.4 : 1
Air induction				4 port induction	6 port induction
Port timing	Intake	Open	Primary	32° ATDC	
			Secondary	32° ATDC	
			Auxiliary	—	45° ATDC
		Close	Primary	50° ABDC	40° ABDC
			Secondary	50° ABDC	30° ABDC
			Auxiliary	—	70° ABDC
	Exhaust	Open		75° BBDC	
		Close		48° ATDC	
Fuel supply system				EGI	
Ignition timing			Trailing	20° ATDC (RED)	
			Leading	5° ATDC (YELLOW)	
Idle speed rpm				750 ± 25	

77U01X-003

TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Difficult starting	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	1—42
	Deformation or abnormal wear of rotor housing	Replace	1—45
	Wear of rotor grooves	Replace	1—45
	Deformation or poor fastening of rotor seals	Replace	1—47
	Worn or weak spring	Replace	—
	Malfunction of fuel system	Refer to Section 4	
	Malfunction of electrical system	Refer to Section 5	
Poor idling	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	1—42
	Deformation or abnormal wear of rotor housing	Replace	1—45
	Wear of rotor grooves	Replace	1—45
	Deformation or poor fastening of rotor seals	Replace	1—47
	Worn or weak spring	Replace	—
	Malfunction of fuel system	Refer to Section 4	
	Malfunction of ignition system	Refer to Section 5	

Problem	Possible cause	Remedy	Page
Insufficient power	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	1—42
	Deformation or abnormal wear of rotor housing	Replace	1—45
	Wear of rotor grooves	Replace	1—45
	Deformation or poor fastening of rotor seals	Replace	1—47
	Worn or weak spring		
	Malfunction of fuel system	Refer to Section 4	
	Malfunction of ignition system	Refer to Section 5	
Abnormal combustion	**Malfunction in combustion chamber**		
	Carbon accumulation	Remove and clean	1—40
	Malfunction of fuel system	Refer to Section 4	
	Malfunction of ignition system	Refer to Section 5	
Excessive oil consumption	**Leakage into combustion chamber**		
	Deformation or abnormal wear of side housing	Replace	1—42
	Malfunction of rotor (blowholes)	Replace	1—45
	Scratched or burred rotor land	Replace	1—45
	Malfunction of oil seal (incorrect angle)	Replace	1—47
	Leakage into coolant passages		
	Deformed rotor housing	Replace	1—45
	Malfunction of sealing rubber	Replace	—
	Leakage to outside of engine	Refer to Section 2	
	Malfunction of lubricating system	Refer to Section 2	
Engine noise	**Rotor seal noise**		
	Malfunction of rotor seals	Replace	1—47
	Malfunction of housing	Replace	1—44
	Malfunction of seal spring	Replace	1—44
	Malfunction of metering oil pump	Refer to Section 2	
	Knocking noise		
	Accumulation of carbon	Remove and clean	1—40
	Hitting noise		
	Malfunction of main bearing or rotor bearing	Replace	1—44,46
	Excessive end play	Adjust	1—64
	Foreign matter in internal gear or stationary gear, or malfunction of gear	Replace	1—43
	Other		
	Malfunction of water pump bearing	Refer to Section 3	
	Drive belt tension	Adjust	1— 7
	Malfunction of alternator bearing	Refer to Section 5	
	Exhaust gas leakage	Refer to Section 4	
	Malfunction of fuel system	Refer to Section 4	

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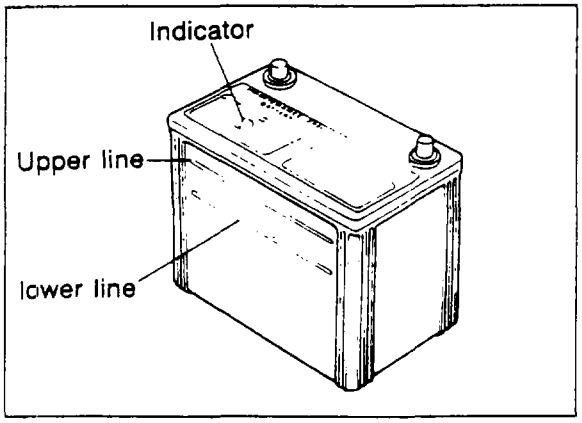

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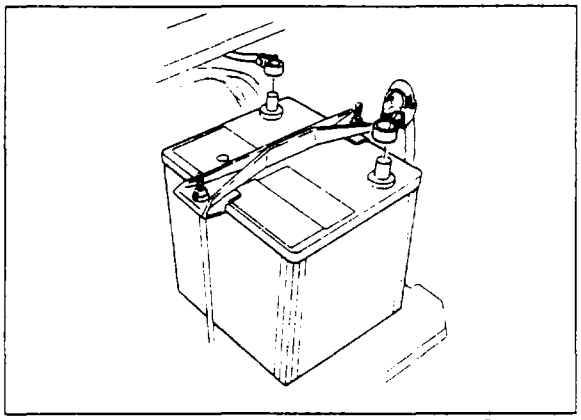
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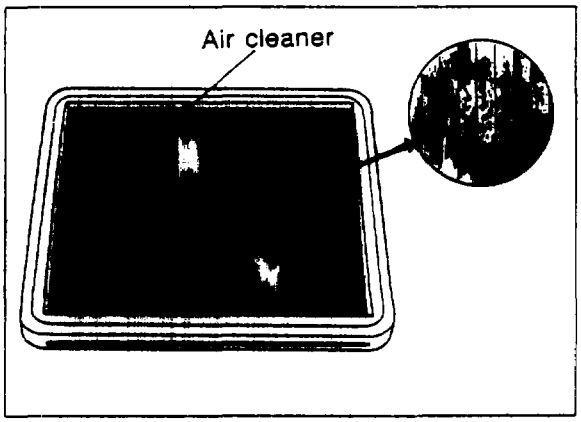

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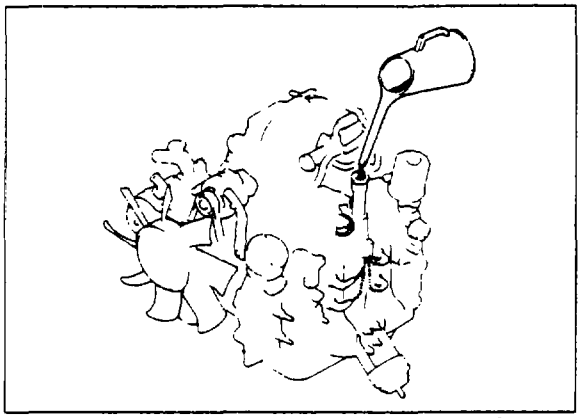
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TUNE-UP PROCEDURE

Tune the engine according to the procedures described below.

Battery

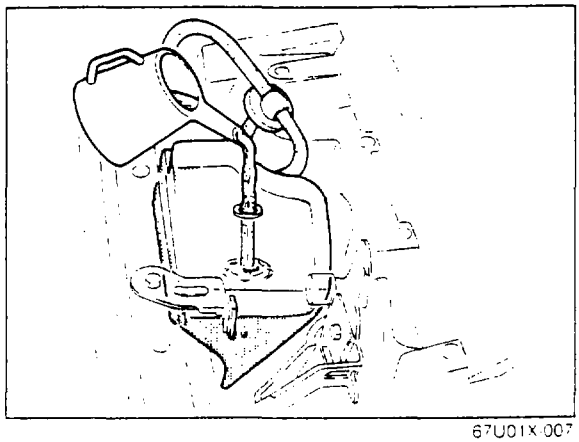
1. Check the indicator sign on the top of the battery. If the indicator sign is blue, the battery is normal.
2. If the blue indicator sign is not visible, then the electrolyte level of the battery is low and/or the capacity is insufficient.
3. Add distilled water and/or recharge according to the procedures described in Section 5.
4. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat the terminals with grease.
5. Inspect for corroded or frayed battery cables.
6. Check the rubber protector on the positive terminal for proper coverage.

Air Cleaner Element

Visually check the air cleaner element for excessive dirt, damage or oil. Replace if necessary.

Engine Oil

Check the engine oil level and condition with the oil level gauge.
Add oil, or change it, if necessary.

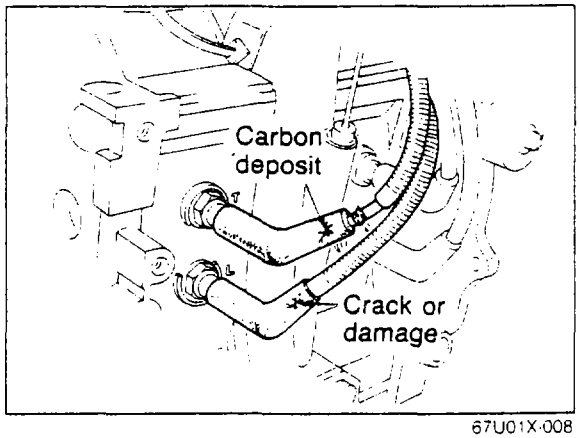


67U01X-007

Coolant Level

Check that the coolant level is near the coolant filler port, and that the level in the reserve tank is between the FULL and LOW marks.
Add coolant if the level is low (Refer to Section 3).

Warning
Never remove the coolant filler cap while the engine is hot.
Wrap a thick cloth around the cap and carefully remove the cap.



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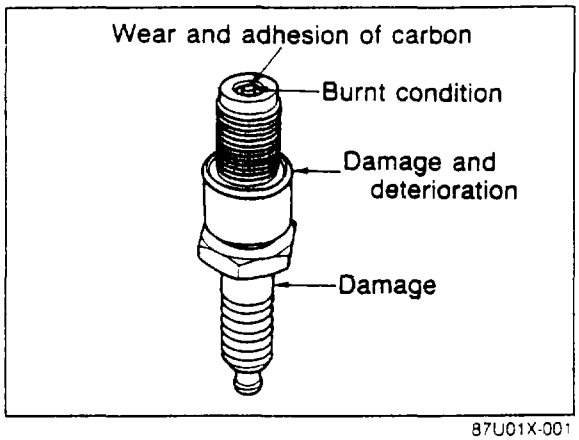
High-tension Lead

Check the following points, clean or replace if necessary.
1. Damaged lead
2. Carbon deposits

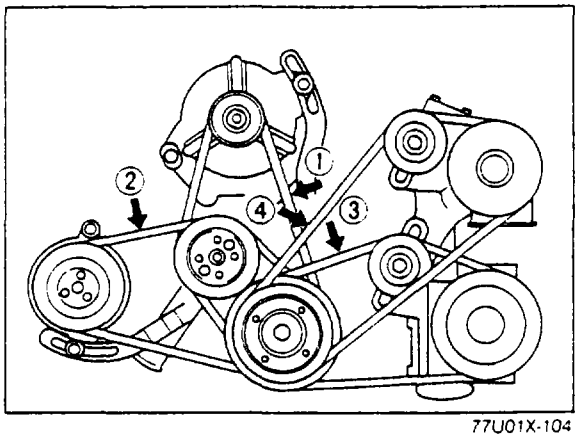


87U01X-001

Spark Plug

Check the following points, clean or replace if necessary.
1. Damaged insulation
2. Worn electrodes
3. Carbon deposits
4. Damaged gasket
5. Burnt spark insulator
6. Plug gap

Standard plug gap:
2.0 mm (0.08 in)

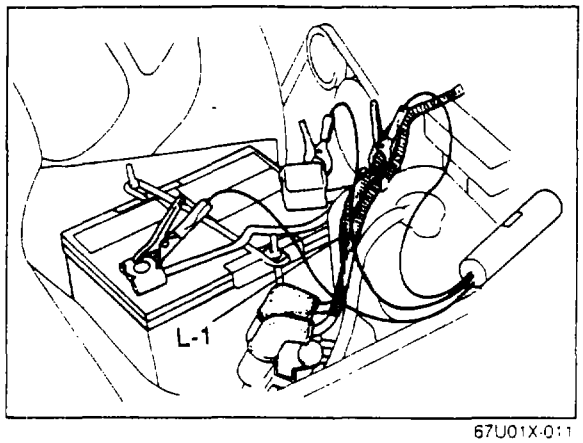


77U01X-104

Drive Belt

1. Check the drive belts for wear, cracks, or fraying, replace if necessary.
2. Check the drive belt tension by applying moderate pressure (98 N, 10 kg, 22 lb) midway between the pulleys. Adjust if necessary.

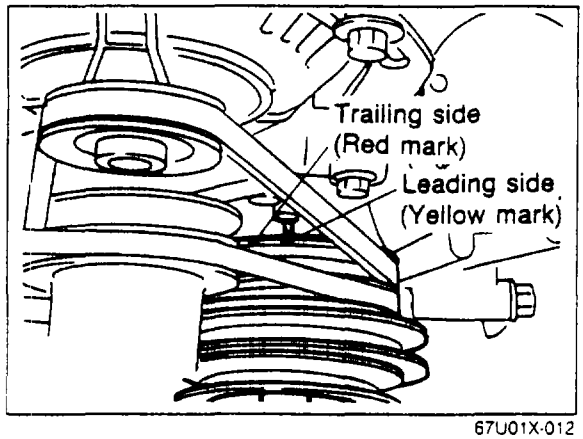
	Drive belt		Deflection
1	Alternator		14—17 mm (0.55—0.67 in)
2	Air pump	Turbo	8—10 mm (0.31—0.39 in)
		Non-turbo	11—13 mm (0.43—0.51 in)
3	A/C compressor		6— 8 mm (0.24—0.31 in)
4	P/S pump		11—13 mm (0.43—0.51 in)



67U01X-011

Ignition Timing

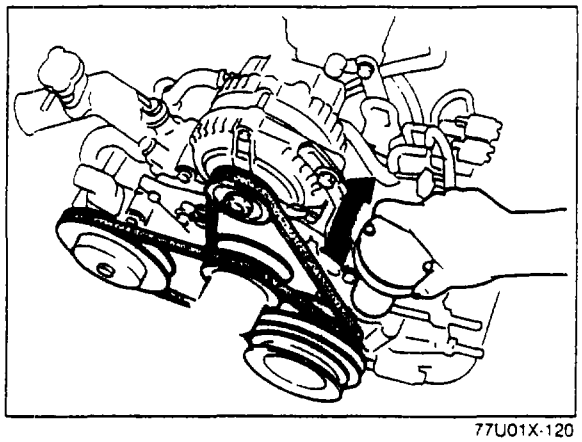
1. Warm up the engine to normal operating temperature.
2. Turn off all unnecessary electrical loads.
3. Connect a tachometer and check the idle speed.
4. Connect a timing light to the high-tension lead of the front leading-side.



67U01X-012

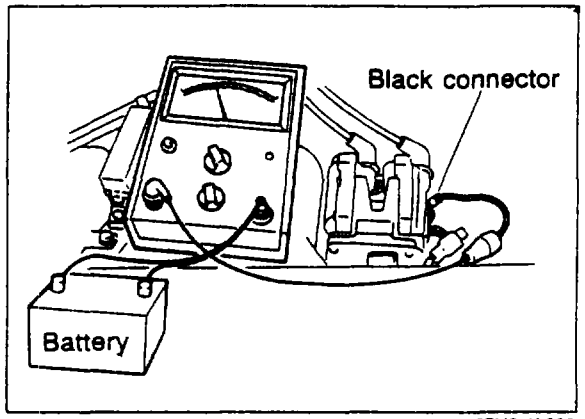
5. Check that the mark on the pulley is aligned with the indicator pin.
6. Connect the timing light to the high-tension lead of the front trailing-side, and check the timing.

Ignition timing:
Leading: 5° ATDC (Yellow)
Trailing: 20° ATDC (Red)


77U01X-120

7. If necessary, turn the crank angle sensor to adjust.

Warning
When adjusting the ignition timing, keep hands, clothing, hair and tools away from the P/S drive belt.

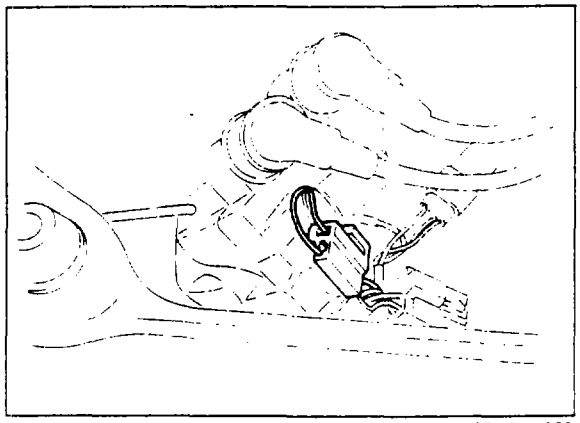


87U01X-002

Idle Speed

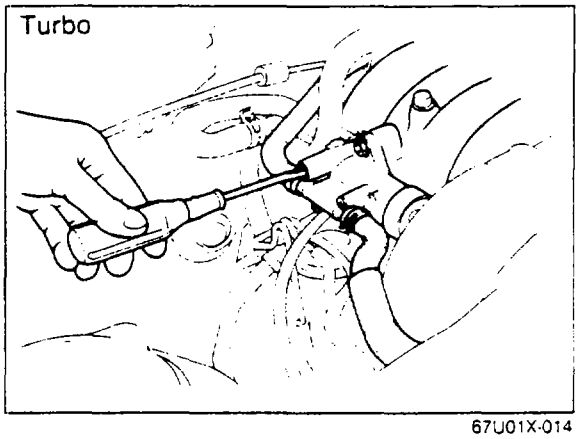
1. Warm up the engine to normal operating temperature.
2. Turn off all unnecessary electrical loads.
3. Connect a tachometer and check the idle speed.

Idle speed: 750 ± 25 rpm



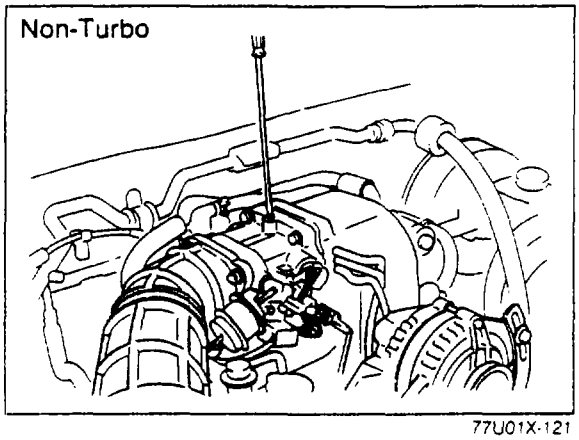
67U01X-020

4. If necessary adjust the idle speed (Refer to Section 4).
   (1) Check the throttle sensor.
   (2) Connect a jumper wire to the terminals of the initial set connector.



67U01X-014

   (3) Turn the air adjust screw and adjust the idle speed.



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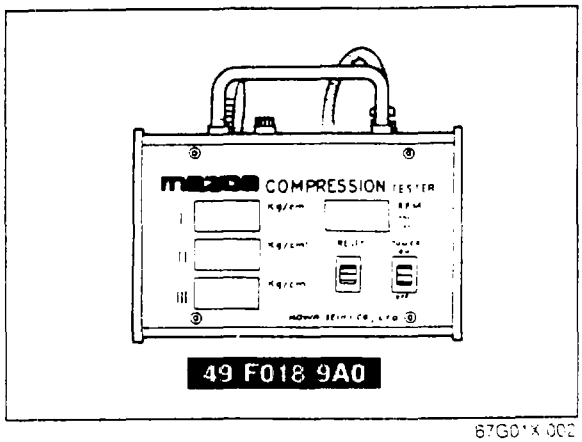
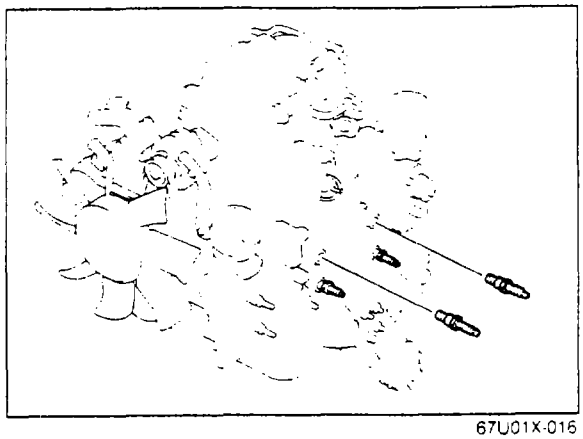


67G01X-002

ON-VEHICLE INSPECTION

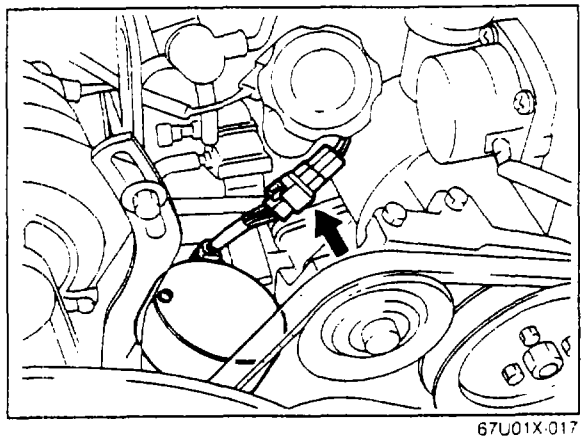
COMPRESSION

Note
The compression tester for conventional piston engines reads only the highest pressure of the three combustion chambers in the rotor housing. Use compression tester (49 F018 9A0) to measure the compression of the three combustion chambers.



67U01X-016

1. Check that the battery is fully charged.
2. Warm up the engine to operating temperature.
3. Turn it off for about 10 minutes to reduce the exhaust pipe temperature.
4. Remove the front and rear trailing-side spark plugs.



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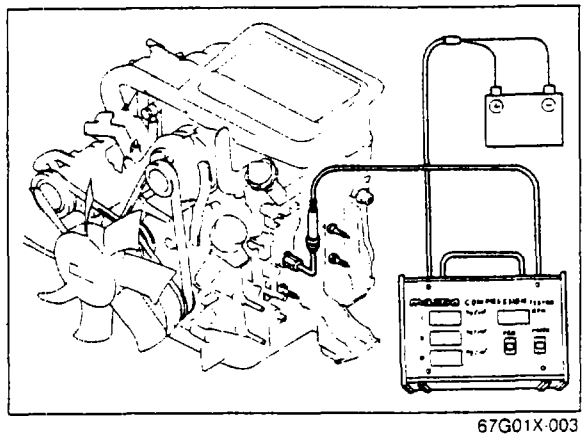
5. Disconnect the crank angle sensor connector.



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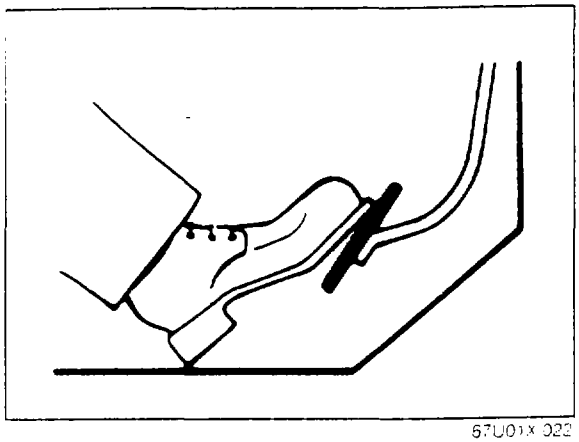
6. Connect the **compression tester** (49 F018 9A0) with **adaptor** to the front rotor housing and the battery.



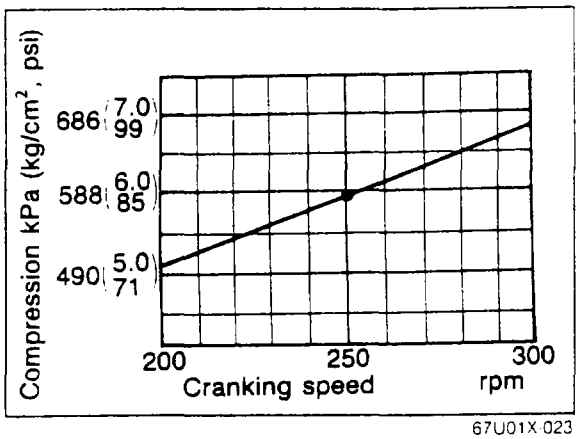
67U01X-022

7. Fully depress the accelerator pedal and crank the engine for 5—10 seconds.
8. Make a note of the compression of the three combustion chambers and cranking speed.

Compression:
588 kPa (6.0 kg/cm², 85 psi) — 250 rpm
Differential limit of chambers:
147 kPa (1.5 kg/cm², 21 psi) — 250 rpm

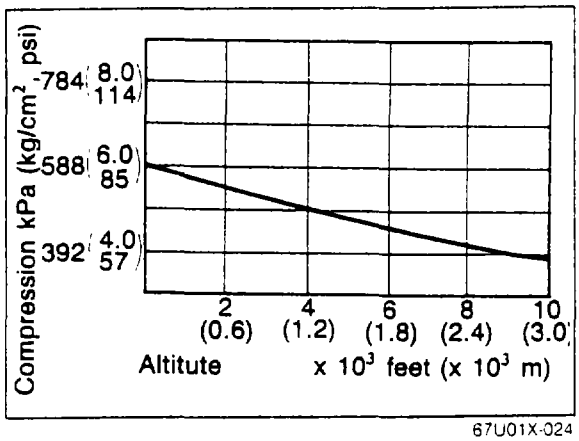
Note
Compensate the compression values if they are measured at different cranking speeds than standard, or measured at a high altitude.

8. Check the rear chambers with the same procedure.



67U01X-023

Cranking speed compensation
Compensate for the cranking speed.



67U01X-024

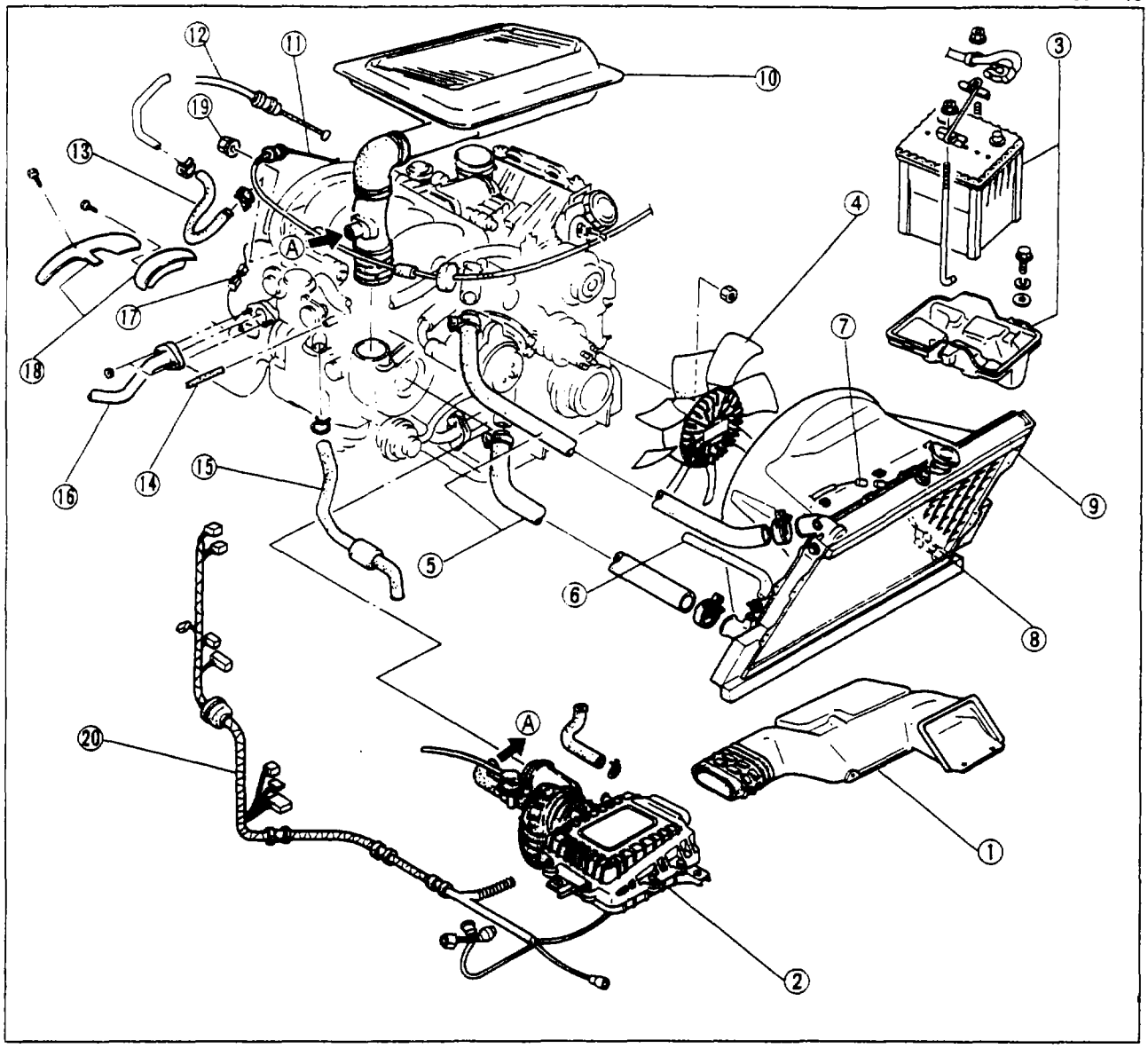
Altitude compensation
Compensate for the altitude.

REMOVAL AND INSTALLATION (TURBO)

1. Disconnect the negative battery cable.
2. Drain the engine oil and coolant.
3. Remove in the sequence shown in the figures.
4. Install in the reverse order of removal.

A. Front and Right Side

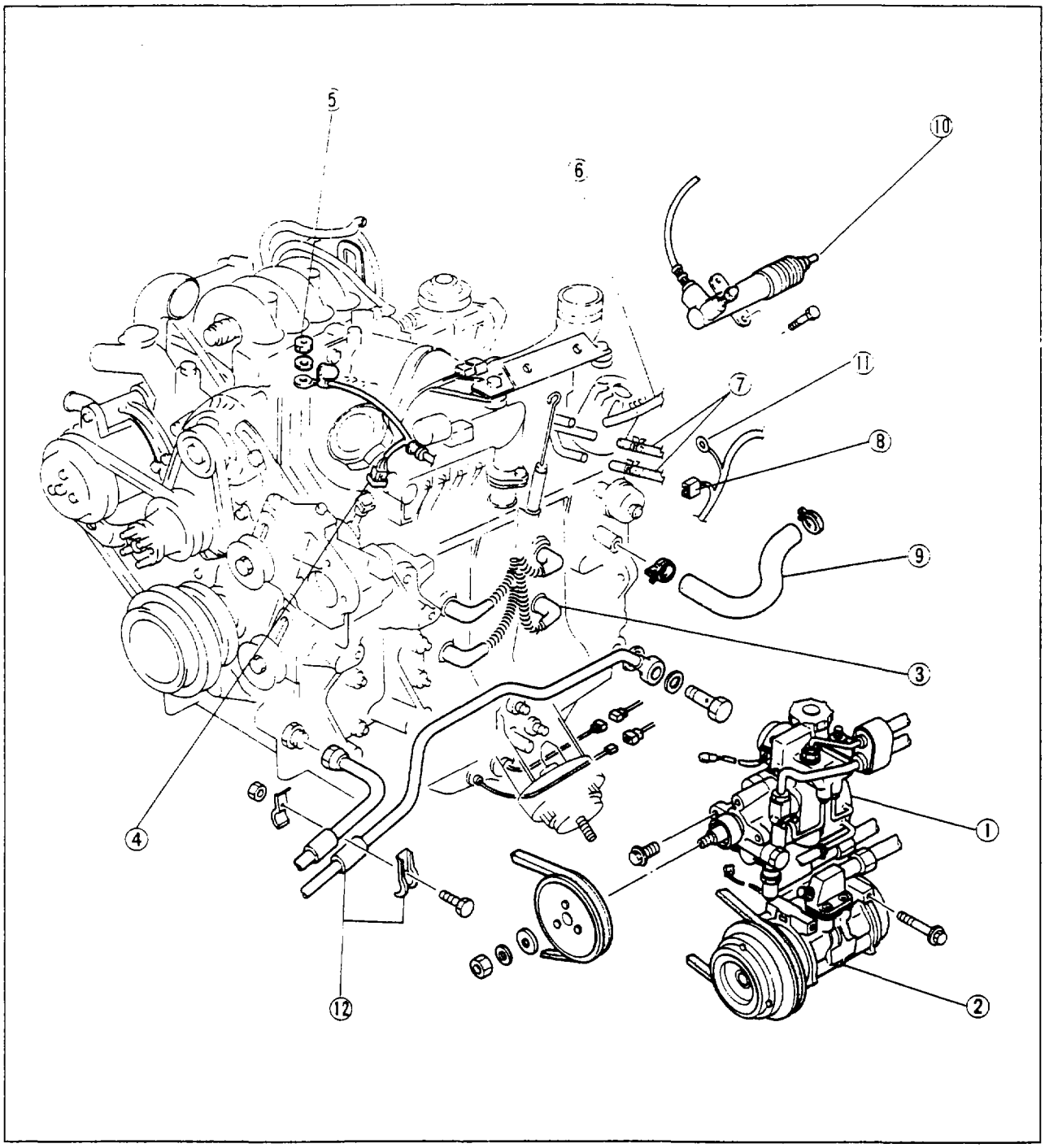
77U01X-105



77U01X 007

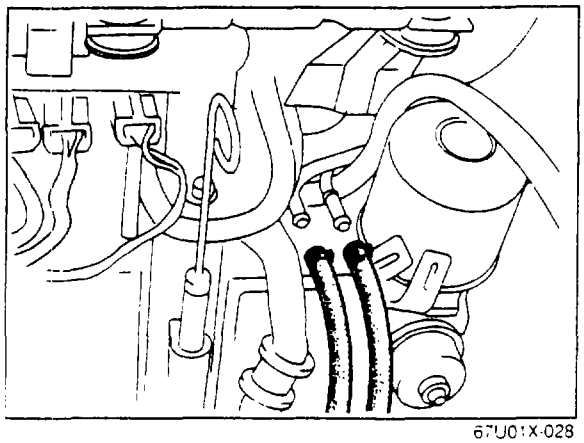
1. Air intake pipe
2. Air cleaner assembly
3. Battery and box
4. Cooling fan
5. Upper and lower radiator hose
6. Heater return hose
7. Coolant level sensor connector
8. Radiator switch connector
9. Radiator and cowling
10. Intercooler
11. Accelerator cable
12. Cruise control cable
13. Brake vacuum hose
14. Pressure sensor vacuum hose
15. Relief silencer hose
16. Split air pipe
17. O_2 sensor connector
18. Insulator covers
19. Front converter upper nut
20. Engine harness connector

B. Left Side



77U01X-008

1. P/S pump and drive belt
2. A/C compressor and drive belt
3. High tension lead
4. Crank angle sensor connector
5. Alternator connector
6. Canister hose
7. Fuel hose
8. Oil pressure gauge connector
9. Heater hose
10. Clutch release cylinder
11. Engine ground
12. Oil cooler pipe and bracket



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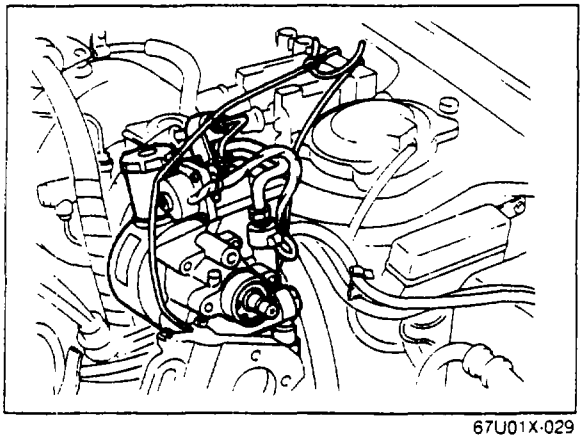
Fuel hose
After disconnecting the fuel hoses (inlet and return), plug them to avoid fuel leakage.



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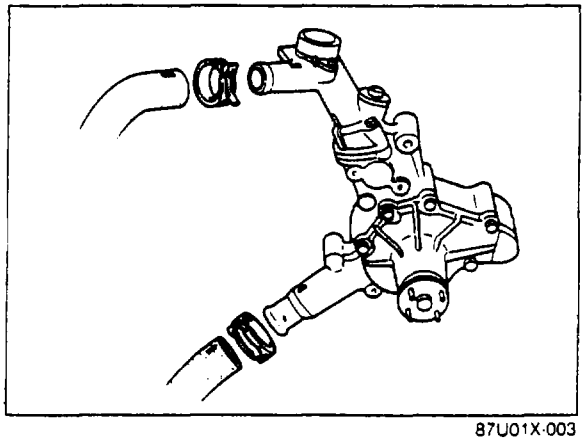
P/S pump, A/C compressor
Remove the P/S pump and A/C compressor with the hoses still connected to them, secure the pump and compressor as shown in the figure.



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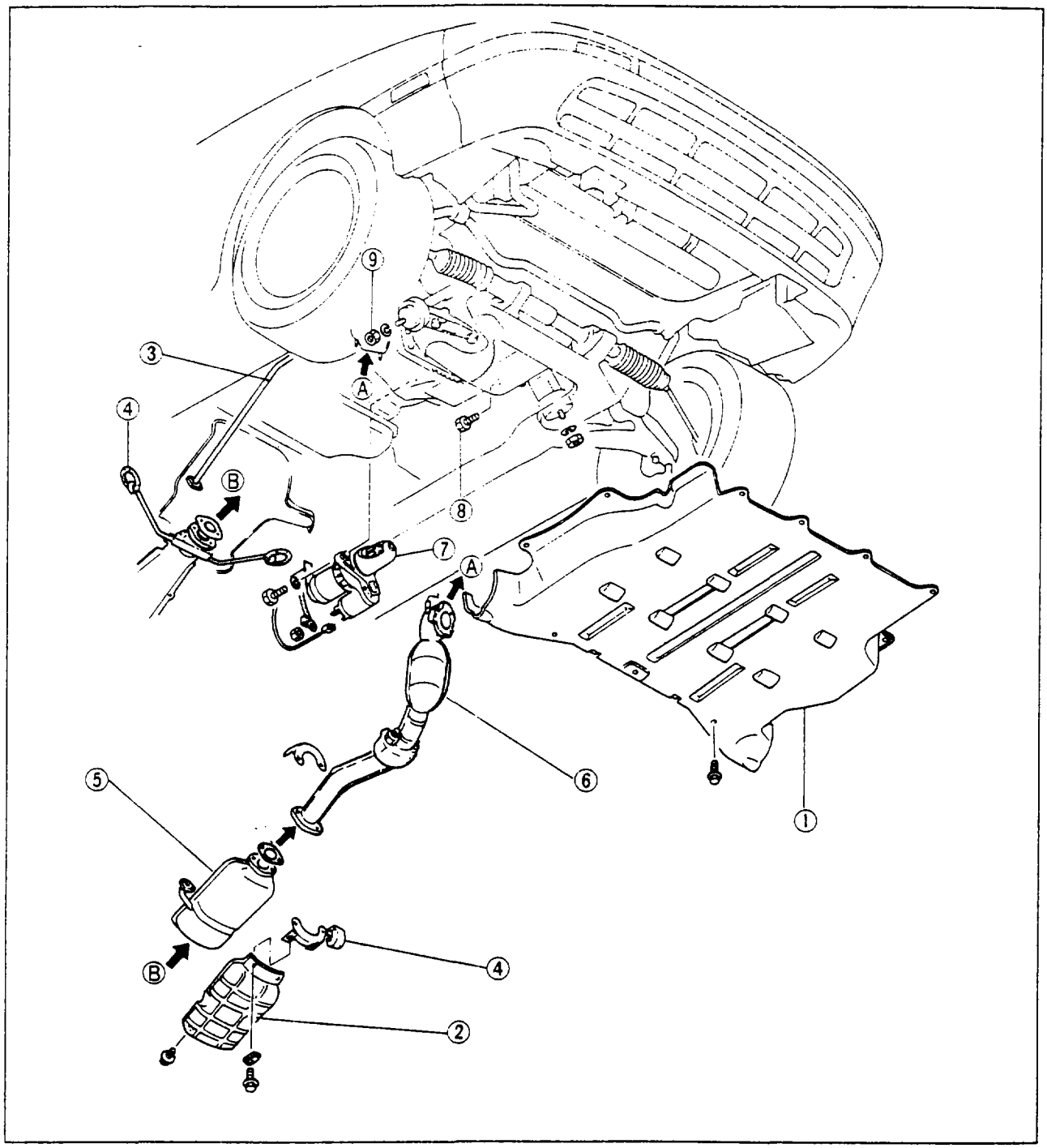
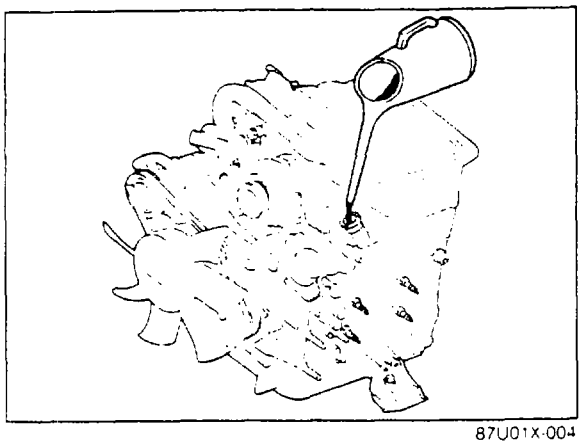
Water hose
Position the hose clamp in the original location on the hose.
Squeeze the clamp lightly with large pliers to ensure a good fit.

C. Under Side



77U01X-010

1. Under cover
2. Catalytic converter insulator
3. Split air pipe
4. Exhaust pipe bracket
5. Catalytic converter
6. Exhaust pipe and front converter
7. Starter
8. Transmission attaching bolt
9. Engine mount nut



87U01X-004

Steps After Installation

After installing the engine, perform the following operations:

Engine oil

Add engine oil (Refer to Section 2).

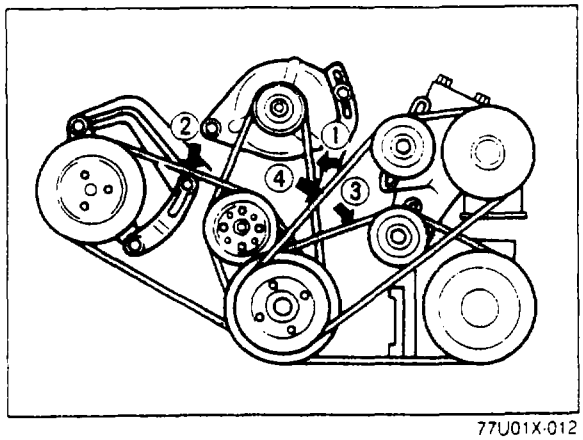
Oil capacity (dry engine):
5.8 liters (6.1 US qt, 5.1 Imp qt)

Coolant

Close the drain cock, fill the radiator with the air bleeder plug removed, and pour the coolant into the coolant reservoir.

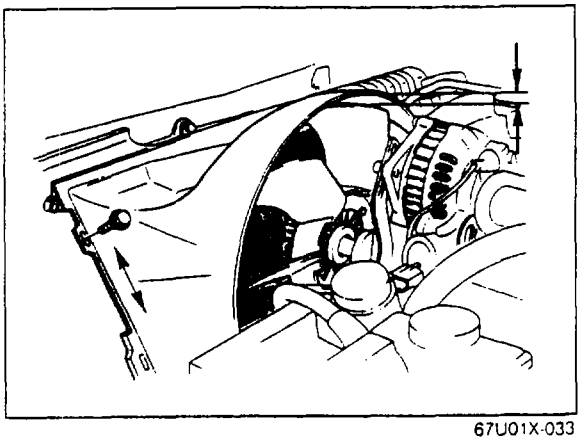
Drive belt

1. Check the drive belts for wear, cracks, or fraying, replace if necessary.
2. Check the drive belt tension by applying moderate pressure (98 N, 10 kg, 22 lb) midway between the pulleys. Adjust if necessary.



77U01X-012

Drive belt	Deflection
1 Alternator	14—17 mm (0.55—0.67 in)
2 Air pump	8—10 mm (0.31—0.39 in)
3 A/C compressor	6— 8 mm (0.24—0.31 in)
4 P/S pump	11—13 mm (0.43—0.51 in)

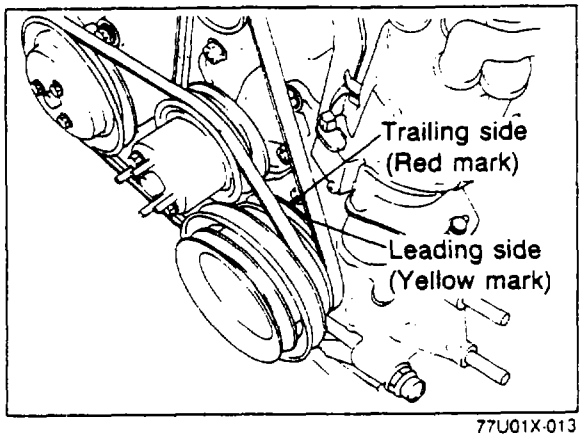


67U01X-033

Cooling fan

Check the cooling fan clearance, if necessary move the radiator cowling and adjust the clearance.

Cooling fan clearance:
16—24 mm (0.63—0.94 in)



77U01X-013

Condition

1. Run the engine and check for leaks.
2. Check the ignition timing.

Ignition timing:
Leading: 5° ATDC (Yellow)
Trailing: 20° ATDC (Red)

3. Check the idle speed (Refer to Section 4B).

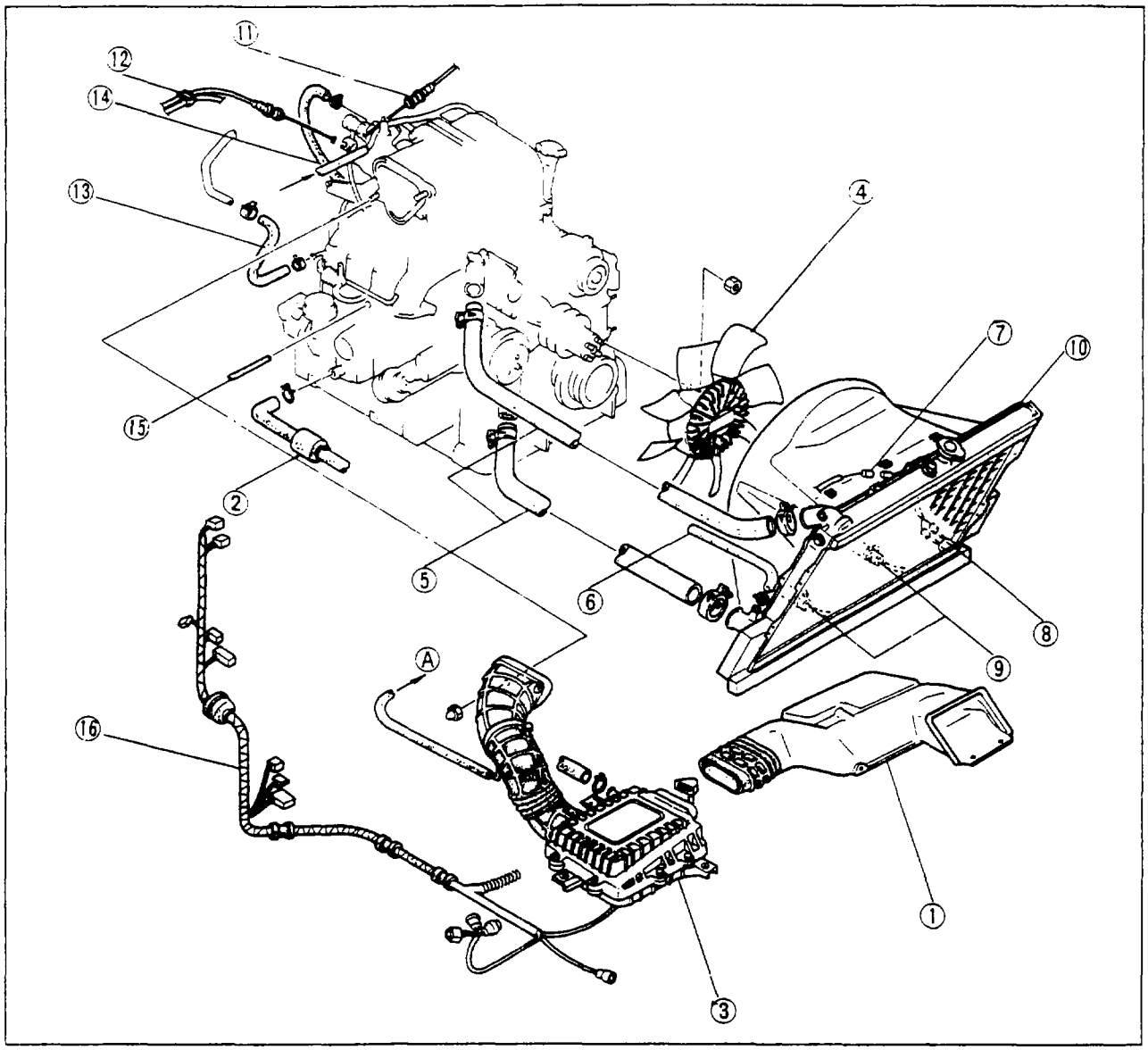
Idle speed: 750 ± 25 rpm

REMOVAL AND INSTALLATION (NON-TURBO)

1 Disconnect the negative battery cable.
2. Drain the engine oil and coolant
3. Remove in the sequence shown in the figures.
4 Install in the reverse order of removal.

A. Front and Right Side

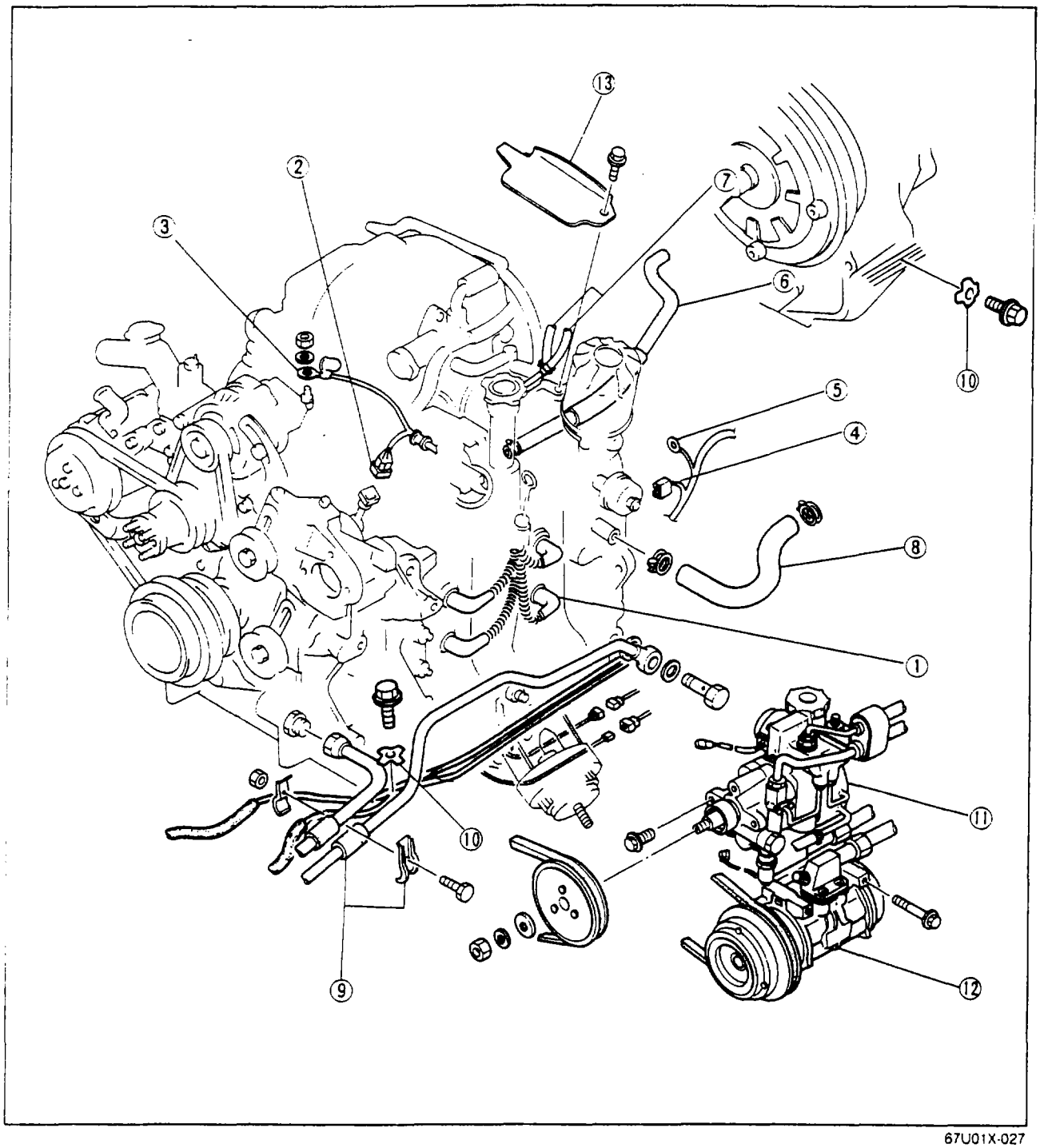
77U01X-106



67U01X-026

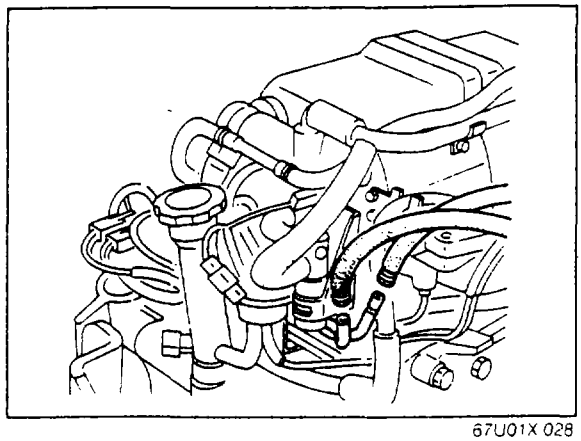
1. Air intake pipe
2. Relief silencer hose
3. Air cleaner assembly
4. Cooling fan
5. Upper and lower radiator hose
6. Heater return hose
7. Coolant level sensor connector
8. Radiator switch connector
9. ATF hose
10. Radiator and cowling
11. Accelerator cable
12. Cruise control cable and vacuum hose
13. Brake vacuum hose
14. BAC air hose
15. Boost sensor vacuum hose
16. Engine harness connector

B. Left Side



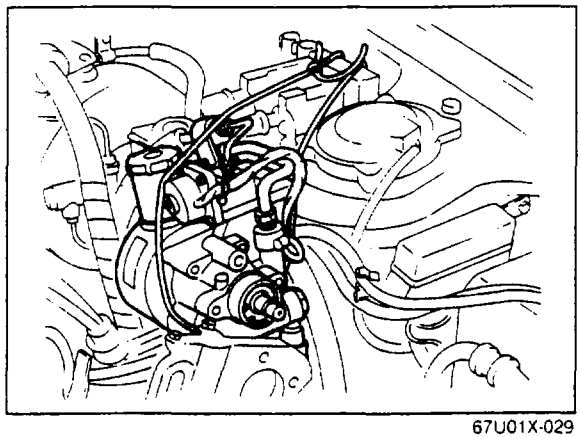
67U01X-027

1. High-tension lead
2. Crank angle sensor connector
3. Alternator connector
4. Oil pressure gauge connector
5. Engine ground
6. Canister hose
7. Fuel hose
8. Heater hose
9. Oil cooler pipe and bracket
10. A/T pipe bracket
11. P/S pump and drive belt
12. A/C compressor and drive belt
13. Dust cover



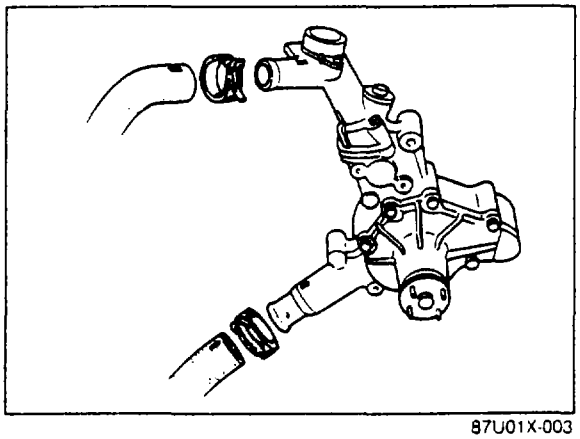
67U01X 028

Fuel hose
After disconnecting the fuel hoses (inlet and return), plug them to avoid fuel leakage.



67U01X-029

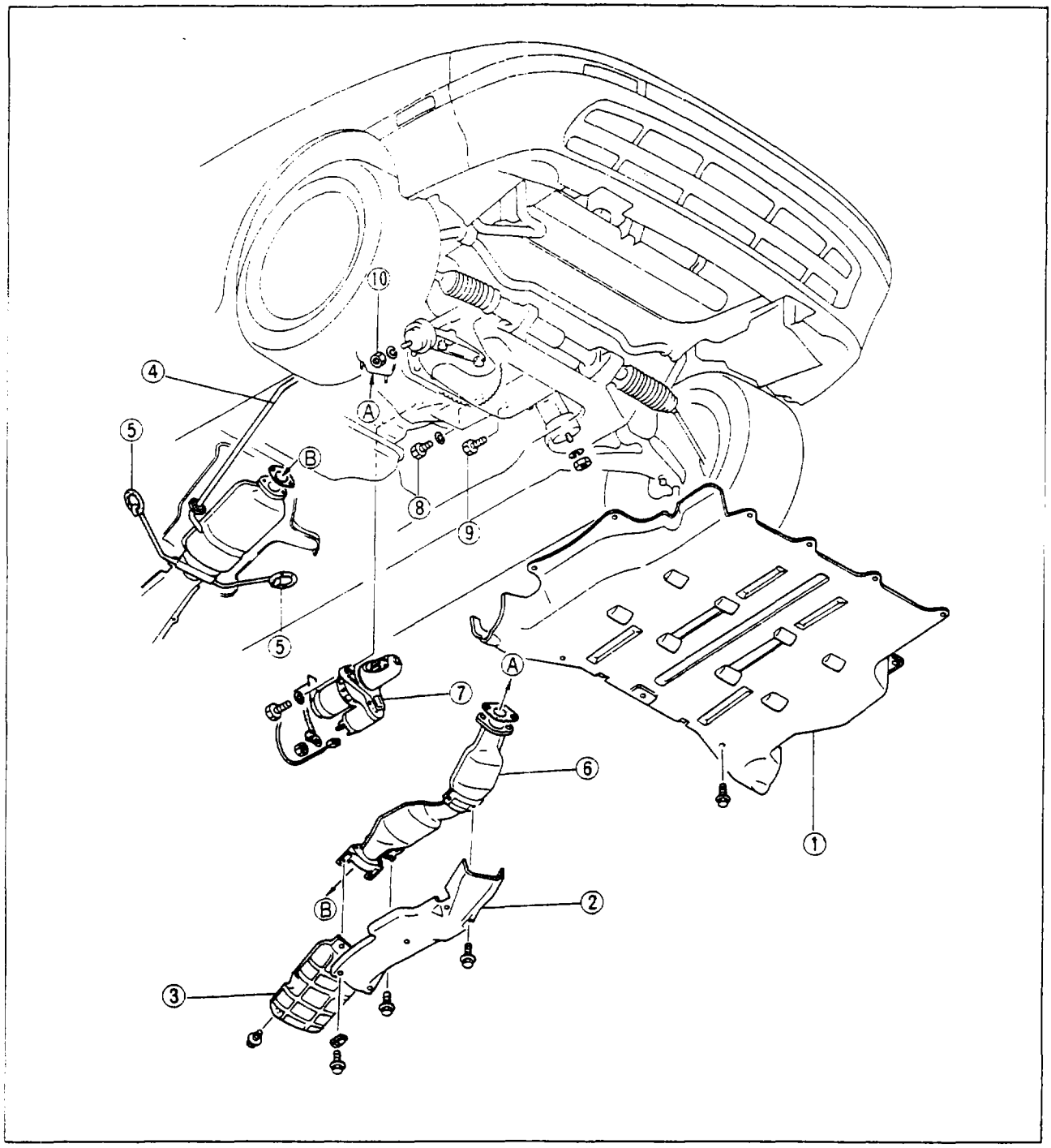
P/S pump, A/C compressor
Remove the P/S pump and A/C compressor with the hoses still connected to them, secure the pump and compressor as shown in the figure.



87U01X-003

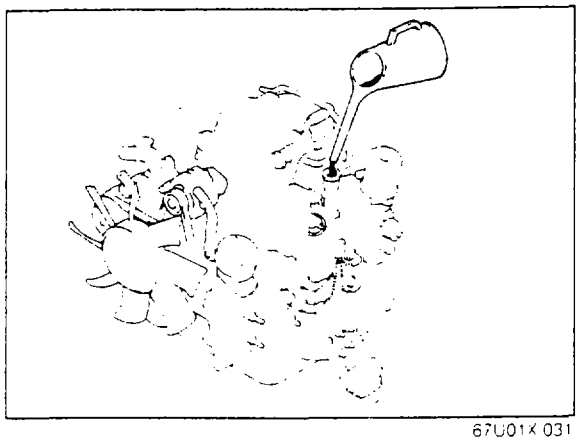
Water hose
Position the hose clamp in the original location on the hose.
Squeeze the clamp lightly with large pliers to ensure a good fit.

C. Under Side



67U01X-030

1. Under cover
2. Exhaust pipe under cover
3. Catalitic converter insulator
4. Secondary air pipe and hose
5. Exhaust pipe bracket
6. Exhaust pipe
7. Starter
8. Torque converter attaching bolt (A/T)
9. Transmission attaching bolt
10. Engine mount nut



67U01X-031

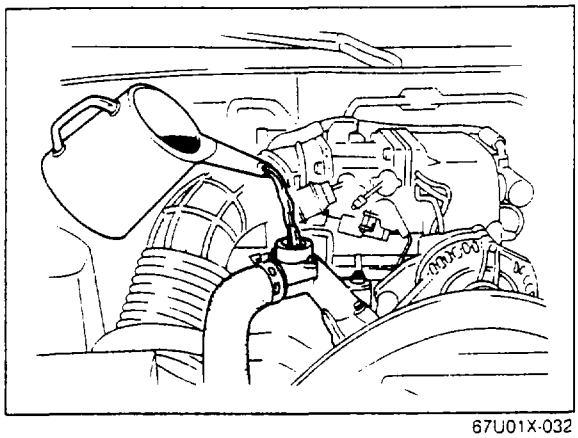
Steps After Installation

After installing the engine, perform the following operations:

Engine oil

Add engine oil (Refer to Section 2).

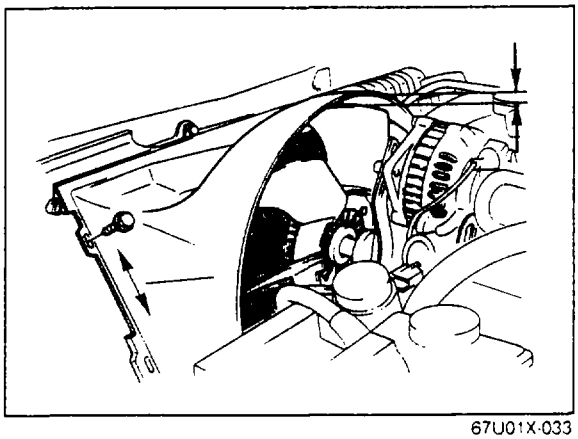
Oil capacity (dry engine):
5.8 liters (6.1 US qt, 5.1 Imp qt)



67U01X-032

Coolant

Close the drain cock, fill the radiator with the air bleeder plug removed, and pour the coolant into the coolant reservoir.

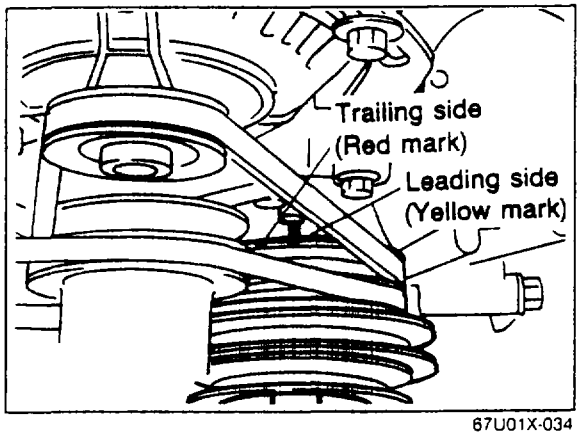


67U01X-033

Cooling fan

Check the cooling fan clearance, if necessary move the radiator cowling and adjust the clearance.

Cooling fan clearance:
16—24 mm (0.63—0.94 in)



67U01X-034

Condition

1. Run the engine and check for leaks.
2. Perform the necessary engine adjustments (Refer to Tune-up Procedure Section).
3. Perform a road test.

DISASSEMBLY

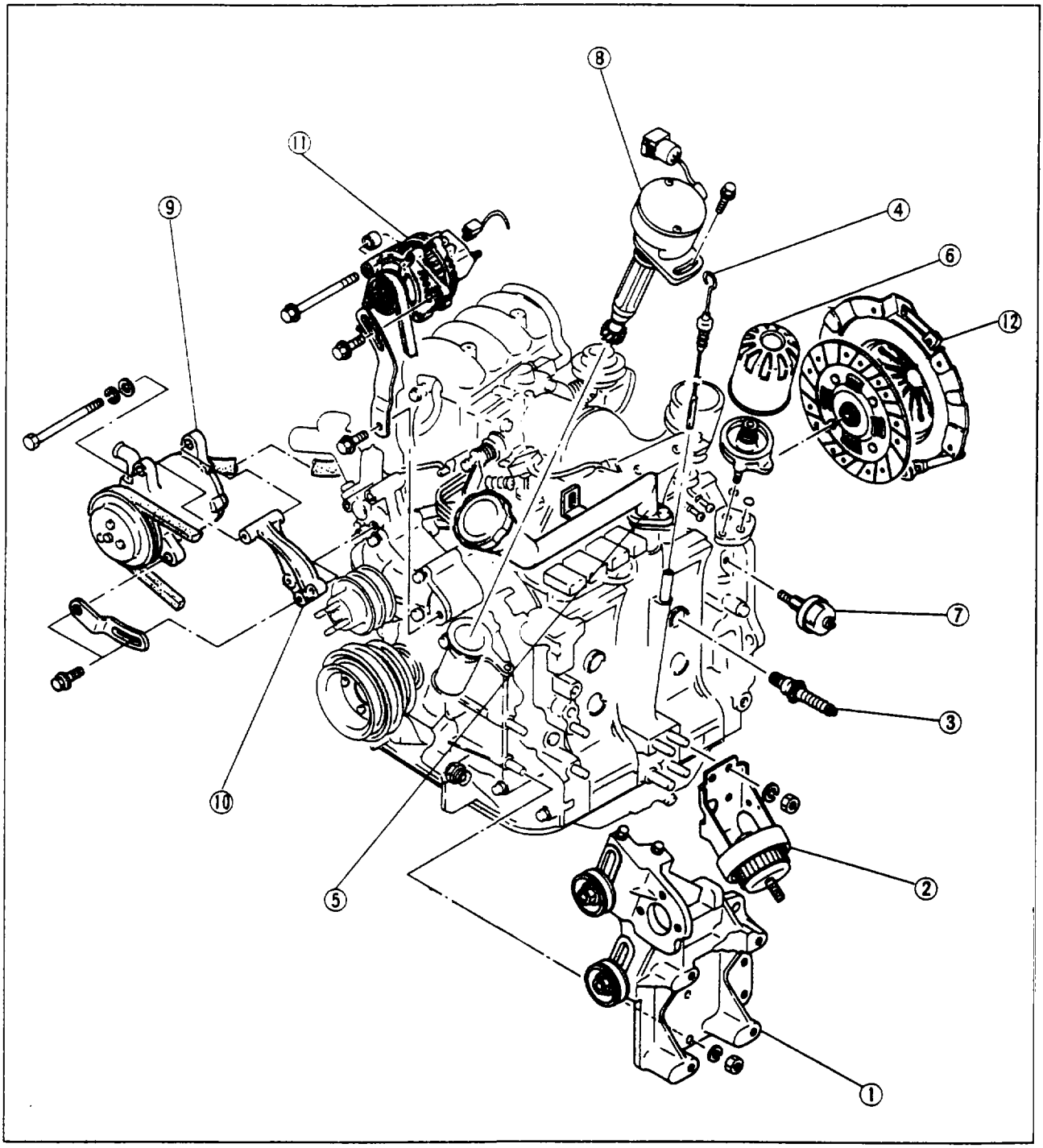
Disassembly Note

1. Care should be taken during the disassembly of any part or system to study its order of assembly. Any deformation, wear, or damage also should be noted.
2. Code all identical parts (such as rotors, rotor oil seals, rotor seals, and seal springs) so that they can be reinstalled in the location from which they were removed.

EXTERNAL (TURBO)

Disassemble in the sequence shown in the figure.

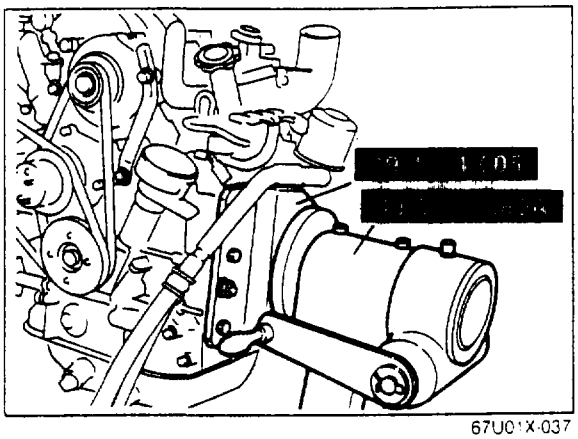
External Disassembly I



77U01X-107

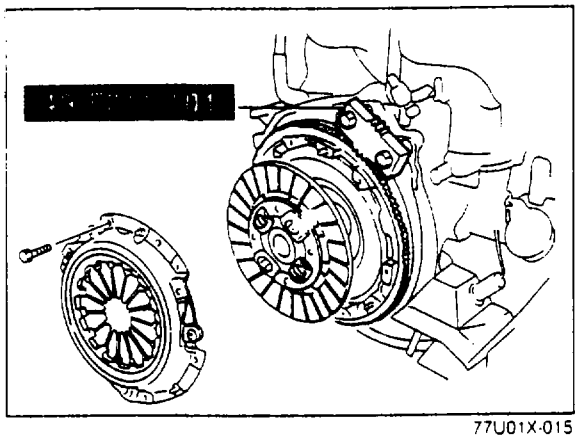
1. A/C compressor — P/S pump bracket
2. Left engine mount
3. Spark plug
4. Oil level gauge
5. Oil filler pipe
6. Oil filter and filter body
7. Oil pressure gauge
8. Crank angle sensor
9. Air pump and drive belt
10. Air pump bracket
11. Alternator and drive belt
12. Clutch cover and clutch disc

77U01X-014



67U01X-037

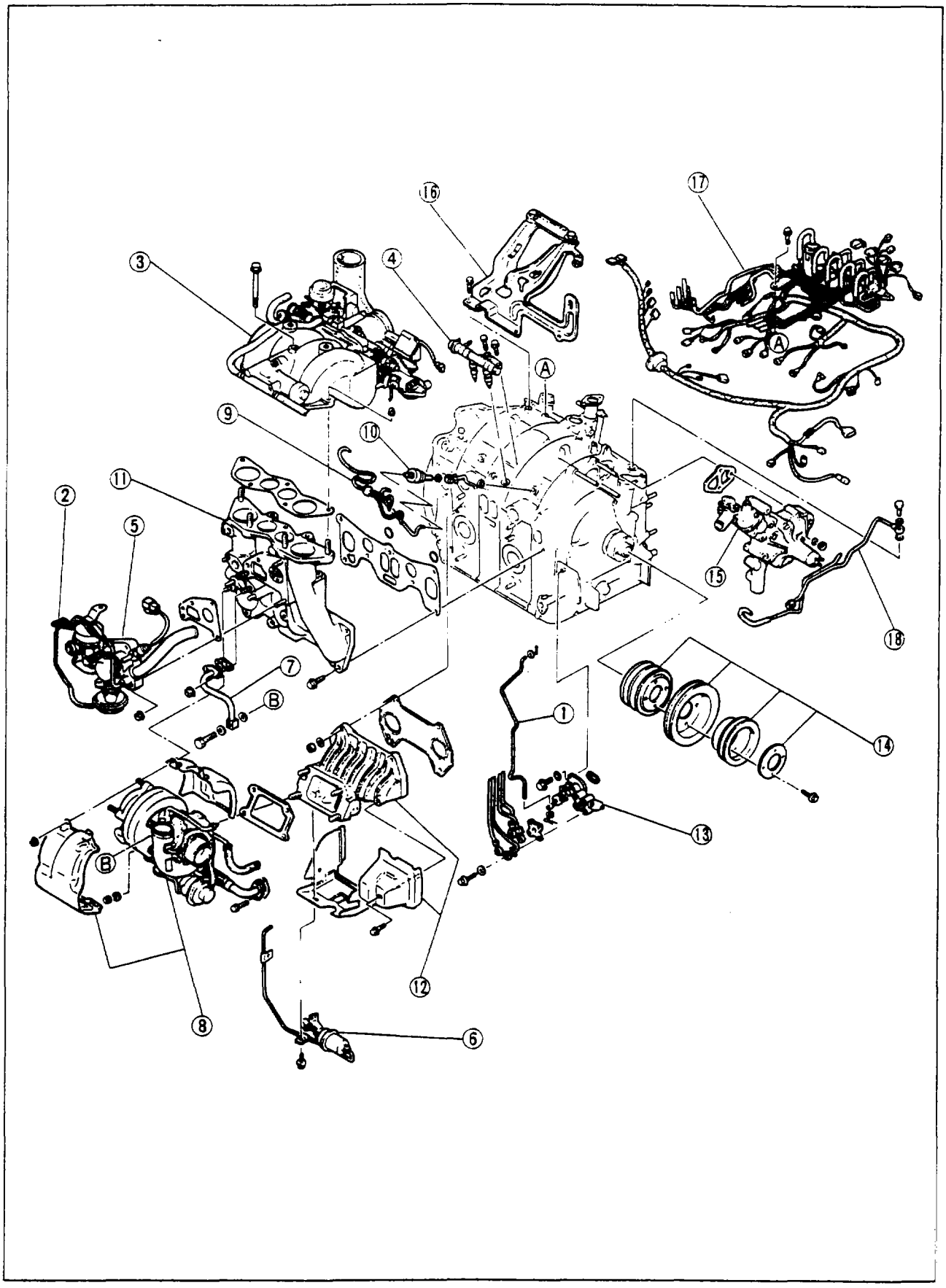
Engine hanger
Install the engine on **engine hanger** (49 1114 005) attached to **engine stand** (49 0107 680A) after removing the left engine mount and the spark plugs.



77U01X-015

Clutch disc and clutch cover
Remove the clutch disc and clutch cover using **ring gear brake** (49 F011 101).

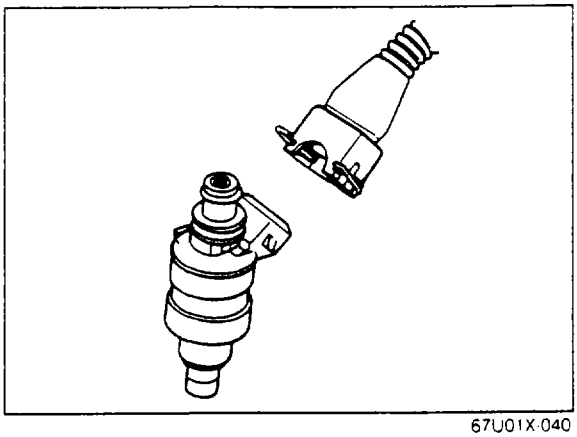
External Disassembly II



67U01X-038

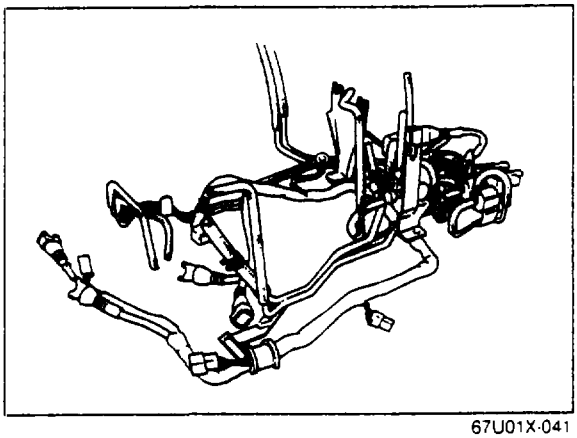
1. Metering oil connecting rod
2. Second vacuum piping
3. Throttle and dynamic chamber
4. Primary fuel injector and distribution pipe
5. Air control valve
6. Switching actuator
7. Water pipe
8. Turbocharger and insulator
9. Air hose
10. Housing oil nozzle and manifold oil nozzle
11. Intake manifold
12. Exhaust manifold and insulator
13. Metering oil pump
14. Eccentric shaft pulley
15. Water pump
16. Dynamic chamber bracket
17. Engine harness and vacuum piping
18. Oil inlet pipe

77U01X 016



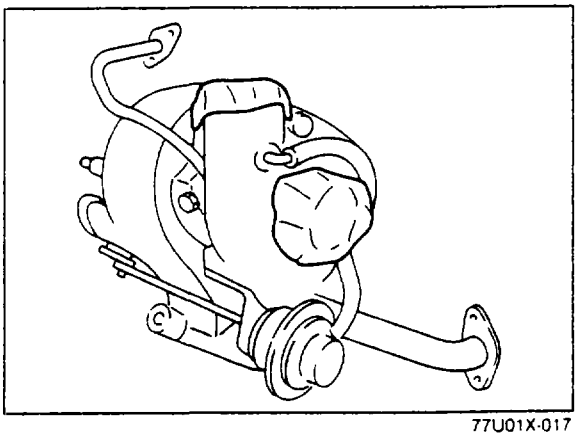
67U01X-040

Connector
Stretch the stopper and disconnect the connectors carefully.



67U01X-041

Engine harness and vacuum piping
Remove the engine harness and vacuum piping as an assembly.



77U01X-017

Turbocharger
Cover the intake and exhaust ports and oil passage to prevent dirt or other contaminants from entering.

DISASSEMBLY

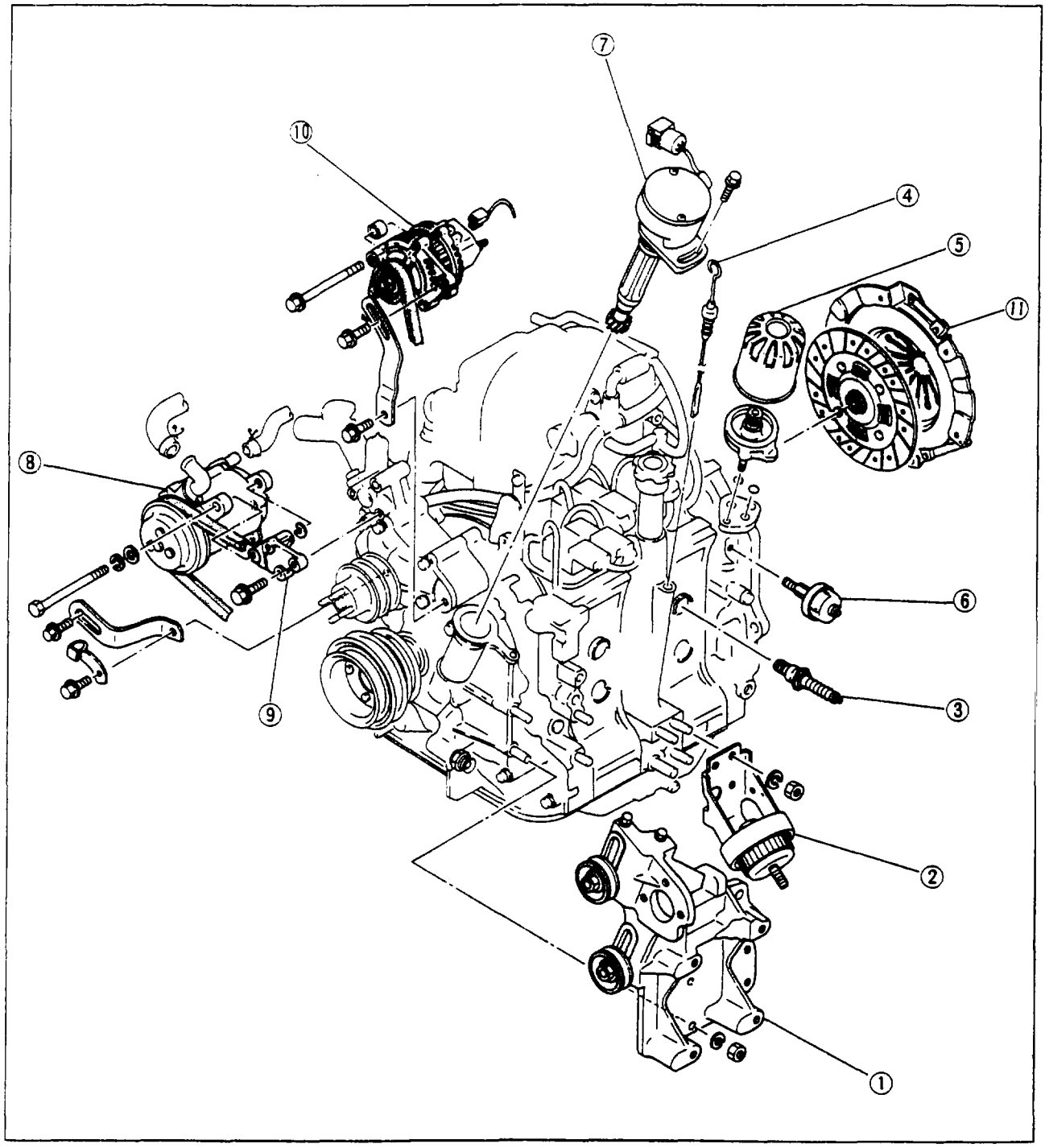
Disassembly Note

1. Care should be taken during the disassembly of any part or system to study its order of assembly. Any deformation, wear, or damage also should be noted.
2. Code all identical parts (such as rotors, rotor oil seals, rotor seals, and seal springs) so that they can be reinstalled in the location from which they were removed.

EXTERNAL (NON-TURBO)

Disassemble in the sequence shown in the figure.

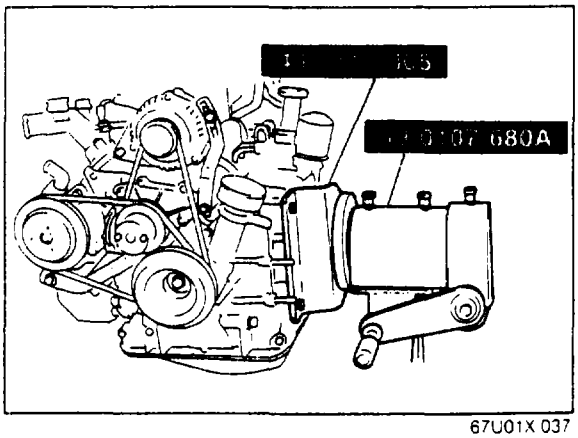
External Disassembly I



77U01X-108

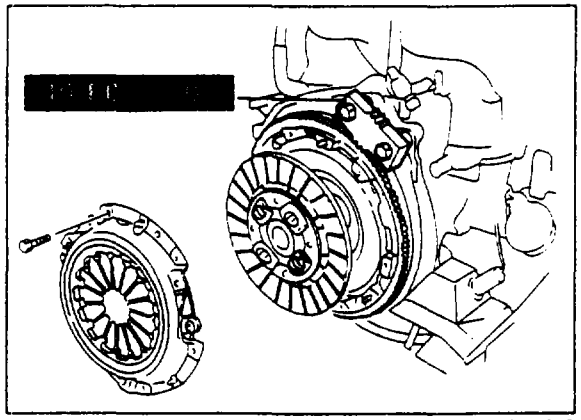
1. A/C compressor — P/S pump bracket
2. Left engine mount
3. Spark plug
4. Oil level gauge
5. Oil filter and filter body
6. Oil pressure gauge
7. Crank angle sensor
8. Air pump and drive belt
9. Air pump bracket
10. Alternator and drive belt
11. Clutch cover and clutch disc

67U01X-036



67U01X 037

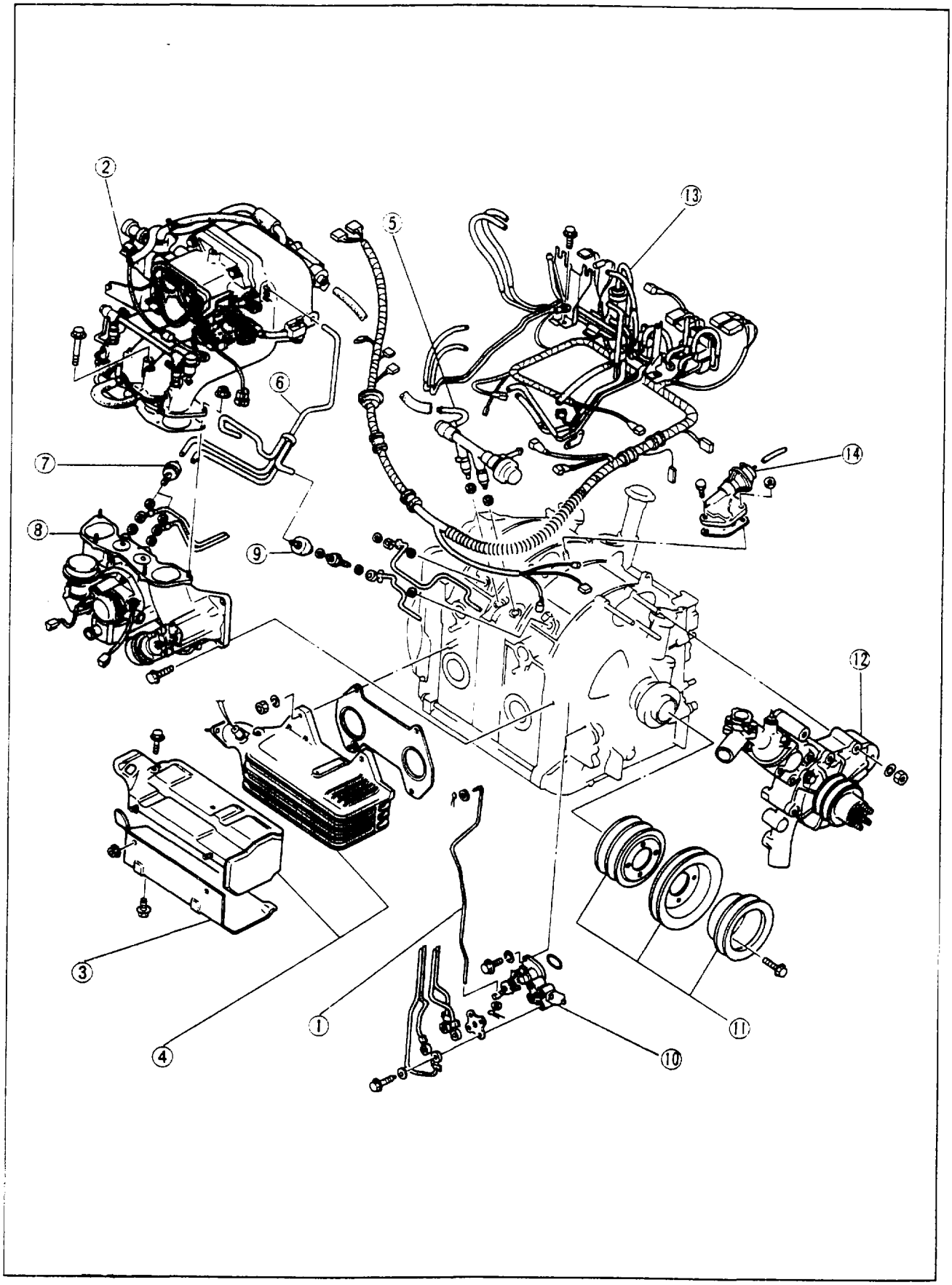
Engine hanger
Install the engine on **engine hanger** (49 1114 005) attached to **engine stand** (49 0107 680A) after removing the left engine mount and the spark plugs.



77U01X-015

Clutch disc and clutch cover
Remove the clutch disc and clutch cover using **ring gear brake** (49 F011 101).

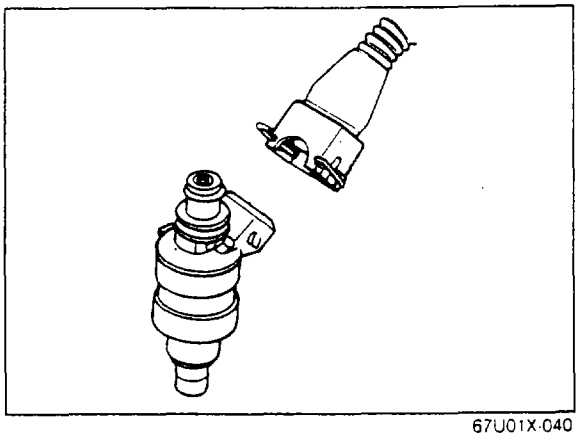
External Disassembly II



67U01X-038

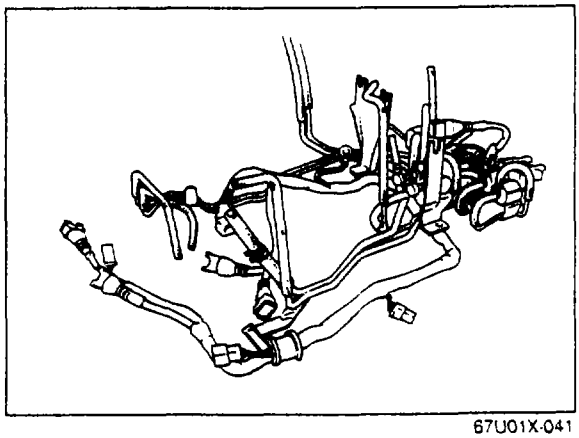
1. Metering oil connecting rod
2. Throttle and dynamic chamber
3. Exhaust absorber plate
4. Exhaust manifold and insulator
5. Fuel injector and delivery pipe
6. Air hose
7. Manifold oil nozzle and metering oil tube
8. Intake manifold
9. Housing oil nozzle and metering oil tube
10. Metering oil pump
11. Eccentric shaft pulley
12. Water pump
13. Engine harness and vacuum piping
14. EGR valve

67U01X-039



67U01X-040

Connector
Stretch the stopper and disconnect the connectors carefully.

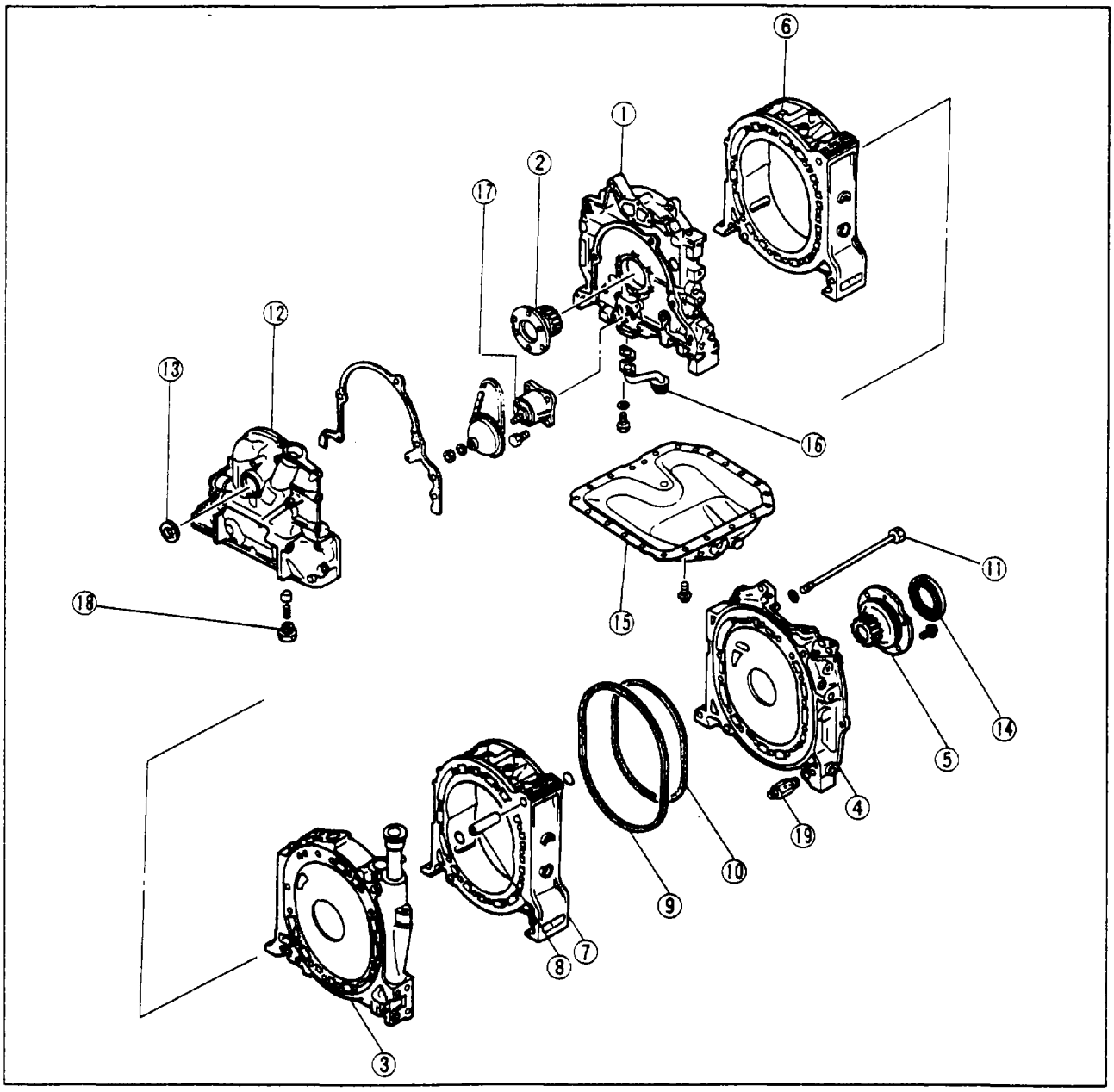


67U01X-041

Engine harness and vacuum piping
Remove the engine harness and vacuum piping as an assembly.

INTERNAL
Component 1 — Housing Related Parts

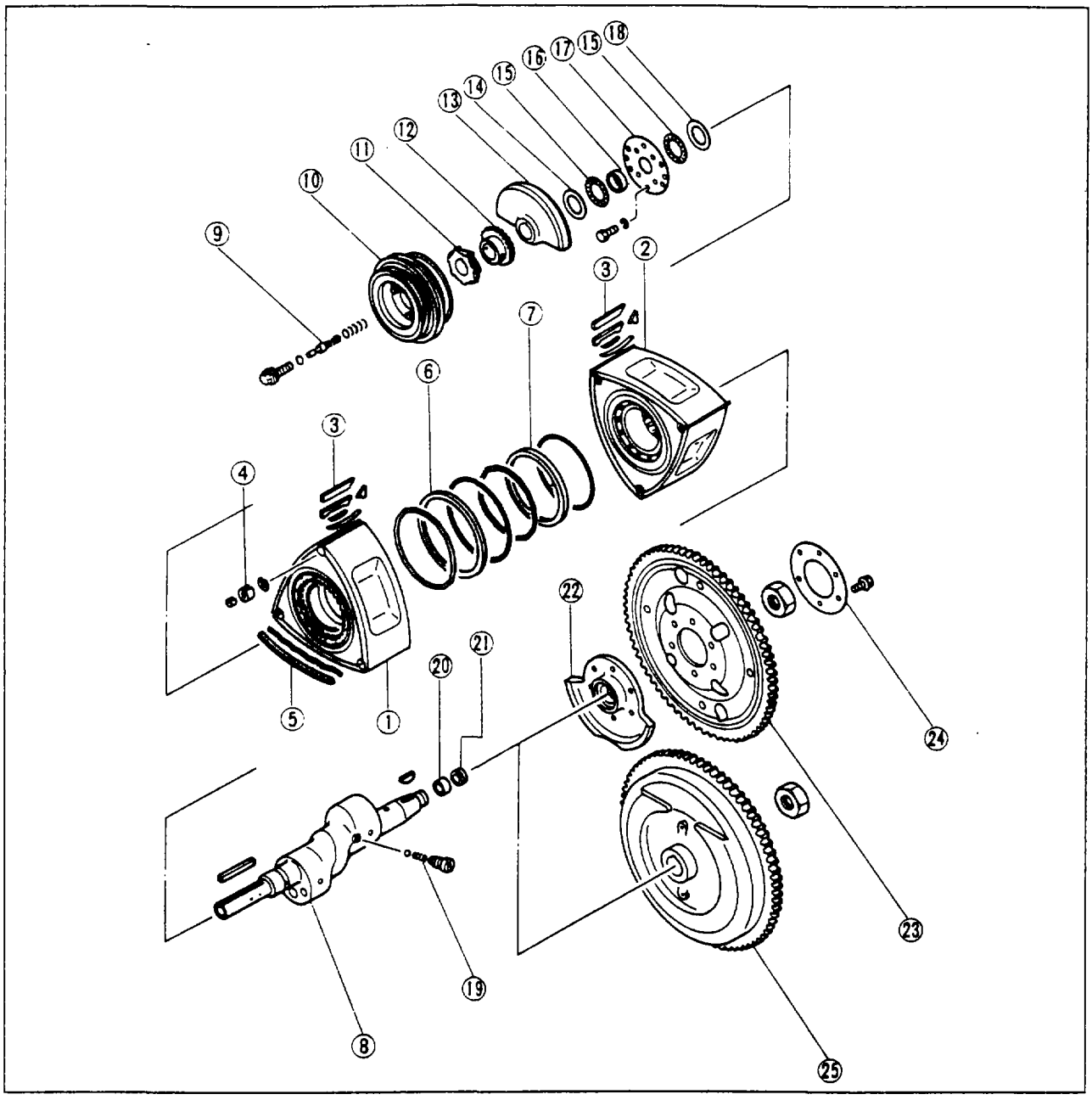
67U01X-042



67U01X-043

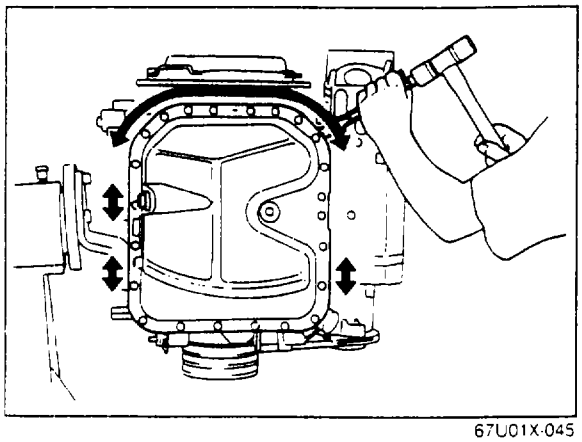
1. Front housing
2. Front stationary gear
3. Intermediate housing
4. Rear housing
5. Rear stationary gear
6. Front rotor housing
7. Rear rotor housing
8. Tubular dowel pin
9. Outer sealing rubber
10. Inner sealing rubber
11. Tension bolt
12. Front cover
13. Front oil seal
14. Rear oil seal
15. Oil pan
16. Oil strainer
17. Oil pump
18. Oil pressure control valve
19. Oil pressure regulator valve

Component 2 — Rotating Related Parts



67U01X-044

1. Front rotor
2. Rear rotor
3. Apex seal
4. Corner seal
5. Side seal
6. Outer oil seal
7. Inner oil seal
8. Eccentric shaft
9. Oil bypass valve
10. Eccentric shaft pulley
11. Distributor drive gear
12. Oil pump drive sprocket
13. Balance weight
14. Thrust washer
15. Thrust needle bearing
16. Spacer
17. Plate
18. Thrust plate
19. Oil jet valve
20. Pilot bearing (M/T)
21. Oil seal (M/T)
22. Counter weight (A/T)
23. Drive plate (A/T)
24. Back plate (A/T)
25. Flywheel (M/T)

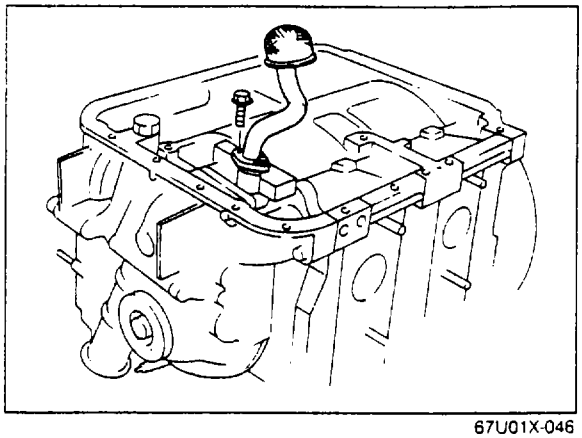


67U01X-045

Disassemble the internal engine components in the following manner.

Oil Pan

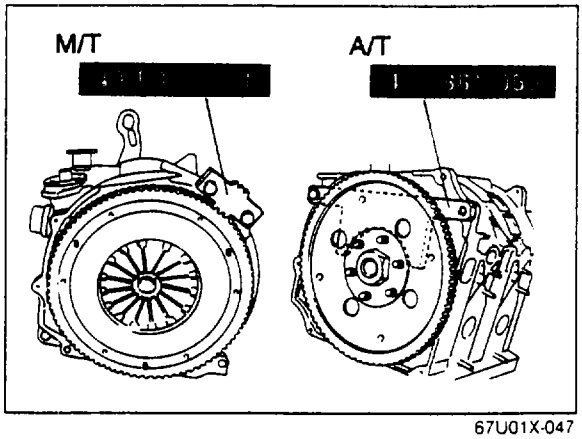
1. Remove the right engine mount and oil pan attaching bolts.
2. Remove the oil pan by inserting a flat-tipped screwdriver or a suitable tool into only the areas shown in the figure.



67U01X-046

Oil Strainer

Remove the oil strainer.

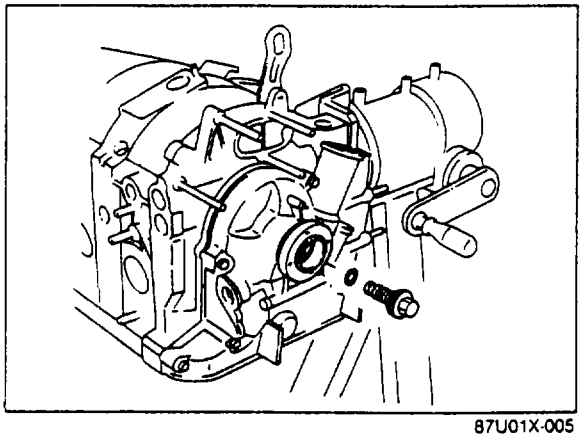


67U01X-047

Eccentric Shaft Lock Bolt and Bypass Valve

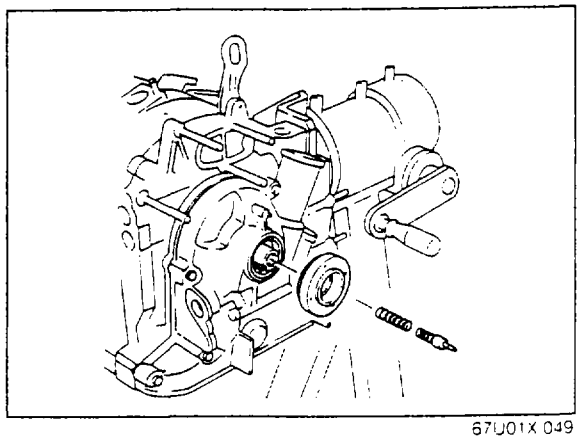
1. Vehicle with **M/T**
   Attach **ring gear brake** (49 F011 101) to the flywheel.

   Vehicle with **A/T**
   Attach **counter weight stopper** (49 1881 055) to the counter weight.



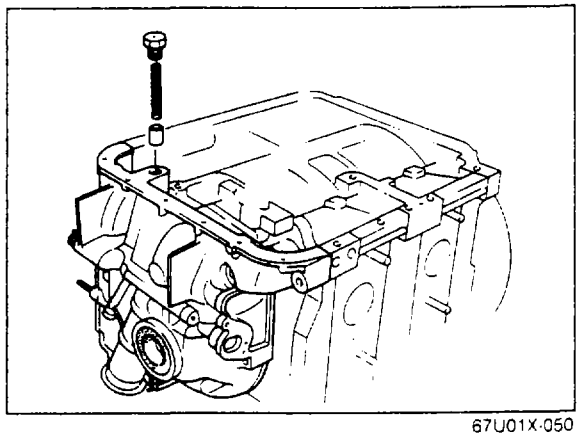
87U01X-005

2. Remove the eccentric shaft lock bolt.
3. Remove "O" ring from the lock bolt.



67U01X-049

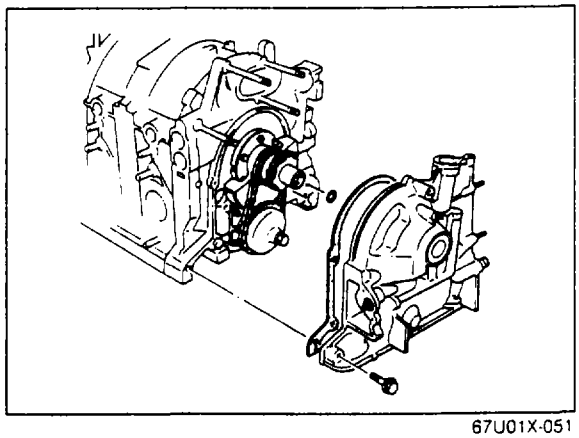
4. Remove the eccentric shaft bypass valve and spring.
5. Remove the eccentric shaft pulley boss.



67U01X-050

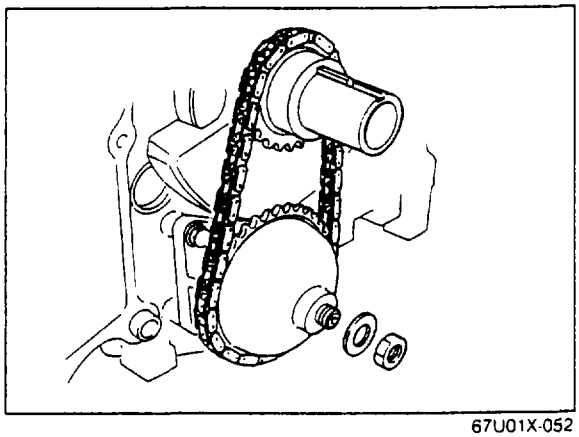
Front Cover

1. Remove the oil pressure control valve
2. Remove the front cover.



67U01X-051

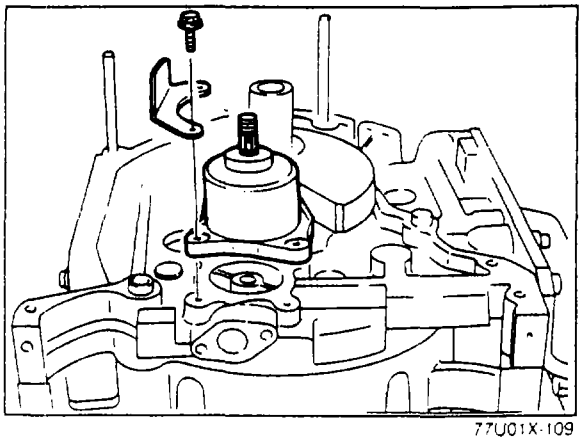
3. Remove the gasket and "O" ring.
4. Remove the distributor drive gear.



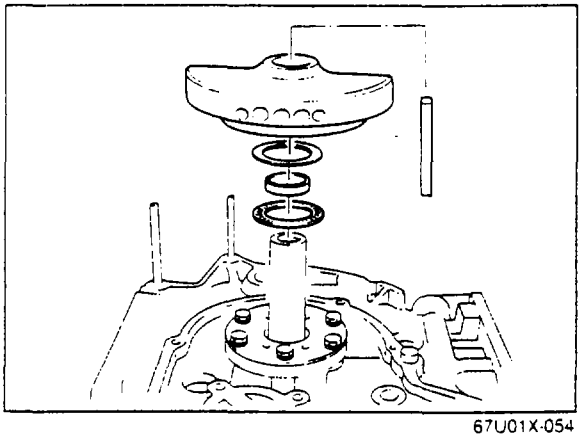
67U01X-052

Oil Pump

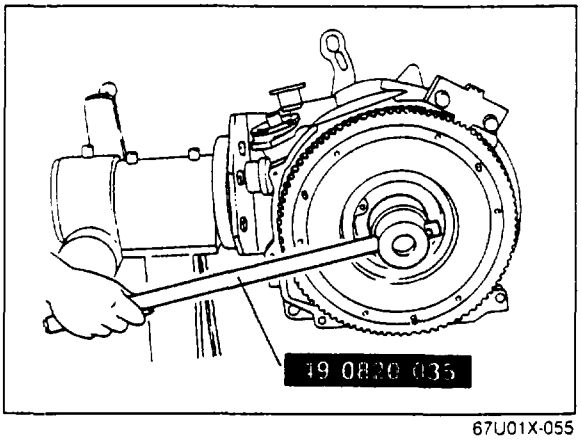
1. Unlock the lock washer tab and remove the sprocket lock nut.
2. Remove the oil pump drive gear, driven gear and drive chain as an assembly.


77U01X-109

4 Remove the baffle plate (turbo only).
5 Remove the oil pump.

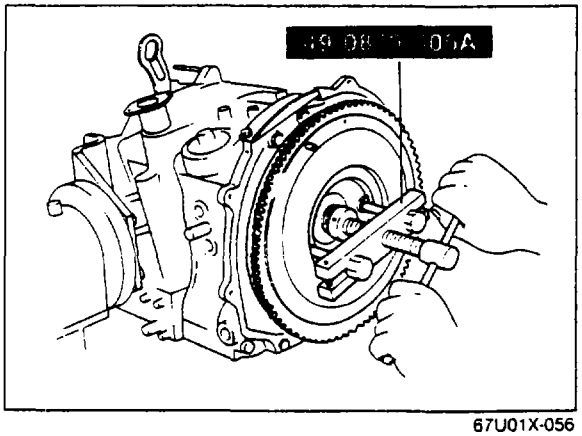

67U01X-054

Balance Weight, Bearing and Spacer
Remove the following parts from the eccentric shaft:
1. Key
2 Balance weight
3 Thrust washer
4 Thrust needle bearing
5 Spacer

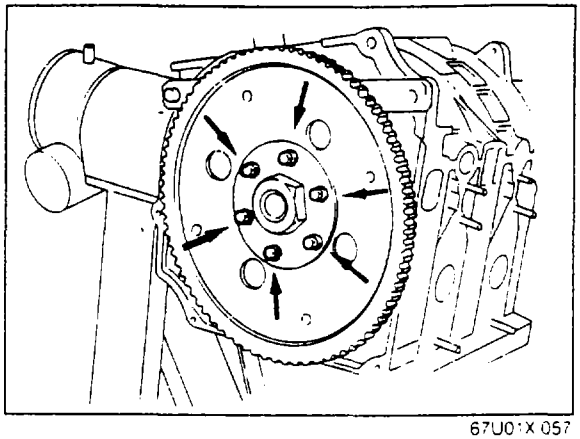


67U01X-055

Flywheel (for M/T)
1. Remove the flywheel nut using **flywheel box wrench** (49 0820 035).


67U01X-056

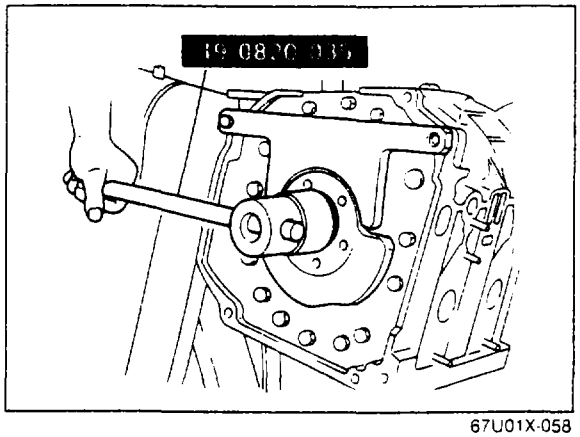
2. Remove the flywheel using **counter weight puller** (49 0839 305A).
3. Remove the key.
4 Remove the ring gear brake.



67U01X-057

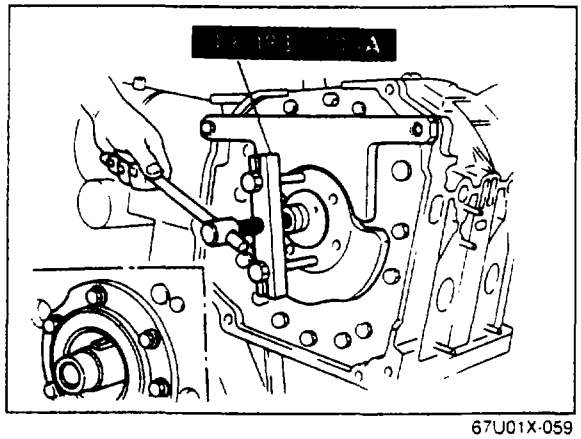
Drive Plate and Counter Weight (for A/T)

1. Remove the retainer and the drive plate.



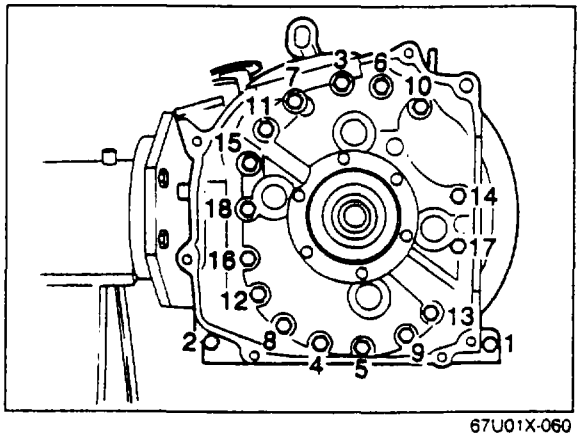
67U01X-058

2. Remove the flywheel nut using **flywheel box wrench** (49 0820 035).



67U01X-059

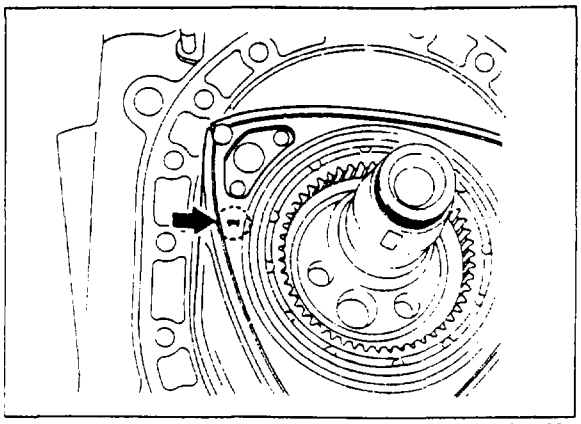
3. Remove the counter weight using **counter weight puller** (49 0839 305A).
4. Remove the key.
5. Remove the counter weight stopper.



67U01X-060

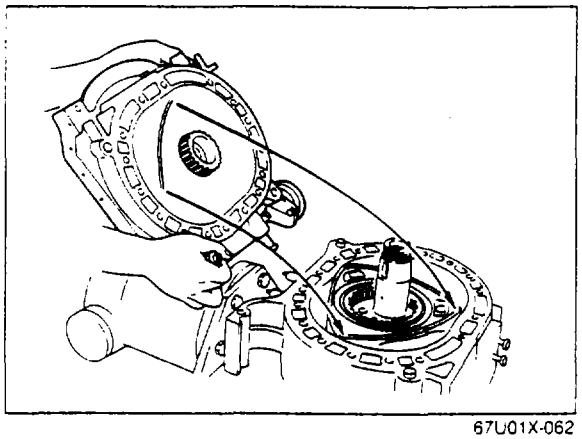
Tension Bolts

Loosen the tension bolts gradually and in the sequencial order shown in the figure, then remove them.



67U01X-061

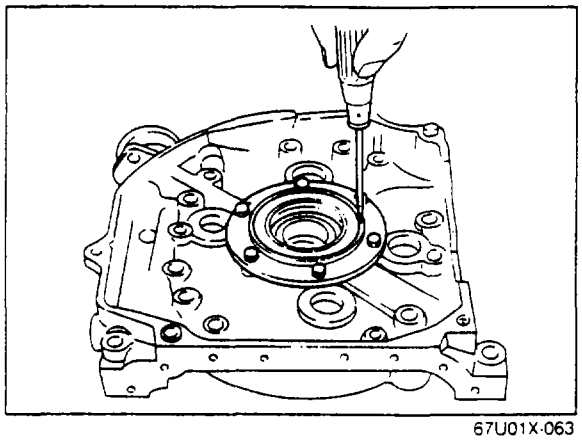
Note
Rotor seals — Apex seals, side seals and corner seals — are distinguishable by the numbers near each respective groove on the rotor face.
Place them in the seal case (49 0813 250) in accordance with the numbers.



67U01X-062

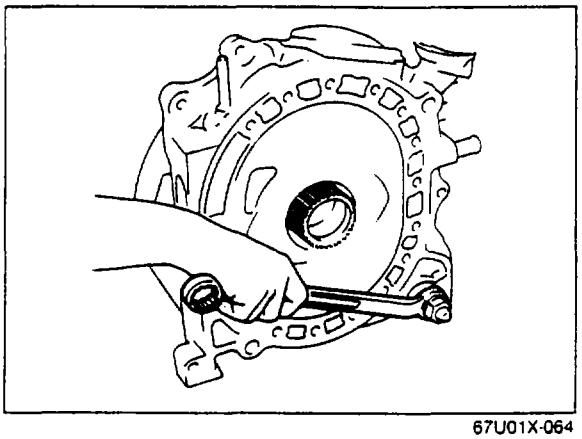
Rear Housing

1. Remove the rear housing.
   If the seals stick to the housing when it is removed, put them back into their original position.



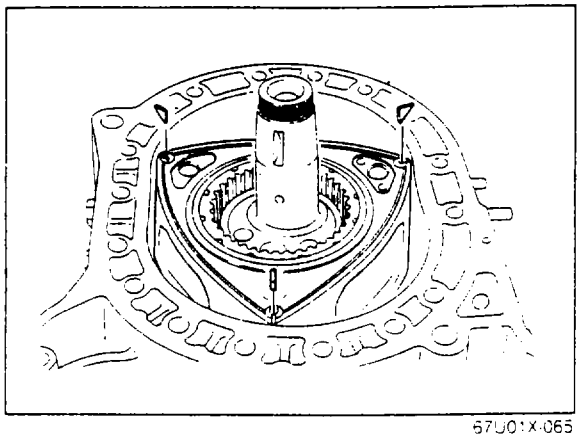
67U01X-063

2. Remove the sealing rubbers and the oil seal from the rear housing.



67U01X-064

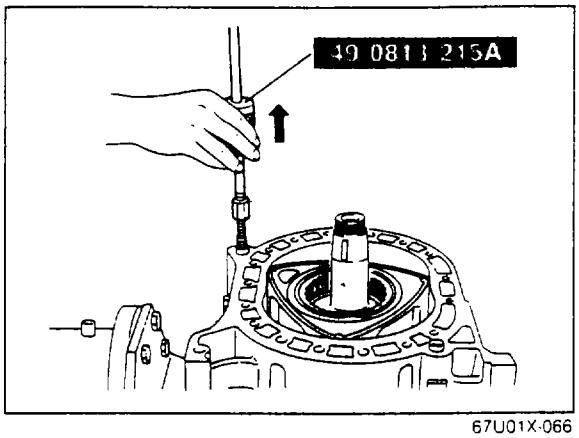
3. Remove the pressure regulator.



67U01X-065

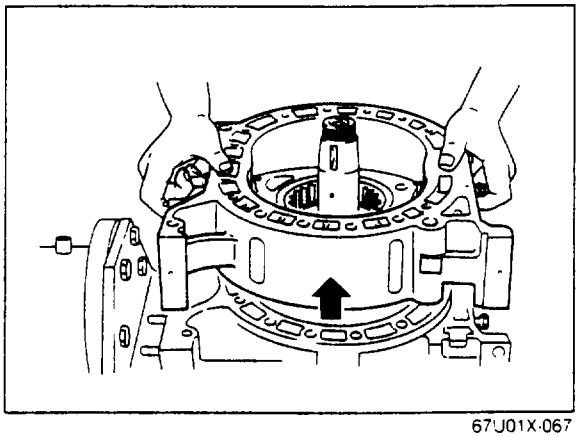
Rear Rotor Housing

1. Remove the side pieces and place them in the **seal case** (49 0813 250).



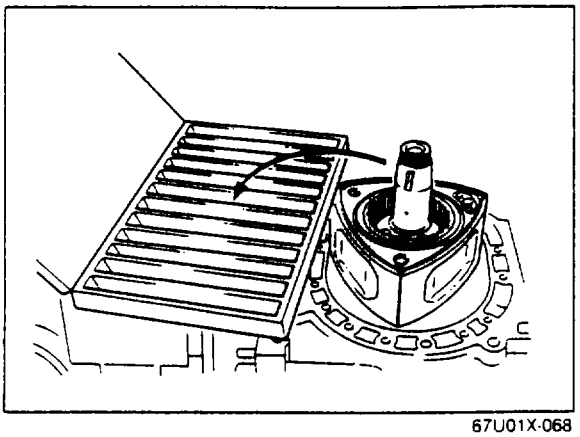
67U01X-066

2. Remove the tubular dowels using **tubular dowel puller** (49 0813 215A).



67U01X-067

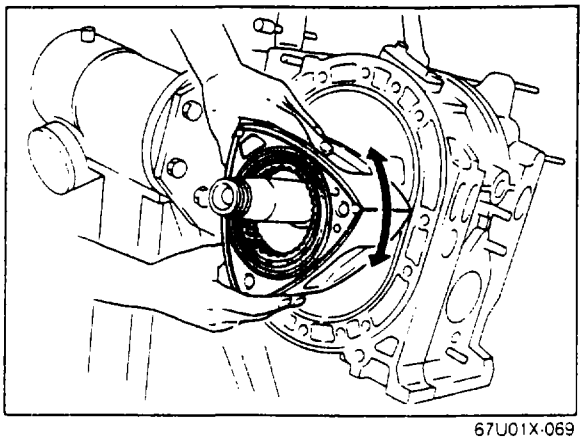
3. Remove the rotor housing. Be careful not to drop the apex seals.
4. Remove the "O" ring from the upper dowel hole.



67U01X-068

Rear Rotor

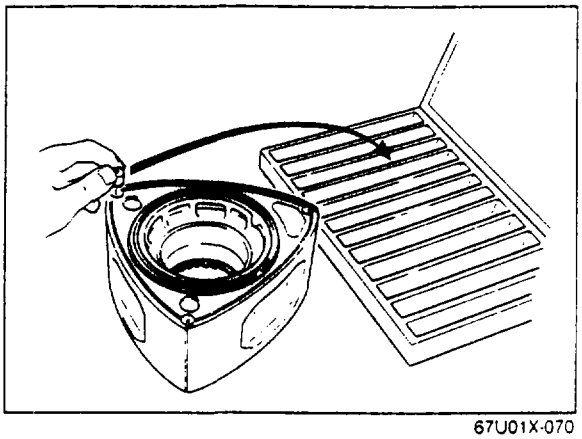
1. Remove the seals and springs, and place them in position in **seal case** (49 0813 250).



67U01X-069

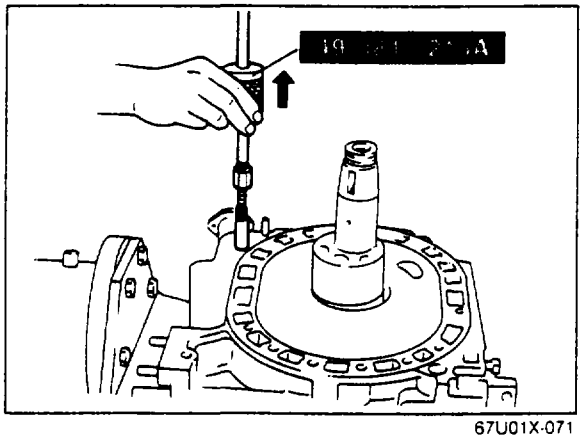
2. Remove the rotor.
   If the seals stick on the intermediate housing surface, put them back into their respective position in the rotor.

Caution
Do not place the rotor on a hard surface.



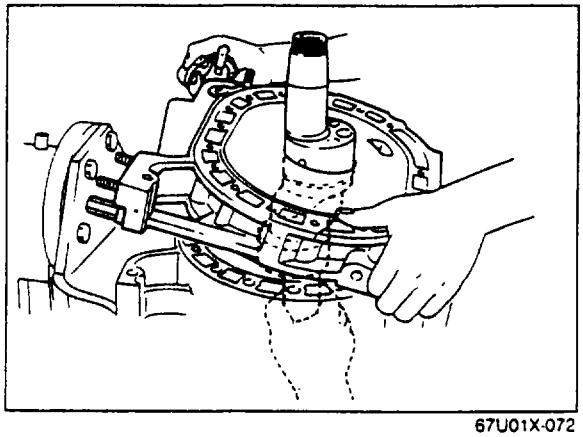
67U01X-070

3. Remove the seals and springs, and put them in position in the seal case.
4. Mark the rotor with an "R" for proper reassembly.



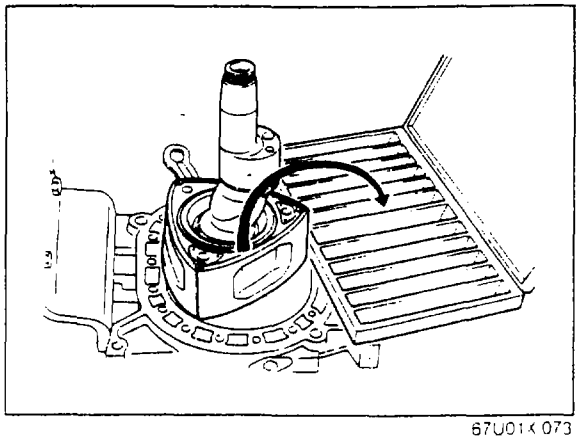
67U01X-071

Intermediate Housing
1. Remove the tubular dowels using **tubular dowel puller** (49 0813 215A).



67U01X-072

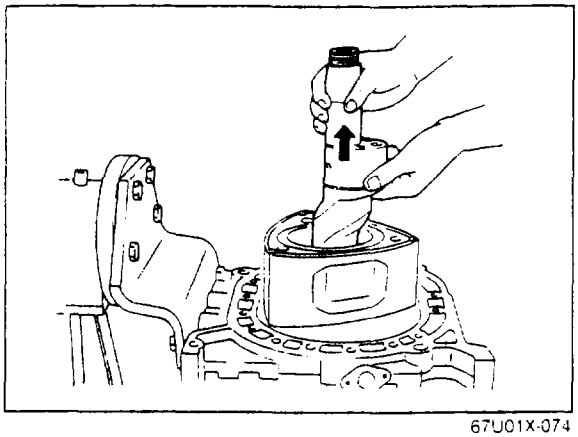
2. Turn the eccentric shaft so that the rotor journal faces in the short axial direction.
3. Remove the intermediate housing while pushing the eccentric shaft up.
4. If the seals stick to the intermediate housing surface, put them back into their respective position in the rotor.
5. Remove the sealing rubbers.



67U01X-073

Front Rotor Housing

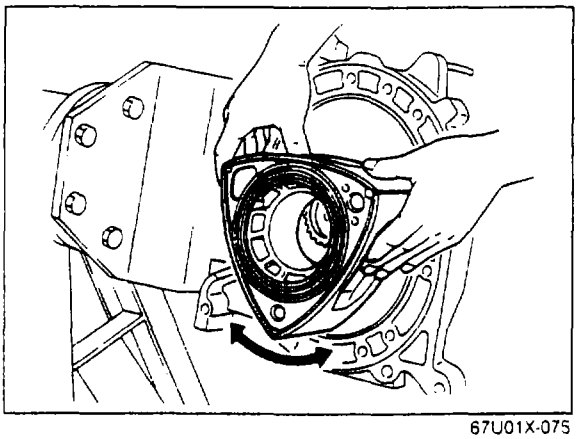
1. Remove the side pieces and place them in **seal case** (49 0813 250).
2. Remove the rotor housing. Be careful not to drop the apex seals.
3. Remove the "O" ring from the upper dowel hole.



67U01X-074

Eccentric Shaft

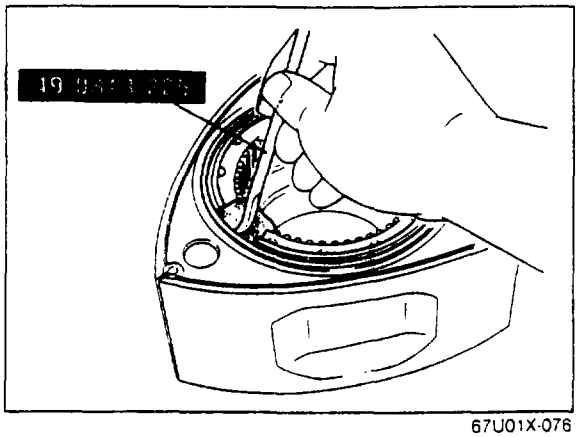
Remove the eccentric shaft.



67U01X-075

Front Rotor

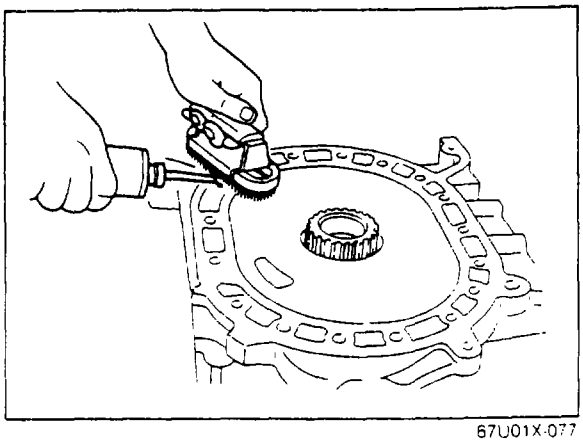
Remove the front rotor in the same procedure as the removal of the rear rotor.

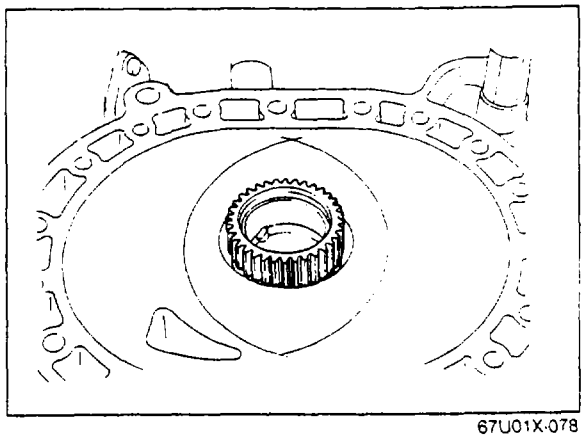


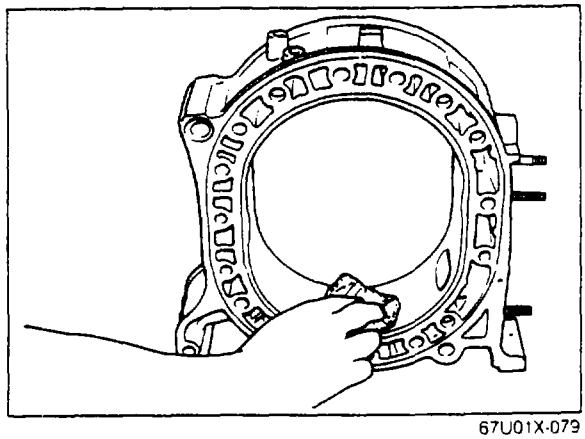
67U01X-076

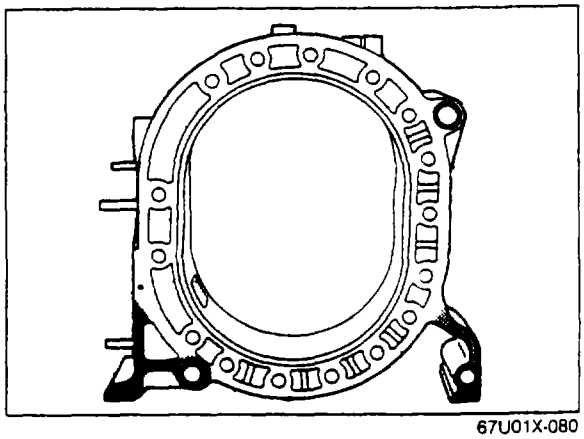
Rotor Oil Seal

1. Remove the outer oil seal from the rotor using **oil seal remover** (49 0813 225).
2. Remove the inner oil seal in the same manner.
3. Remove the oil seal springs.
4. Remove the "O" ring from the oil seal.


67U01X-077


67U01X-078


67U01X-079


67U01X-080

INSPECTION

CLEANING

Clean all of the parts taking care to remove any gasket fragments, dirt, oil or grease, carbon, or other materials.

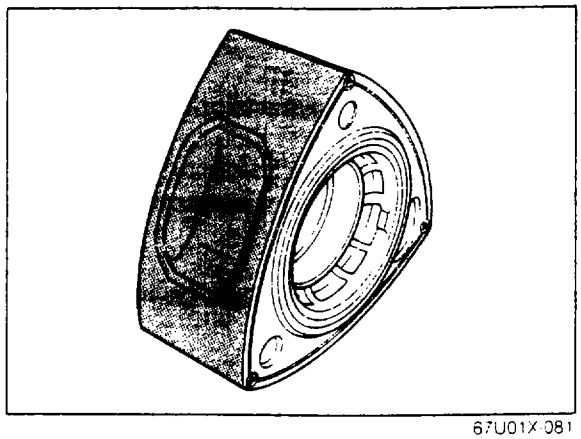
Side Housings (Front, intermediate and rear housings)

1. Remove the sealing agent from the housing surface with a cloth or a brush soaked in solvent or thinner.
2. Remove all carbon on the rotor chamber surface with extra-fine emery paper.
   If using a carbon scraper, be careful not to damage the surface.

Rotor Housing

Note
Before cleaning, check for traces of gas or water leakage along the inner margin of the rotor housings.

1. Remove all carbon from the inner surface of the rotor housing by wiping with a cloth soaked in solvent or thinner.
2. Remove all deposits and rust from the cooling water passages on the housing.
3. Remove the sealing agent from the housing with a cloth or brush soaked in solvent or thinner.



67U01X-081

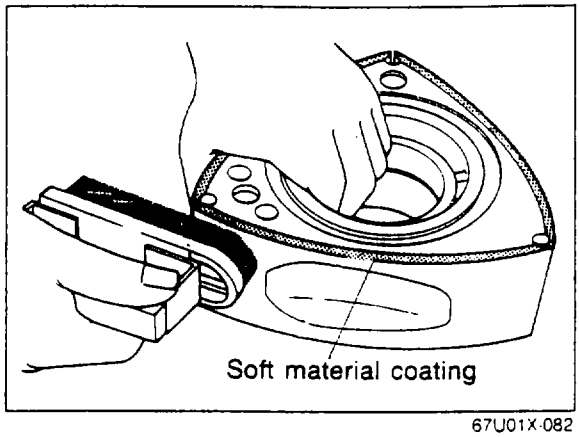
Rotor

1. Remove the carbon from the rotor with a carbon remover or emery paper.

Caution

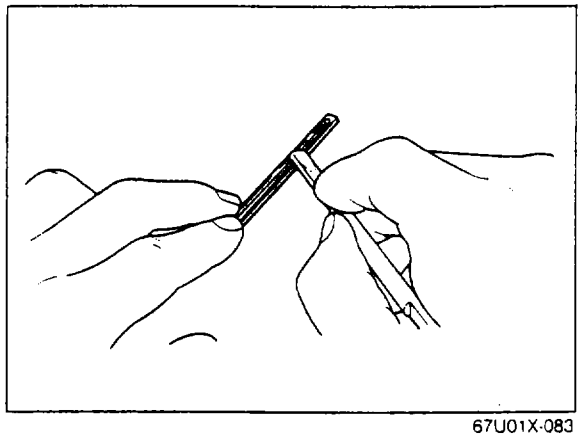
a) Do not use emery paper on the groove of the apex seal or the side seal.

b) Take care not to damage the soft material coating on the side surfaces.



67U01X-082

2. Remove the carbon in each groove.
3. Wash the rotor with a cleaning solution.



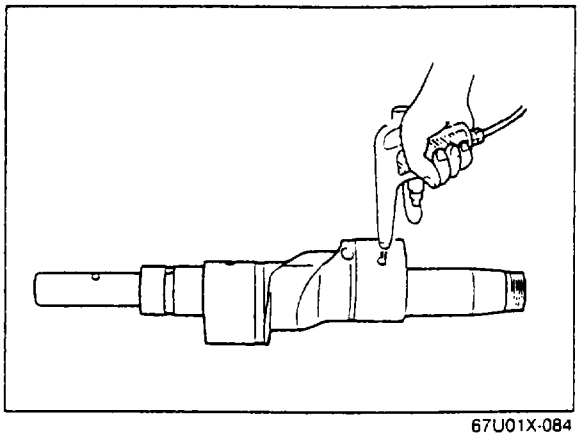
67U01X-083

Rotor Seals (Apex, side and corner seals)

1. Remove the carbon from each seal.
2. Wash the seals with a cleaning solution.

Caution

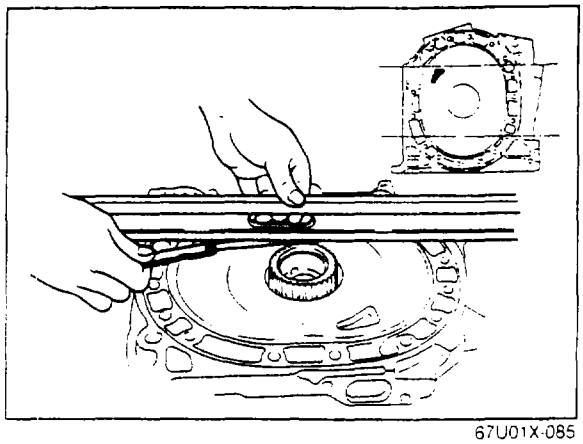
Do not use emery paper.



67U01X-084

Eccentric Shaft

1. Wash the eccentric shaft with a cleaning solution.
2. Blow the oil passage clean with compressed air.


67U01X-085

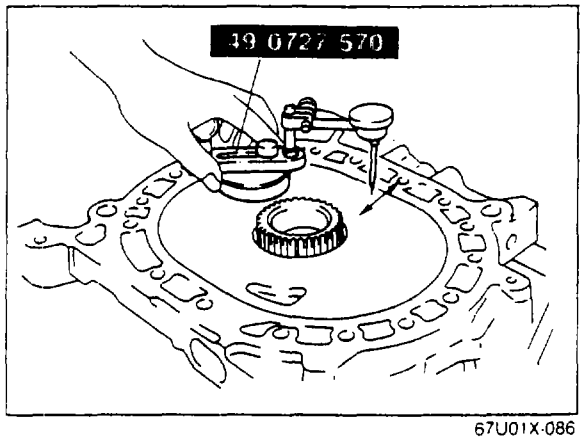
INSPECTION AND REPAIR

Inspect and repair the parts in the following sequence.

Side Housings (Front, intermediate and rear housings)

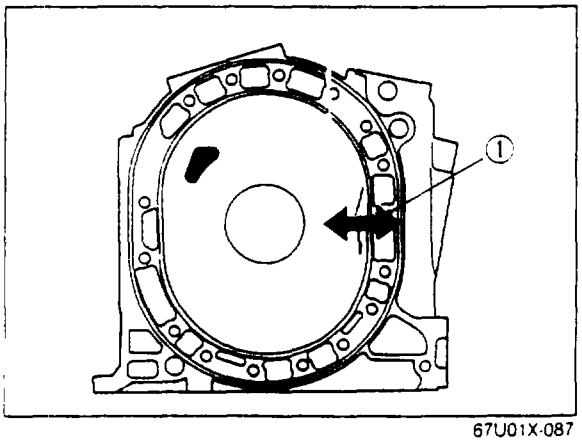
1. Check the housing surface for warpage in the four directions shown in the figure. If necessary, replace the housing.

   Warpage: 0.04 mm (0.0016 in) max.



67U01X-086

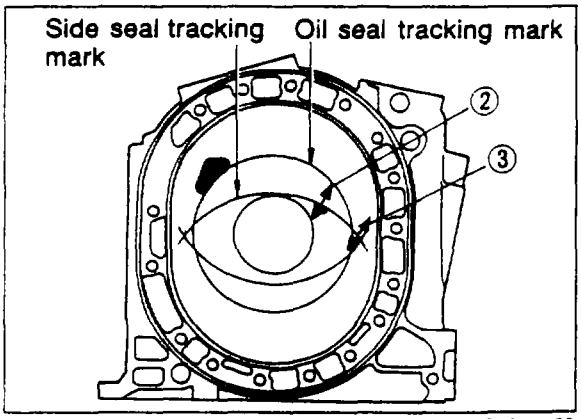
2. Check the contact surface for wear with a dial indicator mounted on **gauge body** (49 0727 570). Slide the gauge across the area as indicated in the figure.



67U01X-087

(1) Side seal wear

Wear: 0.10 mm (0.0039 in) max.



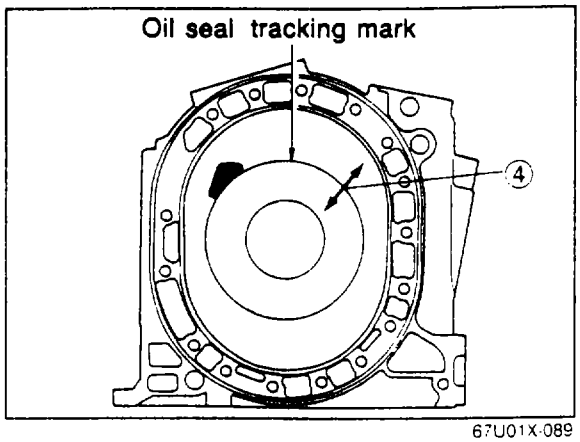
67U01X-088

(2) Side seal wear, overlapping oil seal wear

Wear: 0.01 mm (0.0004 in) max.

(3) Side seal wear, outside oil seal wear

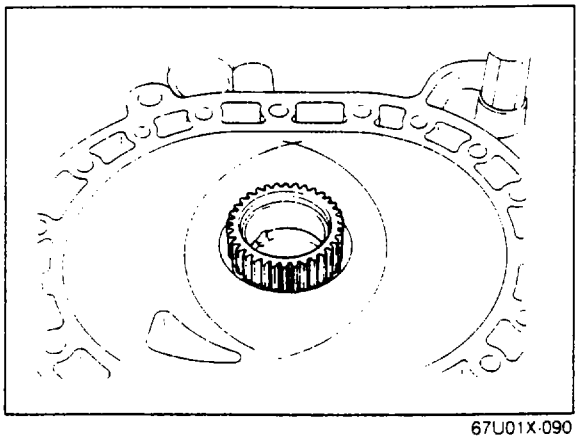
Wear: 0.10 mm (0.0039 in) max.



67U01X-089

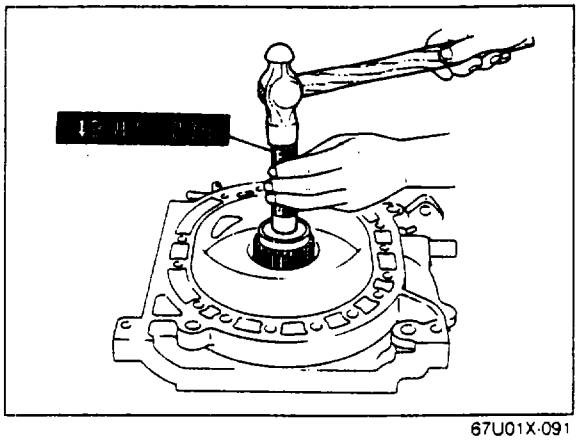
(4) Oil seal wear

Wear: 0.02 mm (0.0008 in) max.

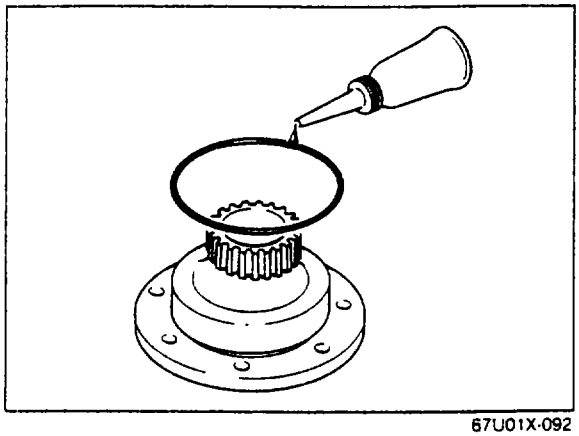

67U01X-090

Stationary Gear

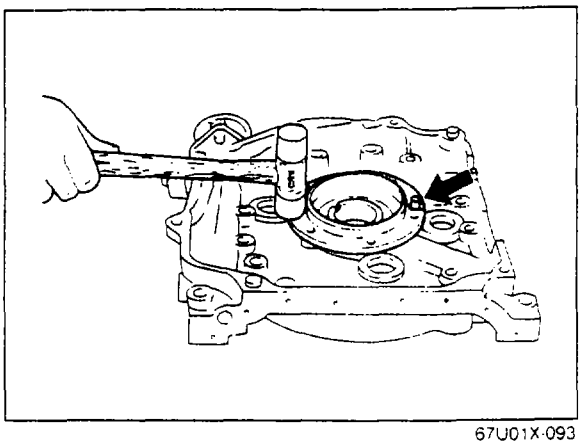
1. Check the front and rear stationary gear for cracked, scored, worn or chipped teeth.


67U01X-091

2. If necessary, replace the stationary gear.
   (1) (Front stationary gear)
   Remove the plate, needle bearing and thrust plate.
   (Rear stationary gear)
   Remove the attaching bolts.
   (2) Remove the stationary gear using **main bearing puller and installer** (49 0813 235).


67U01X-092

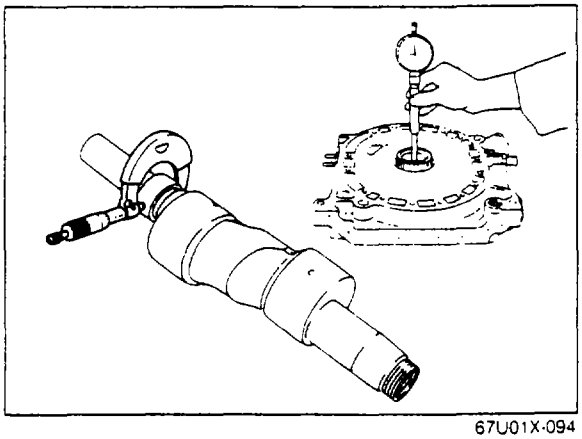
(3) (Rear stationary gear only)
Apply petroleum jelly to a new "O" ring and install it on the rear stationary gear. Apply sealant to the stationary gear flange.



67U01X-093

(4) Install the stationary gear to the housing so that the slot of the stationary gear is aligned with the dowel pin on the housing.
(5) (Front stationary gear)
Install the thrust plate, needle bearing and the plate.
(Rear stationary gear)
Tighten the attaching bolts.

Tightening torque:
16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

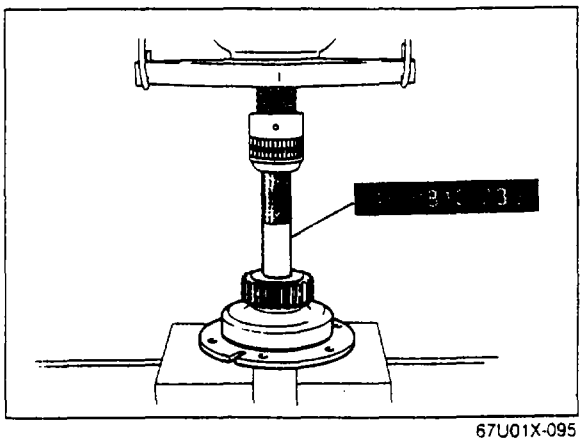


67U01X-094

Main Bearing

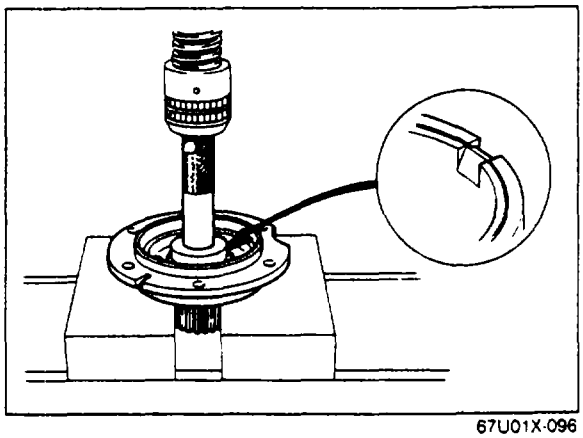
1. Check the main bearing for wear, scoring, flaking or any other damage.
2. Check the main bearing clearance. Measure the inner diameter of the main bearing and the outer diameter of the eccentric shaft main journal.

Standard clearance:
0.04—0.08 mm (0.0016—0.0031 in)
Clearance: 0.10 mm (0.0039 in) max.



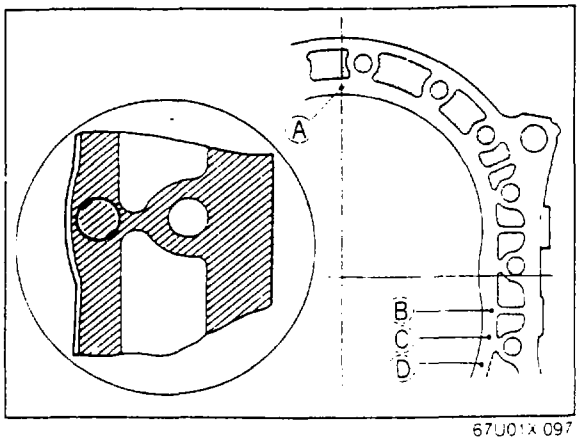
67U01X-095

3. If necessary replace the main bearing.
   (1) Remove the stationary gear.
   (2) Place the stationary gear on the support with the flange side downward.
   (3) Press out the main bearing using **main bearing puller and installer** (49 0813 235) without the adaptor ring.



67U01X-096

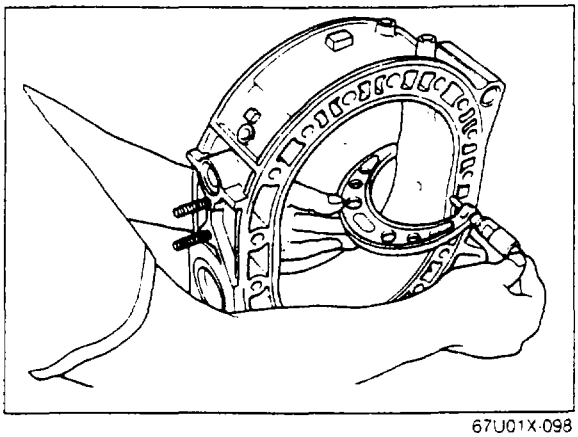
(4) Place the stationary gear on the support with the gear side downward.
(5) Place the new main bearing on the stationary gear so that the bearing lug is in line with the slot of the stationary gear.
(6) Press the main bearing on using **puller and installer** and **adaptor ring.**



67U01X-097

Rotor Housing

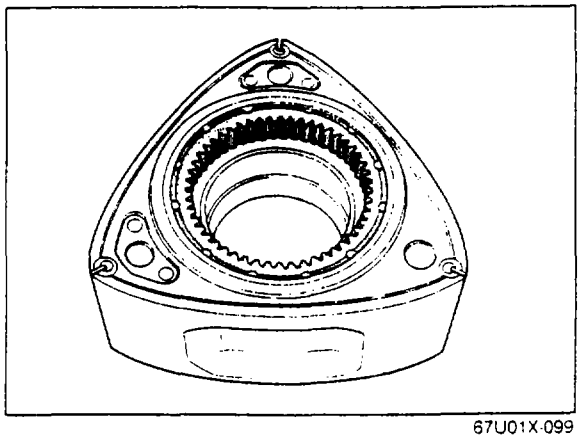
1. Check the chromium plated surface on the rotor housing for scoring, flaking or any other damage.
2. Check the width difference of the rotor housing.
   (1) Measure the rotor housing width at the points (A, B, C and D) as shown in the figure.


67U01X-098

   (2) Check the difference between the value of point A and the minimum value among the points B, C and D.

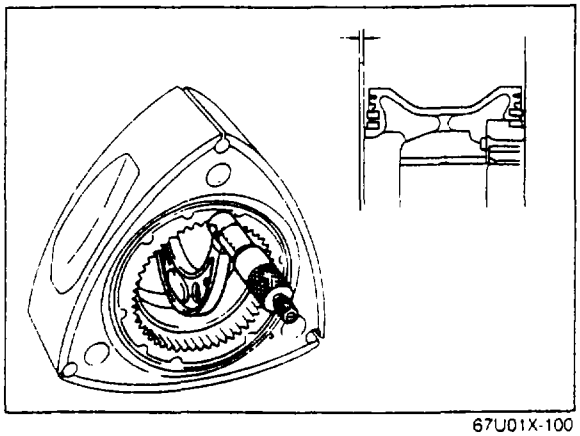
   Difference: 0.06 mm (0.0024 in) max.

3. If necessary, replace the rotor housing.


67U01X-099

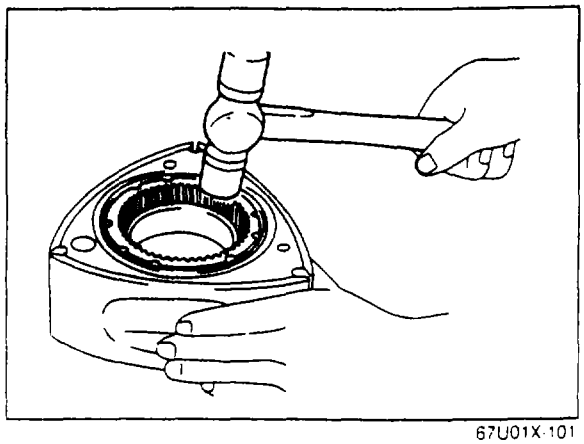
Rotor

1. Carefully inspect the rotor and replace it if it is severely worn or damaged.
2. Check the internal gear for cracked, scored, worn or chipped teeth.


67U01X-100

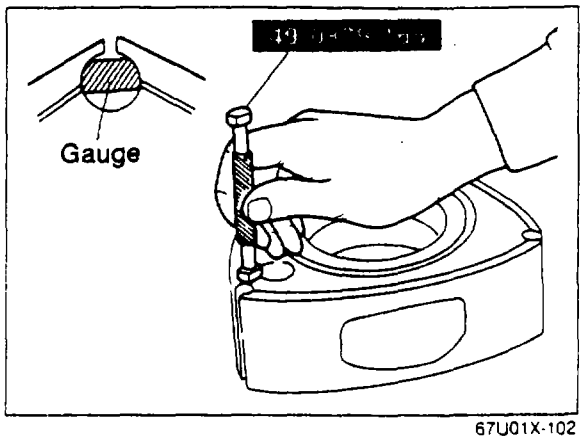
3. Check the clearance between the side housing and rotor.
   Measure the rotor housing width (point A above) and the maximum rotor width at the three points indicated in the figure.

   Standard: 0.12—0.21 mm (0.0047—0.0083 in)
   Clearance: 0.10 mm (0.004 in) min.



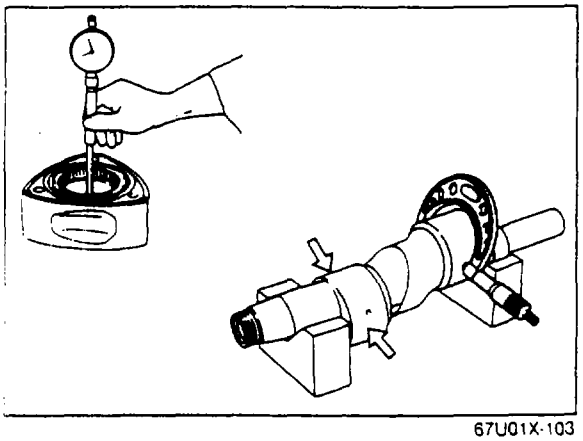
67U01X-101

4. If the clearance is more than the specification, replace the rotor assembly.
   If the clearance is less than the specification, strike the internal gear lightly with a plastic hammer, to reseat the internal gear. Recheck the clearance.



67U01X-102

5. Check the corner seal bores for wear using **corner seal gauge** (49 0839 165).
   (1) If neither end of the gauge goes into the bore, use the original corner seal.
   (2) If only one end of the gauge goes into the bore, replace the corner seal.
   (3) If both ends of the gauge go into the bore, replace the rotor.

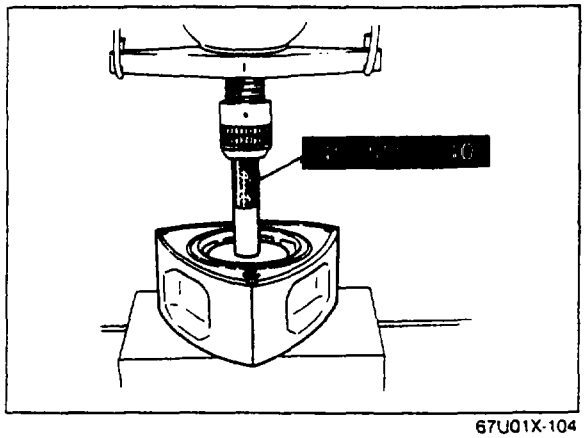


67U01X-103

Rotor Bearing

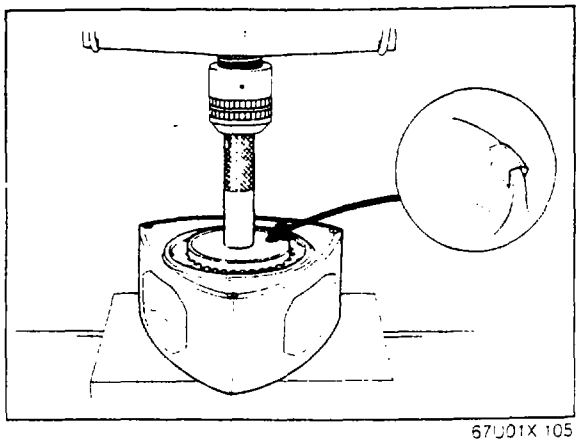
1. Check the rotor bearing for wear, flaking, scoring or any other damage.
2. Check the rotor bearing clearance. Measure the inner diameter of the rotor bearing and the outer diameter of the eccentric shaft rotor journal.

Standard clearance:
0.04—0.08 mm (0.0016—0.0031 in)
Clearance: 0.10 mm (0.0039 in) max.



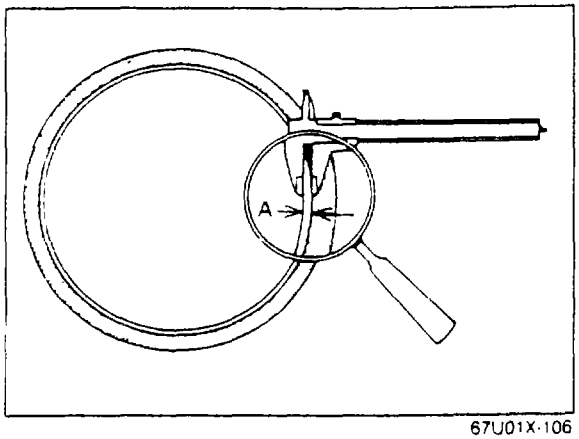
67U01X-104

3. If necessary, replace the rotor bearing.
   (1) Place the rotor on a support with the internal gear downward.
   (2) Press the bearing out of the rotor using **rotor bearing puller and installer** (49 0813 240) without the adaptor ring.



67U01X-105

2. Place the rotor on the support with the internal gear facing upward.
3. Place the new rotor bearing on the rotor so that the bearing lug is in line with the slot of the rotor bore.
4. Press the bearing in until it is flush with the rotor boss, using **puller & installer** and **adaptor ring.**

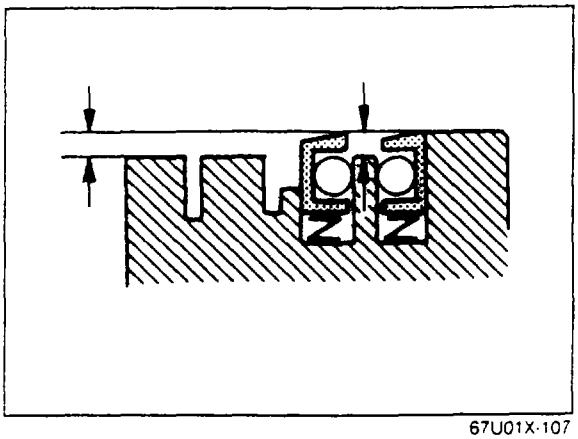


67U01X-106

Rotor Oil Seal

1. Inspect the oil seal for wear or damage. If necessary, replace it.
2. Check the oil seal lip width.

Lip width: 0.5 mm (0.020 in) max.

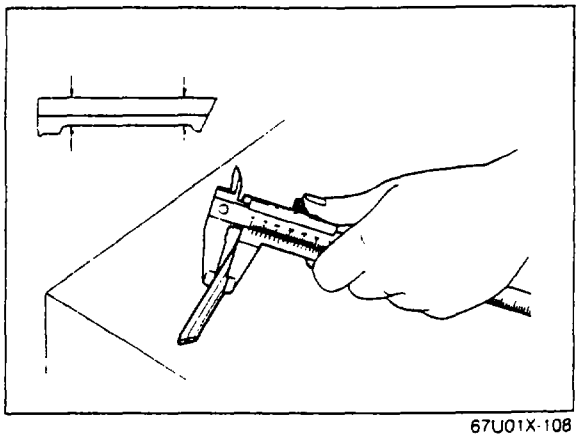


67U01X-107

3. Install the oil seal springs and oil seals into their respective grooves.
4. Check the oil seals for free vertical movement.
5. Check the oil seal protrusion.

Protrusion: 0.5 mm (0.020 in) min.

If necessary, replace the oil seal and/or the spring.



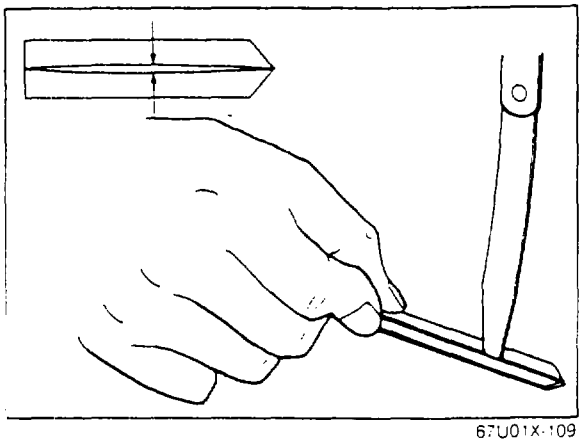
67U01X-108

Apex Seal

1. Check the apex seal for wear, cracks or any otner damage. If necessary, replace it.
2. Measure the combined height of the upper and lower apex seals at two points.

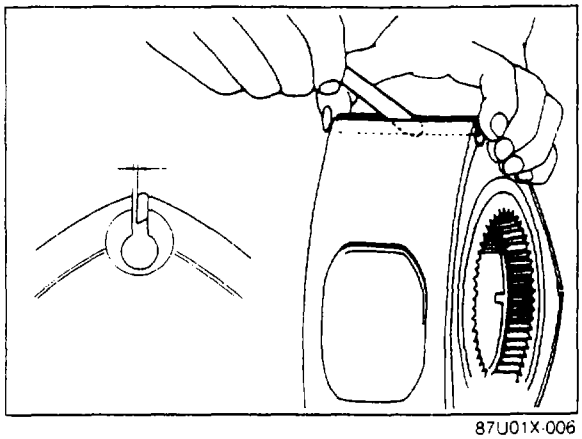
Standard height: 8.0 mm (0.315 in)
Height: 6.5 mm (0.256 in) min.

Note
Replace the short apex seal spring, if the apex seal height is below 7.5 mm (0.295 in).


67U01X-109

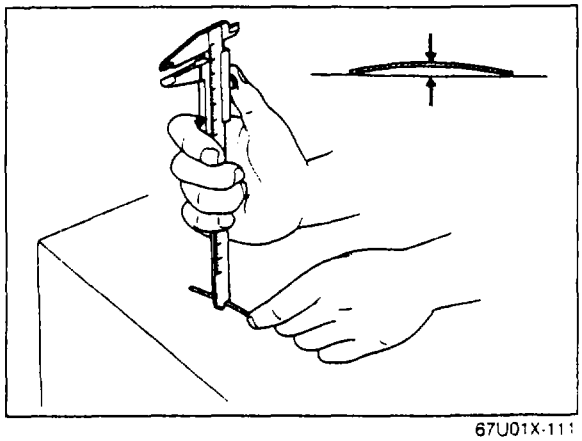
3. Check the apex seals for warpage.
Put two apex seals together, top-to-top, and measure the warpage. Do this with all three seals.
If the clearance exceeds the limit, replace all three apex seals of the rotor.

Warpage: 0.06 mm (0.0024 in) max.


87U01X-006

4. Check the clearance of the apex seal and the groove.
Place the apex seal in its respective groove on the rotor, and measure the apex seal clearance. If necessary, replace it.

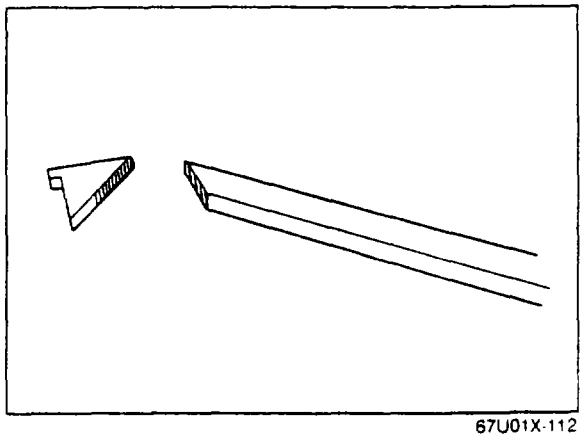
Standard clearance:
0.054—0.101 mm (0.0020—0.0040 in) ...Turbo
0.062—0.102 mm (0.0024—0.0040 in) ...Non-Turbo
Clearance limit: 0.15 mm (0.0059 in)


67U01X-111

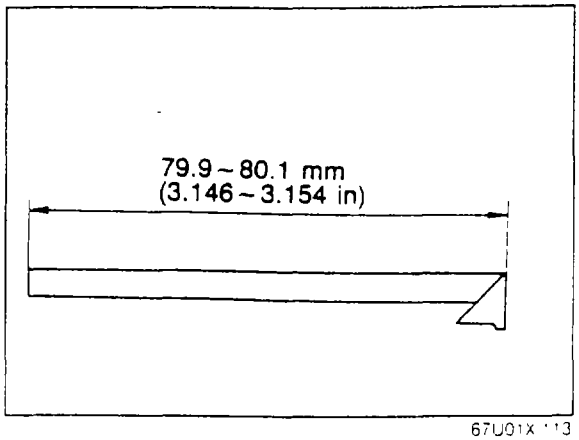
5. Check the apex seal spring for wear and free height. If necessary, replace it.

Free height:
Long spring: 4.6 mm (0.181 in)
Short spring: 3.0 mm (0.118 in)

Note
Replace the short apex seal spring, if the apex seal height is below 7.5 mm (0.295 in).

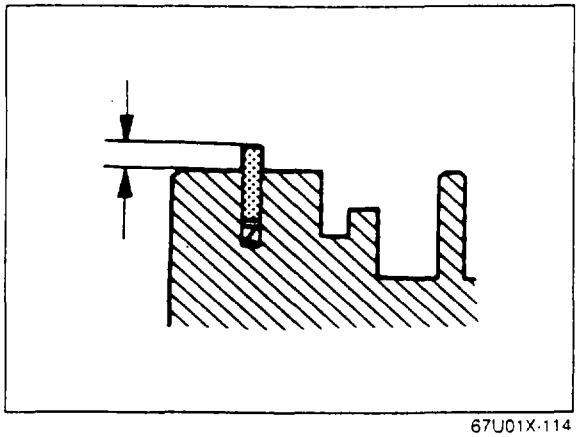

67U01X-112

Assembly of apex seal and side piece
1. Clean the surfaces where adhesive is applied with solvent.



67U01X-113

2. Assemble the apex seal and side piece with anaerobic bonding adhesive (Loctite 312 and Primer NF, or equivalent) so that the sliding surfaces and side surfaces are flush.
3. Cut away any adhesive that protrudes.

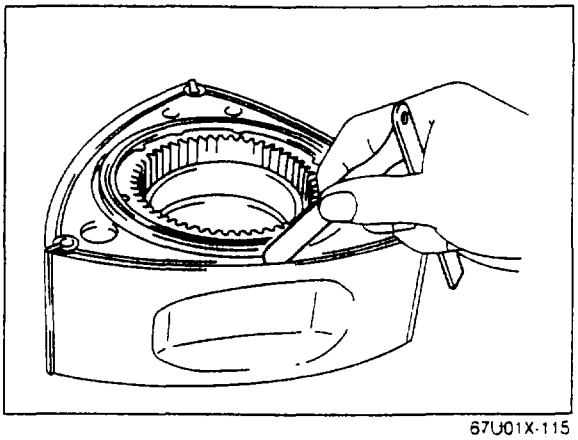


67U01X-114

Side Seal

1. Inspect the side seal for wear or damage, if necessary replace it.
2. Install the side seal spring and side seal into their respective grooves.
3. Check the side seal for vertical free movement.
4. Check the side seal protrusion.

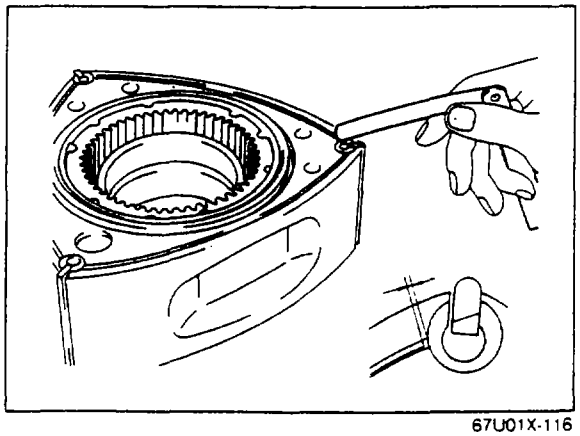
Protrusion: 0.5 mm (0.020 in) min.



67U01X-115

5. Check the clearance between the side seal and the groove.

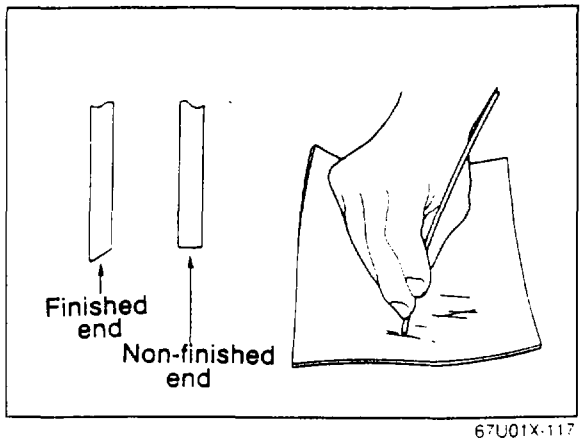
Standard clearance:
0.028—0.078 mm (0.0011—0.0031 in)
Clearance: 0.10 mm (0.0039 in) max.



67U01X-116

6. Check the clearance between the side seal and the corner seal.

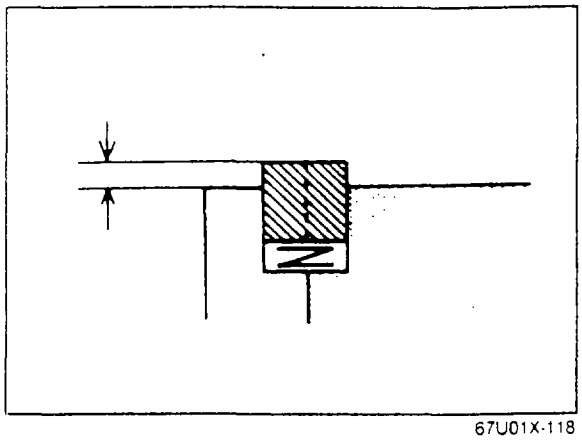
Standard clearance:
0.05—0.15 mm (0.0020—0.0059 in)
Clearance: 0.4 mm (0.016 in) max.



67U01X-117

7. If necessary, replace the side seal.
   Adjust the clearance between the side seal and corner seal by lapping the non-finished end carefully.

   Adjusted clearance:
   0.05—0.15 mm (0.002—0.0059 in)



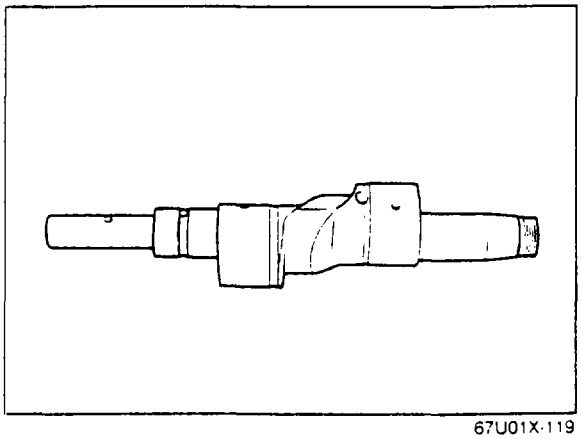
67U01X-118

Corner Seal

1. Inspect the corner seal and soft seal for wear, cracks or any other damage. If necessary, replace them.
2. Install the corner seal spring and corner seal into its respective groove.
3. Check the corner seal for vertical free movement.
4. Check the corner seal protrusion.

   Protrusion: 0.5 mm (0.020 in) min.

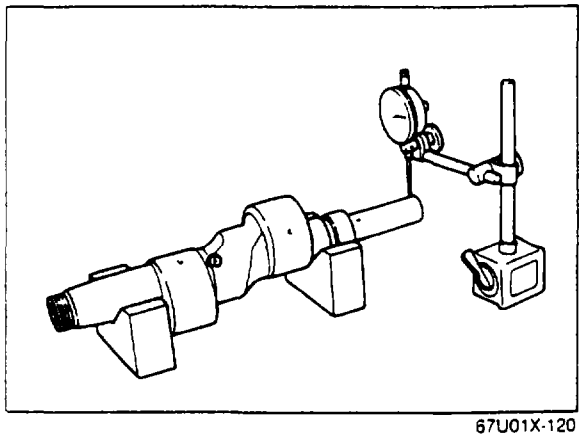
If necessary, replace the corner seal and/or the spring.



67U01X-119

Eccentric Shaft

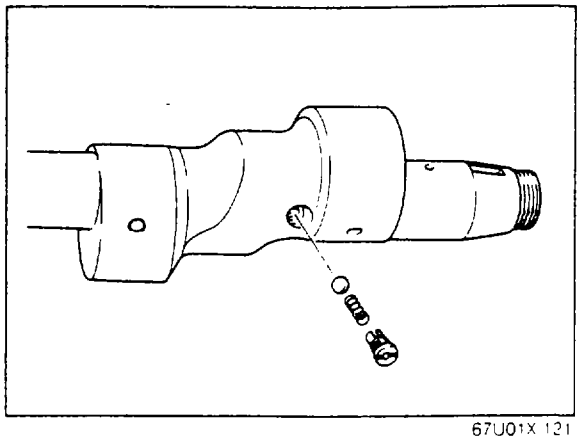
1. Check the eccentric shaft for cracks, scoring, wear or any other damage.
2. Check that the oil passages are open.



67U01X-120

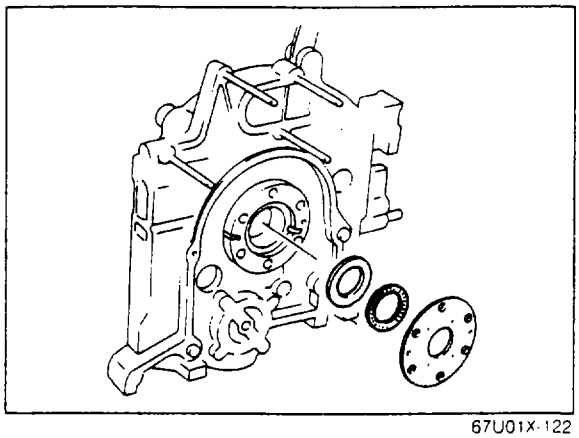
3. Check the eccentric shaft runout. Measure the runout at the end of the shaft, replace it if necessary.

   Runout: 0.12 mm (0.0047 in) max.



67U01X-121

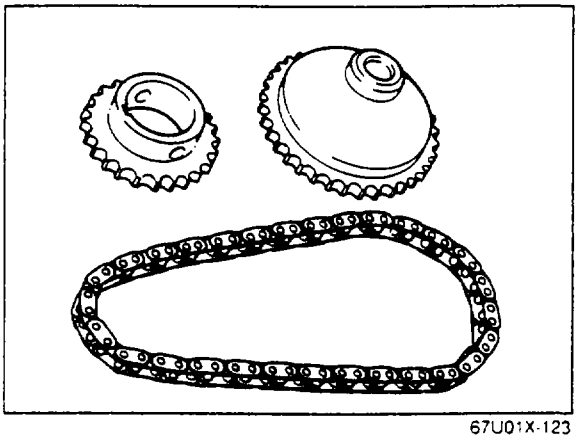
4. Check the oil jet spring for weakness, and sticking or damage of the steel ball.



67U01X-122

Needle Bearing and Thrust Plate

1. Check the needle bearing for wear or damage.
2. Check the bearing housing and thrust plate for wear or any other damage.



67U01X-123

Oil Pump Drive Chain and Sprocket

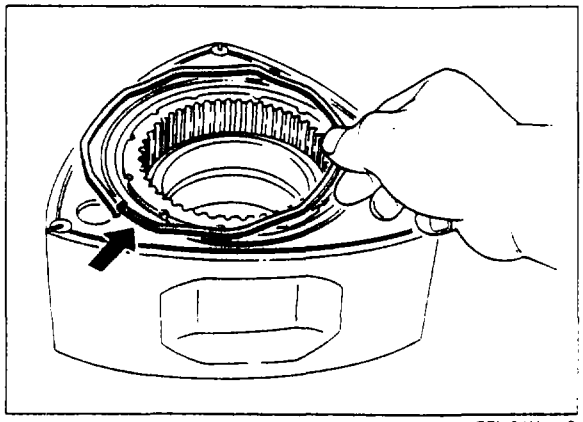
1. Check the oil pump drive chain for broken links.
2. Check the oil pump drive sprocket and driven sprocket for cracks and worn or damaged teeth. If necessary, replace with new parts.

ASSEMBLY

Assembly Notes

1. Be sure all parts are clean before installation.
2. Apply new engine oil to all sliding and rotating surfaces.
3. Install identical parts (such as rotor seals, seal springs, rotor oil seals and rotor) in the exact positions from which they were removed.
4. Use new "O" rings, rubber seals and gasket.
5. Tighten bolts to the specified torques.

67U01X-124

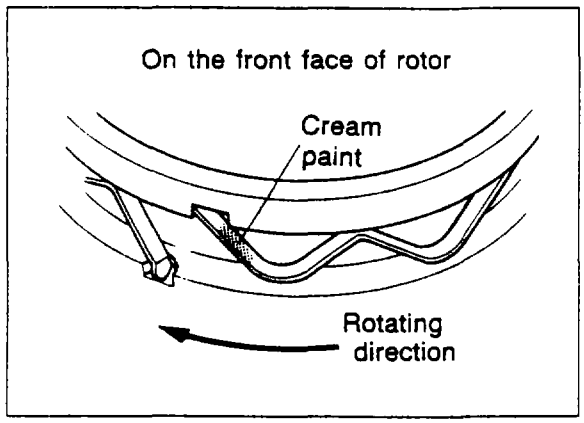


77U01X-112

INTERNAL

Rotor Oil Seal

1 Install the oil seal springs in their respective grooves on the rotor with the round edge of the spring fitted in the stopper hole of the oil seal grooves.



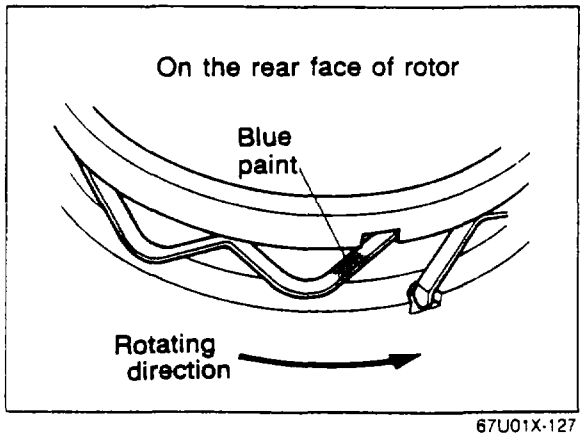
67U01X-126

Note

The oil seal springs are identified by a painted mark.

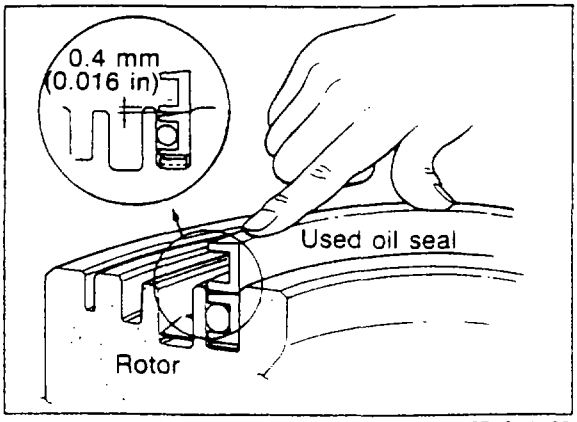
Cream springs.. for front faces of both front and rear rotors.

Blue springs..... for rear faces of both front and rear rotors.



67U01X-127

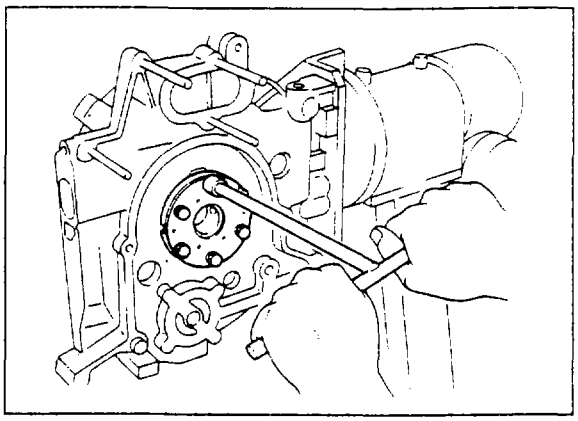
2. Apply engine oil to the new "O" ring.
3. Install the "O" ring in the oil seal.
4. Place the inner oil seal in the oil seal groove so that the square edge of the spring fits in the notch of the oil seal.



67U01X-128

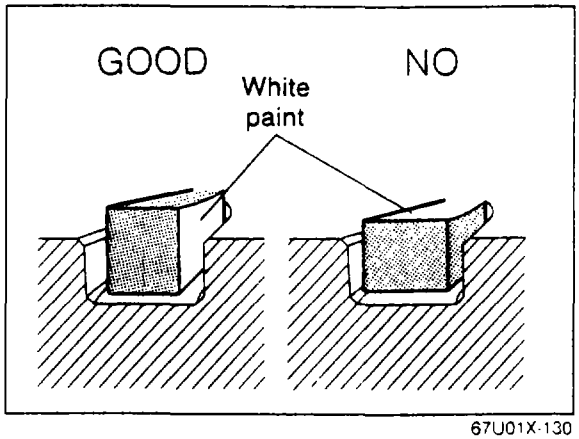
5. Press the oil seal with a used oil seal until the lip of the oil seal is approximately **0.4 mm (0.016 in)** below the surface of the rotor.
6. Push the oil seal slowly by hand and confirm that the oil seal moves freely.

Note
a) When replacing the oil seal, first confirm that the oil seal moves smoothly in the groove without the "O" ring in place.
b) Be careful not to deform the lip of the oil seal.


67U01X-129

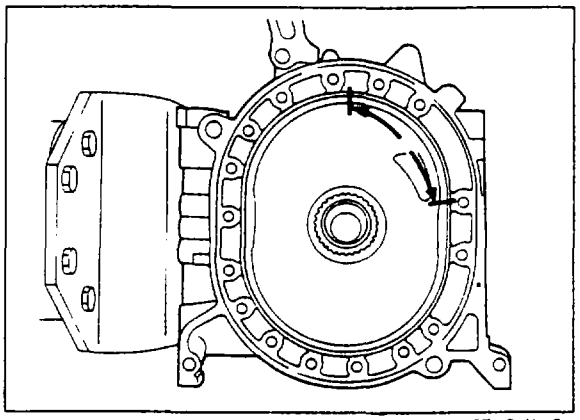
Front Housing
1. Mount the front housing to **engine hanger** (49 1114 005) attached to **engine stand** (49 0107 680A).
2. Position the thrust plate with the chamfer facing toward the front housing. Install the needle bearing and plate.

Tightening torque:
16—22 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

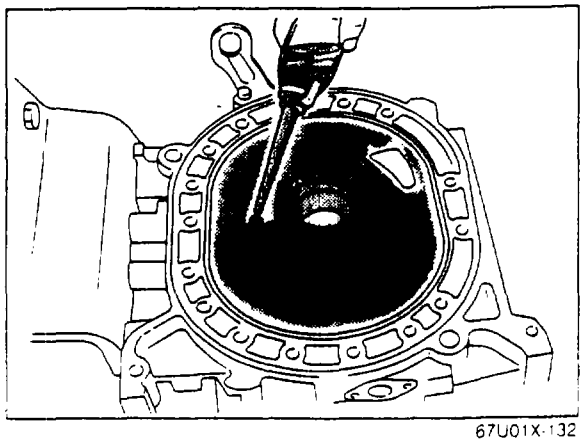


67U01X-130

3. Apply petroleum jelly to the new outer and inner sealing rubbers.
4. Install the outer sealing rubber so that the white paint faces the side wall in the groove.


67U01X-131

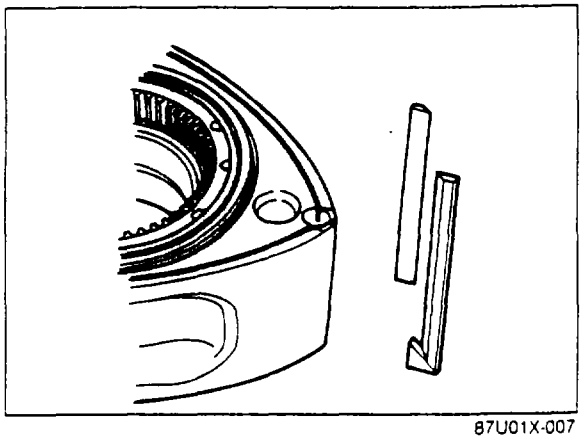
5. Install the inner sealing rubber so that the blue paint faces the outer wall in the groove and so that the seam is placed in position as shown in the figure.
6. Check that both the outer and inner sealing rubbers are not twisted.



67U01X-132

7. Apply engine oil to the contact surfaces, stationary gear and main bearing.

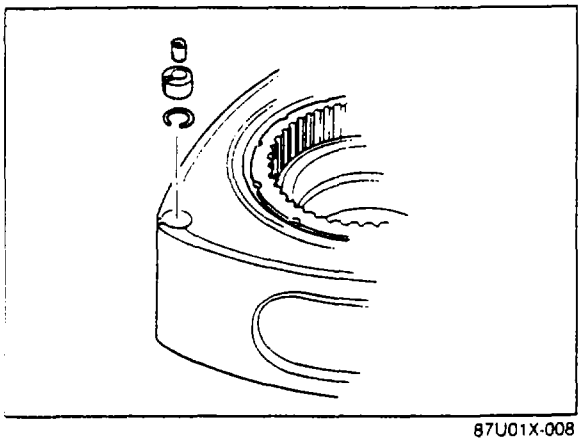
Caution
Do not apply engine oil to the sealing rubber.



87U01X-007

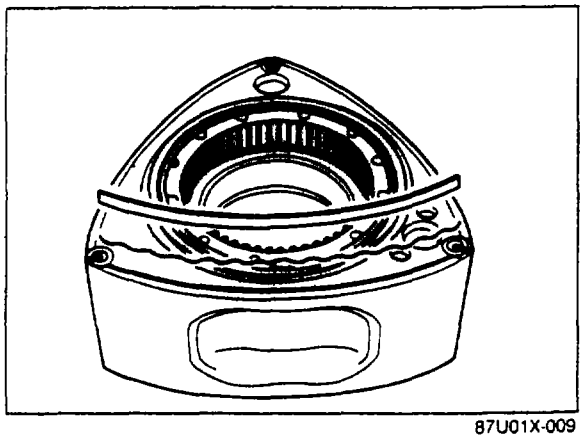
Rotor Seals (Front side of rotor)
1 Assemble the rotor seals (Refer to page 1—48).
2. Place the front rotor on a clean rubber pad or cloth with the front side upward.
3 Install the upper and lower apex seals without the spring so that the side piece is positioned to the rear side of the rotor.

Caution
If the apex seals are installed incorrectly, this may result in poor gas sealing performance.



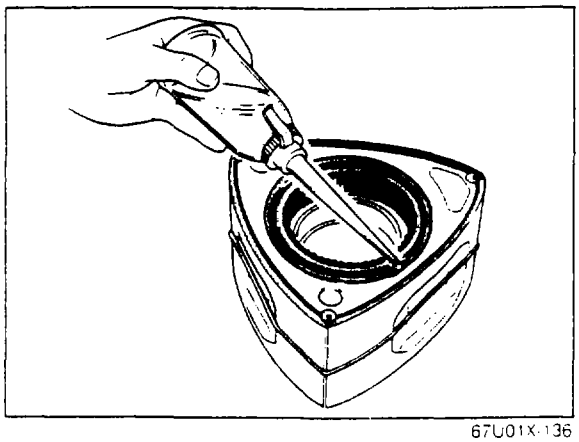
87U01X-008

4. Install the new soft seals into the corner seals.
5. Install the corner seal springs and corner seals so that the chamfer surface faces the bottom of the groove.



87U01X-009

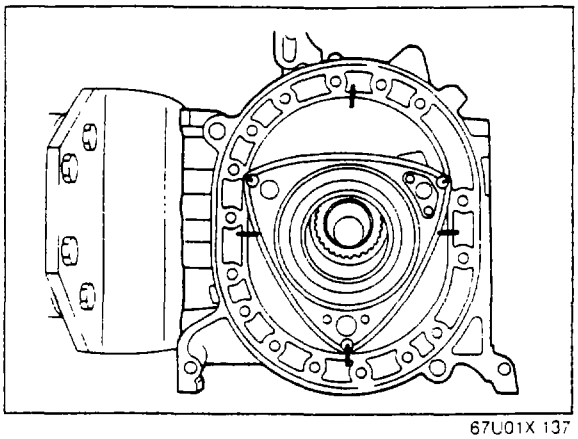
6. Install the side seal springs and side seals so that the paint faces the bottom of the groove.
7. Confirm smooth movement of the corner seals and side seals by lightly pressing them.
8. Apply petroleum jelly to the side seals.



67U01X-136

Front Rotor

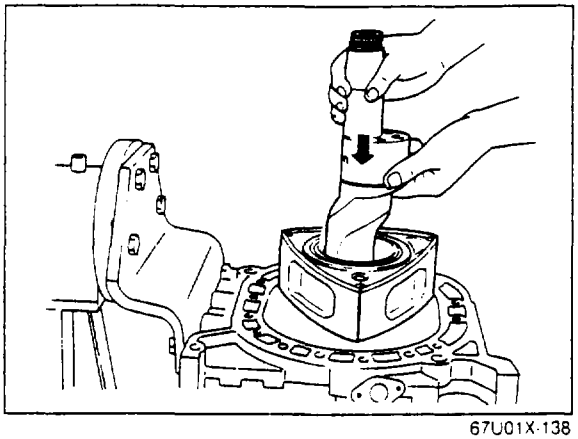
1. Apply engine oil to the rotor oil seal, rotor bearing and internal gear.



67U01X-137

2. Place the front rotor in the front housing, and mesh the internal gear and stationary gear so that one of the rotor apexes is set to one of the four positions illustrated.

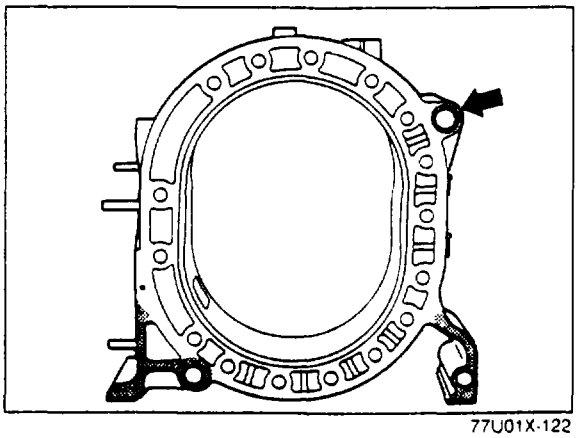
Caution
Do not place the rotor on the sealing rubber.



67U01X-138

Eccentric Shaft

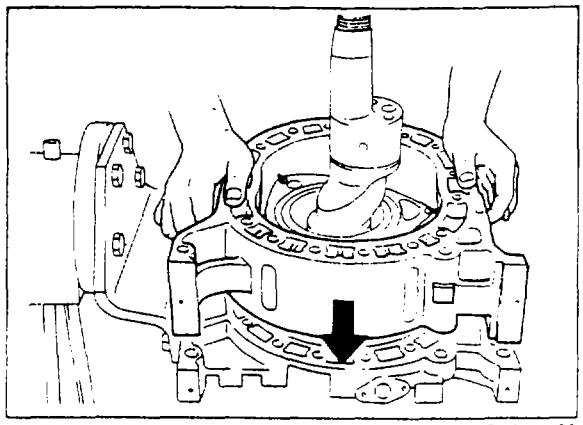
1. Apply engine oil to the front rotor journal and main journal.
2. Insert the eccentric shaft, being careful not to damage the rotor bearing and main bearing.



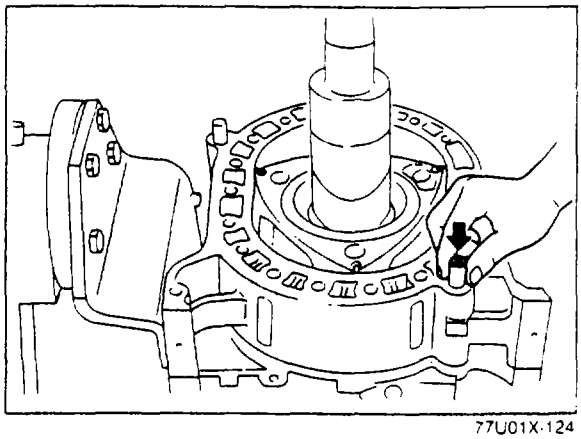
77U01X-122

Front Rotor Housing

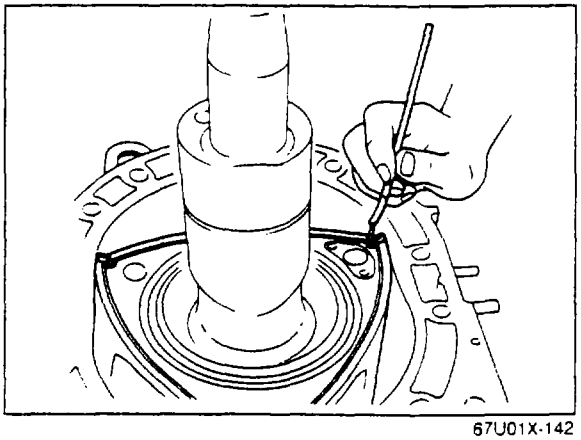
1. Apply petroleum jelly to the new "O" ring, and install it to the rotor housing.
2. Apply a coat of sealant on the rotor housing front side, as shown on the shaded area in the figure.


77U01X-123

3. Apply engine oil to the trochoid surface of the rotor housing.
4. Install the rotor housing.

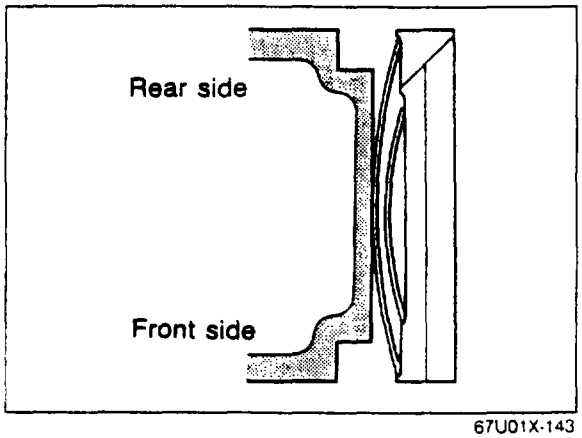

77U01X-124

5. Apply engine oil to the tubular dowels and insert them through the front rotor housing holes into the front housing holes.


67U01X-142

Rotor Seals (Rear side of rotor)

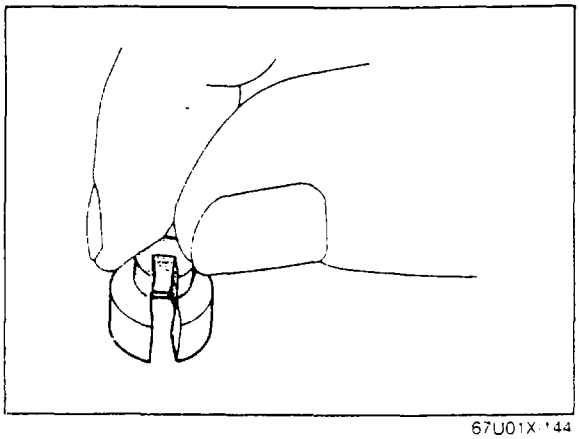
1. Insert the short apex seal springs.



67U01X-143

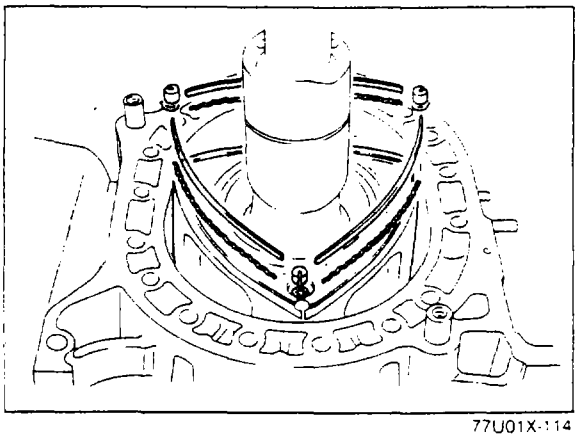
2 Insert the long apex seal springs.

Tightening torque:
39—49 N·m (4.0—5.0 m-kg, 29—36 ft-lb)



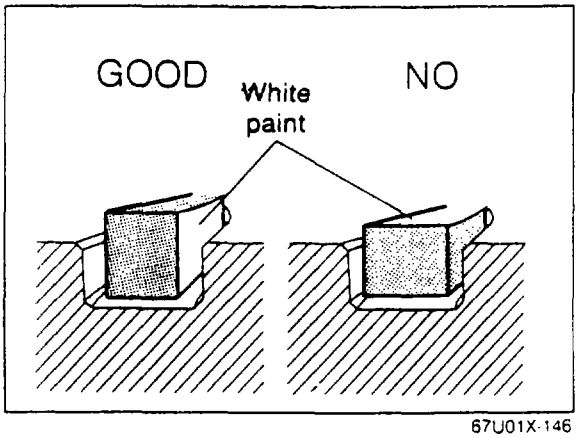
67U01X-144

3. Install the new soft seals into the corner seals.
4. Install the corner seal springs and corner seals so that the chamfer surface faces the bottom of the groove.



77U01X-114

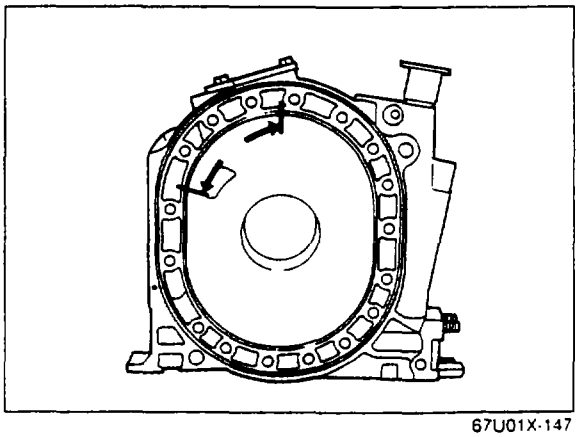
5. Install the side seal springs and side seals so that the paint faces the bottom of the groove.
6. Confirm smooth movement of the corner seals and side seals by lightly pressing them.



67U01X-146

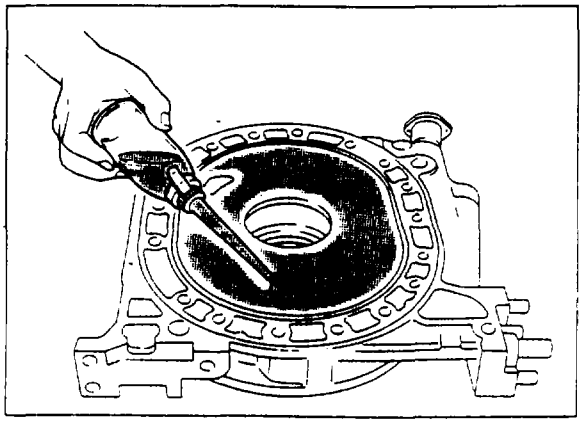
Intermediate Housing

1. Apply petroleum jelly to the new outer and inner sealing rubber.
2. Install the outer sealing rubber to the front side so that the white paint faces the side wall in the groove.



67U01X-147

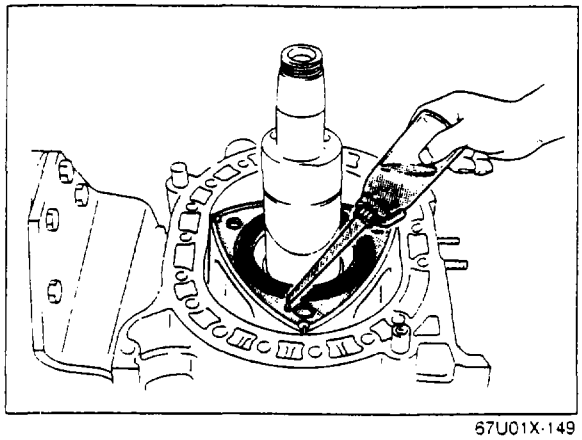
3. Install the inner sealing rubber to the front side so that the blue paint faces the outer wall in the groove and so that the seam is placed in position as shown in the figure.
4. Check that both the outer and inner sealing rubber are not twisted.



87U01X-010

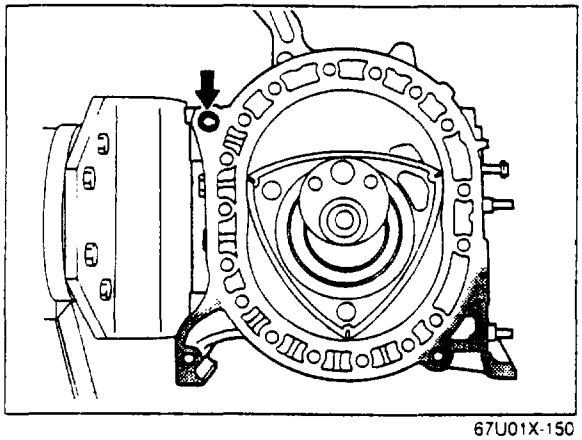
5. Apply engine oil to the contact surfaces of the intermediate housing.

Caution
Do not apply engine oil to the sealing rubber.



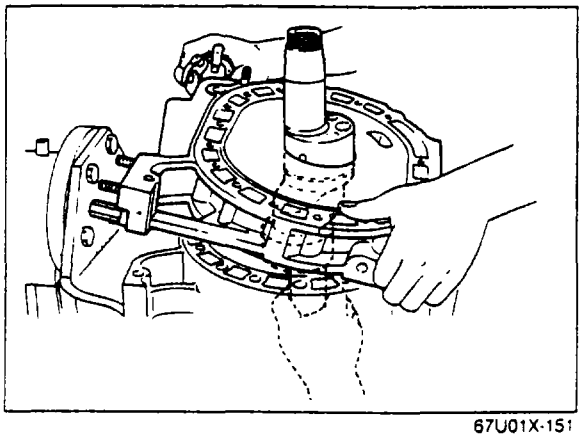
67U01X-149

6. Apply engine oil to the rotor oil seal on the rear side of the front rotor.



67U01X-150

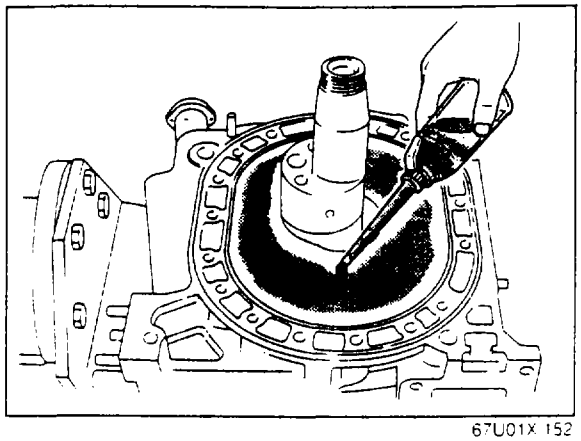
7. Apply petroleum jelly to the new "O" ring, and install it on the rotor housing.
8. Apply a coat of sealant to the shaded area as shown in the figure.



67U01X-151

9. Turn the eccentric shaft so that the rear rotor journal faces the intake and exhaust side.
10. Lift the eccentric shaft about 25 mm (1.0 in), and install the intermediate housing over the eccentric shaft on to the front rotor housing.

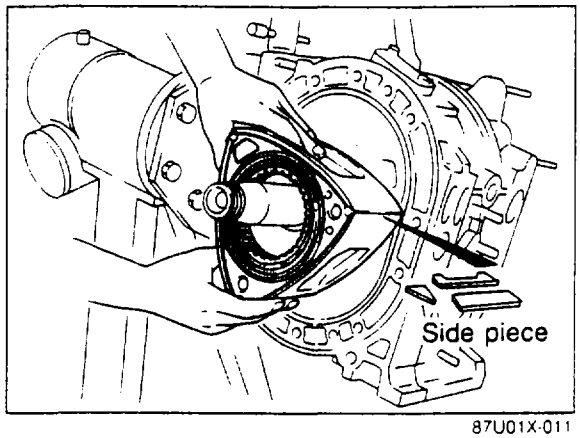
Note
Do not lift the shaft over 35 mm (1.5 in)



67U01X-152

11. Install the outer and inner sealing rubber to the rear side of the intermediate housing using the same method applied to the front side of the intermediate housing.
12. Apply engine oil to the rear contact surfaces.

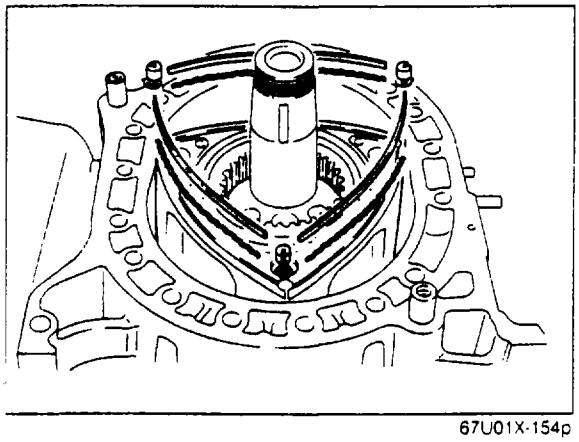
Caution
Do not apply engine oil to the sealing rubber.



87U01X-011

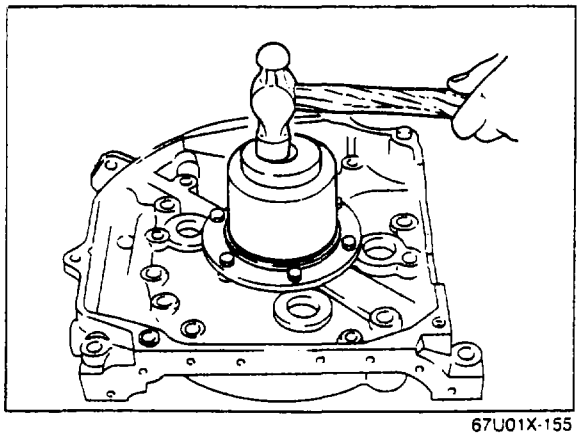
Rear Rotor, Rotor Seals and Rear Rotor Housing
Install the rotor seals, rear rotor and rear rotor housing in the same procedure as the installation of the rotor seals, front rotor and front rotor housing.
1. Install the rotor seals and rear rotor (Refer to Page 1—54).

Caution
Side piece of the rotor seals must be faced rear housing side.



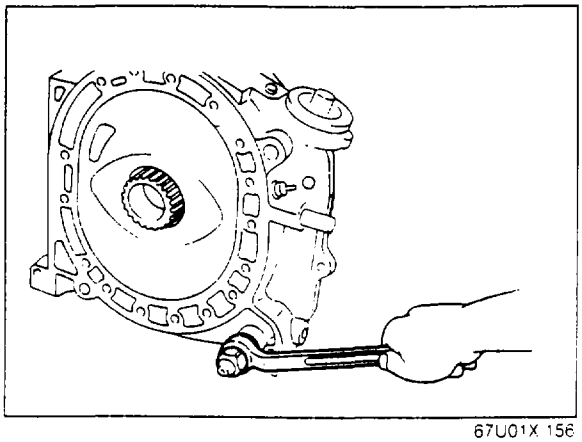
67U01X-154p

2. Install the rear rotor housing (Refer to Page 1—55).
3. Install the tubular dowel pin.
4. Install the rotor seals at the rear side of the rotor (Refer to Page 1—56).



67U01X-155

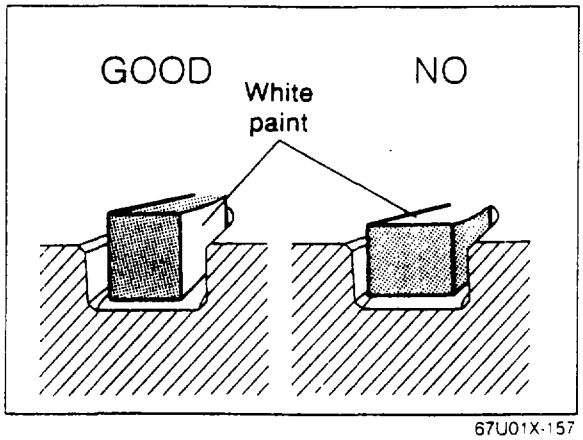
Rear Housing
1. Apply engine oil to the new rear oil seal and the groove of the rear stationary gear.
2. Install the oil seal into the rear stationary gear.



67U01X-156

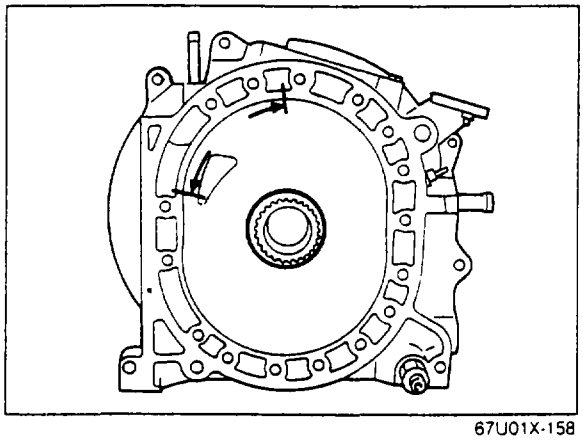
3. Install the oil regulator valve.

Tightening torque:
88—108 N·m (9.0—11.0 m-kg, 65—80 ft-lb)



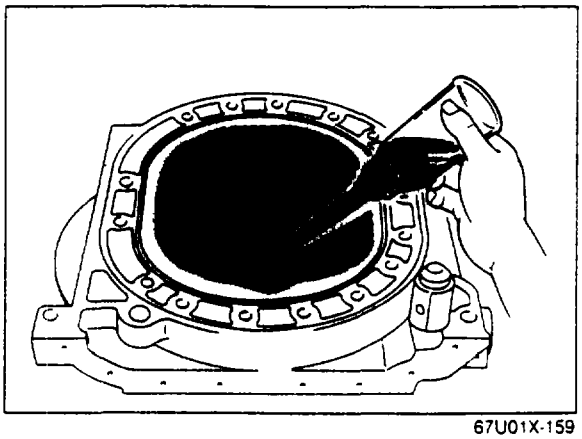
67U01X-157

4. Apply petroleum jelly to the new outer and inner sealing rubbers.
5. Install the outer sealing rubber so that the white paint faces the side wall in the groove.



67U01X-158

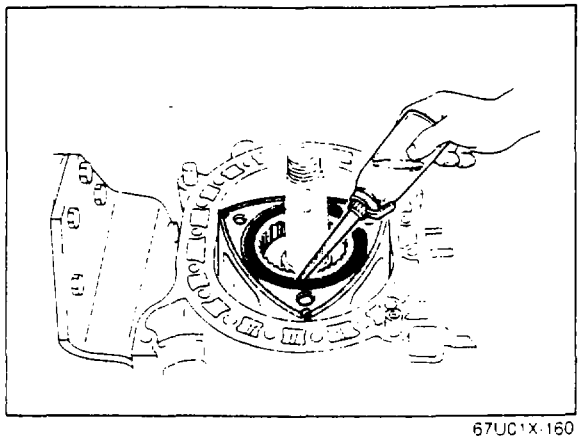
6. Install the inner sealing rubber so that the blue paint faces the outer wall in the groove and so that the seam is placed in position as shown in the figure.
7 Check that both the outer and inner sealing rubbers are not twisted.



67U01X-159

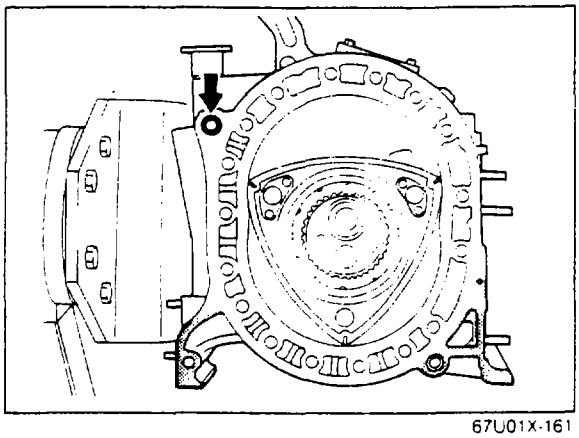
8 Apply engine oil to the contact surfaces, stationary gear and main bearing.

Caution
Do not apply engine oil to the sealing rubber.



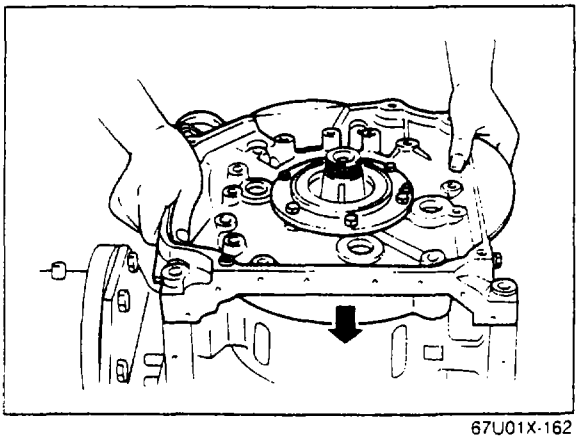
67UC1X-160

9. Apply engine oil to the rotor oil seal of the rear rotor's rear side.



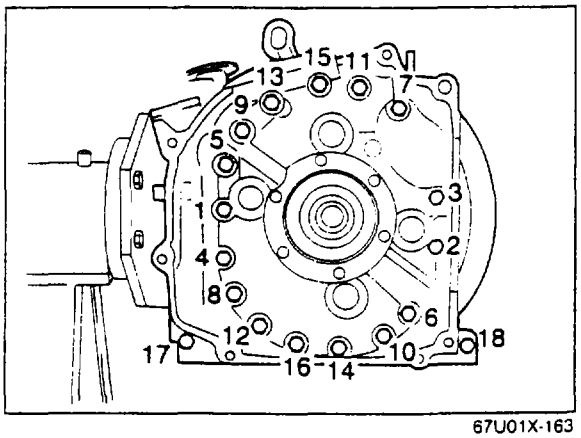
67U01X-161

10. Apply petroleum jelly to the new "O" ring, and install it to the rear rotor housing.
11. Apply a coat of sealant to the shaded area as shown in the figure.



67U01X-162

12. Install the rear housing on the rear rotor housing.
13. Check that the side pieces of the front and rear apex seals are not wedged between the rotor housing and side housing.



67U01X-163

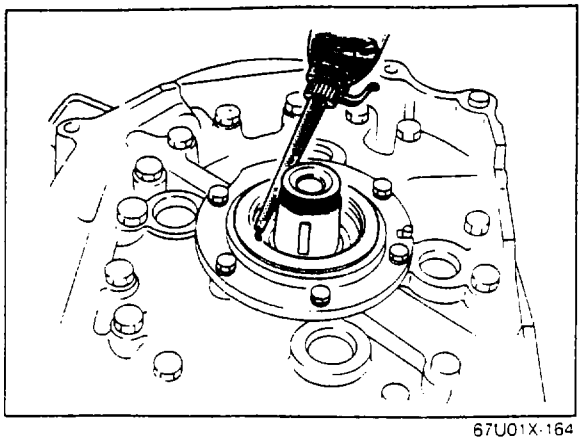
Tension Bolt

1. Apply engine oil to the new seal washers and install them on the tension bolts.
2. Apply engine oil to the bolt threads.
3. Install the tension bolts and tighten them gradually in the order shown in the figure.

Tightening torque:
31—39 N·m (3.2—4.0 m-kg, 23—29 ft-lb)

Note
The bolt with the mark is for the No. 17 position.

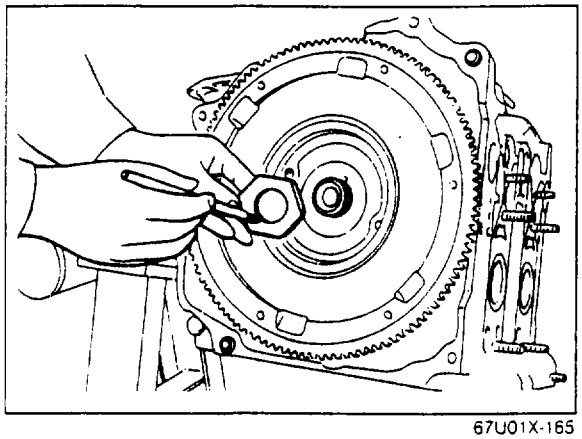
4. Turn the eccentric shaft and make sure that the rotation is easy and smooth.



67U01X-164

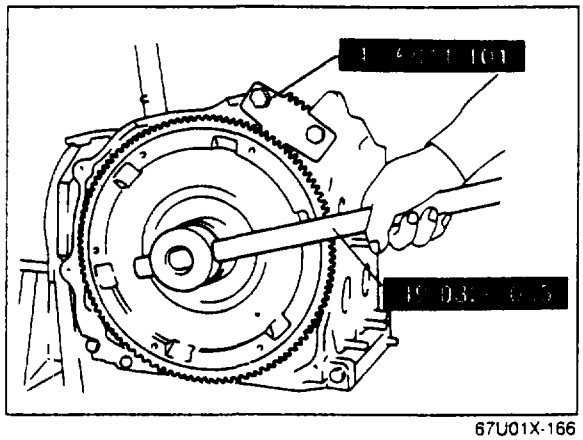
Flywheel (for M/T)

1. Apply engine oil to the oil seal in the rear housing.
2. Fit the key to the eccentric shaft.
3. Install the flywheel to the eccentric shaft.



67U01X-165

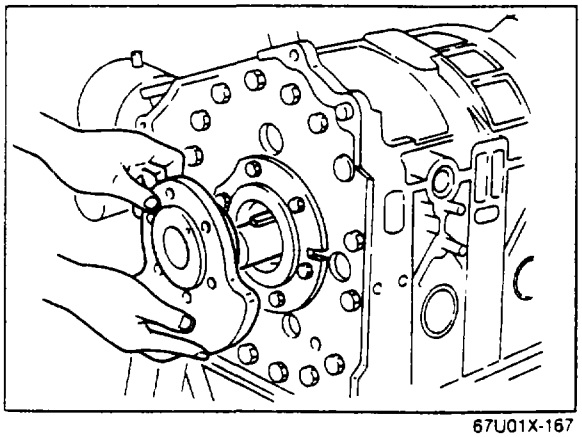
4. Apply thread locking compound to the eccentric shaft threads.
5. Apply a coat of sealant to the contact surface of the lock nut.



67U01X-166

6. Install **ring gear brake** (49 F011 101) and tighten the nut using **flywheel box wrench** (49 0820 035).

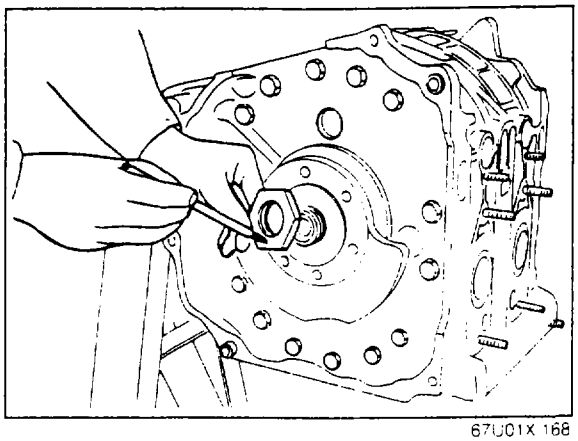
Tightening torque: 390—490 N·m (40—50 m-kg, 290—360 ft-lb)



67U01X-167

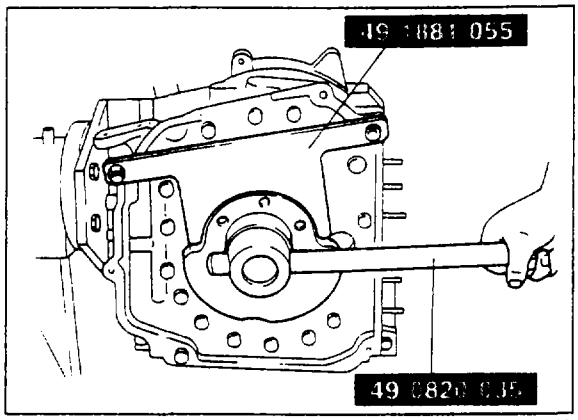
Counter Weight and Drive Plate (for A/T)

1. Apply engine oil to the oil seal in the rear housing.
2. Fit the key to the eccentric shaft.
3. Install the counter weight to the eccentric shaft.



67U01X-168

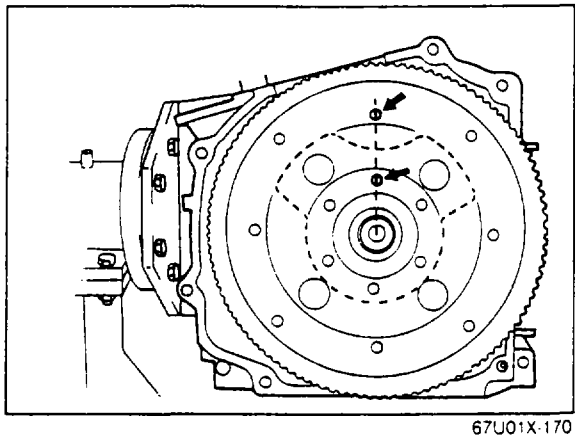
4. Apply thread locking compound to the eccentric shaft threads.
5. Apply a coat of sealant to the contact surface of the lock nut.



67U01X-169

6. Install **counter weight stopper** (49 1881 055) and tighten the nut using **flywheel box wrench** (49 0820 035).

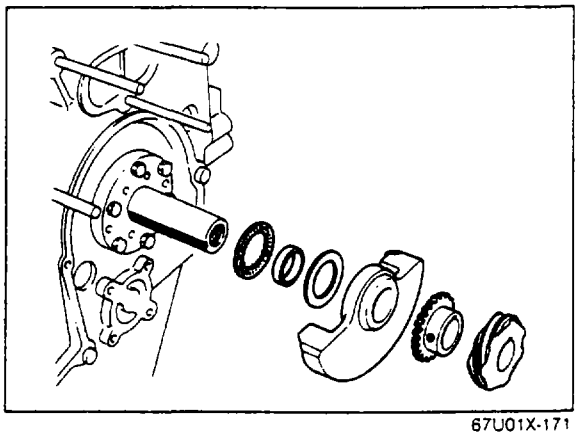
Tightening torque: 390—490 N·m (40—50 m-kg, 290—360 ft-lb)



67U01X-170

7. Install the drive plate so that the holes in the drive plate and counter weight are positioned as shown in the figure. Install the back plate and tighten.

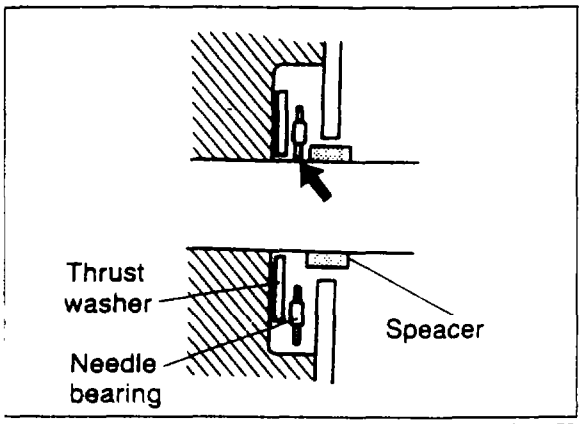
Tightening torque: 43—61 N·m (4.4—6.2 m-kg, 32—45 ft-lb)



67U01X-171

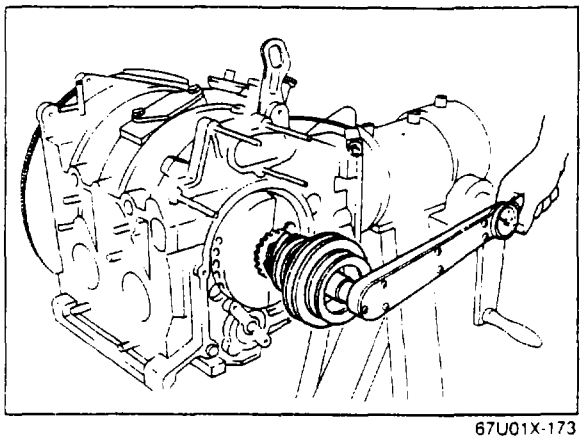
Balance Weight, Bearing and Spacer

1. Install the following parts to the eccentric shaft:
   (1) Spacer
   (2) Thrust needle bearing
   (3) Thrust washer
   (4) Balance weight
   (5) Oil pump drive sprocket
   (6) Distributor drive gear



67U01X-172

Caution
When installing the needle bearing, make sure it is not wedged by the spacer.

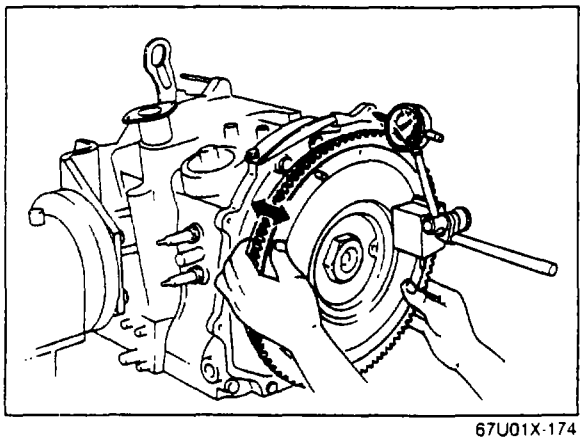


67U01X-173

2. Install the eccentric shaft pulley boss and tighten the pulley lock bolt.

   Tightening torque:
   108—132 N·m
   (11.0—13.5 m-kg, 80—98 ft-lb)

3. Remove the **ring gear stopper** or **counter weight stopper.**

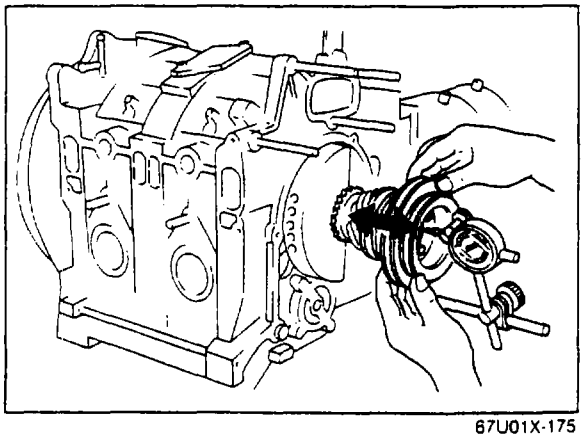


67U01X-174

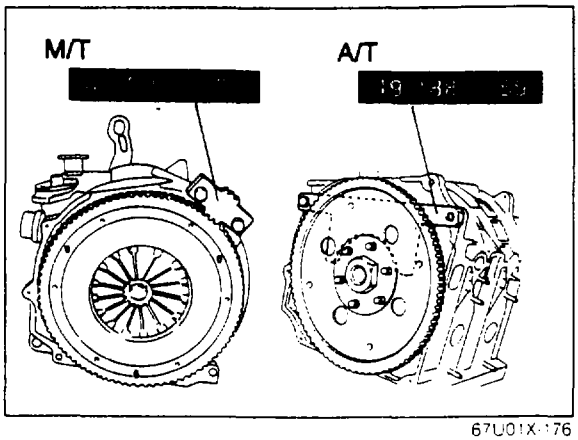
4. Measure the end play of the eccentric shaft.

   Standard end play:
   0.04—0.07 mm (0.0016—0.0028 in)
   End play: 0.09 mm (0.0035 in) max.

   If necessary replace the spacer, continuing with step 5.

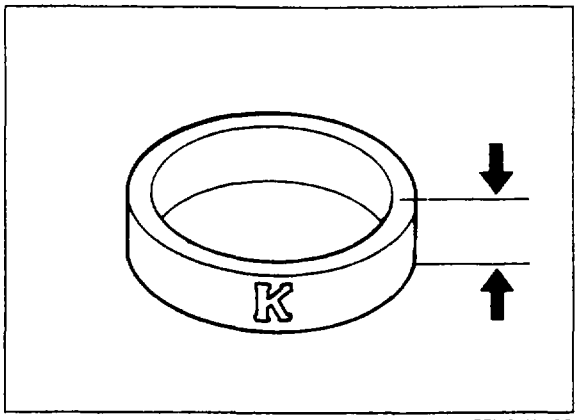


67U01X-175



67U01X-176

5. Attach **ring gear brake** (49 F011 101) to the flywheel (M/T), or attach **counter weight stopper** (49 1881 055) to the counter weight (A/T).
6. Remove the eccentric shaft lock bolt, distributor drive gear and oil pump drive sprocket.

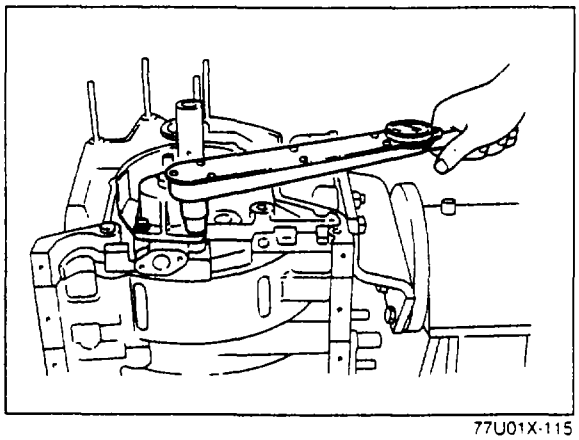


77U01X-125

7. If the end play is less than the standard, replace the spacer with a thicker one. If the end play is more than the standard, replace the spacer with a thinner one.

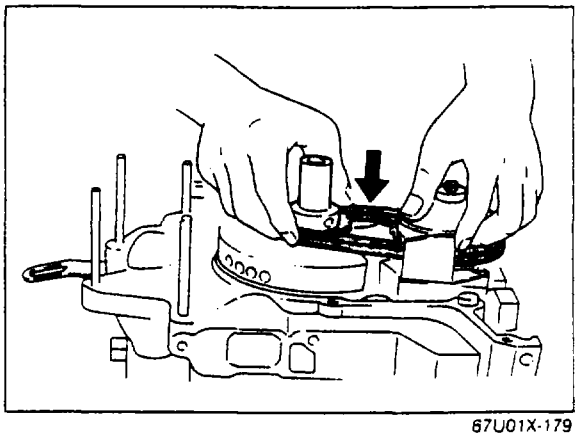
Spacer stamp and thickness

Stamp	Thickness mm (in)	Stamp	Thickness mm (in)
S	8.12 (0.3197)	Y	8.04 (0.3165)
T	8.10 (0.3189)	V	8.02 (0.3157)
X	8.08 (0.3181)	Z	8.00 (0.3150)
K	8.06 (0.3173)		

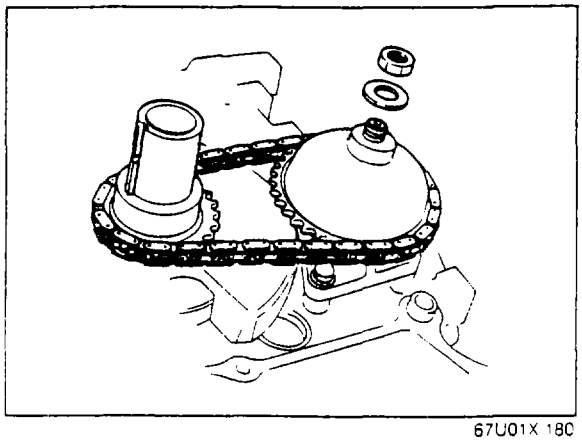

77U01X-115

Oil pump
1. Apply engine oil to the oil pump shaft.
2. Install the oil pump and the baffle plate (only for turbo) to the front housing.

Tightening torque:
7—10 N·m (0.7—1.0 m-kg, 61—87 in-lb)


67U01X-179

2. Install the key to the oil pump shaft.
3. install the oil pump drive gear, driven gear and drive chain as an assembly.

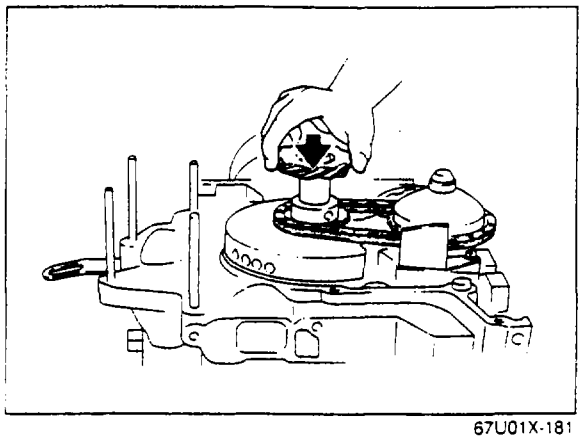


67U01X-180

4 Install the key to the eccentric shaft.
5 Install the new washer and oil pump lock nut.

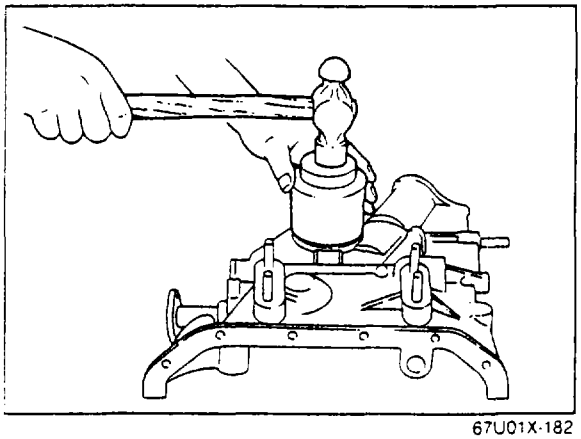
Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

6 Bend the washer and lock the nut.



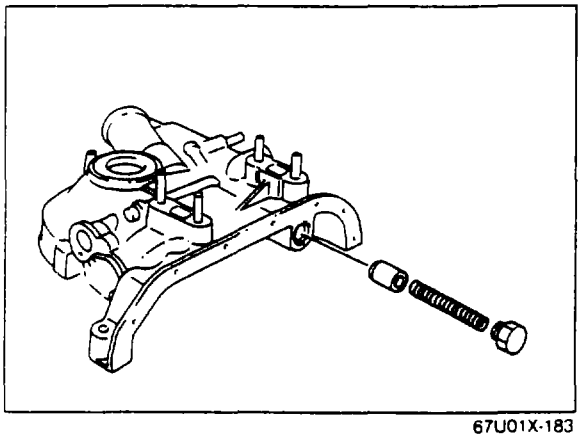
67U01X-181

7 Install the distributor drive gear so that the chamfer surface faces the housing.



67U01X-182

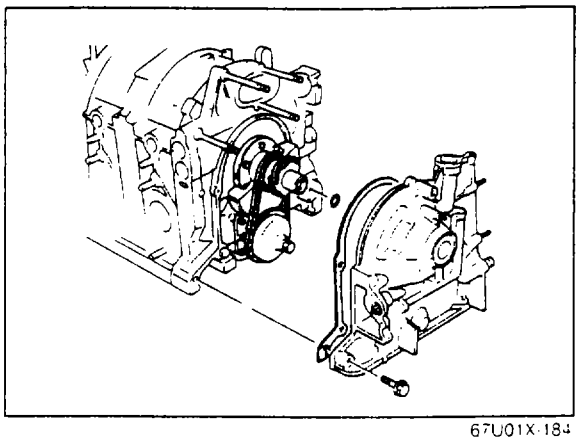
Front Cover
1. Apply engine oil to the new front oil seal and the groove of the front cover.
2. Install the oil seal in the front cover.



67U01X-183

3. Install the oil pressure control valve in the front cover.

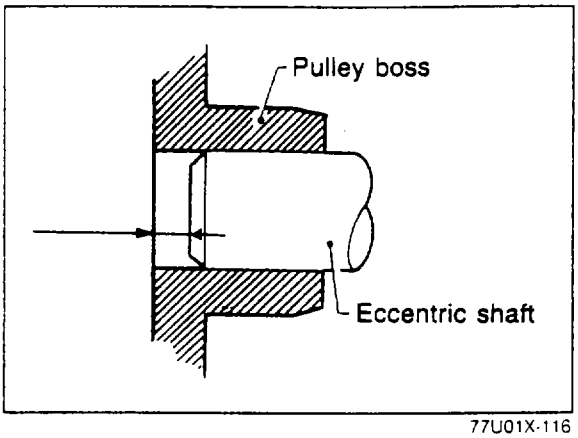
Tightening torque:
39—49 N·m (4.0—5.0 m-kg, 29—36 ft-lb)



67U01X-184

4. Apply petroleum jelly to the new "O" ring and install it on the front cover with a new gasket.

Tightening torque:
16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

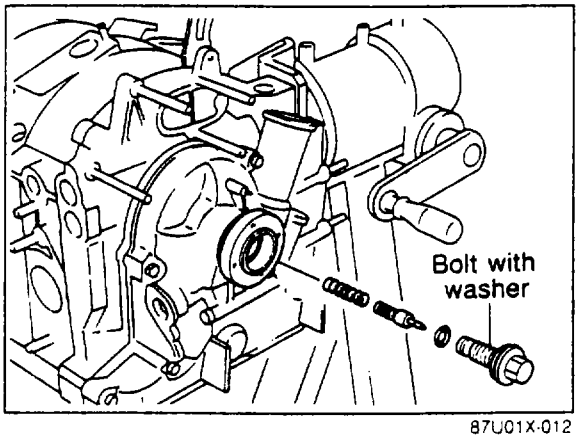


77U01X-116

Eccentric Shaft Lock Bolt and Bypass Valve

1. Install the eccentric shaft pulley boss.
2. Temporarily install the lock bolt, and tighten it by hand.
3. Remove the lock bolt, and measure the pulley boss protrusion. If it is over the limit, the needle bearing may be wedged by the spacer. Remove and reassemble the needle bearing correctly.

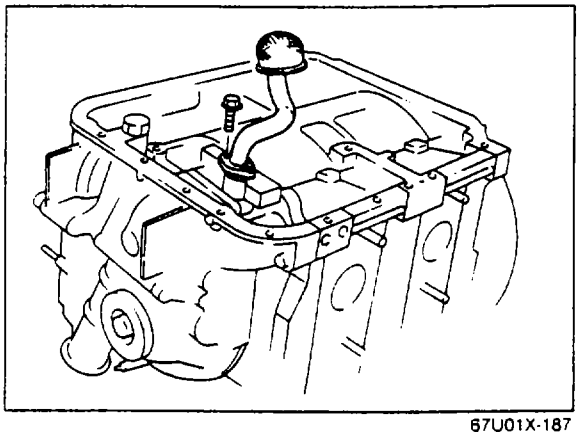
Protrusion: 2.44 mm (0.0961) max.



87U01X-012

4. Install the bypass valve and spring into the eccentric shaft.
5. Apply engine oil to the new "O" ring and install it on the lock bolt.
6. Apply a locking agent to the lock bolt threads.
7. Apply a coat of sealant to the flange face of the lock bolt.
8. Install the new lock bolt.

Tightening torque: 108—132 N·m
(11—13.5 m-kg, 80—98 ft-lb)

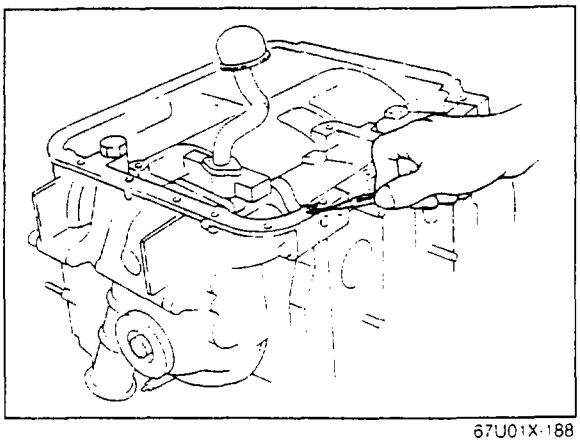


67U01X-187

Oil Strainer

Install the oil strainer with a new gasket.

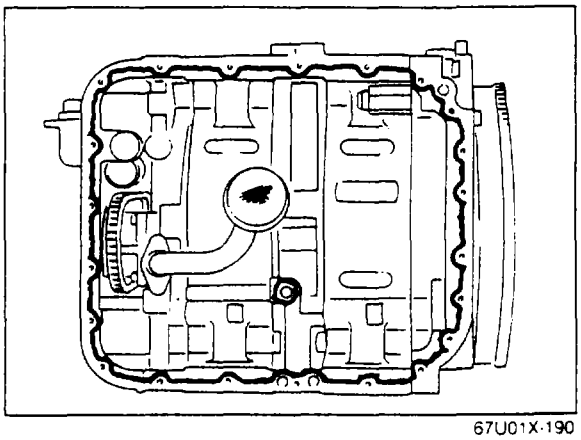
Tightening torque:
7—10 N·m (0.7—1.0 m-kg, 61—87 in-lb)



67U01X-188

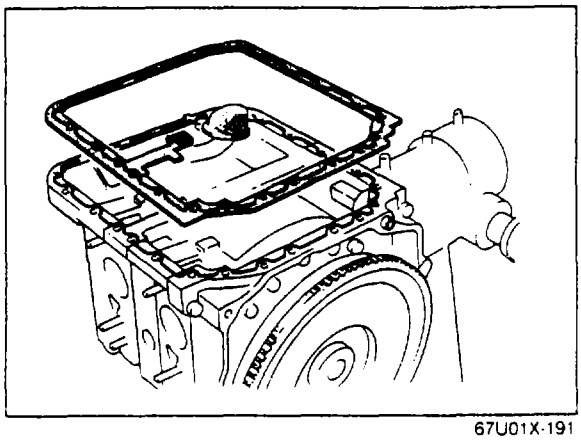
Oil Pan

1. Cut away the part of the gasket that projects out from the front cover to the oil pan.



67U01X-190

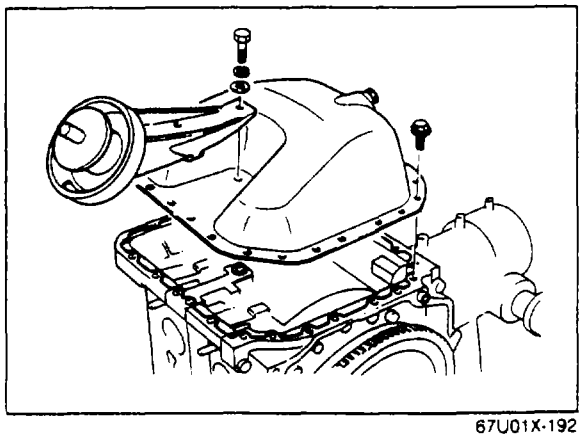
2. Clean the mating surface of the housing and oil pan.
3. **(Without gasket)**
   Apply a **4—6 mm (0.16—0.24 in)** diameter bead of the sealant (8527 77 739) around the rim of the oil pan as shown in the figure. It should be continuously rimmed inside the bolt holes, and the ends should overlap.



67U01X-191

(With gasket)
Apply a **4—6 mm (0.16—0.24 in)** diameter bead of sealant (8527 77 739, or suitable silicone base sealant) around the rim of the oil pan and the housing side of the new gasket. It should be continuously rimmed inside the bolt holes, and the ends should overlap.

Caution
Install the oil pan within 30 minutes after the sealant is applied.

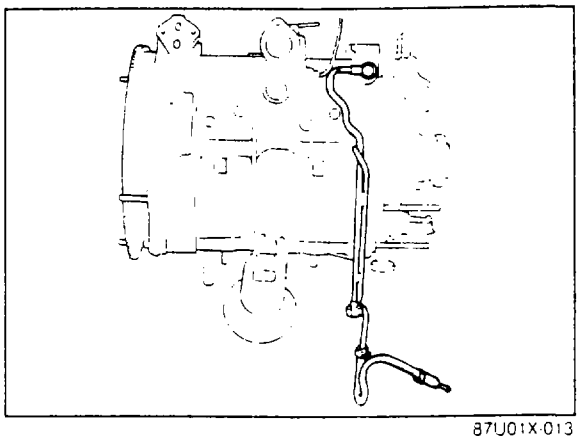


67U01X-192

4. Install the oil pan and the right engine mount, and tighten the bolts gradually.

Oil pan bolt tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

Engine bracket bolt tightening torque:
63—93 N·m (6.4—9.5, 46—69 ft-lb)



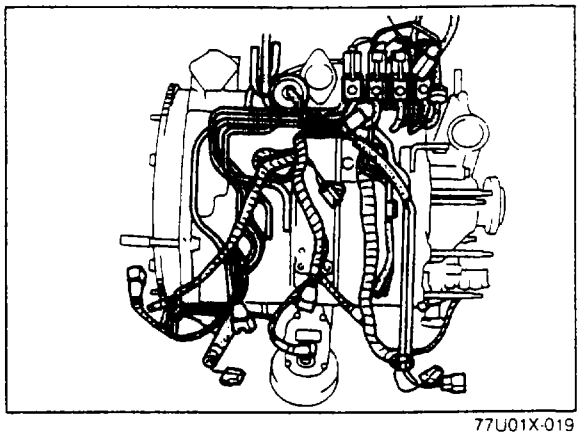
87U01X-013

EXTERNAL (TURBO)

Oil Inlet Pipe

Install the oil inlet pipe with new washers to the front housing.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



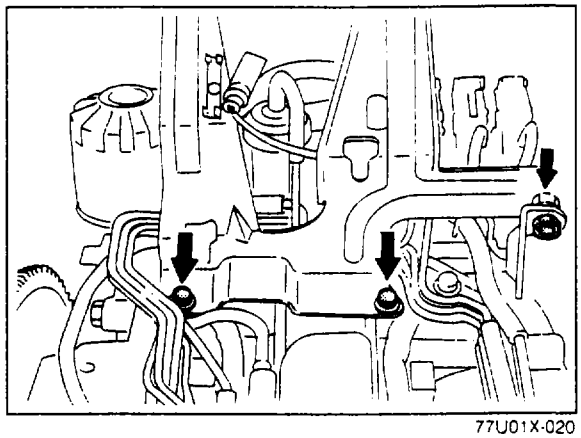
77U01X-019

Engine Harness and Vacuum Piping

1. Install the engine harness and vacuum piping as an assembly.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

2. Connect the couplers of the water temperature gauge.
3. Connect the evaporative hoses to the intermediate housing and oil filler pipe.

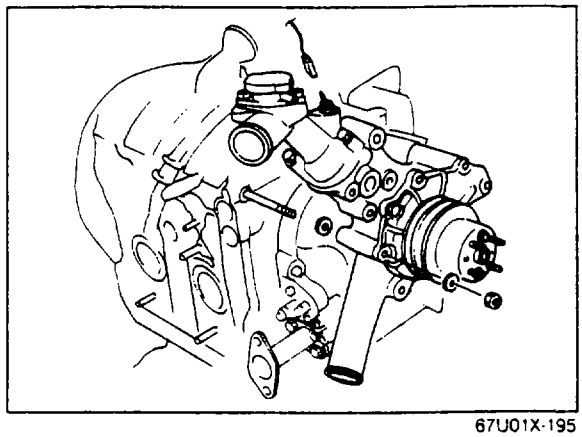


77U01X-020

Dynamic Chamber Bracket

Install the dynamic chamber bracket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



67U01X-195

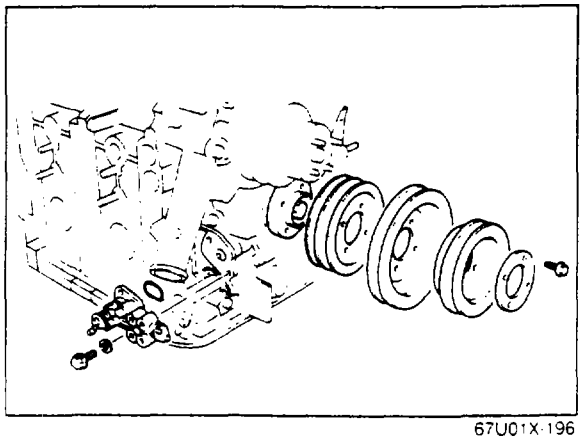
Water Pump

1. Install the water pump with a new gasket.

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

Caution
Do not forget to use shims on the studs where the gasket does not mount.

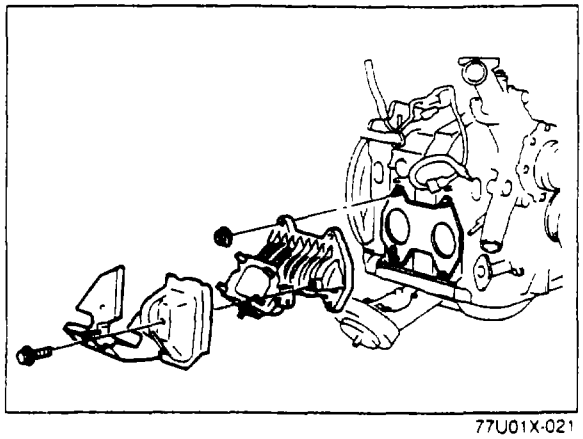
2. Connect the couplers of the water thermo sensor and water thermo switch.


67U01X-196

Eccentric Shaft Pulley
Install the eccentric shaft pulleys and stiffner to the pulley boss.

Metering Oil Pump
1. Apply engine oil to the new "O" ring.
2. Install the metering oil pump to the front housing.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

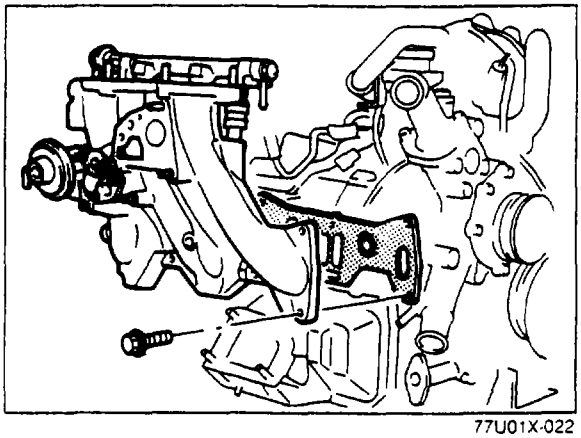

77U01X-021

Exhaust Manifold and Insulator
1. Install the new exhaust manifold gasket so that the secondary air hole is positioned on the rear rotor housing.
2. Install the exhaust manifold.

Tightening torque:
32—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

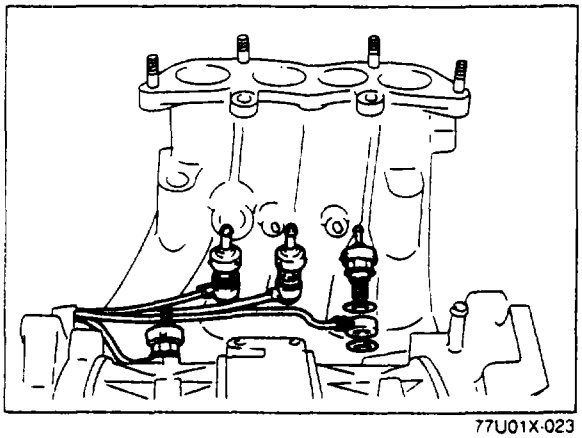
3 Install the exhaust manifold insulator.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)


77U01X-022

Intake Manifold
1. Install the new intake manifold gasket and new "O" rings on the engine.
2. Install the intake manifold.

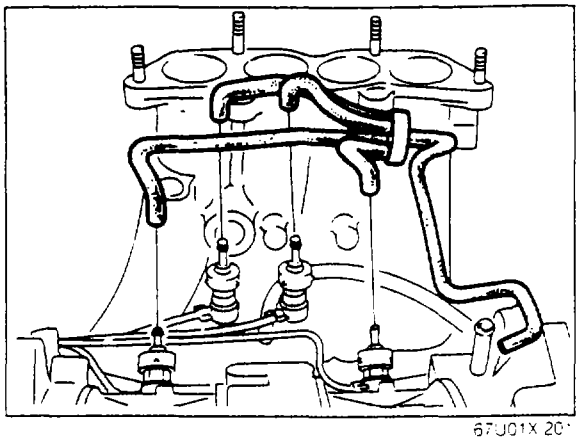
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


77U01X-023

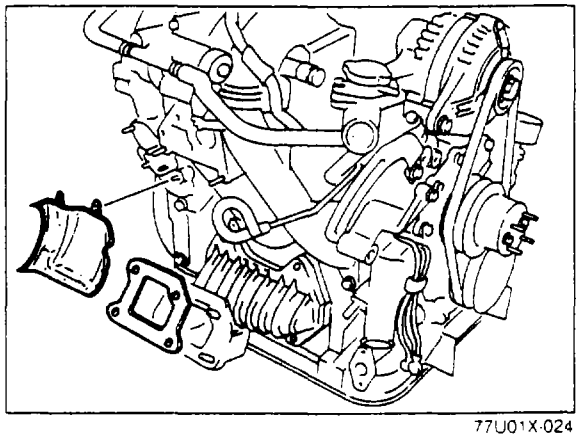
Housing Oil Nozzle and Manifold Oil Nozzle
Install the oil nozzles and connect the metering oil tubes with new washers.

Tightening torque:
16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

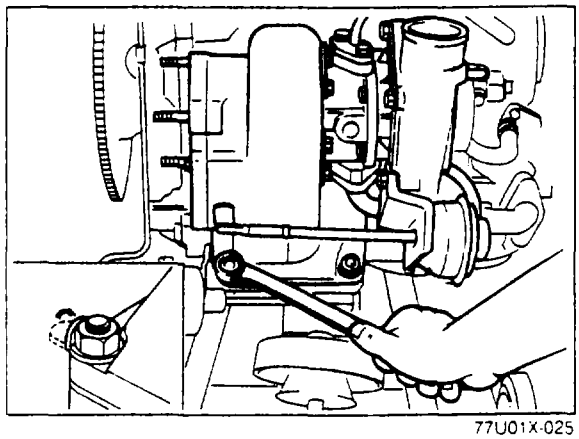
Note
The oil tube ends are colored.
White..... for front rotor housing
Yellow ..... for rear rotor housing
Blue ..... for front inlet port
Green ..... for rear inlet port



Air Hose
Install the air hose assembly and connect the hoses to the oil nozzles.



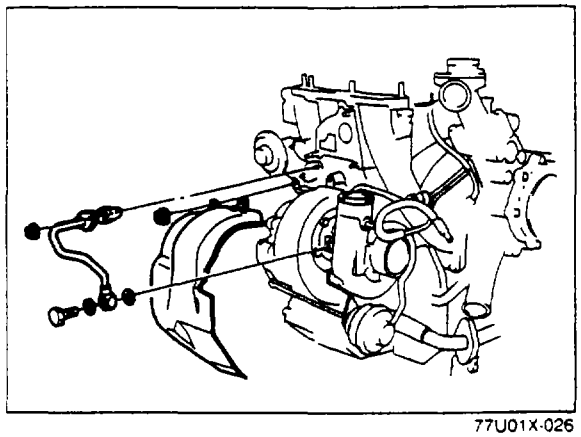
Turbocharger and Insulator
1. Install the new gasket and the insulator.



2. Install the turbocharger.

Tightening torque:
44—54 N·m (4.5—5.5 m-kg, 32—40 ft-lb)

3. Bend the new lock washer and lock the nuts.
4. Connect the water hoses, and the oil pipes with new gaskets.

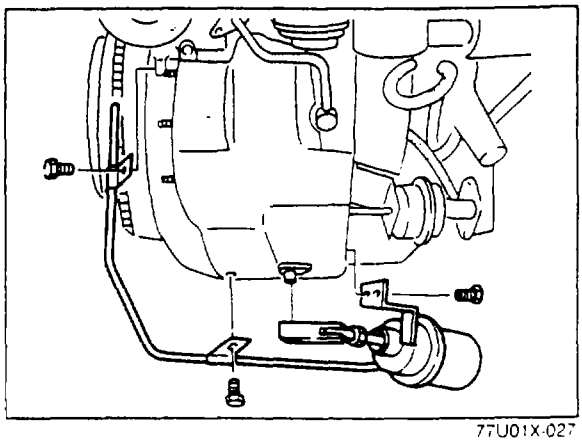


5. Install the insulator.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

6. Install the water pipe with the new gasket and the new washers.

Tightening torque:
24—35 N·m (2.4—3.6 m-kg, 18—26 ft-lb)

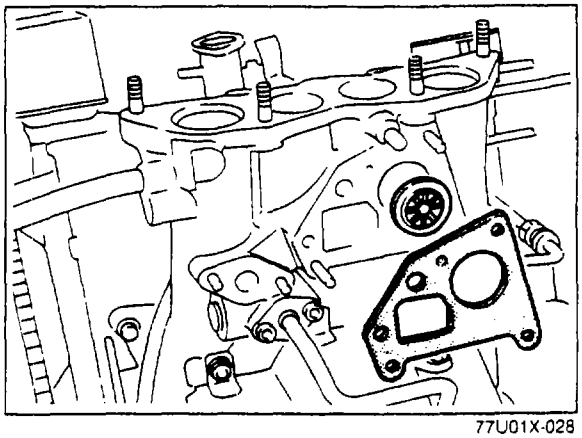

77U01X-027

Switching Actuator

1. Install the switching actuator and air pipe.

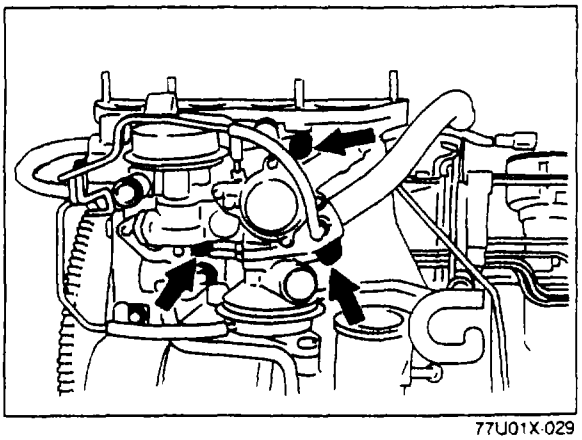
Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

2. Connect the actuator rod to the switching valve lever.
3. Install the "C" clip.


77U01X-028

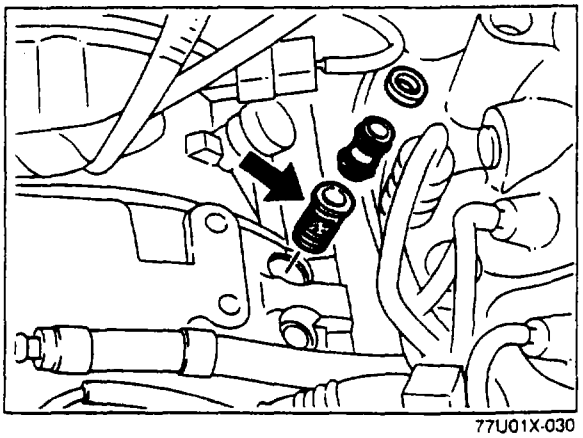
Air Control Valve (ACV)

1. Install the check valve with the new gasket.


77U01X-029

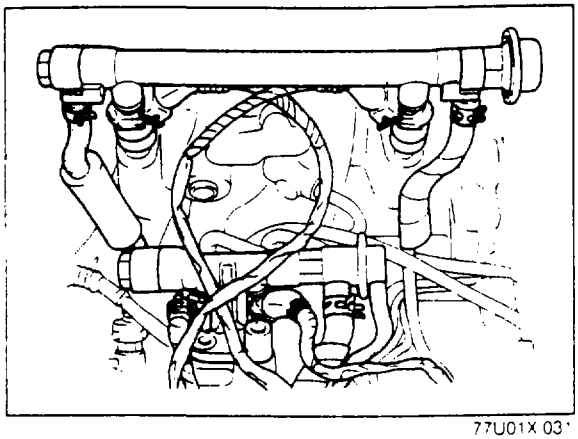
2. Install the air control valve so that the check valve does not fall from the intake manifold.
3. Connect the couplers of the split air solenoid valve and the port air solenoid valve.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)


77U01X-030

Primary Fuel Injectors and Distribution Pipe

1. Apply engine oil to the "O" ring of the air bleed socket.
2. Insert the mixing plate into the intermediate housing with the white paint faced upward.
3. Insert the air bleed socket and injector insulator into the intermediate housing.

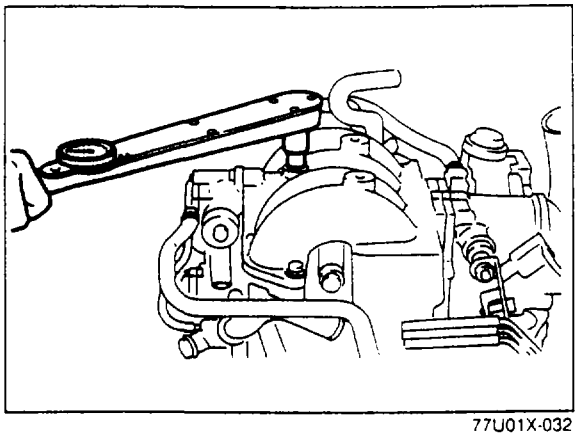


77U01X 03

4. Apply engine oil to the injector "O" rings, and install the primary fuel injectors.
5. Install the fuel distribution pipe with the insulator.

Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

6. Connect the fuel hoses and vacuum hose.
7. Connect the injection couplers.

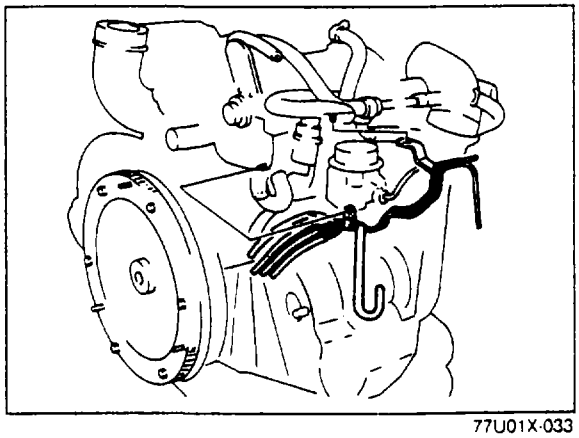


77U01X-032

Throttle and Dynamic Chamber

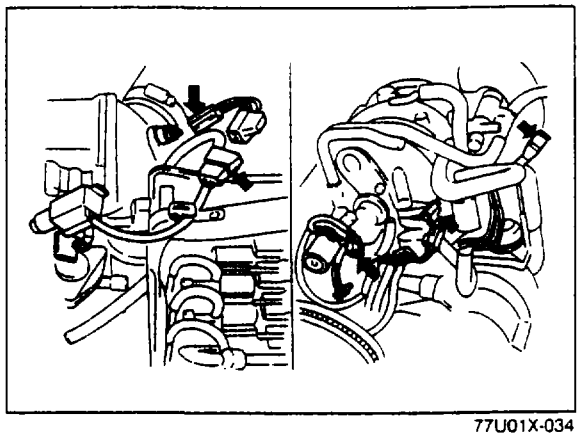
1. Install the throttle and dynamic chamber assembly with the new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



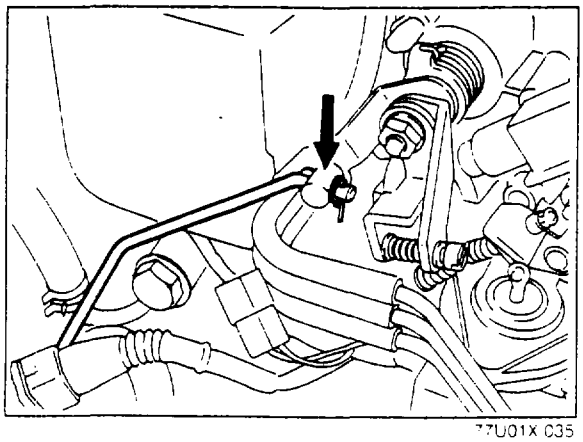
77U01X-033

2. Install the second vacuum piping on the dynamic chamber.



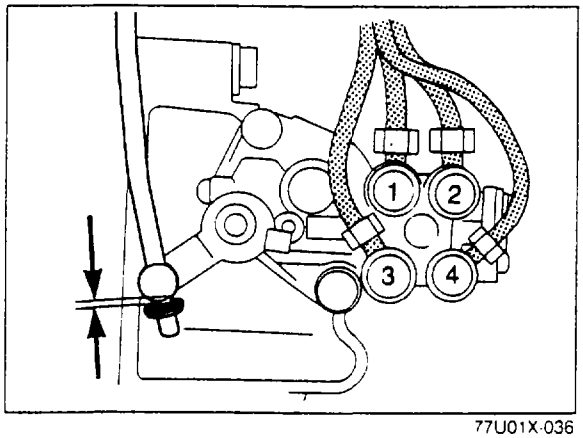
77U01X-034

3. Connect the vacuum hoses and water hoses.
4. Connect the couplers of the throttle sensor, air bypass solenoid valve, bypass air control valve, air supply solenoid valve, and intake air temperature sensor.


77U01X 035

Metering Oil Connecting Rod

1. Install the metering oil connecting rod to the throttle body and the lever of the metering oil pump.



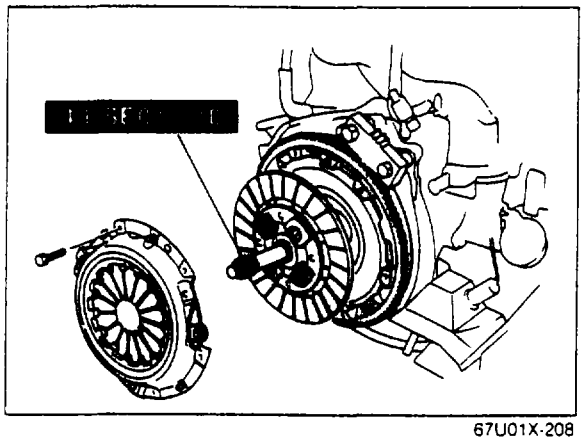
77U01X-036

2. Check the clearance shown in the figure. If necessary, adjust by the number of shims.

   Rod clearance: 0—1.0 mm (0—0.039 in)

3. Connect the oil tubes so that the colors of the tube ends match the numbers as shown.

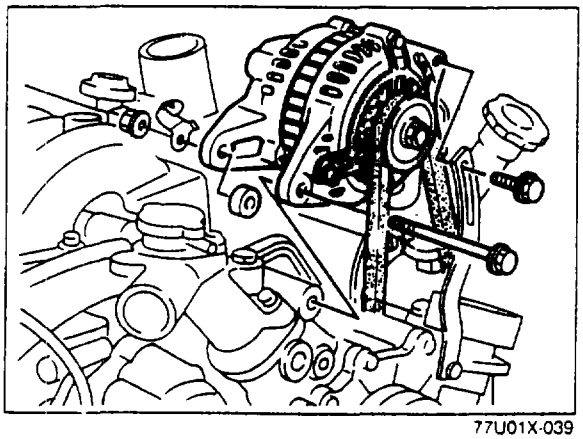
   1.....Blue 2.....White
   3.....Green 4.....Yellow


67U01X-208

Clutch Disc and Clutch Cover

Install the clutch disc and clutch cover using **clutch disc centering tool** (49 SE01 310).

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

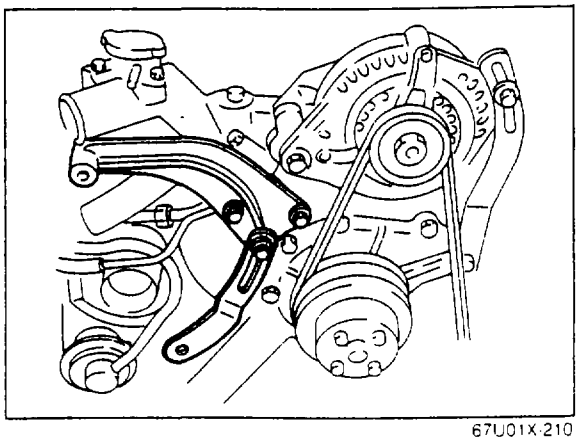

77U01X-039

Alternator

1. Install the alternator strap, alternator and drive belt.

   Tightening torque:
   Alternator long bolt: 37—52 N·m
   (3.8—5.3 m-kg, 27—38 ft-lb)
   Alternator short bolt: 19—26 N·m
   (1.9—2.6 m-kg, 14—19 ft-lb)
   Strap: 22—30 N·m
   (2.2—3.1 m-kg, 16—22 ft-lb)

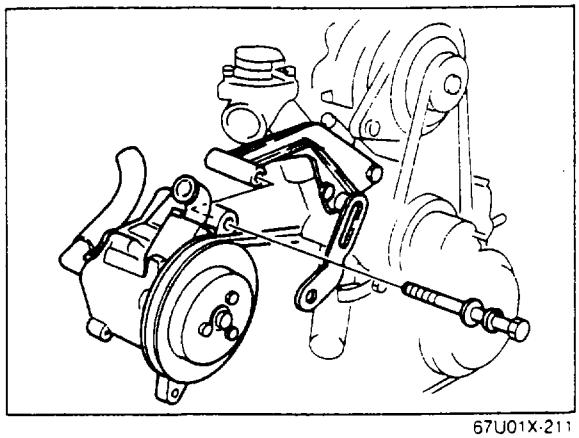
2 Connect the alternator coupler.


67U01X-210

Air Pump

1. Install the air pump bracket and strap to the water pump.

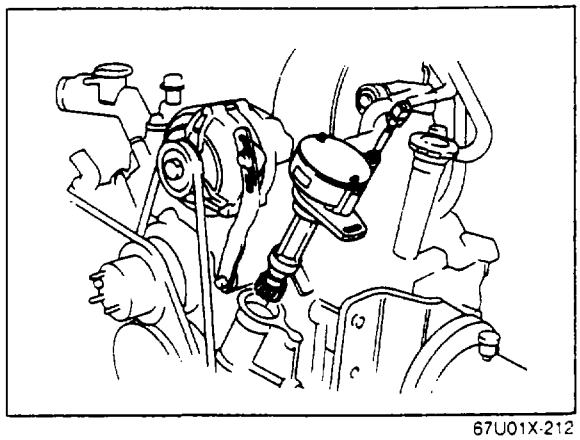
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


67U01X-211

2. Install the air pump.

Tightening torque:
Long bolt: 16—23 N·m
(1.6—2.3 m-kg, 12—17 ft-lb)
Short bolt: 24—30 N·m
(2.4—3.1 m-kg,17—22 ft-lb)

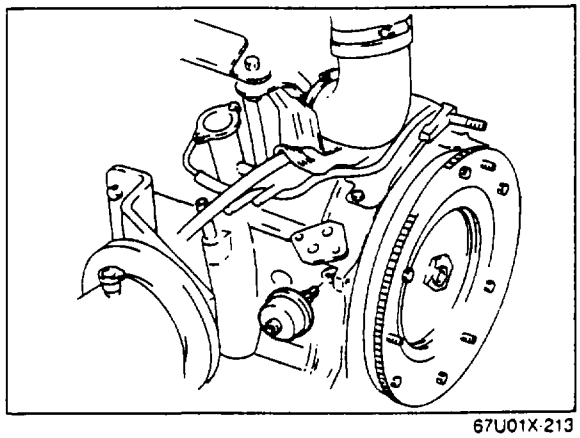
3. Connect the air hose to the air control valve.


67U01X-212

Crank Angle Sensor

1. Turn the eccentric shaft until the leading top mark (Yellow) is aligned with the indicator pin.
2. Apply engine oil to the new "O" ring, and install it on the crank angle sensor.
3. Apply engine oil to the drive gear.
4. Match the mating mark and install the crank angle sensor on the front housing.

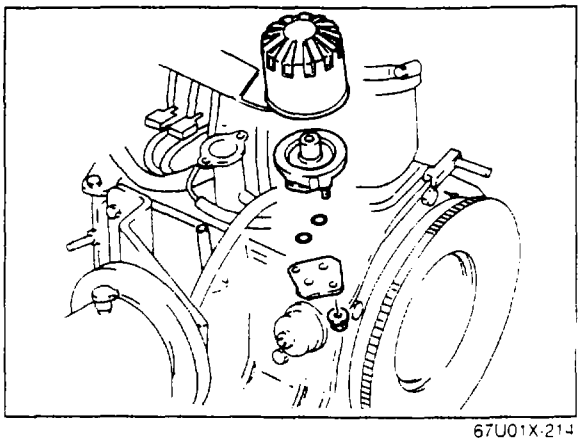
Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)


67U01X-213

Oil Pressure Gauge

Install the oil pressure gauge in the rear housing.

Tightening torque:
11—16 N·m (1.1—1.6 m-kg, 8—12 ft-lb)

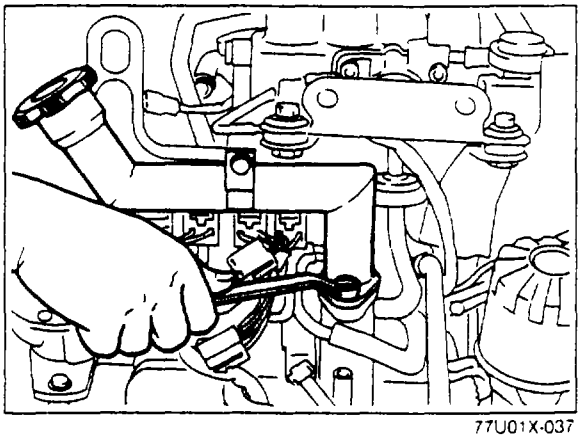

67U01X-214

Oil Filter

1. Install the oil filter body together with the new "O" rings.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

2. Apply engine oil to the rubber seal of the oil filter
3. Install the oil filter and tighten it by hand only.

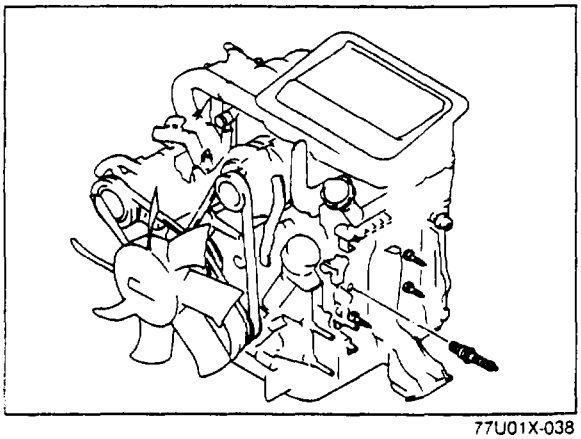

77U01X-037

Oil Filler Pipe

Install the oil filler pipe with a new gasket and the EGR solenoid valve.

Oil Level Gauge

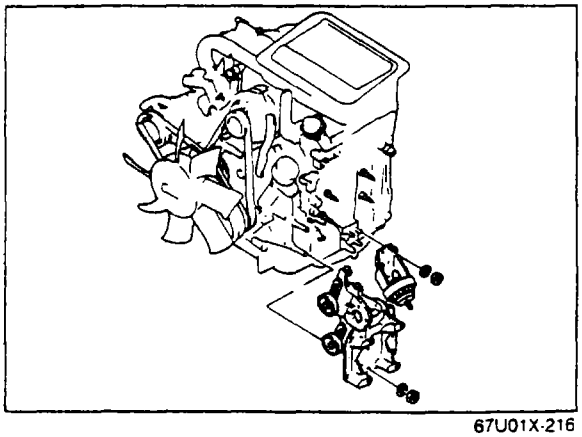
Install the oil level gauge.


77U01X-038

Spark Plug

1. Remove the engine from the **engine hanger** and **engine stand**.
2. Apply anti-seize compound or molybdenum-based lubricant to the spark plug threads.
3. Install the spark plugs.

Tightening torque:
13—18 N·m (1.3—1.8 m-kg, 9.4—13 ft-lb)


67U01X-216

Left Engine Mount

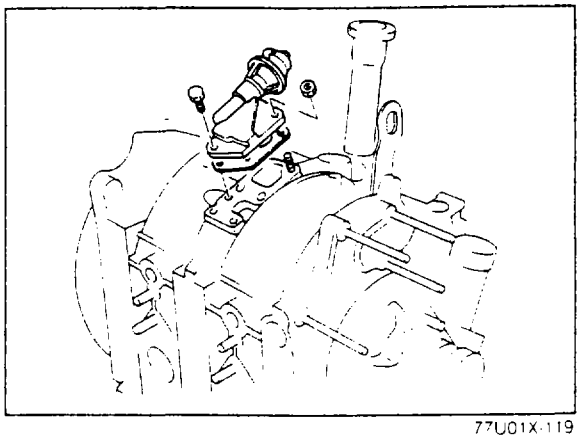
Install the left engine mount.

Tightening torque:
55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)

A/C Compressor and P/S Pump Bracket

Install the A/C compressor and P/S pump bracket.

Tightening torque:
M10: 31—46 N·m
(3.2—4.7 m-kg, 23—34 ft-lb)
M12: 55—80 N·m
(5.6—8.2 m-kg, 41—59 ft-lb)



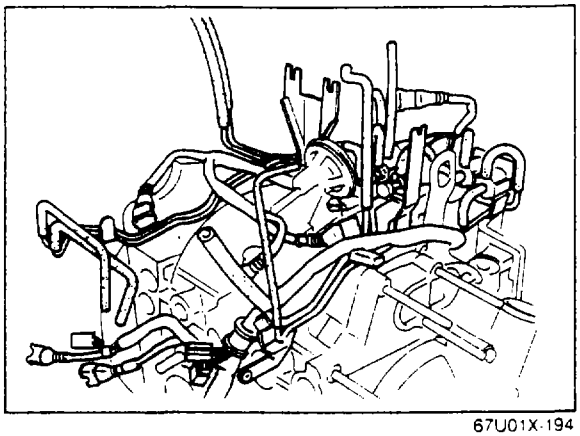
77U01X-119

EXTERNAL (NON-TURBO)

EGR Valve

Install the EGR valve on the intermediate housing with a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



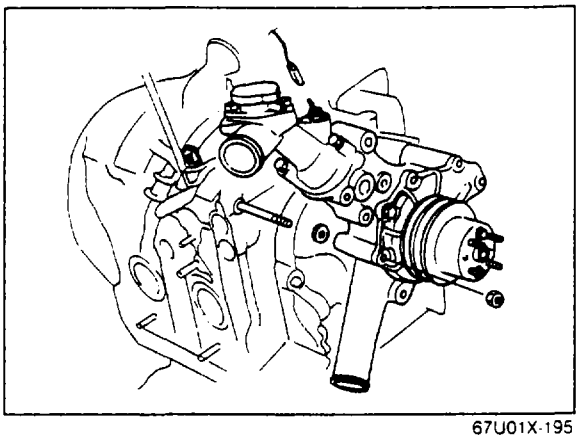
67U01X-194

Engine Harness and Vacuum Piping

1. Connect the evaporate hose to the intermediate housing.
2. Install the engine harness and vacuum piping as an assembly.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

3. Connect the couplers of the water temperature gauge.
4. Connect the hoses to the EGR valve and oil filler pipe.



67U01X-195

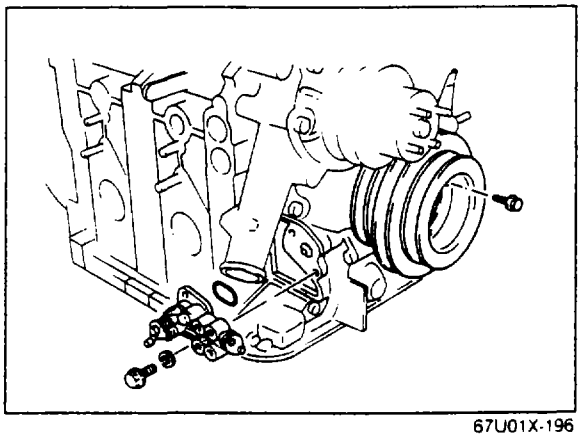
Water Pump

1. Install the water pump with a new gasket.

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

Caution
Do not forget to use shims on the studs where the gasket does not mount.

2. Connect the couplers of the water thermo sensor and water thermo switch.



67U01X-196

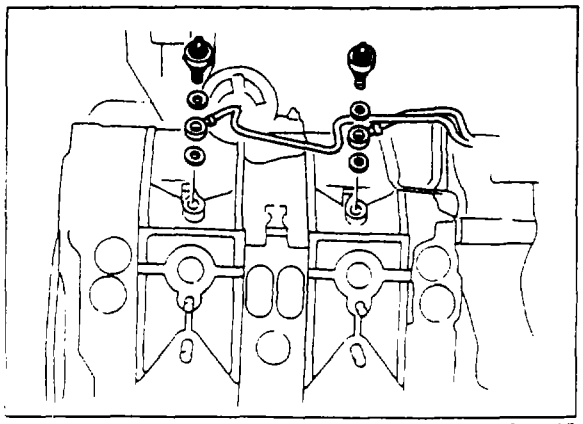
Eccentric Shaft Pulley

Install the eccentric shaft pulleys and stiffner to the pulley boss.

Metering Oil Pump

1. Apply engine oil to the new "O" ring.
2. Install the metering oil pump to the front housing.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

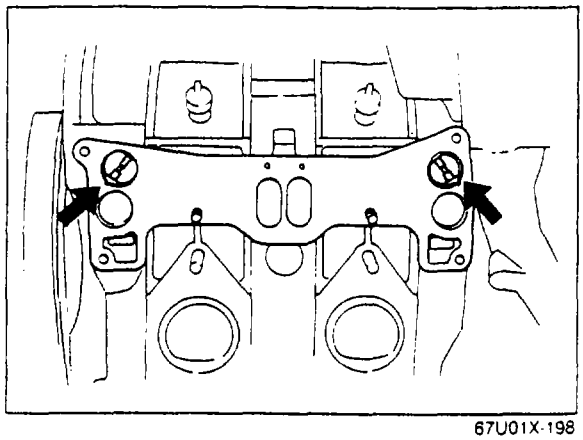


67U01X-197

Housing Oil Nozzle and Metering Oil Tube

1. Install the housing oil nozzle and the oil tube with new washers to the front and rear rotor housing.
2. Connect the oil tubes to the metering oil pump.

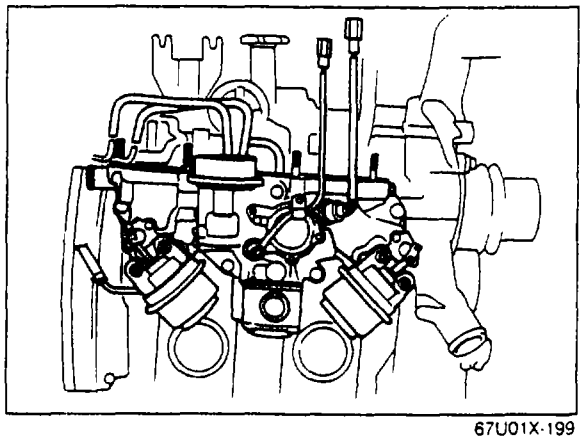
Note
The oil tube ends are colored.
For front housing.....White
For rear housing.....Yellow



67U01X-198

Intake Manifold

1. Install the new intake manifold gasket on the engine.
2. Install the auxiliary port valves so that the bigger side of the pin is aligned to the mating mark.

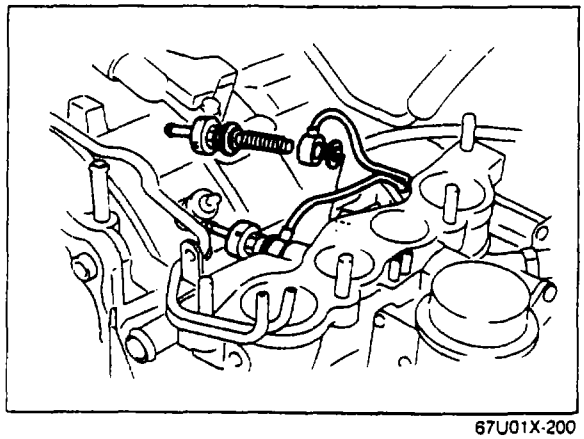


67U01X-199

3. Install the intake manifold.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

4. Connect the coupler of the split air solenoid valve and port air solenoid valve.
5. Connect the vacuum pipes.

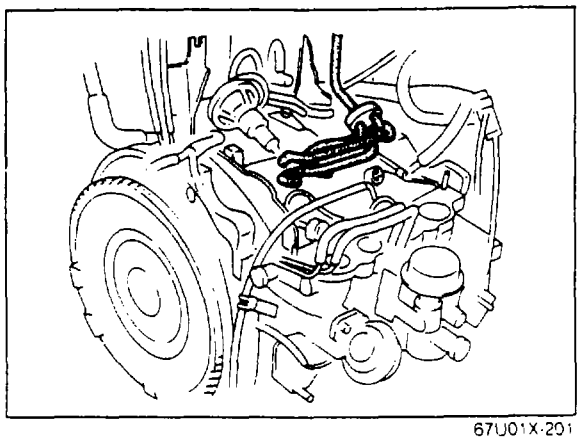


67U01X-200

Manifold Oil Nozzle and Metering Oil Tube

1. Install the manifold oil nozzle and the oil tube with new washers to the intake manifold.
2. Connect the oil tubes to the metering oil pump.

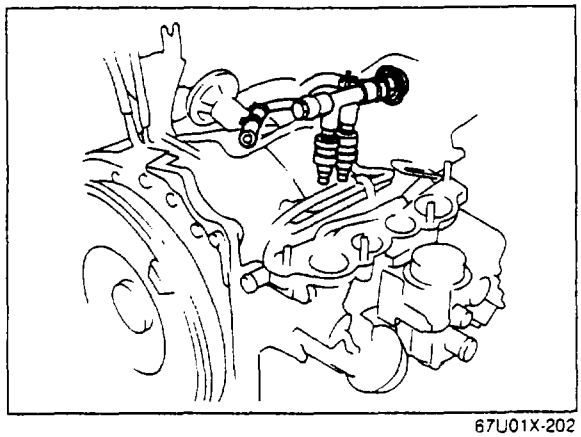
Note
The oil tube ends are colored.
For front port.....Blue
For rear port.....Green



67U01X-201

Air Hose

Install the air hose assembly and connect the hoses to the oil nozzles.

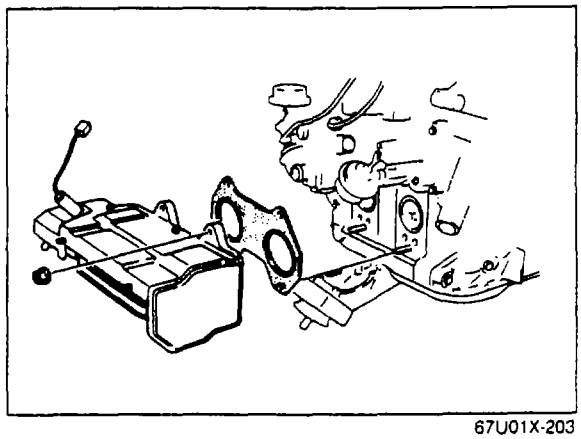


67U01X-202

Fuel Injector and Delivery Pipe

1. Insert the air bleed socket and rubber insert to the injector holes.
2. Apply engine oil to the injector "O" rings, and install the fuel injectors.
3. Install the fuel delivery pipe.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

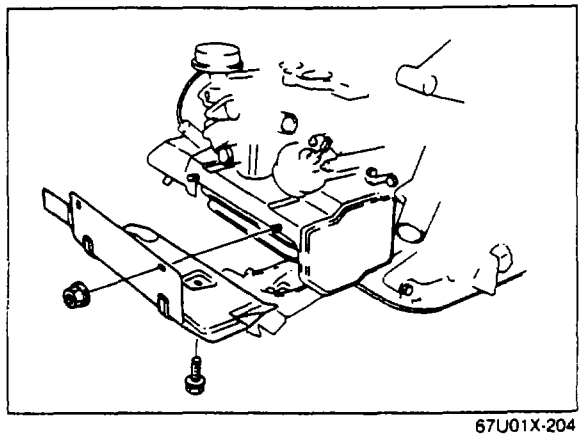


67U01X-203

Exhaust Manifold and Insulator

1. Install the exhaust manifold and insulator with a new gasket.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

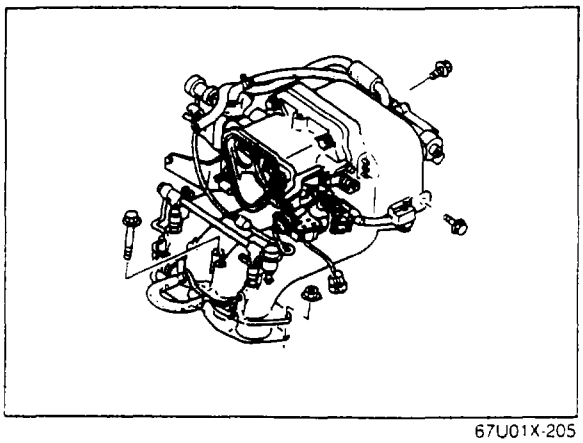


67U01X-204

2. Install the absorber plate.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

3. Connect the coupler to the O_2 sensor.

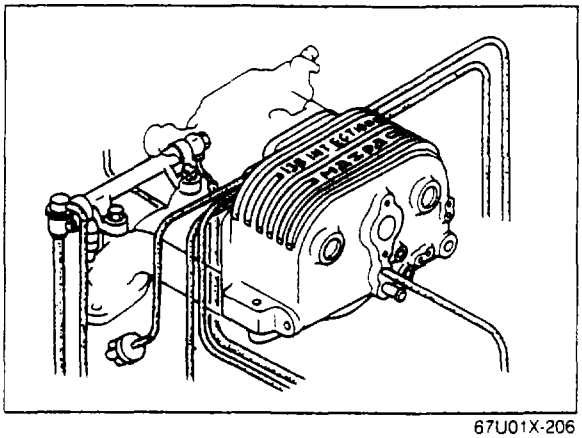


67U01X-205

Throttle and Dynamic Chamber

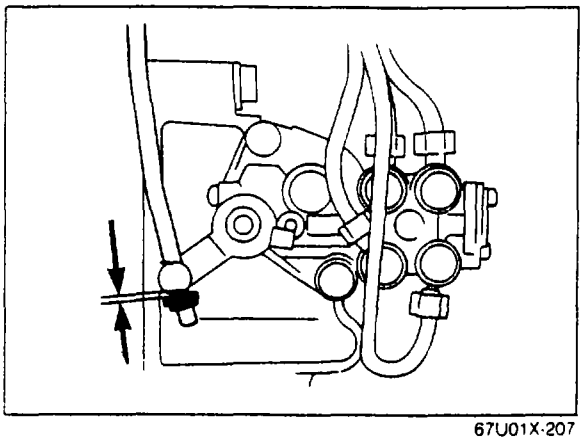
1. Install the throttle and dynamic chamber assembly with a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



67U01X-206

2 Connect the vacuum hoses, water hoses and fuel hose.
3 Connect the couplers of the secondary injectors, throttle sensor, air bypass solenoid valve, bypass air control valve, and intake air temparature sensor.

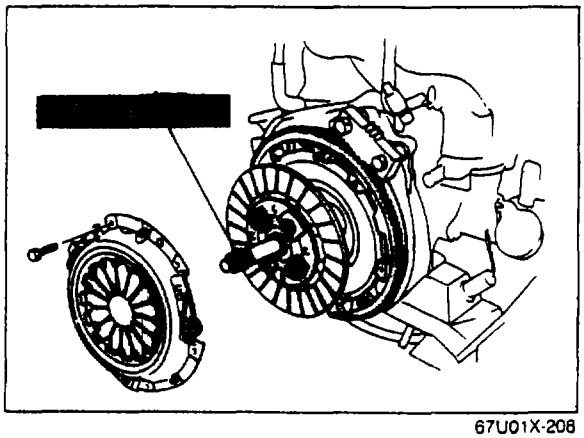


67U01X-207

Metering Oil Connecting Rod

1. Install the metering oil connecting rod to the throttle body and the lever of the metering oil pump.
2. Check the clearance shown in the figure. If necessary, adjust by adding or subtracting of shims.

Rod clearance: 0—1.0 mm (0—0.039 in)

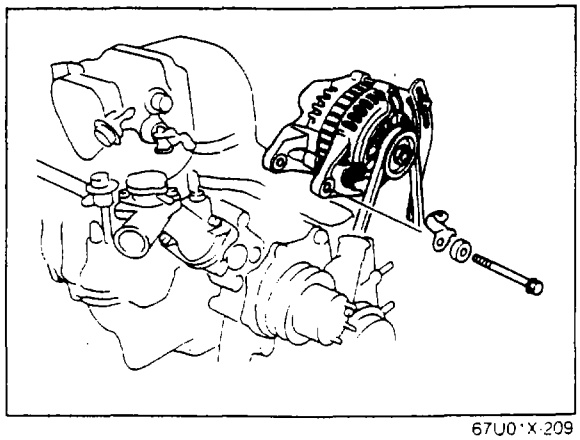


67U01X-208

Clutch Disc and Clutch Cover

Install the clutch disc and clutch cover using **clutch disc centering tool** (49 SE01 310).

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)



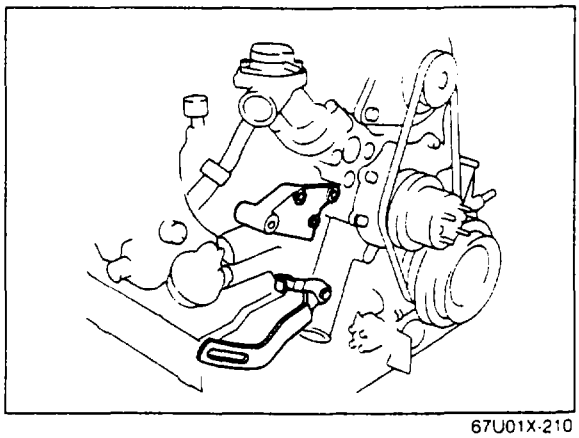
67U01X-209

Alternator

1. Install the alternator strap, alternator and drive belt.

Tightening torque:
Alternator long bolt: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)
Alternator short bolt: 24—30 N·m (2.4—3.1 m-kg, 17—22 ft-lb)
Strap: 16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

2. Connect the alternator coupler.

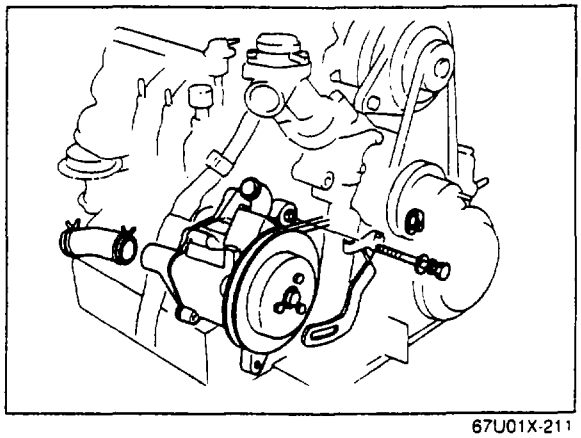


67U01X-210

Air Pump

1. Install the air pump bracket and strap to the water pump.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

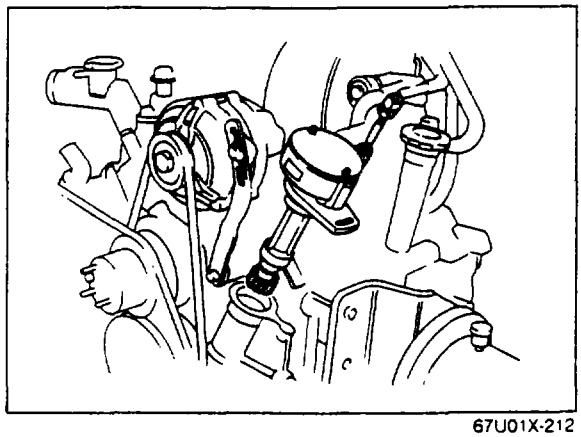


67U01X-211

2. Install the air pump.

Tightening torque:
Long bolt: 16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)
Short bolt: 24—30 N·m (2.4—3.1 m-kg,17—22 ft-lb)

3. Connect the air hose to the air control valve.

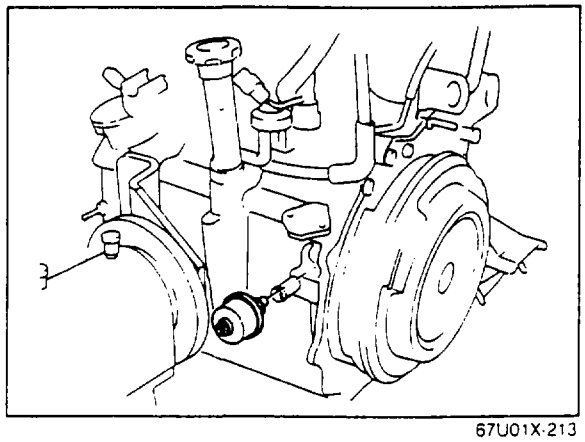


67U01X-212

Crank Angle Sensor

1. Turn the eccentric shaft until the leading top mark (Yellow) is aligned with the indicator pin.
2. Apply engine oil to the new "O" ring, and install it on the crank angle sensor.
3. Apply engine oil to the drive gear.
4. Match the mating mark and install the crank angle sensor on the front housing.

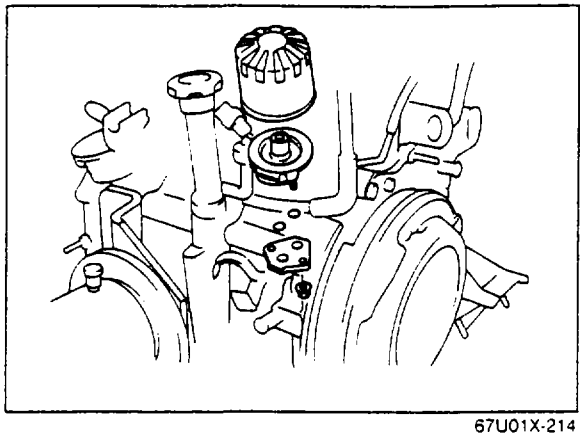
Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)



67U01X-213

Oil Pressure Gauge
Install the oil pressure gauge in the rear housing.

Tightening torque:
11—16 N·m (1.1—1.6 m-kg, 8—12 ft-lb)

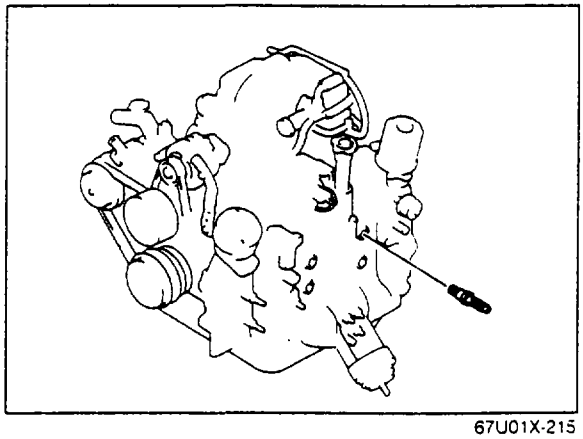


67U01X-214

Oil Filter
1. Install the oil filter body together with the new "O" rings.

Tightening torque:
8—11 N·m (0.8—1.1 m-kg, 69—95 in-lb)

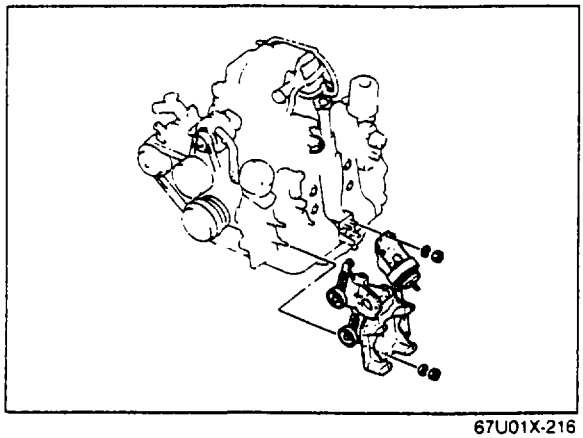
2. Apply engine oil to the rubber seal of the oil filter.
3. Install the oil filter and tighten it by hand only.



67U01X-215

Spark Plug
1. Remove the engine from the **engine hanger** and **engine stand**.
2. Apply anti-seize compound or molybdenum-based lubricant (0259 77 767A, 0259 77 768A or equivalent) to the spark plug threads.
3. Install the spark plugs.

Tightening torque:
13—18 N·m (1.3—1.8 m-kg, 9.4—13 ft-lb)



67U01X-216

Left Engine Mount
Install the left engine mount.

Tightening torque:
55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)

A/C Compressor and P/S Pump Bracket
Install the A/C compressor and P/S pump bracket.

Tightening torque:
M10: 31—46 N·m
(3.2—4.7 m-kg, 23—34 ft-lb)
M12: 55—80 N·m
(5.6—8.2 m-kg, 41—59 ft-lb)