

LUBRICATION SYSTEM

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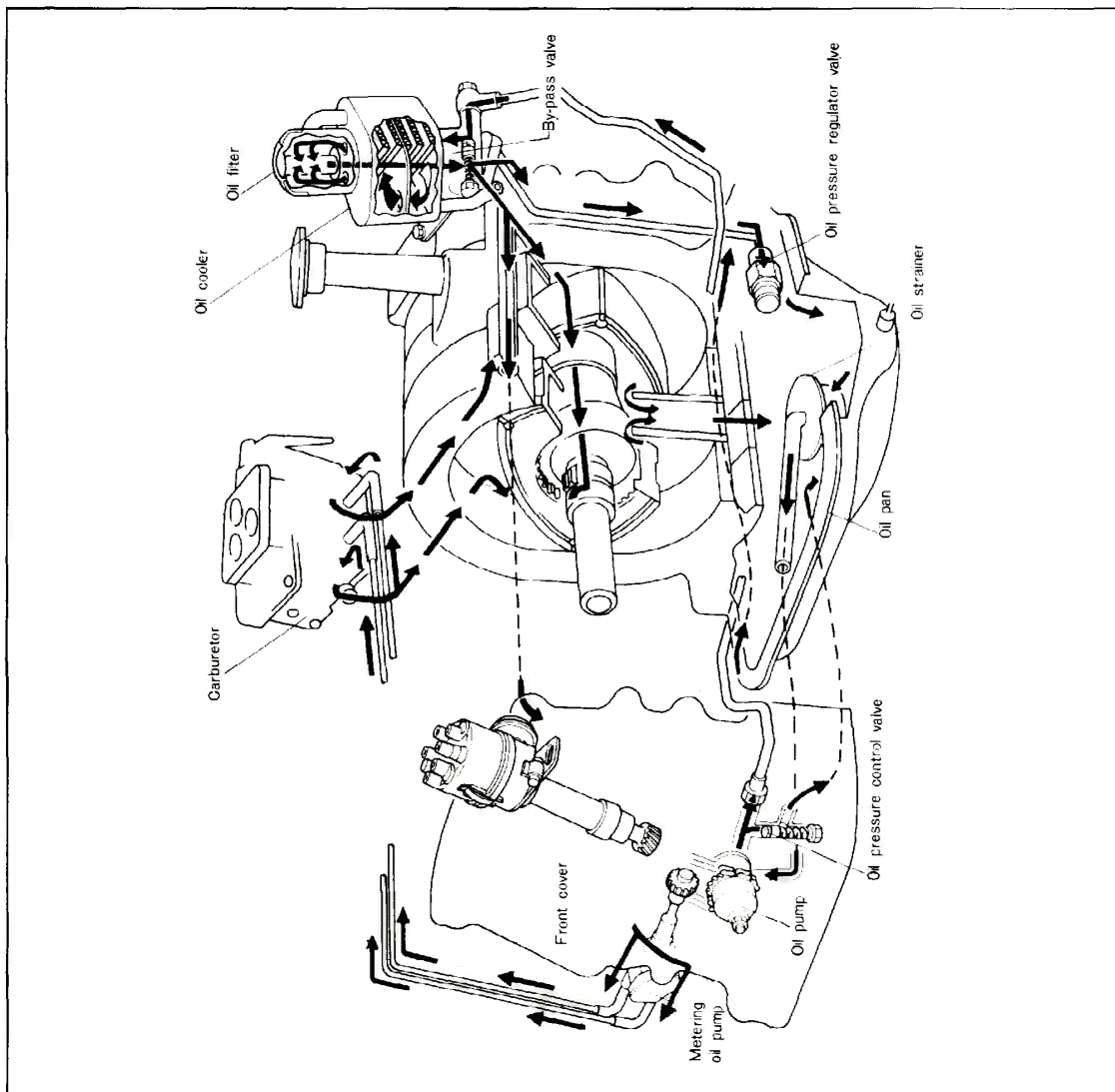
OUTLINE

OUTLINE OF CONSTRUCTION

- The lubrication system in use is the wet-sump system. After the oil in the oil pan is strained by the strainer, a forced lubrication system, which applies compression by the trochoid-type oil pump, is used.
- For the 12A engine, the oil from the metering oil pump is supplied to the carburetor, and, while being mixed by the mixer, is taken into the combustion chamber.
- For the 13B engine, for improved durability, a parallel system by which the oil from the metering pump together with the air led from the throttle chamber are directly supplied to the intake manifold, to the apex seal, where lubrication conditions are most severe, and to the rotor housing trochoid surfaces is used.

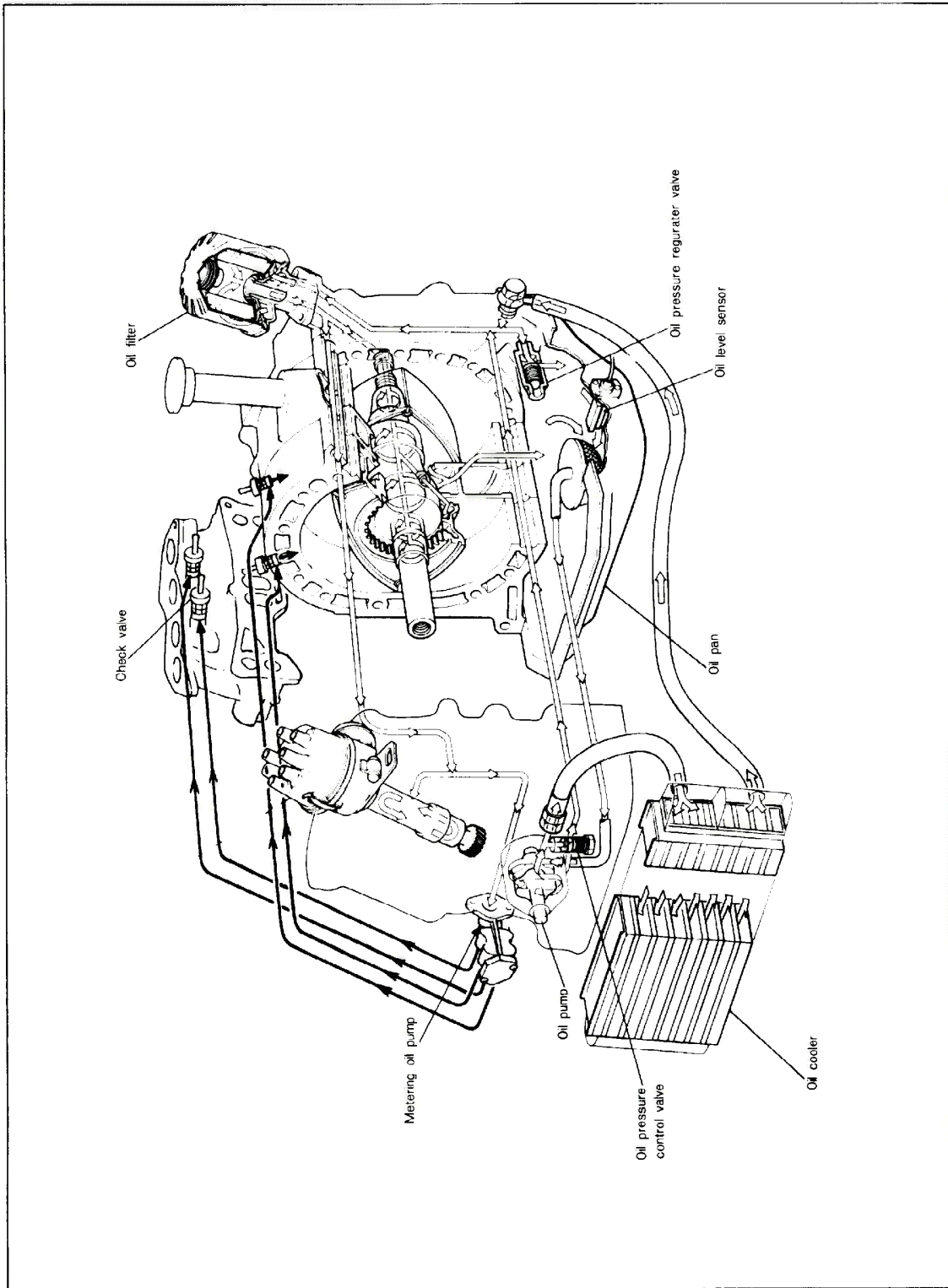
OIL FLOW ILLUSTRATION

12A engine



47U02X-001

13B engine



2 TROUBLESHOOTING GUIDE

SPECIFICATIONS

Engine model		12A	13B
Lubricating system		Forced-fed type	
Oil pump	Type	Trochoid type	
	Pressure control valve opening pressure	900 kPa (128 psi)	
Oil filter	Type	Full-flow type, paper filter	
	Relief valve opening pressure	100 kPa (14 psi)	
Oil capacity	Total	13B engine	5.6 liters (5.8 U.S. qts., 5.1 Imp. qts.)
		12A engine	4.6 liters (4.9 U.S. qts., 4.0 Imp. qts.)
	Oil pan	4.2 liters (4.4 U.S. qts., 3.7 Imp. qts.)	
	Oil filter	0.3 liters (0.32 U.S. qts., 0.26 Imp. qts.)	
Engine oil		API service SD, SE or SF	

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RECOMMENDED SAE VISCOSITY NUMBERS

Temperature	(°C)	-30	-20	-10	0	10	20	30	40	50	
	(°F)	-20	0	20	40	60	80	100	120		
Engine oil											
	5W - 30										
	5W - 20										
	10W - 30										
	10W - 40 10W - 50										
	20W - 40 20W - 50										

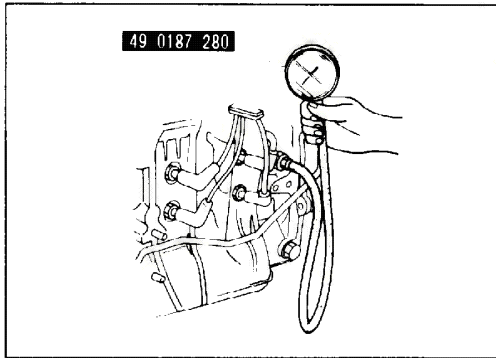
Temperature Range Anticipated Before Next Oil Change, °C.

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TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Oil leakage	Loose drain plug	Tighten or replace	2-8
	Malfunction of oil pan seal	Repair	2-8
	Damaged front cover	Replace	
	Loose front cover bolt or oil pan bolt	Tighten	
	Damaged sealing rubber, O ring, or front housing gasket	Replace	
	Malfunction of oil seal(s)	Repair or replace	
	Loose oil filter	Tighten	2-5
	Loose or damaged oil pressure gauge or oil level gauge	Replace	
Oil pressure drop	Damaged oil cooler or oil cooler hose	Replace	2-6
	Oil leakage	As described above	
	Insufficient oil	Add oil	2-6
	Worn or damaged oil pump gear	Replace	2-9
	Malfunction of oil pressure regulator	Replace	2-11
	Clogged oil strainer	Clean	
	Malfunction of oil safety valve	Replace	
Clogged oil filter	Replace	2-5	
Excessive eccentric shaft and bearing clearance		Section 1	

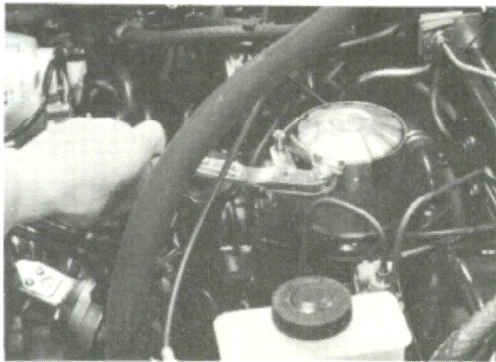
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57U02X-004



47U02X-005

INSPECTION

CHECKING OIL PRESSURE

To check the oil pressure, proceed as follows:

1. Disconnect the connector from the oil pressure gauge unit.
2. Remove the oil pressure gauge unit on the rear housing and connect the **oil pressure gauge** (49 0187 280) instead.
3. Start the engine and warm up the engine to the normal operating temperature.
4. Take a reading of the oil pressure gauge under the following engine conditions.

Engine revolution	Oil pressure
3,000 rpm	450 ~ 550 kPa (64 ~ 79 lb/in ²)
Idling ("D" range for automatic)	90 ~ 270 kPa (12.8 ~ 38.4 lb/in ²)

If the oil pressure is not within the specifications, check the following points.

- 1) Ensure that the oil level is between the "F" and "L" of the dipstick gauge.
- 2) Check the pressure regulator and pressure control valve.
- 3) Check the oil pump as described on page 2-9.

OIL FILTER

REPLACING OIL FILTER

To replace the oil filter, proceed as follows.

1. Remove the oil filter cartridge with a suitable wrench.
2. Apply engine oil to the rubber seal of the new oil filter.
3. **13B engine**
Install the oil filter and fully tighten it by hand.
12B engine
Install the oil filter and tighten it by hand, then tighten it again about **1/8 turn** with a suitable wrench, preferably a band-type. Tightening with a chain-type wrench may deform the oil filter. Therefore, be careful not to damage it.
4. Start the engine and check that the joints are not leaking. Top up with oil if necessary.

OIL COOLER

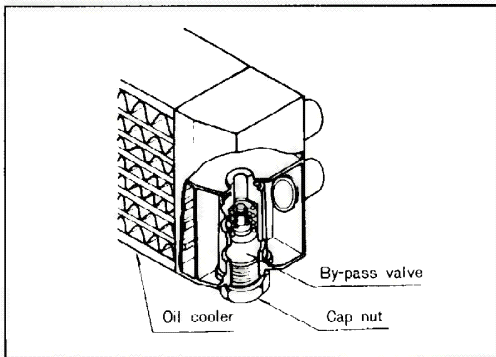
13B ENGINE

Checking Oil Cooler

Visually inspect the oil cooler for damage, crack and leakage.

If any problem is found, repair it by aluminum welding or replace with new one.

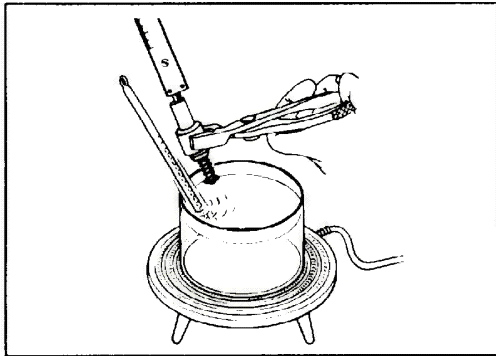
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Replacing By-pass Valve

1. Drain the engine oil.
2. Remove the engine under cover.
3. Remove the cap nut and pull out the by-pass valve.
4. Install the by-pass valve in the reverse order of removing.
5. Fill the engine with specified oil.
6. Start the engine and check that the oil is not leaking from the cap nut.

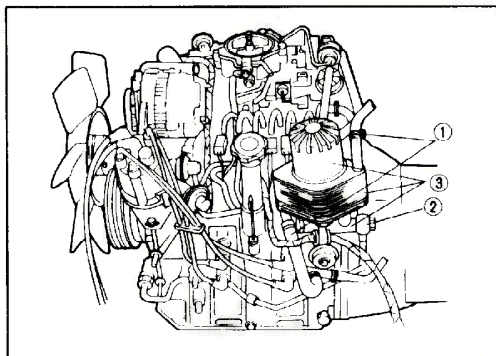


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Checking By-pass Valve

1. Remove the by-pass valve from bottom of the oil cooler.
2. Soak the by-pass valve in oil and heat up the oil gradually.
3. Check the protrusion of the valve when the oil temperature is **65°C (149°F)**.

Protrusion: More than 5 mm (0.2 in)



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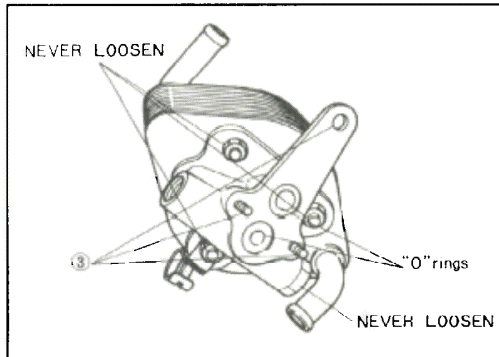
12A ENGINE

Checking Oil Cooler

Visually check the oil cooler for damage and oil leakage. If there is any trouble, replace them with the new.

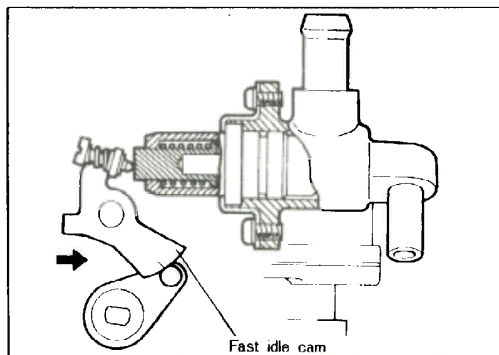
Replacing Oil Cooler

1. Remove the water hoses installed on the inlet side and outlet side.
2. Remove the oil pipe and the sealing washer.



47U02X-009

3. Remove the oil cooler and oil filter cartridge together as one unit. Remove the "O" rings. Replace the oil cooler as an assembly.
4. Assemble the oil cooler in the reverse order of disassembly, but never reuse the oil filter cartridge, "O" rings and the sealing washer.
5. Add engine oil and cooling water.
6. Start the engine and check for oil leakage and water leakage.



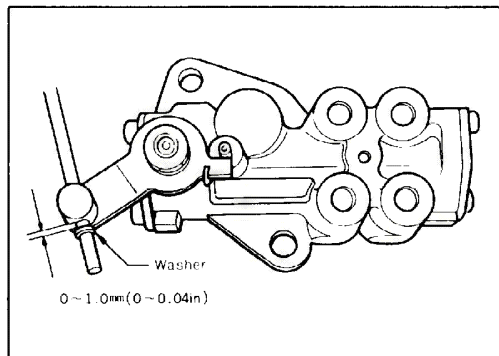
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METERING OIL PUMP

13B ENGINE

Adjusting Metering Oil Pump Rod

1. Push the fast-idle cam in the direction of the arrow, by using a flat-tip screwdriver, in order to force the cam down.



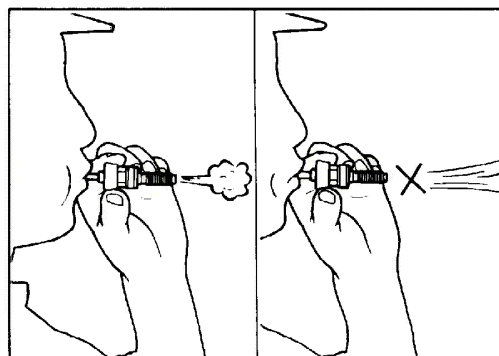
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2. Next, adjust the clearance of the rod and the lever.

Standard clearance: 0 ~ 1 mm (0 ~ 0.04 in)

Caution

Check to be sure that the lever contacts to the stopper of the metering oil pump.

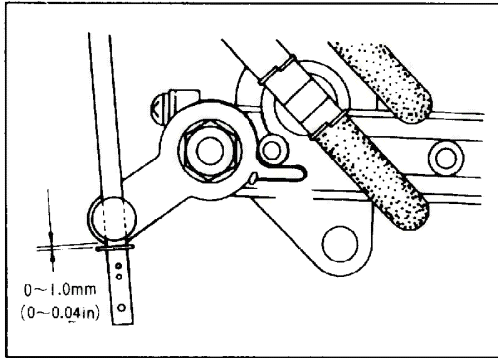


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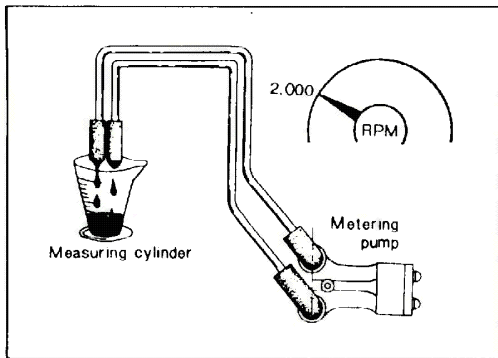
Checking Check Valve

1. Remove the check valves from the rotor housing and intake manifold.
2. Check to be sure that there is continuity during air discharge, and no continuity during air intake. If not normal, replace the check valve.

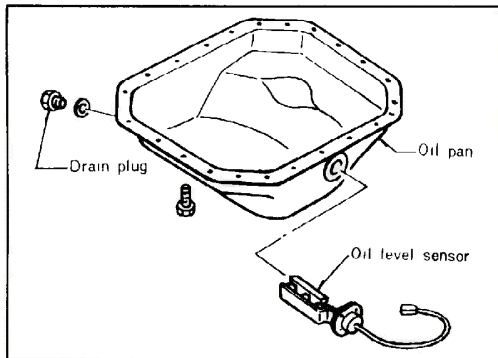
2 OIL PAN



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47U02X-014



47U02X-015

12A ENGINE

Measuring Oil Discharge

Before measuring the oil discharge, check the metering oil pump and oil hoses for leaks.

Make sure that the clearance between the metering oil pump lever and washer is **0 ~ 1.0 mm (0 ~ 0.04 in)**.

1. Connect a tachometer to the engine.
2. Warm up the engine to the normal operating temperature.

3. Disconnect the two metering oil hoses at the carburetor.
4. Set the engine speed to **2,000 rpm** and put the oil hoses in the measuring cylinder.

5. Stop the engine **after 6 minutes** and check the amount of the oil discharge.

The specified amount is **1.8 ~ 2.2 cc/6 min.**

If it is not within the specifications, replace the metering oil pump.

Caution

While the measurements are being taken, a proper amount of clean engine oil should be added into the carburetor.

OIL PAN

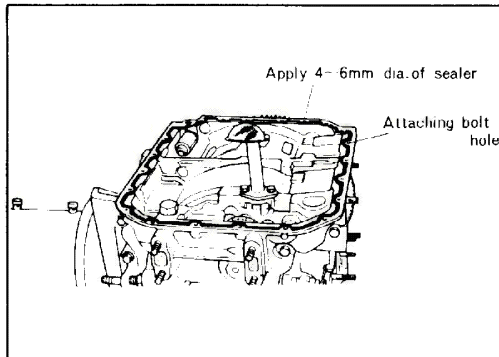
REMOVING OIL PAN

1. Drain the engine oil and remove the engine under cover.
2. Disconnect the connector of the oil level sensor.
3. Disconnect the connector from the oil thermo unit (Except for California).
4. Remove the oil pan.

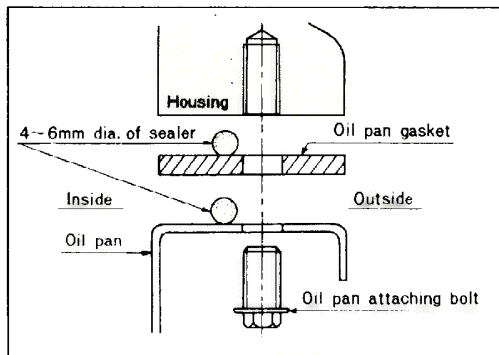
CHECKING OIL PAN

Check the oil pan for cracks, damaged drain plug threads. Straighten the matching surface as required.

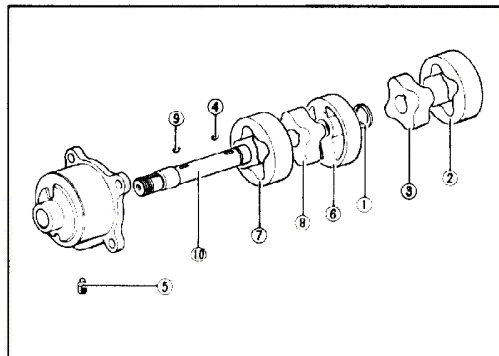
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47U02X-016



57U02X-017



47U02X-018



57U02X-019

INSTALLING OIL PAN

Install the oil pan in the reverse order of removing. Noting the following points.

1. Clean the mating surfaces of the housings and oil pan.
2. Apply the **4 ~ 6 mm (0.16 ~ 0.24 in)** diameter continuous bead of the sealer (Part No. 8527 77 739) to the mounting surface of the oil pan. The sealer bead should be overlapped.

Without the sealer (8527 77 739), use the suitable silicone base sealer and the oil pan gasket.

- (1) Apply the **4 ~ 6 mm (0.16 ~ 0.24 in)** diameter continuous bead of the sealer on mounting surface of oil pan and place the gasket on it. The both ends of the sealer bead should be overlapped.
- (2) Apply the sealer onto the gasket and install the oil pan.
3. Tighten the oil pan attaching bolts little by little in turn until the torque comes to **8 ~ 11 N-m (6 ~ 8 ft-lb)** evenly.

OIL PUMP

DISASSEMBLING OIL PUMP

1. Remove the oil pump from the front housing.
2. Disassemble the oil pump in the order numbered below.

1) Snap ring	6) Middle plate
2) Rear outer rotor	7) Front outer rotor
3) Rear inner rotor	8) Front inner rotor
4) Key	9) Key
5) Screw	10) Shaft

CHECKING OIL PUMP

1. Check the clearance between the lobes of the rotors with a feeler gauge. If the clearance exceeds the limit, replace both rotors.

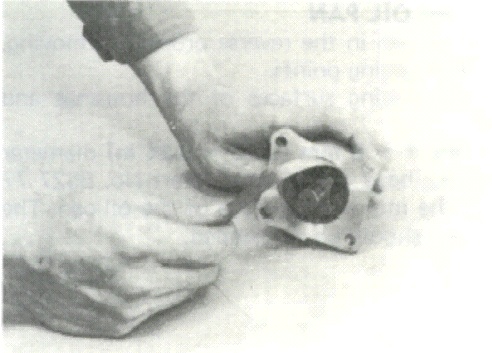
Standard clearance:

0.01 ~ 0.09 mm (0.0004 ~ 0.0035 in)

Clearance limit:

0.15 mm (0.0059 in)

2 OIL PUMP



47U02X-020

2. Check the clearance between the outer rotor and the pump body with a feeler gauge. If the clearance exceeds the limit, replace the rotor or body.

Standard clearance:

0.20 ~ 0.25 mm (0.0079 ~ 0.098 in)

Clearance limit:

0.30 mm (0.0118 in)



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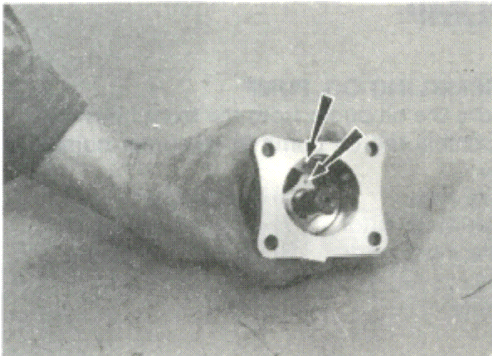
3. Check the end float of the rotors. Place a straight edge across the pump body and measure the clearance between the rotor and the straight edge. Then place a straight edge across the matching surface of the front housing and measure the clearance between the straight edge and the front housing. If the end float exceeds the limit, correct the pump body by grinding.

Standard end float:

0.03 ~ 0.13 mm (0.0012 ~ 0.0051 in)

End float limit:

0.15 mm (0.0059 in)

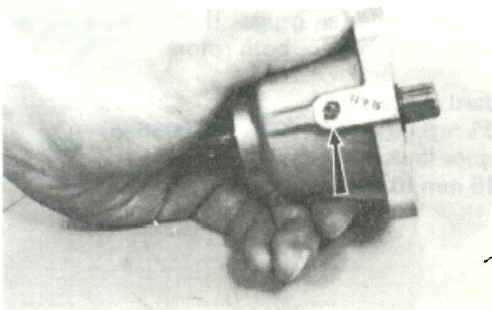


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ASSEMBLING OIL PUMP

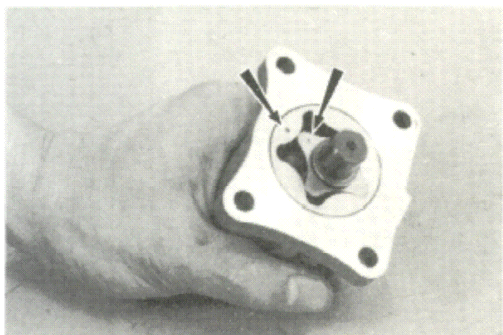
Assemble the oil pump in the reverse order of disassembling, **noting** the following points.

1. Install the inner rotor and shaft assembly, and the outer rotor into the pump body so that the tally marks on the rotors go toward the front housing.



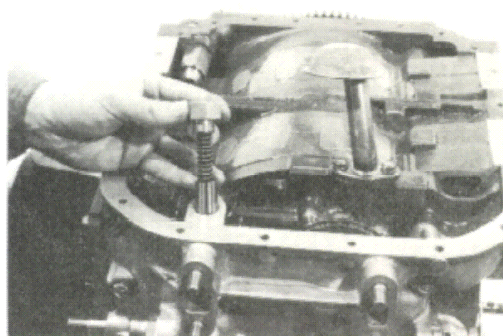
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2. Install the middle plate into the pump body. Install the set screw to the body so that the screw aligns the recess portion of the middle plate.
3. Calk the screw to prevent it from loosening.



47U02X-024

4. Install the rear side inner and outer rotors into the pump body so that the tally marks on the rotors go toward the front housing. Fit the snap ring on the shaft.
5. Prime the oil pump with engine oil.
6. Mount the oil pump assembly on the front housing and fix it with bolts. Rotate the shaft by hand to see whether it rotates smoothly.
7. After installing, check the oil pressure as described on page 2-5.



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OIL PRESSURE CONTROL VALVE

CHECKING OIL PRESSURE CONTROL VALVE

1. Remove the pressure control valve from the front cover.
2. Examine the spring and the plunger for corrosion or any damage. If it is severe, replace with new ones.
3. Measure the free length and replace with new spring, if not within specifications.

	Free length	Paint
13B engine	73.0 mm (2.87 in)	Nothing
12A engine	69.6 mm (2.74 in)	Yellow

Note

Both cap bolt and valve spring of the 12A engine are painted yellow.