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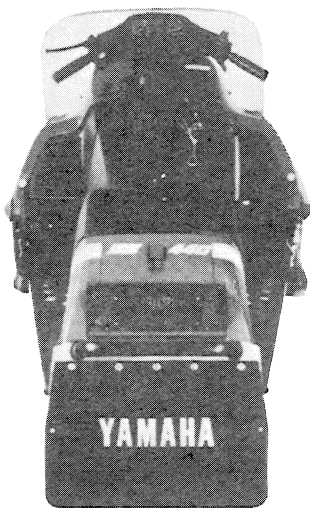
# CHAPTER 1. GENERAL

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# CHAPTER 1. GENERAL

## 1-1. EXTERNAL VIEW



## 1-2. MACHINE IDENTIFICATION

### A. Frame serial number

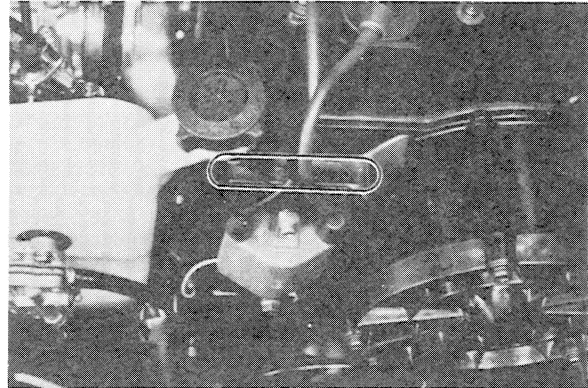
The frame serial number is located on the righthand side of frame (just below the front of seat). The first three digits identify the model. This is followed by a dash. The remaining digits identify the production number of the unit.



Frame starting serial number	8K4-000101
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### B. Engine serial number

The engine serial number is located on the fan case. The prefix indicates engine type and displacement. The prefix is followed by a dash and the serial number. Normally both frame and engine serial numbers are identical.



Engine starting serial number	SA437-000101
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## 1-3. MAINTENANCE INTERVALS CHARTS

### A. Periodic maintenance

(Use this just as guide only. Certain conditions may require more frequent inspection of components.)

Check point	Every			When necessary	Seasonally
	20 hrs. or 400 km (250 mi)	40 hrs. or 800 km (500 mi)	80 hrs. or 1,600 km (1,000 mi)		
<b>ENGINE</b>					
Tightness of bolts and nuts	<input type="radio"/>				<input type="radio"/>
Bends, cracks and wear	<input type="radio"/>				<input type="radio"/>
Abnormal noise	<input type="radio"/>				<input type="radio"/>
Loose connection and breaks of fuel and pulse pipes	<input type="radio"/>				<input type="radio"/>
Loose connection and breaks of oil pipes	<input type="radio"/>				<input type="radio"/>
Loose connection and breaks of oil delivery pipe	<input type="radio"/>				<input type="radio"/>
Fan belt tension/cracks/damage	<input type="radio"/>				<input type="radio"/>
Manual rope starter system		<input type="radio"/>			<input type="radio"/>
<b>Carburetor</b>					
● Operation of starter jet		<input type="radio"/>			<input type="radio"/>
● Mixing adjuster (pilot screw)				<input type="radio"/>	<input type="radio"/>
● Idling speed adjustment				<input type="radio"/>	<input type="radio"/>
Operation and adjustment of oil pump		<input type="radio"/>			<input type="radio"/>
Ignition timing					<input type="radio"/>
Cylinder compressions			<input type="radio"/>		<input type="radio"/>
Cylinder head/exhaust pipe decarbonize					<input type="radio"/>
Spark plug condition, gap and cleaning	<input type="radio"/>				<input type="radio"/>
Tightening of the cylinder head**					<input type="radio"/>

Check point	Every			When necessary	Seasonally
	20 hrs. or 400 km (250 mi)	40 hrs. or 800 km (500 mi)	80 hrs. or 1,600 km (1,000 mi)		
<b>DRIVE:</b>					
Tightness of bolts and nuts	○				○
Wear on slide runners	○				○
Primary drive system		○			○
V-belt	○				○
Secondary drive system		○			○
Sheave distance		○			○
Sheave offset		○			○
Brake pad wear		○			○
Brake operation and adjustment		○			○
Guide wheel rubber		○			○
Wear of drive track wheel sprocket		○			○
Drive track adjustment		○			○
Breaks in drive track		○			○
Bends in front and rear axles		○			○
Checking of lock washers		○			○
Drive chain adjustment		○			○
Drive chain oil level		○			○
<b>CHASSIS:</b>					
Tightness of bolts and nuts	○				○
Bends and cracks	○				○
Welded riveted, joints	○				○
Ski adjustment		○			○
Ski runner wear	○				○
Breaks in fuel tank		○			○
Cleaning of fuel tank					○
Fuel filter					○
Loose connection and breaks in fuel pipe		○			○
Breaks in oil tank		○			○
Oil filter					○
<b>ELECTRICAL:</b>					
Wear, breakage of wire covering		○			○
Breaks in high-tension cord	○				○
Voltage regulator working voltage					○
Operation of engine stop switch		○			○
Operation of tether switch		○			○
Headlight		○			○
Taillight		○			○
Brake light		○			○

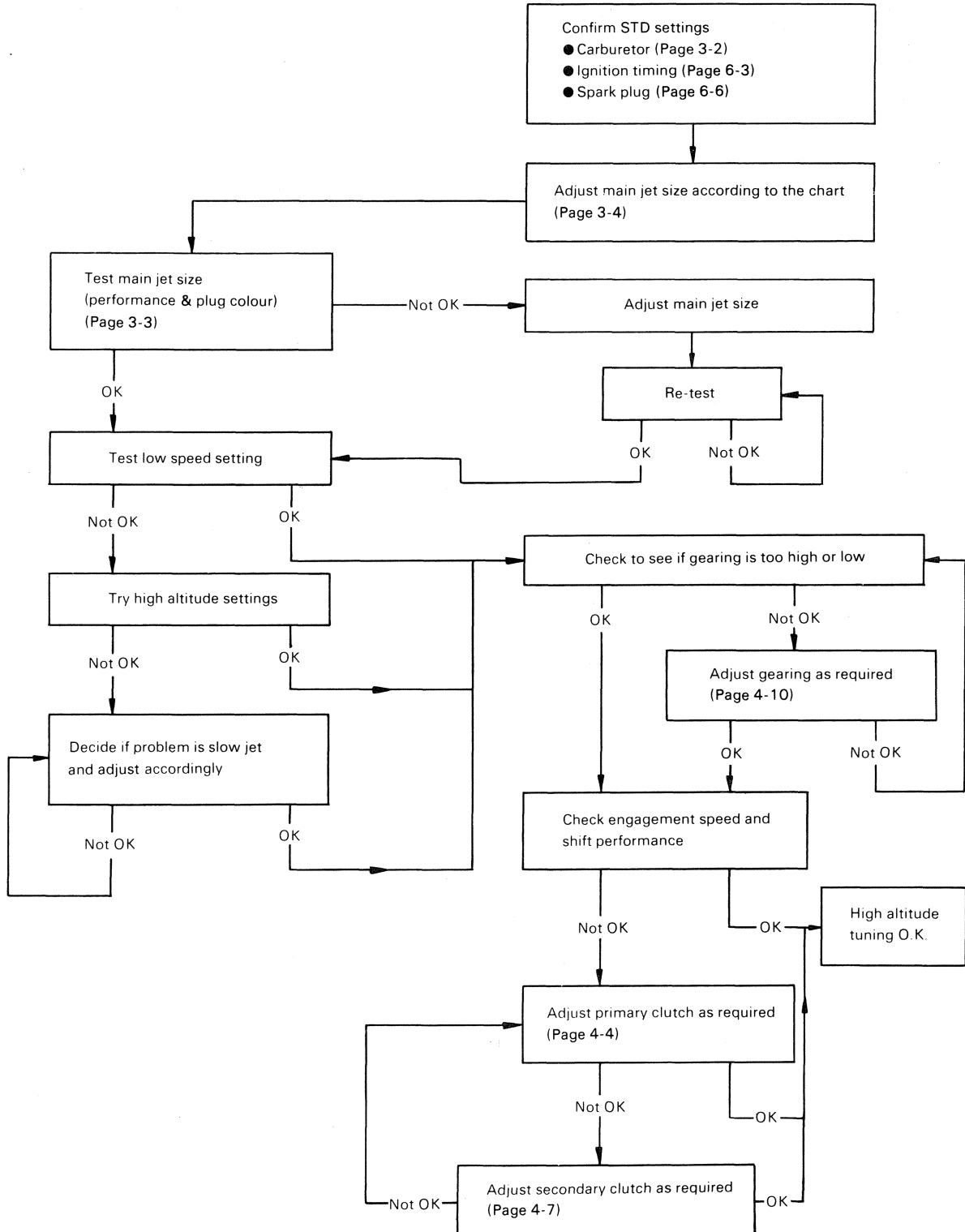
\*\* Retighten every 10 hours from the first use.

**B. Lubrication intervals**

Check point	Every			When necessary	Seasonally	Oil/Grease Brand name
	20 hrs. or 400 km (250 mi)	40 hrs. or 800 km (500 mi)	80 hrs. or 1,600 km (1,000 mi)			
<b>ENGINE:</b>						
Starter case					<input type="radio"/>	Aeroshell grease #7A or Esso Beacon 325 grease
Oil pump control box			<input type="radio"/>		<input type="radio"/>	
Pump drive cover			<input type="radio"/>		<input type="radio"/>	
Oil in the oil tank				<input type="radio"/>		YAMALUBE 2-cycle oil
<b>DRIVE:</b>						
Primary sheave weight and roller pins		<input type="radio"/>			<input type="radio"/>	Molybdenum disulfide snowmobile grease
Secondary shaft and Sliding sheave		<input type="radio"/>			<input type="radio"/>	
Front axle housing		<input type="radio"/>			<input type="radio"/>	Light all-purpose grease
Shaft 1 and shaft 2 (Slide rail)			<input type="radio"/>		<input type="radio"/>	
Drive chain oil replacement		<input type="radio"/>			<input type="radio"/>	Gear oil API "GL-3" SAE #75 or #80
<b>BODY:</b>						
Steering column lower bearing		<input type="radio"/>			<input type="radio"/>	Light all-purpose grease
Steering column upper bearing		<input type="radio"/>			<input type="radio"/>	Motor oil
Steering links		<input type="radio"/>			<input type="radio"/>	Light all-purpose grease
Ski column		<input type="radio"/>			<input type="radio"/>	
Ski wear plate		<input type="radio"/>			<input type="radio"/>	Light all-purpose grease
Ski retaining pin		<input type="radio"/>			<input type="radio"/>	
Brake cable end stopper and brake lever		<input type="radio"/>			<input type="radio"/>	Esso Beacon 325 grease

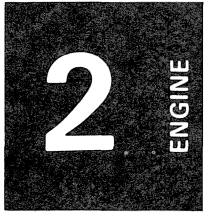
## 1-4. HIGH ALTITUDE TUNING

to attain the best machine performance to match high altitude condition, the snowmobile must be properly set. The tuning should be done as follows.



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# CHAPTER 2. ENGINE

## 2-1. DISASSEMBLY

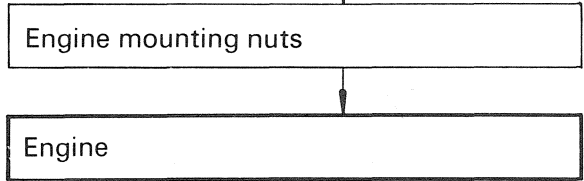
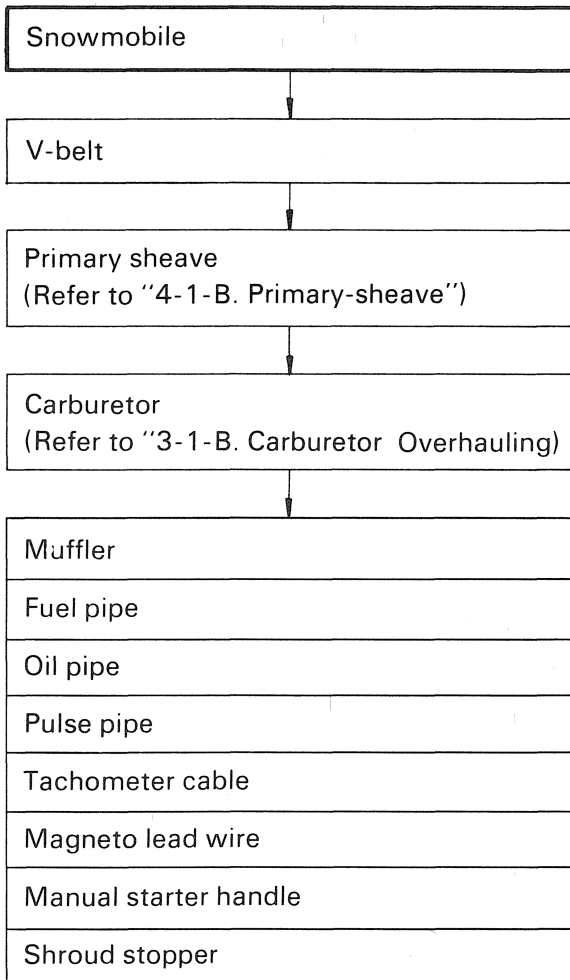
### A. Engine removal

Remove the engine by removing the following parts.

**NOTE:** \_\_\_\_\_

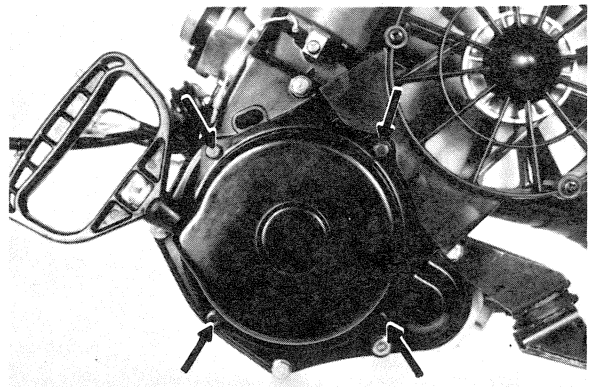
It is not necessary to remove the engine to remove the following parts:

- Cylinder head
- Cylinder
- Piston
- Autolube pump
- Manual starter assembly
- Cooling fan
- Flywheel magneto
- Carburetor
- Intake reed valve

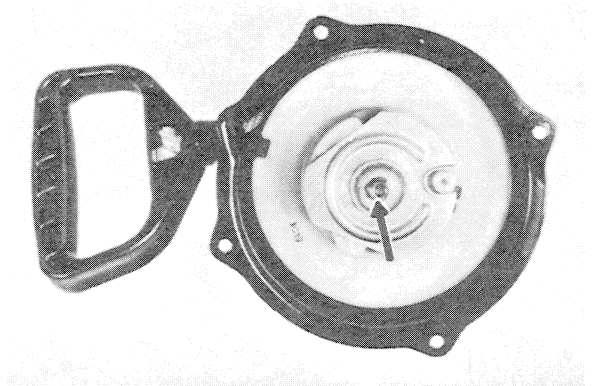


### B. Starter

1. Remove starter assembly from the fan case.



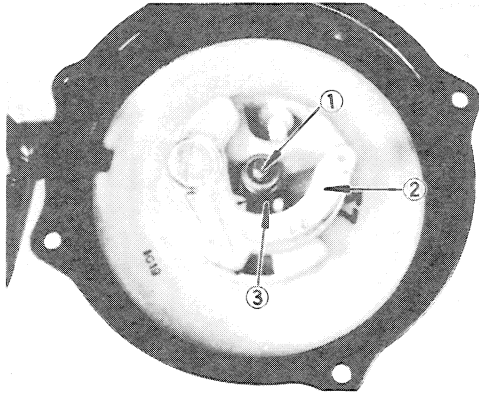
2. Remove the drive plate mounting nut at its center, and remove the drive plate.



3. There is a drive plate spring and a drive pawl under the drive plate.

**NOTE:** \_\_\_\_\_

Take care so that they are not lost.



1. Drive plate spring
2. Drive pawl
3. Return spring

4. Remove the sheave drum.

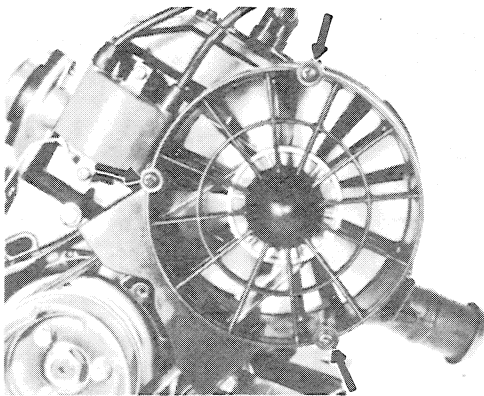
**CAUTION:**

There is a starter spring (coiled) under the sheave drum. Care should be taken so that it will not spring out.

5. To remove the starter rope, undo the knot on one end of the rope. Then pull it out from the starter case.

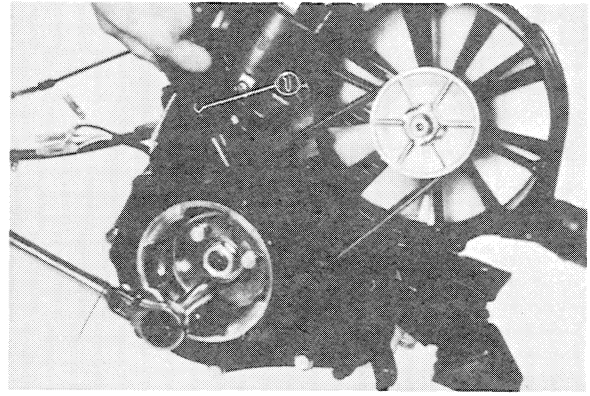
**C. Cooling fan**

1. Remove the fan case cap.



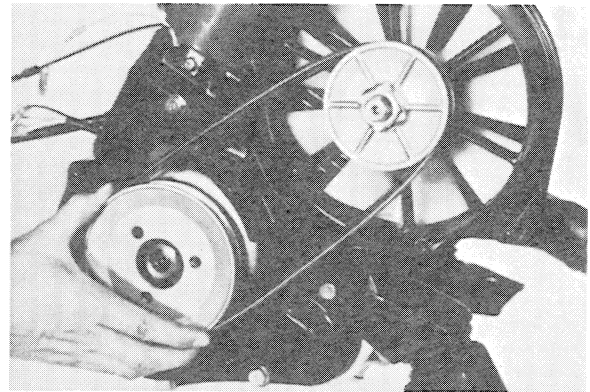
2. Using the rotor holding tool, remove the three bolts, and remove the starter pulley.

Tool name	Tool No.
Rotor holding tool	90890-01235

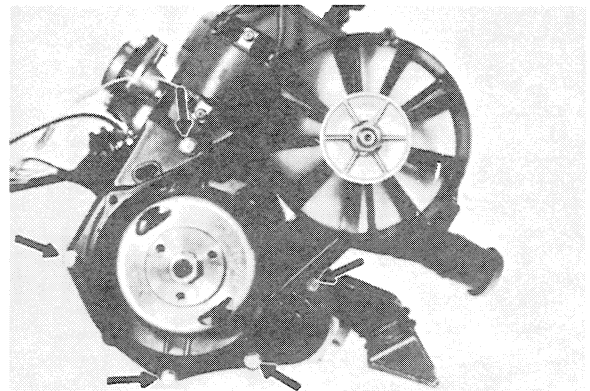


1. Rotor holding tool

3. Remove the drive fan pulley and fan belt.



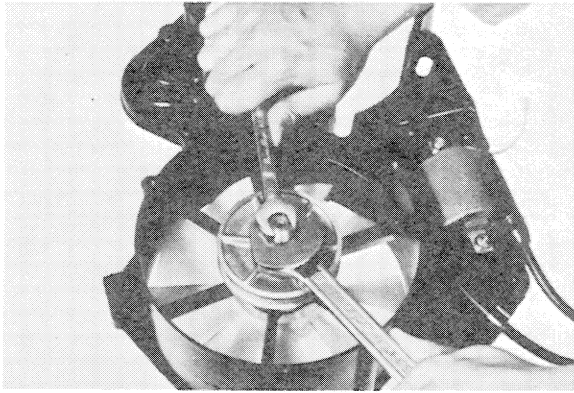
4. Remove the fan case assembly.



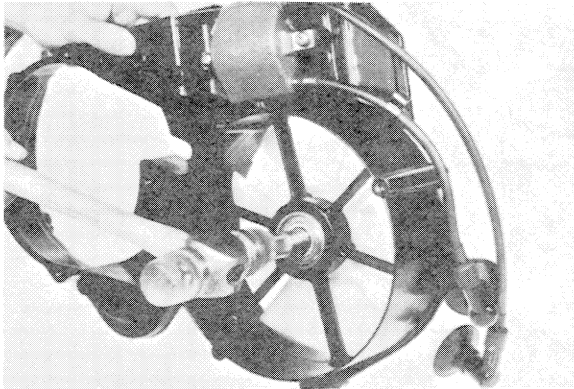
5. Remove the driven fan pulley securing nut, lock washer, fan pulley, key, and washers.

**NOTE:**

Take care so that the key and washers are not lost.



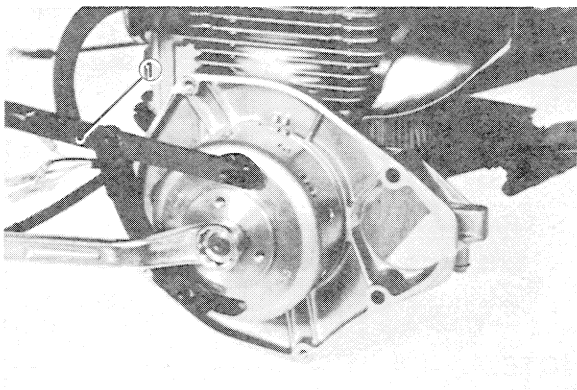
- Remove the cooling fan assembly by tapping the fan shaft.



#### D. Flywheel magneto

- Using the rotor holder tool, remove the flywheel mounting nut.

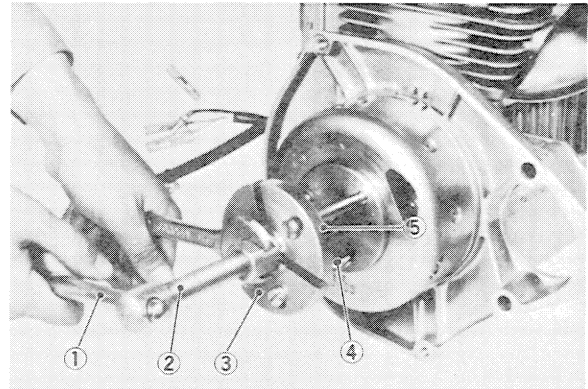
Tool name	Tool No.
Rotor holding tool	90890-01235



- Rotor holding tool

- Using the flywheel puller, remove the flywheel assembly.

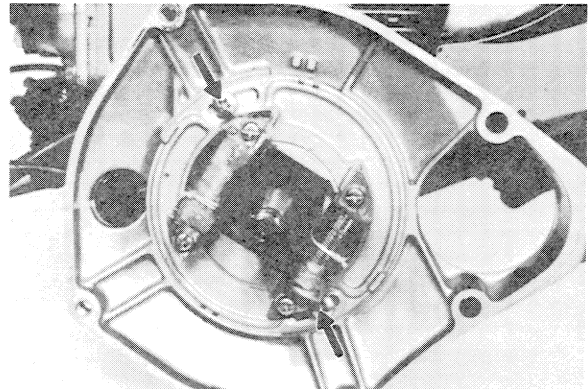
No.	Tool name	Tool No.
1	Drive handle	90890-01817
2	Flywheel puller bolt	90890-01803
3	Flywheel puller body	90890-01848
4	Flywheel puller screw (φ8 x 80mm)	90890-01806
5	Flywheel puller attachment	90890-01804



#### NOTE:

When removing the flywheel, the key must be removed from the crankshaft. Take care so that it is not lost.

- Remove Phillips-head screw, and remove the coil plate.

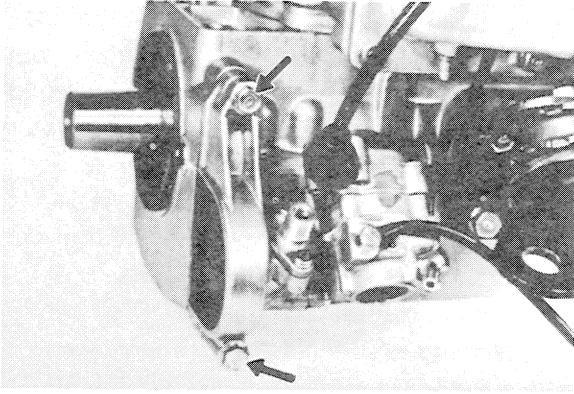


#### E. Oil pump

- Remove the oil delivery pipes.
- Remove the bolts and pump drive case.

#### NOTE:

The oil pump can be removed as an assembly together with the pump drive cover. If it is hard to remove the pump drive case, tap it with a soft-faced hammer.

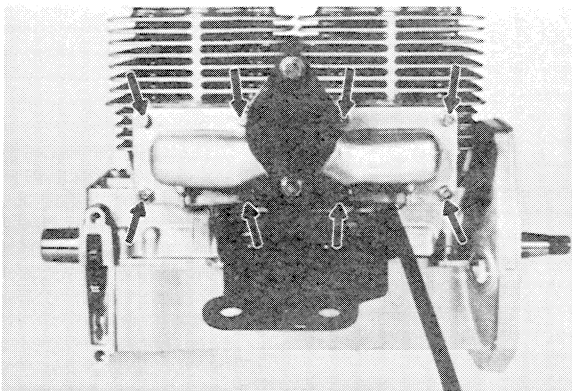


**CAUTION:**  
**The oil pump must not be disassembled, because the oil pump is a precision work.**

3. Remove oil pump cap and pump wire.
4. Remove oil pump assembly.

**F. Engine disassembly**

1. Remove the air shroud.
2. Remove the intake manifold and reed valves.



**NOTE:**  
 For reed valve inspection, refer to 3-2 Reed valve.

3. Remove the exhaust pipe assembly.
4. Remove the cylinder head holding nuts, cylinder head and gasket.

**NOTE:**  
 Loosen spark plugs before removing cylinder head.

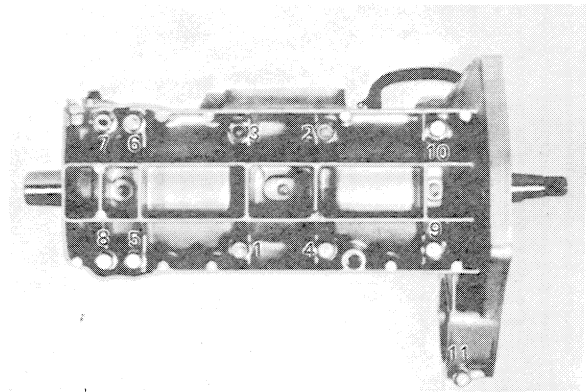
5. Remove the cylinder holding nuts, cylinder and cylinder base gasket.
6. Remove piston pin clip from piston.

**NOTE:**  
 Before removing the piston pin clip, cover the crankcase with a clean rag to prevent the clip from accidentally falling into the crankcase.

7. Push piston pin from opposite side, then pull out. Protect pin with rag.

**NOTE:**  
 Before moving piston pin, deburr clip groove and pin hole area.

8. Remove engine brackets.
9. Remove crankcase holding bolts. Each bolt position is numbered. Start with the largest number for disassembly. Loosen each bolt 1/4 turns and proceed to the next.



10. Split crankcase by lightly striking the upper and lower crankcases.
11. Remove crankshaft by tapping the shaft with your hands.

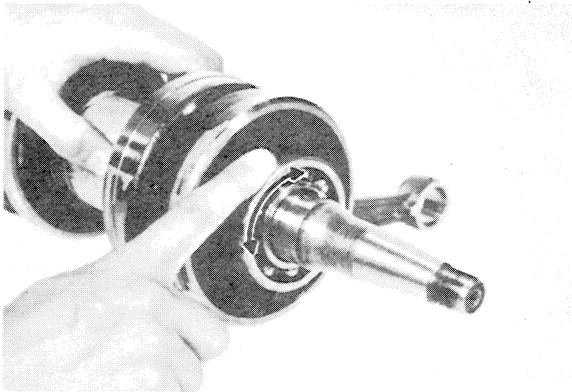
**2-2. INSPECTION, REASSEMBLY AND ADJUSTMENT**

**A. Engine components**

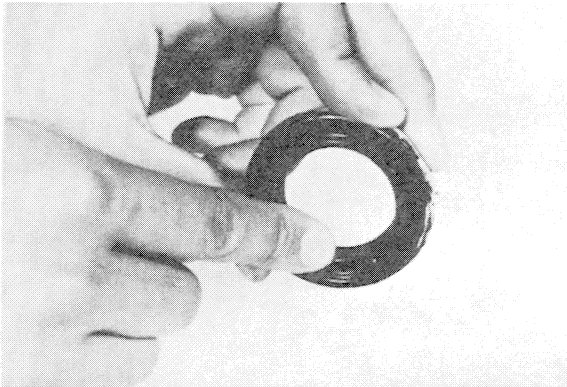
1. Crankcase
  - a. Thoroughly wash the case halves in mild solvent.
  - b. Clean gasket mating surfaces and crankcase mating surfaces thoroughly.
  - c. Visually inspect case halves for any cracks, road damage, etc.
  - d. Check oil delivery passages in transfer ports for signs of blockage.

2. Bearing and oil seal inspection

- a. After cleaning and lubricating bearings, rotate outer race with a finger. If rough spots are noticed, replace the bearing.



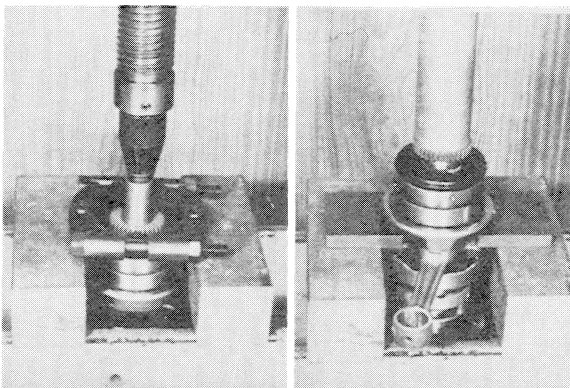
- b. Check oil seal lips for damage and wear. Replace as required.



3. Bearing and oil seal installation

- a. When installing or removing left crank oil seal and bearing, remove the pump drive gear and install the new drive gear.

**CAUTION:** When removing pump drive gear, replace it with new one.



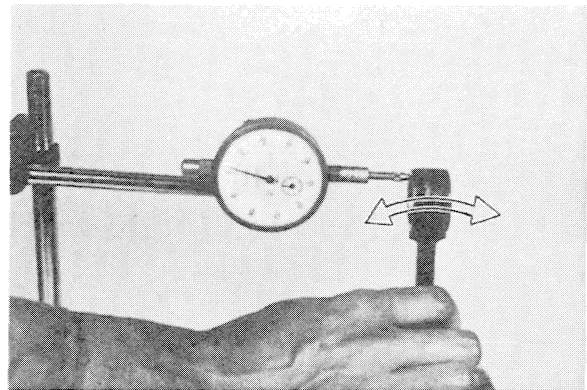
- b. Install bearing(s) with their manufacturer's marks or numbers facing outward. (In other words, the stamped letters must be on the exposed to view side.)
- c. Install oil seal(s) with their manufacturer's marks or numbers facing outward.
- d. When installing bearing(s) or oil seal(s), apply the specified lubrication.

Crank bearing	Yamalube 2-cycle oil
Crankshaft oil seal lip	Low temperature grease (Esso Beacon 325 or Aeroshell grease #7A)

4. Crankshaft inspection / •

- a. Check connection rod axial play at small end (to determine the amount of wear of crank pin and bearing at big end). If small end play exceeds tolerance, disassemble the crankshaft, check connecting rod, crank pin and big end bearing. Replace defective parts. Play after reassembly should be within specification.

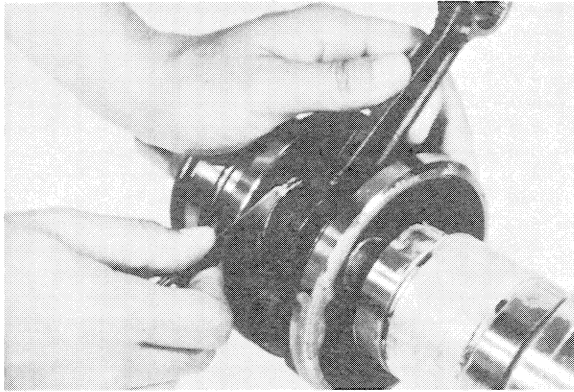
Rod axial play:  
Maximum 2.0 mm (0.079 in)



- b. Check the connecting rod side clearance at big end. If axial play exceeds tolerance, disassemble the crankshaft and replace any worn parts. Big end axial play should be within specification.

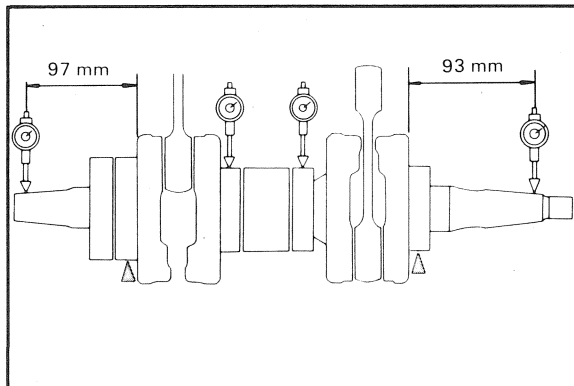
Rod side clearance	
Minimum	Maximum
0.25 mm (0.010 in)	0.75 mm (0.030 in)





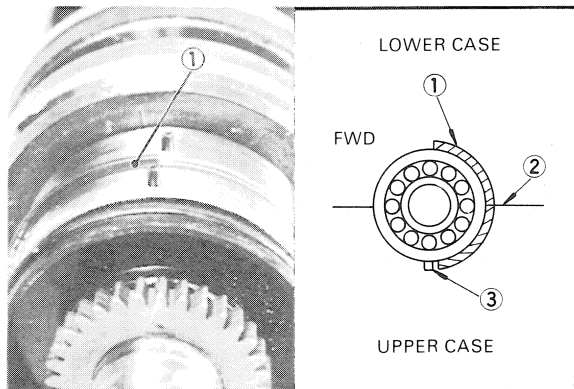
- c. Check crankshaft assembly runout (misalignment of crankshaft parts). Dial gauge readings should be within specification. Correct any misalignment by tapping the flywheel with a brass hammer and/or by using a wedge.

Deflection tolerance			
Left side	Center (left)	Center (right)	Right side
0.03 mm (0.0012 in)	0.04 mm (0.0016 in)	0.04 mm (0.0016 in)	0.05 mm (0.0020 in)



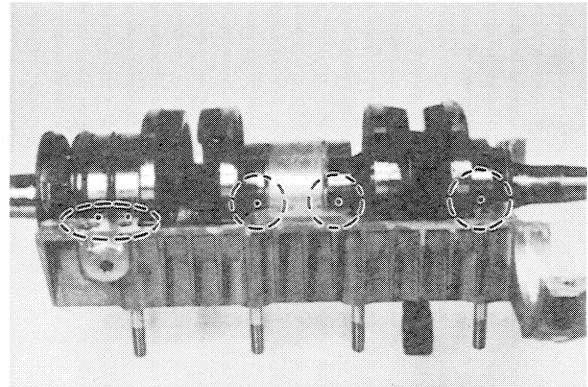
### 5. Crankshaft installation

- a. Install the circlip half on crank bearing as illustrated. (The primary sheave side.)

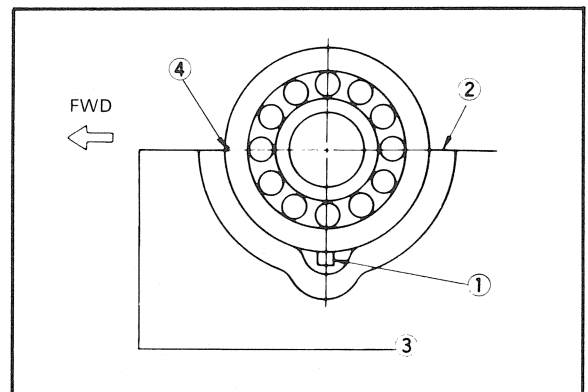


1. Circlip    2. Sealing surface    3. Knock-pin

- b. Install the crankshaft assembly with oil seal, align the bearing punch marks with the crankcase lower and upper mating surfaces.



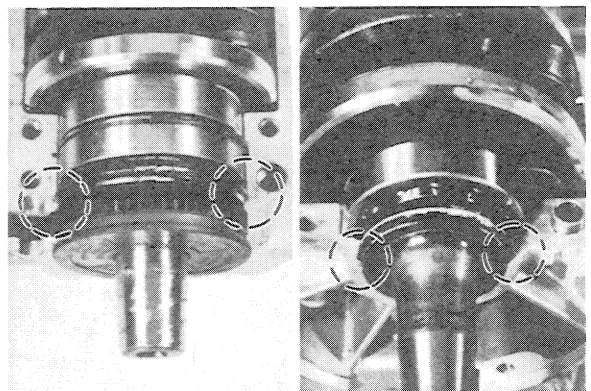
- c. Set the pins of bearing and labyrinth seal in pin holes of crankcase upper by moving the bearings and labyrinth seal.



1. Knock pin    3. Upper case  
2. Sealing surface    4. Aligning mark

### CAUTION:

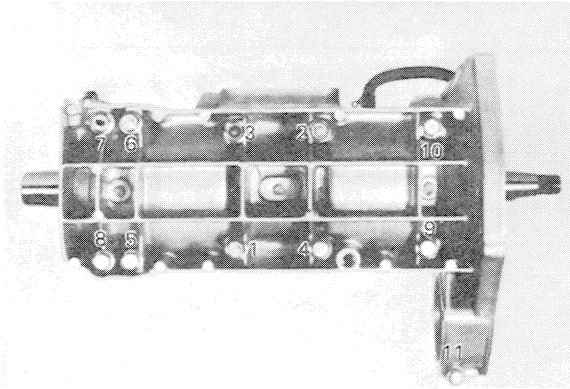
The oil seal lip must fit into the crankcase groove.



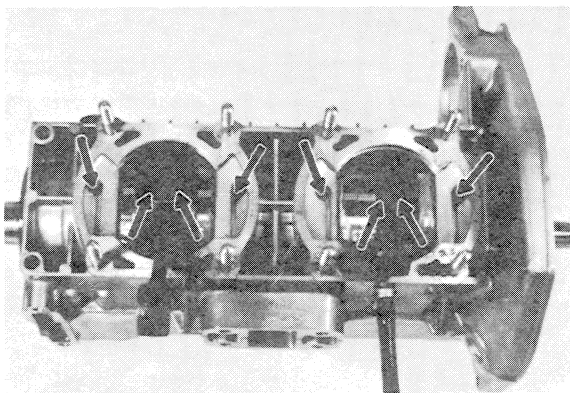
6. Crankcase installation

- a. Apply YAMAHA BOND #4 to the mating surfaces of both case halves.  
Apply thoroughly over all mating surfaces.
- b. Set the crankcase half onto lower case half. Install the crankcase holding bolts. Each bolt position is numbered. Tighten all crankcase holding bolts gradually in the order of the numbers marked on crankcase.

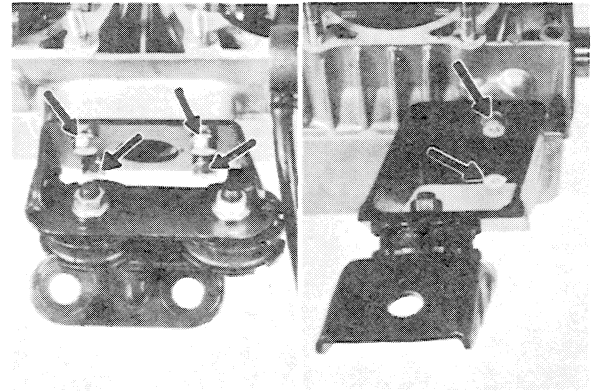
Tightening torque		
8 mm Bolt	First	1.0 m-k $g$ (7 ft-lb)
	Final	2.0 m-k $g$ (15 ft-lb)
6 mm Bolt (No.11)	First	0.5 m-k $g$ (3.5 ft-lb)
	Final	1.0 m-k $g$ (7 ft-lb)



- c. After reassembly, apply a liberal coating of two-stroke oil to the crank pin, bearing and into each crankshaft bearing oil delivery hole.



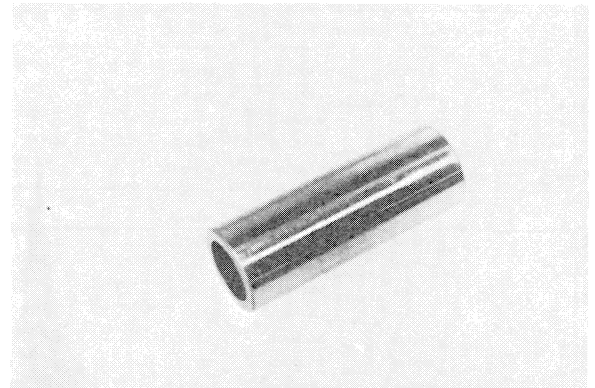
- d. Check crankshaft for freedom of movement.
7. Engine bracket installation  
Install the engine brackets in the correct position.



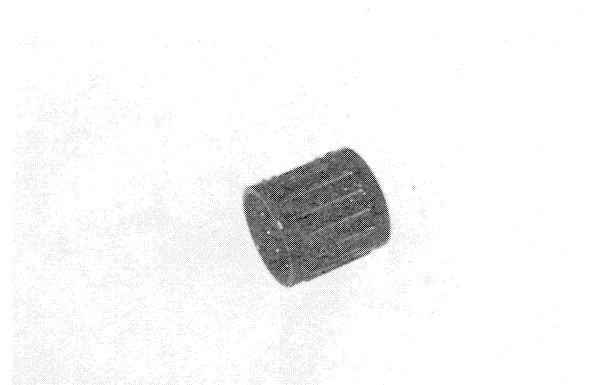
Tightening torque:  
2.0 m-k $g$  (14.5 ft-lb)

8. Piston pin and bearing inspection

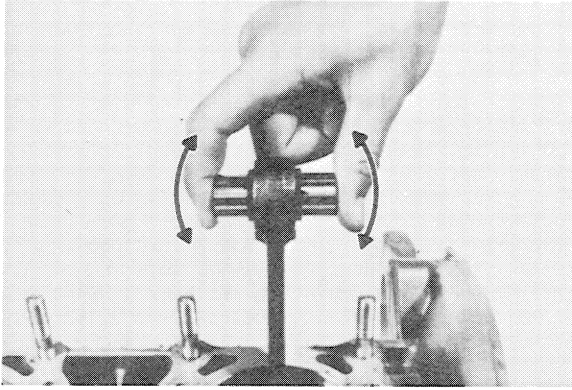
- a. Check the pin for signs of wear. If any wear is evident, replace pin and bearing.



- b. Check the pin and bearing for signs of heat discoloration. If excessive (indentation on pin, etc.), replace pin and bearing.
- c. Check the bearing cage for excessive wear or damage. Check the rollers for signs of flat spots. If such wear is found, replace pin and bearing.



- d. Apply a light film of oil to pin and bearing surfaces. Install them in connecting rod small end to inspect for wear. Check for play. There should be no noticeable vertical play. If play exists, check connecting rod small end for wear. Replace pin, connecting rod and/or bearing, as required.



- e. The piston pin should have no noticeable free play in the piston. If the piston pin is loose, replace the pin and/or piston.

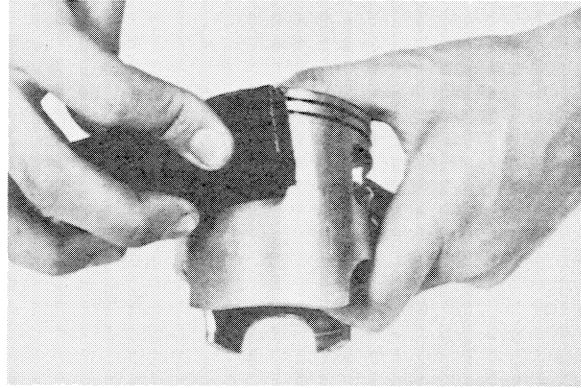


## 9. Piston inspection

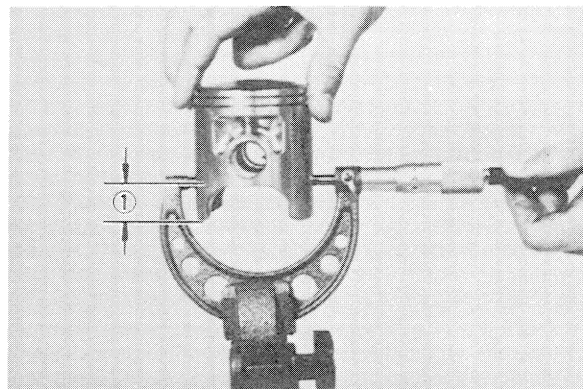
- a. Remove piston rings.
- b. Remove carbon deposits from piston crown.



- c. Carefully remove carbon deposits from ring grooves with filed end of ring.
- d. Remove score marks and lacquer deposits from sides of piston using 600 ~ 800 grit wet sandpaper. Sand in a criss-cross pattern. Do not sand excessively.



- e. Wash piston in solvent and wipe dry.
- f. Measure the outside diameter of the piston at the piston skirt. Measurement should be made at a point 17 mm (0.67 in) above the bottom edge of the piston. Place the micrometer at right angles to the piston pin. Piston maximum diameter subtracted from minimum cylinder diameter gives piston clearance. If beyond tolerance, hone cylinder to tolerance or bore to next oversize and fit oversize piston.



1. 17 mm (0.67 in)



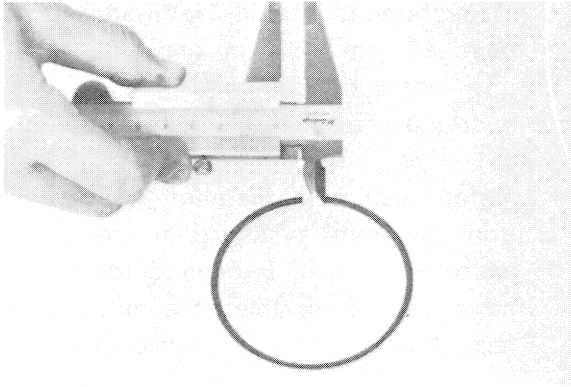
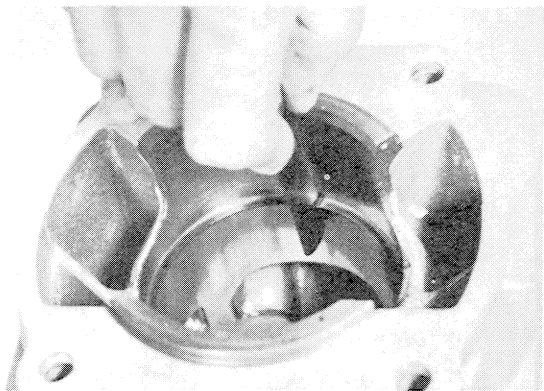
Piston clearance: Minimum.....0.045 mm (0.0018 in) Maximum.....0.050 mm (0.0020 in)
Piston oversize: 66.25 mm (2.608 in) 66.50 mm (2.618 in) 66.75 mm (2.628 in) 67.00 mm (2.638 in)

c. Push the ring into the bore and check end gap clearance with a feeler gauge. If beyond tolerance, replace ring set.

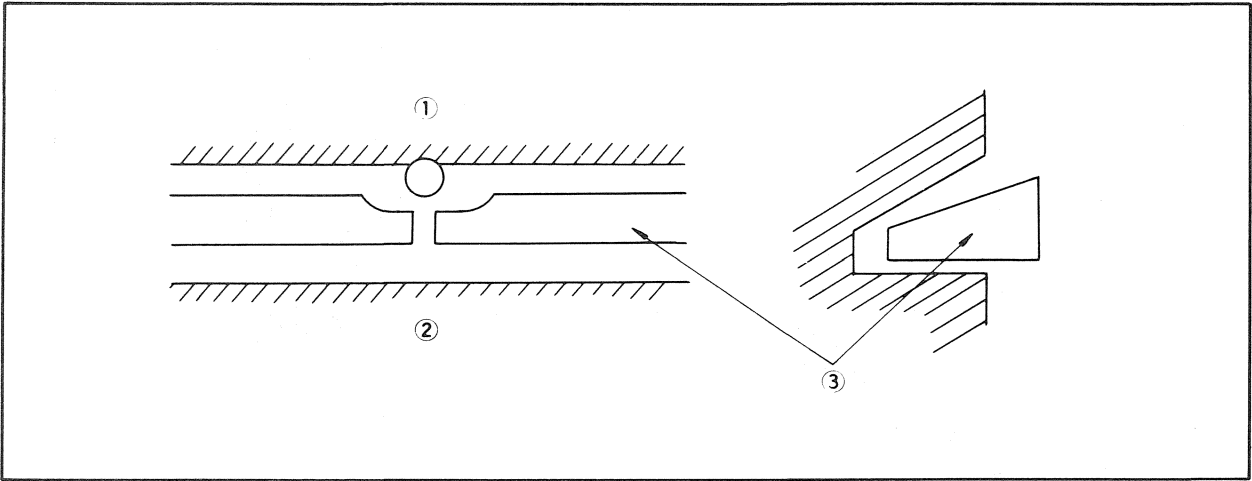
Ring end gap, installed		
	Minimum	Maximum
Top	0.30 mm (0.012 in)	0.50 mm (0.020 in)
Second	0.30 mm (0.012 in)	0.50 mm (0.020 in)

10. Piston ring inspection
- Check rings for scoring any severe scratches and noticed, replace ring set.
  - Measure ring end gap in free position. If beyond tolerance, replace ring set.

Ring end gap, free	
Top	Approx. 8 mm (0.31 in)
Second	Approx. 8 mm (0.31 in)



11. Piston installation
- Install the piston rings as illustrated.

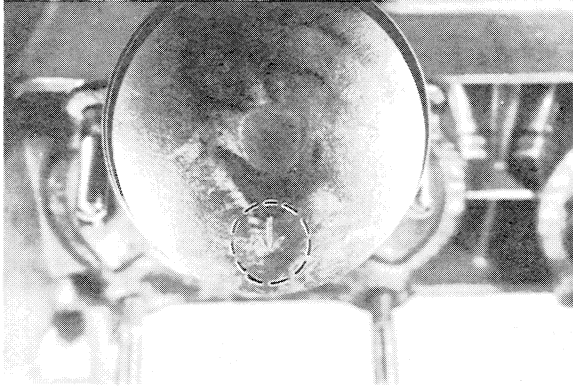


1. Piston head      2. Piston bottom      3. Piston ring

- During reassembly, coat the piston ring grooves, piston skirt areas, piston pin, and bearing with two-stroke engine oil.
- Install new piston pin clips and make sure they are full-seated in their grooves.

**NOTE:**

Take care during installation to avoid damaging the piston skirts against the crankcase as the cylinder is installed. Be sure the arrow stamped on the piston crown points forward.

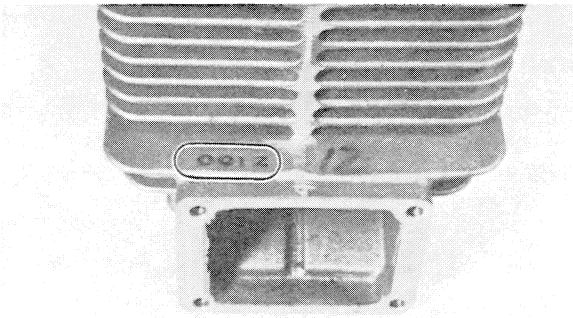


**12. Cylinder inspection**

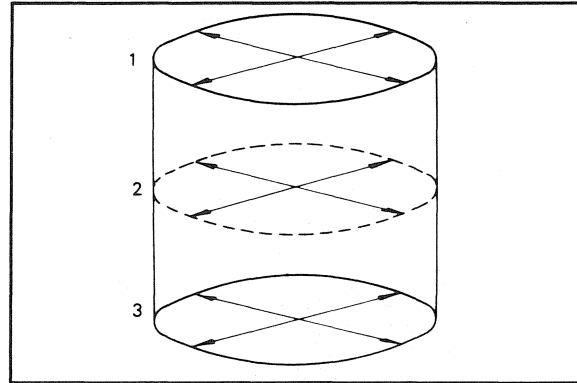
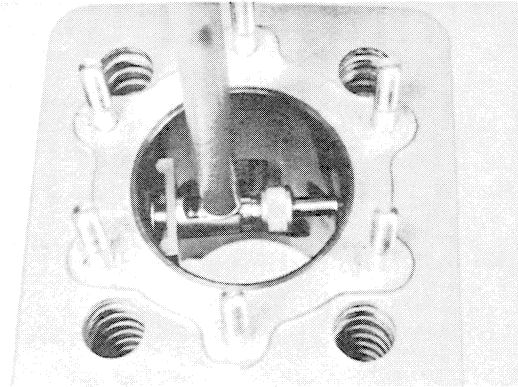
- a. Inspect the cylinder walls for scratches. If vertical scratches are evident, the cylinder wall should be rebored or the cylinder should be replaced.

**NOTE:**

Cylinder size mark is stamped upper part of the intake port.



- b. Measure cylinder wall wear as shown. If wear is excessive, compression pressure will decrease. Rebore the cylinder wall and replace the piston and piston rings. Cylinder wear should be measured at three depths with a cylinder bore gauge. (See illustration)



	Standard	Wear limit
Cylinder bore	66.00~66.02 mm (2.598~2.599 in)	66.05 mm (2.600 in)
Cylinder taper	—	0.05 mm (0.002 in)
Cylinder out-of-round	—	0.01 mm (0.004 in)

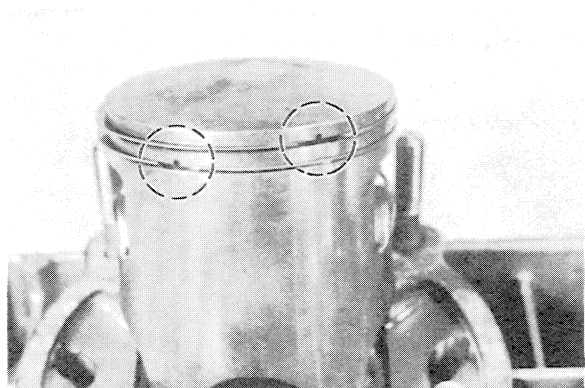
If the cylinder wall is worn more than wear limit, it should be rebored.

**13. Cylinder installation**

- a. Install a new cylinder base gasket.
- b. Install cylinder with one hand while compressing piston rings with other hand.

**NOTE:**

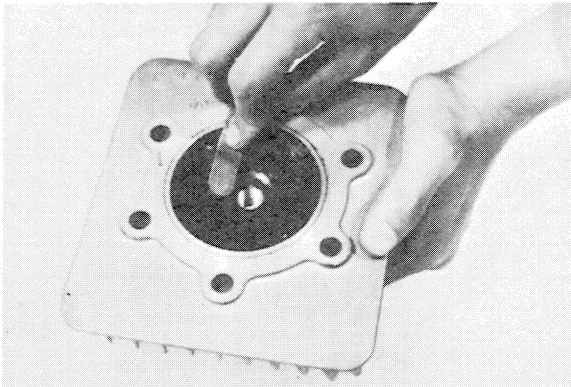
Make sure the rings are properly positioned.



- c. Working in a crisscross pattern, tighten the cylinder nuts in two steps.

Cylinder holding nut torque:  
2.5 m-kg (18 ft-lb)

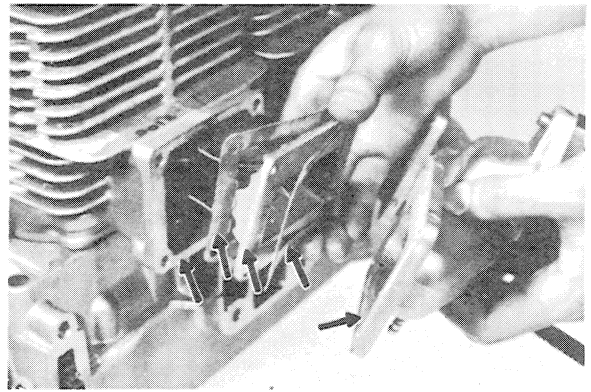
14. Cylinder head inspection
  - a. Remove spark plug.
  - b. Using a rounded scraper, remove carbon deposits from combustion chamber. Take care to avoid damaging spark plug threads. Do not use a sharp instrument. Avoid scratching the aluminum.



15. Cylinder head installation  
Install cylinder head gasket and cylinder head. Working in a crisscross pattern, tighten head nuts in two steps.

Head nut torque:  
2.5 m-kg (18 ft-lb)

16. Intake manifold installation
  - a. Clean the mating surfaces of cylinder, reed valve and intake manifold.
  - b. Coat the mating surfaces of cylinder, reed valve and intake manifold with Three Bond #50 and install new intake manifold gaskets.



- c. Install the reed valve and intake manifold.

Tightening torque:  
1.0 m-kg (7 ft-lb)

**NOTE:** \_\_\_\_\_

For reed valve inspection, see "3-2. REED VALVE"

17. Exhaust pipe installation  
Remove the carbon deposits from exhaust pipe. Inspect the exhaust gasket for damage and replace it as required. Install the exhaust pipe with gasket.

Tightening torque:  
2.3 m-kg (16.5 ft-lb)

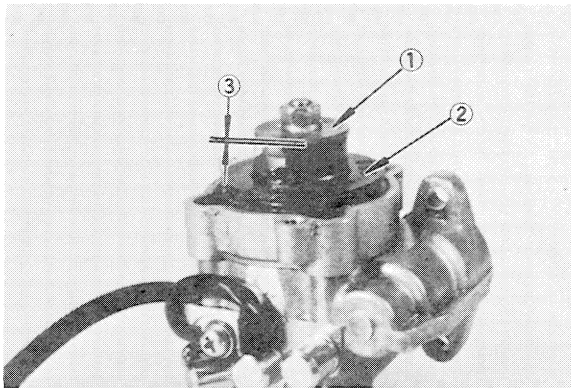
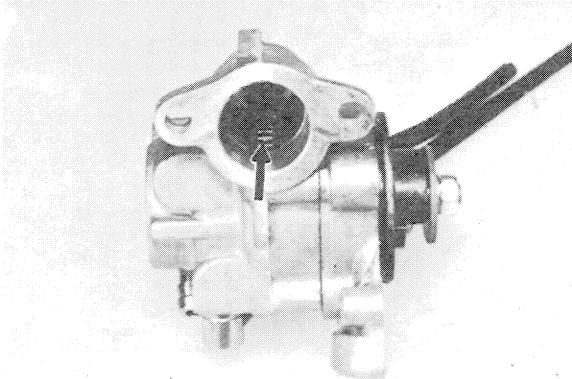
18. Install air shroud.

Tightening torque:  
0.6 m-kg (4 ft-lb)

**B. Oil pump**

1. Minimum pump stroke checking and adjustment.  
Normally the checking the adjustment of the pump stroke are not required, but if any sign of trouble resulting from an incorrect minimum pump stroke is noticed (e.g., excessive engine oil consumption or engine seizure), proceed as follows:

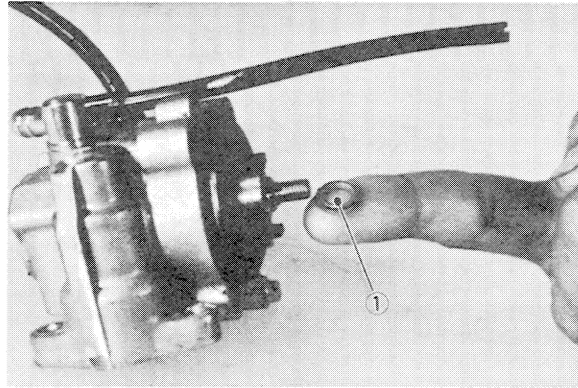
- a. Remove the oil pump assembly from the engine.
- b. Turn the oil pump worm wheel until the pump plunger moves fully out and away from the pump body to its outermost limit.
- c. Measure the gap with the thickness gauge between the raised boss on the pump adjust pulley and the adjust plate.



1. Adjust plate
2. Adjust pulley
3. Minimum pump stroke

Minimum pump stroke:  
0.20 ~ 0.25 mm  
(0.0079 ~ 0.0098 in)

- d. If clearance is not correct, remove the adjust plate lock nut and the adjust plate.
- e. Remove or add an adjust shim as required.



1. Adjust shim

- f. Reinstall adjust plate and lock nut. Tighten the lock nut. Re-measure gap. Repeat procedure as required.
2. Oil pump drive case installation  
Coat the pump drive gear with grease. And install the pump drive case.

Recommended grease:  
Low temperature grease  
(Esso Beacon 325 or Aeroshell grease #7A)

Pump case tightening torque:  
1.0 m-kg (7 ft-lb)

3. Install pump wire, pump case and oil delivery pipe.

**CAUTION:**  
Before installing pump wire and pump case, apply grease to the pump pulley thoroughly.

Recommended grease:  
Low temperature grease  
(Esso Beacon 325 or Aeroshell grease #7A)

4. Air bleeding (After remounting engine)  
The oil pump and delivery lines must be bled on the following occasions:
  - Setting up a new machine out of the crate.
  - Whenever the oil tank has run dry.
  - Whenever any portion of the oil pump system is disconnected.



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