

Kawasaki

FA76-FA130-FA210

4-stroke air-cooled gasoline engine

WORKSHOP MANUAL

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A. GENERAL SPECIFICATIONS

FA76D

*Air cooling:

Large capacity, curved vane blower casting, integrated with flywheel. Air passes through deep fins to maintain optimum operating temperature of engine.

*Ignition:

Magneto with waterproof molded ignition coil and dustproof breaker point enclosure.

Breaker system standard. (Electronic ignition system available as optional specification.)

*Lubrication: Splash type.

*Carburetor:

Pulse pump type; with idle mixture adjustment.

Float type; anti-erosion aluminum alloy, with idle mixture adjustment and fuel shut off valve.

*Air cleaner:

Semi-dry type, washable polyurethane element with nylon brush.

*Fuel tank:

Sheet metal for pulse pump carburetor model.

Polyethylene for Float carburetor model.

*Governor:

Mechanical fly-weight type, running in crankcase oil.

*Governor control:

Adjustable speed control. Wire joint and outer wire clamp are optional for remote speed control.

*Cylinder and crankcase:

One piece hypereutectic aluminum-silicon alloy die casting with plateau honing.

*Piston:

Hard-chrome plated aluminum alloy.

*Piston rings:

Two compression rings including silicon carbide (on an iron base) plated top ring. One oil control ring.

*Connecting rod:

I-beam cross section, heat treated aluminum alloy, with large bearings.

*Crankshaft:

Heat treated ductile iron integrated with counter-balance weights and camshaft drive gear. Induction hardened crankpin and main journals.

*Main bearings:

Durable bush type, lead bronze sintered alloy plain bearings with steel back metal.

*Valves:

Forged 21-4N austenitic stainless steel exhaust valve.

Forged heat-resisting steel intake valve.

*Valve seats:

Exhaust; Sintered alloy insert (Co-W-Ni-Cr-Mo) on an iron base.

Intake; Sintered alloy insert (Cu-Mo) on an iron base.

*Valve guides:

Exhaust; Sintered alloy insert (Cu-P-Sn) on an iron base.

Intake; Directly borne by cylinder/crankcase. Die-casted hypereutectic aluminum-silicon alloy, machined.

*Valve tappets:

Wear resisting stamp-forged steel, hardened and ground.

*Breather:

Vacuum type, vented through air cleaner to prevent oil spill.

*Muffler:

Sheet metal painted with heat-resisting paint, effective noise suppression. (Optional parts available.)

*Starter:

Recoil starter with safety cover as standard. (Optional parts available.)

*Direction of rotation:

Counterclockwise, viewed from power take-off side.

*Finish:

Anti-rust, painted.

	Direct Drive, Pulse Pump Carburetor	Direct Drive, Float Carburetor
Bore and stroke	52 x 36 mm [2.05 x 1.42 in]	
Piston displacement	76 cc [4.66 cu. in]	
Compression ratio	6.4 : 1	
Maximum output	1.7 HP/4000 rpm [SAE J607a]	
Maximum torque	0.32 kgm/3200 rpm [2.31 ft-lbs/3200 rpm]	
Fuel consumption ratio	330 gr/HP, Hr [0.73 lbs/HP, Hr]	
Fuel tank capacity	1.15ℓ [1.22 Qt US]	1.7ℓ [1.8 Qt US]
Fuel	Regular gasoline	
Oil volume: crankcase max.	320 cc [0.678 Pt US]	
Oil volume: crankcase min.	200 cc [0.42 Pt US]	
Lubricating oil	A.P.I. Grade: SC, SD, SE class SAE #20 - Winter, SAE #30 - Summer	
Oil fill and drain	Dual (carb. side and opposite carb.)	
Ignition timing	Fixed 23° B.T.D.C	
Spark plug	14 mm NGK BM-6A	
Permissible inclination of engine for continuous operation without any lubrication problem.	Angled forward (carb. side up) 20° Angled backward (carb. side down) 20° Angled P.T.O. shaft (towards both) 20°	
Idle speed set, no load	1600 rpm (crankshaft)	
Max. speed set, no load	4000 rpm (crankshaft)	
Dry weight (S.T.D. set-up)	7.3 kg [16.1 lbs]	

FA130D

*Air cooling:

Large capacity, curved vane blower casting, integrated with flywheel. Air passes through deep fins to maintain optimum operating temperature of engine.

*Ignition:

Magneto with waterproof molded ignition coil and dust-proof breaker point enclosure.

Breaker system standard. (Electronic ignition system available as optional specification.)

*Lubrication:

Splash type.

*Carburetor:

Pulse pump type, with idle mixture adjustment.

*Air cleaner:

Semi-dry type, washable polyurethane element with nylon brush.

*Fuel tank:

Sheet metal.

*Governor:

Mechanical fly-weight type, running in crankcase oil.

*Governor control:

Adjustable speed control. Remote speed control joint optional.

*Cylinder and crankcase:

One piece hypereutectic aluminum-silicon alloy die-casting with plateau-honing.

*Piston:

Hard-chrome plated aluminum alloy.

*Piston rings:

Two compression rings including silicon carbide (on an iron base) plated top ring. One oil control ring.

*Connecting rod:

I-beam cross section, heat treated aluminum alloy, with large bearings.

*Crankshaft:

Heat treated ductile iron integrated with counter

balance weights and camshaft drive gear. Induction hardened crankpin and main journals.

*Main bearings:

P.T.O. side, ball bearing. Magneto side, lead bronze sintered alloy plain bearing with steel back metal.

*Valves:

Forged 21-4N austenitic stainless steel exhaust valve.

Forged heat-resisting steel intake valve.

*Valve seats:

Exhaust; Sintered alloy insert (Co-W-Ni-Cr-Mo) on an iron base.

Intake; Sintered alloy insert (Cu-Mo) on an iron base.

*Valve guides:

Exhaust; Sintered alloy insert (Cu-P-Sn) on an iron base.

Intake; Directly borne by cylinder/crankcase. Die-casted hypereutectic aluminum-silicon alloy, machined.

*Valve tappets:

Wear resisting stamp-forged steel, hardened and ground.

*Breather:

Vacuum type, vented through air cleaner to prevent oil spill.

*Muffler:

Sheet metal painted with heat-resisting paint, effective noise suppression. (Optional parts available.)

*Starter:

Recoil starter with safety cover as standard. (Optional parts available)

*Direction of rotation:

Counterclockwise, viewed from power take-off side.

*Finish:

Anti-rust, painted.

	Direct Drive, Pulse Pump Carburetor	Direct Drive, Float Carburetor
Bore and stroke	62 x 43 mm [2.44 x 1.69 in]	
Piston displacement	129 cc [7.92 cu. in]	
Compression ratio	6.4 : 1	
Maximum output	3.1 HP/4000 rpm [SAE J607a]	
Maximum Torque	0.62 kgm/3000 rpm [4.48 ft-lbs/3000 rpm]	
Fuel consumption ratio	310 gr/HP, Hr [0.68 lbs/HP, Hr]	
Fuel tank capacity	2.7ℓ [2.8 Qt US]	
Fuel	Regular gasoline	
Oil volume: crankcase max.	500 cc [1.06 Pt US]	
Oil volume: crankcase min.	300 cc [0.63 Pt US]	
Lubricating oil	A.P.I. Grade: SC, SD, SE class SAE #20 - Winter, SAE #30 - Summer	
Oil fill and drain	Dual (carb. side and opposite carb.)	
Ignition timing	Fixed 23° B.T.D.C.	
Spark plug	14 mm, NGK BM-6A	
Permissible inclination of engine for continuous operation without any lubrication problem.	Angled forward (carb. side up) 20° Angled backward (carb. side down) 20° Angled P.T.O. shaft (towards both) 20°	
Idle speed set, no load	1600 rpm (crankshaft)	
Max. speed set, no load	4000 rpm (crankshaft)	
Dry weight (S.T.D. set up)	10 kg [22 lbs]	11.5 kg [25 lbs]

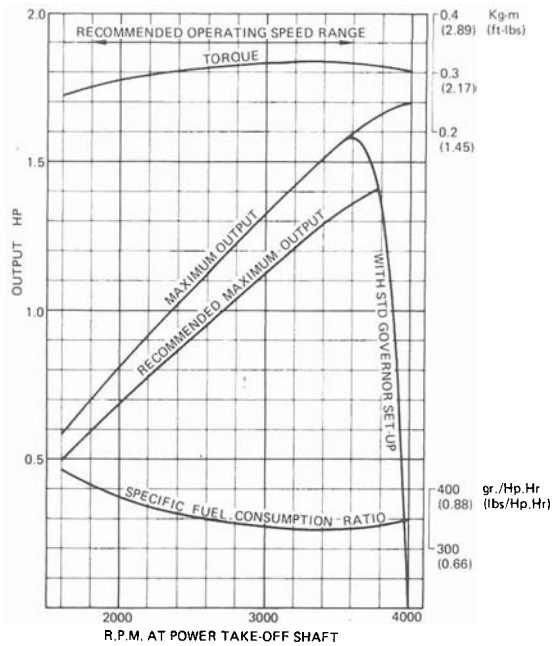
FA210D

- *Air cooling:
Large capacity, curved vane blower casting, integrated with flywheel. Air passes through deep fins to maintain optimum correct operating temperature of engine.
- *Ignition:
Magnetos with waterproof molded ignition coil and dustproof breaker point enclosure.
Breaker system standard. (Electronic ignition system available as optional specification.)
- *Lubrication:
Splash type.
- *Carburetor:
Pulse pump type, with idle mixture adjustment.
- *Air cleaner:
Semi-dry type, washable polyurethane element with nylon brush.
- *Fuel tank:
Sheet metal.
- *Governor:
Mechanical fly-weight type, running in crankcase oil.
- *Governor control:
Adjustable speed control. Remote speed control joint optional.
- *Cylinder and crank case:
One piece hypereutectic aluminum-silicon alloy die-casting with plateau honing.
- *Piston:
Hard-chrome plated aluminum alloy.
- *Piston rings:
Two compression rings including silicon carbide (on an iron base) plated top ring. One oil control ring.
- *Connecting rod:
I-beam cross section, heat treated aluminum alloy, with large bearings.
- *Crankshaft:
Heat treated ductile iron integrated with counter-balance weights and camshaft drive gear. Induction hardened crankpin, main journals and output shaft.
- *Main bearings:
P.T.O. side, ball bearing. Magneto side, lead bronze sintered alloy plain bearing with steel back metal.
- *Valves:
Forged 21-4N austenitic stainless steel exhaust valve.
Forged heat-resisting steel intake valve.
- *Valve seats:
Exhaust; Sintered alloy insert (Co-W-Ni-Cr-Mo) on an iron base.
Intake; Sintered alloy insert (Cu-Mo) on an iron base.
- *Valve guides:
Exhaust; Sintered alloy insert (Cu-P-Sn) on an iron base.
Intake; Directly borne by cylinder/crankcase. Die-casted hypereutectic aluminum-silicon alloy, machined.
- *Valve tappets:
Wear resisting stamp-forged steel, hardened and ground.
- *Breather:
Vacuum type, vented through air cleaner to prevent oil spill.
- *Muffler:
Sheet metal painted with heat-resisting paint, effective noise suppression. (Optional parts available.)
- *Starter:
Recoil starter with safety cover as standard. (Optional parts available.)
- *Direction of rotation:
Counterclockwise, viewed from power take-off side.
- *Finish:
Anti-rust, painted.

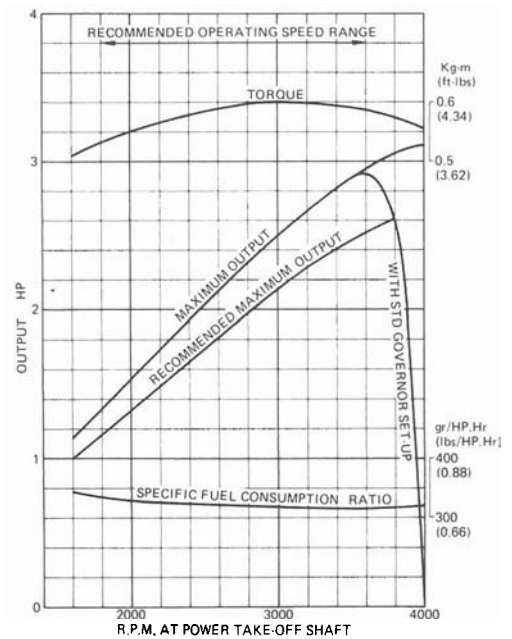
	Direct Drive, Pulse Pump Carburetor	Direct Drive, Float Carburetor
Bore and stroke	72 x 51 mm [2.83 x 2.01 in]	
Piston displacement	207 cc [12.67 cu. in.]	
Compression ratio	6.4 : 1	
Maximum output	5.2 HP/4000 rpm [SAE J607a]	
Maximum Torque	1.09 kgm/2600 rpm [7.88 ft-lbs/2600 rpm]	
Fuel consumption ratio	310 gr/HP, Hr [0.68 lbs/HP, Hr]	
Fuel tank capacity	2.7ℓ [2.8 Qt US]	
Fuel	Regular gasoline	
Oil volume: crankcase max.	600 cc [1.27 Pt US]	
Oil volume: crankcase min.	350 cc [0.74 Pt US]	
Lubricating oil	A.P.I. Grade: SC, SD, SE class SAE #20 - Winter, SAE #30 - Summer	
Oil fill and drain	Dual (carb. side and opposite carb.)	
Ignition timing	Fixed 23° B.T.D.C.	
Spark plug	14 mm NGK BM - 6A	
Permissible inclination of engine for continuous operation without any lubrication problem.	Angled forward (carb. side up) 20° Angled backward (carb. side down) 20° Angled P.T.O. shaft (towards both) 20°	
Idle speed set, no load	1600 rpm (crankshaft)	
Max. speed set, no load	4000 rpm (crankshaft)	
Dry weight (S.T.D. set up)	13 kg [28.7 lbs]	

B. PERFORMANCE CURVES

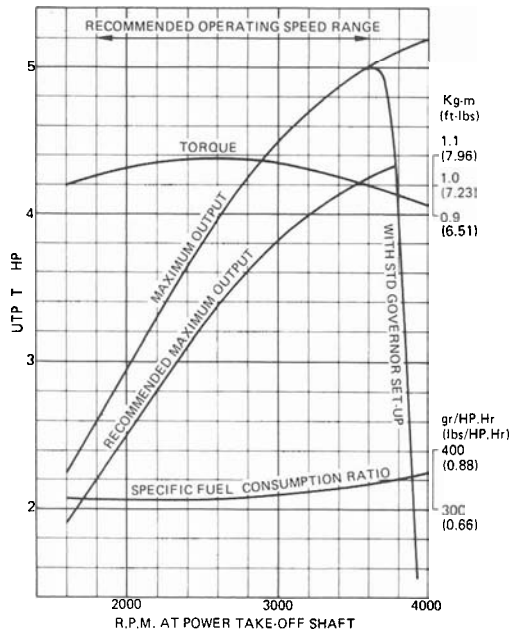
FA76D



FA130D



FA210D



Horsepower is measured in accordance with the appropriate SAE test procedures.

Power curves are corrected to standard conditions of atmospheric pressure at sea level and temperature of 60°F and are developed from laboratory test engines equipped with standard air cleaner and muffler.

The Maximum B.H.P. curve represents laboratory test engines equipped to operate at full performance.

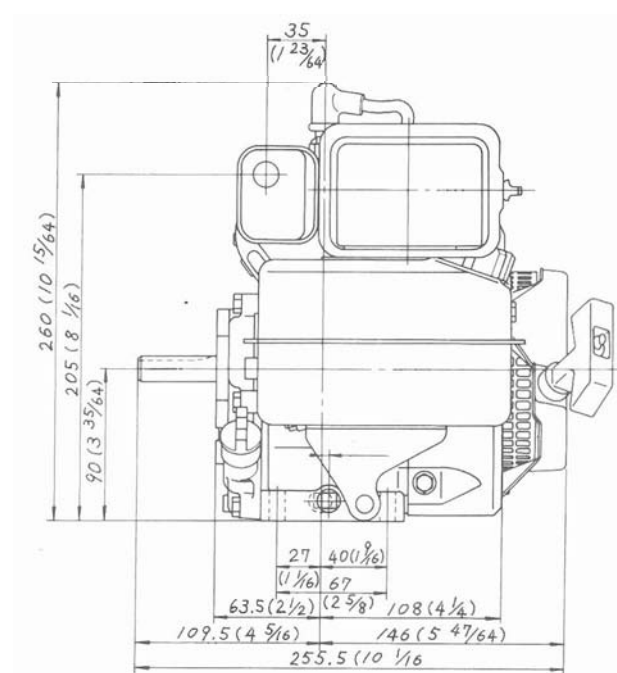
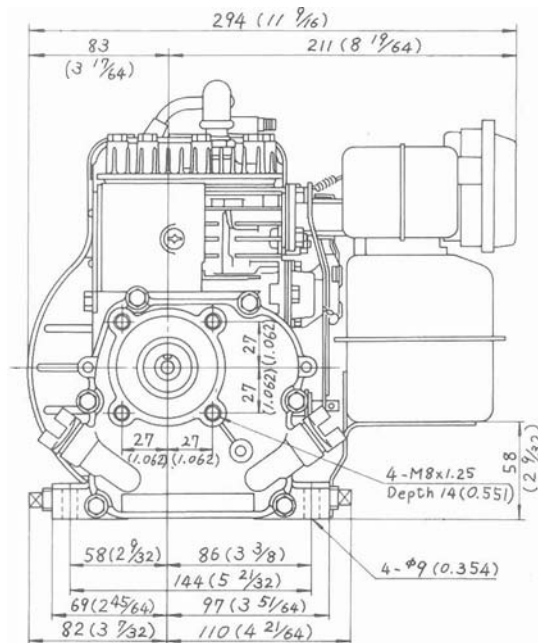
Production engines will develop 95% of the Maximum B.H.P. when tested after run-in to reduce friction and after clean out of the combustion chamber, with valves, carburetor and ignition system adjusted to laboratory standards.

Engine power will decrease 3 1/2% for each 1,000ft, above sea level and 1% for each 10°F above standard temperature of 60°F. For practical operation B.H.P. load and speed should be within the limits shown by the recommended Maximum B.H.P. Complete details of installations requiring operation at other than recommended speeds should be referred to factory for approval.

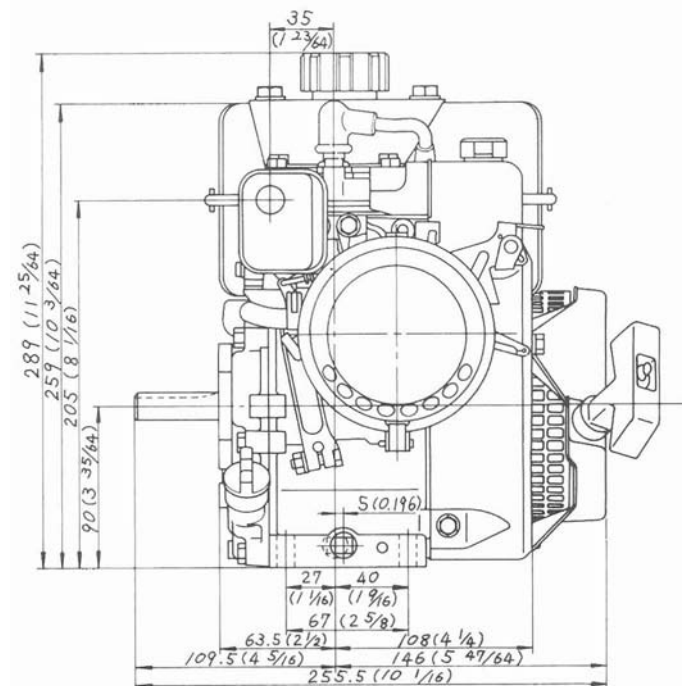
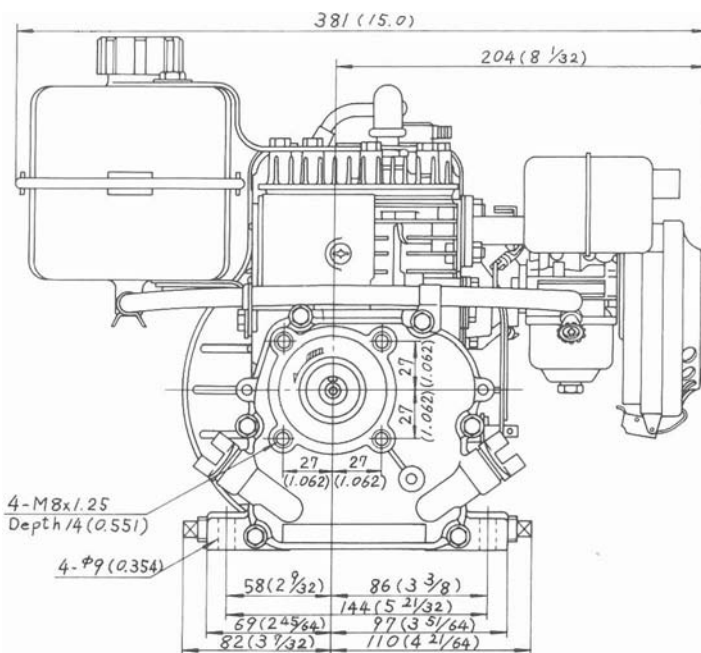
C. DIMENSIONAL SPECIFICATIONS

FA76D

Pulse pump model

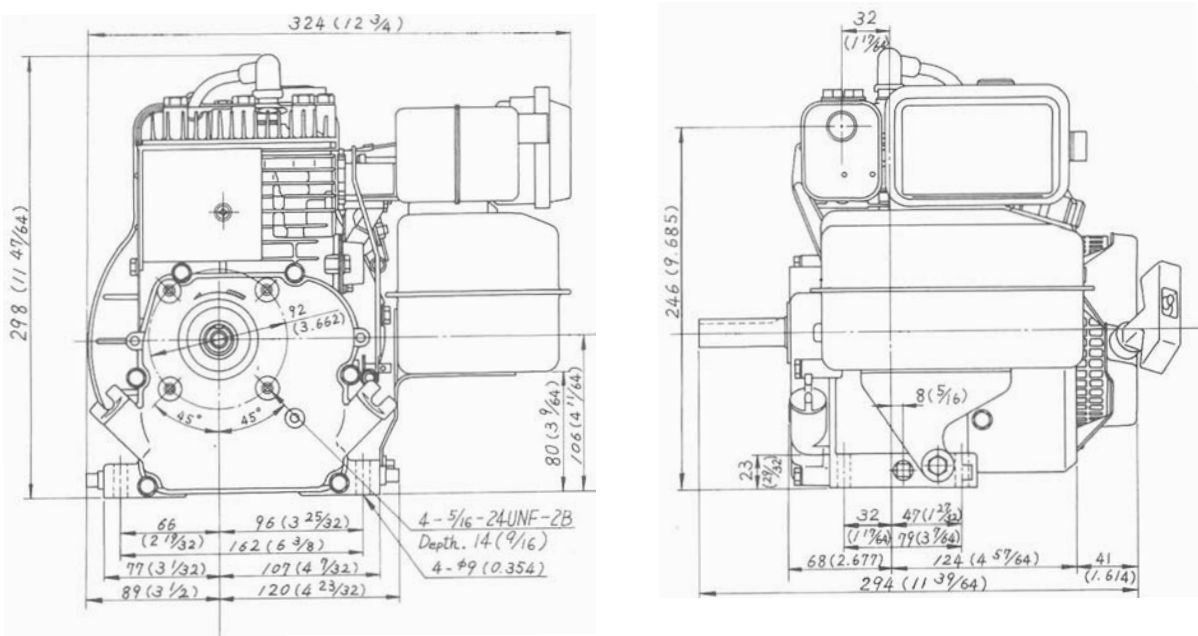


Float model

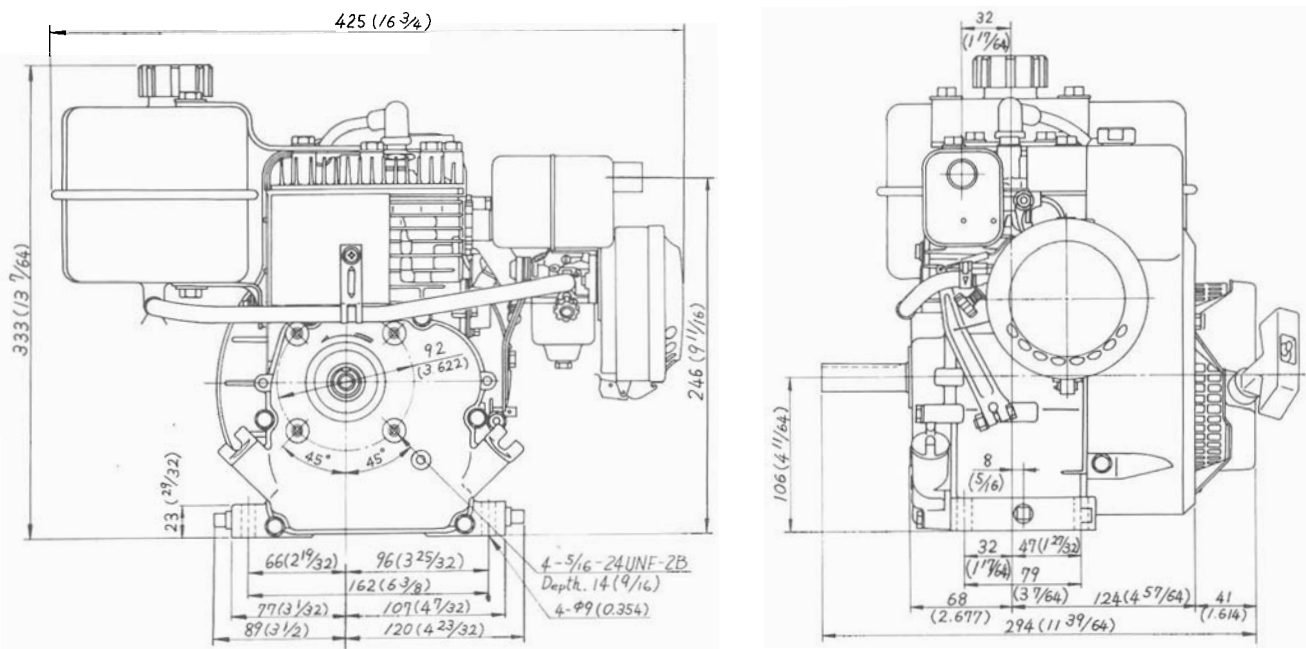


FA130D

Pulse pump model

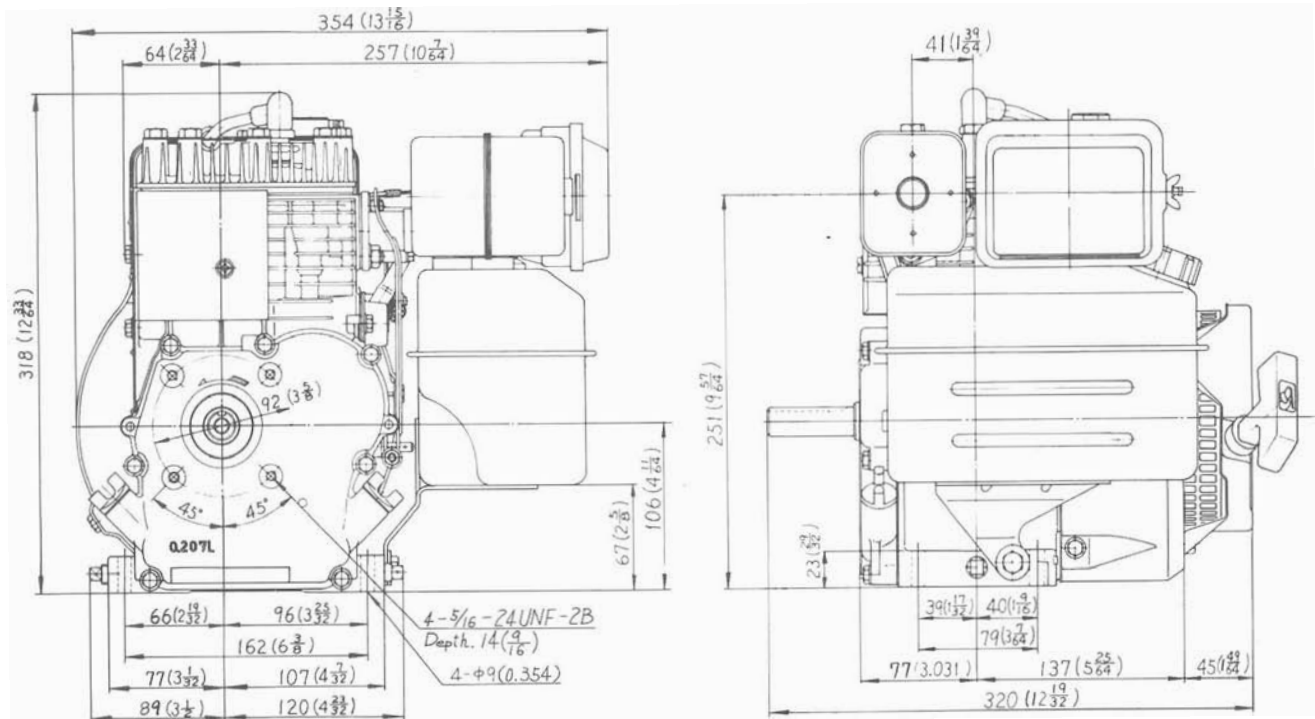


Float model

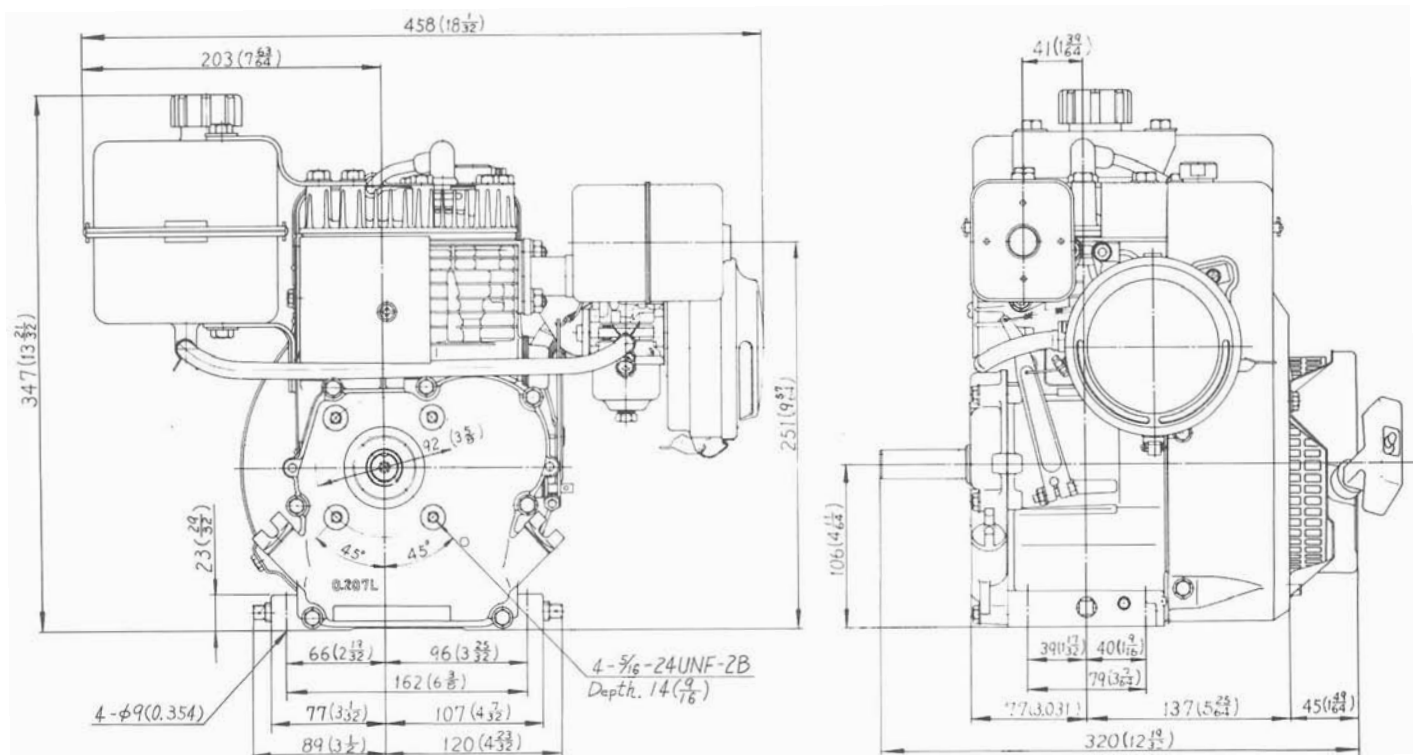


FA210D

Pulse pump model

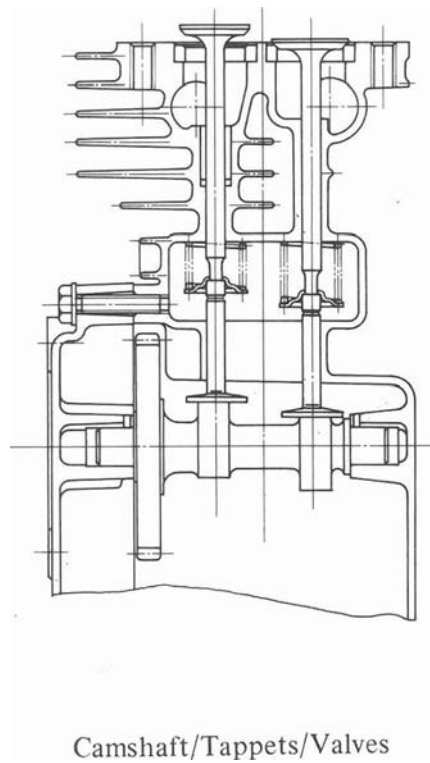
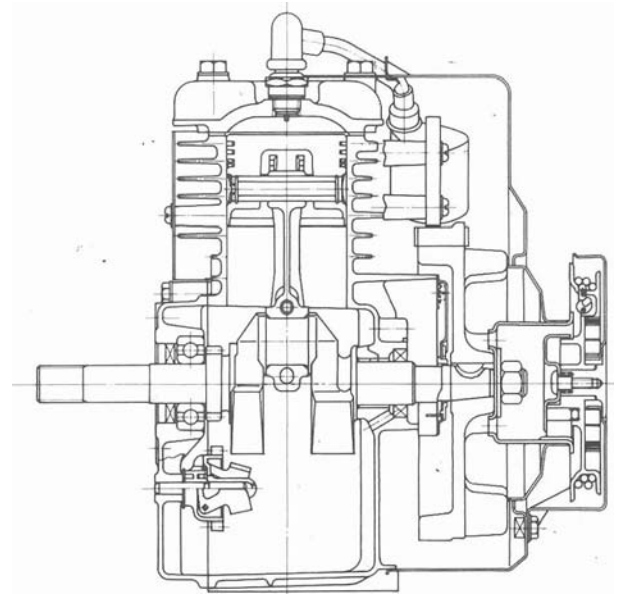
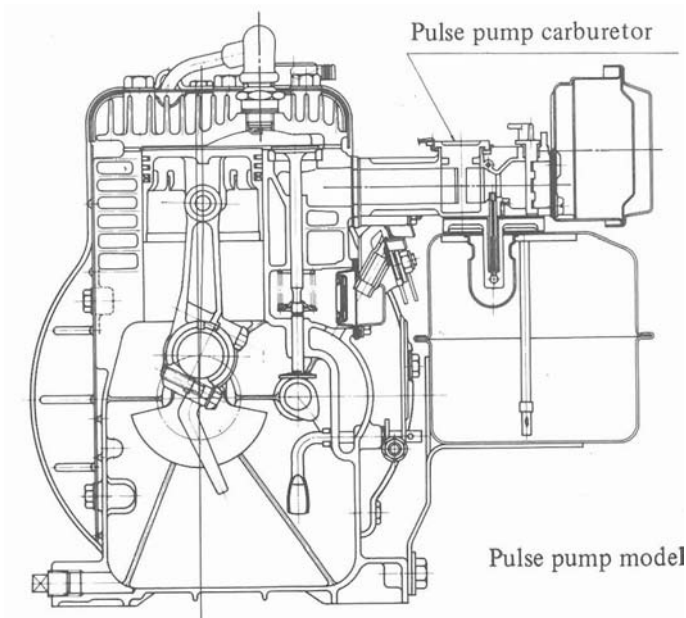


Float model



D. CONSTRUCTION

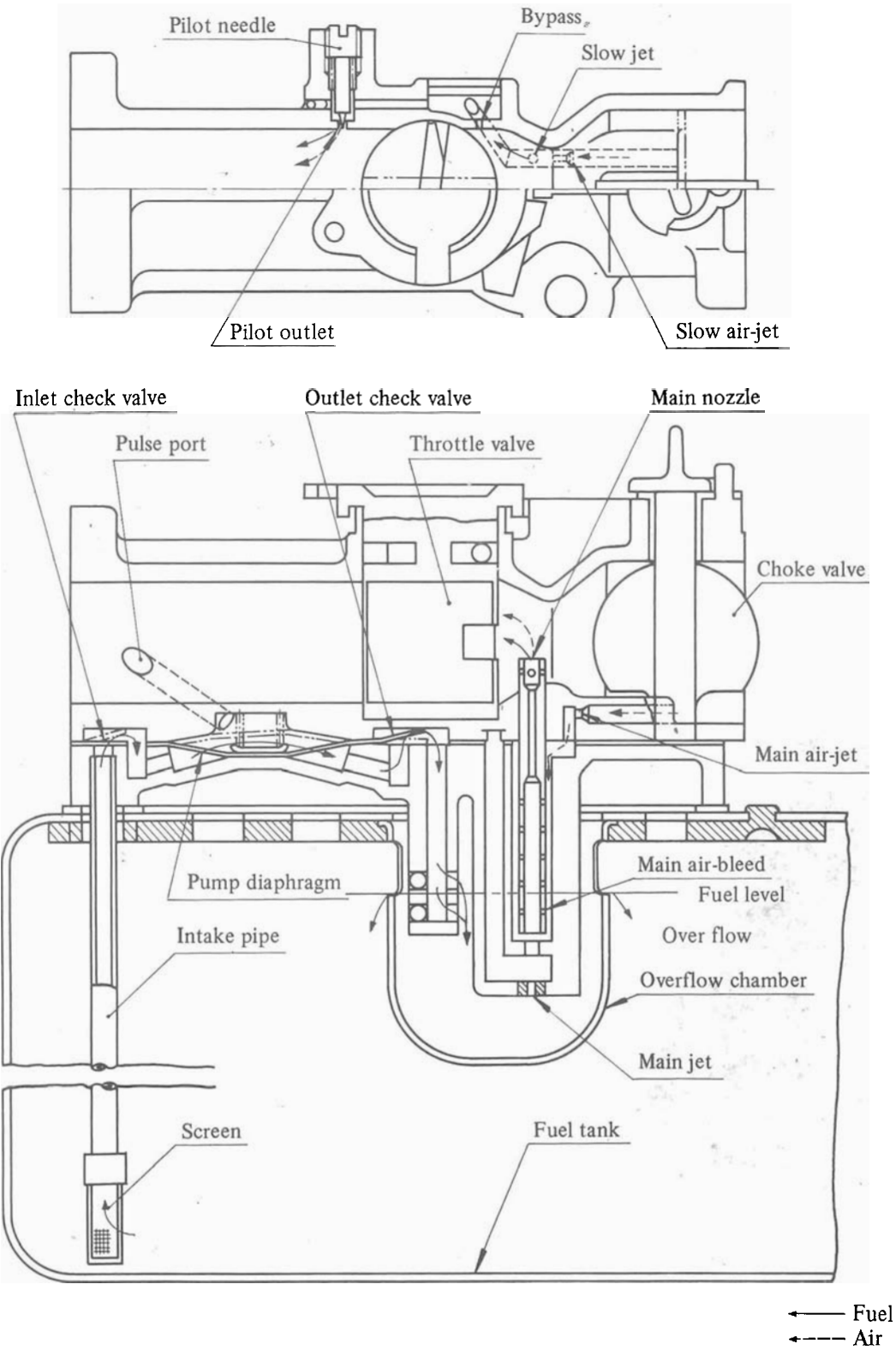
Main Parts



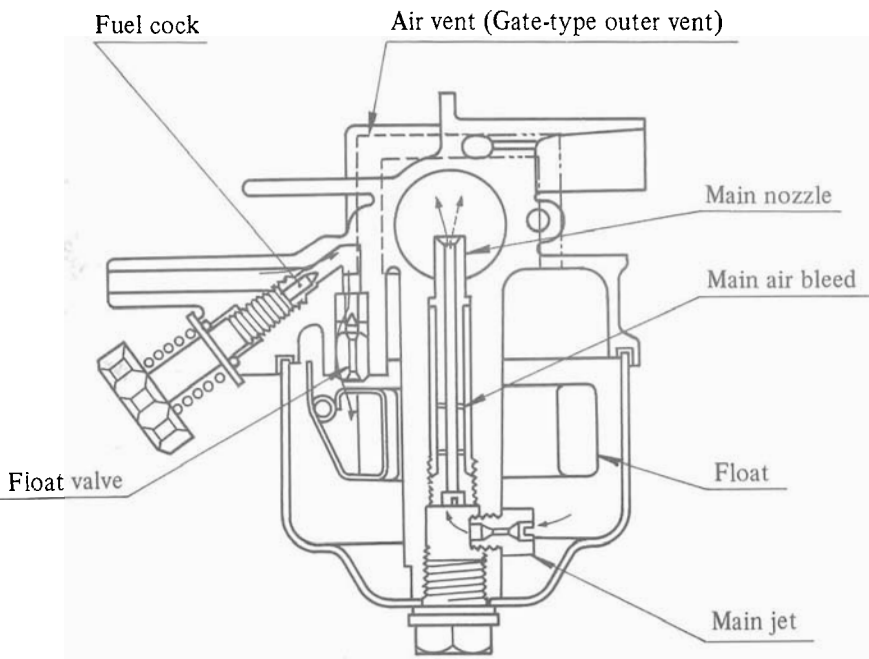
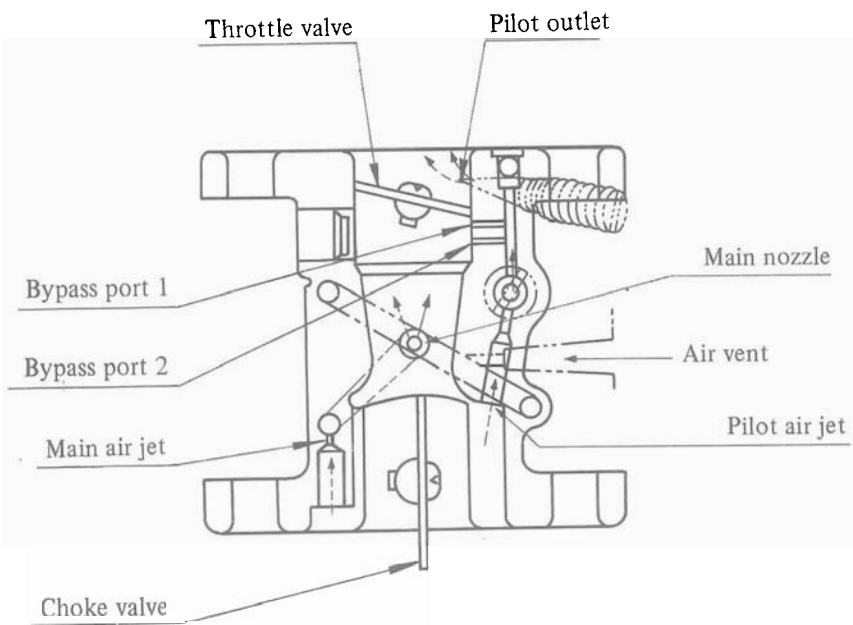
Carburetor Construction

Pulse Pump Type
(FA76, FA130, FA210)

Pulse pump model

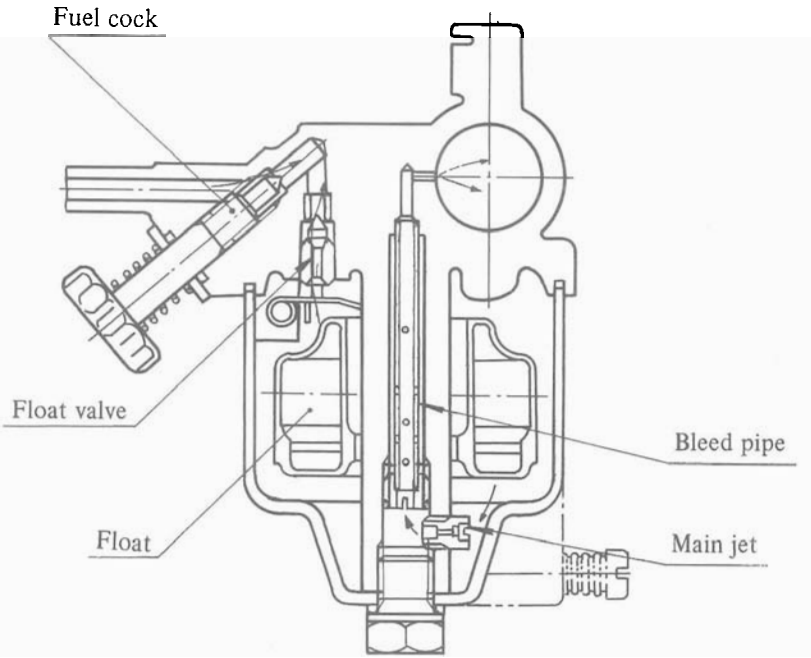
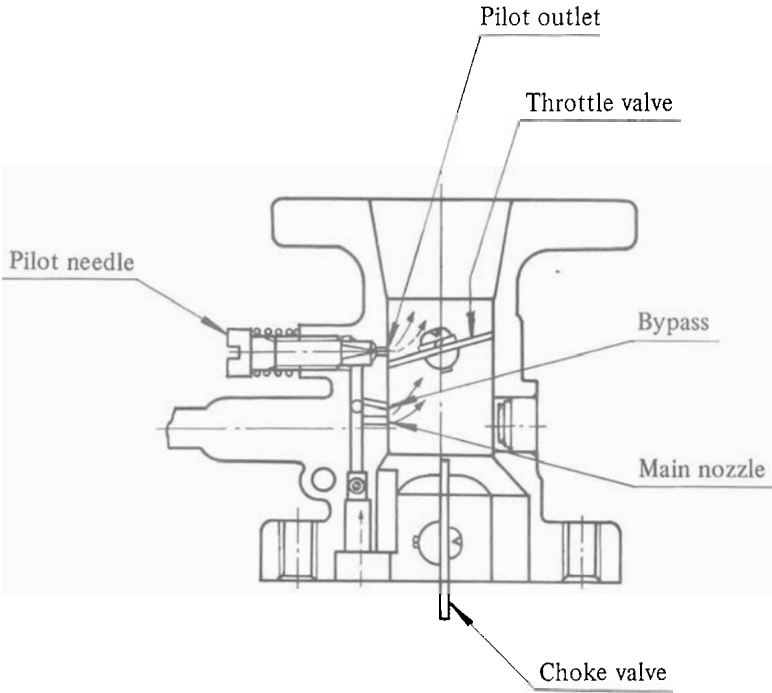


Float Type
(FA76, FA210)



← Fuel
← Air

Float Type
(FA130)



— Fuel
- - - Air

E. DISASSEMBLY

1. Draining engine oil

Remove drain-plug and drain off engine oil.

- In general, drain off the oil after the engine has been stopped and the oil is still warm.
- There are two drain plugs, one on the carburetor side and the other one on the opposite side, either of which can be used for draining the oil.
- Check for dirt and foreign matter in the oil. If any foreign matter is found, inspect the following parts during disassembly for any wear or damage: piston, piston rings, cylinder, con-rod, bearings, crank-pin, crankshaft and camshaft journals.

10 mm spanner.

2. Oil-gauge

There is an oil-gauge located on the carburetor side and on the opposite side. Remove both of them.

3. Output-shaft pulley

If the pulley is on the output shaft, remove it at this point

4. Air-cleaner

Remove the air-cleaner from the carburetor.

- Inspect the gasket for any damage, and if necessary replace it with a new one when reassembling.

5. Fuel-tank

(Pulse pump model) Remove the fuel-tank from the carburetor and crankcase.

- Inspect the gasket for any damage, and if necessary replace it with a new one when reassembling.

FA76: Screwdriver. 10 mm spanner.
FA130, FA210: Screwdriver. 13 mm spanner.



E-1

(Float model) After removing the center clamp for the fuel pipe except FA76, pull the fuel pipe off the carburetor and insert a 6 mm dia. bolt in the fuel pipe to prevent fuel flowing out. Then remove the four bolts holding the fuel tank in place and remove the fuel tank from the engine. Also remove the lower tank bracket from the crankcase.

10 mm spanner.



E-2

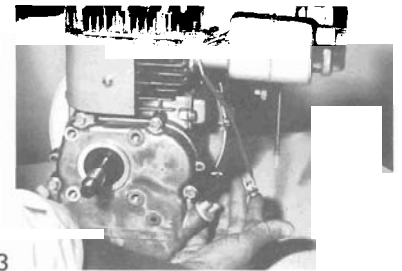
6. Governor arm

6-1. Loosen the governor arm nut.

6-2. Take the governor arm off the governor shaft, and then remove the governor link, link spring and governor spring from the governor arm.

6-3. Remove the other end of the governor link and link spring from the carburetor, and remove the other end of the governor spring from the speed control lever.

10 mm spanner.



E-3

7. Carburetor

(Pulse pump model) Remove the carburetor nuts and take off the carburetor, two gaskets and insulator.

- Inspect the gaskets for any damage, and if necessary replace them with new ones when reassembling.

10 mm spanner.



E-4

(Float model) Remove the inlet pipe from the cylinder.

8. Speed control plate assembly and breather cover

Remove the control plate assembly and breather cover from the crankcase.

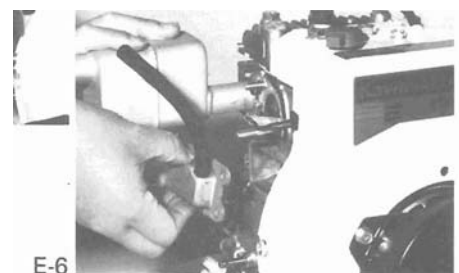
- If the gasket is damaged, replace it with a new one during reassembly.

10 mm box spanner.



E-5

10 mm box spanner.

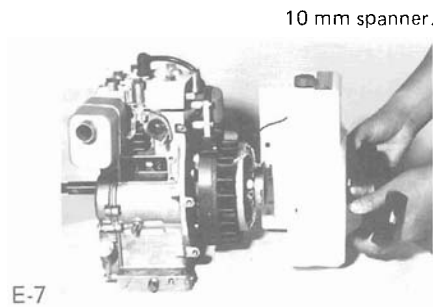


E-6

9. Fan housing

Remove the fan housing from the crankcase and cylinder head. (It is not necessary to remove the recoil starter from the fan housing.)

- For this operation, disconnect the wire going to the stop-switch.

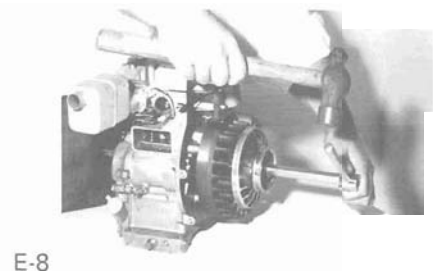


10. Flywheel

10-1. Loosen the nut by turning it counter-clockwise and take it off.

- Wedge a piece of wood against the vanes of the flywheel to stop it from turning.

FA76: 17 mm box spanner (plug-wrench).
FA130, FA210: 19 mm box spanner (plug-wrench).



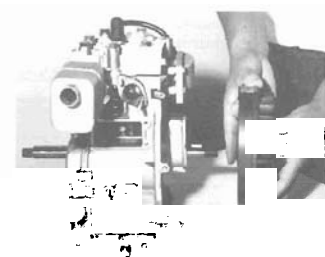
10-2. Use a pulley puller to remove the flywheel.

I 10-3. Pull the cap off the sparkplug.

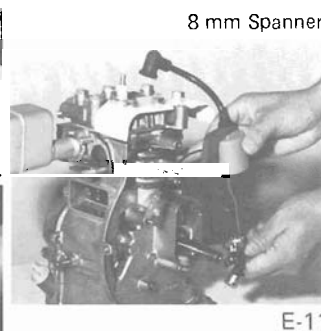
10-4. Take off the contact breaker cover and remove the ignition coil, the contact breaker and the condenser.

- Take care not to damage the wires.

Pulley puller



Screwdriver.



E-10

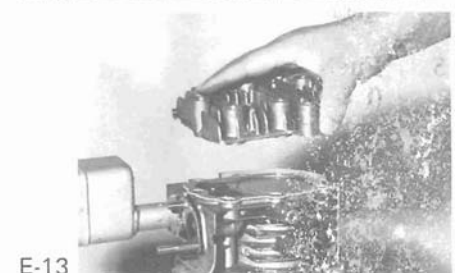
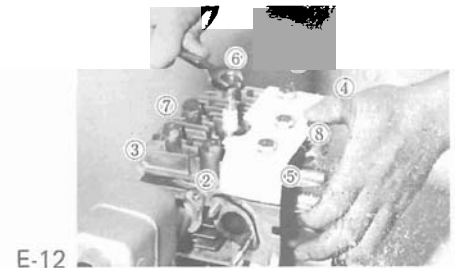
11. Cylinder head and cylinder head cover

11-1. Take out the sparkplug.

- Check the sparkplug gap, and look for any burning or carbon build-up on the electrodes, and replace the plug with a new one if necessary, or clean it and adjust it before re-using it.

11-2. Evenly loosen the cylinder head bolts in the same order as specified in the assembly instruction, and remove the cylinder head and cylinder head cover. Follow the order shown in the photo.

FA76: 10 mm spanner.
FA130, FA210: 13 mm spanner.

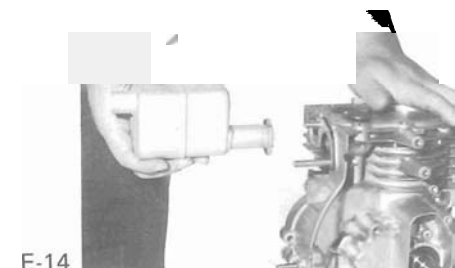


- Inspect for combustion gas leakage and any related gasket damage. If there is any sign of such leakage, take care when reassembling to tighten the bolts evenly to the specified torque. Replace the gasket if it is damaged.
- Inspect the combustion chamber for carbon build-up, and remove any such build-up prior to reassembly.

12. Muffler

Loosen the nuts and remove the muffler

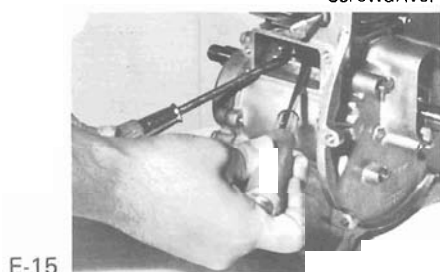
FA76: 10 mm spanner
FA130, FA210: 13 mm spanner



13. Valves

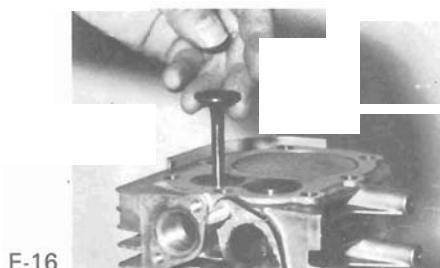
13-1. Use screwdrivers to remove the retainers.

Screwdriver.



E-15

13-2. Remove the valves from the cylinder.



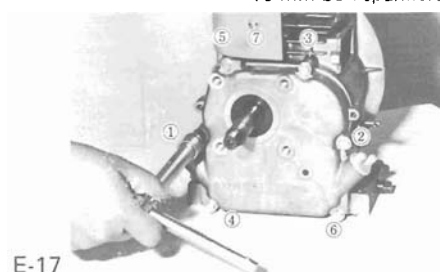
E-16

- Check that both valves are seating properly. If necessary, reface the valve seats.
- Inspect the valves for any damage, and replace any valve that is damaged. Also check the stems carefully.
- Remove any carbon build-up on the valves.

14. Crankcase cover

14-1. Evenly loosen the crankcase cover bolts in the same order as for assembly, and take out all the bolts. Loosen the bolts in the order shown in the photo.

10 mm box spanner.



E-17

14-2. Use a wooden (or plastic) hammer to gently tap the crankcase cover loose, and remove it from the crankcase. Do not try to prise it off by force.

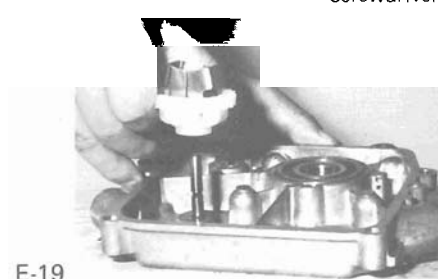
Wooden (or plastic) hammer.



E-18

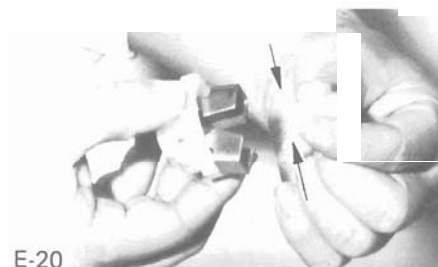
- Take care not to damage the oil seal. Check whether this oil seal has been damaged during crankcase removal, and if so replace it with a new one during reassembly.
- Check the governor assembly in the crankcase cover for any wear or malfunction.
 - If the governor gear or governor weight show any sign of damage, remove the governor gear assembly from the cover, take out the pin and remove the weight from the gear. Replace any damaged parts for reassembly. To remove the governor gear, grip the gear section firmly and pull it off straight along its shaft.

Screwdriver.



E-19

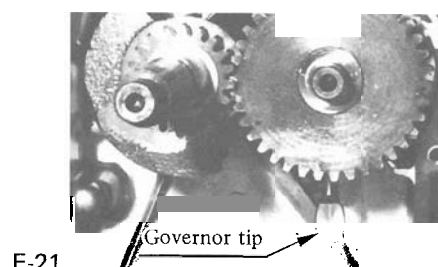
- Remove the governor sleeve if it is worn and replace it for reassembly. Only the sleeve needs to be removed. The photo shows the assembly after removal. Remove it by pressing the tip of a screwdriver against the arrowed part.



E-20

- Do not remove the governor gear except when necessary. If it is removed even once, replace it with a new one for reassembly.

- Check for wear to the governor tip. If it is worn, replace with a new one when reassembling.



E-21

15. Camshaft, tappet and governor tip

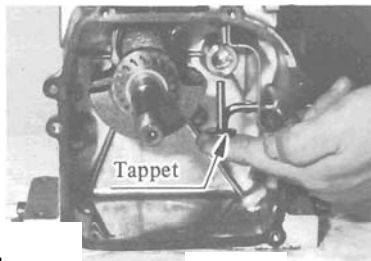
15-1. Remove the camshaft from the crankcase



E-22

- Inspect the cams and journals for any wear, and replace camshaft if necessary when reassembling.
(Refer to Settings Table)
- Inspect the camshaft bearings for wear.
(Refer to Settings Table)

15-2. Remove the tappets from the crankcase.



E-23

- After removing the tappets, make sure not to mix up the intake and exhaust sides, so they can be refitted in their original positions.
- Check for any damage to tappet stems and faces, and replace if necessary when reassembling.

15-3. Withdraw the snap-pin and remove the governor tip.

Thin nosed plier.

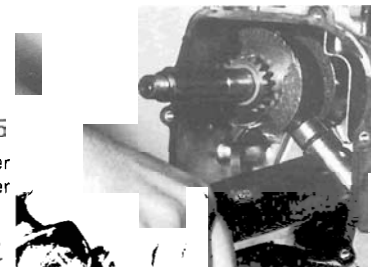


E-24

16. Con-rod cap (big-end disassembly)

16-1. Bend down the con-rod lock.

16-2. Loosen and remove the con-rod bolts.



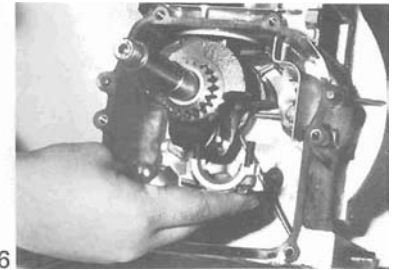
E-25

FA76: Hammer, Screwdriver
8 mm box spanner

FA130, FA210: Hammer.
Screwdriver,
10 mm box spanner

- Evenly loosen the two bolts.

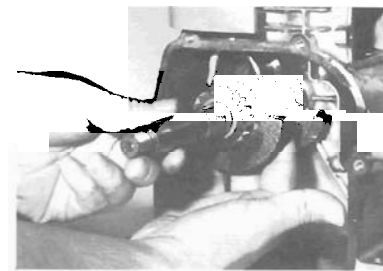
Remove the con-rod cap, splasher and con-rod lock together



E-26

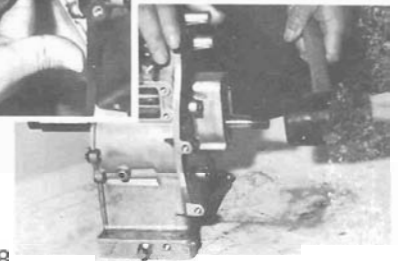
17. Crankshaft

Using a wooden (or plastic) hammer to gently tap the end of the crankshaft on the magneto side, remove the crankshaft.



E-27

Wooden (plastic) hammer.



E-28

- Carefully ease the con-rod big-end free of the crankshaft by tapping it very carefully with the wooden (or plastic) hammer.
- Take care not to damage the oil seal.
- With pump shaft models, take care not to lose a shim on the side of the crank gear.

18. Piston (with con-rod)

Withdraw the piston (with con-rod) from the cylinder by gently tapping the piston crown with a wooden (or plastic) hammer.

Wooden (plastic) hammer.



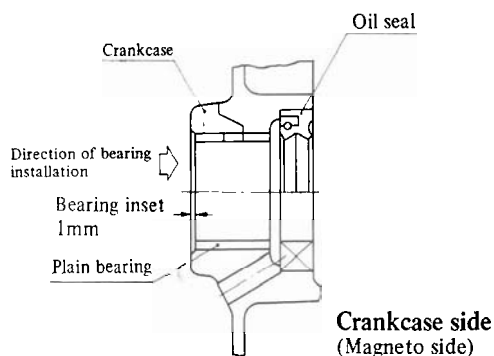
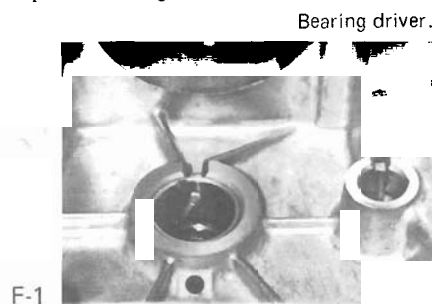
E-29

- Take care not to damage the cylinder.
- Check the degree of cylinder wear. (Refer to the Settings Table for wear limits.)
- Align the con-rod cap with the con-rod big-end and check the big-end bearing for damage; that is, look for any scoring on the crankpin. If there is any scoring, a new con-rod and crankshaft should be used for reassembly.

F. ASSEMBLY

1. Crankshaft bearing (when bearing is replaces)

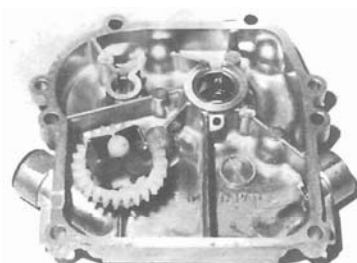
1-1. Insert the plain bearing into the crankcase.



- Align the oil groove with the hole in the plain bearing.
- The direction of the plain bearing groove must be as shown in the photo.
- The bearing should be pressed in 1 mm, as shown in the diagram.

1-2. Insert the ball bearing into the crankcase cover. Insert the plain bearing into the crankcase cover.

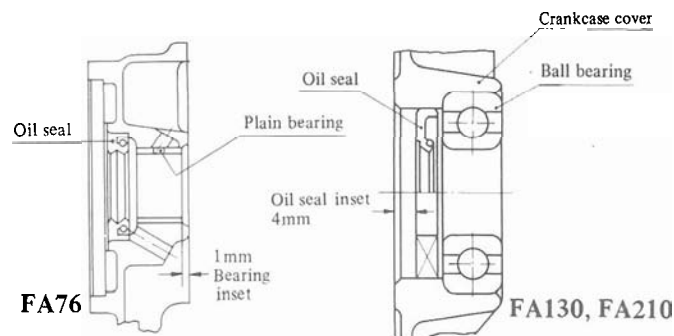
- Align the oil groove with the hole in the plain bearing.
- The direction of the plain bearing groove must be as shown in the photo.
- The bearing should be pressed in 1 mm, as shown in the diagram.



F-2



F-3



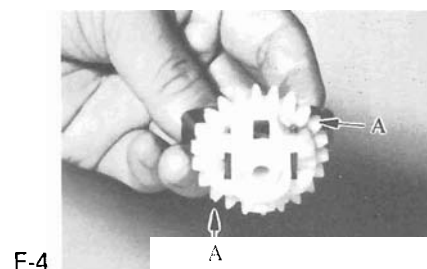
Crankcase cover side (PTO side)

1-3. Fit the crankcase and crankcase cover oil seals.

- The oil seals should be facing the way shown in the diagrams. The oil seal should be pressed right in, as shown.

2. Governor gear assembly (when this has been disassembled)

2-1. Fit the governor weight onto the governor gear with the pin.

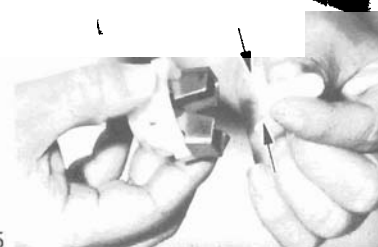


F-4

- If a governor gear has been removed, always use a new one for reassembly.
- Push the pins right in so it is against the shaped projection (photo, part A) on the governor gear.

2-2. Fit the governor sleeve. Use a screwdriver to press the two tongued parts of the sleeve into the groove of the governor gear.

Screwdriver.



F-5

2-3. Put the thrust washer on the governor gear shaft, and then press the governor assembly well on to the shaft.

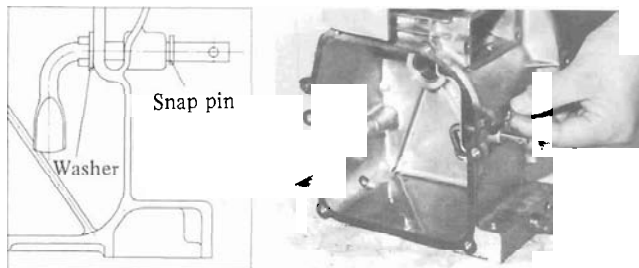


F-6

3. Governor tip

Put the washer shown in the diagram on the governor tip.

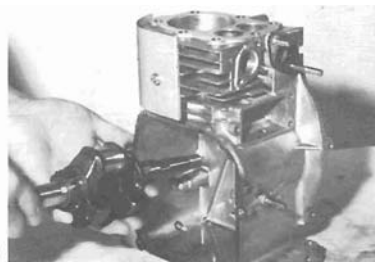
Insert the governor tip into the crankcase from the inside, and clip the snap-pin firmly.



F-7

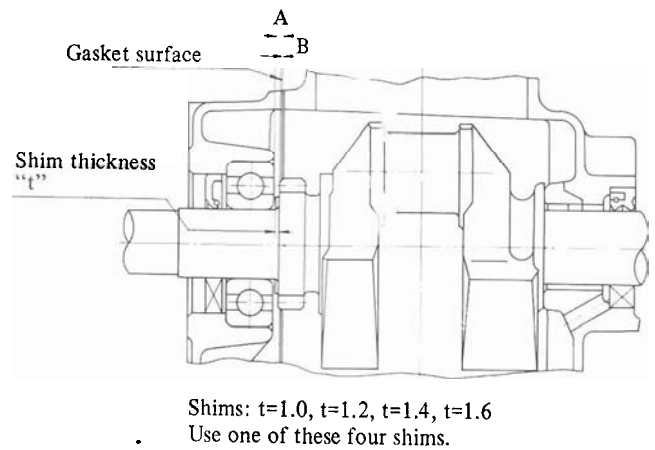
4. Crankshaft

Insert the crankshaft into the crankcase



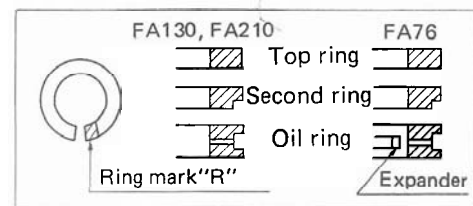
F-8

- First coat the crankshaft journals, bearings and oil seal sections with fresh oil.
- Take care not to damage the oil seals. (Pump shaft model (Shaft Code No. **06 & 07**))
- No shim adjustment is required on model FA76 in which both ends of crankshaft are supported by plain bearings.
- Replace a shim on the end of the crank gear. However, if the crankshaft or the crankcase has been replaced by a new one, measure the axial play and select the type of shim accordingly.
- Axial play is not to exceed 0.3 mm.
- Use one of the shims (which are 1.0, 1.2, 1.4 or 1.6 mm in thickness)
- To determine shim thickness: Measure A and B, then the required thickness "t" is that which provides $0 < A - B - t \leq 0.3$

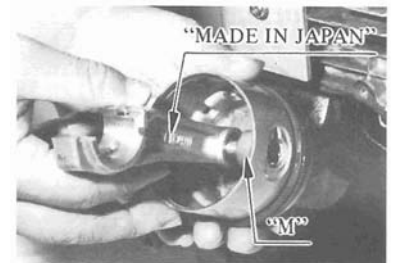


5. Piston and con-rod

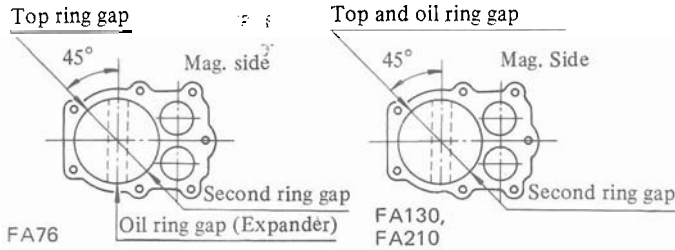
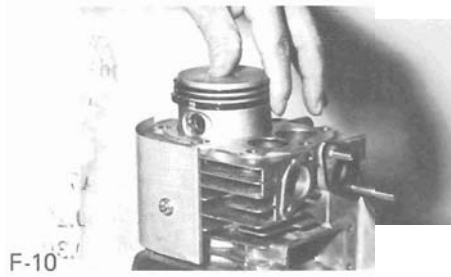
5-1. Fit the piston rings (the oil ring, second ring and top ring) in the correct grooves in the piston in accordance with the following procedure.



- Take care not to put a ring in the wrong groove.
 - Have the side of each ring marked facing upwards.
- 5-2. At this point, fit the snap-ring on just one side of the piston.
- 5-3. Position the con-rod small-end on the piston, so that the "M" mark on the piston and the "Made In Japan" mark on the con-rod are on the same side. Then insert the piston pin and put the snap-ring on the other end of the pin.

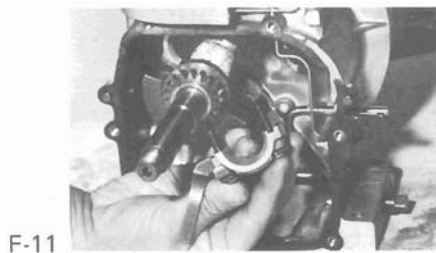


- Put a coating of fresh oil on the con-rod small-end and bearing before inserting the piston pin.
- 5-4. Insert the piston/con-rod assembly into the cylinder, so that the "Made In Japan" mark on the con-rod is on the magneto side of the engine.
- Before inserting the assembly, arrange the openings of the piston rings to the positions shown in the diagram.



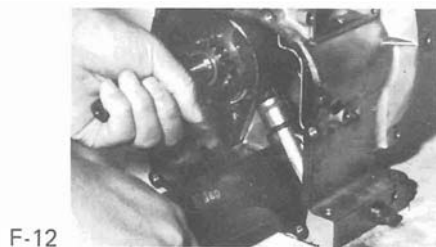
- Give a liberal coating of fresh oil to the con-rod big end bearing, the outside of the piston and the inner wall of the cylinder before inserting the assembly into the cylinder.

5-5. Align the con-rod cap, together with the con-rod lock washer and splasher, with the con-rod already located on the crankpin. Then insert and finger-tighten the two con-rod bolts.



- In principle a new con-rod lock washer should be used each time the unit is reassembled.
- Make sure the splasher is the right way around.

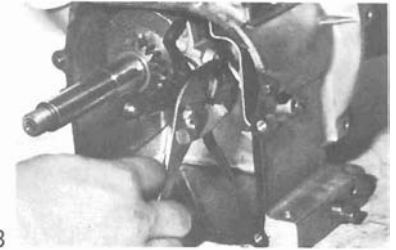
5-6. Tighten the con-rod bolts evenly, a little at a time. FA76 : 8mm box spanner, Torque wrench
FA130 FA210 : 10mm box spanner, Torque wrench



- Use a torque wrench to tighten finally.
Specified torque
FA76: 0.7 kg-m
FA130, FA210: 1.2 kg-m

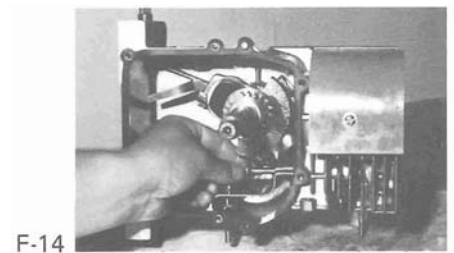
5-7. Bend the con-rod lock washer up against the bolt heads.

- It is very important to make sure this is done properly, otherwise the engine may be irreparably damaged.



6. Tappets and camshaft

6-1. Insert the tappets into the tappet guide holes from the inside of the crankcase. Tappets taken from the intake side should be replaced in the intake side, and the same goes for the exhaust side.



First give the tappets a fresh coating of oil. It is easier to have the crankcase lying on one side until the camshaft has been inserted.

6-2. Insert the camshaft into the crankcase, with the mark (" ") on the crank gear lined up with the mark on the cam gear.



Crank gear • Cam gear

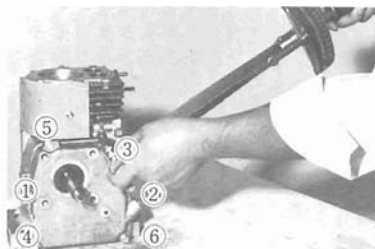
- Before fitting the camshaft, give a fresh coating of oil to the journals, cams and the bearings.

7. Crankcase cover

In the case of the FA76 float carburetor type, the crankcase cover should be fastened together with fuel pipe clamp at the position 3 shown below.

Carefully position the gasket on the mounting surface of the crankcase. And fit the cover onto the crankcase with the governor gear in the cover positioned so as to mesh with the cam gear and then tighten up the bolts.

10 mm box spanner, Torque wrench.
10 mm box spanner, Torque wrench.



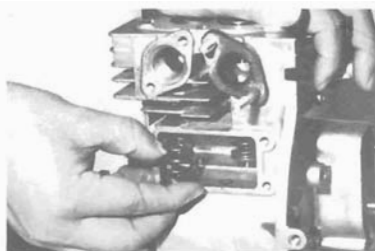
F-16

- Replace the gasket if it is damaged.
- It is important to tighten the bolts evenly and a little at a time (and in the order shown in the photo).

Tightening torque: 0.6 kg-m.

8. Valves (checking tappet clearances)

8-1. Insert the valve springs and retainers in the spring chamber.



F-17

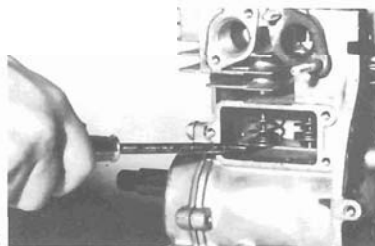
8-2. Insert the valves in the valve guides.

Before insertion coat the valve stems with fresh oil.

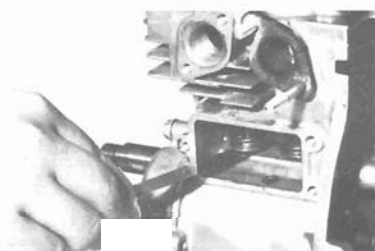
8-3. Lever each valve spring up with a screwdriver and slot the retainer into the valve stem groove.

Screwdrivers.

Thickness gauge.



F-18



F-19

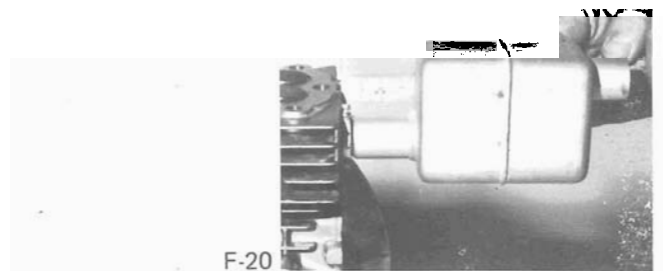
- Bring the piston to t.d.c. on the compression stroke (that is, with intake and exhaust valves closed), and measure the tappet clearances to make sure they are within the following standard ranges.

	FA 76	FA130, FA210
Intake (Cold)	0.10~0.20	0.12~0.18 mm
Exhaust (Cold)	0.10~0.30	0.10~0.34 mm

9. Muffler

Put the muffler onto the exhaust port with the gasket and tighten the flange nuts evenly.

FA76: 10 mm spanner.
FA130, FA210: 13 mm spanner.



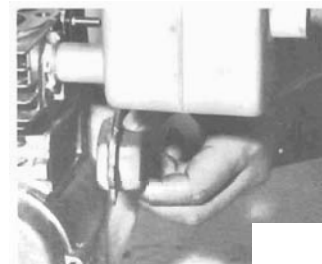
F-20

10. Breather cover and control panel assembly

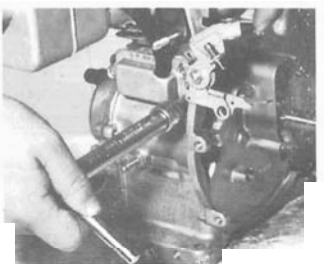
10-1. Fit the breather cover, with its gasket, and the control panel assembly.

10 mm box wrench.

10 mm box wrench.



F-21



F-22

10-2. Plug the breather tube into the cover.

11. Cylinder head

11-1. First arrange the gasket correctly, and put the cylinder head in position. Then place the cylinder cover on the cylinder head.

FA76: 10 mm box wrench. Torque wrench
FA130, FA210: 13 mm box wrench. Torque wrench.

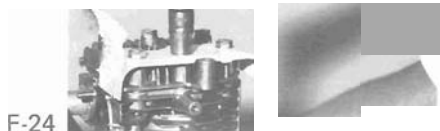


F-23

(Float model) Then position the upper stay of the fuel tank on the top, and hand-tighten the head bolts. Next, carefully tighten the bolts evenly a little at a time with a box wrench.

- Finally, tighten with a torque wrench to the specified torque.

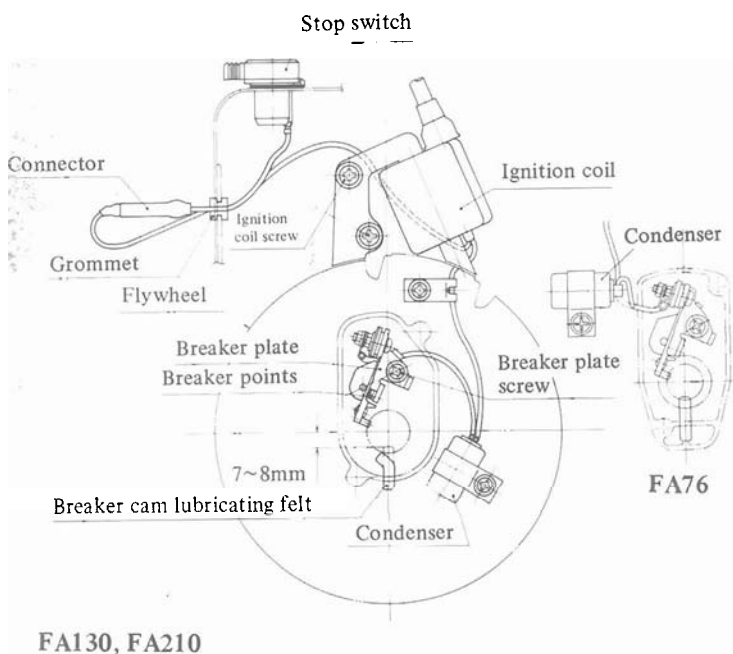
Specified torque
FA76: 0.7 kg-m
FA130, FA210: 2 kg-m



F-24

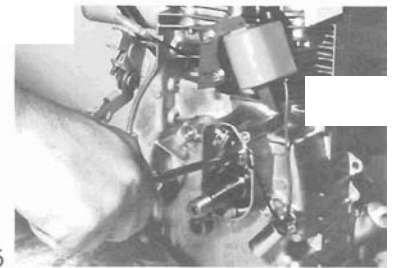
12. Flywheel (adjusting the ignition timing)

Ignition System



12-1. Tighten the ignition coil just enough so it can still be moved slightly.

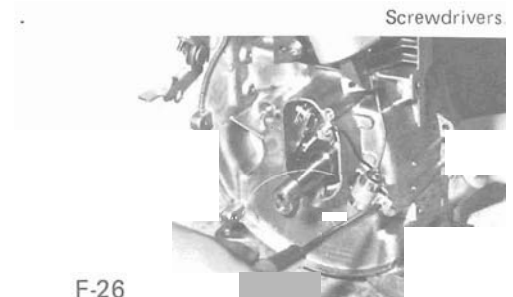
12-2. Position the contact breaker and fasten its plate screw just enough to put a light tension on the plate.



F-25

12-3. Fit the condenser.

- In the case of the FA76, position of the condenser is different from other models, as shown above.

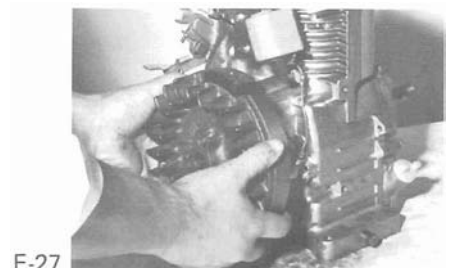


F-26

12-4. Locate the flywheel key in the crankshaft keyway.

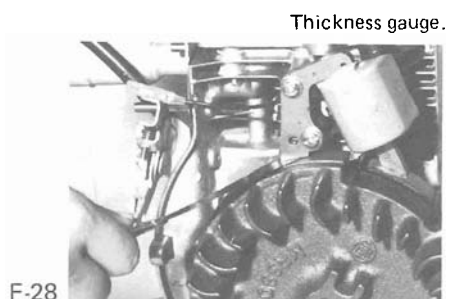
- The flywheel will be fitted and removed several times after this, but the key should remain in the keyway.

12-5. Position the flywheel on the crankshaft and finger-tighten the flywheel nut.



F-27

12-6. Move the ignition coil core slightly to adjust the gap between core and flywheel rim to 0.5 mm, using a thickness gauge to measure. Then tighten up the ignition coil.



F-28

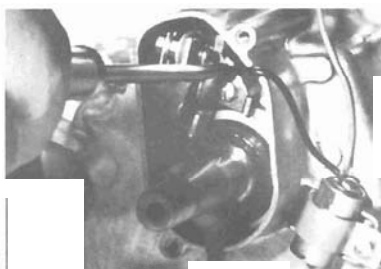
- 12-7. Slowly turn the flywheel clockwise until the edge of the flywheel rim is in line with the edge of the coil core.



F-29

- The ignition timing adjustment is made so as to cause ignition at this piston position (crank angle).
- 12-8. Maintaining the alignment of flywheel and core obtained in 12-7, remove the flywheel nut and pull the flywheel off.
- Take care not to rotate the flywheel when you remove it.
- 12-9. Move the contact breaker plate a fraction at a time, until you confirm the closed points are just about to start to open. Then tighten up the contact breaker plate screw. Ignition will take place at this instant.
- Use a tester to confirm the position at which the points are about to open.

Screwdriver, Tester.



F-30

- 12-10. Turn the crankshaft clockwise and use a thickness gauge to measure the widest gap the points open to. This gap should be 0.3 mm – 0.5 mm.

Thickness gauge.

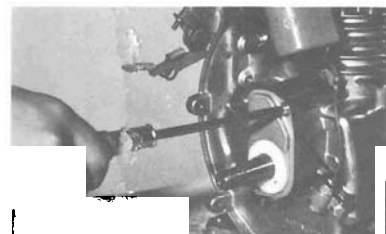


F-31

- 12-11. Fit the flywheel in position again, and finger-tighten the flywheel nut as before. Then turn the flywheel slowly clockwise and check that the contact breaker points are just starting to open at that instant when the edge of the flywheel rim is in line with the edge of the ignition coil core. (Refer to F-29)

- Use a test-meter to confirm the position at which the points are about to open.
- If the timing is off, repeat steps 12-7 through 12-10.

- 12-12. Remove the flywheel again, then fit on the points cover.



F-32

- Take care the wire is not caught or does not stick up.
- 12-13. Fit the flywheel, starter pulley (with screen) and washer, in that order, and tighten up the flywheel nut.

Specified torque

FA76: 3 ~ 3.5 kg-m

FA130, FA210: 6 ~ 6.5 kg-m

- Make sure that the flywheel key is properly located in the crankshaft keyway.
- Use a suitable piece of wood to brace against the flywheel vanes to stop the flywheel from turning when tightening the nut.

FA76: 17 mm box spanner, Torque wrench.
FA130, FA210: 19 mm box spanner, Torque wrench.



F-33

- The rotating screen (optional) is included in the photo.
- 12-14. Screw the sparkplug into the cylinder head, and push the sparkplug cap (with cable) down onto the top of the plug.
- Position the plug cable along the cylinder head cover guide.

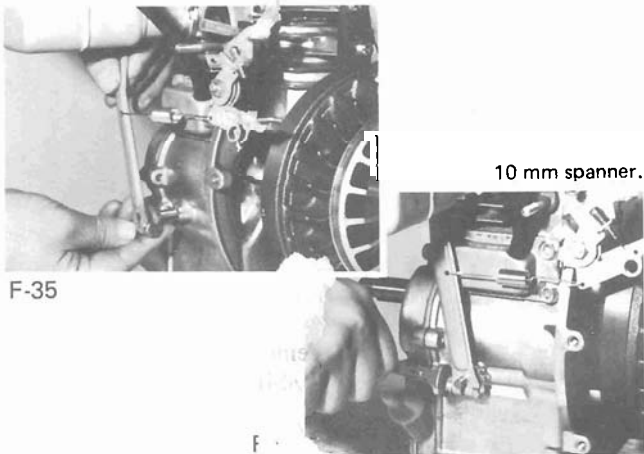
13. Carburetor and governor (governor adjustment)

- 13-1. Hook one end of the governor spring on the speed control lever and the other end on the governor arm.



F-34

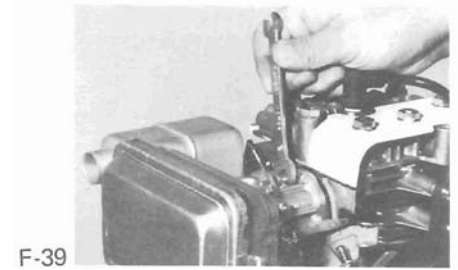
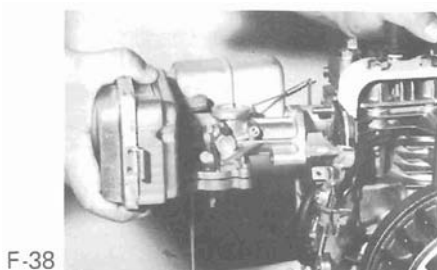
- Refer to the photo for which way to position governor spring.
- 13-2. Lightly fix governor arm on the governor tip shaft.



- 13-3. **(Pulse pump model)** Position a gasket, insulator and another gasket, in that order, on the inlet port of the cylinder.
- Replace any gasket or insulator that has been damaged.
- 13-4. **(Float model)** For FA76/FA130: Put a gasket, insulator, and another gasket on the cylinder intake port and fit the inlet pipe to the port.
For FA130: Put a gasket on the cylinder intake port and fit the inlet pipe to the port.
- 13-5. **(Pulse pump model)** Use the governor link and link spring to link the governor arm to the carburetor (throttle valve).



- Do not carry out steps 13-5 and 13-6 in reverse order.
- 13-6. **(Pulse pump model)** Fix the carburetor onto the cylinder.



13-7. **(Float model)**

For FA76, FA210: Hold gasket, carburetor, gasket and the air cleaner element case together and fix them to the carburetor with two thru-bolts.

For FA130: Use the governor link and link spring to link the governor arm to the carburetor (throttle valve).

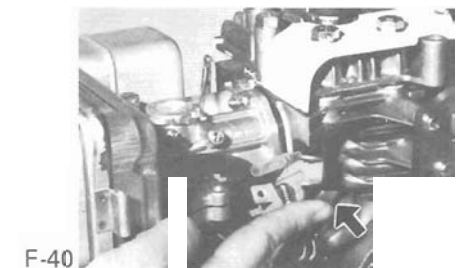
— Do not carry out steps 13-7 and 13-8 in reverse order.

13-8. **(Float model)** Put a gasket on the inlet pipe flange and fix the carburetor onto the inlet pipe.

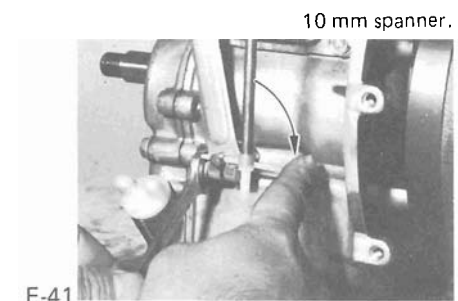
Next, put a gasket on the carburetor, and fix air cleaner element case in place.

- Tightening the flange nuts evenly and a little at a time is especially important here. If the nuts are unevenly tightened, it can cause starting difficulties, power drop and flange damage.

13-9. Pull up the speed control lever to fully open the throttle valve.



13-10. Poke a rod of the right size into the governor tip shaft hole and turn the shaft fully clockwise, and with it in this position tightly fix the governor arm onto the governor tip shaft.



- 13-9 and 13-10 form the governor adjustment.

14. Fan housing (with recoil starter)

14-1. Fix the fan housing on the cylinder (crankcase).

10 mm spanner.



- Make sure the high tension cable is not caught anywhere in the fan housing.
- Also make sure there is a grommet on the wire outlet.

14-2. Connect the wire going to the stop switch.



15. Fuel tank

15-1. **(Pulse pump model)** Position the gasket on the fuel tank and screw the fuel tank to the carburetor. Also screw the fuel tank stay to the crankcase.

FA76: Screwdriver, 10 mm spanner.

FA130, FA210: Screwdriver, 13 mm spanner.



F-44



F-45

- Evenly tighten the three screws that fasten the fuel tank to the carburetor, and at the same time tighten the fuel tank stay screw.



F-46

- Replace any damaged gasket.

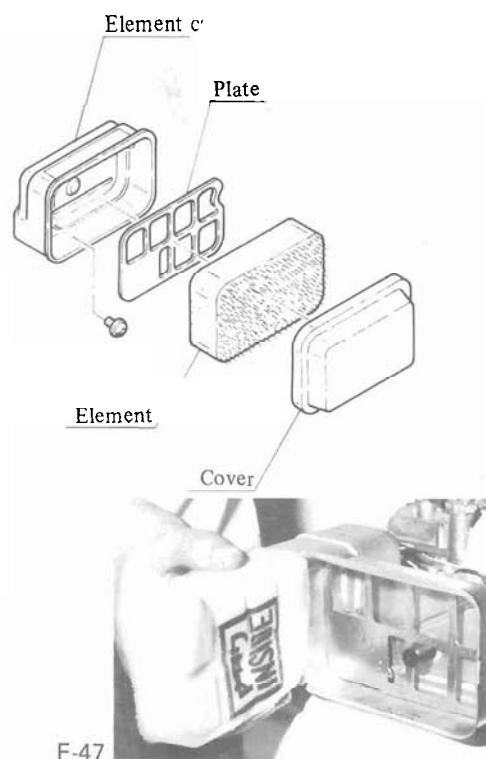
(Float model) Screw the fuel tank lower stay to the crankcase. Fit the fuel tank between the upper and lower tank stays. Tighten the four fixing bolts with washers evenly, then connect the fuel pipe to the carburetor.

16. Air cleaner

16-1. **(Foam type)**

Fit the air cleaner onto the carburetor.

- Replace the gasket if it is damaged.
- If the element is dirty:
 - Wash it in kerosene, wring it out and dry it.
 - Soak it in engine oil and wring out any excess.
 - Replace the element in the case, with the side marked "IN" "DE" to the back.



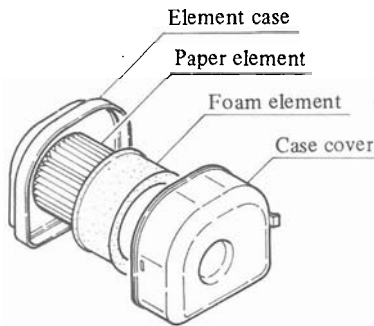
- Check when fitting the case cover that the edge of the element is not twisted.

(Dual element type)

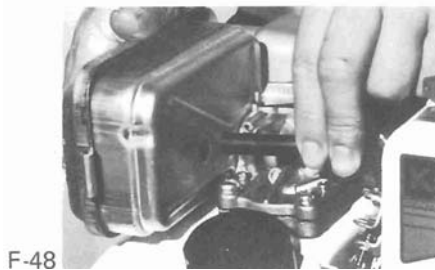
Fit the air cleaner on to the carburetor.

- Replace the gasket if it is damaged.
- If the elements are dirty:
 - Remove foam element by sliding it over paper element.
 - Wash the elements in liquid detergent and water. Rinse until water remains clear, and dry them.
 - Soak the foam element in engine oil, and squeeze it to remove excessive oil. Don't soak the paper element in oil.

Note: Foam elements should be cleaned every 25 hours and paper elements every 100 hours. Clean them more often if used under dusty conditions.



16-2. Insert the free end of the breather tube into the hole in the back of the air cleaner.



17. Replace the drain plugs.

18. Fill with oil up to the specified level.

19. Replace the oil gauges.

20. Fill the fuel tank.

Refer to the Instruction Manual for details concerning 18 and 20. These steps are required for the following carburetor adjustment, engine speed regulation and trial operation.

21. Carburetor adjustment (idling adjustment)

The carburetor has more effect on engine performance than any other single unit, and it has been completely adjusted before leaving the factory. It should therefore not be dismantled or readjusted by non-expert users. However, when the carburetor has been disassembled and reassembled in the dealer's service shop, one readjustment is necessary. That is the adjustment of the slow channel mixture (air-fuel ratio) when the engine is idling. If this adjustment is incorrect it can cause irregular starting, erratic idling, engine stoppages and increased fuel consumption.

21-1. To obtain an initial setting, first screw the pilot airscrew right in, then unscrew it by the specified amount.

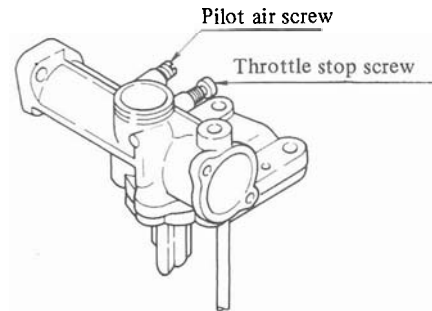
- The soft pilot airscrew taper-section is easily damaged, so make sure it is only lightly screwed in, not tightly.

(Pulse pump model) — Pilot air screw initial setting: FA130, FA210: Unscrew 1¼ turns
FA76: Unscrew 1 turn

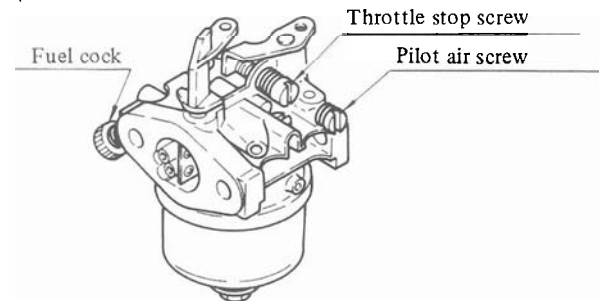
(Float model) — Pilot air screw initial setting: FA130, FA210: Unscrew 1½ turns
FA76: Unscrew 1¼ turns

21-2. Next, unscrew the idling limiter to the point where it does not reduce engine speed any more, then place the speed control lever at the lower end.

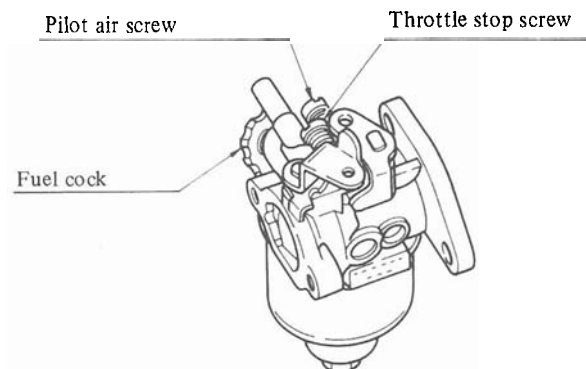
Plus pump type



Float type (FA76, FA210)



Float type (FA130)



21-3. Start the engine and let it warm up thoroughly. (Float model) For this screw the fuel cock home, then unscrew it 1½ turns to turn the fuel supply on.

- 21-4. Gradually unscrew the throttle stop screw until the engine speed drops almost to the point of stopping.
- 21-5. Then turn the pilot air screw to bring the engine speed up just a fraction; the engine speed will come up gradually and then suddenly drop. Determine the point where the engine speed is highest, and leave the pilot air screw at that setting for the moment.
- 21-6. Gradually unscrew the throttle stop screw to reduce the engine speed until it is barely turning over.
- 21-7. Screw the pilot air screw either way to see if doing this raises the engine speed at all. If the engine speed increases even a fraction, repeat steps 21-4 and 21-5.
When turning the pilot air screw either way no longer increases the engine speed, carburetor adjustment is finished. The pilot air screw opening at this point is its final setting, and will be within $\pm\frac{1}{4}$ turns out from the initial setting.

22. Engine speed settings (no-load)

The engine has specific maximum and idling speed settings. These settings have been completed in the factory. However, the following readjustments are necessary when the engine has been disassembled and reassembled in the dealer's service shop.

22-1. CARBURETOR IDLE

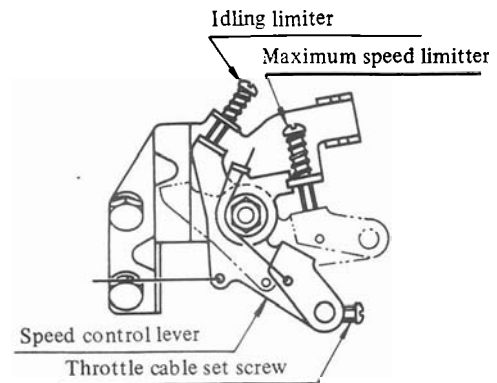
Hold throttle valve in closed position and adjust throttle stop screw to 1500 r.p.m.

GOVERNED IDLE

Release the throttle valve. Adjust idling limiter to 1600 r.p.m.

22-2. MAXIMUM SPEED

Adjust maximum speed limiter to 4000 r.p.m.



- It is important to first screw in the speed limiter enough to bring the engine speed well below the specified maximum, then gradually unscrew it to slowly bring the speed up to the specified level.

Do not let the engine speed exceed the specified level during this adjustment, even for an instant.

G. SETTING TABLE

Item			FA76	FA130	FA210
Ignition timing			23° B.T.D.C.		
Contact breaker gap (Max.)			0.3 ~ 0.5 mm		
Valve timing At standard tappet clearance when cold (*)	Intake	Open	50° B.T.D.C.	48° B.T.D.C.	40° B.T.D.C.
		Closed	80° A.B.D.C.	120° A.B.D.C.	117° A.B.D.C.
	Exhaust	Open	77° B.B.D.C.	97° B.B.D.C.	80° B.B.D.C.
		Closed	37° A.T.D.C.	57° A.T.D.C.	40° A.T.D.C.
Tappet clearances	Intake		0.10 ~ 0.20 mm	0.12 ~ 0.18 mm	
	Exhaust		0.10 ~ 0.30 mm	0.10 ~ 0.34 mm	
Sparkplug gap			0.6 ~ 0.7 mm		
Lubricants	Max. oil capacity		320 cc	500 cc	600 cc
	Min. oil capacity		200 cc	300 cc	350 cc
Carburetor	Pulse pump model	Pilot air screw initial setting	Unscrew 1 turn	Unscrew 1¼ turns	
	Float model	Fuel cock opening	Unscrew 1½ turns		
		Pilot air screw initial setting	Unscrew 1¼ turns	Unscrew 1½ turns	
Engine speed (no-load)	Idling	Carburetor	1500 rpm	—	1500 rpm
		Governed	1600 rpm	1600 rpm	1600 rpm
	Max.		4000 rpm		

B.T.D.C. : Before Top Dead Center
 A.B.D.C. : After Bottom Dead Center
 B.B.D.C. : Before Bottom Dead Center
 A.T.D.C. : After Top Dead Center

H. TORQUE SETTINGS

(kg-m)

Item		FA76	FA210	FA210
Cylinder head bolts		0.7	2.0	2.0
Con-rod bolts		0.7	1.2	1.2
Flywheel nut		3.5	6.0 ~ 6.5	6.0 ~ 6.5
Drain plug		1.4	1.4	1.4
General nuts and bolts	M8P1.25	1.5	1.5	1.5
	M6P1.0	0.6	0.6	0.6
	M5P0.8	0.35	0.35	0.35

I. STANDARD TOLERANCES

(mm)

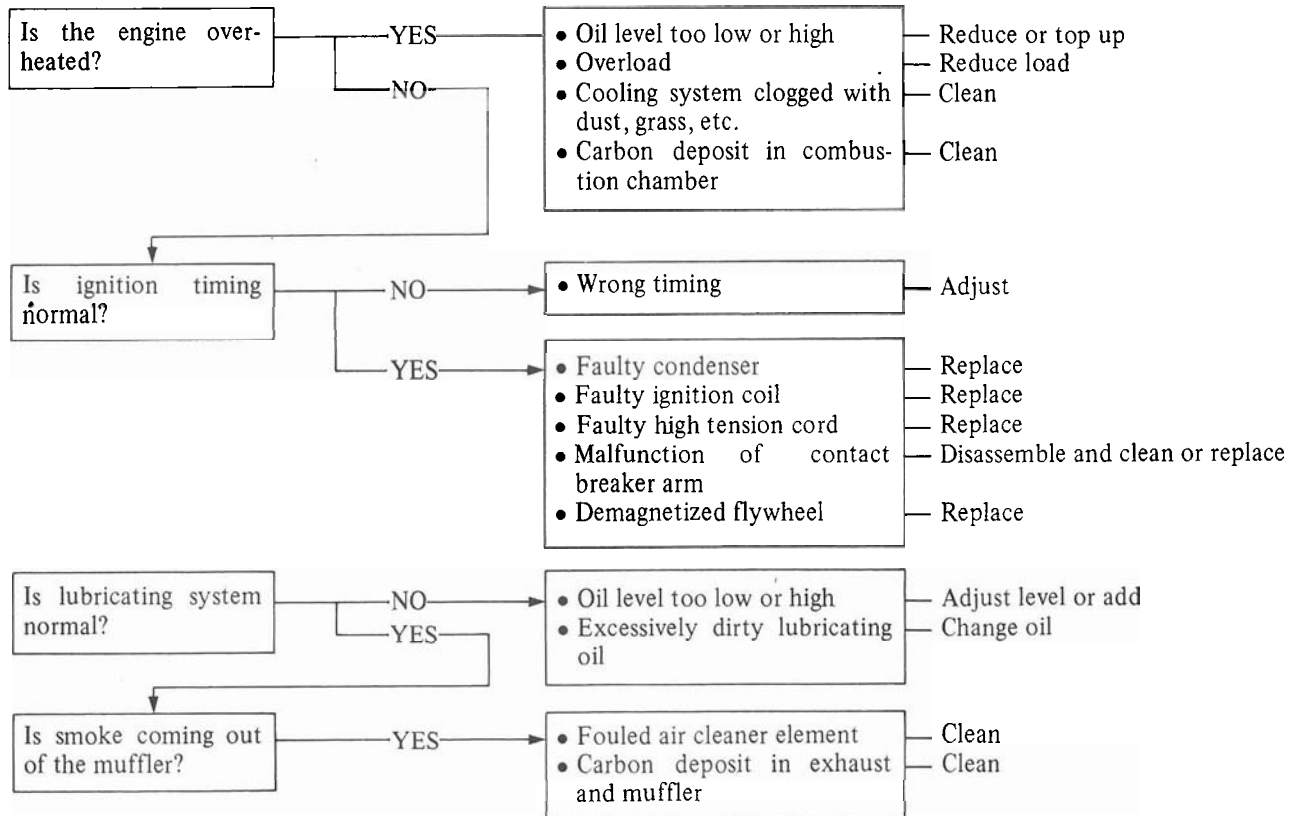
Item		FA76	FA130	FA210	Remedy
Throttle shaft play		0.1 max.	0.1 max.	0.1 max.	Replace
Cylinder bore		52.07 max.	62.07 max.	72.07 max.	Replace
Clearance between piston and cylinder		0.20 max.	0.25 max.	0.25 max.	Replace
Clearance between top ring and ring groove		0.15 max.	0.15 max.	0.15 max.	Replace
Clearance between second ring and ring groove		0.15 max.	0.15 max.	0.15 max.	Replace
Clearance between oil ring and ring groove		0.15 max.	0.15 max.	0.15 max.	Replace
Top ring gap		0.10 max.	0.10 max.	0.10 max.	Replace
Second ring gap		0.10 max.	0.10 max.	0.10 max.	Replace
Oil ring gap		0.10 max.	0.10 max.	0.10 max.	Replace
Clearance between piston and piston pin		0.05 max.	0.05 max.	0.05 max.	Replace
Con-rod big end side play		0.70 max.	0.70 max.	0.70 max.	Replace
Clearance between con-rod small end and piston pin		0.05 max.	0.05 max.	0.05 max.	Replace
Crank pin diameter		19.95 min.	23.92 min.	26.92 min.	Replace
Clearance between con-rod big end and crank pin		0.07 max.	0.10 max.	0.10 max.	Replace
Clearance between crankshaft and bearing (Bush type)		0.13 max.	0.13 max.	0.13 max.	Replace
Clearance between camshaft and bearing (Bush type)		0.10 max.	0.10 max.	0.10 max.	Replace
Ball bearing play		—	0.30 max.	0.30 max.	Replace
Cam lift (Base dia plus lift)	Intake	17.35 min.	23.25 min.	26.45 min.	Replace
	Exhaust	17.35 min.	23.25 min.	26.35 min.	Replace
Free length of valve spring		20.50 min.	23.50 min.	23.50 min.	Replace
Width of valve seat		0.5 ~ 1.1	1.0 ~ 1.6	1.0 ~ 1.6	Correct
Clearance between stem and valve guide		0.15 max.	0.15 max.	0.15 max.	Replace
Clearance between tappet and tappet guide		0.10 max.	0.10 max.	0.10 max.	Replace
Tappet clearance (cold)	Intake	0.1~0.2	0.12~0.18	0.12~0.18	Correct
	Exhaust	0.1~0.3	0.10~0.34	0.10~0.34	
Axial play	Crankshaft	0.6 max.	0.6 max.	0.6 max.	Correct
	Camshaft	0.6 max.	0.6 max.	0.6 max.	

J. TROUBLESHOOTING

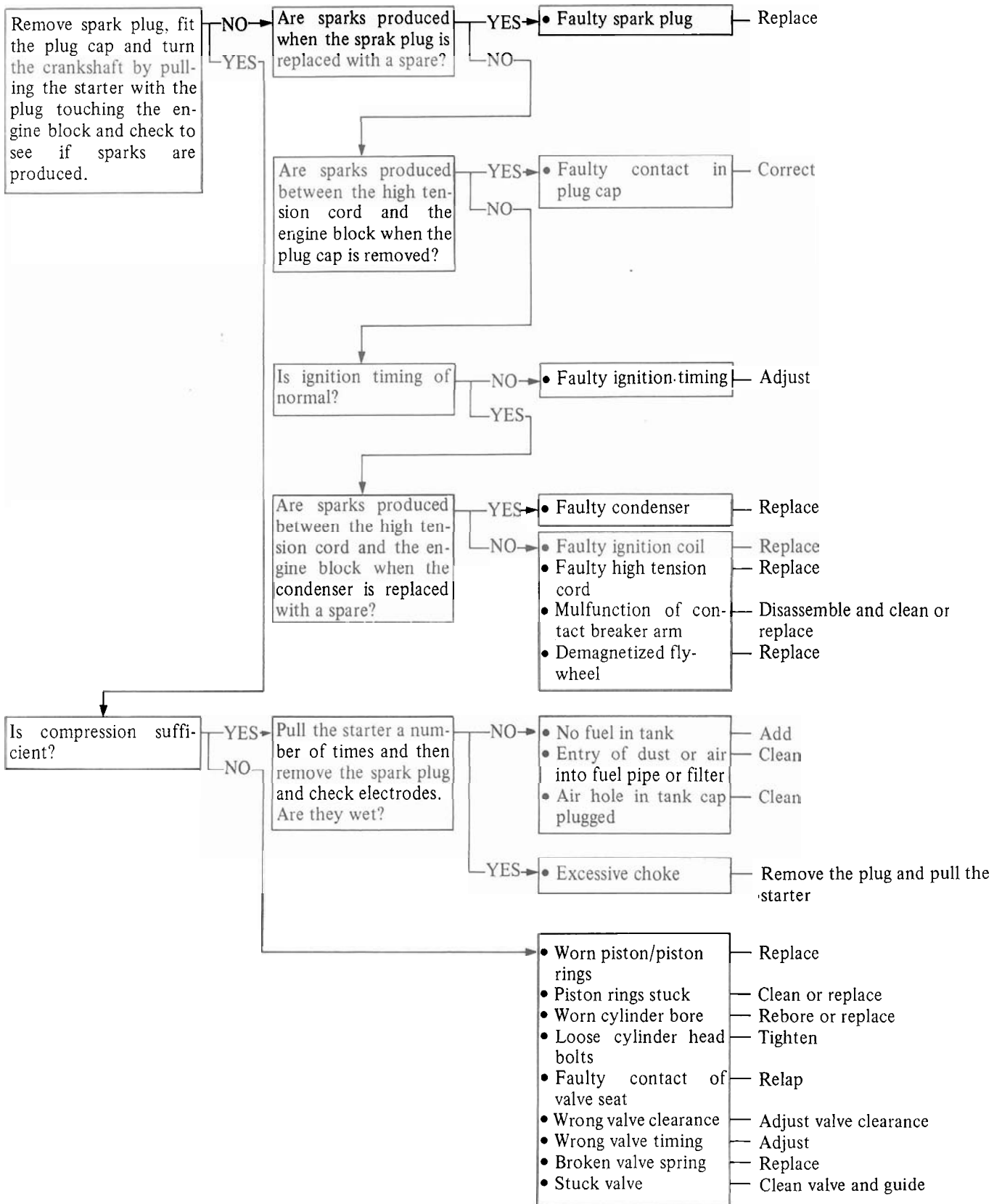
If the engine malfunctions, it is first necessary to check if the way the engine is being used is correct. If the engine malfunctions even if it is being used correctly, it is important to systematically carry out troubleshooting starting with easy items.

This section describes typical troubleshooting procedures. Do not unnecessarily disassemble the carburetor, magneto or engine unless it has been found to be the cause of the malfunction.

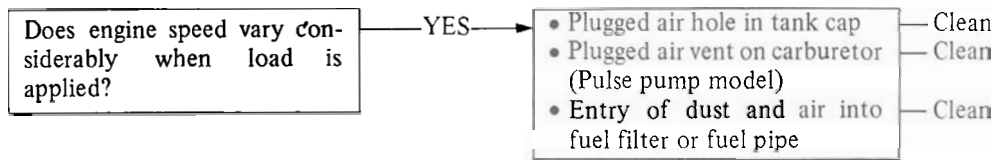
Low Power Output



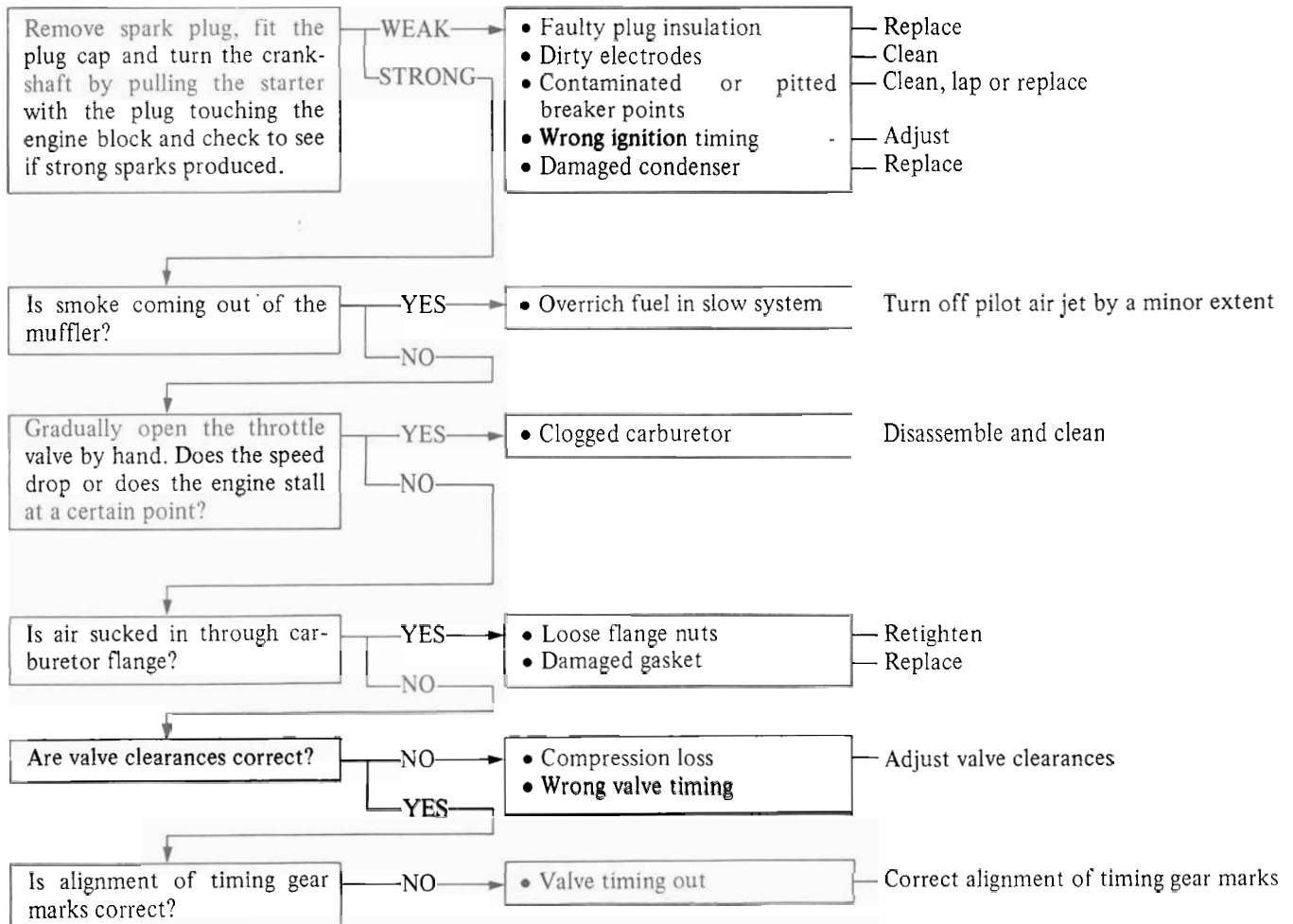
Starting Difficulties



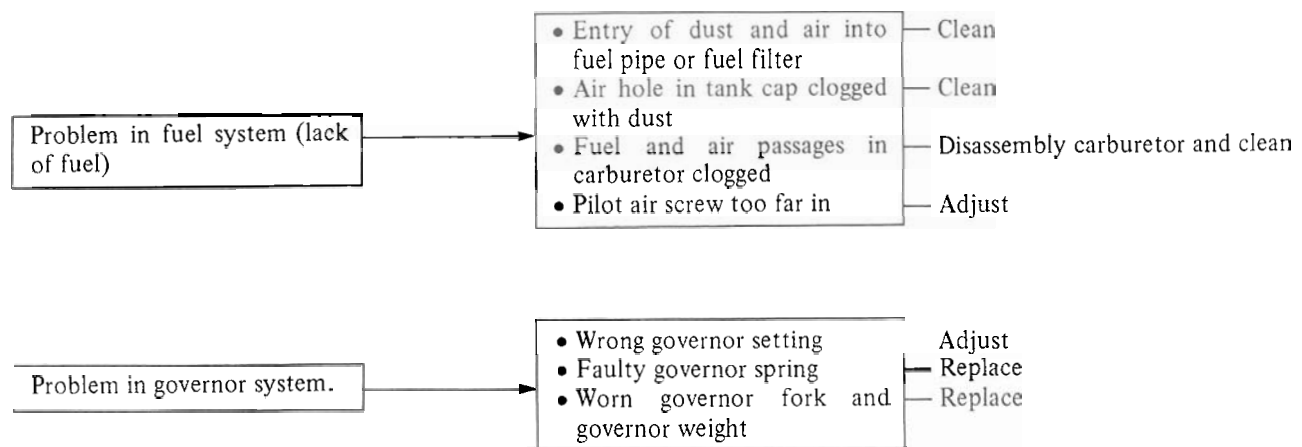
Engine Malfunctions at High Speed



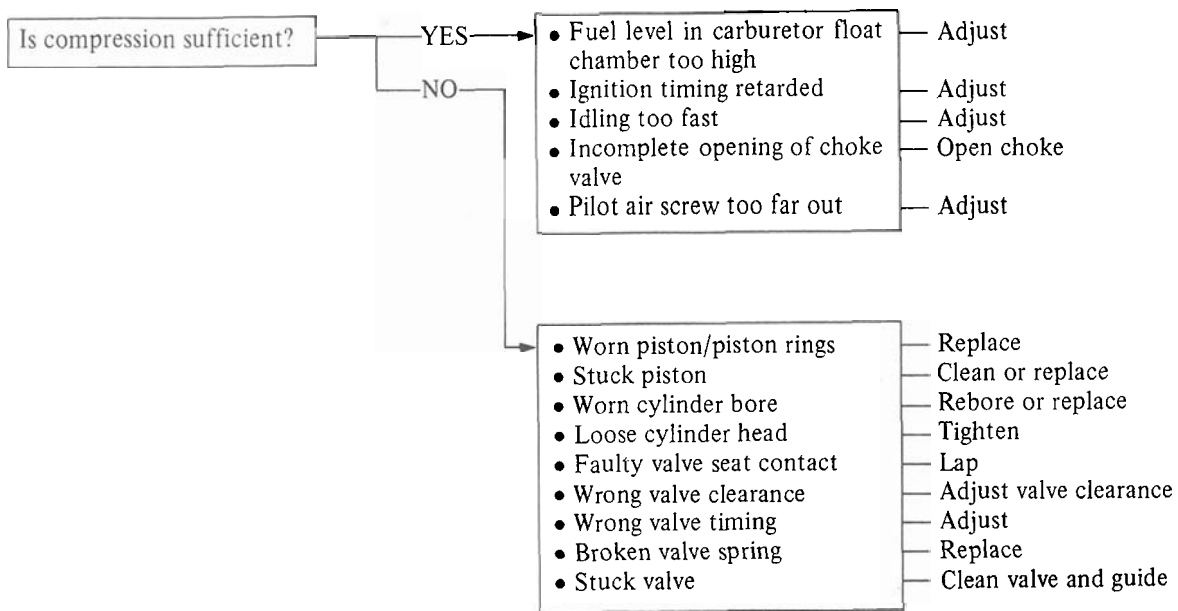
Engine Malfunctions at Low Speed



Engine Hunts



Excessive Fuel Consumption



Excessive Oil Consumption

