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 counterbalance 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.

**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.

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

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

*Direction of rotation:*
Counter clockwise, viewed from power take-off side.

*Finish:*
Anti-rust, painted.

<table>
<thead>
<tr>
<th>Bore and stroke</th>
<th>62 x 43 mm [2.44 x 1.69 in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston displacement</td>
<td>129 cc [7.92 cu. in]</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>6.4 : 1</td>
</tr>
<tr>
<td>Maximum output</td>
<td>3.1 HP/4000 rpm [SAE J607a]</td>
</tr>
<tr>
<td>Maximum Torque</td>
<td>0.62 kgm/3000 rpm [4.48 ft-lbs/3000 rpm]</td>
</tr>
<tr>
<td>Fuel consumption ratio</td>
<td>310 gr/HP, Hr [0.68 lbs/HP, Hr]</td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>2.78 [2.8 Qt US]</td>
</tr>
<tr>
<td>Fuel</td>
<td>Regular gasoline</td>
</tr>
<tr>
<td>Oil volume: crankcase max.</td>
<td>500 cc [1.06 Pt US]</td>
</tr>
<tr>
<td>Oil volume: crankcase min.</td>
<td>300 cc [0.63 Pt US]</td>
</tr>
<tr>
<td>Lubricating oil</td>
<td>A.P.I. Grade: SC, SD, SE class SAE #20 - Winter, SAE #30 - Summer</td>
</tr>
<tr>
<td>Oil fill and drain</td>
<td>Dual (carb. side and opposite carb.)</td>
</tr>
<tr>
<td>Ignition timing</td>
<td>Fixed 23° B.T.D.C.</td>
</tr>
<tr>
<td>Spark plug</td>
<td>14 mm, NGK BM-6A</td>
</tr>
<tr>
<td>Permissible inclination of engine for continuous operation without any lubrication problem.</td>
<td>Angular forward (carb. side up) 20°</td>
</tr>
<tr>
<td></td>
<td>Angular backward (carb. side down) 20°</td>
</tr>
<tr>
<td></td>
<td>Angular P.T.O. shaft (towards both) 20°</td>
</tr>
<tr>
<td>Idle speed set, no load</td>
<td>1600 rpm (crankshaft)</td>
</tr>
<tr>
<td>Max. speed set, no load</td>
<td>4000 rpm (crankshaft)</td>
</tr>
<tr>
<td>Dry weight (S.T.D. set up)</td>
<td>10 kg [22 lbs]</td>
</tr>
</tbody>
</table>
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:
  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.

*Air cleaner:
  Semi-dry type, washable polyurethane element with nylon brush.

*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.

*Connecting rod:
  I-beam cross section, heat treated aluminum alloy, with large bearings.

*Crankshaft:
  Heat treated ductile iron integrated with counter-clockwise, viewed from power take-off side.

*Valves:
  One piece hypereutectic aluminum-silicon alloy die-casting with plateauhonning.

*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 guides:
  Exhast: Sintered alloy insert (Co-W-Ni-Cr-Mo) on an iron base.
  Intake: Sintered alloy insert (Cu-Mo) on an iron base.

*Valve seats:
  Exhaust: Sintered alloy insert (Cu-P-Sn) on an iron base.
  Intake: Directly bore 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.)

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

*Direction of rotation:
  Counter clockwise, viewed from power take-off side.

*Finish:
  Anti-rust, painted.

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<th>Direct Drive, Pulse Pump Carburetor</th>
<th>Direct Drive, Float Carburetor</th>
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<tbody>
<tr>
<td>Bore and stroke</td>
<td>72 x 51 mm [2.83 x 2.01 in]</td>
<td></td>
</tr>
<tr>
<td>Piston displacement</td>
<td>207 cc [12.67 cu. in]</td>
<td></td>
</tr>
<tr>
<td>Compression ratio</td>
<td>6.4 : 1</td>
<td></td>
</tr>
<tr>
<td>Maximum output</td>
<td>5.2 HP/4000 rpm [SAE J607a]</td>
<td></td>
</tr>
<tr>
<td>Maximum Torque</td>
<td>1.09 kgm/2600 rpm [7.88 ft-lbs/2600 rpm]</td>
<td></td>
</tr>
<tr>
<td>Fuel consumption ratio</td>
<td>310 gr/HP, Hr [0.68 lbs/HP, Hr]</td>
<td></td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>2.78 [2.8 Qt US]</td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>Regular gasoline</td>
<td></td>
</tr>
<tr>
<td>Oil volume: crankcase max.</td>
<td>600 cc [1.27 Pt US]</td>
<td></td>
</tr>
<tr>
<td>Oil volume: crankcase min.</td>
<td>350 cc [0.74 Pt US]</td>
<td></td>
</tr>
<tr>
<td>Lubricating oil</td>
<td>A.P.I. Grade: SC, SD, SE class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAE #20 - Winter, SAE #30 - Summer</td>
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<td>Ignition timing</td>
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<td>Permissible inclination of</td>
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<td>Angled backward (carb. side down) 20°</td>
</tr>
<tr>
<td>engine for continuous</td>
<td>Angled backward (carb. side down) 20°</td>
<td>Angled P.T.O. shaft (towards both) 20°</td>
</tr>
<tr>
<td>operation without any</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lubrication problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle speed set, no load</td>
<td>1600 rpm (crankshaft)</td>
<td></td>
</tr>
<tr>
<td>Max. speed set, no load</td>
<td>4000 rpm (crankshaft)</td>
<td></td>
</tr>
<tr>
<td>Dry weight (S.T.D. set up)</td>
<td>13 kg [28.7 lbs]</td>
<td></td>
</tr>
</tbody>
</table>
B. PERFORMANCE CURVES

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
Pulse pump model

Float model
Pulse pump model

Float model
D. CONSTRUCTION

Main Parts

Pulse pump carburetor

Pulse pump model

Camshaft/Tappets/Valves
Carburetor Construction

Pulse Pump Type
(FA76, FA130, FA210)

Pilot needle
Bypass
Slow jet
Pilot outlet
Slow air-jet

Inlet check valve
Outlet check valve
Main nozzle

Pulse port
Throttle valve
Choke valve

Pump diaphragm
Intake pipe

Main air-jet
Main air-bleed
Fuel level
Overflow
Overflow chamber
Main jet
Fuel tank

Fuel
Air
Float Type
(FA76, FA210)

Throttle valve
Pilot outlet

Bypass port 1
Bypass port 2
Main air jet
Choke valve

Main nozzle
Air vent
Pilot air jet

Fuel cock
Air vent (Gate-type outer vent)

Float valve
Main nozzle
Main air bleed
Float
Main jet

Fuel
Air
**Float Type**

(FA130)
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.

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.

   (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.

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.

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.

   (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.
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.
   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.

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.

12. Muffler
    Loosen the nuts and remove the muffler
13. Valves

13-1. Use screwdrivers to remove the retainers.

- Screwdriver.

13-2. Remove the valves from the cylinder.

- 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.

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.

- 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.

- 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.

- 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.
15. Camshaft, tappet and governor tip
15-1. Remove the camshaft from the crankcase.
- 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.
  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.

16. Con-rod cap (big-end disassembly)
16-1. Bend down the con-rod lock.
16-2. Loosen and remove the con-rod bolts.

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

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

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

- 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.

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

![Diagram of governor tip](image)

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.

![Diagram of piston rings](image)

- 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.

![Image of piston and con-rod](image)

- 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.

4. **Crankshaft**
Insert the crankshaft into the crankcase

![Image of crankshaft](image)

- 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

\[0 < A - B - t < 0.3\]
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.

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.

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 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.

- Bring the piston to TDC 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.

   **Intake (Cold)** 0.10–0.12 mm
   **Exhaust (Cold)** 0.10–0.18 mm

8. **Valves (checking tappet clearances)**

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

   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.

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.

10. **Breather cover and control panel assembly**

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

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

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.
(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

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.

12-3. Fit the condenser.

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

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.

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

- 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.

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.

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.

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 shaft 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.

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.

- 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.
• Refer to the photo for which way to position the 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 through 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).

- 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.

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

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 oil and wring out any excess.
  - Replace the element in the case, with the side marked “IP 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 air screw right in, then unscrew it by the specified amount.

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

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.

(Pulse pump model) - Pilot air screw initial setting: FA130, FA210: Unscrew 1 ¼ turns
FA76: Unscrew 1 turn

(Float model) - Pilot air screw initial setting: FA130, FA210: Unscrew 1 ½ turns
FA76: Unscrew 1 ¼ turns

21-3. Start the engine and let it warm up thoroughly.

(Float model) For this screw the fuel cock home, then unscrew it 1 ½ 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 ±¼ 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

<table>
<thead>
<tr>
<th>Item</th>
<th>FA76</th>
<th>FA130</th>
<th>FA210</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ignition timing</strong></td>
<td>23° B.T.D.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contact breaker gap (Max.)</strong></td>
<td>0.3 ~ 0.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve timing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tappet clearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>when cold (*)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td></td>
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<tr>
<td>Closed</td>
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<td>Exhaust</td>
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<tr>
<td>Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tappet clearances</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>77° B.B.D.C.</td>
<td>97° B.B.D.C.</td>
<td>80° B.B.D.C.</td>
</tr>
<tr>
<td><strong>Sparkplug gap</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.6 ~ 0.7 mm</td>
</tr>
<tr>
<td>Lubricants</td>
<td>Max. oil capacity 320 cc</td>
<td>500 cc</td>
<td>600 cc</td>
</tr>
<tr>
<td>Min. oil capacity</td>
<td>200 cc</td>
<td>300 cc</td>
<td>350 cc</td>
</tr>
<tr>
<td>Carburetor</td>
<td>Pilot air screw initial setting Unscrew 1 turn</td>
<td>Unscrew 1½ turns</td>
<td></td>
</tr>
<tr>
<td>Pulse pump model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Float model</td>
<td>Pilot air screw initial setting</td>
<td>Unscrew 1½ turns</td>
<td></td>
</tr>
<tr>
<td>Fuel cock opening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine speed (no-load)</td>
<td>Idling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carburetor</td>
<td>1500 rpm</td>
<td>—</td>
<td>1500 rpm</td>
</tr>
<tr>
<td>Governed</td>
<td>1600 rpm</td>
<td>1600 rpm</td>
<td>1600 rpm</td>
</tr>
<tr>
<td>Max.</td>
<td>4000 rpm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>FA76</th>
<th>L.9</th>
<th>FA210</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder head bolts</td>
<td>0.7</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Con-rod bolts</td>
<td>0.7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Flywheel nut</td>
<td>3.5</td>
<td>6.0 ~ 6.5</td>
<td>6.0 ~ 6.5</td>
</tr>
<tr>
<td>Drain plug</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>General nuts and bolts</td>
<td>M8P1.25</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>M6P1.0</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>M5P0.8</td>
<td>0.35</td>
<td>0.35</td>
</tr>
</tbody>
</table>
## I. STANDARD TOLERANCES

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Troubleshooting</th>
</tr>
</thead>
</table>
| **Is the engine overheated?**    | **YES**  • Oil level too low or high  • Overload  • Cooling system clogged with dust, grass, etc.  • Carbon deposit in combustion chamber  
|                                  | **NO**  | **Reduce or top up**  **Clean**  **Clean** |
| **Is ignition timing normal?**   | **NO**  | **Wrong timing**  
|                                  | **YES** | **Adjust** |
|                                  | **Faulty condenser**  • Faulty ignition coil  • Faulty high tension cord  • Malfunction of contact breaker arm  • Demagnetized flywheel  
|                                  | **Replace**  **Replace**  **Replace**  **Replace**  **Replace** |
| **Is lubricating system normal?**| **NO**  | **Oil level too low or high**  • Excessively dirty lubricating oil  
|                                  | **YES** | **Adjust level or add**  **Change oil**  **Clean**  **Clean** |
| **Is smoke coming out of the muffler?** | **YES** | **Fouled air cleaner element**  • Carbon deposit in exhaust and muffler  
|                                  | **Clean**  **Clean** |
Starting Difficulties

Remove spark plug, fit the plug cap and turn the crankshaft by pulling the starter with the plug touching the engine block and check to see if sparks are produced.

- Are sparks produced when the spark plug is replaced with a spare?
  - NO
  - YES → Faulty spark plug → Replace

- Are sparks produced between the high tension cord and the engine block when the plug cap is removed?
  - NO → Faulty spark plug → Replace
  - YES → Faulty contact in plug cap → Correct

- Is ignition timing of normal?
  - NO
  - YES → Faulty ignition timing → Adjust

- Is compression sufficient?
  - NO
  - YES → Pull the starter a number of times and then remove the spark plug and check electrodes. Are they wet?
    - NO → No fuel in tank → Add
    - YES → Excessive choke → Remove the plug and pull the starter

- Are sparks produced between the high tension cord and the engine block when the condenser is replaced with a spare?
  - NO → Faulty ignition coil → Replace
  - YES → Faulty condenser → Replace

- Faulty ignition timing:
  - Adjust

- Faulty condenser:
  - Replace

- Faulty ignition coil:
  - Replace

- Faulty high tension cord:
  - Replace

- Malfunction of contact breaker arm:
  - Disassemble and clean or replace
  - Replace

- Demagnetized flywheel:
  - Replace

- Worn piston/piston rings:
  - Replace

- Piston rings stuck:
  - Clean or replace

- Worn cylinder bore:
  - Re bore or replace

- Loose cylinder head bolts:
  - Tighten

- Faulty contact of valve seat:
  - Relap

- Wrong valve clearance:
  - Adjust valve clearance

- Wrong valve timing:
  - Adjust

- Broken valve spring:
  - Replace

- Stuck valve:
  - Clean valve and guide
Engine Malfunctions at High Speed

Does engine speed vary considerably when load is applied?

YES →
- Plugged air hole in tank cap
- Plugged air vent on carburetor
  (Pulse pump model)
- Entry of dust and air into fuel filter or fuel pipe
  - Clean

Engine Malfunctions at Low Speed

Remove spark plug, fit the plug cap and turn the crankshaft by pulling the starter with the plug touching the engine block and check to see if strong sparks produced.

WEAK →
- Faulty plug insulation
- Dirty electrodes
- Contaminated or pitted breaker points
- **Wrong ignition** timing
- Damaged condenser
  - Replace
  - Clean
  - Clean, lap or replace

STRONG →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Is smoke coming out of the muffler?

YES →
- Clogged carburetor
  - Disassemble and clean

NO →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Gradually open the throttle valve by hand. Does the speed drop or does the engine stall at a certain point?

YES →
- Loose flange nuts
- Damaged gasket
  - Retighten
  - Replace

NO →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Is air sucked in through carburetor flange?

YES →
- Compression loss
- Wrong valve timing
  - Adjust valve clearances

NO →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Are valve clearances correct?

NO →
- Compression loss
- Wrong valve timing
  - Adjust valve clearances

YES →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Is alignment of timing gear marks correct?

NO →
- Valve timing out
  - Correct alignment of timing gear marks

YES →
- Overrich fuel in slow system
  - Turn off pilot air jet by a minor extent

Engine Hunts

Problem in fuel system (lack of fuel)

- Entry of dust and air into fuel pipe or fuel filter
- Air hole in tank cap clogged with dust
- Fuel and air passages in carburetor clogged
- Pilot air screw too far in
  - Clean
  - Clean
  - Disassembly carburetor and clean
  - Adjust

Problem in governor system.

- Wrong governor setting
- Faulty governor spring
- Worn governor fork and governor weight
  - Adjust
  - Replace
  - Replace
Excessive Fuel Consumption

Is compression sufficient?

YES →
- Fuel level in carburetor float chamber too high
- Ignition timing retarded
- Idling too fast
- Incomplete opening of choke valve
- Pilot air screw too far out
  - Adjust

NO →
- Worn piston/piston rings
- Stuck piston
- Worn cylinder bore
- Loose cylinder head
- Faulty valve seat contact
- Wrong valve clearance
- Wrong valve timing
- Broken valve spring
- Stuck valve
  - Replace
  - Clean or replace
  - Rebore or replace
  - Tighten
  - Lap
  - Adjust valve clearance
  - Adjust
  - Replace
  - Clean valve and guide

Excessive Oil Consumption

Is compression sufficient?

YES →
- Plugged oil ring groove
- Oil level too high
- Faulty valve seat contact
- Worn valve stems and valve guides
- Oil leakage along governor shaft
- Oil leakage from oil seal
  - Oil leakage from side base mounting surface
  - Oil leakage from drain plug
  - Clean
  - Adjust
  - Lap
  - Replace

NO →
- Worn piston rings
- Stuck piston rings
- Worn cylinder bore
  - Replace
  - Clean or replace
  - Rebore or replace

Retighten or replace gasket