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**TROUBLE-SHOOTING OF SMALL GASOLINE ENGINES**

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PROBLE SHOOTING OF SMALL GAZON THE ENGINE

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## Preface

This reference text book on Trouble-shooting of Gasoline Engines has been compiled for use by trainees on the SEAFDEC/TD Marine Engineering Regional Training Course.

Trouble-shooting is the intelligent, step-by-step process of locating engine trouble.

The troubleshooter examines and/or tests the engine to determine the cause of its disorder.

To engage in this process, a person must thoroughly understand the intricacies of engine operations.

The general approach to trouble shooting of diesel engines is mentioned in text book TRB/No. 19 by the same compiler; the same approach is applicable to gasoline engines.

The troubleshooter first establishes the engine's symptoms. The most common causes for these symptoms are then checked on the table or chart. If a solution is not found, another possible cause for the problem is explored. The reason for the engine failure must be narrowed down accurately because there are many afflictions that can affect an ailing engine.

Troubleshooting is slightly different for the two-cycle engine than for the four-cycle engine. This text contains a troubleshooting chart that will be of great assistance to the trainee.

The contents of this book reflect the experience and technology of Mitsubishi Heavy Industries Ltd. I'm grateful for the opportunities given to me by the company to introduce this subject matter.

Shinzo YAMAMOTO  
Instructor

May 7, 1991



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**AIR-COOLED ENGINE**

**4-CYCLE**

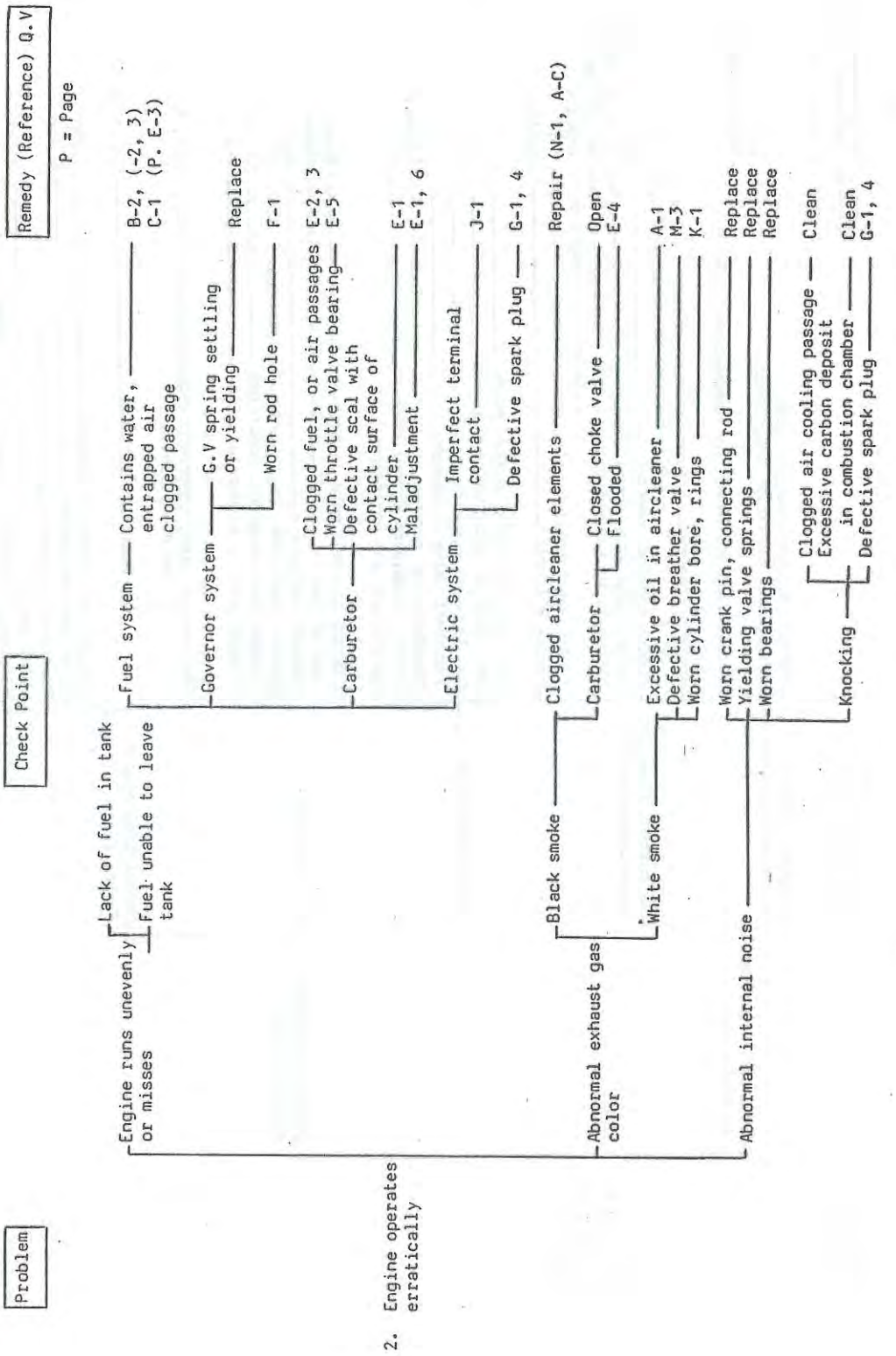
**TROUBLE SHOOTING**







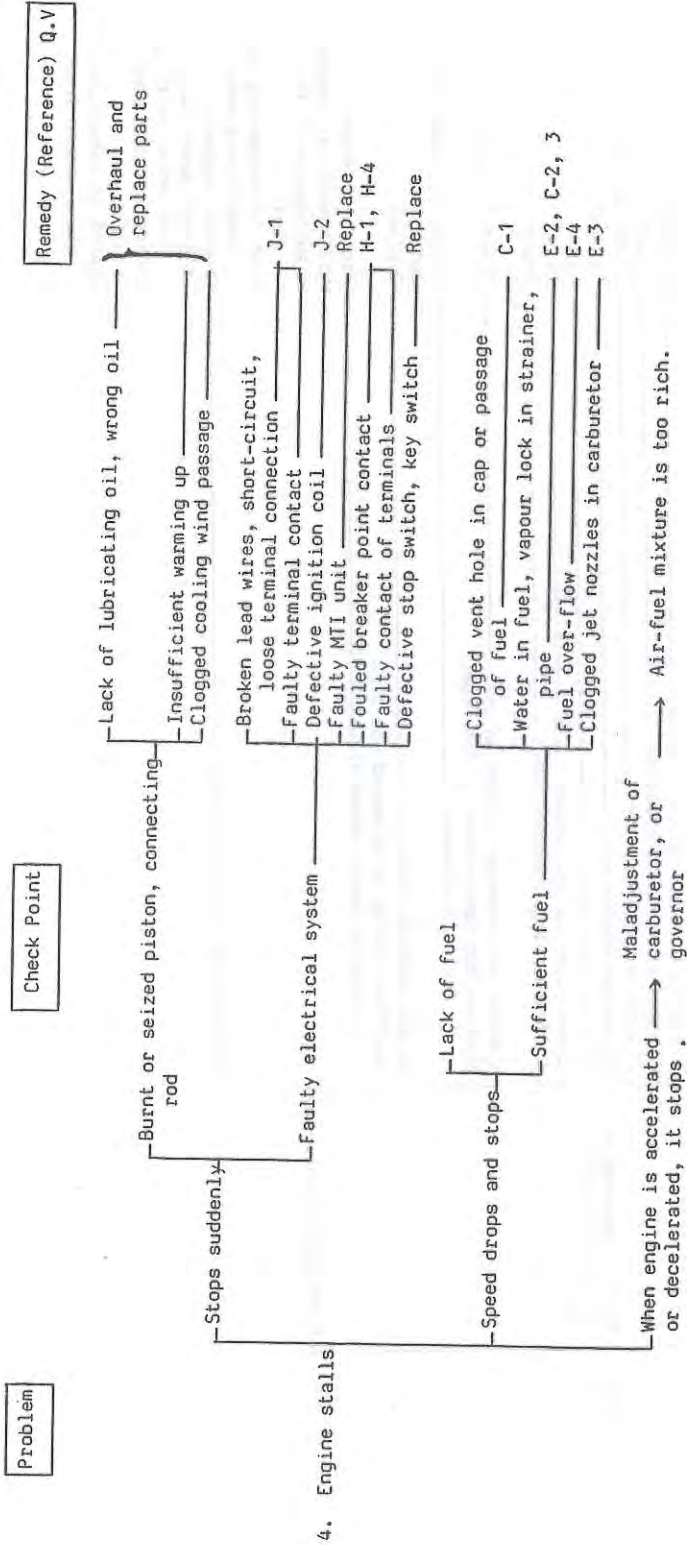
PROBLEMS AND REMEDIES



PROBLEMS AND REMEDIES

Problem	Check Point	Remedy (Reference) Q. V
Low compression	<ul style="list-style-type: none"> <li>- Piston rings stuck</li> <li>- Head gasket leaking</li> <li>- Worn cylinder bore, piston rings</li> <li>- Valve seat leaking</li> <li>- faulty valve clearance</li> </ul>	<ul style="list-style-type: none"> <li>K-2</li> <li>M-2</li> <li>K-1</li> <li>L-1</li> <li>L-2</li> </ul>
3. Engine lacks power	<ul style="list-style-type: none"> <li>- Yielding governor spring</li> <li>- Clogged air-cleaner elements</li> <li>- Clogged exhaust-muffler</li> <li>- Excessive engine oil</li> <li>- Clogged fuel line</li> <li>- Choke valve is not opened fully</li> <li>- Malfunctioning breather valve</li> </ul>	<ul style="list-style-type: none"> <li>Replace</li> <li>Clean</li> <li>Clean or replace</li> <li>Correct</li> <li>Clean</li> <li>Open</li> <li>Repair</li> </ul>
Overheated	<ul style="list-style-type: none"> <li>- Cooling air passage blocked by dust</li> <li>- Suction air temperature is too high, or dirty air-cleaner</li> <li>- Broken cooling fins</li> <li>- Ignition timing is advanced too much (Excessive spark advance)</li> </ul>	<ul style="list-style-type: none"> <li>Clean &amp; correct</li> <li>Lower, or clean air passage</li> <li>Replace</li> <li>Correct &amp; check</li> <li>Misassembly of camshaft</li> <li>Misalignment of fly-wheel</li> </ul>
Overloading		<ul style="list-style-type: none"> <li>Wear on connecting rods</li> <li>small-large ends</li> <li>Check &amp; correct:</li> <li>Improper spark plug heat valve or range</li> <li>Internal carbon deposits,</li> <li>fouled or carbonized plug, reduce load.</li> </ul>

PROBLEMS AND REMEDIES





Problem	Check Point	PROBLEMS AND REMEDIES	Remedy (Reference) Q.V
5. High oil consumption	Lower compression	<ul style="list-style-type: none"> <li>— Stuck or seized piston rings</li> <li>— Worn cylinder bore, piston rings</li> <li>— Piston ring gap are positioned in-line</li> </ul>	K-2 K-1 K-4
	Normal compression	<ul style="list-style-type: none"> <li>— Worn breather valve guide</li> <li>— Defective breather valve</li> <li>— Rings upside down</li> <li>— Worn or damaged cylinder bore</li> </ul>	Replace K-3 K-3 Replace
	External oil leakage	<ul style="list-style-type: none"> <li>— Defective breather valve</li> <li>— Loose bolts</li> <li>— Damaged oil-seal</li> </ul>	K-3 Retighten Replace
6. Excessive fuel consumption	Insufficient out-put	_____	See No. 3 lacks power
	Fuel leakage	_____	Correct

REPAIR IS MADE & LINE REPAIR AND REPAIR INSTITUTE

SUMMARY OF PARTS & ITEMS CHECKED AND RELATED TROUBLES

Part	Checking List	Symptoms
Air-cleaner	Clogged filter element Oil quantity (A-1)	Excess fuel consumption Innerpart worn-out
Fuel tank	Clogged air-vent. Is the fuel old; has it deteriorated? Water in fuel (B-1) Clogged filter (B-2)	Hard starting  Can't start
Fuel strainer	Clogged net (C-1) Water in fuel (C-2) Vapour-lock (C-3) Cock is closed	Hard starting Erratic running  Can't start
Fuel pipe	Hardening of plastic Leaking from connecting pipe Vapour-lock	Breakage, or leakage Cause of fire Hard starting, erratic operation
Carburetor	Air tightness of flange surface (E-2) Clogging of air-vent Incorrect choke valve operation Deteriorated fuel, inner rust (E-3)  Clogged jets (E-3) Worn fuel jet needle (E-4) Malfunctioning of jet needle (E-5) Worn throttle shaft bearing Maladjusted idling (E-6)	Erratic operation Hard starting Hard starting Hard starting & erratic running Erratic running Flooding Flooding Erratic running Faulty acceleration and deceleration
Governor	Damaged spring, or lever links (F-1) Worn rod hole (F-2) Maladjusted slow speed control (F-3) Maladjusted high speed control (F-4)	Erratic running, poor output Erratic running Defective accel-deceleration Poor output and large fuel consumption Engine stalls

Air and Fuel Systems

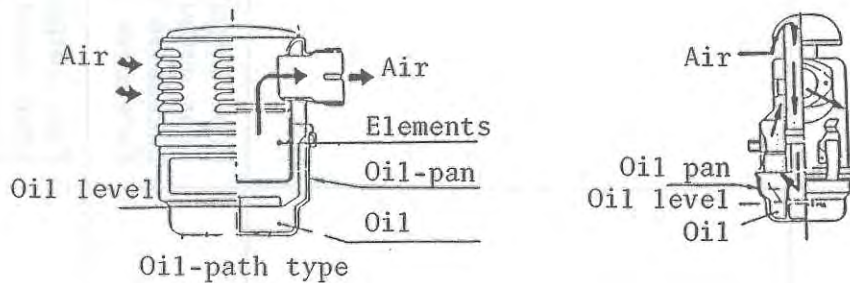
Governor system



	Part	Checking List	Symptoms
Electrical System	Spark plug	Carbon deposits (G-1) Defective spark plug gap (G-2) Burnt electrode (G-3)	
	Spark plug cap	Damaged iron portion Faulty spark plug contact	
	Breaker points (contact breaker)	Fouled contact points (H-1) Incorrect points gap (H-2) Transition of contact points (H-3) Lack of oil for rotating shaft (H-4) Excessive oil on felt cloth (H-5) Faulty contact of terminals (J-1) Broken wire, short circuit Faulty stop switch, key switch Faulty ignition coil Faulty MTT unit Faulty rectifier Fuse Battery Starting motor Incorrect wiring Excessively low starting speed	
Others	Piston rings	Worn rings (K-1) Seized or stuck rings (K-2) Installed upside down (K-3) End gaps positioned in line (K-4)	Poor output, excessive L.O. consumption Poor output, excessive L.O. consumption Excessive L.O. consumption Excessive L.O. consumption
	Intake exhaust valves	Leak at valve seat (L-1) Incorrect valve clearance (L-2) Worn valve guide (M-1) Setting of valve springs Worn cylinder bore Worn crank-pin, connecting-rod Worn bearings Hard gasket leak (M-2)	Poor output, hard starting Poor output, hard starting Excessive L.O. consumption, poor output Erratic running, hard starting Poor output, hard starting Abnormal internal sound Abnormal internal sound Hard starting, poor output

### A-1 Filling the air-cleaner with oil

The air-cleaner must be filled with the correct amount of oil. Excessive oil may cause the combustion chamber to accumulate carbon, however, insufficient oil may result in worn cylinders or rings, due to the effects of dust.



### B-1 The use of fresh and clean gasoline

If the fuel is allowed to stand for three months or more, the engine becomes difficult to start due to the volatility of the light gravity oil. Moreover, if fuel is left for an even longer period it may deteriorate, turn yellow in colour and corrode the inner tank surface producing water. This will result in clogged filter elements due to adhesion of the corroded matter or gum deposits.

### B-2 Water in gasoline

Moisture in the air may produce "dew-drops" on the inner surface of the tank, and this water settles in the tank bottom. It flows from the fuel strainer to the carburetor. When the flow rate is increased, the parts in contact with the flow may rust and this may result in difficulty with starting the engine.

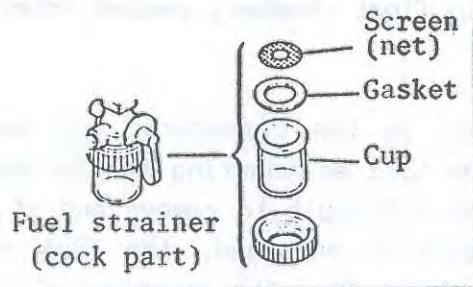


### C-1 Clogged screen (net)

When the contaminated or color-changed gasoline passes through the screen net, a vapour lock tends to occur because the fuel flow is obstructed by dirt adhering to the net. The net should therefore be cleaned frequently.

### C-2 Water in fuel

Water tends to settle in the strainer cup bottom because its greater specific gravity is greater than that of the fuel. When water is observed in the cup, clean it.

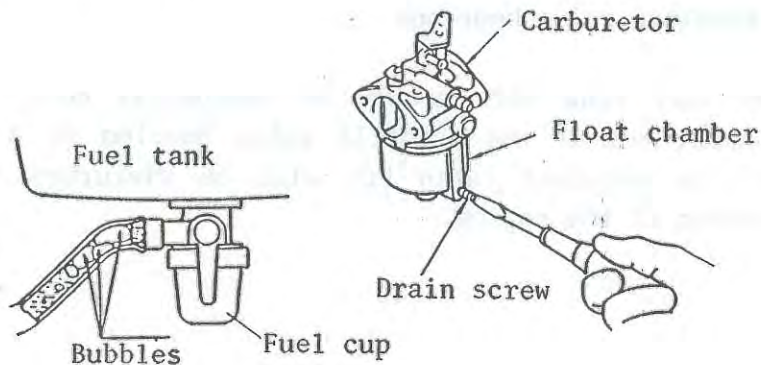


### C-3 Vapour lock

When large bubbles form, it causes a vapour lock. Vent the bubbles to prevent this from occurring.

#### D-1 Vapour lock in fuel pipe

Accumulation of gas bubbles causes a vapour lock to occur. Vent or purge the bubbles. The procedure is the same as the one for discharging the drain in the float chamber.



#### **E-1 Air-tightness of carburetor flange**

When the surfaces of the insulator, or the flange of the carburetor are distorted, some air may be sucked through them. This may cause erratic running of the engine due to the reduction of fuel.

#### **E-2 Clogging of air vent hole on tank-cap**

In the case of a clogged air vent hole in the tank-cap, the engine will run erratically due to an inadequate air-fuel ratio.

#### **E-3 Deteriorated fuel in float chamber, rusted interior chamber, and clogged jets**

Deteriorated fuel in the carburetor may corrode the inner surface of the chamber as well as adhering to the small main jet and nozzle holes; this may be difficult to remove and if the holes of the nozzle or jet are damaged or enlarged, the flow rate will change resulting in erratic running. When the cleaning of these holes is too difficult, replace the main jet and main nozzle.

#### **E-4 Worn or malfunctioning float valves**

When the circular cone of the float valve tip is worn out, the gap between the cone and valve seat may be enlarged resulting in over-flooding of fuel.

Flooding of the carburetor may also be caused by uneven vertical motion of the float due to excessive wear of the float valve guide.

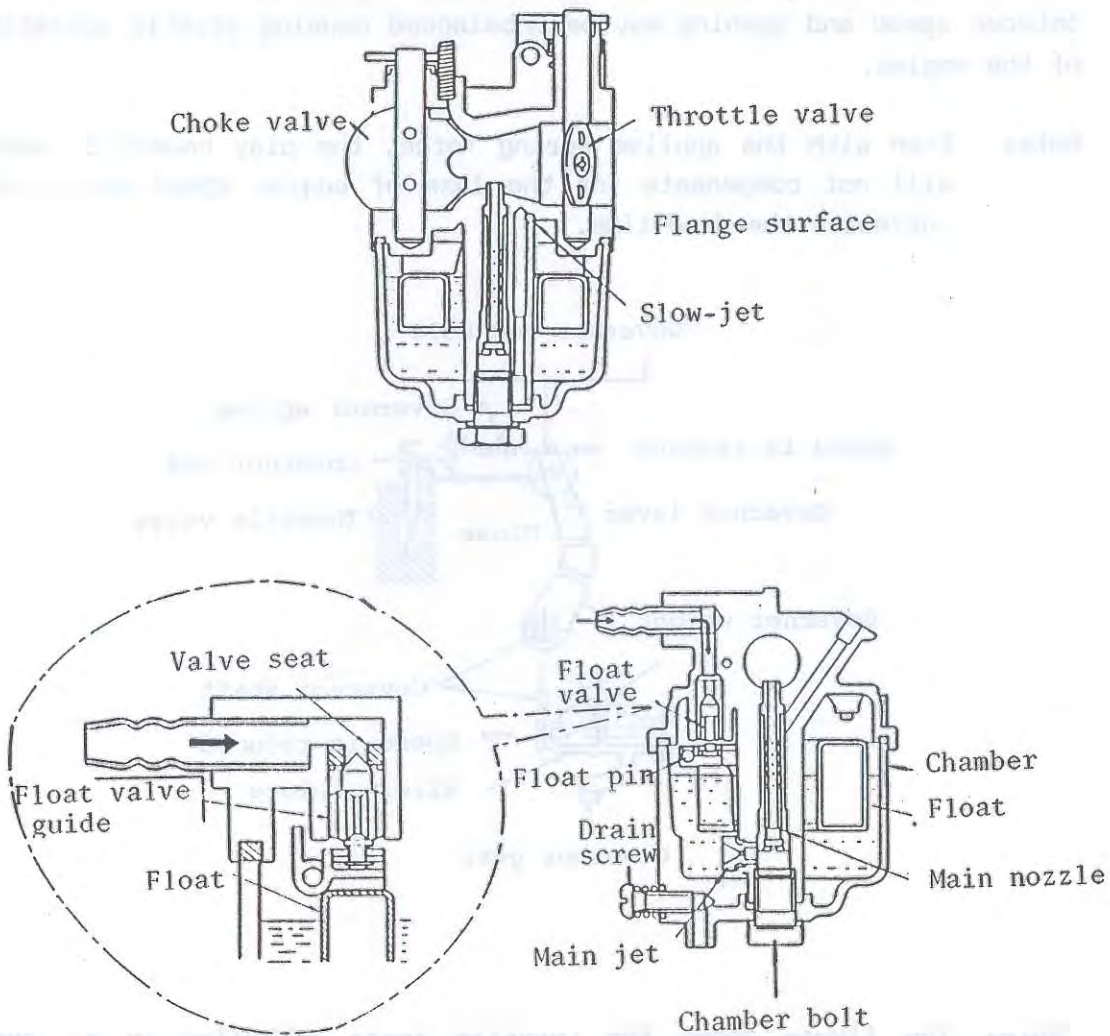
#### **E-5 Worn throttle valve bearings**

The fuel flow rate should be adequately controlled by the throttle valve, but if the throttle valve bearing is worn out, the balance of the air-fuel ratio but will be disturbed resulting in erratic running of the engine.



### E-6 Adjustment of idle speed

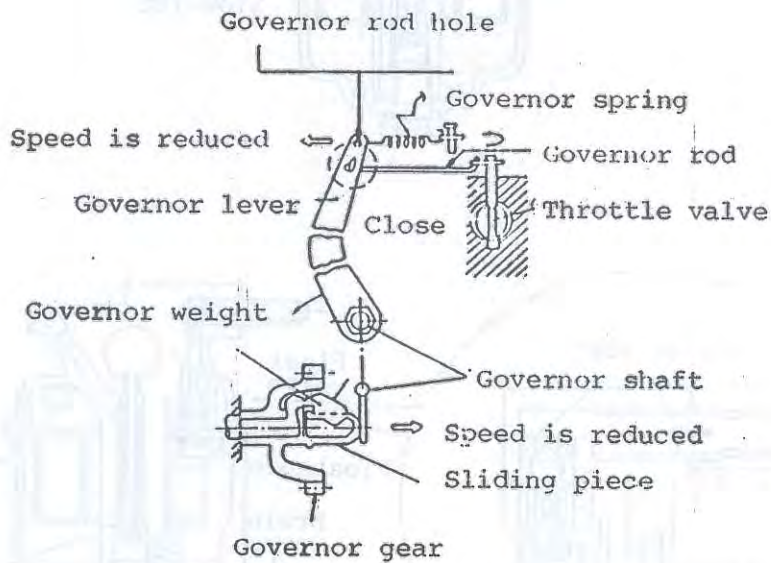
After warming-up the engine, the idling speed should be adjusted with the idling-adjustment screw so that even when a quick deceleration is performed, the engine does not stall i.e. the speed adjustment should be a little bit higher than that of dead-slow speed.



### F-1 Worn governor rod hole

The throttle valve is opened and closed by force exerted in response to the engine speed, i.e. the force produced by the governor weight is transmitted by the sliding piece → governor shaft → governor lever to the governor rod. The engine speed is therefore strongly related to the opening of the throttle valve. However, if the hole of the governor rod is excessively worn, the relationship between speed and opening may be unbalanced causing erratic operation of the engine.

**Note:** Even with the applied spring force, the play caused by wear, will not compensate for the loss of engine speed which only increases the dead time.



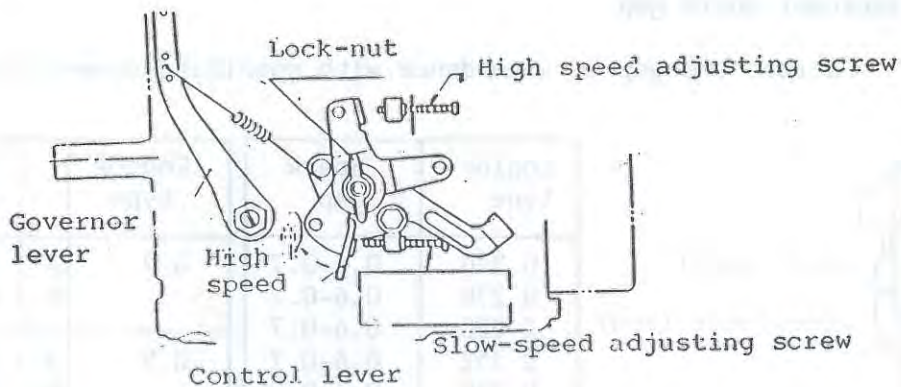
**Note:** The figure shows the throttle lever installed in an upper position.

### F-2 Slow-speed adjustment

Operate engine at idle speed without-load, unscrew the lock-nut and free the lever.

While measuring the crankshaft speed, set the engine speed at about 1,300 rpm by turning the slow speed adjusting screw.

**Note:** The control lever is identical to the throttle lever.



**Note:** The figure shows the throttle lever installed in the lower position.

### F-3 Slow-speed adjustment

Operate engine at idle speed without-load; turn the adjusting screw with the control lever touching the tip of the high speed adjusting screw, and then set the engine speed under the maximum output condition. (e.g. 3,800  $\pm$  100 rpm).

### F-4 Acceleration & Deceleration Adjustments

While the engine is running without-load, release the control lever. Starting with the lever touching the slow speed adjusting screw, move the lever quickly so that it touches the high speed adjusting screw, and then it quickly back to move the slow speed position again. Check that the engine runs normally throughout.



If the engine stops, readjust the idle speed setting (procedure E-6) by readjusting the setting speed a little bit higher, followed by the adjustment procedure (F-2). Repeat until no stalling occurs.

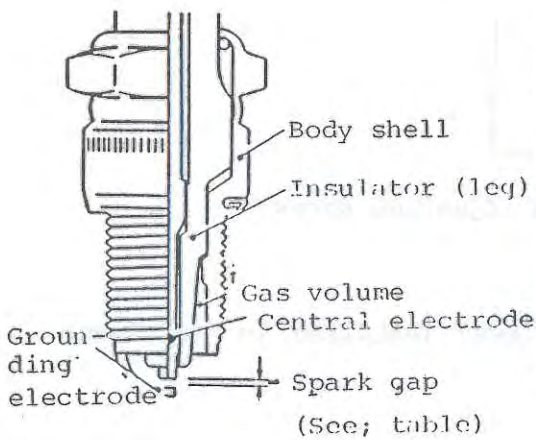
**Note:** If misfiring or hunting of the engine occurs, check the air-bleed.

**G-1 Carbon deposits**

Clean all carbon deposits as far as possible. Black carbon deposits may cause current leakages.

**G-2 Improper spark gap**

Correct the gap in accordance with specified dimensions below.



Engine type	Spark gap	Engine type	Spark gap
G 220	0.6-0.7	G 7	A 0.6-0.7
G 270	0.6-0.7		M 0.9-1.0
G 350	0.6-0.7		
G 352	0.6-0.7	G 9	A 0.6-0.7
G 510	0.6-0.7		M 0.9-1.0
G 710	0.6-0.7		
G 910	0.6-0.7	G 11	A 0.6-0.7
			M 0.9-1.0
		G 1200	0.9-1.0
		G 1500	0.9-1.0

A: Breaker point types

M: Mitsubishi Transister & Capacitor Ignitor (MTI)

### G-3 Burned spark plug

Excessively burnt or pitted plugs should be replaced with new ones.



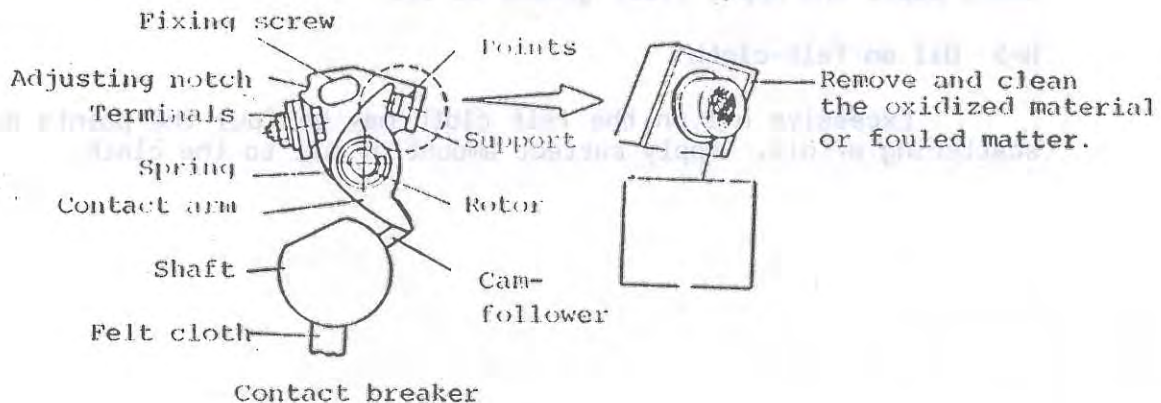
Burned electrode  
(caution: check grounding  
electrode carefully)

### G-4 Leaks

Although the outer appearance of a plug may be fine, there may sometimes be a leakage of the gas from inside; in this case replace the plug with a new one. (Check for cracks, fractures on the insulator portion).

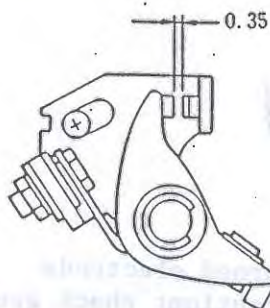
### H-1 Fouled contact points

When the contact point is defective due to oxidization on the points, remove the oxidized substance with a dry oil stone. If they are otherwise fouled clean the metal powder or oil, on the points, to achieve good conductivity. (See H-2, H-5).



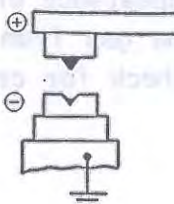
## H-2 Improper point gaps

Adjust while turning the engine by hand; the widest point gap should be 0.35 mm.



## H-3 Transition of contact points

Point transition caused by melting of the contact point on one side may be caused by a defective condenser. In this case, replace the condenser (capacitor) with a new one.



## H-4 Lack of oil in rotor shaft

Lack of oil in the rotor shaft may cause misfiring due to the open state of the contact points. Remove the rust on the shaft with emery paper and apply fiber grease to it.

## H-5 Oil on felt-cloth

Excessive oil on the felt cloth may be foul the points due to scattering of oil. Apply correct amount of oil to the cloth.



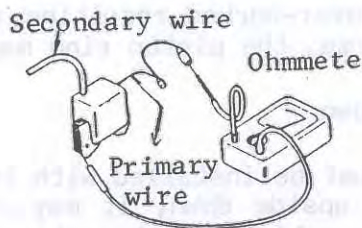
### J-1 Loose terminal connection

Defective or broken wire, due to rusting on the coupler or terminals, should be corrected or replaced.

### J-2 Ignition coil

The quality of the ignition coil (except the integrated type) may be checked with a radio-tester.

Connect the wire as shown below i.e. the primary wire terminal (+ polarity) is connected to the iron core, (- polarity) and measure the resistance of the coil. (Neither resistance value zero or infinite should be rejected).



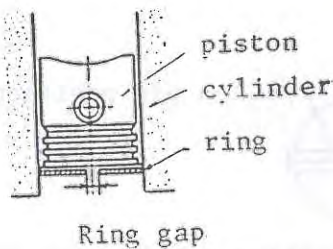
### Standard resistance values

- Primary wire; 0.8 - 1.0 SL (ohm)
- Secondary wire; 10 - 10 KSL (ohm)

### K-1 Worn piston rings

Judge the need for ring replacement by the amount of wear compared to the specified servicing (repair) limits. The repair limit may be approximately three times that of the standard ring gap value.

How to measure the ring gap. Insert piston ring into the cylinder skirt (lower) bore, and measure the gap with a thickness gage after pushing the ring with the piston; avoid tilting the ring.



Engine	Ring gap (m/m) (Standard)
G 220	0.15-0.35
G 270	0.15-0.35
G 350, 352	0.15-0.35
G 510	0.15-0.35
G 710	0.15-0.35
G 910	0.15-0.35
G 1200	0.3 -0.5
G 1500	0.3 -0.5

### K-2 Stuck piston ring

The engine's lubricating oil may become tarry and more viscose due to the high combustion temperature.

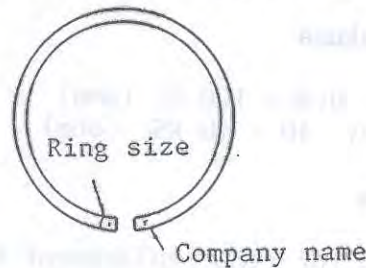
Excessive heating of the oil may cause production of hard coal like substances. These scuffing or scratching of the liner and rings. Furthermore, the oil cause between the piston and the cylinder tends to become tar oil because of constant exposure to high temperatures.

The tar oil adheres to the rings and their grooves, they become hard to move, and eventually stick.

If the engine is over-worked resulting in the cooling passage being choked for a long time, the piston ring may stick.

### K-3 Piston ring upside down

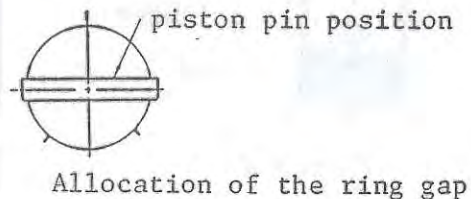
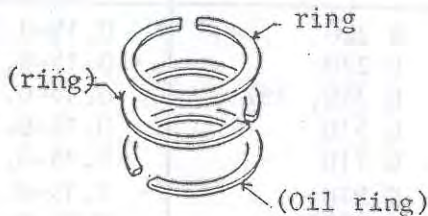
The piston ring must be installed with the marked side upward. If the ring is installed upside down, it may cause incomplete functioning and excessive consumption of lubricating oil.



### K-4 Rings gaps positioned in-line

If the ring gaps are assembled in-line the combustion gas may leak through the gap, causing such problems as poor output, and excessive fuel and lubricating oil consumption.

The rings gap should be positioned as shown in the Figure below.





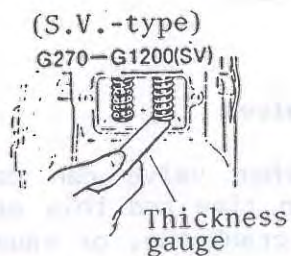
### L-1 Valve seat leaking

If a blow-by or blown out of combustion gas occurs or valve leakage due to uneven wear, the valve seat should be refaced or replaced. The blow-by at the valve seat is usually caused by an accumulation of carbon deposits on the valve faces. These deposits will hold the valve open, allowing the hot flames of burning fuel to erode or melt away the valve face and seat.

### L-2 Faulty or Incorrect valve clearance

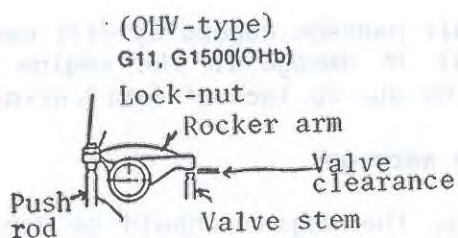
#### Side-valve (S.V.) type

After grinding the valve steam end surface, adjust the valve clearance to the standard value (cold; 0.1-0.2 m/m) at Compression Top Dead Center. (C.T.D.C)



#### Over head valve (OHV)

Adjust the valve clearance to the standard value (0.28-0.30 mm.) at compression Top Dead Center (C.T.D.C.)



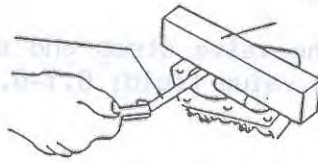
### M-1 Worn valve guide

A worn valve guide can cause the valve seat to wear unevenly, and this may result in hard-starting, a drop in horse-power, or excessive fuel consumption.

With an inside valve type of engine, replace the body or cylinder. In an over head valve type, replace the valve guide or cylinder head with a new one.

#### **M-2 Gas leaks at cylinder gasket**

If the gasket is burned, replace it with a new one. If the cylinder or cylinder head surface has distorted, correct it to the maximum service limit; 0.3 mm.



#### **M-3 Defective breather valve**

A defective breather valve can cause the pressure in the crankcase interior this to rise and this may cause an oil leak from the joint surface of the crankcase, or cause excessive oil build up. (i.e.; oil is sucked up through the cylinder or valve guide into the combustion chamber) The oil may then be stuck on the intake valve surface and changed into a tarry substance, resulting in excessive oil consumption. If this symptom is observed, replace the breather valve with a new one.

#### **M-4 Clogged cooling air passage**

A clogged air passage caused by dirt can make the engine over-heat and may result in damage to the engine owing to knocking, or burning of the engine due to lack of lubrication.

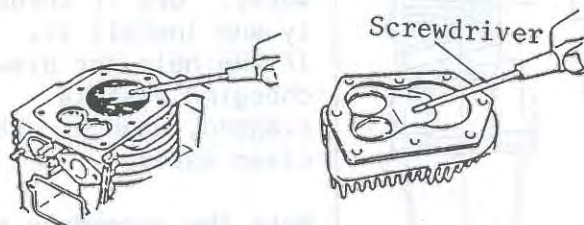
#### **M-5 Lack of engine warm-up**

On starting, the engine should be run slowly, without-load, for a short time to ensure that sufficient lubricating oil reaches all parts of the engine. Insufficiency may result in engine seizure or burning.




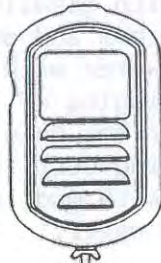
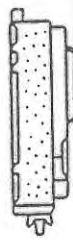
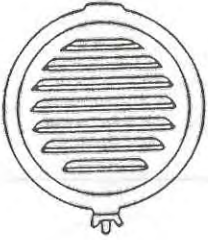
**M-6 Excessive carbon deposit on combustion chamber**

Excessive accumulation of carbon deposits may cause poor output or knocking due to red-hot carbon deposits. Remove the carbon deposits with care to avoid damaging the parts.

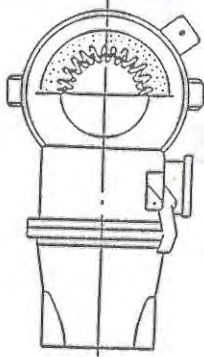
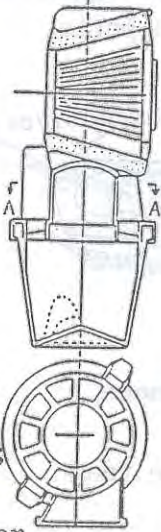
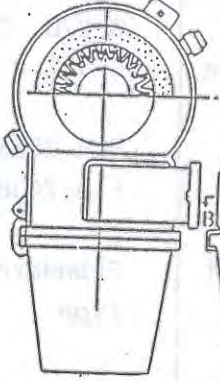
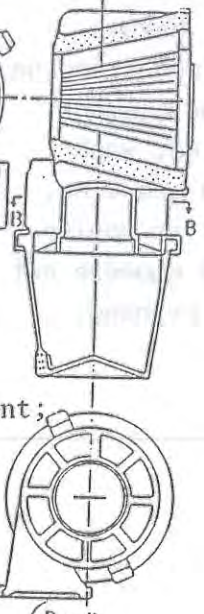


**N-1 Clogged aircleaner and its maintenance**

A. Semi-wet type with polyurethane foam

Shape	Cross section	Maintenance	Remarks
		Inspect before operation of engine. When the element is fouled, wash it with gasoline, soak it in engine oil and squeeze out excess by hand.	G 270, C 350 G 352  F A 25265 F A 24088  Standard type.
			G 270, G 350  F A 25278  Standard type.

B. Dry-cyclone type

Shape	Cross section	Maintenance	Remarks
 <p>A-A Section</p> <p>Primary element; Polyurethane</p> <p>Secondary; filter paper</p>		<p>Wash the fouled element with soapy water, and then clean water. Dry it thoroughly and install it. If the hole for discharging dust is clogged, wash it with clean water.</p> <p><u>Note</u> The secondary element has changed from filter paper to unwoven cloth in series No. #51524</p> <p>Maintenance method See: FA 24224</p>	<ul style="list-style-type: none"> <li>● G 350</li> <li>● F A 25276</li> </ul> <p>Specified engine</p>
 <p>Primary element; Polyurethane</p> <p>Secondary; non-woven fabric</p>	 <p>B-B cross-section</p>	<p>Wash the inside element and outside sponge with gasoline, squeeze them and shake out the water with sharp swinging of the hand. If the hole discharging dust is clogged with mud, wash out with water.</p>	<ul style="list-style-type: none"> <li>● G 500, G 700</li> <li>● F A 24224</li> </ul> <p>Specified engine</p> <p>Tiller</p> <p>Sweeper</p>

C. Other type of aircleaner (except A, B type)

Air-cleaner type	Materials for element	Washing solution	Remarks
Semi-dry double elements	Un-woven (2nd)	Light oil (followed by mixed-oil)	● G 270, G 350 ● F A 25277
Dry-double elements	Filter paper	Soap water (followed by drying)	● G 500 ● FA 21514
Oil bath	Steel wool	Kerosene (prohibited use of gasoline)	● G 500, G 700 ● F R 43319
Oil-bath (MAN)	Steel wool	Kerosene - ditto -	● G 500 ● F R 41587
Impact type	Felt cloth	Gasoline (followed by mixed oil)	● G 9, G 111 ● F R 50611





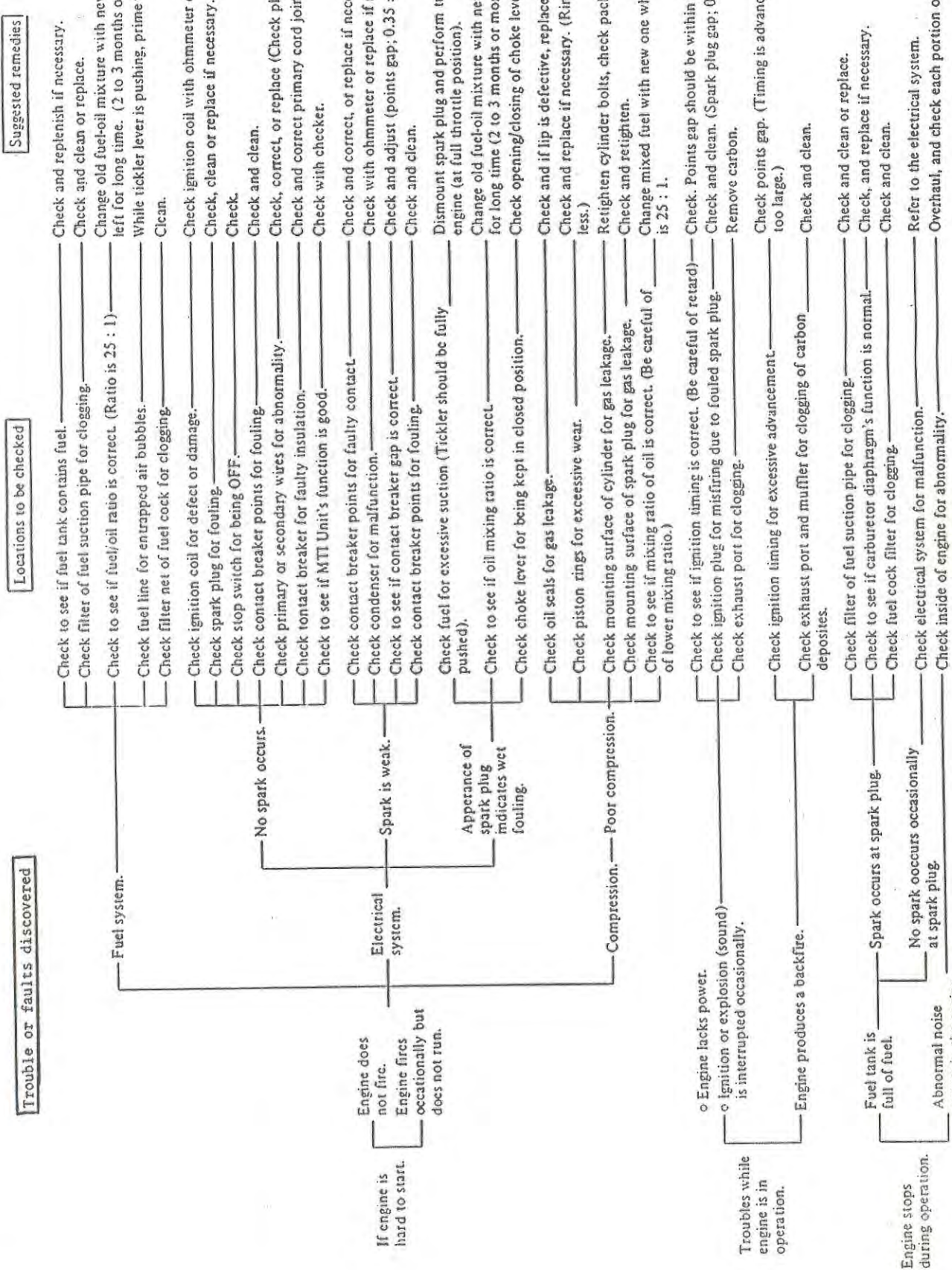
**AIR-COOLED ENGINE**

**2-CYCLE**

**TROUBLE SHOOTING**



# Trouble Shooting Procedures [ ]



**Trouble or faults discovered**

**Locations to be checked**

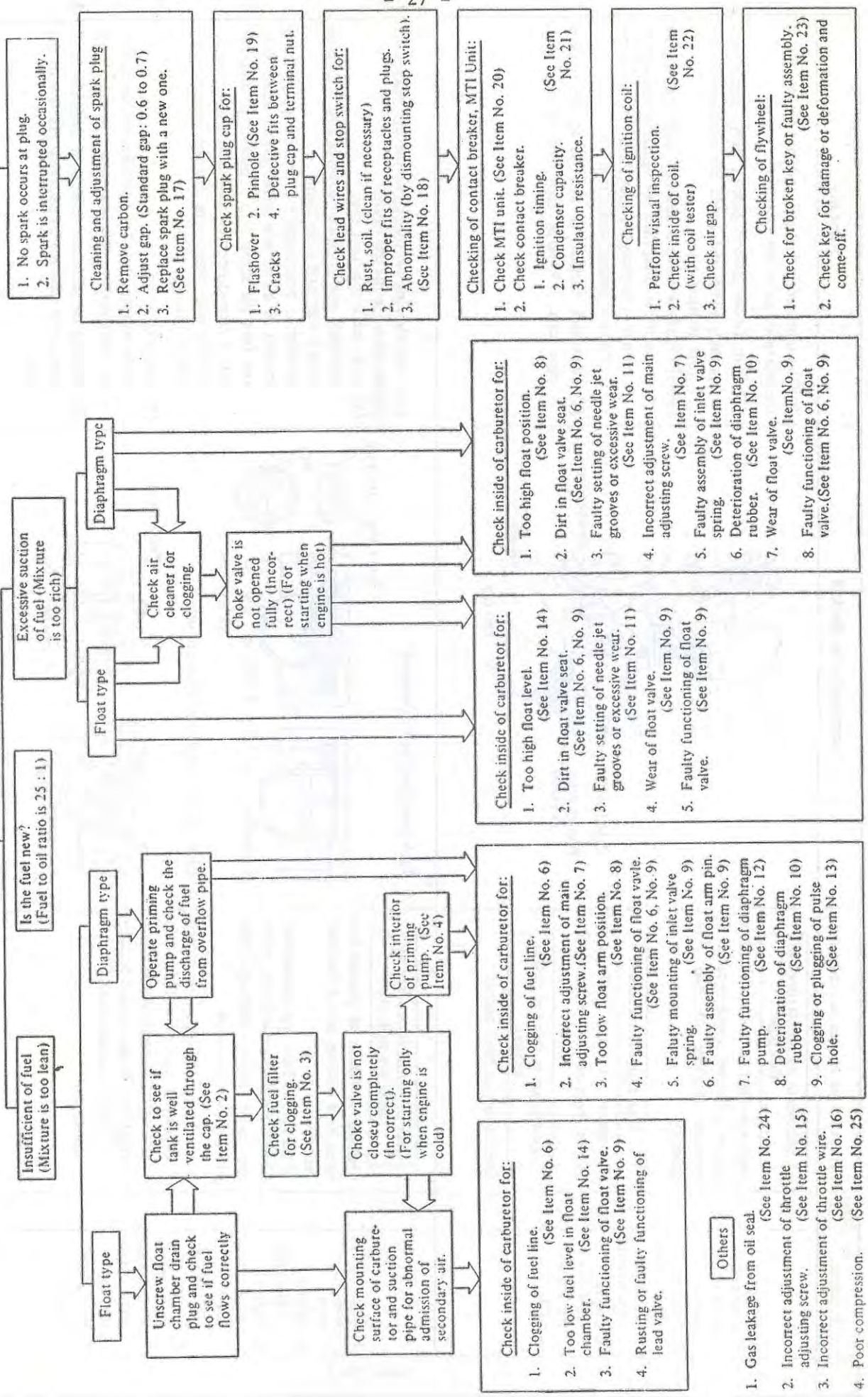
**Suggested remedies**



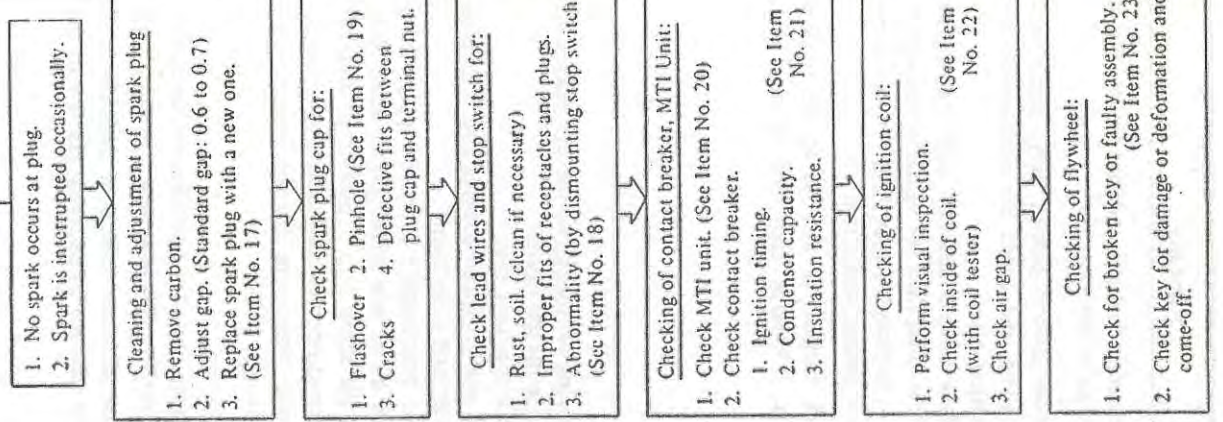


# Trouble Shooting Procedures [ II ]

## Fuel system



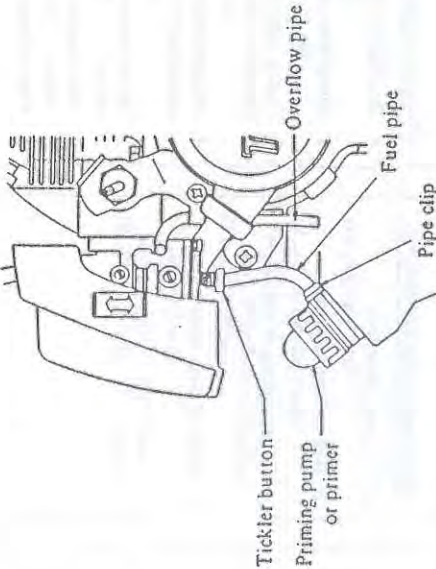
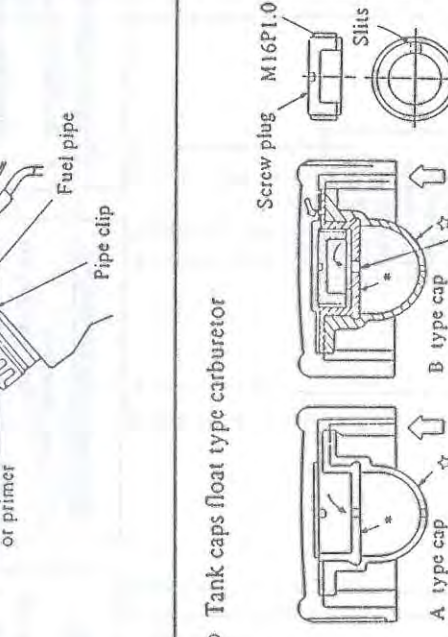
## Electrical system



## Others

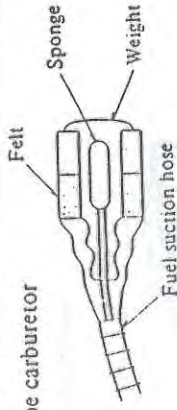
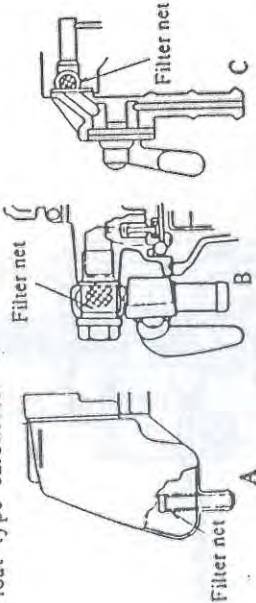
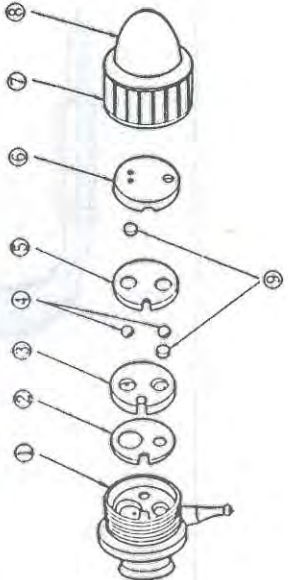
1. Gas leakage from oil seal. (See Item No. 24)
2. Incorrect adjustment of throttle adjusting screw. (See Item No. 15)
3. Incorrect adjustment of throttle wire. (See Item No. 16)
4. Poor compression. (See Item No. 25)



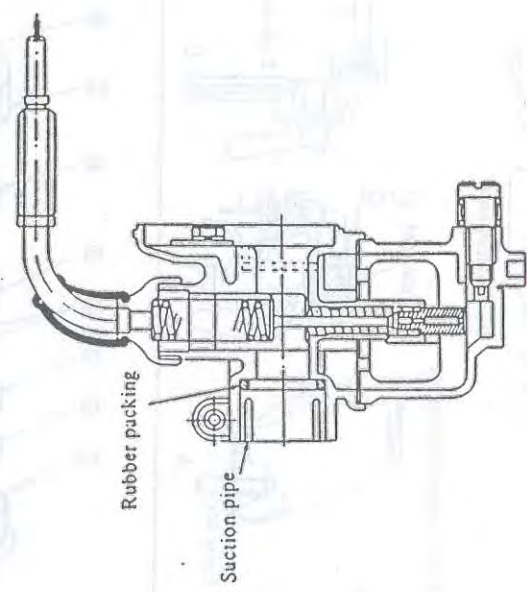
Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<ol style="list-style-type: none"> <li>1. Engine won't or hard to start.</li> <li>2. Engine speed fluctuates at high speed.</li> <li>3. Engine stalls during operation.</li> </ol>	1	<p>Bubbles or air is entrapped in fuel pipe</p> <p>Engine is hard to start, or hard to obtain sufficient speed because of extreme shortage of fuel flow quantity.</p> <p>Pipe clips are cracked</p> <p>Phenomena of Item No.3 occur, due to shortage of interference fit.</p> <p>Insufficient pushing of tickler button.</p> <p>Overflowing or flood occurs.</p>	 <p>The diagram shows a carburetor with several components labeled: Tickler button, Priming pump or primer, Overflow pipe, Fuel pipe, and Pipe clip. Arrows point to these specific locations on the carburetor assembly.</p>	<p>Bubbles observed in fuel pipe indicate the residue of the entrapped air in carburetor.</p> <ol style="list-style-type: none"> <li>(1) With tickler button pushed fully, prime with priming pump and check the discharge of fuel from overflow pipe.</li> </ol> <p>[Note] Overflow device consists of tickler button and overflow valve, then the operations should be done in two steps such as tickler button operation and priming operation.</p> <ol style="list-style-type: none"> <li>(2) Abnormal suction of air due to the cracked pipe clip. Replace clip with a new one.</li> </ol>
<ol style="list-style-type: none"> <li>1. Engine is hard to start.</li> <li>2. Insufficient speed.</li> <li>3. Engine speed fluctuates at high speed.</li> <li>4. Engine stalls several minutes after from starting.</li> <li>5. Poor acceleration.</li> </ol>	2	<p>Lack of ventilation caused by defective tank cap.</p> <p>Clogging of intake air passage can cause hard starting due to fuel starvation.</p> <p>In the case of float type carburetor, a small amount of ventilation, of air can cause engine stoppage after running several minutes.</p> <p>In the case of long-term stored engine, if the slits of umbrella valve of the C type cap are stuck together, the fluctuation or surging will occur due to insufficient ventilation.</p>	 <p>The diagrams illustrate different tank cap types: A type cap, B type cap, and C type cap. They show the internal structure, including the screw plug (M16P1.0), slits, and the air vent hole. A diaphragm type carburetor is also shown with its tapping screw and slits. The diagrams are labeled with 'A type cap', 'B type cap', 'C type cap', 'Screw plug M16P1.0', 'Slits', 'Air vent hole', 'Tapping screw', and 'D type cap'.</p>	<p>Carry out cleaning of clogging of the marked air passage shown in the left figures.</p> <ol style="list-style-type: none"> <li>(1) A, B, and C type tank cap.             <ul style="list-style-type: none"> <li>Dismount the marked packing and * marked valve holder, and clean them.</li> <li>In order to disassemble B type cap, apply small amount of oil to M16 screw part of screw plug, and turn the screw 2 to 3 times right and left with a serewdriver and then draw screw plug by tapping with piano wire inserted from air vent hole on the valve holder.</li> </ul> </li> <li>(2) D type tank cap             <ul style="list-style-type: none"> <li>Clean tapping screw head portion and check slits for abnormality. (Sticking and opening of it)</li> </ul> </li> <li>(3) Sticking or adhesion of slits of umbrella in C type cap is removed by applying gasoline to the slits.</li> </ol>

The \* marked part is valve holder.  
The ☆ marked part is packing.



Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies																														
<p>1. Engine is hard to start.</p> <p>2. Insufficient speed.</p> <p>3. Poor acceleration.</p> <p>4. Engine stalls after starting.</p>	3	<p><b>Clogging of fuel filter</b></p> <p>Because of shortage of fuel flow quantity, no fuel is sucked into cylinder. Therefore it causes hard starting, poor acceleration, engine surging at high revolution.</p> <ul style="list-style-type: none"> <li>o Engine stops or engine speed fluctuates during operation and operates several minutes after restarting.</li> </ul>	<p>Locations to be checked</p> <p>1. Diaphragm type carburetor</p>  <p>2. Float type carburetor</p> 	<p>(1) Diaphragm type carburetor Take out suction hose in fuel tank, wash felt and sponge attached onto the weight.</p> <p>(2) Float type carburetor A Pull up fuel pipe and dismount filter net inserted into outlet port of fuel tank, and clean meshes of net. B Dismount throttle adjusting bolt from carburetor, and clean filter net. C Dismount fuel cock from carburetor and take filter net and clean it.</p>																														
<p>1. Engine won't start.</p> <p>2. Engine is hard to start.</p>	4	<p><b>Faulty functioning of priming pump.</b></p> <p>1. If rubber packings in priming pump are deteriorated and swollen, they may cause the malfunction of valve stopping the flow of gasoline into carburetor. This will cause hard starting of engine.</p> <p>2. If rubber cap becomes soft, the pumping function fails, with the result that the fuel is not fed under pressure at starting of engine. The causes of softening are as follows:</p> <ul style="list-style-type: none"> <li>① Deterioration of rubber caused by gasoline. (This occurs especially in long term use of engine)</li> <li>② The long term stored spare parts covered with plastic film are liable to occur the softening of the cap due to the absorption of moisture.</li> </ul>	 <p>Inner part of priming pump</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Name of part</th> <th>Part No.</th> <th>Amount</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Pump body</td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>2</td> <td>Packing B</td> <td>FR64285</td> <td>1</td> <td>t 0.6 (mm)</td> </tr> <tr> <td>3</td> <td>Valve seat A</td> <td>FR64244</td> <td>1</td> <td></td> </tr> <tr> <td>4</td> <td>Valve</td> <td>FR64246</td> <td>2</td> <td>Ball</td> </tr> <tr> <td>5</td> <td>Packing A</td> <td>FR64245</td> <td>1</td> <td>t 1.2 (mm)</td> </tr> </tbody> </table>	No.	Name of part	Part No.	Amount	Remarks	1	Pump body		1		2	Packing B	FR64285	1	t 0.6 (mm)	3	Valve seat A	FR64244	1		4	Valve	FR64246	2	Ball	5	Packing A	FR64245	1	t 1.2 (mm)	<p>(1) If rubber packings in priming pump were swollen, replace them with new ones. Since the rubber packing is made from fluorine, it is hardly swollen by regular gasoline.</p> <p>(2) Replace the softened rubber cap with a new one.</p> <p>Order of assembly</p> <ul style="list-style-type: none"> <li>① Insert packing B into pump body.</li> <li>② Insert valve seat A into body. (With seat portion upward)</li> <li>③ Insert valve cushion (1 piece) into pipe joint.</li> <li>④ Insert packing A into body.</li> <li>⑤ Install balls (2 pieces) on valve seat.</li> <li>⑥ Insert valve cushion into valve seat B. . . . . (Onto the two holes' side)</li> <li>⑦ Insert valve seat B into body.</li> <li>⑧ Tighten cap, . . . . . with finger tightly.</li> </ul>
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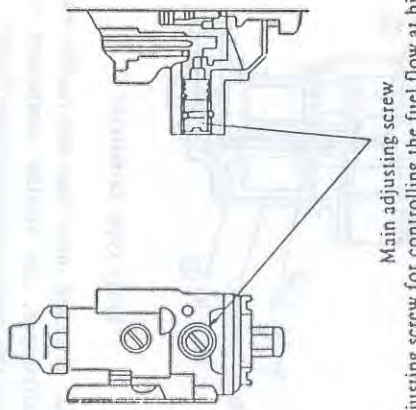


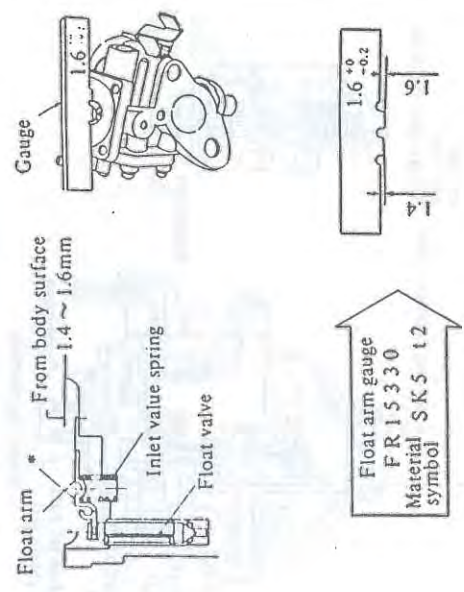
Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies																									
		<p>[Note] Cut the corner of plastic film bag which contains the spare parts to facilitate a good ventilation, when the bag has no hole.</p>	<table border="1"> <thead> <tr> <th>No.</th> <th>Name of part</th> <th>Part No.</th> <th>Amount</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>Valve seat B</td> <td>FR64284</td> <td>1</td> <td></td> </tr> <tr> <td>7</td> <td>Pump cap</td> <td>FR64248</td> <td>1</td> <td></td> </tr> <tr> <td>8</td> <td>Rubber cap</td> <td>FR64247</td> <td>1</td> <td></td> </tr> <tr> <td>9</td> <td>Valve cushion</td> <td>FR64281</td> <td>2</td> <td>Sponge</td> </tr> </tbody> </table>	No.	Name of part	Part No.	Amount	Remarks	6	Valve seat B	FR64284	1		7	Pump cap	FR64248	1		8	Rubber cap	FR64247	1		9	Valve cushion	FR64281	2	Sponge	
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<p>1. Engine is hard to start. 2. Unstable idling.</p>	5	<p><b>Faulty installation of carburetor</b> When installing carburetor, if there exists any gap between packing and suction pipe, the starting of engine at cold condition becomes harder due to admittance of additional secondary air from the gap. And this also can cause the unstable idling of the engine.</p>	 <p>Float type carburetor</p>	<p>Install carburetor firmly onto suction pipe while pressing it against suction pipe. [Note] The packing is bonded on carburetor, however if it is stripped off, caution must be taken not to drop or lose it.</p>																									



Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<p>1. Engine is hard to start.</p> <p>2. Insufficient speed.</p> <p>3. Engine speed fluctuates at high speed.</p> <p>4. Poor acceleration.</p> <p>5. Unstable idling.</p> <p>6. Carburetor floods or overflows.</p>	<p>6</p>	<p><b>Clogging of fuel passage of carburetor or adherence of gummy matter produced by gasoline to fuel passage.</b></p> <p>Because of shortage of fuel flow quantity, various troubles such as hard starting, insufficient speed, poor acceleration, poor output also occur and engine surges at high speed.</p> <p>① Main jet ② Air vent ③ Needle jet ④ Slow air jet</p> <p>○ When gummy matter adheres to float valve or is jammed between valve and valve seat, it will cause overflow or flooding as well.</p> <p>Before engine is stocked for long time without using, it is desirable that the user should be instructed to operate the engine until entire fuel in the float chamber and metering chamber is consumed completely and the engine stops.</p>	<p>Diaphragm type carburetor</p> <p>Float type carburetor</p>	<p>(1) Main jet</p> <ul style="list-style-type: none"> <li>○ Diaphragm type Dismount main diaphragm and main adjusting screw, remove the foreign matter attached on the fuel passage of main jet part with a wire.</li> <li>○ Float type Dismount float chamber and main jet, remove the foreign matter attached in the holes.</li> </ul> <p>(2) Needle jet Dismount mixing chamber cap and throttle valve, remove the foreign matter attached on the needle jet from upper side of it with a wire.</p> <p>(3) As for diaphragm type slow air jet and float type air vent, dismount air cleaner and remove the foreign matter with a thin wire attached on a tag.</p> <p>[Note] Wire should be used for cleaning of fuel passage, but do not use forcedly a thick wire to clean the passage, as the possible enlargement of calibrated holes will disturb operation of engine due to the excessive flow rate of fuel.</p> <p>Replace the mixed fuel if it has been left for long time (one to two months or more) with a new one.</p>
	<p><b>Deterioration of fuel (gasoline)</b></p> <p>Starting engine becomes harder.</p>	<p>When engine is stored more than one month with gasoline filled in carburetor, the volatile component of gasoline evaporates and this makes engine starting difficult. And it may cause the corrosion of carburetor inside. And the gummy matter produced from the deteriorated gasoline sticks to the fuel passage.</p>		

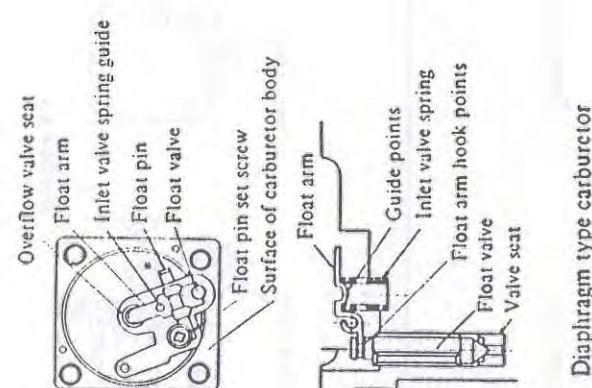
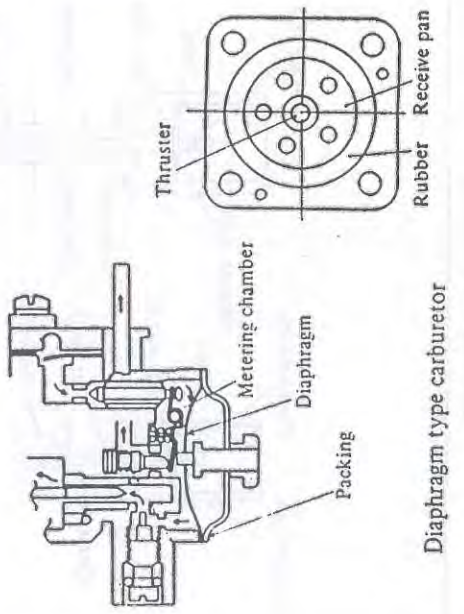


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<p>1. Insufficient output.</p> <p>2. Poor acceleration.</p> <p>3. Unstable idling.</p> <p>4. Engine is hard to start (When engine is hot.)</p>	<p align="center">7</p>	<p><b>Faulty adjustment of main adjusting screw.</b></p> <p>1. Excessive screwing-in of adjusting screw. In this case, the fuel mixture becomes too lean and it will result poor acceleration and insufficient output.</p> <ul style="list-style-type: none"> <li>o Especially in summer it will cause the engine to overheat and may result in impossibility of restarting after the engine being stopped by overheating.</li> </ul> <p>2. Excessive back-off turns of adjusting screw. The air fuel mixture becomes too rich, and it will result insufficient output (poor speed) and unstable idling speed.</p>	<p align="center">Locations to be checked</p>  <p align="center">Diaphragm type carburetor</p>	<p>Adjust the engine with the main adjusting screw so that the maximum output is developed when a load is applied at a high speed. (8000 rpm and over)</p> <p align="center">Standard back-off turns: 2 to 3 turns</p> <p>(1) Move throttle lever to the full opening position.</p> <p>(2) Set main adjusting screw within the range of standard back-off turns by turning it right and left.</p> <p>The air-fuel mixture becomes lean when screw is turned clockwise.</p> <p>The air-fuel mixture becomes rich when screw is turned counterclockwise.</p> <p>(3) Checking of rapid acceleration and deceleration. Perform the opening and closing operations quickly many times and check to see if the acceleration and deceleration of the engine are made smoothly. If the engine stalls or the acceleration is unsatisfactory, it is assumed that the air-fuel mixture is too lean.</p> <p>[Note] The above mentioned adjustments should be done on condition that the causes of troubles of Item No. 1 to Item NO. 6 had been removed beforehand.</p>
<p>1. Overflowing.</p> <p>2. Hard starting.</p> <p>3. Engine stalls after starting.</p> <p>4. Insufficient output.</p> <p>5. Poor acceleration.</p>	<p align="center">8</p>	<p><b>Incorrect float arm height</b></p> <p>1. Float arm position is too high. Because of excessive suction of fuel, engine starting becomes harder or even if it starts high speed can not be obtained.</p> <ul style="list-style-type: none"> <li>o The fuel flows into cylinder or flows out through air cleaner owing to overflowing.</li> </ul> <p>2. Float arm position is too low. Although diaphragm is operated, float arm is not function or even if it functions, the operational stroke is not sufficient, and therefore shortage of fuel quantity occurs, that will cause the stoppage of engine after starting, poor acceleration, and insufficient output.</p>	<p>Dismount diaphragm cover and diaphragm, and measure the height as shown in left figure with a measuring gauge.</p> <p align="center">The height from carburetor body surface: 1.4 to 1.6 mm</p> <ul style="list-style-type: none"> <li>o Slide the gauge on the body surface, and ensure that 1.4 mm gauge enters and 1.6 mm gauge does not.</li> <li>o The height of float arm is adjustable by bending the arm of the * marked points close to float lever pin with a long nose plier.</li> </ul> <p>[Note] The above mentioned adjustments should be done on condition that the causes of troubles of Item No. 9 had been removed beforehand.</p>	

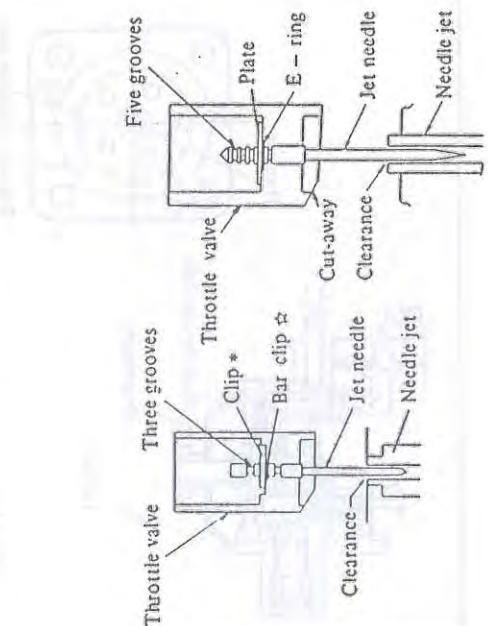
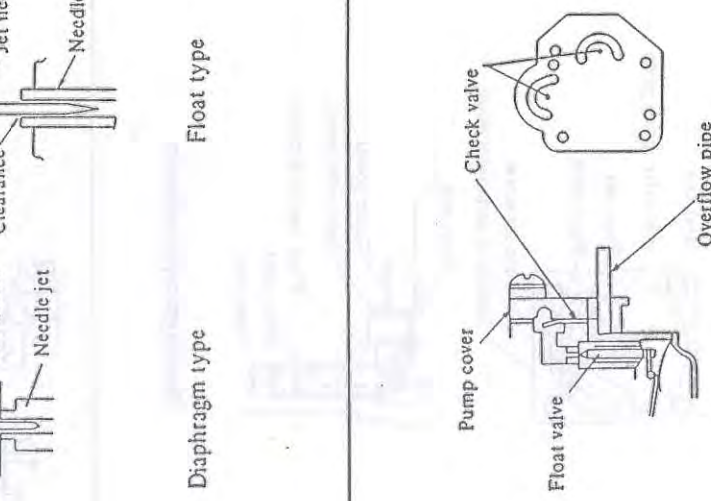


Diaphragm type carburetor

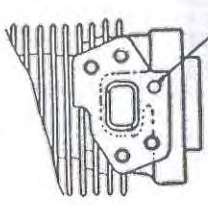
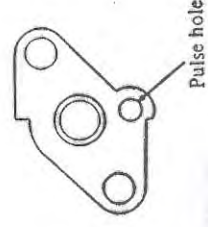
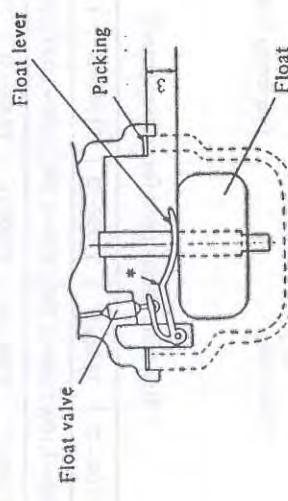


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<p>1. Hard starting.</p> <p>2. Overflowing.</p> <p>3. Engine speed fluctuates at high speed.</p>	<p>7</p>	<p><b>Faulty assembly of float valve</b></p> <p>If float valve becomes worn or foreign matter attaches to valve seat, the replacement or cleaning of valve should be performed.</p> <p>However, in this case, if float valve is assembled incorrectly float valve opening pressure will drop and carburetor is susceptible to overflowing (mixture becomes too rich), it will result hard starting and disorder at high speed.</p> <p>○ In the case of float type carburetor, when valve seat becomes worn or foreign substance adheres to valve seat, or after long term laying-up of engine, gummy matter produced by gasoline sticks to the valve seat as well, the faulty functioning of float valve will be caused and it will result the overflowing.</p>	 <p>Diaphragm type carburetor</p>	<p>(1) On installation of inlet valve spring, the initial mounting load for the spring is important. Therefore, the free length of spring should not be changed by compressing and be careful of the inclination at the time of mounting to attain correct valve opening pressure.</p> <ol style="list-style-type: none"> <li>① Free length of inlet valve spring . . . . . 8mm</li> <li>② Valve opening pressure . . . . . <math>0.9 \pm 0.2</math> kg/cm<sup>2</sup></li> <li>③ Check if the spring is securely seated on the guide (protruded portion) of the float arm.</li> </ol> <p>(2) Fully draw or bring float pin near the side of set screw when tightening float pin.</p> <p>If float pin is tightened at the position as it is closer to the "*" marked position as shown in the left figure, the pin will be lifted upward and will cause dropping of valve opening pressure and consequently overflowing will be induced due to tilting installation of float valve.</p> <p>○ The valve opening pressure is measured with the pressure gauge.</p> <p>When measuring the valve opening pressure, pressurize fuel line filled with fuel from fuel inlet of diaphragm with the pressure gauge and read the scale of the pressure gauge at the moment of the valve opening.</p>
<p>1. Hard starting.</p> <p>2. Overflowing.</p> <p>3. Engine speed fluctuates.</p> <p>4. Engine stalls after starting.</p>	<p>8</p>	<p><b>Deterioration of main diaphragm rubber.</b></p> <p>On long-term storage of engine, if fuel remains in metering chamber, diaphragm rubber may be hardened and deformed, and therefore the float lever will be pressed upward ceaselessly, so consequently the overflowing will be induced and it will result hard starting or stoppage of engine, because of excessive suction of fuel and excessive richness of mixture.</p> <p>If adequate quantity of fuel is not fed into the engine due to the faulty function of diaphragm, the engine starts but, soon stops.</p>	 <p>Diaphragm type carburetor</p>	<p>(1) Replace diaphragm whole assembly together with packing.</p> <p>[Assembly procedure]</p> <ol style="list-style-type: none"> <li>① When packing and diaphragm are assembled separately, attach the packing to the body side, if it is installed at cover side, leakage of fuel will result.</li> <li>② Mount diaphragm to the body with directing receive pan toward body side.</li> <li>③ Align knock-pin with hole.</li> </ol>

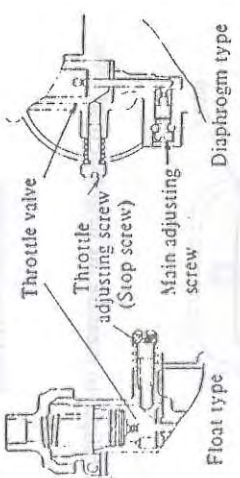
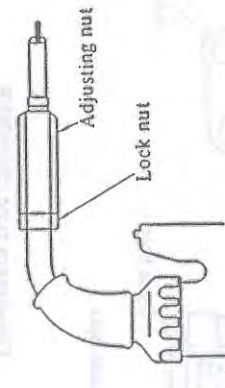


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<ol style="list-style-type: none"> <li>1. Unstable idling.</li> <li>2. Spark plug becomes sooty.</li> <li>3. Engine speed fluctuates at medium speed.</li> </ol>	11	<p><b>Wear of jet needle</b></p> <p>When jet needle becomes worn, the fuel flow rate ranging from idle to medium speed, goes to excess and it will cause the disorder of engine such as unstable idling etc.</p> <ol style="list-style-type: none"> <li>1. Although engine speed is set at normal speed, when engine is accelerated, the speed drops abnormally and stops. ((The straight portion of needle becomes worn.))</li> <li>2. When engine is operated at medium speed (5000 to 6000 rpm), the carbon deposits or soot of plug occurs due to incomplete combustion. ((The taper portion of needle jet hole becomes worn))</li> </ol>	 <p>Diaphragm type</p> <p>Float type</p>	<p>(1) When jet needle becomes worn, it should be replaced with a new one, however if the mixture is too rich only at medium speed (5000 to 6000 rpm), try to elevate the groove by one step from the former groove position.</p> <p>(2) Two types of needle jet such as assembly type or press-in type are used properly according to the engine models, if they are assembly type, replace them with new ones all together.</p> <p>(3) A portion shown in left figure; functions at slow speed.          C portion shown in left figure; is diameter of cylinder portion.          B portion shown in left figure; functions at medium speed.</p> <p>[Note] When assembling jet needle, the * marked place (points) clip should be positioned at the under side of the * marked place clip as shown in the left figure.</p>
<ol style="list-style-type: none"> <li>1. Insufficient speed.</li> <li>2. Engine stalls after starting.</li> <li>3. Poor acceleration.</li> </ol>	12	<p><b>Deterioration of pump diaphragm</b></p> <p>If the same deterioration as the main diaphragm occurs in pump diaphragm, the pumping function of check valve decreases, and it will cause troubles such as insufficient speed of engine, poor acceleration, stoppage of engine etc. due to the lack of fuel flow rate under pressure.</p>	 <p>Diaphragm type carburetor</p>	<p>When installing new pump diaphragm to pump chamber for replacing old one, the direction and surface of diaphragm should be aligned accurately with the mounting surface and order of gasket set should be correct.</p> <p>o The function of check valve is a pumping action generated by pressure fluctuation in the crankcase.</p>

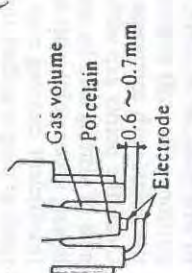
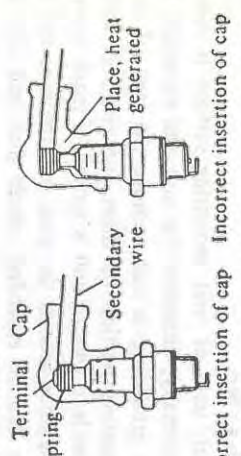


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
1. Engine stalls after starting.	13	<p>Clogging of pulse hole.</p> <p>If pulse hole is clogged, the fuel which is fed by priming pump ignites, and it will cause the engine to stop.</p> <p>○ Because of the pressure fluctuation of crank-case is not applied to pump diaphragm, the fuel is not fed to carburetor.</p>	<p>Cylinder</p>  <p>Carburetor</p>  <p>Intake side port</p> <p>Diaphragm type carburetor</p>	<p>The pulse holes are being drilled on cylinder, packing, insulator and carburetor, and therefore, when assembling them, align these four holes of the parts with each other and tighten them.</p> <p>Avoid application of adhesives such as Three bond etc. to the packing.</p>
1. Hard starting. 2. Unstable idling. 3. Engine speed fluctuates at high speed.	14	<p>Improper fuel level in float chamber.</p> <p>1. If fuel level is :</p> <ul style="list-style-type: none"> <li>○ Too high . . . . . overflow or flooding occurs, hard starting will result due to excessive of fuel.</li> <li>○ Too low . . . . . shortage of flow quantity occurs, fluctuation of speed at high speed or stoppage of engine will result. (due to the suction of bubbled fuel caused by the vibration)</li> </ul>	 <p>Use caliper to measure the height of float lever.</p> <p>Float type carburetor</p>	<p>The fuel level can be adjusted with float lever. Adjust float lever height so that 3 to 3.5mm of distance between float lever and packing surface (as shown in the left figure), can be attained with a long nose plier at the * marked points.</p> <p>[Note]</p> <p>① Some float levers are made of resin according to the types of carburetors, this float lever is made of special resin uniquely developed, and therefore, occurrence of the deformation is very rare in practice.</p> <p>② Some float valves are equipped with a spring, and therefore, be careful not to press the float lever excessively.</p>

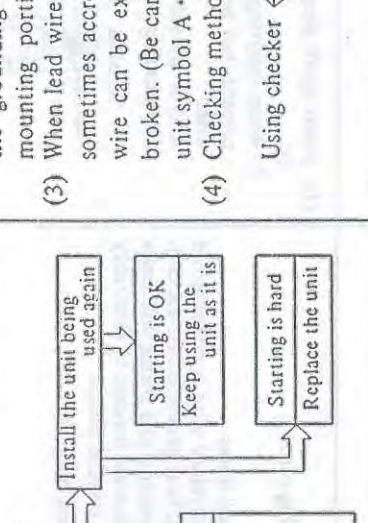
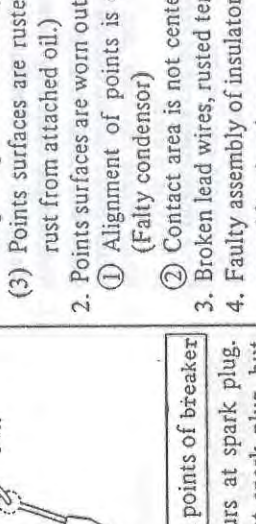
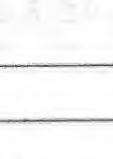


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies																				
<p>1. Engine stalls after idling or at slow speed operation.</p> <p>2. The cutter is rotated slow due to slight transmission of engine output.</p>	<p>15</p>	<p>Faulty adjustment of throttle adjusting screw. (Slow-speed adjusting screw)</p> <p>After the slow-speed has been set at excessively low revolution if the speed is changed from high to low, the engine sometimes stalls, on the other hand if the slow-speed is set at excessively high revolution, the cutter is rotated due to the engagement of the clutch installed in the engine.</p> <p>[Note] If the engine is not governed at the correct slow-speed, the remedy of above mentioned item of the unstable idling is required beforehand.</p>	<p>Locations to be checked</p>  <p>Standard idling speed for setting (rpm)</p> <table border="1" data-bbox="558 771 750 1406"> <tr> <td>T50M-D</td> <td>T80P-D</td> <td>T130P-D</td> <td>T130P-C</td> <td>T170P-D</td> </tr> <tr> <td>2,000~3,100</td> <td>2,300~2,700</td> <td>2,800~3,200</td> <td>2,500~3,000</td> <td>2,300~2,700</td> </tr> <tr> <td>T170P-C</td> <td>T200P-D</td> <td>T200P-C</td> <td>T240P-D</td> <td>T240P-C</td> </tr> <tr> <td>2,000~2,400</td> <td>2,300~2,700</td> <td>2,000~2,400</td> <td>2,300~2,700</td> <td>2,000~2,400</td> </tr> </table>	T50M-D	T80P-D	T130P-D	T130P-C	T170P-D	2,000~3,100	2,300~2,700	2,800~3,200	2,500~3,000	2,300~2,700	T170P-C	T200P-D	T200P-C	T240P-D	T240P-C	2,000~2,400	2,300~2,700	2,000~2,400	2,300~2,700	2,000~2,400	<p>Adjustment</p> <p>Adjust the opening of throttle valve with throttle adjusting screw while the engine idling.</p> <p>The engine speed increases when the screw is turned clockwise.</p> <p>The engine speed decreases when the screw is turned counterclockwise.</p> <p>[Note] When the engine idle speed is set at extremely low revolution, the engine might stop.</p>
T50M-D	T80P-D	T130P-D	T130P-C	T170P-D																				
2,000~3,100	2,300~2,700	2,800~3,200	2,500~3,000	2,300~2,700																				
T170P-C	T200P-D	T200P-C	T240P-D	T240P-C																				
2,000~2,400	2,300~2,700	2,000~2,400	2,300~2,700	2,000~2,400																				
<p>1. Hard starting.</p>	<p>16</p>	<p>Excessive play of throttle wire</p> <p>If the play of throttle wire is too large, the opening of throttle valve (about 30% of opening at starting) is changed, even if throttle lever is placed to the starting position, the starting of the engine becomes harder due to lack of admittance of proper air-fuel mixture.</p>	<p>Adjustment</p> <p>Loosen lock nut, and turn adjusting nut to the left, the play of the wire becomes small.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Standard play of throttle wire : 0.5 ~ 1.0 mm</p> </div> 																					

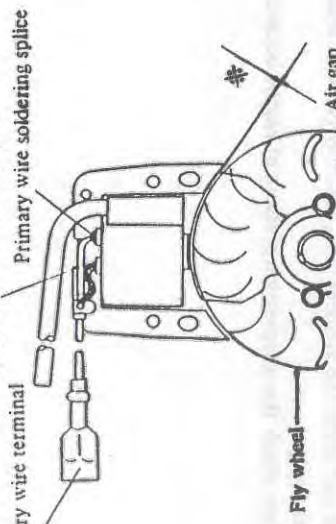
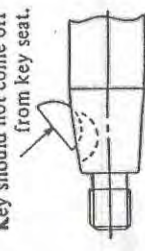


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
1. Engine won't start. 2. Engine is hard to start.	17	Defective spark plug. 1. Spark occurs at gas circulation space (inner part of center electrode). 2. Spark does not occur. 3. Spark is weak.	1. When engine being operated on an overly rich mixture condition or idled for long period, the incombustible tar and carbon will adhere to the electrodes and the appearance of electrodes will indicate wet fouling. Same phenomena can be seen when improper fuel-lubricating oil mixture is used. 2. When engine has been used over long term without servicing, accumulated carbon deposit on the gas circulation space (volume) will cause misfire at inner part of the electrodes. 3. Widened gap caused by burning of electrodes is hard to produce spark, and therefore ignition does not occur in richer mixture. And the central electrode is liable to be damaged or burnt in lean mixture.	(1) Remove carbon deposited on electrodes and porcelain of plug. Especially clean the porcelain until the original surface of it is revealed, and adjust the gap after cleaning of it. (2) After removing the heavily sooted deposit, wash it with gasoline and dry it by blowing with compressed air before using. 
1. Engine won't start.	18	Defective stop switch. 1. No spark occurs at spark plug. 2. Engine won't stop if the stop switch is pressed.	1. In case of no spark occurs after cleaning of the plug or with a new plug, disconnect lead terminal of stop switch and perform the spark test. 2. If spark occurs across the gaps, the stop switch is defective. 3. In case of engine can not be stopped even if pressing the stop switch, the cause of trouble is due to water penetration or rusty contacts.	Replace defective switch with a new one, since construction of this switch is not allowed to be disassembled.
1. Electric leakage. 2. Engine won't restart.	19	Defective spark plug cap. 1. Electric leakage occurs at engine-powered equipment. 2. Engine stalls under rainy operating conditions.	1. Pin holes are observed on spark plug cap. 2. Cap hole (Hole for plug) burnt. [Note] Possible causes of above two items : If spring connected to secondary wire is not inserted securely into plug terminal, heat generated on the contact surface between the terminal and spring will make the rubber burn, and it will cause leakage of electricity through external metal or electric shock. 3. Small or fine cracks occur on spark plug cap.	(1) Insert spark plug cap into terminal of plug securely. ○ When inserting cap, the cap should not only be pressed, but be inserted while screwing it clockwise. And it should be screwed anticlockwise when dismounting it.  (2) Replace cap occurring leakage or electric shock with a new one. (3) Since cracked cap with the exterior part cracked lacks holding force and might be penetrated by water and will cause electric shocks. Replace it with a new one in advance.

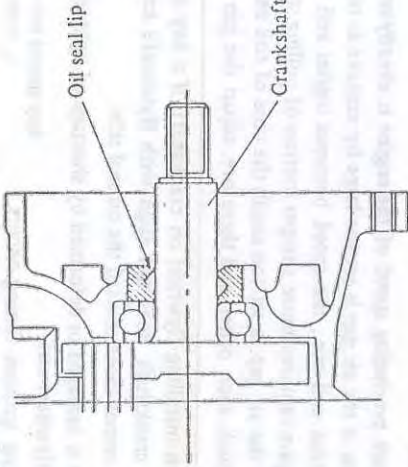


Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<p>1. Engine won't start.</p> <p>2. Engine can start occasionally.</p>	20	<p><b>Defective MTI unit.</b></p> <p>1. No spark occurs at spark plug.</p> <p>2. Spark occurs at spark plug, but the engine is hard to start.</p>	<p>1. If terminal portion becomes rusty by the penetration of water or dirt, electric conduction of terminal becomes bad.</p> <p>2. Enlarged double plug receptacle causes bad conduction due to faulty contact of plug and receptacle.</p> <p>3. In the case of engine used for water pump, if the mounting portion of unit-case rusts, the grounding becomes wrong.</p> <p>4. Lead wire was broken at the outlet portion of unit due to vibration.</p> <p>5. Abnormality of MTI inner parts.</p> 	<p>(1) Disconnect lead wire terminal and clean it. And if the fit of plug receptacle and plug is loose, squeeze or draw the opening of plug receptacle with a plier.</p> <p>(2) When unit or unit mounting surface is rusty abnormally, dismount the unit and especially if the grounding is bad, remove the rust of the mounting portion of them and clean as well.</p> <p>(3) When lead wire of unit is moved, if spark occurs sometimes across the wire, pull the wire and if wire can be extended, check that lead wire is broken. (Be careful of the unit S type indicated unit symbol A · B)</p> <p>(4) Checking method of unit.                      Measurement of sole unit.                      Measurement of actual unit with master unit.                      Measurement of actual unit with spare unit.</p> <p>Using checker ←</p>
<p>1. Engine won't start.</p> <p>2. Engine can start occasionally.</p>	21	<p><b>Defective contact points of breaker</b></p> <p>1. No spark occurs at spark plug.</p> <p>2. Spark occurs at spark plug, but the engine is hard to start.</p> <p>3. No spark occurs short time after cleaning the points.</p>	 <p>1. Points surfaces fouling.</p> <p>(1) Points surfaces fouled with oil.</p> <p>① Excessive oil is applied on the felt when overhauled.</p> <p>② Gas leakage from the oil seal portion of crankshaft.</p> <p>(2) Water penetrated points due to breakage of packing or forgetting of its assembly will result in same phenomena.</p> <p>(3) Points surfaces are rusted. (The points metal is liable to rust from attached oil.)</p> <p>2. Points surfaces are worn out.</p> <p>① Alignment of points is changed as shown in the figure. (Falty condensor)</p> <p>② Contact area is not centered due to worn out of bearing.</p> <p>3. Broken lead wires, rusted terminals.</p> <p>4. Faulty assembly of insulator when assembling breaker.</p> <p>5. Faulty adjustment of breaker-points.</p> 	<p>(1) When abnormality of breaker is observed, determine the causes of the troubles according to the checking items written in the left column and repair them temporarily.</p> <p>(2) Adjusting procedure of points.                      Clean the points with an emery cloth or sandpaper of fine grain, or oil stone and wash only contacts the points with small amount of gasoline and blow the points with compressed air.                      Clean the points gap with a paper having a thickness of visiting card by inserting it into the gap aligning upper point with lower point.                      Insufficient cleaning may cause occurrence of no spark at plug in a short time.</p> <p>(3) When breaker points are replaced owing to occurrence of the abnormal transference or misalignment of point surfaces, replace the condenser as well.</p> <p>(4) When contact surfaces of upper and lower points are misaligned each other abnormally, replace them with new ones.</p> <p>(5) Adjust points gap to the value of 0.35 mm at maximum opening position of it. (If ignition timing is late, the spark plug becomes sooty.)</p>



Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies												
<p>1. Engine won't start.</p> <p>2. Engine is hard to start.</p>	<p>22</p>	<p>Defective ignition coil</p> <p>1. Engine stops during operation, after that no spark occurs at spark plug.</p> <p>2. As the temperature of engine rises, no spark occurs at spark plug, whereas when temperature falls, spark occurs.</p>	<p>Grounding wire soldering splice</p> <p>Primary wire terminal</p>  <p>Three-needle sparking performance</p> <table border="1" data-bbox="558 793 718 1020"> <thead> <tr> <th>type</th> <th>model</th> <th>T80, T130</th> <th>T170, T200, T240</th> </tr> </thead> <tbody> <tr> <td>Contact breaker</td> <td>T50</td> <td>7.5mm and over/500rpm 8.0mm and over/1000rpm</td> <td>7.0mm and over/550rpm 7.0mm and over/500rpm</td> </tr> <tr> <td>M T I</td> <td></td> <td>6.5mm and over/550rpm</td> <td>8.0mm and over/1000rpm 8.5mm and over/1000rpm</td> </tr> </tbody> </table> <p>Air gap ✱</p> <p>T50, T280, T340 → 0.3 to 0.5mm T80, T130~T240 0.4 to 0.5mm</p> <p>* The air gap should not be permitted to exceed the upper limit.</p> <p>The spark producing speed of the engine is already set at 500 at 600 rpm, if the air gap is set too large by mistake at replacement of ignition coil etc., the speed becomes higher and starting of the engine requires more sharper motion of pulling starter rope. And if the air gap is set too small, the core of coil and flywheel may touch each other, and therefore, adjust the gap with care.</p>	type	model	T80, T130	T170, T200, T240	Contact breaker	T50	7.5mm and over/500rpm 8.0mm and over/1000rpm	7.0mm and over/550rpm 7.0mm and over/500rpm	M T I		6.5mm and over/550rpm	8.0mm and over/1000rpm 8.5mm and over/1000rpm	<p>(1) Perform visual inspection of ignition coil.</p> <p>① Check the soldering splice or portion of grounding wire and primary wire for abnormality.</p> <p>② Check primary wire (lead wire) and secondary wire for the damage owing to the contact with inner parts.</p> <p>③ Check primary terminals and receptacles for rusting or loosening.</p> <p>(2) If no abnormality is observed at above visual inspection, proceed spark performance test with a coil-tester, diagnosing that the cause of troubles should exist inside of the ignition coil.</p> <p>(3) In the case of above mentioned (paragraph 2) troubles it may be decided that the insulation of inner coil was defective or wire was broken.</p> <p>Perform air gap adjustment with specified measuring gauge.</p> <p>(1) For T50, T80 and T130 model engine equipped with ignition coil on the driving-side of the case, use the 0.4 mm stainless steel gauge formed into the shape of flywheel circumference to adjust the air gap.</p> <p>(2) For T170, T200 and T240 model engine equipped with ignition coil at the fan case side, use specified gauge to adjust the air gap.</p>
type	model	T80, T130	T170, T200, T240													
Contact breaker	T50	7.5mm and over/500rpm 8.0mm and over/1000rpm	7.0mm and over/550rpm 7.0mm and over/500rpm													
M T I		6.5mm and over/550rpm	8.0mm and over/1000rpm 8.5mm and over/1000rpm													
<p>1. Engine won't start.</p>	<p>23</p>	<p>Faulty installation of flywheel key</p> <p>After overhauling the engine, spark occurs at spark plug but the engine does not start or is hard to start.</p>	<p>1. When installing flywheel on crankshaft, if a key installed on the crankshaft does not align with flywheel's keyway, the key comes loose toward the oil seal side.</p> <p>2. Key is damaged or deformed by shortage of tightening torque for flywheel nut.</p> <p>Wrong ignition timing occurs because of above mentioned troubles.</p> 	<p>1. Align keyway on the flywheel with the key installed on the crankshaft correctly and insert flywheel into the crankshaft.</p> <p>2. Tightening torque of flywheel nut (kg · m) :</p> <table border="1" data-bbox="1149 204 1228 657"> <tbody> <tr> <td>T50, T80</td> <td>T130 ~ T240</td> <td>T280 ~ T340</td> </tr> <tr> <td>0.8 ~ 1.0</td> <td>1.0 ~ 1.3</td> <td>2.3 ~ 2.7</td> </tr> </tbody> </table> <p>[Note] Replace damaged or deformed key with a new one, if necessary replace the flywheel as well.</p>	T50, T80	T130 ~ T240	T280 ~ T340	0.8 ~ 1.0	1.0 ~ 1.3	2.3 ~ 2.7						
T50, T80	T130 ~ T240	T280 ~ T340														
0.8 ~ 1.0	1.0 ~ 1.3	2.3 ~ 2.7														



Troubles	Item No.	Symptoms or causes of troubles	Locations to be checked	Remedies
<ol style="list-style-type: none"> <li>1. Engine is hard to start.</li> <li>2. Engine has no power.</li> <li>3. No spark occurs.</li> </ol>	<p style="text-align: center;">Gas leakage from oil seal</p> <p>Excessive wear of lip or come-loose of oil seal in the engine equipped MTI unit, will cause the mixture gas leakage and result in the following troubles ;</p> <ol style="list-style-type: none"> <li>1. Hard starting.</li> <li>2. Lack of output (Sufficient speed can not be obtained)</li> <li>3. Contact breaker's points are fouled.</li> </ol>		<p>(1) Causes of troubles</p> <ol style="list-style-type: none"> <li>① Oil seal lip worn out after long operating time.</li> <li>② Oil seal inserted slantly when replacing crank-case or oil seal.</li> <li>③ Dirt or foreign matter stuck between the oil seal lip and shaft.</li> </ol> <p>(2) Use specified inserting-tool when oil seal is pressed into the housing. And do not apply oil to the outer case surface of the oil seal of the following serial number's engine: T130 model E/# 311574 (including) and the former (Serial number's engine) T170 model E/# 69032 (including) and the former (serial number's engine)</p>	
<ol style="list-style-type: none"> <li>1. Engine is hard to start.</li> <li>2. Engine has no power.</li> </ol>	<p style="text-align: center;">Poor compression</p> <p>Engine is hard to start and has no power.</p>	<ol style="list-style-type: none"> <li>1. Worn piston and piston rings. Wear of the cylinder is relatively smaller than the wear of piston and rings. (Chrome-plated cylinder)</li> <li>2. If ring in width or piston ring grooves become worn, the rings may tilt and catch the cylinder port, and may result in breakage of the rings. Therefore check the compression pressure of engine occasionally.</li> </ol>	<p>(1) Perform checking and cleaning according to the following items.</p> <ol style="list-style-type: none"> <li>① Check for sucking of dust due to clogging or fouling of the air cleaner.</li> <li>② Check for containing of water and dust in the fuel.</li> <li>③ Check for the carbon deposited on the piston and piston rings.</li> </ol> <p>(2) Replace the piston or rings if the dimensions exceed the following allowable limits :  <ul style="list-style-type: none"> <li>o Clearance between piston rings and piston grooves ; 0.15 mm and over.</li> <li>o Ring gap ; 0.7 mm and over.</li> </ul> </p>	