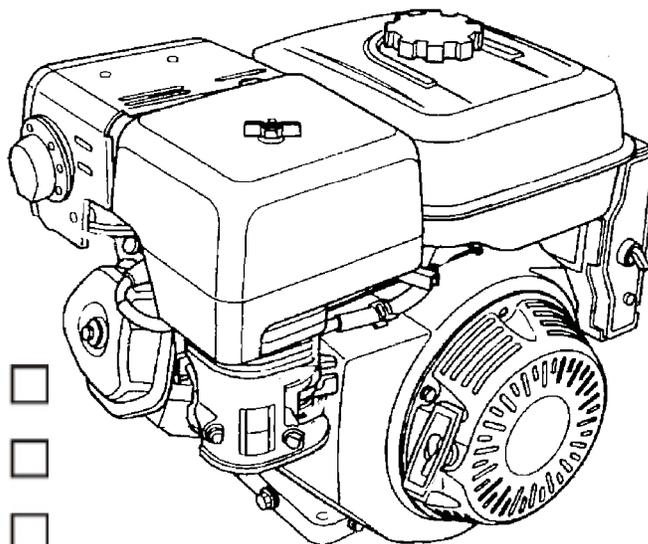


# Gasoline Engine Owner's Manual



- |              |                          |               |                          |
|--------------|--------------------------|---------------|--------------------------|
| <b>PD200</b> | <input type="checkbox"/> | <b>PD200E</b> | <input type="checkbox"/> |
| <b>PD390</b> | <input type="checkbox"/> | <b>PD390E</b> | <input type="checkbox"/> |
| <b>PD420</b> | <input type="checkbox"/> | <b>PD420E</b> | <input type="checkbox"/> |

**SAVE THIS MANUAL FOR FUTURE REFERENCE**

This manual provides information regarding the operation and maintenance of these products. We have made every effort to ensure the accuracy of the information in this manual. We reserve the right to change this product at any time without prior notice.

Please keep this manual available to all users during the entire life of the Gasoline Engine.

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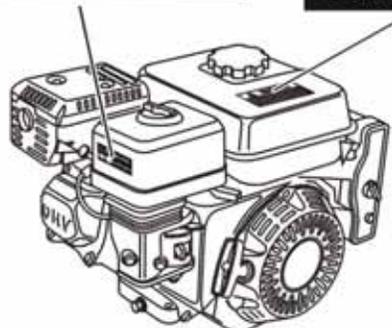
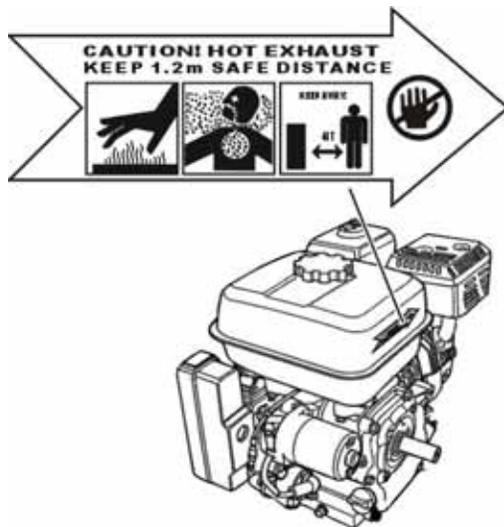
# SAFETY PRECAUTIONS

## WARNING:

Before operating the engine, be sure to read and familiar with the manual carefully, otherwise personal injury or equipment damage may produce.

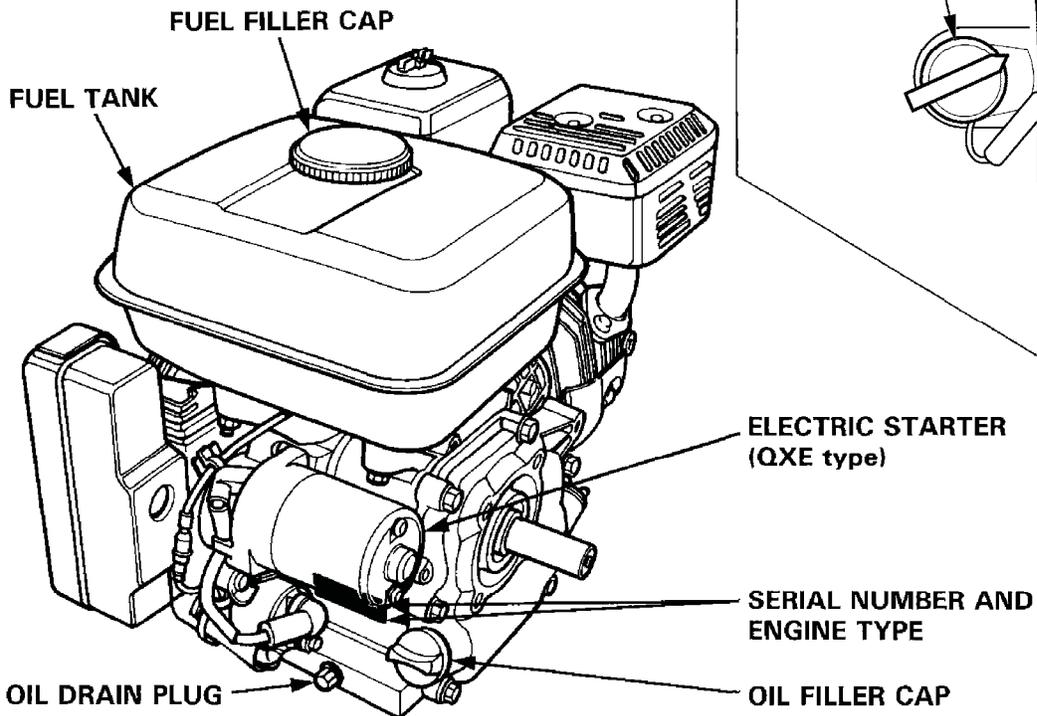
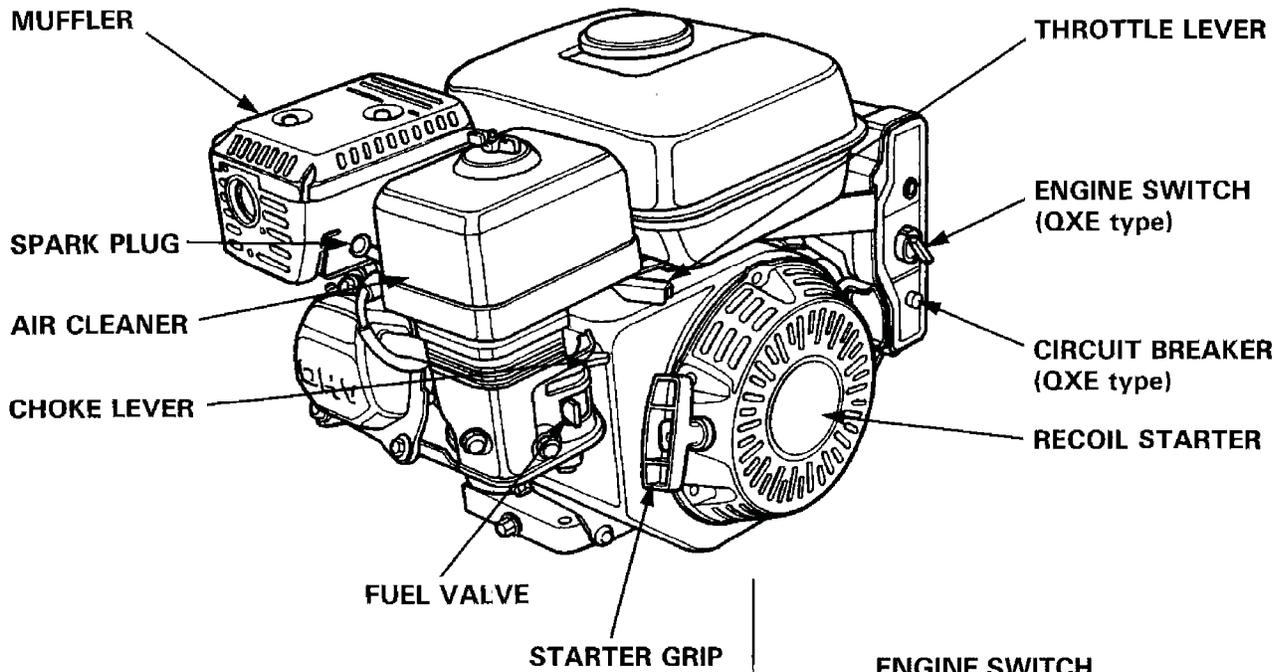
Please pay special attention to the following:

1. Running the engine in a well-ventilated place, keep it at least one meter away from building walls or other equipments, keep away from inflammables such as gasoline, matches and so on to avoid possibility of fire.
2. Keep the engine out of reach of children and pets to avoid accidents.
3. Operator of engine has been specially trained.
4. Refuel in a well-ventilated area with the engine stopped, and in places refueling or storing gasoline, no smoking and any flames or sparks.
5. Refuel the fuel tank not too full so as to avoid fuel's spilling out. If there is spilled fuel around, be sure to clean it thoroughly before starting.
6. Locate the engine on a level-working platform to avoid fuel's spilling out.
7. Make sure the fuel filler cap is tightened securely.
8. The exhaust muffler is very hot during running the engine even after the engine stops. Never touch it, or you may get burns. Transport or store the engine with it cooling down entirely.

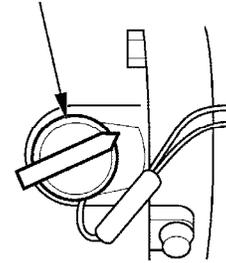


# PARTS DESCRIPTION

The main parts of engine are located as follows



ENGINE SWITCH



## BATTERY CONNECTION (electric-start type)

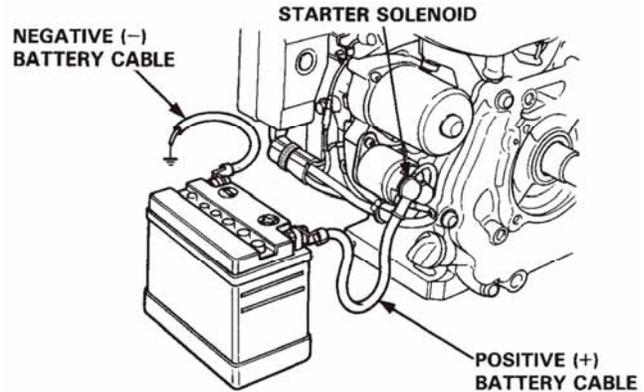
In the case that the specifications of the battery are **12V** and more than **18A.h** connect its positive lead to the electromagnetic coil while connect its negative lead to engine mount strew, base screw or any place capable of grounding with the engine well. Make sure the battery leads are connected tightly and no corrosion is found. If any, eliminate it.

### WARNING:

- The battery may give off explosive gas; keep sparks, flames and cigarettes away. Charge or use it in an area with good ventilation.
- The battery contains sylphlike acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield. If electrolyte gets in your skin, flush with water; if gets in your eyes, flush with water for at least 15 minutes and call a physician at once.
- Electrolyte is poisonous. If swallowed, drink large quantities of water or milk, and follow with milk of magnesia or vegetable oil and oil a physician.
- Keep out of reach of children.

### CAUTION:

- Do not add tap water to the battery instead of distilled water, or the battery life will be short-need.
- Do not add distilled water over electrolyte upper level mark, or electrolyte will spill out to corrupt the engine parts. If so, be sure to wash them away with water.
- Make sure not to connect the battery leads in reverse or-deer, or short-circuit or breaker's cutting may result.



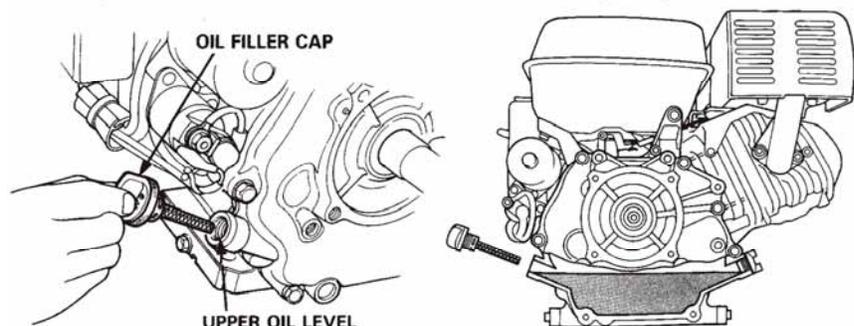
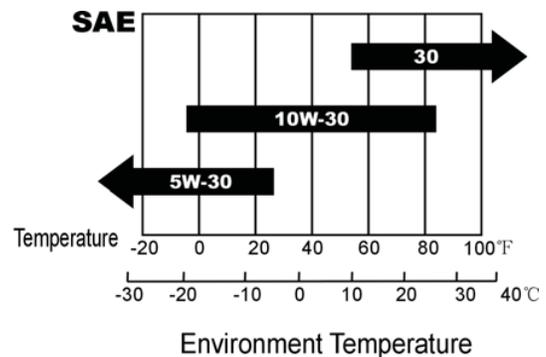
## PRE-OPERATE INSPECTION

### ENGINE OIL

### CAUTION:

- Engine oil is key factor in deciding the engine's performance. Do not apply engine oil with additives or 2-stroke gasoline oil, as they haven't enough lubrication, which may shorten the en-gene's service life.

- Check the engine with it stopped on a level ground. Engine oil recommended: SAE10W-30. As viscosity varies with regions and temperatures, so the lubricant has to be



selected in accordance with our recommendation.

## Check

1. Ensure that the engine is stopped on a level ground.
2. Remove the dipstick and clean it.
3. Reinsert the dipstick into the oil filler without screwing it, and check oil level.
4. If the oil level is too low, add the recommended engine oil up to the oil filler neck.
5. Reinstall the dipstick.

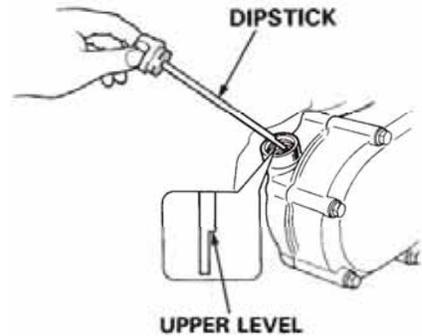
**CAUTION: Run with insufficient engine oil may damage the engine severely.**

**OIL IN THE REDUCTION GEAR BOX (only for the model equipped with it) 1/2 Reduction gear with an auto-centrifugal clutch**

Brand of the box oil is the same as that of engine oil.

Oil capacity: 0.3liters for 173F and 177F and 182F and 188F, 0.5liters for 168F and 168F-II. Check the oil lever in the following order.

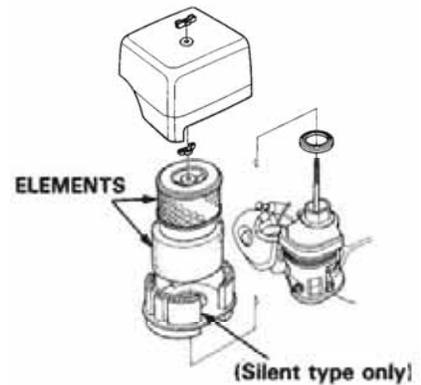
1. Remove the dipstick and clean it.
2. Reinsert the dipstick without screwing it in, and then check oil level
3. If the oil level is too low, add the recommended engine oil until it arrives the upper level mark.
4. Reinstall the dipstick.



## AIR CLEANER

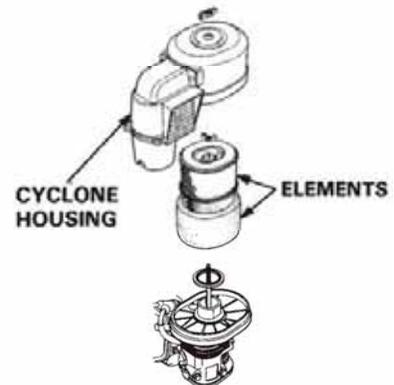
### I. Double-core type

Dismantle the air cleaner housing and check its filter element, make sure it clean and intact, otherwise clean or replace it.



### II. Dust-collecting type

1. Dismantle the dust-collecting hood and check the filter element of the air cleaner; make sure it is clean and intact, otherwise clean or replace.
2. Check whether there is any dust or dirt inside the dust-collecting hood, if any, clears away.



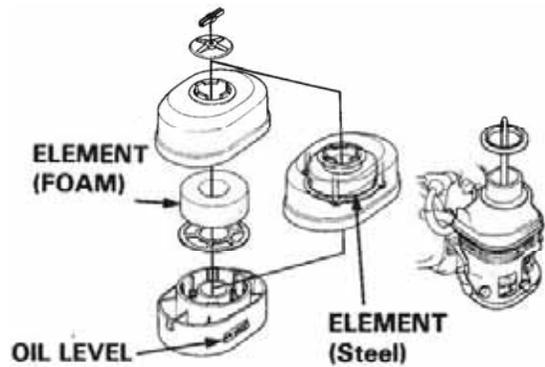
### III. Single-core type

Dismantle the air cleaner housing and check its filter element, make sure it is clean and intact, otherwise clean or replace.



#### IV. Oil-bath type

1. Dismantle the air cleaner housing and check its core, make sure it is clean and intact, otherwise clean or replace.
2. Check oil level and oil quality. If the oil level is too low, add the recommended engine oil up to oil level mark.



#### CAUTION:

Never run the engine without an air cleaner, or severe wear of the engine may result.

#### FUEL AND FUEL TANK

##### Fuel

To ensure that the engine runs smoothly use only **FRESH, UNLEADED GAS WITH AN OCTANE RATING OF 87 OR HIGHER**. Using unleaded gasoline will decrease the possibility of producing carbon deposit and will prolong the engine's service life. Never apply used or polluted gasoline or a mixture of gasoline with engine oil. Make sure the fuel is free of dirt and water.

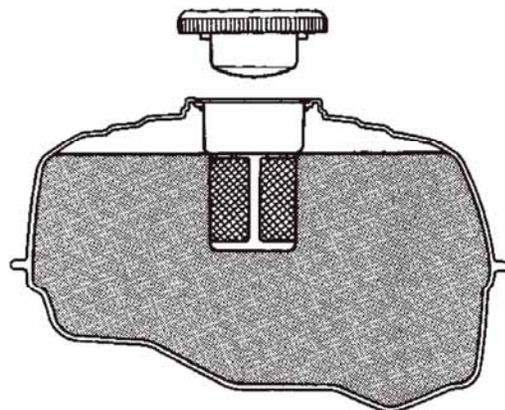
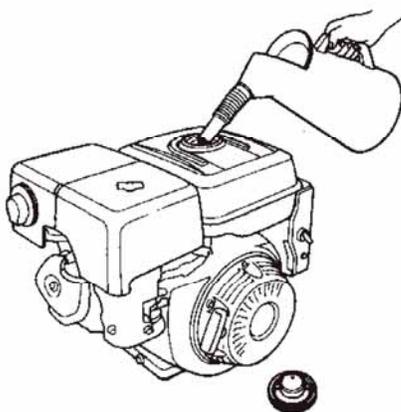
##### Gasoline Containing Alcohol

If you decide to use a gasoline containing alcohol (fuel blend), be sure its octane rating is at least as high as that recommended by the company. There are two types of "gasohol". One contains ethanol, and the other contains methanol. Neither gasoline containing more than 10% ethanol nor 5% methanol is allowed to be used. If methanol content in the fuel blend exceeds 5%, it may bring bad effect on the engine performance, besides, it may damage metals, rubber and plastic parts.

**CAUTION:** Handle fuel with care because it changes plastic and painted surface.

It is normal when you hear occasionally light spark knock or pinking with the engine running under heavy load.

**If "spark knock" or "pinking" occurs at a steady speed under normal load, change brand of gasoline; if such phenomena still happen, consult your dealer for help, otherwise the engine may be damaged.**



##### Fuel Tank

Fuel tank capacity: 3.6liters for 168F and 168F-II , 6.5liters for 173F ,177F, 182F , 188F and 188F.

## **Check**

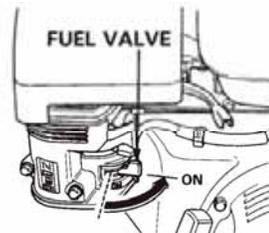
1. Remove the fuel filler cap and check fuel level.
2. If the fuel level is too low, refuel the tank. Remember adding fuel not over the fuel filler shoulder.

## **WARNING:**

- **Gasoline is extremely flammable and is explosive under certain conditions. Refueling in a well-ventilation area with the engine stopped. Do not smoke and allow flames or sparks in the area where gasoline is stored or where the fuel tank is refueled.**
- **Do not overfill the tank (there should be no fuel in the filler neck). After refueling, make sure the fuel filler cap is set back securely.**
- **Be careful not to spill fuel when refueling. Spilled fuel or fuel vapor may ignite. If any fuel is spilled, make sure the area is dry before starting the engine.**
- **Avoid repeated or prolonged contact with skin or breathing of fuel vapor. Keep out of reach of children.**

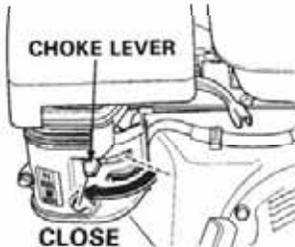
# STARTING THE ENGINE

1. Push the fuel cock to "ON".



2. Push the choke lever to "CLOSE".

**NOTE:** if the engine is hot, closing the choke is unnecessary.



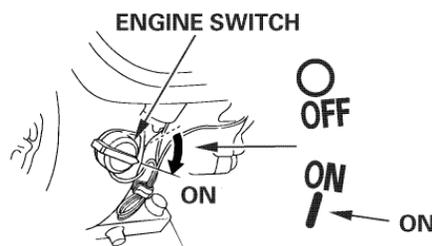
3. Move left the throttle lever a little.



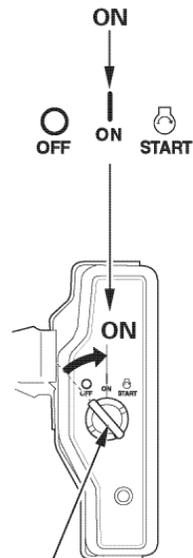
4. Start the engine as follows:

a) Hand-operated kick-starter Push the engine switch to "ON". Pull slightly the starting rope handle up until feeling anti-action, and then make a rapid pull.

## EXCEPT ELECTRIC STARTER TYPES



## ELECTRIC STARTER TYPES

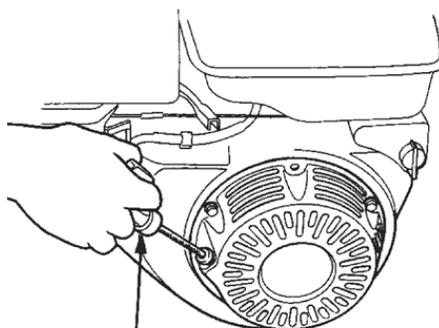


### CAUTION:

Releasing the handle suddenly may make it hitting the engine. Release the handle slowly conforming to its recoiling force.

b) Electric starter

Push the engine switch to "START" and remain there until the engine starts. Once the engine starts, reset the engine switch to "ON".

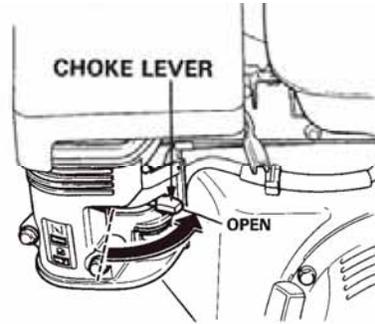


### CAUTION:

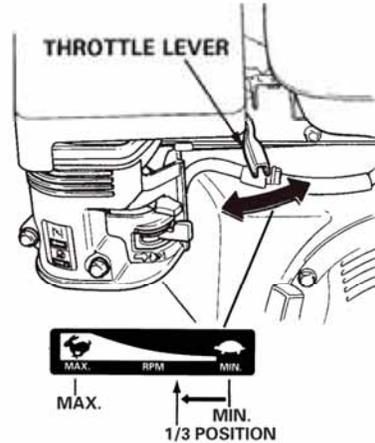
Use the engine switch not more than 5 minutes each time to avoid damage of the engine. Try once more 10 minutes later after last attempt failures.

# RUNNING THE ENGINE

1. Preheat the engine and push back the choke lever to “OPEN”.



2. Set the throttle lever in proper position to ensure the engine runs at required velocity.



## ENGINE OIL ALARM

The engine oil alarm is designed to function when the engine oil in the crankcase is insufficient. Lack of engine oil may damage the engine. Oil may damage the engine. Once oil level in the crankcase is too low, the engine oil alarm will stall the engine automatically to make it free of damage while the engine switch is still at “ON”.

## CAUTION:

If cannot restart the engine, check the engine oil level first before go to other check items.

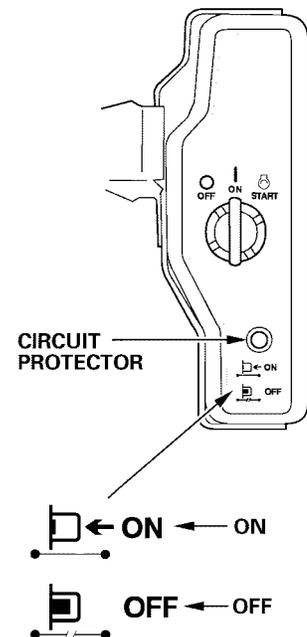
## BREAKER (Electric-start type)

The breaker will cut off automatically to protect the charging circuit of the battery in the case that short circuit or incorrect connection of the battery poles occurs.

The green indicator in the breaker will jump out with the circuit cutting off. After finding troubles and troubleshooting, depress the breaker button to tune the breaker on.

## OPERATING ON HIGHLANDS

On highlands, the standard mixture ratio is relatively too big so the engine performance may be impaired while the fuel consumption may increase, besides, too big mixture ratio will pollute the spark plug to result in starting the engine difficultly. This problem can be solved by amending the carburetor technological status. If always using on highlands with a height above sea level of 1800 meters, ask your dealer for doing the job.



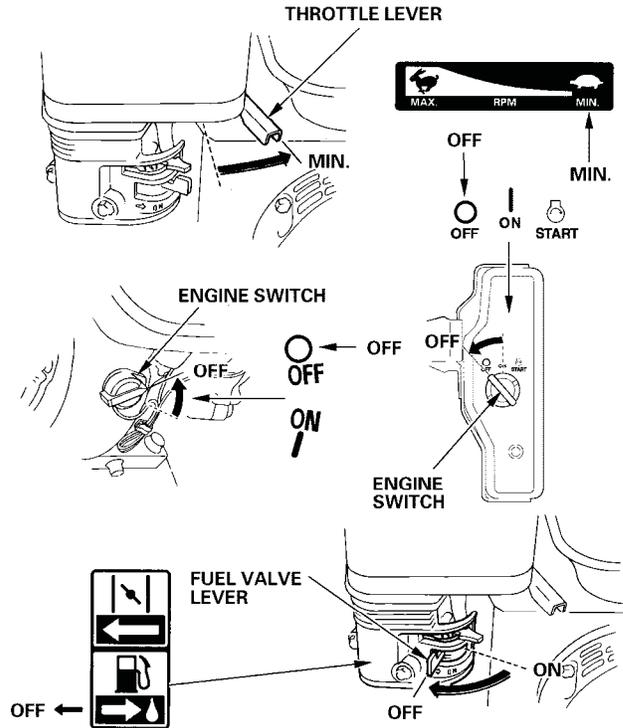
**CAUTION:**

Amended engine applicable to highlands may be damaged seriously in area below altitude of 1800 meters for overheating, because its mixture ratio is too small for operation in low altitude area. In the case, ask your dealer to recover the engine to its normal technical status.

**STOP**

In emergency, push the engine switch to “OFF” to stall the engine; to stop it in normal, do as follows:

1. Push right the throttle lever to the bottom.
2. Push the engine switch to “OFF”.
3. Set the fuel cock to “OFF”.



**CAUTION:**

Sudden stopping at high speed under heavy load is forbidden, otherwise damage will result.

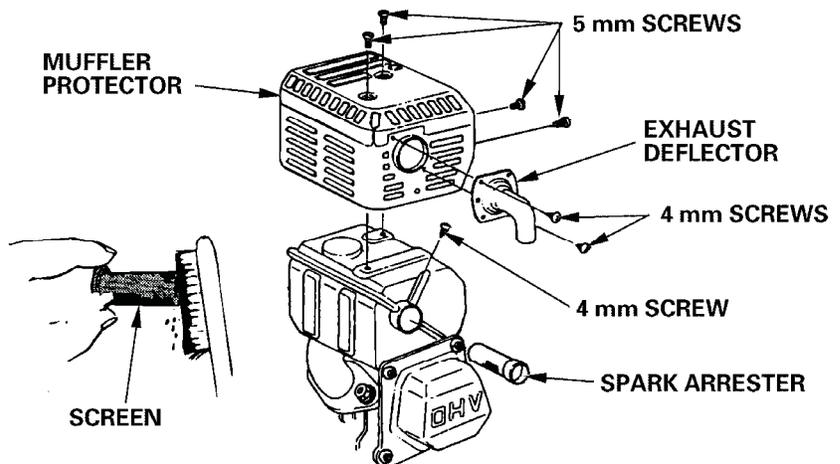
**EXHAUST CONTROL SYSTEM**

With the engine running, carbon monoxide, oxide of nitrogen and hydrocarbon will produce, and in certain conditions, oxide of nitrogen and hydrocarbon will react chemically each other to make smoke while carbon monoxide is toxic, so exhaust control of them is very important. The company decreases the exhaust emissions by introducing poor-fuel carburetors and other devices into the engine to solve the problem.

To keep the exhaust of your engine with in the standard exhaust emission, pay attention to the following:

**1. Maintenance**

Maintain the engine periodically in accordance with the maintenance schedule in the manual. The maintenance schedule is made out on the base of normal use in normal conditions, if using under heavy load, dusty or wet circumstances or in high temperature, service of the engine should be done more



often.

## 2. Replacement of Parts

We recommend that you should choose such parts which are manufactured by the company or equivalent to these in quality as replacement ones. Replacement without so high quality as the original may impair the exhaust the exhaust control system in effectiveness.

## 3. Modifying

Modifying the exhaust control system may make actual exhaust emissions exceeding statutory limit values. Illegal modification as such:

- a) Dismantle or modify any part of air intake or exhaust system.
- b) Modify or take off speed-adjusting connection device or speed adjustment device to result in the engine's running beyond the set parameters.

## 4. Problems Affecting Exhaust Emissions

- a) Difficult starting or difficult stopping.
  - b) Unstable idling.
  - c) Give off black smoke or consume too much fuel.
  - d) Poor ignition sparks or sparks returned.
- Once you find any of above problems, contact your dealer for help.

# MAINTENANCE

## MAINTENANCE SCHEDULE

Frequency Item		Each	First	Each	Every	6	Each
		time	month	season	month	or	year
			12 hrs	or	100 hrs	or	300 hrs
Engine oil	Oil level check	√					
	Replace		√		√		
Reduction gear oil	Oil level check	√					
	Replace		√		√		
Air cleaner	Check	√					
	Clean			√ <sup>①</sup>	√ <sup>②*</sup>		
	Replace						√ <sup>**</sup>
Deposit cup	Clean				√		
Spark plug	Clean, adjust				√		
	Replace						√
Spark eliminator	Clean				√		
Idling	Check-adjust						√ <sup>②</sup>
Valve clearance	Check-adjust						√ <sup>②</sup>
Fuel tank & fuel filter	Clean						√ <sup>②</sup>
Fuel supply line	Check	Every two years (do a replacement if necessary)					

### CAUTION:

Use only parts from the company or equivalents in quality; otherwise engine damage may result.

### NOTE:

\*: only for inside-ventilating double-core carburetors.

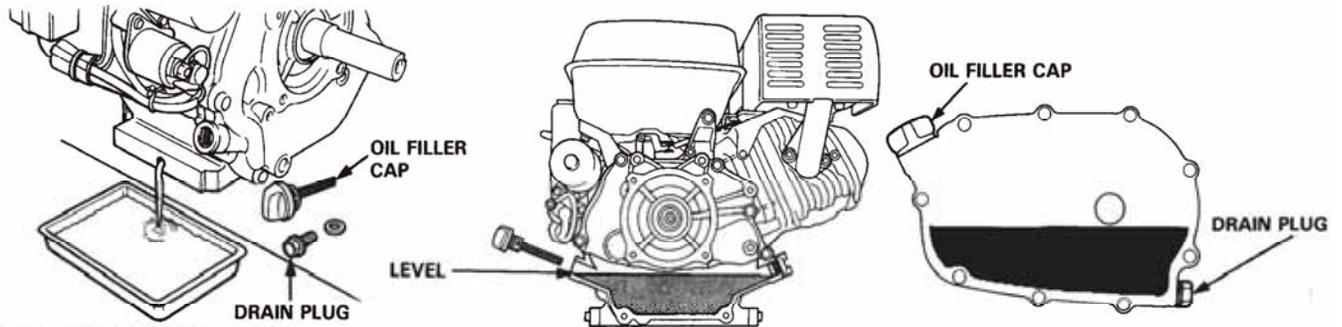
\*\* : only for paper core air cleaners. Every two years or 600 hours' later for dust collecting air cleaners.

- ① More often than that in the schedule if in dusty circumstances.
- ② Should be done by your dealer unless you are specially trained and is well equipped with tools.

**WARNING:**

Stall the engine before service. If service is required with the engine running, be sure to keep good ventilation in the area. The exhaust emissions from the engine contain toxic carbon monoxide, inbreathing of it may result injury and even death.

**REPLACEMENT OF ENGINE OIL**



**[REDUCTION GEAR OIL]**

A still hot engine is helpful to drain out the engine oil in the crankcase rapidly and entirely.

1. Turn off the oil filler cap and drain plug to drain engine oil thoroughly. Reinstall the drain plug and screw in securely.
2. Fill the specified engine oil up to the upper level mark.
3. Reinstall the oil filler cap.

Engine oil capacity in the reduction gear box is 0.3 0.5 liters, engine oil capacity in the crankcase is 0.6(1.1) liters.

**NOTE:**

Do not dump oil containers or discarded engine oil into rubbish boxes or onto the ground. For the sake of environmental protection, we suggest you take in discarded engine oil with a closed container and bring to local recycling station.

**SERVICE OF AIR CLEANER**

A dirty air cleaner may block enough air's flowing into the carburetor. To keep the carburetor in good working conditions, please service the air cleaner periodically. If operating the engine in extremely dusty area, the job should be done more often.

**WARNING:**

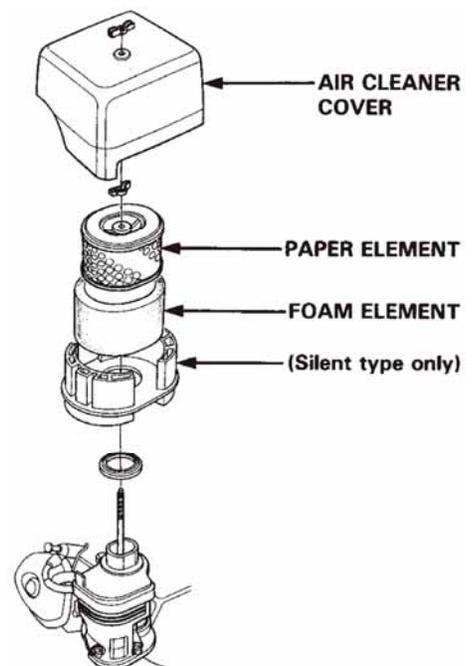
Never clean the air cleaner core in gasoline or low flash-point detergents, or explosion may happen.

**CAUTION:**

Never run the engine without an air cleaner, or air with dirt and dust may enter the engine so speed the engine's wear.

**Dual element type**

Unscrew the wing nut, dismantle the air cleaner housing. Check if the two cores are damaged, if so, replace with new



one.

a) Foam filter element: clean with home detergents and warm water (or non-flammable or high flash-point cleansing solvents) and dry up, then soak in clean engine oil until saturated. Squeeze out excess oil, otherwise, the engine will discharge smoke in starting stage.

b) Paper filter element: knock the core against a solid plane to get rid of accumulated dust or blow out dust from inside to outside with high-pressure air flow (not more than 30psi). Never clean with a brush, as brushing may force the dust into the core fiber. If the core is extremely filthy, replace with a new one.

### Dust-collecting type

1. Unscrew the wing nut, dismantle the air cleaner housing, check if the two cores are damaged, if so, replace with new one.

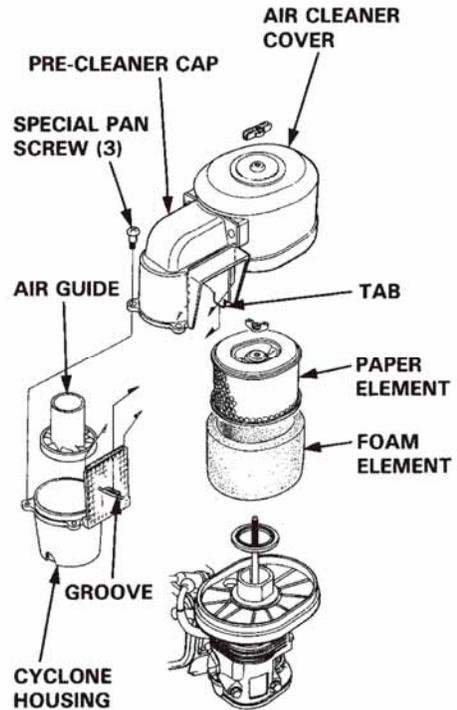
a) Foam filter element: clean with home detergents and warm water (or non-flammable or high flash-point cleansing solvents) and dry up, then soak in clean engine oil until saturated. Squeeze out excess oil, otherwise, the engine will discharge smoke in starting stage.

b) Paper filter element: knock the core against a solid plane to get rid of accumulated dust or blow out dust from inside to outside with high-pressure air flow (not more than 30psi). Never clean with a brush, as brushing may force the dust into the core fiber. If the core is extremely filthy, replace with a new one.

2. Clean the dust-collecting hood: screw off the three special semi-round screws and remove the hood, wash parts with water and then dry up. Reinstall the hood.

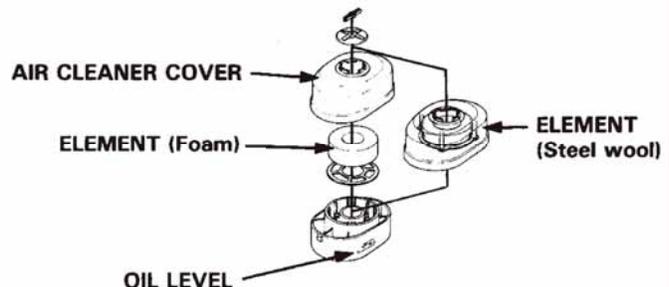
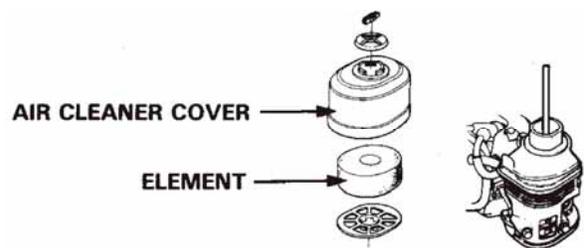
#### CAUTION:

- When reinstalling the dust collecting core air cleaner, make sure to embed the fin on the pre-air cleaner hood in the dent in the dust-collecting hood.
- Install the air guide in correct order.



### Single-core type

1. Remove the wing nut and air cleaner housing, and take out the filter element.
2. Clean with home detergents (or high flash-point cleansing solvents) and warm water, and dry up.
3. Soak in clean engine oil until saturated; squeeze excess oil, or the engine will exhaust smoke in starting stage.
4. Reinstall the filter element and air cleaner housing.



### Oil bath type

1. Remove the nut and air cleaner housing, and take out the filter element.

2. Clean with home detergents (or high flash-point cleansing solvents) and warm water, and dry up.
3. Soak in clean engine oil until saturated. Squeeze excess oil, or the engine will discharge smoke in starting stage.
4. Empty the air cleaner housing of oil. Clear away the dust inside with non-flammable or high flash-point cleansing solvents, and dry it up.
5. Fill the air cleaner housing with the specified engine oil up to the standard oil level mark.
6. Reinstall the air cleaner.

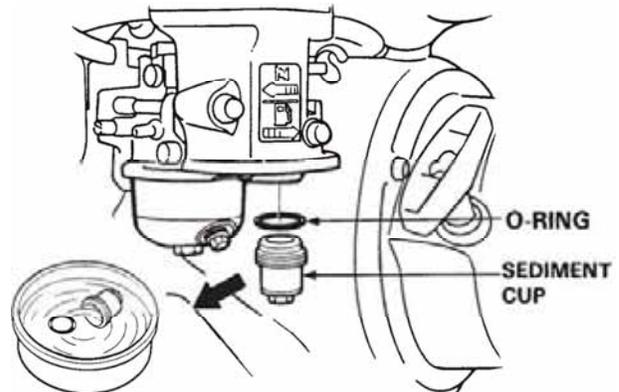
## WASHING OF DEPOSIT CUP

Set the fuel cock at "OFF", disconnect the deposit cup and O-ring. Wash in non-flammable or high flash-point cleansing solvents, and then try them up, at last, reinstall it. Set the fuel cock to "ON" and check for leaks.

### WARNING:

Gasoline is extremely flammable and explosive in certain condition. Keep cigarette, sparks and open flames away.

- After reinstalling the deposit cup, make sure the area around the engine is dry enough.



## SPARK PLUG

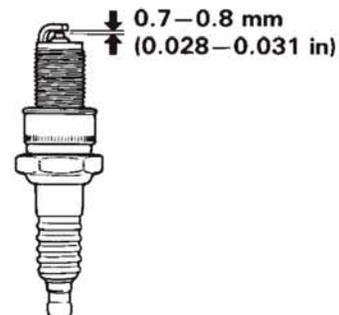
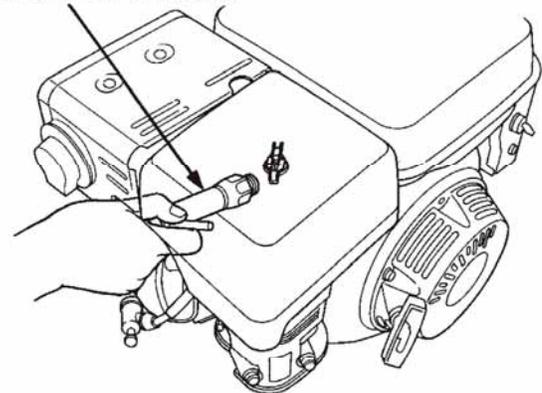
Spark plug type: BPR6ES (NGK) or NHSP LD F6RTC

Proper spark plug clearance ensures the engine's normal running under no deposit around the

spark plug.  Warning Be careful not to touch the muffler during or just after running the engine.

1. Remove the spark plug cap.
2. Clear away dirt around the spark plug base.
3. Dismantle the spark plug with a spark plug wrench.
4. Clean with a steel brush. If the insulator is damaged, replace the spark plug instead.
5. Measure the spark plug clearance with a feeler. The clearance should be 0.7~0.8mm. If adjustment is necessary, bend the side electrode carefully.
6. Check if the spark plug gasket is in good conditions, or replace with a new one. Screw on the spark plug to the bottom first by hand and then screw in by a spark plug wrench. If a new spark plug is used, twist 1/2 more turns after impacting the gasket, if reinstall the original one, just twist 1/8-1/4 more turns.

SPARK PLUG WRENCH

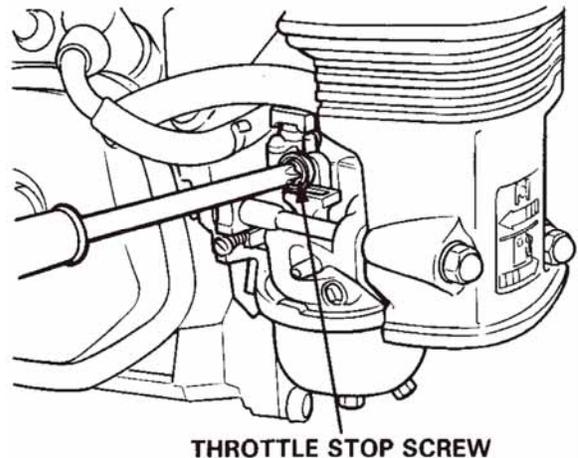


## CAUTION:

- The spark plug must be tightened securely, or it may become very hot to damage the engine.
- Only use recommended spark plug or the equivalent. Incorrect heat range of the spark plug may damage the engine.

## CARBURETOR IDLING ADJUSTMENT

1. Start and preheat the engine until arriving at the normal working temperature.
2. Obtain standard idling by adjusting the throttle fixing screw under the engine's idling. Standard idling:  $1700 \pm 150$ rpm.



## TRANSPORT, STORAGE AND REMOVAL FROM STORAGE

### TRANSPORT

Transport with the fuel cock turned off. Transport or store the engine when it is cool so as to avoid getting burns or fire.

### CAUTION:

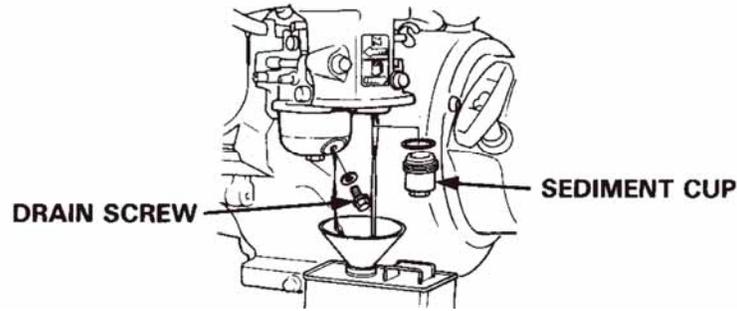
Do not incline the engine so as to avoid fuel's spill. Spilled fuel or fuel vapor may ignite to cause fire.

### STORAGE

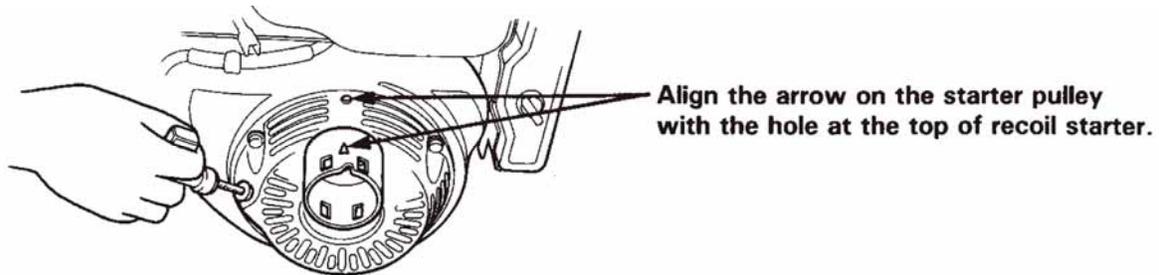
If the engine is not kept in use for a long time, be sure to store it properly. Make sure the storage area is dry and free of dust.

1. Drain the fuel ...
  - a. With the fuel valve in the OFF position, remove and empty the sediment cup.
  - b. Turn the fuel valve to the ON position and drain the gasoline from the fuel tank into a suitable container.
  - c. Replace the sediment cup and tighten securely.
  - d. Drain the carburetor by loosening the drain screw. Drain the gasoline into a suitable container.

**WARNING:** Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in the area.



2. Replace engine oil.
3. Disconnect the spark plug. Fill about a spoon of fresh engine oil from the spark plug mount hole into the cylinder. Crank the engine up to distribute engine oil evenly. Reinstall the spark plug.
4. Pull the starting rope slowly until feeling a slight anti-action, and then keep pulling it so as to align the arrow of the starting sleeve with the hole of the starter. At this time, both the inlet and outlet valves are closed so help prevent the engine inside from rusting.
5. Electric starter: disconnect the battery and store in dry and cool area. Charge once every month.
6. Cover the engine so keep dust away.



## REMOVAL FROM STORAGE

Before reusing, service the engine in accordance with the instruction of the table

STORAGE TIME	SERVICE ITEM
Within one month	Non
One ~ tow months	Drain out original fuel of the fuel tank and refuel
Two month ~ one year	Drain out original fuel of the fuel tank and refuel; Drain out fuel in the carburetor <sup>①</sup> ; Empty the deposit cup <sup>②</sup>
Above one year	Drain out original fuel of the fuel tank and refuel; Empty the fuel cup in the carburetor <sup>①</sup> ; Empty the deposit cup <sup>②</sup>

(1) Screw off the drain plug and drain out fuel in the carburetor.

(2) Turn off the engine switch first, disconnect the deposit cup and empty it.

Note: for the sake of environmental protection, we recommend to fill the discarded fuel into a closed container and bring to local recycling station. Never pour freely.

## WARNING:

Fuel is extremely flammable and explosive under certain conditions. Keep cigarette, open flames and sparks away from operating site.

## SPECIFCAIONS

### MAIN SPECIFICATIONS

Model Items	PD200	PD200E	PD390	PD390E	PD420	PD420E
Engine type	4-strok, OHV, 25°, single-cylinder, force air-cooled					
bore×stroke(mm)	68×54		88×64		90×66	
Rated output (kW/rpm)	3.7/3600		7.0/3600		7.8/3600	
Max. torque (N·m/rpm)	10.1/2500		20/2500		23.1/2500	
Displacement(ml)	196		389		419	
Starting type	recoil	Electric start	recoil	Electric start	recoil	Electric start
Ignition type	Induction ignition					
Lubricating type	splashing					
Noise Level	76dB@7m (22 feet)					
Fuel consumption (g/kW-h)	≤395			≤375		
Oil capacity	0.63 US. Qt.(0.6 L, 20 fl oz.)			1.16 US. Qt. (1.1 L, 37 fl oz.)		
Dry weight	33 lbs.	35.3 lbs.	70.5 lbs.	75 lbs.	73 lbs.	77 lbs.
Dimension (L×W×H) (in.)	14.25×12.3×13.2			17.7×16×17.4		

### TORQUE OF IMPORTANT BOLTS

S/N	Item	Specifications	Torque Value(N · m)
1	Cylinder head bolt	M8×1.25	24±2
2	Crankcase cover bolt	M8×1.25	24±2
3	Tie-rod bolt	M7×1	12±2
4	Flywheel bolt		70~80
5			8~10

# TROUBLESHOOTING

## I. START ENGINE DIFFICULTLY

### 1. By using kick-starter

TROUBLE	CAUSE	REMEDY
1. Normal cylinder compression. 2. Normal spark plug spark. 3. Something wrong with the fuel system. 4. Fuel supply is not smooth or no fuel supply.	There is no enough fuel in fuel tank of fuel cock is closed.	Fill fuel, open fuel cock.
	Air vent in the fuel filler cap is clogged.	Dredge air vent.
	Fuel cock is clogged.	Clean first and then dredge.
	Improper or clogged main oil flow hole.	Readjust or clean, blow to get through.
	Needle valve is not closed properly or start hole is clogged.	Dismantle needle valve and repair, clean, blow to get through.
	Float is damaged or sticking.	Repair float
1. Normal cylinder compression. 2. Normal spark plug spark. 3. Something wrong with the fuel system. 4. Smooth fuel flow.	Fuel is too filthy or deteriorated	Replace
	There is water in fuel	Replace
	Too much fuel in engine	Drain extra fuel, dry up spark plug electrodes
	Wrong fuel brand	Select proper fuel brand corresponding with the requirements
1. Normal cylinder compression. 2. Normal fuel supply. 3. Normal high-pressure coil spark. 4. Spark plug is in bad conditions.	Too much carbon deposit and dirt around electrodes.	Clear away
	Electrodes are burn damaged seriously or insulators damaged	Replace spark plug
	Improper electrodes gap	Adjust to proper value
1. Normal cylinder compression. 2. Normal fuel supply. 3. No high-pressure coil spark. 4. Normal spark plug.	High-pressure coil is damaged	Replace
	Ignition coil is damaged	Replace
	Magneto loses magnetism	Replace
1. Poor cylinder compression. 2. Normal fuel	Piston ring is worn to or even over its wear limit	Replace
	Piston ring is broken	Replace

supply system. 3. Normal ignition system.	Piston ring is sticking	Clear up carbon fouling
	Spark plug is not installed tighten or without a gasket	Tighter with a gasket in
	Air leakage between cylinder block and cylinder head	Check cylinder gasket, and the flatness of the surface by which cylinder block contacting with cylinder head, tighten cylinder head bolts in stipulated order to stipulated torque.
	Air leakage in valves	Check valve, clearance and tightness, repair if necessary

**WARNING:**

- When testing the spark plug, never hold the high-voltage wire of the spark plug with wet hand.
- Make sure there is no spilled fuel outside the engine and that the spark plug isn't dipped with fuel.
- To prevent fire, keep sparks far away from the spark plug mount hole.

2. By using starting motor

ITEM	CAUSE	REMEDY
Check battery connection	Incorrect connection	Correct
Check battery	No charge or under charge, corrosion	Check the breaker, charge up the battery or replace it
Starting motor functions normally	Be the same as kick-starter	Conduct it in the same way of kick-starter

Having fulfilled all the check items above, the engine still fails to work, contact your dealer for help.

**II. LOW GASOLINE ENGINE POWER OUTPUT**

TROUBLE	CAUSE		REMEDY
When turning throttle greater, speed in crease responds slow or speed is decreased even engine stops running	Ignition system	Incorrect ignition time	Readjust ignition advance angle
	Fuel supply system	Air in fuel line or fuel line clogged	Exhaust air or dredge fuel line
		Main oil flow hole is not adjusted properly	Readjust
		In carburetor, needle valve hole and main oil flow hole clogged	Clean and blow to get through
		Fuel cock is clogged up	Clean, replace damaged part
		Too much carbon deposit in combusting chamber	Clear away
		Too much carbon fouling in muffler and exhaust pipe	Clear away
	Air cleaner is clogged up	Clean air cleaner filter elemi	
Poor	Intake pipe is leaking	Repair or replace	

	compression	Piston or cylinder or piston ring is worn	Replace the worn
		Air leakage from the surface by which cylinder block contacting with cylinder head	Replace cylinder gasket
		Too big or too small valve clearance	Readjust it
		Valve tightness is poor	repair

### III. GASOLINE ENGINE CANNOT RUN SMOOTHLY

TROUBLE	CAUSE	REMEDY
Engine is pinging	Piston, cylinder or piston ring is worn excessively	Replace the worn
	Piston pin and piston pin hole are worn excessively	Replace piston or piston pin
	Tie rod small head is worn excessively	Replace tie rod
	Roller bearing for crankshaft main shaft is worn	Replace roller bearing
Abnormal combustion	Engine is too hot	Shoot trouble
	Too much carbon deposit in combustion chamber	Clear away
	Improper gasoline brand or low gasoline quality	Replace with qualified gasoline
Engine cannot start because of spark lacking	There is water in float chamber	Clean
	Improper spark plug electrodes clearance	Adjust
	Incorrect ignition time	Readjust
	Something wrong with induced coil, and so on	Check and replace damaged parts

### IV. STOP SUDDENLY WHEN RUNNING

TROUBLE	CAUSE	REMEDY	
Stop suddenly when running	Fuel supply system	Fuel is used up	Refill fuel
		Carburetor is clogged	Check fuel line and dredge
		Float is leaking	Repair
		Needle valve sticks	Dismantle float chamber and crimate it
	Ignition system	Spark plug is struck through, or short-circuited by carbon deposit	Replace spark plug
		Side electrode of spark plug is dropped out	Replace spark plug
		High-pressure wire is dropped out	Weld on

		Ignition coil is struck through to be short-circuited	Replace ignition coil
		Parking wire is located on engine body	Find out meeting and insulate
	The other	Cylinder is pulled damage, valve is dropped out	Repair or replace damaged parts

#### V. GASOLINE ENGINE IS EXCESSIVELY HOT

TROUBLE	CAUSE	REMEDY
Gasoline engine is excessively hot	Improper ignition time	Adjust ignition advance angle properly
	Insufficient fuel supply	Refill engine oil
	Exhaust pipe is blocked up	Dredge exhaust pipe
	Flow guard is leaking	Repair damaged part
	Dirt or something like this fill up among air cooling fins	Clear away dirt or something like this
	Cooling fan is loosen, losing function	Reinstall well
	The rod deformation makes piston and cylinder bushing side wear	Replace tie rod
	Cylinder or piston or piston ring is worn, resulting in air flow between cylinder and crankcase	Replace the worn
	Improper adjustment of engine speed produces excessive rotational speed	Readjust engine speed to proper value by speed regulator
Crankshaft main bearing is burnt out	Replace main bearing	

NOTE: the gasoline should run under certain temperature. Generally, permitting temperature at the flow guard outlet is between 80-110°C, while the temperature of the crankcase is about 60°C under the magneto. If temperatures surpass the limits, it is an indication that the gasoline engine is excessively hot.

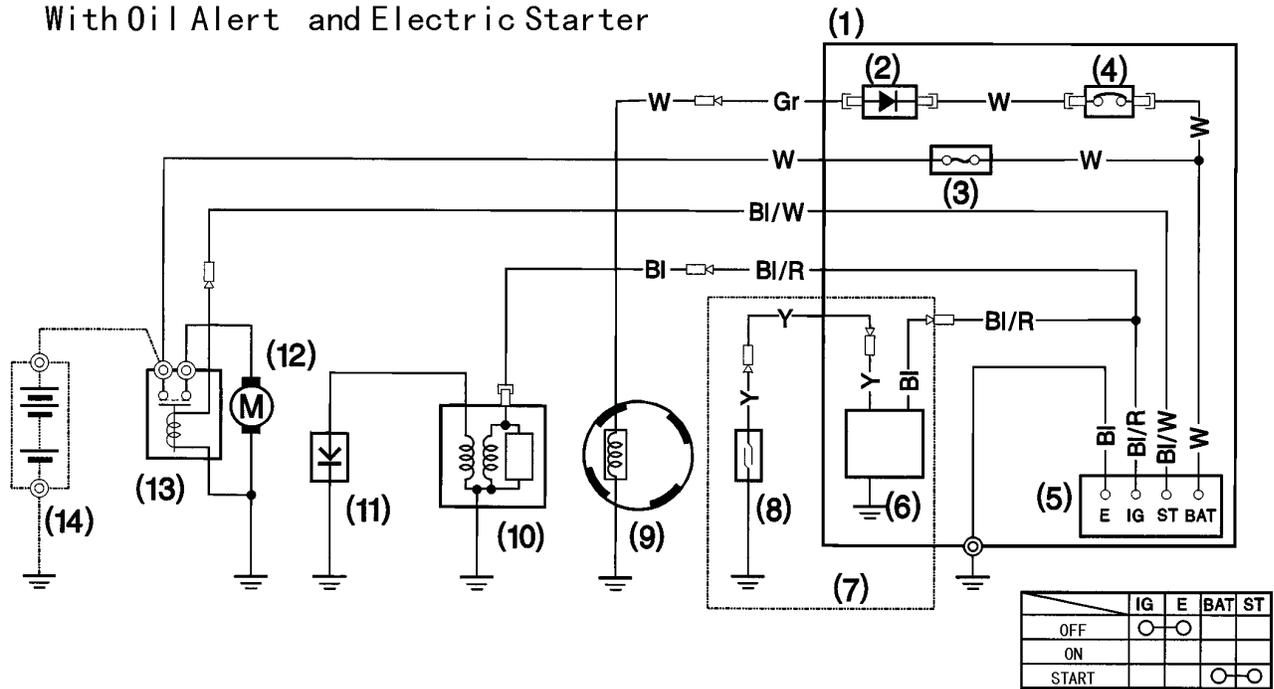
#### VI. THERE EXISTS ABNORMAL NOISE WHEN ENGINE RUNNING

TROUBLE	CAUSE	REMEDY
Abnormal noise	Piston, piston ring or cylinder is worn	Replace the worn
	Tie rod or piston pin and piston pin hole is worn	Replace the worn
	Crankshaft main bearing is worn	Replace
	Piston ring is broken	Replace
There is an abnormal noise during	Too much carbon deposit in combusting chamber	Clear away carbon deposit

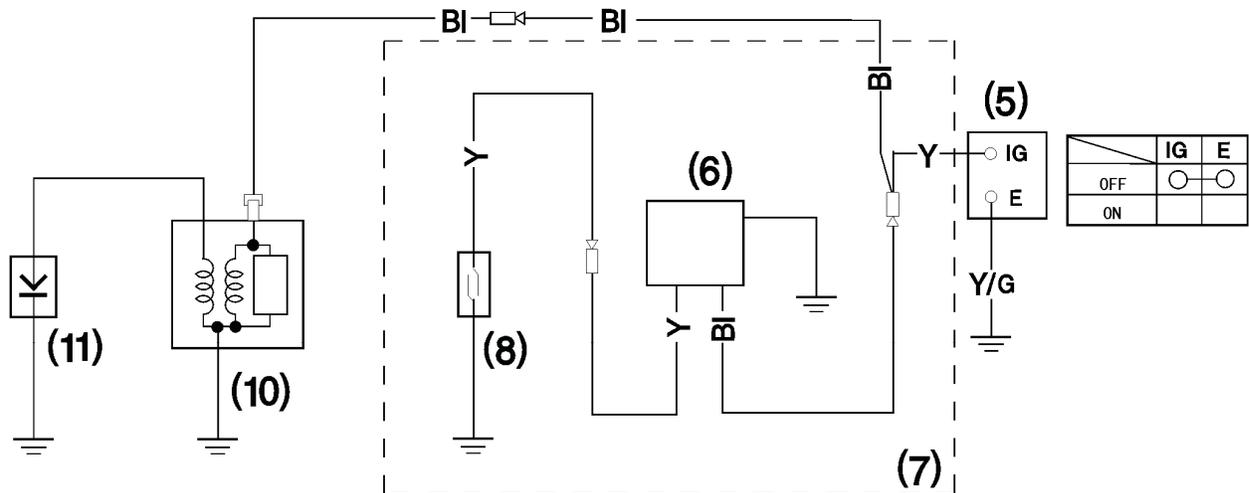
combustion	Too small electrode clearance of spark plug	Adjust electrode clearance properly
	Engine is flooded with fuel	Check relative parts such as carburetor
	Improper fuel brand	Replace fuel
	Engine is excessively hot	Find a cause and eliminate it
The other	Improper valve clearance	Readjust valve clearance properly
	Fly wheel is not connected with crankshaft tightly	Connect tightly

# WIRING DIAGRAM

### With Oil Alert and Electric Starter



### With Oil Alert and Without Electric Starter



(1) CONTROL BOX

(2) RECTIFIER

(3) FUSE

(4) CIRCUIT BREAKER

(5) ENGINE SWITCH

(6) OIL ALERT UNIT

(7) TYPE WITH OIL ALERT UNIT

(8) OIL LEVEL SWITCH

(9) CHARGING COIL

(10) IGNITION COIL

(11) SPARK PLUG

(12) STARTER MOTOR

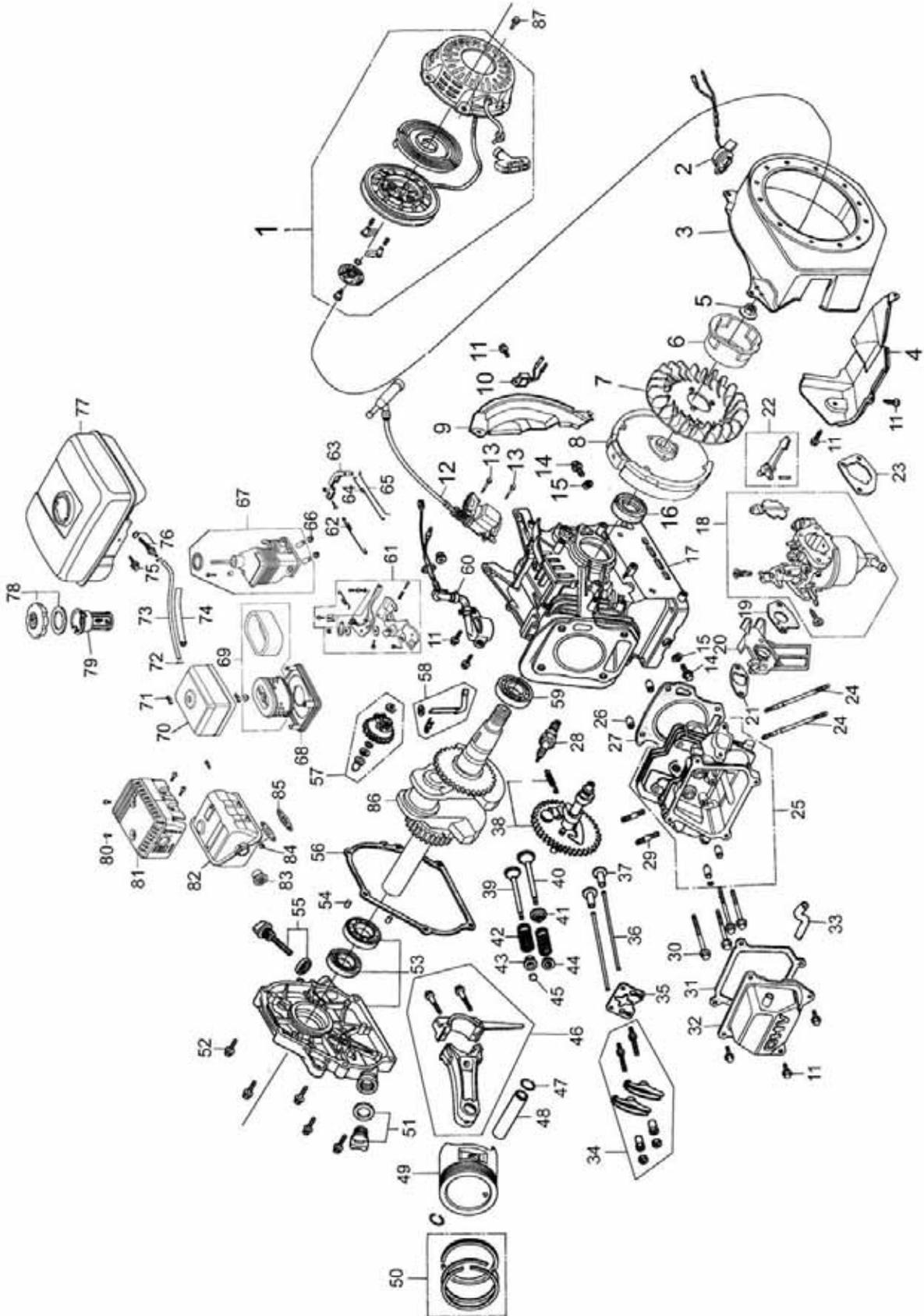
(13) STARTER SOLENOID

(14) BATTERY (12 V)

BI	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light green
R	Red	P	Pink
W	White	Gr	Gray

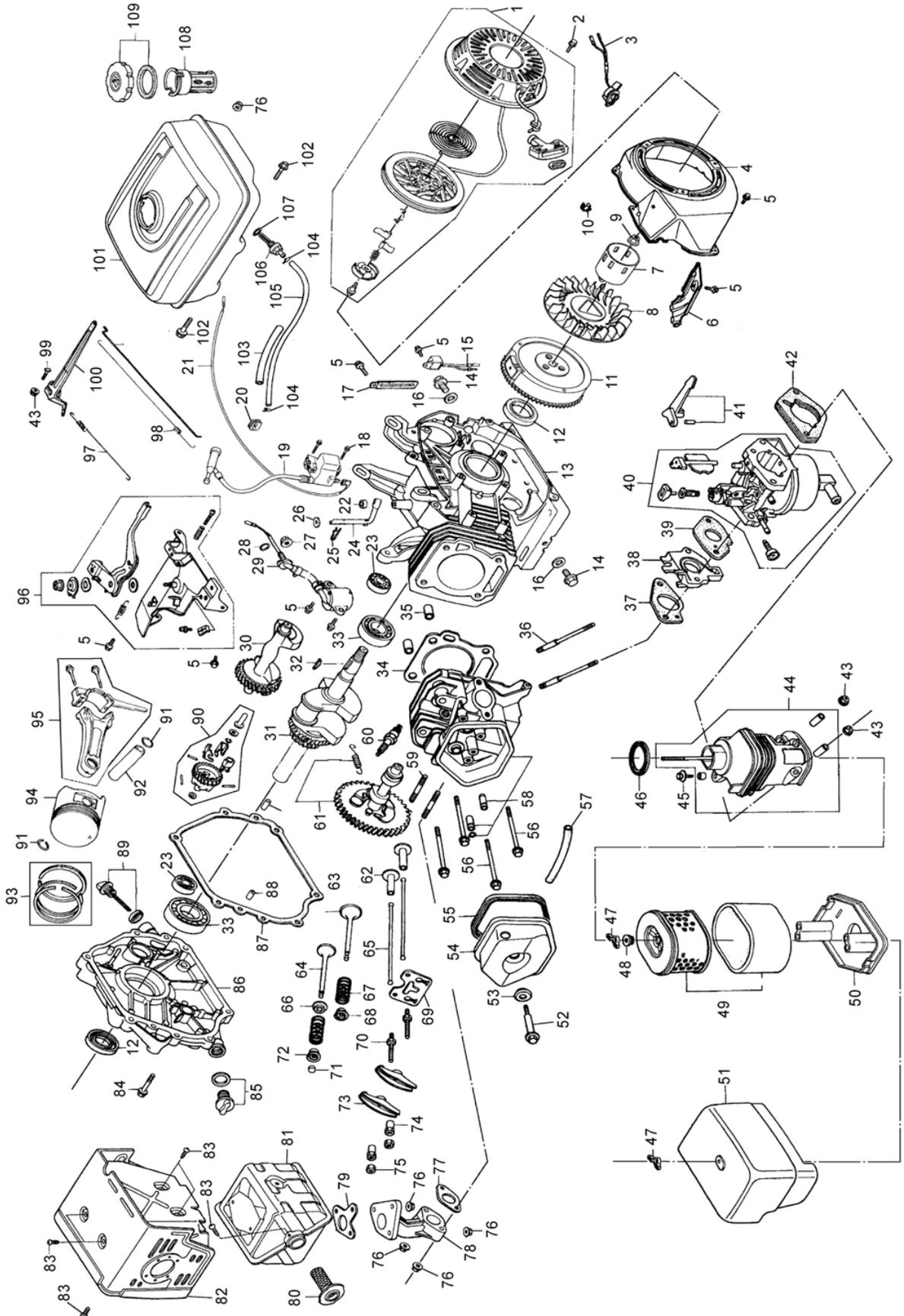
**Note:** The diagram for other types may be different with the exception of electric-start type.

# EXPLODED VIEW AND PARTS LIST(PD200)



Item	Part	Qty	Description	Item	Part	Qty	Description
1	21100	1	Starter comp, recoil	45	11213	1	Rotator, valve
2	12302	1	Engine switch	46	13106	1	Connecting rod assy.
3	12310	1	Fan, cover comp	47	13015	2	Clip, piston pin
4	19003	1	Shroud comp	48	13104	1	Pin, piston
5	GB6177-86	1	Flange nut M14	49	13101	1	Piston
6	19005	1	Pulley, starter	50	13100	1	Ring set, piston
7	19001	1	Fan, cooling	51	12103	1	Cap, oil hole
8	81200	1	Flywheel comp	52	GB5789-86	5	Flange bolt M8x32
9	19002	1	Plate, side	53	12100	1	Cover assy. crankcase
10	87500	1	Diode	54	92003	2	Pin, dowel, 8x14
11	B5787-86	15	Flange bolt M6x12	55	121102	1	Cap assy. oil filler
12	81100	1	Coil assy. ignition	56	90001	1	Packing, case cover
13	B5789-86	2	Flange bolt M6x25	57	12230	1	Governor assy.
14	13203	2	Bolt, drain lug	58	12208	1	Shaft, governor assy.
15	12217	2	Washer, drain lug	59	GB/T276-94	2	Radial ball bearing (6025)
16	900008	2	Oil seal, 25x41.25x6	60	87400	1	Switch assy. oil level
17	12200	1	Crank case assy.	61	17200	1	Control assy.
18	17300	1	Carburetor assy.	62	17001	1	Spring, governor
19	90003	1	Packing, carburetor	63	17004	1	Arm, governor
20	90004	1	Insulator, carburetor	64	17002	1	Spring, throttle return
21	90005	1	Packing, insulator	65	17003	1	Rod, governor
22	17316	1	Lever comp, choke	66	GB6177-86	6	Nut, M6
23	90002	1	Packing air cleaner	67	16003	1	Case comp, air cleaner
24	91004	2	Bolt head, 6x112	68	16002	1	Separator, air cleaner
25	11250	1	Head comp, cylinder	69	16001	1	Element, air cleaner
26	92002	2	Pin, dowel, 10x16	70	16004	1	Cover, air cleaner
27	90007	1	Casket, cylinder head	71	16007	2	Nut, M6
28	11202	1	Plug, spark	72	91002	2	Clip, tube
29	91005	2	Bolt head, M8x32	73	91009	1	Tube, fuel
30	GB5789-86	4	Flange bolt M8x60	74	17102	1	Rubber, supporter
31	90006	1	Exhaust piper	75	GB5789-86	1	Flange bolt M6x25
32	11240	1	Cover comp, head	76	17101	1	Joint, fuel tank
33	92001	1	Casket, muffler	77	17120	1	Tank fuel
34	11200	1	Arm, valve rocker assy.	78	17110	1	Fuel filler cap
35	11215	1	Plate, push rod guide	79	17130	1	Filter, fuel
36	15001	2	Rod, push	80	GB847-85	5	Screw, tapping M5x8
37	15002	2	Lifter, valve	81	18002	1	Protector, muffler
38	15100	1	Camshaft assy.	82	18001	1	Muffler
39	11209	1	Valve, EX.	83	18003	1	Arrester, spark
40	11208	1	Valve, IN.	84	GB41-86	2	Nut, M8
41	11216	1	Seat, valve spring	85	18101	1	Casket EX. Pipe
42	11206	2	Spring, valve	86	13000	1	Crankshaft comp
43	11212	1	Retainer, EX. Valve spring	87	GB5787-86	3	Flange bolt M6x8
44	11211	1	Retainer, IN. Valve spring				

# EXPLODED VIEW AND PARTS LIST(PD390/PD420)



Item	Part	Qty	Description	Item	Part	Qty	Description
1	21100	1	Starter comp, recoil	44	12005	1	Case comp, air cleaner
2	GB5787-86	3	Flange bolt M6×8	45	GB5789-86	1	Flange bolt M6×20
3	11082	1	Engine switch	46	12010	1	Seal, air cleaner
4	12310	1	Fan, cover comp	47	16007	2	Nut, M6
5	GB5787-86	12	Flange bolt M6×12	48	16008	2	Washer, drain lug
6	19003	1	Shroud comp	49	12010	1	Element assy. air cleaner
7	19005	1	Pulley, starter	50	12004	1	Separator, air cleaner
8	19001	1	Fan, cooling	51	12007	1	Cover comp, air cleaner
9	GB6177-86	1	Flange nut M16	52	11242	1	Bolt, head cover
10	23007	1	Clip. Wire harness	53	11243	1	Washer comp head cover
11	81200	1	Flywheel comp	54	11240	1	Cover comp, head
12	12215	2	Oil seal, 35×52×8	55	11241	1	Exhaust piper
13	12200	1	Crank case assy.	56	GB5789-86	4	Flange bolt M10×80
14	12203	2	Bolt, drain lug	57	12001	1	Tube, breather
15	87500	1	Amplifier	58	11250	1	Head comp, cylinder
16	12217	2	Washer, drain lug	59	11217	2	Bolt head, M8×34
17	87601	1	Clip, wire	60	11202	1	Plug, spark
18	GB5789-86	2	Flange bolt M6×25	61	15100	1	Camshaft assy.
19	81100	1	Coil assy. ignition	62	15002	2	Lifter, valve
20	81103	1	Grommet cord	63	11208	1	Valve, IN.
21	81102	1	Cord stop switch	64	11209	1	Valve, EX.
22	12216		Oil seal, 8×14×5	65	15001	2	Rod, push
23	GB/T276-94	2	Radial ball bearing (6202)	66	11216	1	Seat, valve spring
24	12208	1	Shaft, governor arm	67	11206	2	Spring, valve
25	12212	1	Pin, lock, 10mm	68	11211	1	Retainer, IN. Valve spring
26	12209	1	Washer, 8.2×17×0.8	69	11215	1	Plate, push rod guide
27	GB6177-86	1	Flange nut M10	70	11214	2	Bolt, pivot
28	12221	1	O-ring, 14mm	71	11213	1	Rotator, valve
29	12200	1	Switch assy. oil level	72	11212	1	Retainer, EX. Valve spring
30	13200	1	Weight, balancer	73	11205	2	Arm, valve rocker
31	13000	1	Crankshaft comp	74	11204	2	Nut, Arm, valve rocker
32	GB/T 99-88	1	Key	75	11206	2	Nut, pivot adjusting
33	GB/T276-94	2	Radial ball bearing (6207)	76	GB6177-86	6	Flange nut M8
34	11219	1	Casket, cylinder head	77	13202	1	Casket (B) EX. Pipe
35	12220	2	Pin, dowel, 12×20	78	13200	1	Pipe comp EX.
36	11218	2	Bolt head, 8×111	79	13010	1	Muffler stay
37	23003	1	Packing, insulator	80	13003	1	Arrester, spark
38	23001	1	Insulator, carburetor	81	13020	1	Muffler
39	23002	1	Packing, carburetor	82	13030	1	Muffler guard
40	23000	1	Carburetor assy.	83	GB847-85	5	Screw, tapping M5×8
41	22000	1	Stay manual choke	84	GB5789-86	7	Flange bolt M8×40
42	23008	2	Packing, air cleaner	85	12103	1	Cap, oil hole
43	GB6177-86	5	Flange nut M6	86	12100	1	Crankcase cover

87	12214	1	Packing, case cover	88	12213	2	Pin, dowel, 8×12
89	121102	1	Cap assy. oil filler	100	17004	1	Arm, governor
90	12230	1	Governor kit	101	14200	1	Fuel tank
91	13105	2	Clip, piston pin	102	GB5789-86	2	Flange bolt M8×25
92	13104	1	Pin, piston	103	14102	1	Rubber, supporter
93	13100	1	Ring set assy. piston	104	14100	1	Fuel cock
94	13101	1	Piston	105	14004	1	Outlet pipe $\phi$ 4.5×235
95	13106	1	Connecting rod assy.	106	17101	1	Joint, fuel tank
96	17220	1	Control assy.	107	17102	1	Rubber joint, fuel tank
97	17001	1	Spring, governor	108	14302	1	Fuel filter
98	17002	1	Spring, throttle return	109	14300	1	Fuel filler cap comp
99	17005	1	Bolt, governor arm				