

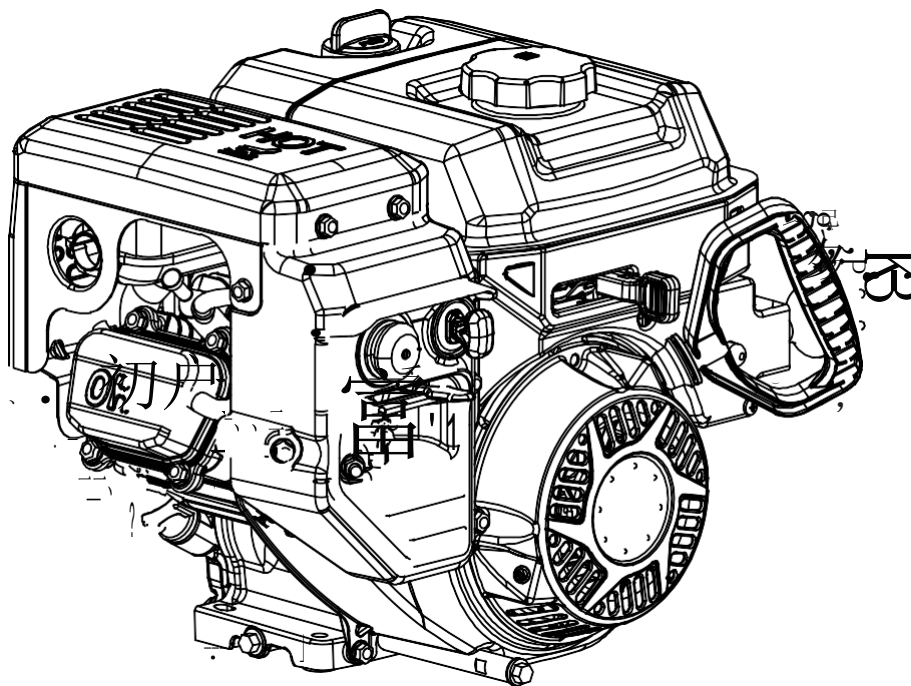
# DUCAR<sup>®</sup>

## POWER WITH VISION

### 212cc OHV Winter Gas Engine

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User Manual



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# SPECIFICATIONS

Model	DUEDHP212E
Displacement	212cc
Max RPM	3600
Compression Ratio	8.8:1
Bore	75 mm
Stroke	48 mm
Shaft	3/4 in. (19,05 mm)
Fuel Tank Capacity	3.4L
Oil Capacity	0.55L
Net Weight	19kg
<b>Tune Up Specifications</b>	
Spark Plug Gap	0.7 ~ 0.8 mm
Spark Plug Torque	18 ~ 22 N-m
Intake Valve Clearance	0.08 ~ 0.12 mm
Exhaust Valve Clearance	0.13 ~ 0.17 mm

## INTRODUCTION

This winter engine features a weather resistant cover and fuel primer and choke system for easy starting. Ideal for snow blowers, agricultural equipment, forestry equipment.

## SAFETY

**WARNING! Read and understand all instructions before using this engine. The operator must follow basic precautions to reduce the risk of personal injury and/or damage to the equipment.**

Keep this manual for safety warnings, precautions, operating or inspection and maintenance instructions.

## HAZARD DEFINITIONS

Please familiarize yourself with the hazard notices found in this manual. A notice is an alert that there is a possibility of property damage, injury or death if certain instructions are not followed.

- DANGER!** This notice indicates an immediate and specific hazard that **will** result in **severe personal injury or death** if the proper precautions are not taken.
- WARNING!** This notice indicates a specific hazard or unsafe practice that **could** result in **severe personal injury or death** if the proper precautions are not taken.
- CAUTION!** This notice indicates a potentially hazardous situation that may result in minor or moderate injury if proper practices are not taken.
- NOTICE!** This notice indicates that a specific hazard or unsafe practice will result in equipment or property damage, but not personal injury.

## **WORK AREA**

1. Operate in a safe work environment. Keep your work area clean, well lit and free of distractions.
2. Keep anyone not wearing the appropriate safety equipment away from the work area.
3. Store tools properly in a safe and dry location. Keep tools out of the reach of children.
4. Do not install or use in the presence of flammable gases, dust or liquids.
  - a. Do not use pressurized starting fluids with the engine, because the vapours are flammable.

## **PERSONAL SAFETY**

**WARNING!** Wear personal protective equipment approved by the Canadian Standards Association (CSA) or American National Standards Institute (ANSI).

## **PERSONAL PROTECTIVE EQUIPMENT**

1. Always wear impact safety goggles that provide front and side protection for the eyes.
  - a. Eye protection equipment should comply with ANSI Z87.1 standards.
2. Wear gloves that provide protection based on the work materials or to reduce the effects of tool vibration.
3. Non-skid footwear is recommended to maintain footing and balance in the work environment.
4. Wear protective clothing designed for the work environment and tool.

## **PERSONAL PRECAUTIONS**

Control the tool, personal movement and the work environment to avoid personal injury or damage to tool.

1. Do not operate any tool when tired or under the influence of drugs, alcohol or medications.
2. Avoid wearing clothes or jewelry that can become entangled with the moving parts of a tool. Keep long hair covered or bound.
3. Do not overreach when operating a tool. Proper footing and balance enables better control in unexpected situations.

## **SPECIFIC SAFETY PRECAUTIONS**

1. All users must understand the operation of all controls and learn how to stop the engine quickly in case of emergency.
2. The engine and exhaust become very hot during operation. Severe thermal burns can occur on contact, especially with the muffler.
  - a. Keep the engine at least 3 feet (1 meter) away from buildings and other equipment during operation.
  - b. Remove accumulated debris from muffler and cylinder area. Combustible debris, such as leaves, grass, brush, etc. can catch fire if they come in contact with a hot engine.
  - c. Do not place anything on the engine while it is running.
  - d. Allow muffler, engine cylinder and fins to cool before touching grass-covered or brush-covered unimproved land.

## CARBON MONOXIDE POISONING

**WARNING! Never start or run this engine indoors as exhaust contains carbon monoxide gas. Opening windows and doors is not enough to ventilate the area.**

Carbon monoxide is a colourless and odourless gas that is difficult to detect. Carbon monoxide poisoning results from inhalation of the gas and may be lethal if left untreated. Evacuate all people to an area with clean air and seek immediate medical attention for any person experiencing the following symptoms:

- |                        |                                        |                                         |
|------------------------|----------------------------------------|-----------------------------------------|
| 1. Headache            | 5. Fatigue                             | 8. Nausea & vomiting                    |
| 2. Confusion           | 6. Dizziness                           | 9. Unconsciousness                      |
| 3. Shortness of breath | 7. Unstable gait<br>(stumbling around) | 10. Flu-like symptoms<br>without fever. |
| 4. Weakness            |                                        |                                         |

## USE AND CARE OF ENGINE

1. This engine was designed for a specific function. Do not modify or alter this engine or use it for an unintended purpose.
  - a. Do not tamper with governor spring, links or other parts to increase engine speed.
2. Maintain engine with care (see Maintenance).
3. Remove adjusting keys and wrenches from the engine before operation. A wrench or key that is left attached to a rotating part of the tool increases the risk of personal injury.

## PARTS IDENTIFICATION

**WARNING! Do not operate the tool if any part is missing. Replace the missing part before operating. Failure to do so could result in a malfunction and personal injury.**

Remove the parts and accessories from the packaging and inspect for damage. Make sure that all items in the parts list are included.

Contents:

- Motor

## IDENTIFICATION KEY

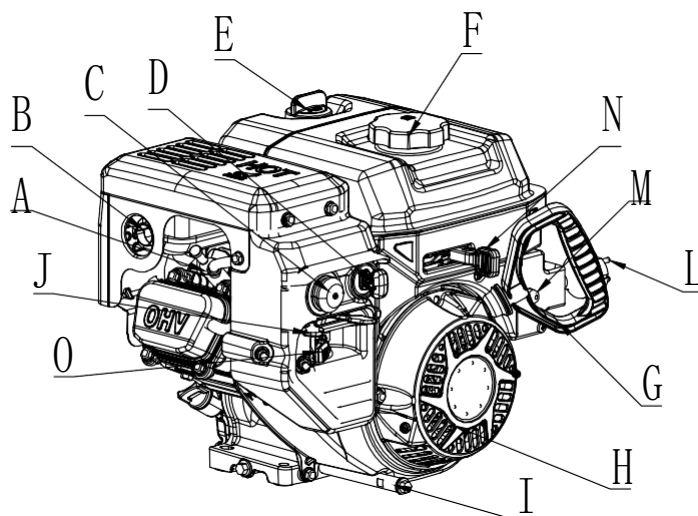


Fig. 1

- |                     |                         |                   |
|---------------------|-------------------------|-------------------|
| A Spark Plug        | G Starting Handle       | M Push Button     |
| B Muffler           | H Finger Guard          | Electric Start    |
| C Primer            | I Oil Drain Plug        | N governor handle |
| D Safety Key        | J Choke                 | O Oil Switch      |
| E Oil Fill Cap      | K Snow Hood             |                   |
| F Fuel Tank and Cap | L Power Cord Receptacle |                   |

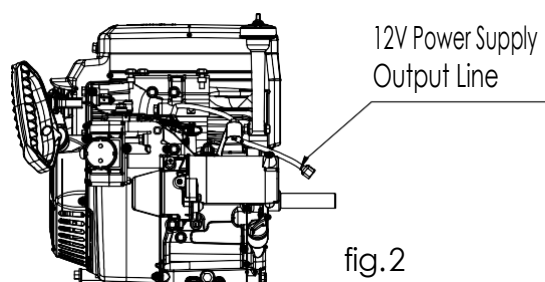
## ASSEMBLY

The engine comes pre-assembled. The engine comes with both a 12V power supply cord and a kill switch cable. A wiring diagram is found in Appendix A.

**WARNING! All wiring should be performed by a qualified electrician.**

### 12V POWER SUPPLY CORD

The engine has a 12 Volt/20 Watt power supply cord for a work light or similar accessory (Fig. 2). Do not attach any device to this cord that draws more than 60 watts of power. The power supply cord has a two-prong male connector for an easy connection to accessories.



## OPERATION

**NOTICE! The manufacturer of the equipment on which this engine is installed specifies the top speed at which the engine will be operated. Do not exceed this speed.**

### PRE-OPERATION CHECKS

**NOTICE! The engine is not shipped with oil. Before starting the engine, add oil according to the instructions in this manual. Starting the engine without oil will damage the engine beyond repair.**

Check the engine's condition before operating to maximize the user's safety and the service life of the engine. Ensure that the engine is level and the switch is in the OFF position before beginning the pre-operation checks.

### GENERAL CONDITION

1. Look around and underneath the engine for signs of oil or gasoline leaks.
2. Remove any excessive dirt or debris, especially around the muffler and recoil starter.
3. Look for signs of damage.
4. Check that all shields and covers are in place.
5. Check that all nuts, bolts and screws are tight.

### CHECK THE ENGINE

1. Check the fuel level. This will save time for refuelling later.
2. Check the engine oil level. Running the engine with a low oil level can cause engine damage (see How to Check/Add Oil).
3. Check the air filter. A dirty air filter will reduce engine performance.

4. Check the equipment powered by this engine.
5. Review the instructions provided with the equipment powered by this engine for precautions and procedures that should be followed before starting the engine.

## BEFORE STARTING THE ENGINE

**WARNING! Do not start or run engine in enclosed area, even if doors or windows are open. Engine exhaust contains carbon monoxide, an odorless and colorless poison gas.**

Before starting the engine take these precautions:

1. Make sure spark plug, muffler, fuel cap and air filter are in place and secured. Do not crank engine with spark plug removed.
2. Do not start the engine until any spilled fuel evaporates.
3. Do not crank engine with spark plug removed.

## STARTING THE ENGINE

**WARNING! Failure to follow the steps below will result in rapid retraction of the starter cord faster than the user can let go. This will pull the user's hand and arm toward the engine, possibly resulting in serious injury.**

**CAUTION! Direct-coupled equipment components such as, but not limited to, blades, impellers, pulleys, sprockets, etc., must be securely attached before the engine is started to avoid injury or damage.**

### RECOIL START

1. To start a cold engine, move the choke (J) to the CLOSED position.
  - a. To restart a warm engine, leave the choke lever in the OPEN position.
  - b. The choke opens to the far left to close and the far right to open.
2. Set the shutdown control switch to the running position.
  - a. Press and hold the handle D and push it all the way in for the running position; pull it out for the shutdown state.
  - b. After shutting down the generator, push the handle all the way in to ensure that the handle does not fall off.
3. Push the primer (C) 3 times. Priming is usually unnecessary when restarting a warm engine.
4. Pull the starter cord handle (G) lightly until resistance is felt, then pull briskly.
5. After the machine is running, the speed control handle N is pushed to the leftmost side to keep the highest RPM, and the speed control handle can adjust the engine RPM: the leftmost side is the highest RPM, and the right side is the idle speed.

### ELECTRIC START

1. Follow Steps 1 to 3 in Starting the Engine.
2. First connect the extension cord to the power cord receptacle (3-1) and then into a wall receptacle. If an additional extension cord is required, make sure it is a 3-wire extension cord.
3. Depress the push button (3-2). After you have started the engine, first, disconnect the extension cord from the wall receptacle and then from the power cord receptacle.
4. Allow the engine to warm up for several minutes. Then slowly move the choke control to the run position.

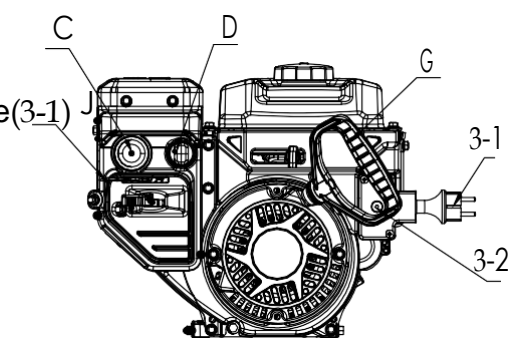


Fig.3

**IMPORTANT! If the engine fails to start within 5 seconds, release the button and wait at least 10 seconds before attempting to start the engine again.**

**IMPORTANT! Occasionally you may hear a light 'spark knock' or 'pinging' (metallic rapping noise) while operating under heavy loads. This is no cause for concern.**

Should the spark knock or pinging continue to occur when the engine speed is steady under a normal load consider replacing the fuel. If the sounds continue after changing the fuel, contact your dealer for a solution or see a qualified technician.

**IMPORTANT!** Running the engine with persistent spark knock or pinging can cause engine damage.

## STOPPING THE ENGINE

**CAUTION!** Do not choke carburetor to stop engine.

Turn the safety key (D) to the OFF position.

## FUEL RECOMMENDATIONS

This engine is certified to operate on unleaded gasoline with a minimum of 87 octane/87 AKI (91 RON). Recommend the use of gasoline without ethanol or similar alcohol based additives. Gasoline with up to 10% ethanol (gasohol) or up to 15% MTBE (methyl tertiary butyl ether) is acceptable. The emissions control system for this engine is EM (Engine Modifications).

**NOTICE!** Do not use unapproved Gasoline, such as E85. Do not mix oil in gasoline or modify the engine to run on alternate fuels. This can damage the engine components. To protect the fuel system from gum formation, mix a fuel stabilizer into the fuel.

If the engine is routinely operated at altitudes over 5,000 ft (1,524 meters), it will be necessary to have a qualified technician modify the engine for increased performance. Fuel should be a minimum of 85 octane/85 AKI (89 RON) to prevent decreased performance.

## HOW TO ADD FUEL

**WARNING!** Do not refuel the engine inside a building. Gasoline and its vapors are extremely flammable and explosive. Keep gasoline away from appliance pilot lights, barbecues, electric appliances, power tools, etc.

Do not use stale or contaminated gasoline or oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

1. Clean the fuel cap area of dirt and debris. Remove the fuel cap.
2. Refuel outdoors or in a well-ventilated area.
3. Stop the engine and place it on a level surface.
4. Let engine cool at least 2 minutes before removing the fuel cap (Fig. 4-1).
5. Check the fuel level.
6. Fill the fuel tank (Fig. 5-2) with gasoline. To allow for expansion of the gasoline, do not fill above the bottom of the fuel tank neck (Fig. 5-1).

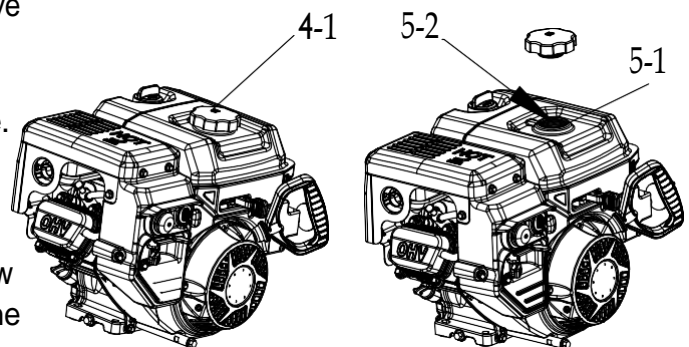


Fig. 4

Fig. 5

- a. Fill the tank to approximately 1.5 in. (38 mm) below the top of the fuel tank to allow for fuel expansion.
7. Take care to not overfill the tank.

**IMPORTANT!** It may be necessary to lower the fuel level depending on operating conditions.

8. Check fuel lines, tank, cap and fittings frequently for cracks or leaks. Replace if necessary.
9. After refueling, tighten the fuel tank cap securely.
10. Wipe up any spilled fuel before starting the engine or allow the fuel to evaporate. Spilled fuel is both a fire hazard and an environmental hazard.

## MAINTENANCE

The following section includes a maintenance schedule, routine inspection procedures and simple maintenance procedures using basic hand tools. Service tasks that are more difficult or require special tools are best handled by a technician or other qualified mechanic.



1. Maintain the engine with care. A well maintained engine is efficient, easier to control and will prevent unnecessary problems.
2. Sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions will require more frequent servicing.
3. Follow instructions for servicing
4. Inspect the engine components periodically. Have damaged or worn components repaired or replaced by an authorized technician.
5. Maintain the engine's label and nameplate. These carry important information. If unreadable or missing, contact your dealer for replacements.

**WARNING! Only qualified service personnel should repair the engine. An improperly repaired engine may present a hazard to the user and/or others.**

## MAINTENANCE SCHEDULE

Remember that this schedule is based on the assumption that your machine will be used for its designed purpose. Sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, will require more frequent service.

First 5 Hours	Change oil
Every 8 Hours or Daily	Check engine oil level
	Clean the air filter
Every 50 Hours or Annual	Change engine oil
	Check muffler, muffler guard and flywheel brake pad (A types).
Annual	Replace spark plug
	Clean fuel tank and filter
	Check and adjust (if necessary) the idle speed
	Check and adjust (if necessary) the valve clearance

## PERFORMING MAINTENANCE

**WARNING! Always ensure that the engine is off before you begin any maintenance or repairs.**

**WARNING! Use only a nonflammable solvent, not gasoline, to clean engine parts. Keep cigarettes, sparks and flames away from all fuel related parts.**

Before performing adjustments or repairs:

1. Disconnect the spark plug wire and keep it away from the spark plug.
  - a. Disconnect battery at negative terminal (only engines with electric start).
2. Replacement parts must be the same and installed in the same position as the original parts.
3. Do not tamper with the governor spring, links or other parts to increase engine speed.
4. Do not strike the flywheel with a hammer or hard object. The flywheel may later shatter during operation.

## CARBURETOR ADJUSTMENT

Never make adjustments to the carburetor. The carburetor was set at the factory to operate efficiently under most conditions. However, if adjustments are required, contact your dealer for a solution.

## INSPECT MUFFLER

**WARNING! Running engines produce heat. Engine parts, especially the muffler, become extremely hot. Severe thermal burns can occur on contact. Combustible debris, such as leaves, grass, brush, etc. can catch fire.**



## ENGINE OIL

High-quality detergent engine oils are acceptable if the American Petroleum Institute (API) performance rating is SF, SG, SH, SJ or higher. Always check the API service label on the oil container for the performance rating. Do not use special additives.

SAE 10W-30 is recommended for general use. Other viscosities may be used when the average temperature in your area is within the range indicated in the chart below.

\* Below 40° F (4° C) the use of SAE 30 will result in hard starting.

\*\* Above 80° F (27° C) the use of 10W-30 may cause increased oil consumption. Check oil level more frequently.

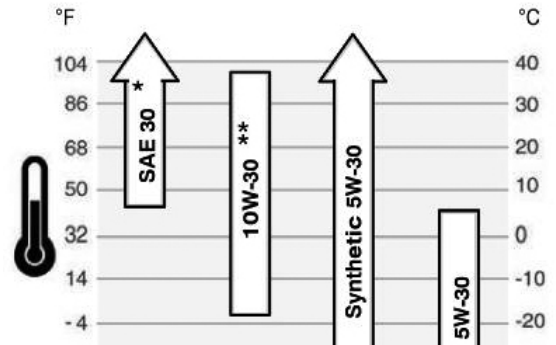


Fig. 6

## HOW TO DRAIN OIL

**WARNING!** When you drain the oil from the oil drain plug, the fuel tank must be empty or fuel can leak out and result in a fire or explosion. To empty the fuel tank, run engine until it stops from lack of fuel or drain the tank and carburetor using the drain plug.

1. The oil must be drained from the oil drain plug (I).
2. Remove the dipstick (N).
3. Place an approved container below the oil drain plug.
4. Remove the oil drain plug and allow oil to drain into an approved container.
5. Install the oil drain plug and wrench tighten.

**IMPORTANT!** Used oil must be disposed of properly. Do not pour it on the ground or down a drain or throw it in the trash. It is recommended to take it to your local recycling centre or service station for reclamation.

## HOW TO CHECK/ADD OIL

1. Level the engine.
2. Clean the oil fill area of any debris.
3. Remove the dipstick (Fig. 8-1) and wipe with a clean cloth.
4. Insert the dipstick into the oil filler neck without screwing it in.
5. Remove the dipstick and check the oil level. Make sure the oil is at the FULL mark (Fig. 8-2) on the dipstick.
6. Remove the oil fill cap (E).
7. To add oil, pour the oil slowly into the engine oil filler neck (Fig. 8-3). Do not overfill. After adding oil, wait one minute and then recheck the oil level.
8. Replace and tighten the dipstick and oil fill cap.

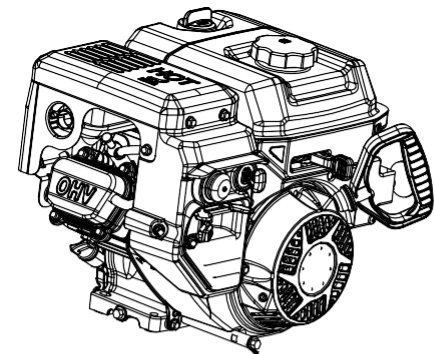


Fig. 7

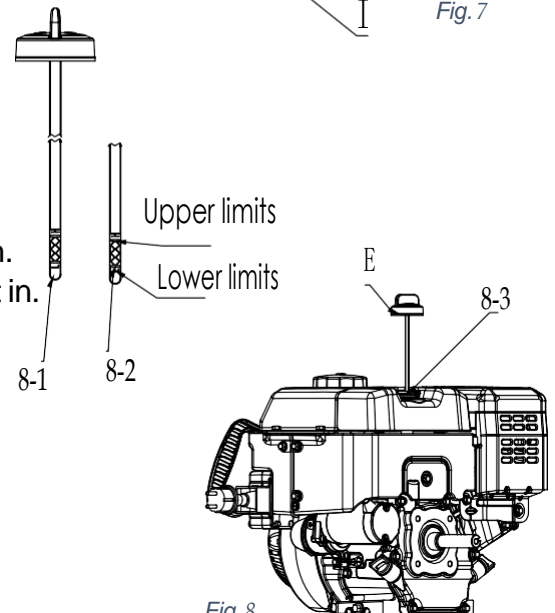


Fig. 8

## AIR FILTER

This engine is not equipped with an air filter. Do not use this engine for anything other than snow removal. Use during spring, summer or autumn can allow moisture and dust to enter and damage the engine's internal components.

## TESTING FOR SPARK

There are several types of spark testers. All will attach to the engine's spark cap and the spark plug terminal.

1. Remove the spark cap.
2. Attach tester's spark cap to the spark plug terminal.
3. Insert the other end of spark tester into the engine's spark cap.
4. Pull recoil starter one or more times and observe the spark tester to see if it indicates the spark plug is working.

## REPLACING A SPARK PLUG

**NOTICE!** Using an incorrect spark plug can cause engine damage.

**NOTICE!** Do not choke for spark with spark plug removed.

For the engine to perform well, the spark plug must be properly gapped and free of deposits.

1. Remove any dirt from around the spark plug area.
2. Pull the Spark plug cap off of the spark plug (Fig. 9-1).
3. Remove the spark plug with a spark plug wrench.
4. Inspect the spark plug. Replace it if damaged, badly fouled, the sealing washer is in poor condition, or the electrode is worn.
5. Check the gap (Fig. 9-2) with a spark plug gauge/gapper or feeler gauge (Fig. 9-3). If necessary, reset the gap (See Specifications).
6. Install the spark plug carefully by hand to avoid cross threading.
7. Tighten the spark plug.
  - a. When installing a new spark plug, tighten 1/2 turn after the spark plug seats to compress the washer.
  - b. When reinstalling the original spark plug, tighten 1/8 to 1/4 turn after the spark plug seats to compress the washer.
8. Attach the spark plug cap to the spark plug.

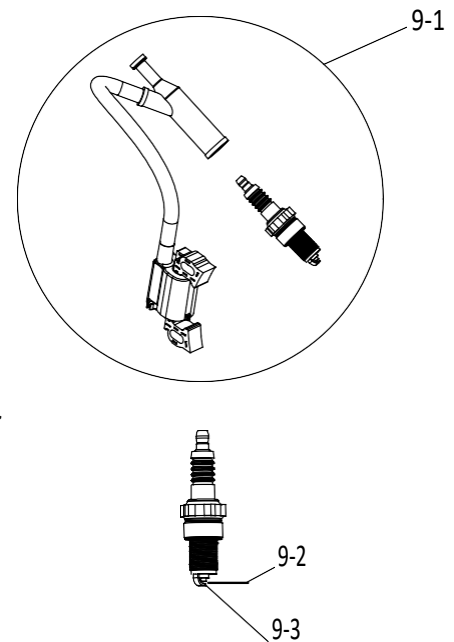


Fig. 9

**IMPORTANT!** In some areas, local law requires using a resistor spark plug to suppress ignition signals. If this engine was originally equipped with a resistor spark plug, use the same type for replacement.

## INSPECT THE MUFFLER

**WARNING!** Running engines produce heat. Engine parts, especially the muffler, become extremely hot. Severe burns can occur on contact. Combustible debris, such as leaves, grass, brush, etc. can catch fire.

1. Allow the muffler (Fig. 10-1), the engine cylinder and fins to cool before touching.
2. Remove any accumulated debris from the muffler area and cylinder area.
3. Clean muffler cover of debris to allow air flow.

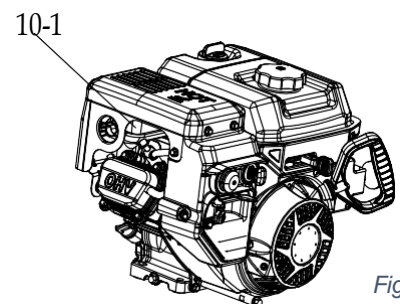


Fig. 10

## EMISSION CONTROL SYSTEM INFORMATION

The combustion process produces carbon monoxide, hydrocarbons and oxides of nitrogen. Control of these emissions is very important for personal and environmental health.

The following instructions must be followed in order to keep the emissions from your engine within Canadian emission standards.

1. Do not remove or alter any part of the intake, fuel, or exhaust systems.
2. Do not alter or defeat the governor linkage or speed-adjusting mechanism to cause the engine to operate outside its design specifications.

## PROBLEMS THAT MAY AFFECT EMISSIONS

If you are aware of any of the following symptoms, have your engine inspected and repaired by a qualified technician.

1. Hard starting after stalling.
2. Rough idle.
3. Misfiring or backfiring under load.
4. Afterburning (backfiring).
5. Black exhaust smoke or high fuel consumption.

## REPLACEMENT PARTS

The emission control systems on your engine were designed, built and certified to conform to Canadian emission regulations. The use of genuine parts is recommended whenever maintenance is done to the engine. Genuine replacement parts are manufactured to the same standards as the original parts. Using replacement parts that are not of the original design and quality may impair the effectiveness of your emission control system.

It is the responsibility of the manufacturer of an aftermarket part to certify that use of the part will not result in a failure of the engine to comply with emission regulations.

## MODIFYING CARBURETOR FOR HIGH ALTITUDES

At high altitude, the standard air-fuel mixture will be too rich, causing increased fuel consumption and decreased performance. A rich mixture will also foul the spark plug and cause hard starting.

A qualified technician can improve high altitude performance with certain modifications. Have your carburetor modified if the engine will routinely be operated at altitudes above 5,000 ft (1,500 m). Even with carburetor modification, engine power will decrease about 3.5% for each 1,000 ft (300 m) increase in altitude. The effect of altitude on power will be greater than this is if no modification is made.

**CAUTION!** When the carburetor has been modified for high altitude operation, the air fuel mixture will be too lean for low altitude use. Operation at altitudes below 5,000 ft (1,500 m) may cause the engine to overheat and result in serious engine damage. When using this engine at low altitudes, have a qualified technician return the carburetor to original factory specifications.

## ADJUSTING THE ENGINE IDLE SETTING

**NOTICE!** The engine speed is set by the factory. Increasing the speed too much can damage the engine. Too low a speed will reduce the engine's efficiency. Have a qualified technician adjust the engine speed if necessary.

The engine does not have a variable speed option. The engine's idling speed is adjustable by turning the governor arm screw (#38) to lower or increase the engine output (RPMs).

1. Move the governor handle to the far left.
2. Start the generator.
3. After the generator starts, test the idle speed.
  - a. The generator's idle speed should range from 1600rpm to 2200rpm.
  - b. If the idle speed is too low: turn the idle adjustment screw clockwise.
  - c. If the idle speed is too high: turn the idle adjustment screw counterclockwise.

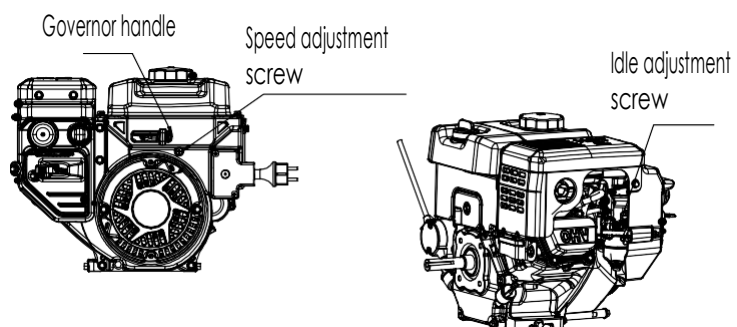


fig. 11

# STORAGE

**WARNING!** Keep the engine away from sources of open flame such as the pilot light of a furnace, stove, water heater or other appliances when storing with fuel in the tank, as an ignition source can ignite gasoline vapors.

**WARNING!** Transport the engine with an empty fuel tank.

Proper storage preparation is essential for keeping your engine in good condition. The steps below will help to keep rust and corrosion from impairing your engine's function and appearance and will make the engine easier to start when used again.

The following precautions should be taken if storing your engine for a period exceeding 30 days, or for seasonal storage.

1. Store in a clean dry area.
2. Change the oil while the engine is still warm.
3. Clean the debris, chaff or grass from the engine's surface.
4. Drain all fuel from the fuel tank into a proper receptacle for storage.
5. Remove the spark plug. Place 1 teaspoon or 5 ml of oil into the spark plug hole.
6. Pull starter rope slowly 8-10 times to properly coat the cylinder bore and piston for storage. Replace spark plug and tighten. Any residual oil may burn off in subsequent starts. This may result in white smoke emission from muffler.
7. Store this engine in horizontal position with the spark plug up. Do not store or transport with the spark plug down.

**IMPORTANT!** Storing or transporting with the spark plug down will result in hard starting and/or engine smoking.

## STORING ENGINE WITH FUEL

1. If your engine will be stored with gasoline in the fuel tank and carburetor, it is important to reduce the hazard of gasoline vapour ignition.
  - a. Select a well-ventilated storage area away from any appliance that operates with a flame, such as a furnace, water heater, or clothes dryer.
  - b. Avoid any area with a spark-producing electric motor.
  - c. Avoid any area where power tools are operated.
2. If possible, avoid storage areas with high humidity, as this promotes rust and corrosion.
3. Keep the engine level in storage. Tilting can cause fuel or oil leakage.
4. Cover the engine once the engine and exhaust system are cool. Some materials can ignite or melt if the engine and/or exhaust system is hot. Do not use sheet plastic as a dust cover.
  - a. Do not use a nonporous cover, as this will trap moisture around the engine and promote rust and corrosion.
5. Store with gasoline that does not contain ethanol or a similar alcohol-based fuel additive. Fuel with alcohol-based additives may Phase Separate into gasoline, alcohol and water when stored for more than a few weeks.

## TRANSPORTING THE ENGINE

1. Keep the engine level when transporting to reduce the possibility of fuel leakage.
  - a. Remove fuel and oil if possible. Refill at the destination.
2. Remove safety key.
3. Strap or bolt engine to a platform for transportation.
4. Cover to prevent contamination from weather or road conditions.

## REMOVAL FROM STORAGE

1. Check the engine as described in the section Before Starting the Engine.
2. If the fuel was drained during storage preparation, fill the tank with fresh gasoline.
  - a. If you keep a container of gasoline for refuelling, ensure that it contains only fresh gasoline.
  - b. Gasoline will oxidize and deteriorate over time, causing hard starting.
3. If the cylinder was coated with oil during storage preparation, the engine will smoke briefly at start up. This is normal.

## CLEANING

**NOTICE!** Do not use a garden hose or pressure washer to clean the engine. This may cause water to enter the cylinder and cause damage the engine.

1. If the engine has been running, allow it to cool for at least half an hour before cleaning.
2. Clean all exterior surfaces.
3. Touch up any damaged paint.
4. Coat other areas that may rust with a light film of oil.

## FUEL

Gasoline with ethanol or alcohol-based additives may Phase Separate and deteriorate in storage. Phase Separated gasoline will cause hard starting and leave gum deposits that clog the fuel system. Phase Separated fuel will contain water that will prevent the engine from working and may damage the engine systems. If that gasoline in your engine deteriorates during storage, you may need to have the carburetor and other fuel system components serviced or replaced.

The length of time that gasoline can be left in your fuel tank and carburetor without causing functional problems will vary with factors such as gasoline blend, storage temperatures and the amount of fuel in the tank. The air in a partially filled fuel tank will promote fuel deterioration, as will warm storage temperatures. Fuel problems may occur in a few months or sooner if the gasoline was not fresh when the tank was filled.

Adding a gasoline stabilizer that is formulated for this purpose can extend fuel storage life. Deterioration problems can also be avoided by draining the fuel tank and carburetor prior to storage.

## ADDING A GASOLINE STABILIZER

1. Fill the fuel tank with fresh gasoline. If the tank is only partially filled, air in the tank will promote fuel deterioration during storage.
2. Add gasoline stabilizer. Ensure that the instructions for that product are followed.
3. Run the engine outdoors for 10 minutes to ensure that treated gasoline has replaced the untreated gasoline in the carburetor.
4. Stop the engine.

## DISPOSING OF ENGINE

If your engine has become damaged beyond repair, do not throw it out. Bring it to the appropriate recycling facility.

# TROUBLESHOOTING

Contact your dealer for a solution if the tool does not function properly or parts are missing. If unable to do so, have a qualified technician service the tool.

Problem(s)	Possible cause(s)	Suggested solution(s)
Engine will not start.	Engine is cold.	Move choke to CLOSED Position until warm, then move to the OPEN position.
	Engine switch is in OFF position	Move engine switch to ON position
	Engine oil is low.	Fill with the recommended oil to the proper level.
	Out of fuel.	If engine is cold, ensure choke knob is set correctly. Refuel.
	Bad fuel, engine stored without treating or draining gasoline, or refueled with bad gasoline	Drain fuel tank and carburetor. Refuel with fresh gasoline.
	Spark plug is faulty or improperly gapped.	Gap or replace spark plug.
	Engine Flooded	Set choke knob to open/run position.
	Spark plug fouled/Engine fails to produce a spark.	Remove and clean spark plug. Check electrode spacing and set the gap to the correct dimension. Replace spark plug if damaged. Ensure the spark plug is installed and wire is connected.
	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as needed. Contact your dealer or take engine to an authorized service center if necessary.
	Electric Starter	Have the starter checked by a qualified service technician.
Engine lacks power.	Bad fuel, engine stored without	Drain fuel tank and carburetor. Refuel with fresh gasoline.
	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as needed. Contact your dealer or take engine to an authorized service center if necessary.

# APPENDIX A

## WIRING DIAGRAM

