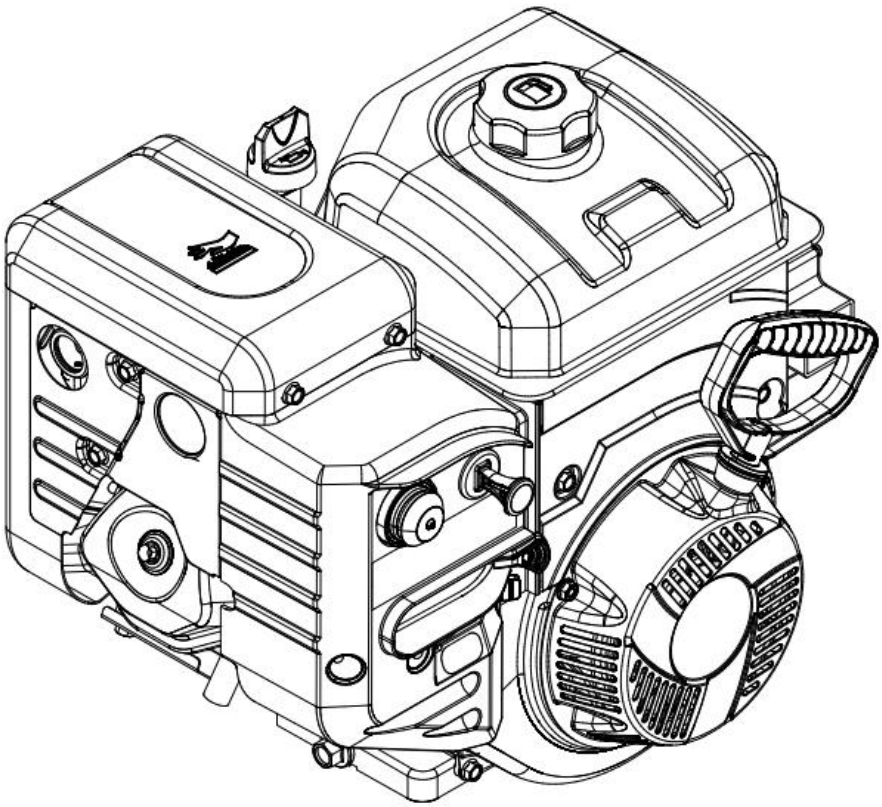
DR® GASOLINE ENGINE
SAFETY & OPERATING INSTRUCTIONS



Models:
W210FS/P
W300FS(E)/P
W420FS(E)/P

DR Power Equipment
Toll-free phone: 1-800-DR-OWNER (376-9637)

⚠ WARNING

Read and understand this manual and all instructions before operating the DR GASOLINE ENGINE.

Keep this owner's manual handy, so you can refer to it at any time.

This owner's manual is considered a permanent part of the engine and should remain with the engine if it changes hands.

The information and specifications included in this publication were in effect at the time of approval for printing.

Only the D Type is equipped for both electric and manual starting.

If a problem should arise, or if you have any questions about your engine, consult your engine dealer.

READ THIS OWNER'S MANUAL CAREFULLY. Pay special attention to areas that use the warning symbols below and any instructions that follow:

⚠ DANGER

This indicates a hazardous situation, which, if not avoided, ***will*** result in death or serious injury.

⚠ WARNING

This indicates a hazardous situation, which, if not avoided, ***could*** result in death or serious injury.

⚠ CAUTION

This indicates a hazardous situation, which, if not avoided, ***could*** result in minor or moderate injury.

NOTICE

This information is important in the proper use of your machine. Failure to follow this instruction could result in damage to your machine or property.

Table of Contents

Important Safety Information

Most accidents with engines can be prevented if you follow all instructions in this manual and on the engine. Some of the most common hazards are discussed below, along with the best way to protect yourself and others.

Owner Responsibilities

- The engines are designed to give safe and dependable service if operated according to instructions. Read and understand this owner's manual before operating the engine. Failure to do so could result in personal injury or equipment damage.
- Know how to stop the engine quickly and understand the operation of all controls. Never permit anyone to operate the engine without proper instructions.
- Do not allow children to operate the engine. Keep children and pets away from the area of operation.

Other Equipment

Review the instructions provided with the equipment powered by this engine for any additional safety precautions that should be observed in conjunction with engine startup, shutdown, operation, or protective apparel that may be needed to operate the equipment.

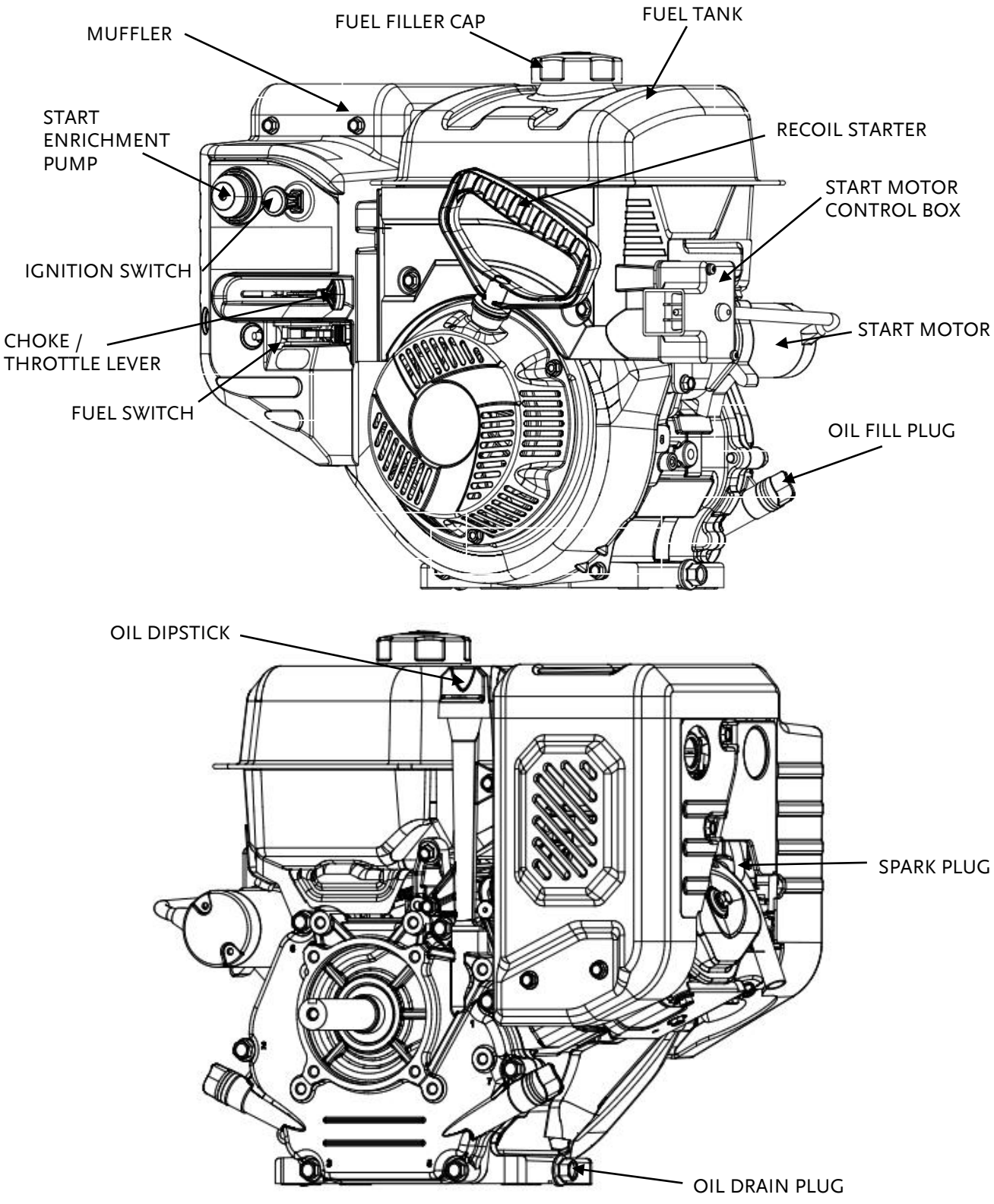
Safety with Gasoline - Powered Machines

⚠ WARNING

Gasoline is a highly flammable liquid. Gasoline also gives off flammable vapor that can be easily ignited and cause a fire or explosion. Never overlook the hazards of gasoline. Always follow these precautions:

- Never run the engine in an enclosed area or without proper ventilation as the exhaust from the engine contains carbon monoxide, which is an odorless, tasteless, and deadly poisonous gas.
- Store all fuel and oil in containers specifically designed and approved for this purpose and keep away from heat, open flame, and out of the reach of children.
- Replace rubber fuel lines and grommets when worn or damaged and after 5 years of use.
- Fill the gasoline tank outdoors with the engine off and allow the engine to cool completely. Don't handle gasoline if you or anyone nearby is smoking, or if you're near anything that could cause it to ignite or explode. Reinstall the fuel tank and fuel container caps securely.
- If you spill gasoline, do not attempt to start the engine. Move the machine away from the area of the spill and avoid creating any source of ignition until the gas vapors have dissipated. Wipe up any spilled fuel to prevent a fire hazard and properly dispose of the waste.
- Allow the engine to cool completely before storing in any enclosure. Never store a machine that has gas in the tank, or a fuel container, near an open flame or spark such as a water heater, space heater, clothes dryer, or furnace.
- Never adjust or repairs with the engine running. Shut down the engine, disconnect the spark plug wire, keeping it away from the spark plug to prevent accidental starting, wait 5 minutes before adjusting or repairing.
- Never tamper with the engine's governor setting. The governor controls the maximum safe operation speed and protects the engine. Over-speeding the engine is dangerous and will cause damage to the engine and to the other moving parts of the machine. If required, see your authorized dealer for engine governor adjustments.
- Keep combustible substances away from the engine.
- Never cover the machine while the muffler is still hot.
- Do not operate the engine with the air cleaner or the carburetor air intake cover removed. Removal of such parts could create a fire hazard. Do not use flammable solutions to clean the air filter.
- The exhaust area on the engine becomes very hot with use. Allow the engine to cool before doing maintenance or adjusting.
- Never tamper with safety devices. Check their proper operation regularly.
- To reduce fire hazard, keep the engine and muffler free of debris build-up.

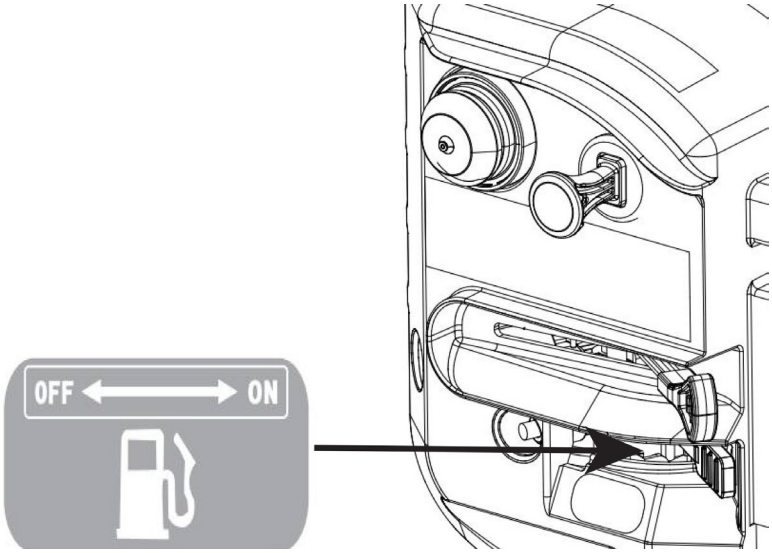
COMPONENTS & CONTROL LOCATIONS



Fuel Valve Lever

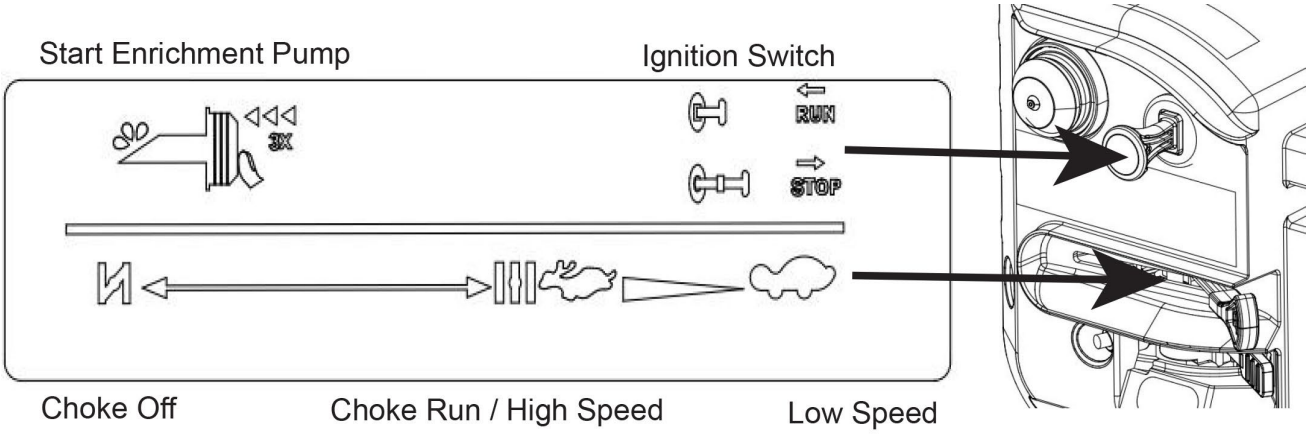
The fuel valve opens and closes the passage between the fuel tank and the carburetor. The fuel valve lever must be in the ON position for the engine to run.

When the engine is not in use, leave the fuel valve lever in the OFF position to prevent carburetor flooding and to reduce the possibility of fuel leakage.



Throttle Lever

The throttle lever controls engine speed.

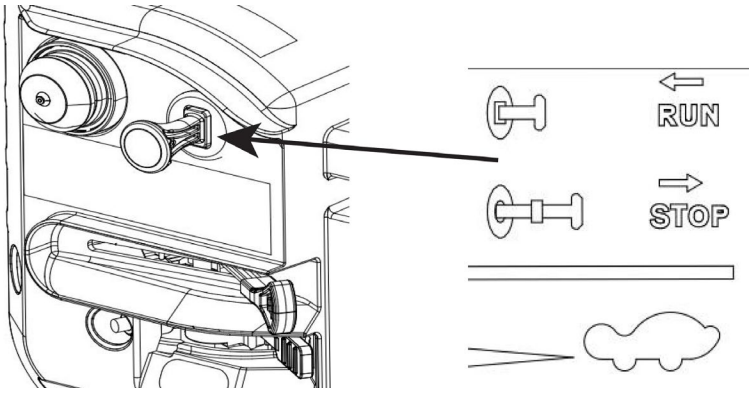


Moving the throttle lever in the directions shown makes the engine run faster or slower.

Engine Switch

The engine switch enables and disables the ignition system.

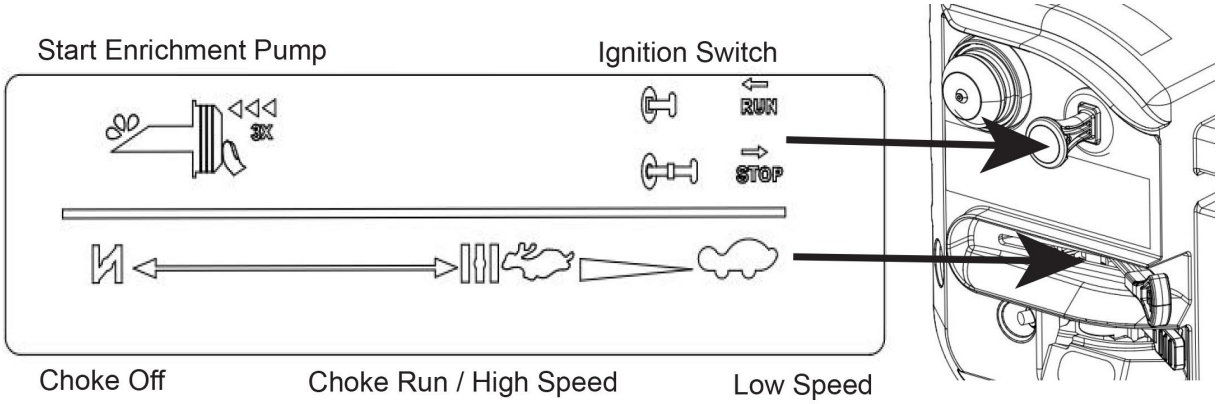
The engine switch must be in the RUN position for the engine to run. Turning the engine switch to the STOP position stops the engine.



Choke Lever

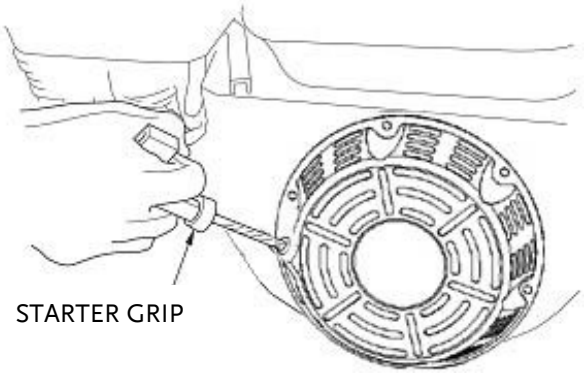
The choke lever opens and closes the choke valve in the carburetor. The CHOKE OFF position enriches the fuel mixture for starting a cold engine.

The Choke Run position provides the correct fuel mixture for operation after starting, and for restarting a warm engine.



Recoil Starter Grip

Pulling the starter grip operates the recoil starter to crank the engine.



ADDING OIL FOR THE FIRST TIME

Oil Capacity	W210FS/P: 20.3 fl oz (0.6L) W300FS(E)/P: 32.1 fl oz (0.95L) W420FS(E)/P: 37.2 fl oz (1.1L)

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

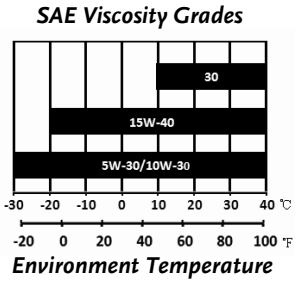
1. Remove the dipstick and add oil until it reaches the lower threads in the oil filler hole.
2. Reinsert the dipstick into the oil filling hole without screwing it in. Pull dipstick out and check oil level.
3. If the oil level is too low, add oil until it reaches the oil upper level.
4. Reinstall the dipstick when finished and screw all the way in.

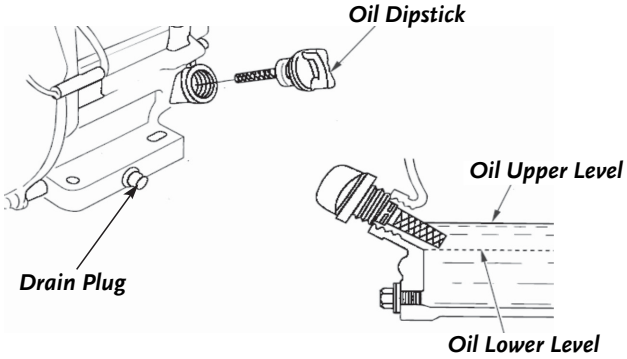
⚠ CAUTION

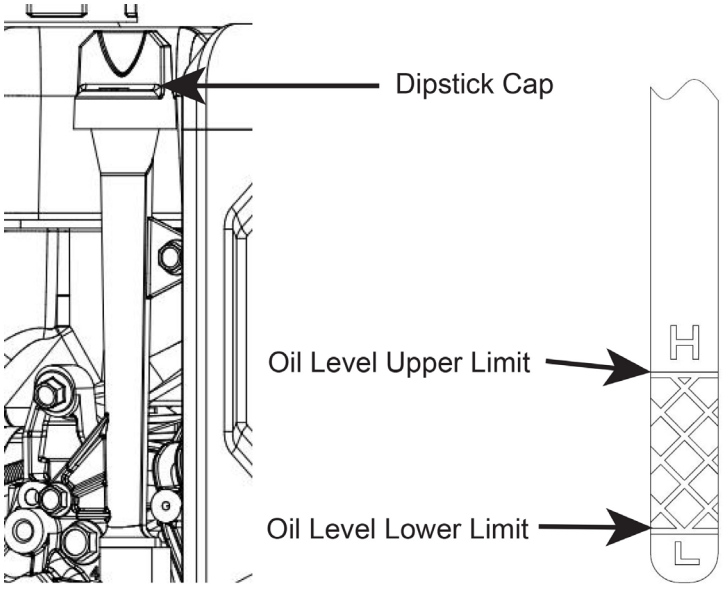
Use 4-stroke engine oil, API service classification SJ class or equivalent. Check the API service label on the oil container to be sure it includes the letters SJ class or equivalent.

NOTICE

Running the engine with insufficient engine oil may damage the engine severely and would not be covered under warranty.







ADDING GAS FOR THE FIRST TIME

⚠ WARNING

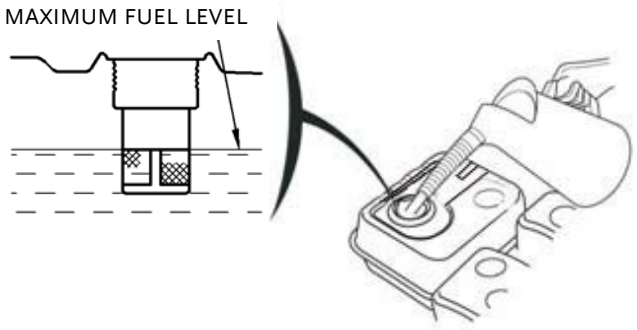
- Gasoline is extremely flammable and is explosive under certain conditions.
- Only add fuel in a well-ventilated area with the engine stopped. Do not smoke and do not allow flames or sparks in the area where gasoline is stored or where the fuel tank is refueled.
- Do not overfill the fuel tank (there should be no fuel in the filling neck). After refueling, make sure the fuel tank cap is installed 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 cleaned up and is dry before starting the engine.
- Avoid repeated or prolonged contact with skin or breathing of fuel vapor. Keep out of reach of children.

NOTICE

- Fuel may damage paint and plastic. Be careful not to spill fuel when refueling. Any damage due to fuel spilling is not covered under warranty.
- It is normal to hear a "light knocking" sound when the engine is overloaded. Do not be concerned if this occurs. If "knocking" or sounds occur at a steady speed under normal load, change the brand of gasoline; if the sounds continue, consult your dealer for help.
- If you continue to run the engine with a "knocking" sound during normal operation, it will damage the engine.
- Continuing to use the engine with "knocking" sounds from misusing will void the engine warranty.

Fuel tank capacities: W210FS/P： 2.2 L (2.3 qts)
W300FS(E)/P： 4.5 L (4.8 qts)
W420FS(E)/P： 5.0 L (5.3 qts)

1. Remove the fuel tank cap.
2. Add gas no higher than the level shown below to allow for expansion.
3. Install the fuel cap when finished.



Is Your Engine Ready to Go?

For your safety, and to maximize the service life of your equipment, it is very important to take a few moments before you operate the engine to check its condition. Be sure to take care of any problem you find or have your servicing dealer correct it before you operate the engine.

⚠ WARNING

- Improperly maintaining this engine, or failing to correct a problem before operation, could cause a malfunction in which you could be seriously injured.
- Always perform a pre-operation inspection before each operation and correct any problem.

Before beginning your pre-operation checks, be sure engine is level and the engine switch is in the STOP position.

Check the General Condition of the Engine

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

Check the Engine

Check the engine oil level. Running the engine with a low oil level can cause engine damage.

The Oil Alert system (applicable engine types) will automatically stop the engine before the oil level falls below safe limits. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

Check the fuel level. Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.

Check the Equipment Powered by This Engine

Review the instructions provided with the equipment powered by this engine for any precautions and procedures that should be followed before engine startup.

Safe Operating Precautions

Before operating the engine for the first time, please review the **IMPORTANT SAFETY INFORMATION** and the chapter titled **BEFORE OPERATION**.

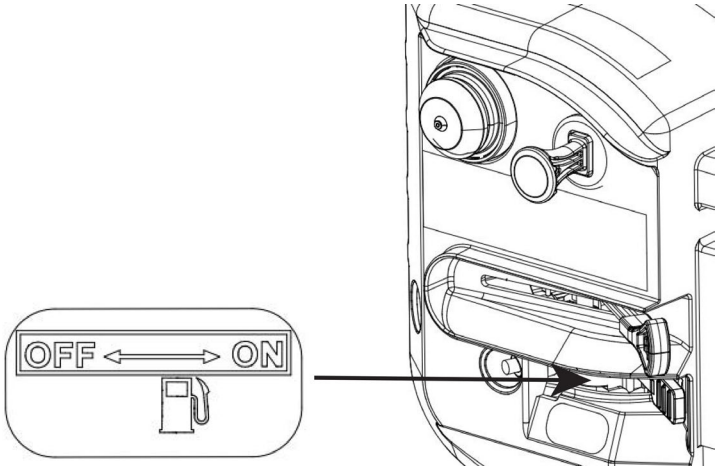
⚠ WARNING

Carbon monoxide gas is toxic. Breathing it can cause unconsciousness and even kill you. Avoid any areas or actions that expose you to carbon monoxide.

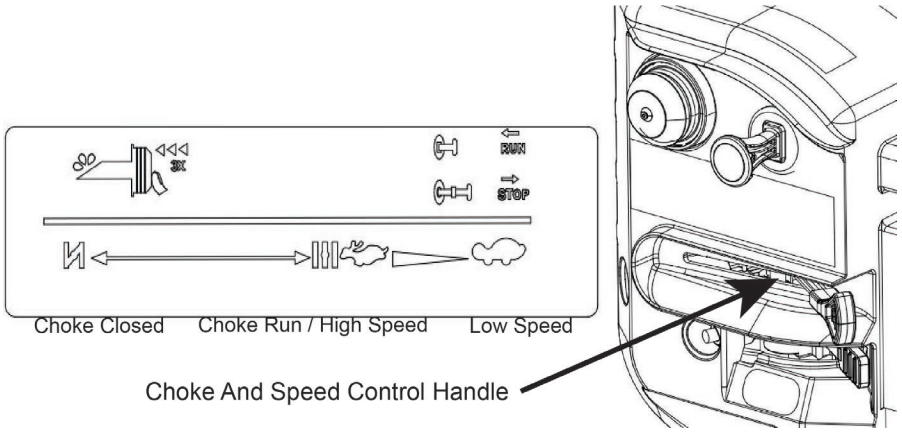
Review the instructions provided with the equipment powered by this engine for any safety precautions that should be observed in conjunction with engine startup, shutdown, or operation.

Starting the Engine

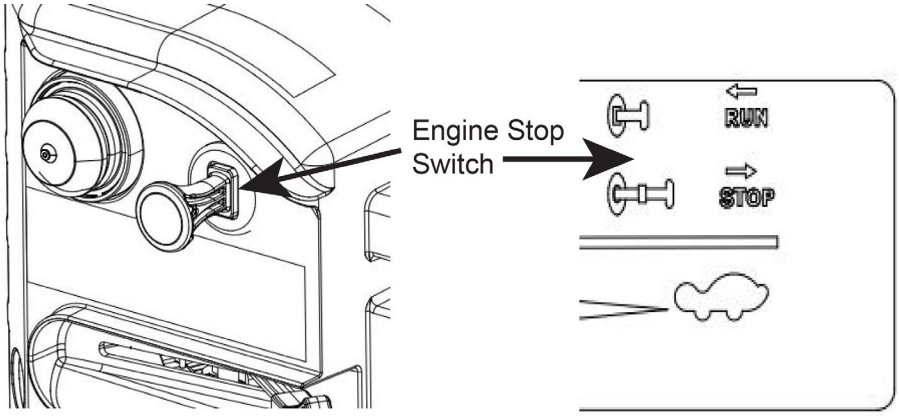
1. Move the fuel valve lever to the ON position.



2. To start a cold engine, move the choke lever to the Choke Off position. (To restart a warm engine, leave the choke lever in the Choke Run position.)

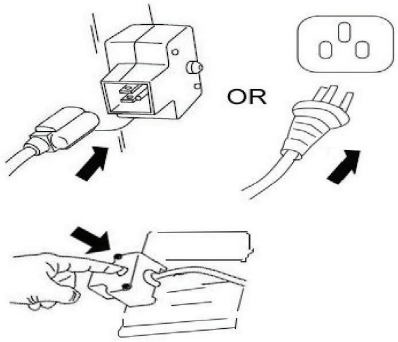


3. Push the engine key switch to the ON position.

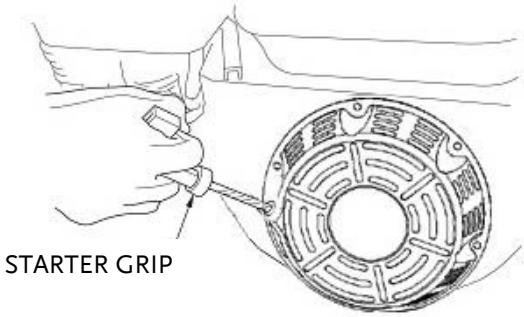


4. ELECTRIC START: For starting engine with electric start, connect start cord to 120 V power supply.
5. Press start button to start engine.

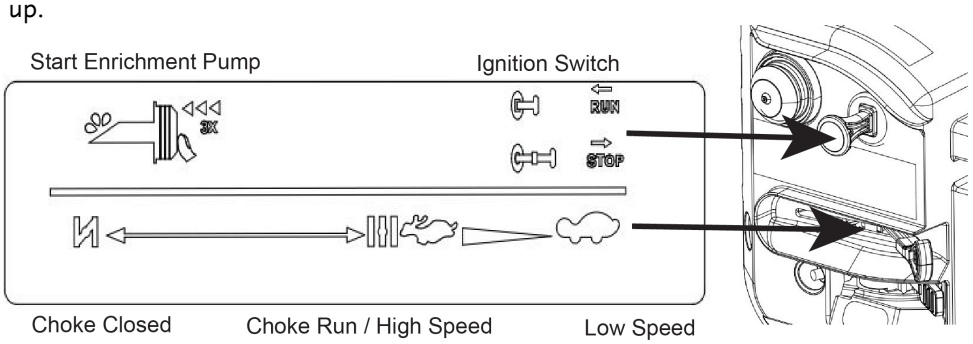
Note: *AC start rule: run 5 seconds, stop for 5 seconds, and run no more than 10 times continuously. If start motor runs continuously, and the engine still can't start, let the ac starter motor cool at least 40 minutes, then restart the start procedure.*



6. RECOIL STARTER (all engine types): Pull the starter grip lightly until you feel resistance, then pull briskly.
7. Return the starter grip gently.



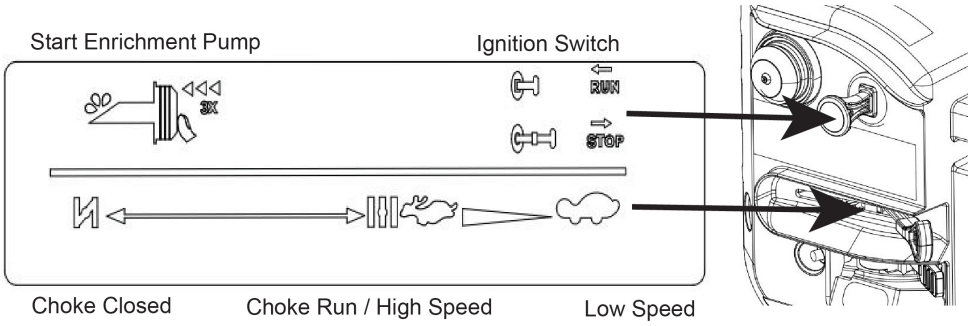
8. If the choke lever has been moved to the Choke Off position to start the engine, gradually move it to the Choke Run position as the engine warms up.



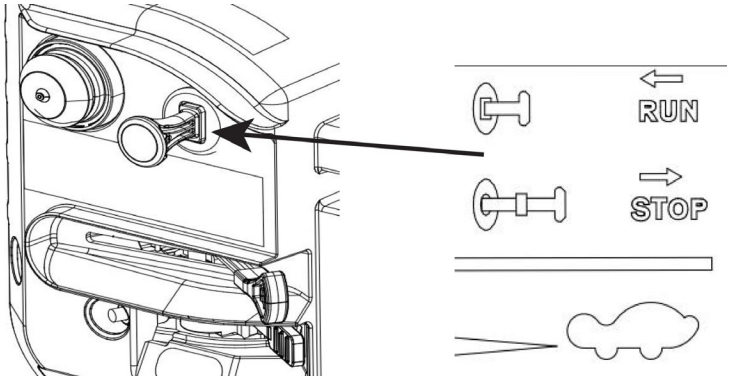
Stopping the Engine

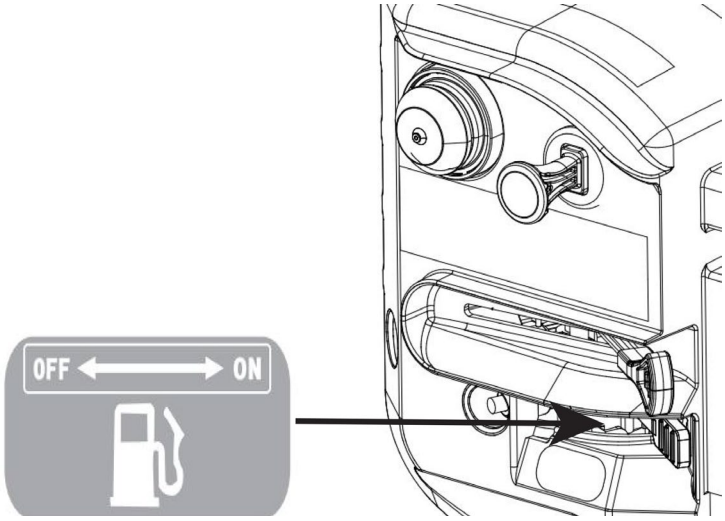
To stop the engine in an emergency, simply Pull the engine switch to the STOP position. Under normal conditions, use the following procedure.

1. Move the throttle lever to the SLOW position.



2. Turn the fuel valve lever to the OFF position.
3. Pull the engine switch to the STOP position.

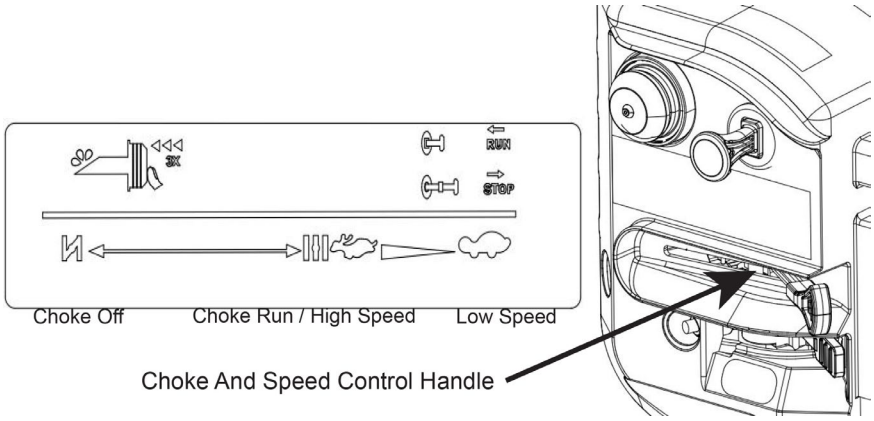




Setting Engine Speed

1. Position the throttle lever for the desired engine speed.

Note: *For engine speed recommendations, refer to the instructions provided with the equipment powered by this engine.*



The Importance of Maintenance

Good maintenance is essential for safe, economical, and trouble-free operation. It will also help reduce air pollution.

⚠ WARNING

- Improperly maintaining this engine, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.
- Always follow the inspection and maintenance recommendations and schedules in this owner's manual.

To help you properly care for your engine, the following pages include a maintenance schedule, routine inspection procedures, and simple maintenance procedures using basic hand tools. Other service tasks that are more difficult, or require special tools, are best handled by professionals, and are normally performed by a technician or other qualified mechanic.

The maintenance schedule applies to normal operating conditions. If you operate your engine under unusual conditions, such as sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, consult your servicing dealer for recommendations applicable to your individual needs and use.

Maintenance Safety

Some of the most important safety precautions are as follows: However, we cannot warn you of every conceivable hazard that can arise in performing maintenance. Only you can decide whether you should perform a given task.

⚠ WARNING

- Failure to properly follow maintenance instructions and precautions can cause you to be seriously hurt or killed.
- Always follow the procedures and precautions in the owner's manual.

Safety Precautions

Make sure the engine is off before you begin any maintenance or repairs. This will eliminate several potential hazards:

Carbon Monoxide Poisoning from Engine Exhaust

Be sure there is adequate ventilation whenever you operate the engine.

Injury from Hot Parts

Let the engine and exhaust system cool before touching.

Injury from Moving Parts

Do not run engine unless instructed to do so.

• Read the instructions before you begin, and make sure you have the tools and skills required.

• To reduce the possibility of fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep cigarettes, sparks, and flames away from all fuel-related parts.

Remember that your servicing dealer knows your engine best and is fully equipped to maintain and repair it.

To ensure the best quality and reliability, use only new, genuine parts or their equivalents for repair and replacement.

Maintenance Schedule

REGULAR SERVICE PERIOD Performed at every indicated month or operating hour interval, whichever comes. first. ITEM			Each use	First month or 20 Hrs.	Every 3 months or 50 Hrs.	Every 6 months or 100 Hrs.	Every year or 150 Hrs.
•	Engine oil	Check level	O				
		Change		O		O	
•	Sediment Cup	Clean				O	
•	Spark plug	Check-Clean				O	
		Replace					O
•	Idle speed	Check-Adjust					O (1)
•	Valve clearance	Check-Adjust					O (1)
•	Fuel tank and filter	Clean					O (1)
•	Combustion chamber	Clean	After every 150 Hrs.				
•	Fuel line	Check	Every 2 years (Replace if necessary)				

- Emission-related items.

（1） These items should be serviced by your servicing dealer unless you have the proper tools and are mechanically proficient. Refer to manual for service procedures.

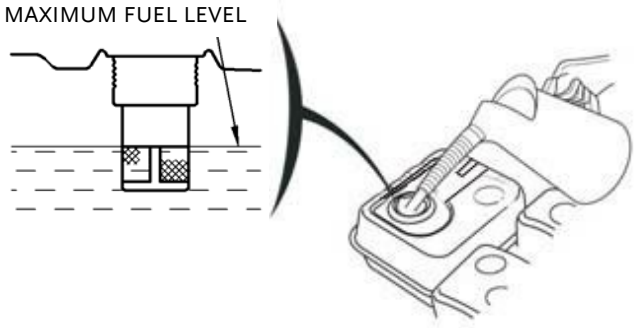
REFUELING

Fuel tank capacities:
W210FS/P： 2.2 L (2.3 qts)
W300FS(E)/P： 4.5 L (4.8 qts)
W420FS(E)/P： 5.0 L (5.3 qts)
With the engine stopped, remove the fuel tank cap and check the fuel level. Refill the tank if the fuel level is low.

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Stop the engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.



Refuel in a well-ventilated area before starting the engine. If the engine has been running, allow it to cool. Refuel carefully to avoid spilling fuel. Do not fill above the fuel strainer shoulder. After refueling, tighten the fuel tank cap securely.

Never refuel the engine inside a building where gasoline fumes may reach flames or sparks. Keep gasoline away from appliance pilot lights, barbecues, electric appliances, power tools, etc.

Spilled fuel is not only a fire hazard, it causes environmental damage. Wipe up spills immediately.

NOTICE

Fuel can damage paint and plastic. Be careful not to spill fuel when filling your fuel tank. Damage caused by spilled fuel is not covered under warranty.

Fuel Recommendations

Use unleaded gasoline with a pump octane rating of 86 or higher.

These engines are certified to operate on unleaded gasoline. Unleaded gasoline produces fewer engine and spark plug deposits and extends exhaust system life.

Never use stale or contaminated gasoline or an oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

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

If spark knock or pinging occurs at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see an authorized servicing dealer.

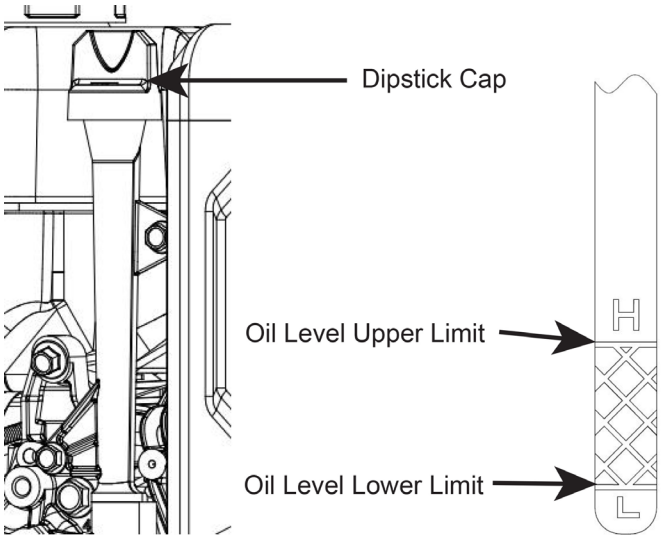
NOTICE

- Running the engine with persistent spark knock or pinging can cause engine damage.
- Running the engine with persistent spark knock or pinging is considered misuse, and the Distributor’s Limited Warranty does not cover parts damaged by misuse.

Engine Oil Level Check

Check the engine oil level with the engine stopped and in a level position.

1. Remove the filler cap/dipstick and wipe it clean.



2. Insert and remove the dipstick without screwing it into the filler neck. Check the oil level shown on the dipstick.
3. If the oil level is low, fill with the recommended oil.
4. Screw in the filler cap/dipstick securely.

NOTICE

Running the engine with a low oil level can cause engine damage. The Oil Alert system (applicable engine types) will automatically stop the engine before the oil level falls below safe limit. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

Engine Oil Change

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the engine to catch the used oil, and then remove the filler cap/dipstick and the drain plug.
2. Allow used oil to drain completely, and then reinstall the drain plug, and tighten it securely.

Dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not discard used oil in the trash; pour it on the ground; or down a drain.

3. With the engine in a level position, fill to outer edge of the oil filler hole with the recommended oil.

Engine oil capacities:

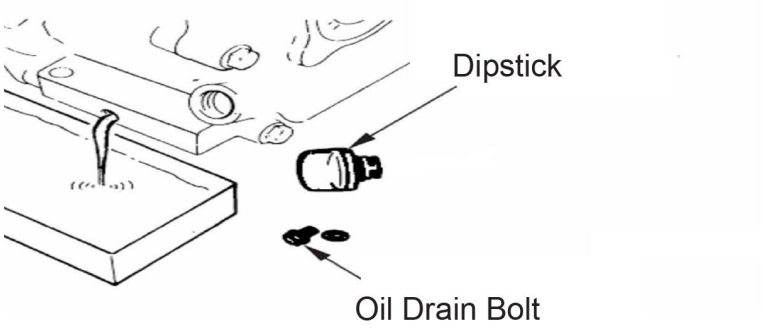
W210FS/P: 20.3 fl oz (0.6L)
W300FS(E)/P: 32.1 fl oz (0.95L)
W420FS(E)/P: 37.2 fl oz (1.1L)

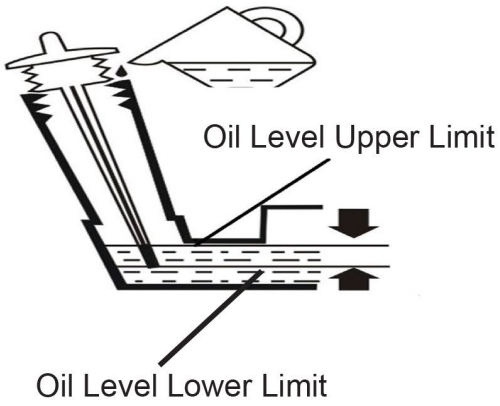
Running the engine with a low oil level can cause engine damage.

The Oil Alert system (applicable engine types) will automatically stop the engine before the oil level falls below the safe limit.

However, to avoid the inconvenience of an unexpected shutdown, fill to the upper limit, and check the oil level regularly.

4. Screw in the filler cap/dipstick securely.





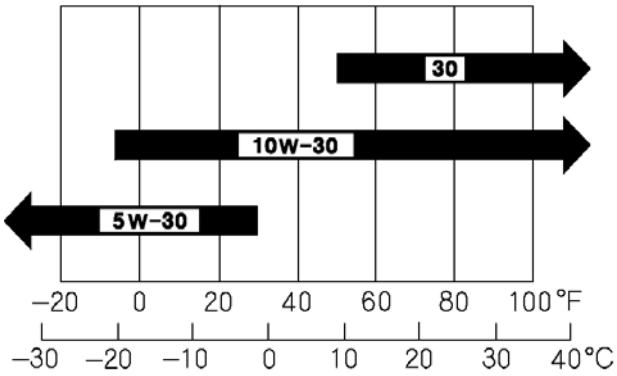
Servicing Your Engine

Engine Oil Recommendations

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

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

SAE Viscosity Grades



AMBIENT TEMPERATURE

The SAE oil viscosity and service classification are in the API label on the oil container. We recommend that you use API SERVICE Category SJ class or equivalent.

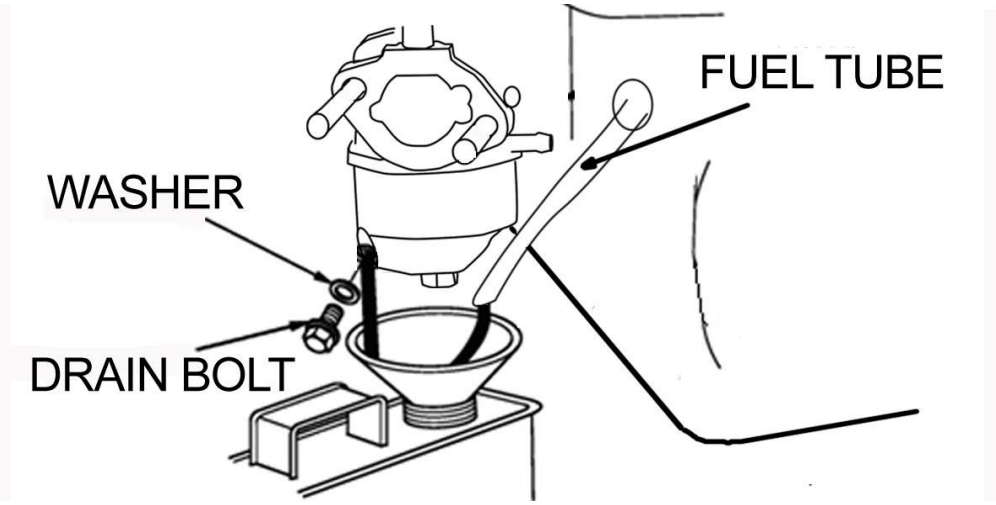
Sediment Cup Cleaning

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Stop the engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

1. Move the fuel valve to the OFF position, and then remove the fuel sediment cup and O-ring.
2. Wash the sediment cup and O-ring in nonflammable solvent and dry them thoroughly.
3. Place the O-ring in the fuel valve and install the sediment cup. Tighten the sediment cup securely.
4. Move the fuel valve to the ON position, and check for leaks. Replace the O-ring if there is any leakage.



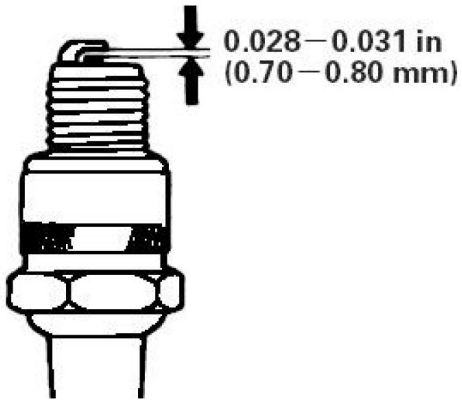
Spark Plug Service

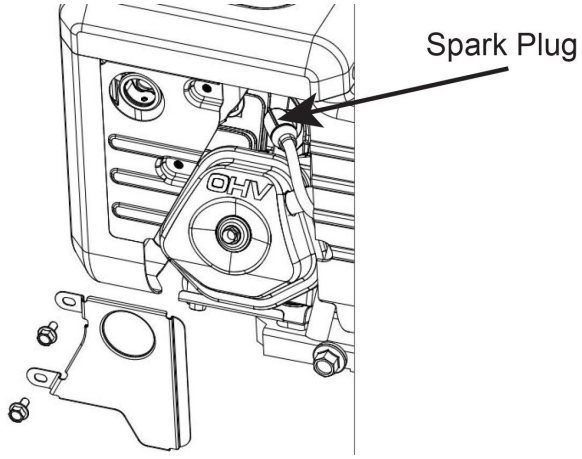
Recommended spark plugs: F7RTC or other equivalents.

NOTICE

An incorrect spark plug can cause engine damage.

1. Disconnect the spark plug cap, and remove any dirt from around spark plug area.
2. Remove spark plug with a spark plug wrench.
3. Inspect spark plug. Replace if electrodes are worn, or if insulator is cracked or chipped.





4. Measure spark plug electrode gap with a suitable gauge. The gap should be 0.028 in -0.031 in (0.70 mm - 0.80 mm). Correct the gap, if necessary, by carefully bending side electrode.
5. Install spark plug carefully, by hand, to avoid cross-threading.
6. After the spark plug seats, tighten with a spark plug wrench to compress the washer.

   If reinstalling used spark plug tighten 1/8 - 1/4 turn after the spark plug seats.

   If installing a new spark plug, tighten 1/2 turn after spark plug seats.

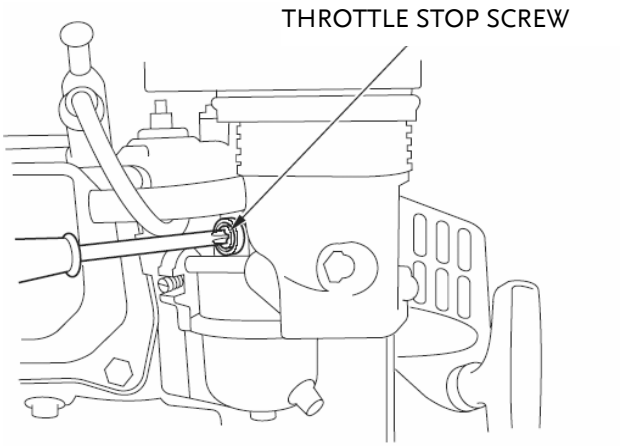
NOTICE

- A loose spark plug can overheat and damage engine.
- Over tightening spark plug can damage threads in cylinder head.

7. Attach spark plug cap.

Idle Speed Adjustment

1. Start the engine outdoors and allow it to warm up to operating temperature.
2. Move throttle lever to its slowest position.
3. Turn throttle stop screw to obtain standard idle speed. Standard idle speed: 2,000±200 rpm



Storing Your Engine

Proper storage preparation is essential for keeping your engine trouble free and looking good. The following steps will help to keep rust and corrosion from impairing your engine's function and appearance and will make the engine easier to start after storage.

Cleaning

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

NOTICE

- Using a garden hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage.
- Water contacting a hot engine can cause damage. If the engine has been running, allow it to cool for at least half an hour before washing.

Fuel

Gasoline will oxidize and deteriorate in storage. Old gasoline will cause hard starting, and it leaves gum deposits that clog the fuel system. If the 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 such factors as gasoline blend, your storage temperatures, and whether the fuel tank is partially or completely filled. The air in a partially filled fuel tank promotes fuel deterioration. Very warm storage/temperatures accelerate fuel deterioration. Fuel deterioration problems may occur within a few months, or even less if the gasoline was not fresh when you filled the fuel tank.

The Distributor's Limited Warranty does not cover fuel system damage or engine performance problems resulting from neglected storage preparation.

You can extend fuel storage life by adding a fuel stabilizer that is formulated for that purpose, or you can avoid fuel deterioration problems by draining the fuel tank and carburetor.

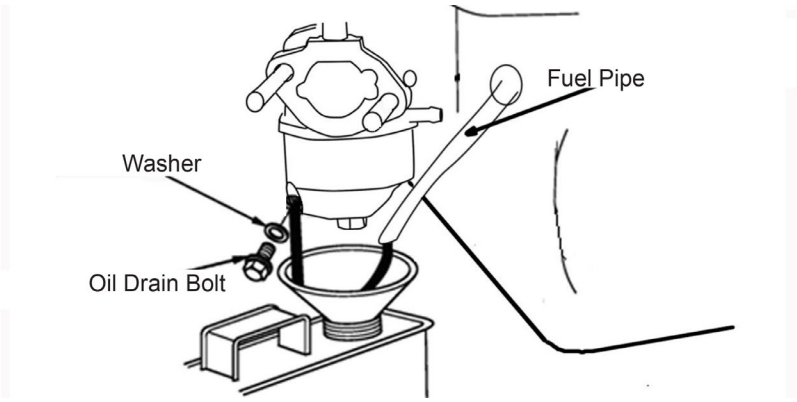
Adding a Fuel Stabilizer to Extend Fuel Storage Life

When adding a fuel stabilizer, fill the fuel tank with fresh gasoline. If only partially filled, air in the tank will promote fuel deterioration during storage. If you keep a container of gasoline for refueling, be sure that it contains only fresh gasoline.

1. Add fuel stabilizer following the manufacturer's instructions.
2. After adding a fuel stabilizer, run the engine outdoors for 10 minutes to be sure that treated gasoline has replaced the untreated gasoline in the carburetor.
3. Stop the engine and move the fuel valve to the OFF position.

Draining the Fuel Tank and Carburetor

1. Place an approved gasoline container below the carburetor and use a funnel to avoid spilling fuel.
2. Remove carburetor drain bolt and sediment cup.
3. Move the fuel valve lever to the ON position.



4. After all fuel has drained into container, reinstall drain bolt and sediment cup. Tighten them securely.

Storage Precautions

1. Change engine oil.
2. Remove spark plugs.
3. Pour a tablespoon (5-10 cc) of clean engine oil into cylinder.
4. Pull starter rope several times to distribute oil in cylinder.
5. Reinstall spark plugs.
6. Pull starter rope slowly until resistance is felt. This will close the valves so moisture cannot enter the engine cylinder. Return starter rope gently.

If your engine will be stored with gasoline in the fuel tank and carburetor, it is important to reduce the hazard of gasoline vapor ignition. Select a well-ventilated storage area away from any appliance that operates with a flame, such as a furnace, water heater, or clothes dryer. Also avoid any area with a spark-producing electric motor, or where power tools are operated.

If possible, avoid storage areas with high humidity, because that promotes rust and corrosion.

Unless all fuel has been drained from the fuel tank, leave the fuel valve lever in the OFF position to reduce the possibility of fuel leakage.

Position equipment so the engine is level. Tilting can cause fuel or oil leakage.

With the engine and exhaust system cool, cover the engine to keep out dust. A hot engine and exhaust system can ignite or melt some materials. Do not use sheet plastic as a dust cover. A nonporous cover will trap moisture around the engine, promoting rust and corrosion.

If equipped with a battery for an electric starter, recharge the battery once a month while the engine is in storage. This will help to extend the service life of the battery.

Removal from Storage

Check your engine as described in the chapter CHECK BEFORE OPERATION.

If the fuel was drained during storage preparation, fill the tank with fresh gasoline. If you keep a container of gasoline for refueling, be sure that it contains only fresh gasoline. Gasoline oxidizes and deteriorates over time, causing hard starting.

If the cylinders were coated with oil during storage preparation, the engine may smoke briefly at startup. This is normal.

Transporting

If the engine has been running, allow it to cool for at least 15 minutes before loading the engine-powered equipment on the transport vehicle. A hot engine and exhaust system can burn you and can ignite some materials.

Keep the engine level when transporting to reduce the possibility of fuel leakage. Move the fuel valve lever to the OFF position.

Engine Will Not Start				Possible Causes	Solution
Cylinder pressure is normal	Ignition ok	Abnormal fuel flow	Abnormal fuel flow	No fuel in fuel tank or fuel switch is off	Add fuel, open fuel switch
				Fuel cap gap is blocked	Unchoke
				Fuel switch is stuck	Clean
				Improper adjustment or blockage of main gauge hole	Adjust, clean, or blow off
				Pin valve or float locked	Repair or replace
			Fuel flows smoothly	Fuel is dirty or degenerated	Change fuel and clean carburetor
				Water in fuel	Change fuel and clean carburetor
				Cylinder is over fueled	Drain fuel and dry spark plug
				Wrong fuel	Change fuel
	Fuel system is ok	Abnormal ignition	Spark plug failure	Carbon deposit or dirty electrode	Clean carbon deposits
				Isolator damage	Replace spark plug
				Severe ablation of electrode	Replace spark plug
				Wrong spark plug gap	Adjust the gap
			No spark	High voltage wire damage	Replace wire
				Ignition coil damage	Replace ignition coil
				Insufficient magnetic field strength	Magnetize or replace
Cylinder pressure is abnormal	Fuel system is ok	Ignition system is ok	Spark plug is ok	Over wear or damage to piston rings	Replace piston rings
				Piston ring bonding	Clean carbon deposits
				No washer or loose spark plug	Install washer or tighten the spark plug
				Air leakage of cylinder block and joint surface of cylinder head	Replace cylinder washer
				Valve seal failure	Grind or replace

Engine Lacks Power		Possible Cause	Correction
Engine rotates slowly when increasing throttle. Engine will slow or even stop with throttle advancement	Ignition system	Improper ignition timing	Replace ignition coil
	Fuel system	Air enters fuel pipe	Drain out air
		Improper adjustment of main jet	Adjust
		Pin hole valve and main jet blocked	Clean or blow off
		Fuel switch stuck	Clean or replace broken parts
		Carbon deposit in combustion chamber	Clean carbon deposits
	Inlet system	Air cleaner stuck	Clean
		Leakage of inlet system	Repair or replace
	Bad compression	Over-wear of piston	Replace
		Leakage of joint surface between cylinder and cylinder head	Replace cylinder gasket
		Wrong valve clearance	Adjust
		Poor seal of valve	Grind or replace

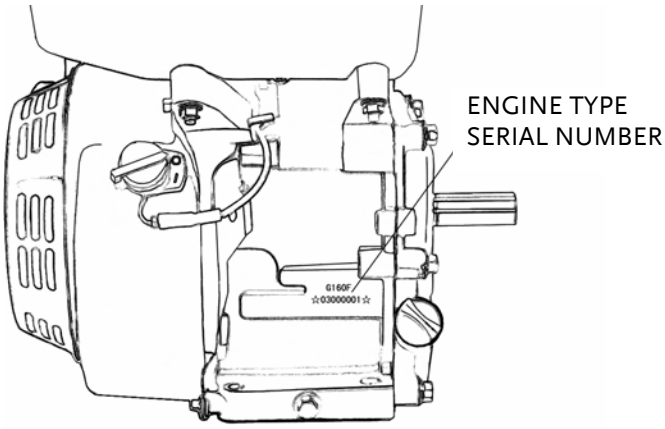
Engine Stalls		Possible Cause	Correction
Sudden shutoff	Fuel system	Runs out of fuel	Add fuel or unchoke
		Carburetor stuck	Check fuel pipe or unchoke
		Oil leakage of carburetor float	Repair float
		Pin valve stuck	Repair
	Ignition system	Spark plug breakdown, carbon leads to short circuit	Replace spark plug
		Spark plug electrode off	Replace spark plug
		High voltage wire off	Repair or replace
		Ignition coil breakdown	Replace
	Other	Severely scored cylinder or valve off	Repair or replace damaged parts

Engine Overheating	Possible Cause	Correction
Overheating of engine	Wrong ignition timing	Replace ignition coil
	Shortage of oil	Add oil
	Exhaust pipe stuck	Clean exhaust pipe
	Leakage of wind scooter	Repair
	Debris blockage in air duct	Clean cooling fin
	Cooling fan broken	Replace
	Piston ring failure results in emission of air between cylinder and crankcase	Replace broken parts
	Speed is too high	Check speed regulating system or replace speed regulating gear
	Crankshaft bearing burn down	Repair or replace

Abnormal Noise	Possible Cause	Correction
Knocking sounds	Piston and piston rings damaged	Replace damaged parts
	Over-wear of connecting rod, piston pin and pin hole	Replace wear parts
	Over-wear of crankshaft bearing	Repair or replace
	Piston ring broken	Replace piston ring
Detonation with metallic sound	Too much carbon deposit in combustion chamber	Clean carbon deposit
	Spark plug electrode gap is too small	Adjust spark plug gap
	Too much oil	Check carburetor
	Wrong fuel	Replace fuel
	Engine overheated	Refer to overheating troubleshooting
Other noise	Valve clearance is wrong	Adjust
	Connection between flywheel and crankshaft is loose	Replace connecting key or reassemble in place

Technical Information

Serial Number Location



Record the engine serial number in the space below. You will need this serial number when ordering parts, and when making technical or warranty inquires.

Engine serial number: _____

Carburetor Modification for High Altitude Operation

At high altitude, the standard carburetor air-fuel mixture will be too rich. Performance will decrease, and fuel consumption will increase. A very rich mixture will also foul the spark plug and cause hard starting. Operation at an altitude that differs from that at which this engine was certified, for extended periods of time, may increase emissions.

High altitude performance can be improved by specific modifications to the carburetor. If you always operate your engine at altitudes above 5,000 feet (1,500 meters), have your servicing dealer perform this carburetor modification. This engine, when operated at high altitude with the carburetor modifications for high altitude use, will meet each emission standard throughout its useful life.

Even with carburetor modification, engine horsepower will decrease about 3.5% for each 1,000-foot (300-meter) increase in altitude. The effect of altitude on horsepower will be greater than this if no carburetor modification is made.

NOTICE

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 feet (1,500meters) with a modified carburetor may cause the engine to overheat and result in serious engine damage. For use at low altitudes, have your servicing dealer return the carburetor to original factory specifications.

Oxygenated Fuels

Some conventional gasoline is being blended with alcohol or an ether compound. These gasoline blends are collectively referred to as oxygenated fuels.

To meet clean air standards, some areas use oxygenated fuels to help reduce emissions.

If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirement.

Before using oxygenated fuel, try to confirm the fuel's contents. Some areas require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates:

ETHANOL ————(ethyl or grain alcohol) 10% by volume

You may use gasoline containing up to 10% ethanol by volume. Gasoline containing ethanol may be marketed under the name ''Gasohol''.

MTBE ————————(methyl tertiary butyl ether) 15% by volume

You may use gasoline containing up to 15% MTBE by volume.

METHANOL ———(methyl or wood alcohol) 5% by volume

You may use gasoline containing up to 5% methanol by volume, as long as it also contains cosolvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station, or switch to another brand of gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

Emission Control System Information

Source of Emissions

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

This utilizes lean carburetor settings and other systems to reduce the emissions of carbon monoxide, oxides of nitrogen and hydrocarbons.

Tampering and Altering

Tampering with or altering the emission control system may increase emissions beyond legal limit. Among those acts that constitute tampering are:

- Removal or alteration of any part of the intake, fuel, or exhaust systems.
- Altering or defeating the governor linkage or speed-adjusting mechanism to cause the engine to operate outside its design parameters.

Problems That May Affect Emissions

If you are aware of any of the following symptoms, have your engine inspected and repaired by your servicing dealer.

- Hard starting or stalling after starting.
- Rough idle.
- Misfiring or backfiring under load.
- Afterburning (backfiring).
- Black exhaust smoke or high fuel consumption.

Replacement Parts

The emission control systems on your engine were designed and built. We recommend the use of genuine parts whenever you have maintenance done. These original-design replacement parts are manufactured to the same standards as the original parts, so you can be confident of their performance. The use of replacement parts that are not of the original design and quality, may impair the effectiveness of your emission control system.

A manufacturer of an aftermarket part assumes the responsibility that the part will not adversely affect emission performance. The manufacturer or rebuilder of the part must certify that use of the part will not result in a failure of the engine to comply with emission regulations.

Maintenance

Follow the 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.

Engine Tune-up

ITEM	SPECIFICATION
Spark plug gap	0.028-0.031 in (0.70 mm -0.80 mm)
Valve clearance	IN: 0. 10mm-0.15 mm (cold) EX: 0.10mm-0.15 mm (cold)
Other specifications	No other adjustments needed

Quick Reference Information

Engine Oil	Type	SAE 10W-30, API SE or SF, for general use
	Capacity	W210FS/P: 20.3 fl oz (0.6L) W300FS(E)/P: 32.1 fl oz (0.95L) W420FS(E)/P: 37.2 fl oz (1.1L)
Spark Plug	Type	F7RTC or other equivalents.
	Gap	0.028—0.031 in (0.70 mm—0.80 mm)
Carburetor	Idle speed	2,000 rpm±200 rpm
Maintenance	Each use	Check engine oil.
	First 20 hours	Change engine oil.
	Subsequent	Refer to the maintenance

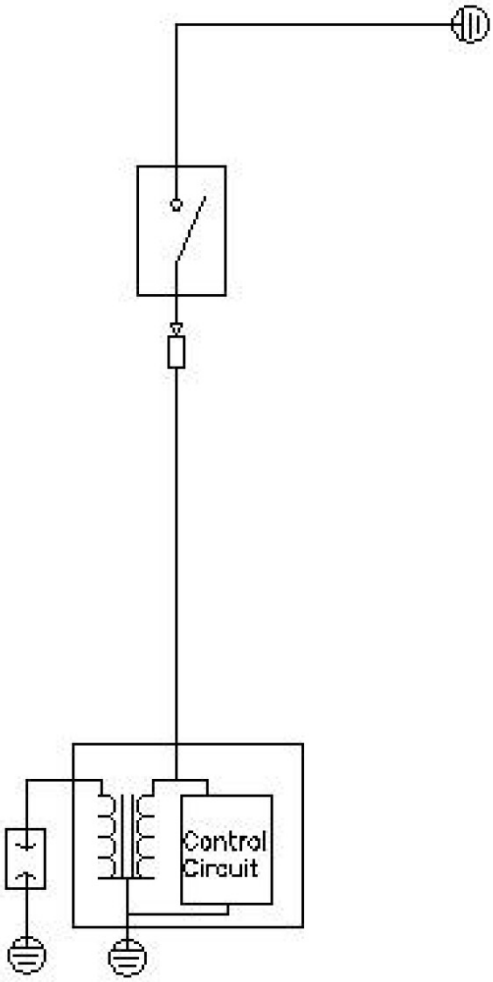
SPECIFICATIONS

Model	W210FS/P	W300FS(E)/P	W420FS(E)/P
Type	Single cylinder, 4-stroke, Air cooled, OHV		
Net Power (kW/3,600 RPM)	4.5	6.3	9.0
Max Torque (Nm/2,800 RPM)	12.5	18.5	26.5
Fuel Consumption (g/kWh)	395	395	420
Idle Speed (RPM)	2,000	2,000	2,000
Speed Fluctuating ratio	10%	10%	10%
Bore x Stroke (mm)	70 x 55	80 x 60	90 x 66
Displacement	212	302	420
Compression Ratio	8.5:1	8.7:1	8.7:1
Lubrication mode	Splash Lubrication		
Starting Mode	Plug in electric start with recoil backup		
Rotation	Counter-clockwise (from PTO side)		
Valve Clearance (mm)	Intake: 0.10 - 0.15 Exhaust: 0.12 - 0.20	Intake: 0.10 - 0.15 Exhaust: 0.12 -0.20	Intake: 0.10 - 0.15 Exhaust: 0.12 - 0.20
Spark Plug Gap (mm)	0.7 - 0.8	0.7 - 0.8	0.7 - 0.8
Ignition Mode	Transistorized magneto ignition		
Air Cleaner	No filter core		
Dimensions (LxWxH) (mm)	432 x 356 x 343	475 x 336 x 433	510 x 405 x 440
Net Weight (kg)	18	27.5	35

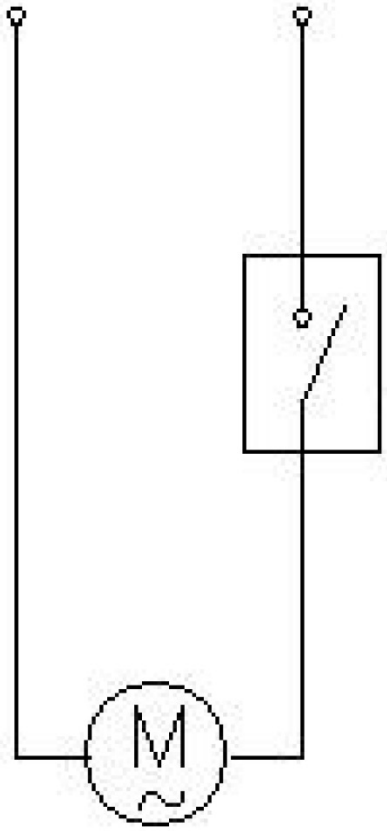
The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (Net Power) and at 2,500 rpm (Max. Net Torque). Mass production engines may vary from this value.

Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

Ignition Circuit Diagram



Electric Start Diagram



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