Safe Operation Practices • Set-Up • Operation • Service And Maintenance • Troubleshooting • Replacement Parts

OPERATOR'S MANUAL

357 cc and 420 cc

OHV Horizontal Shaft Engines

Record Product Information

Before setting up and operating your new engine, please locate the model plate and record the information in the provided area to the right. This information will be necessary, should you seek technical support via our web site, Customer Support Department, or with a local authorized service dealer.

Model Number

Serial Number

⚠ WARNING

Read and follow all safety rules and instructions in this manual before attempting to operate.

Failure to comply with these instructions may result in personal injury - SAVE THESE INSTRUCTIONS.

⚠ WARNING

CALIFORNIA PROPOSITION 65

Engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to State of California to cause cancer and birth defects or other reproductive harm.

NOTE: This Operator's Manual covers several models. Features may vary by model. Not all features in this manual are applicable to all models and the model depicted may differ from yours.

Form No. 769-25490
(May 22, 2020)

SAFE OPERATION PRACTICES

⚠ WARNING

This symbol points out important safety instructions which, if not followed, could endanger the personal safety and/or property of yourself and others. Read and follow all instructions in this manual before attempting to operate. Failure to comply with these instructions may result in personal injury. When you see this symbol, HEED ITS WARNING!

⚠ DANGER

This engine was built to be operated according to the safe operation practices in this manual. As with any type of power equipment, carelessness or error on the part of the operator can result in serious injury. Failure to observe the following safety instructions could result in serious injury or death.

TRAINING

1. Read, understand and follow all warnings and instructions on the engine and the equipment, and in the operator's manuals before attempting to install and/or operate. Keep this manual in a safe place for future and regular reference and for ordering replacement parts.
2. Be familiar with all controls and their proper operation. Know how to stop the engine and disengage them quickly.
3. Never allow children under 14 years of age to operate the equipment. Children 14 and over should read and understand the warnings and instructions both on the product and in the manuals and be trained and supervised by an adult.
4. Never allow adults to operate the equipment without proper instruction.
5. Keep the area of operation clear of all persons, particularly small children and pets. Stop the engine if anyone enters the area.

PREPARATION

1. Wear sturdy, rough-soled work shoes and close fitting slacks and shirts. Loose fitting clothes or jewelry can be caught in the moving parts. Never operate the equipment in bare feet or sandals.
2. Disengage all powered clutch and drive control levers on the equipment before starting the engine.
3. Never leave the engine running while unattended.
4. Never attempt to make any adjustments while the engine is running, except where specifically recommended in the operator's manual(s).

SAFE HANDLING OF GASOLINE:

To avoid personal injury or property damage, use extreme care in handling gasoline. Gasoline is extremely flammable and the vapors are explosive. Serious personal injury can occur when gasoline is spilled on yourself and/or your clothes which can ignite. Wash your skin and change clothes immediately.

1. When adding fuel, turn engine OFF and let engine cool at least 5 minutes before removing the fuel cap.
2. Fill fuel tank outdoors or in well ventilated area.
3. Use only an approved fuel container.
4. Never fill containers inside a vehicle or on a truck or trailer bed with a plastic liner. Always place containers on the ground away from your vehicle before filling.
5. If possible, remove equipment from the truck or trailer and refuel it on the ground. If this is not possible, then refuel equipment on a trailer with a portable container, rather than from a fuel pump dispenser nozzle.
6. Keep the nozzle in contact with the rim of the fuel tank or container opening at all times until fueling is complete. Do not use a nozzle lock-open device.
7. Do not overfill fuel tank. Fill tank to full as indicated by the fuel level indicator installed inside the fuel tank to allow space for fuel expansion. On some models, a fuel level indicator may NOT be present, in this instance, fill the tank no more than 1/2 inch below the bottom of the filler neck to allow space for fuel expansion.
8. Replace fuel cap and tighten securely.
9. If fuel is spilled, wipe it off the engine and the equipment. Move equipment to another area and wait 5 minutes before starting the engine.
10. To reduce fire hazards, keep the engine and equipment free of grass , leaves or other debris build up. Clean up oil or fuel spillage and remove any fuel-soaked debris.
11. Keep fuel away from sparks, open flames, pilot lights, heat, and other ignition sources.

SAFE OPERATION PRACTICES

12. Never fuel equipment indoors because flammable vapors will accumulate in the area.
13. Extinguish all cigarettes, cigars, pipes, and other sources of ignition.
14. Check fuel line, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.

OPERATION

1. When starting the engine, make sure spark plug, muffler, and fuel cap are in place.
2. Do not crank engine with spark plug removed.
3. If fuel is spilled, wipe it off the engine and the equipment. Move equipment to another area and wait 5 minutes before starting the engine.
4. Allow engine and muffler to cool before touching.
5. Keep small children away from hot or running engines. They are unaware of the dangers and can suffer burns from the engine and muffler.
6. Remove any accumulated debris from the engine cylinder and muffler areas.
7. Operate equipment with all shields and guards in place.
8. Keep hands and feet away from rotating parts.
9. Wear sturdy, rough-soled work shoes and close-fitting slacks and shirts. Loose fitting clothes, jewelry and long hair can be caught in moving parts. Shirts and pants that cover the arms and legs and steel-toed shoes are recommended.
10. When starting the engine with the recoil starter, pull handle slowly until resistance is felt, then pull rapidly, repeat if necessary.
11. Remove all equipment engine loads before starting engine.
12. Direct coupled equipment components such as, but not limited to blades, impellers, pulleys, sprockets, etc., must be securely attached.

MAINTENANCE & STORAGE

1. Keep the engine and equipment in safe working condition.
2. Allow the engine to cool at least 5 minutes before storing equipment. Never tamper with safety devices. Check their proper operation regularly.
3. Check bolts and screws for proper tightness at frequent intervals to keep the engine and equipment in safe working condition. Visually inspect them for any damage.
4. Before cleaning, repairing or inspecting; stop the engine and make certain all moving parts have stopped. Disconnect the spark plug wire and ground it against the engine to prevent unintended starting.
5. Do not change the engine governor settings or over-speed the engine. The governor controls the maximum safe operating speed of the engine.
6. Maintain and replace safety and instruction labels as necessary.
7. Always refer to the operator's manuals for important details if the equipment is to be stored for an extended period of time.
8. If the fuel tank has to be drained, do this outdoors.
9. Observe proper disposal laws and regulations for fuel, oil, etc. to protect the environment.

DO NOT MODIFY ENGINE

To avoid serious injury or death, do not modify engine in any way. Tampering with the governor setting can lead to a runaway engine and cause it to operate at unsafe speeds. Never tamper with factory setting of engine governor.

NOTICE REGARDING EMISSIONS

Engines which are certified to comply with California and federal EPA emission regulations for SORE (Small Off Road Equipment) are certified to operate on regular unleaded gasoline, and may include the following emission control systems: Engine Modification (EM), Oxidizing Catalyst (OC), Secondary Air Injection (SAI) and Three Way Catalyst (TWC) if so equipped.

INTENDED USE:

The engine models listed on the cover of this manual are specifically designed and intended for use on designated outdoor power equipment only. The engine models listed also have been approved for use as replacement engines for products such as snow throwers, log splitters, tillers, chipper/shredders and wheeled blowers. These engines are not approved for use in other applications. Engines used in non-approved applications or subjected to any modifications or misuse will void the engine warranty.

⚠ WARNING

Failure to use an engine as intended and as instructed may lead to property damage, personal injury or death.

ENGINE REPLACEMENT:

Please check your equipment specifications for important specific engine information, such as engine size (cc), type of shaft (horizontal or vertical) crank shaft dimensions, mounting bolt pattern, engine speed (rpm), oil capacity, fuel tank size, controls (throttle/choke), starting (recoil or electric), shut down capabilities, accessory wiring needs and other emission related specifications.

SAFE OPERATION PRACTICES

SPARK ARRESTOR

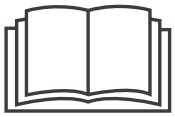
⚠ WARNING

Any equipment equipped with an internal combustion engine should not be used on or near any unimproved forest-covered, brush covered or grass-covered land unless the engine's exhaust system is equipped with a spark arrestor meeting applicable local or state laws (if any).

If a spark arrestor is used, it should be maintained in effective working order by the operator. In the State of California the above is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal lands. A spark arrestor for the muffler is available through your nearest engine authorized service dealer or contact the service department, P.O. Box 361131 Cleveland, Ohio 44136-0019.

SAFETY SYMBOLS

This page depicts and describes safety symbols that may appear on the engine. Read, understand, and follow all warnings and instructions on the engine and equipment, along with the operator's manuals before attempting to install and/or operate.

Symbol	Description
	**WARNING – READ THE OPERATOR'S MANUAL(S)** **Read, understand and follow all the safety rules and instructions in the manual(s) and on the equipment before attempting to operate. Failure to comply with this information may result in personal injury or death. Keep the manual(s) in a safe location for future and regular reference.**
	**DANGER — CARBON MONOXIDE** **Never run an engine indoors or in a poorly ventilated area. Engine exhaust contains carbon monoxide, an odorless and deadly gas.**
	**DANGER — ELECTRICAL SHOCK** **Do not use the engine's electric starter in the rain.**
	**WARNING—GASOLINE IS FLAMMABLE** **Allow the engine to cool at least 5 minutes before refueling.**
	**WARNING— AVOID BURN INJURY** **The muffler and engine become very hot and can cause serious burn injuries. Do not touch. Allow the equipment to cool for at least 5 minutes before storing or attempting any service.**

⚠ WARNING

Your Responsibility—**Restrict the use of the equipment to persons who read, understand and follow all warnings and instructions on the engine and the equipment, and in the operator's manuals. - SAVE THESE INSTRUCTIONS!**

SET-UP

Fuel & Oil

IMPORTANT: The engine is shipped without fuel in the engine. See the following instructions for adding fuel.

IMPORTANT: Some engines are shipped with oil already in the engine. It is very important to check the oil level and to add oil, if necessary. Running the engine with insufficient oil can cause serious engine damage and void the engine warranty.

OIL RECOMMENDATIONS

Before starting engine, fill with motor oil, capacity is 1100 ml/37.2 oz. Refer to viscosity chart in Figure 1 for oil recommendations. Do not over-fill. Use a 4-stroke, or an equivalent high detergent, premium quality motor oil certified to meet or exceed U.S. automobile manufacturer's requirements for service classification of a minimum level SJ (higher letter ratings are acceptable such as SL and SM grades). Motor oil will display this designation on the container.

NOTE: Do not use non-detergent oil or 2-stroke engine oil. It could shorten the engine's service life.

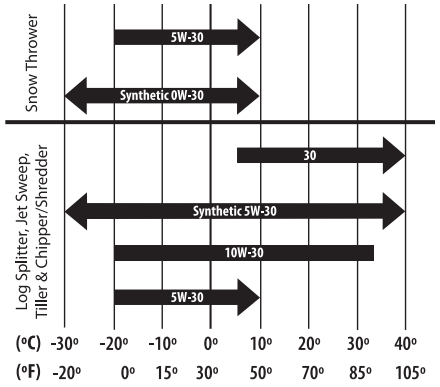


Figure 1

⚠ CAUTION

Do not use non-detergent oil or 2-stroke engine oil. It could shorten the engine's service life.

CHECKING OIL LEVEL/ADDING OIL

NOTE: Be sure to check the oil while on a level surface with the engine off.

NOTE: To install or remove the oil fill cap, rotate 1/4 turn or push/pull it from the oil fill neck.

To avoid engine damage, it is important to:

- Check oil level before each use and every 5 operating hours when engine is warm. Check oil level more frequently during engine break-in.
- Keep oil level between "H" and "L" marks on dipstick (Figure 2).
- Be sure oil fill cap is installed securely when checking.

1. Remove the oil fill cap and wipe the dipstick clean (Figure 2).
2. Insert the oil fill cap back into the oil fill neck and securely fasten.
3. Loosen and remove the oil fill cap from the oil fill neck. Note the oil level, if oil reading on the dipstick is below the "L" mark, slowly add oil to reach the "H" level (Figure 2).
4. Replace the oil fill cap into the oil fill neck and securely fasten before starting engine.

NOTE: Do not overfill. Overfilling with oil may cause smoking, hard starting, or spark plug fouling.

NOTE: DO NOT allow oil level to fall below the "L" mark on the dipstick. Doing so may result in equipment malfunctions or damage.

NOTE: To change the oil on your engine, see Changing the Oil on page 12.

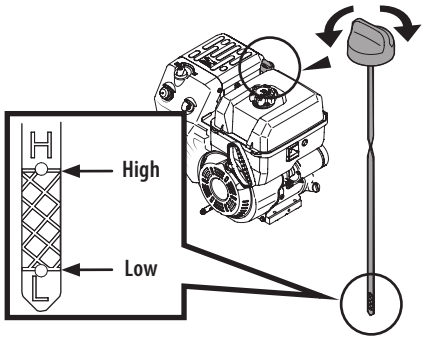


Figure 2

SET-UP

FUEL REQUIREMENTS

⚠ CAUTION

Operating the engine with E15 or E85 fuel, an oil/gasoline mixture, dirty gasoline, or *gasoline over 30 days old* without fuel stabilizing additive may result in damage to your engine's carburetor. Subsequent damage would *not* be covered under the manufacturer's warranty.

Use automotive gasoline (unleaded or low leaded to minimize combustion chamber deposits) with a minimum of 87 octane. Gasoline with up to 10% ethanol (E10) or 15% MTBE (Methyl Tertiary Butyl Ether) can be used. Never use an oil/gasoline mixture or dirty gasoline. Avoid getting dirt, dust, or water in the fuel tank. **DO NOT use E15 or E85 gasoline**.

⚠ WARNING

Gasoline is extremely flammable and is explosive under certain conditions.

- Refuel in a well-ventilated area with the engine off and allowed to cool. Do not smoke or allow flames or sparks in the area where the engine is refueled or where gasoline is stored.
- Do not overfill the fuel tank. After refueling, make sure the fuel cap is closed properly and securely.
- If fuel is spilled, wipe it off the engine and the equipment. Move equipment to another area and wait five minutes before starting the engine.
- Avoid repeated or prolonged contact with skin or breathing of vapor.

ADDING FUEL

⚠ WARNING

An adult should fuel this engine. NEVER allow children to refuel the engine. Gasoline (fuel) vapors are highly flammable and can explode. Fuel vapors can spread and be ignited by a spark or flame many feet away from engine. To prevent injury or death from fuel fires, follow these instructions:

- DO NOT use leaded fuel.
- Fuel must be fresh and clean. NEVER use fuel left over from last season or stored for long periods.
- NEVER mix oil with fuel.
- DO NOT use fuel containing Methanol (Wood Alcohol)

NOTE: Before refueling, allow engine to cool for at least 5 minutes.

1. Be sure engine is outdoors and in a well-ventilated area.
2. Clean area around the fuel fill cap and remove the fuel cap.
3. Use an approved red GASOLINE container, add fuel slowly, being careful to avoid spilling.
4. Fill fuel tank until fuel reaches 1/2 inch below the bottom of the filler neck to allow space for fuel expansion. Be careful not to overfill.
5. Replace the fuel cap and tighten securely. Wipe up spilled fuel before starting engine. If fuel is spilled DO NOT start engine. Move equipment away from area of spillage. Avoid creating any source of ignition until fuel vapors are gone.
6. Be sure fuel shut-off valve, if present, is open in the "on" position.

ELECTRICAL POWER

⚠ WARNING

DO NOT pull recoil starter with engine running. Doing so may VOID YOUR WARRANTY.

⚠ CAUTION

The extension cord can be any length, but *must* be rated for 15 amps at 125 volts, grounded and rated for outdoor use.

NOTES: When connecting power cord always connect power cord to electric starter inlet on engine first; then into outlet (Figure 3).

Determine what type of power source outlet you will be connecting the power cord to, before you start your engine. See Engines with Electric Starters instructions in the Operation Section of this manual.

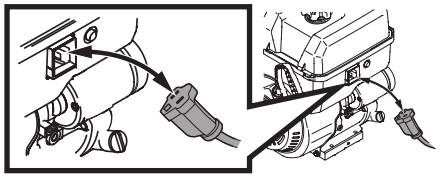


Figure 3

OPERATION

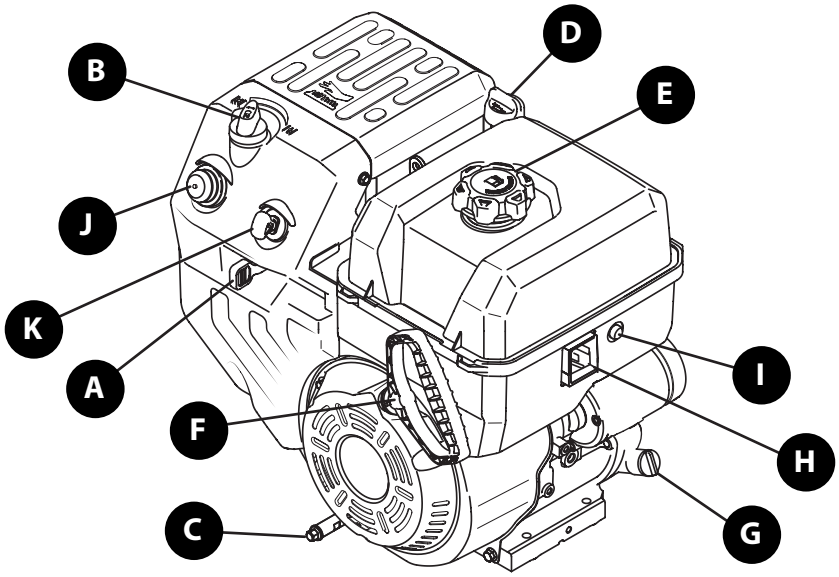


Figure 4

Features

A. THROTTLE
The throttle control regulates the speed of the engine and will shut off the engine when it is moved into the stop position.

B. CHOKE
Activating the choke closes the choke plate on the carburetor and aids in starting the engine.

C. OIL DRAIN PLUG
Removing the oil drain plug will drain the oil from the engine.

D. OIL FILL CAP & DIPSTICK
Remove the oil fill cap & dipstick to check the oil level and add oil.

E. FUEL CAP
Remove the fuel cap to add fuel.

F. RECOIL STARTER HANDLE
Pull the recoil starter handle to start the engine.

G. FACTORY FILL & DRAIN (IF EQUIPPED)
DO NOT USE - this port is used by the manufacturing factory only.

H. ELECTRIC STARTER INLET (IF EQUIPPED)
Requires the use of a three-prong outdoor extension cord and a 120V power source/wall outlet.

I. ELECTRIC START BUTTON (IF EQUIPPED)
Pressing the button on the top of the electric starter switch engages the engine's electric starter when plugged into a 120V power source.

J. PRIMER BULB (IF EQUIPPED)
Pressing the primer bulb forces fuel directly into the engine's carburetor to aid in starting a "cold" engine.

K. SAFETY KEY (IF EQUIPPED)
The safety key is a safety device. It must be fully inserted in order for the engine to start. Remove the safety key when the equipment is not in use.

IMPORTANT: Do not turn the safety key in an attempt to start the engine. Doing so may cause it to break

OPERATION

Pre-Operation Check

IMPORTANT: The engine is shipped without fuel in the engine. See the Set-Up section of this manual for instructions on adding fuel.

IMPORTANT: Some engines are shipped with oil already in the engine. It is very important to check the oil and add oil if necessary. Running the engine with insufficient oil can cause serious engine damage and void the engine warranty. See Checking Oil Level/Adding Oil on page 5.

For your safety, and in order to maximize the service life of this engine, it is very important to check its condition before starting. Make certain to service, correct or fix any problem that might be identified before attempting to operate.

⚠ WARNING

Improperly maintaining this engine, or failure to correct any problem before operation can cause a malfunction which could result in serious injury or even death.

Always perform a pre-operation inspection before each use, and correct any problem.

Before you start the engine, always check the following items:

1. Checking Oil Level/Adding Oil on page 5.
2. Fuel Requirements on page 6.
3. General overall inspection. Check for any fluid leaks or any loose or damaged parts.
4. Check the operator's manual provided with the equipment that is powered by this engine. Review the operator's manual for any precautions and procedures that should be followed before starting the engine.

Starting the Engine

⚠ WARNING

Never allow children under 14 years of age to operate the equipment. Children 14 and over should read and understand the warnings and instructions both on the equipment and in the manuals and be trained and supervised by an adult.

⚠ WARNING

If you are unable to start this engine after following instructions in this manual, contact your authorized MTD Service Dealer. To avoid serious burn injuries or damage to your engine, DO NOT attempt to start or troubleshoot the engine as listed below:

- **DO NOT use starting fluid.**
- **DO NOT spray flammable vapors into the carburetor.**
- **DO NOT put flammable liquids into carburetor.**
- **DO NOT operate engine or pull on recoil starter with spark plug removed. Fuel can spray from spark plug hole and ignite.**

NOTE: Allow the engine to warm up for a few minutes after starting. The engine will not develop full power until it reaches normal operating temperatures.

OPERATION

Familiarize yourself with the engine symbols shown in Figure 5 before attempting to start engine. If engine is remotely controlled by the equipment it is powering, be sure to familiarize yourself with the equipment Operator's Manual as well.

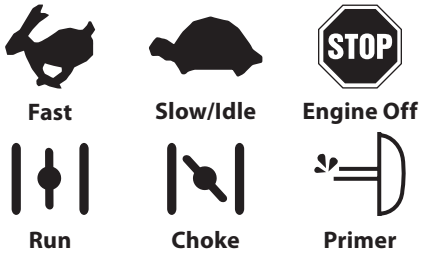


Figure 5

1. If equipped, insert the safety key (Figure 6).

IMPORTANT: The safety key is a safety device. Do not turn the safety key in an attempt to start the engine. Doing so may cause it to break.

Figure 6

NOTE: The following starting instructions are for several different types of engines. In order to locate the instructions that apply to your engine, first determine what type of starter you have (Figure 7). If you have an electric starter, see Engines With Electric Starters. If you have a manual recoil starter, see Engines with Recoil Starters later in this section.

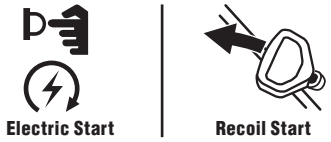


Figure 7

Engines With Electric Starters

If you have a manual recoil starter, see Engines with Recoil Starters later in this section.

⚠ WARNING

DO NOT pull recoil starter with engine running. Doing so may VOID YOUR WARRANTY.

⚠ WARNING

The electric starter is equipped with a 120V A.C. Power Plug designed to operated with a grounded extension cord and on 120V A.C. household current. It must be properly grounded at all times to avoid the possibility of injury or death from electrical shock.

Determine if your house wiring has a Ground Fault Interrupted (G.F.I.) Three-Wire Grounded System; if you are not sure, ask a Licensed Electrician.

If your house wiring does not have a G.F.I. Three-Wire Grounded System, DO NOT USE THIS ELECTRIC STARTER UNDER ANY CONDITION.

If your house wiring is grounded and a G.F.I. Three-Prong Wall Receptacle is not available at the location where your starter will be used, one must be installed by a Licensed Electrician BEFORE USING THE ELECTRIC STARTER!

1. To avoid carbon monoxide poisoning, be sure engine is started and run outdoors in a well-ventilated area.
2. Be sure fuel shut-off valve, if present (see equipment Operator's Manual instructions) is open and all switches are in the "on" position..
3. Plug an extension cord into the electric starter inlet located on the engine's surface. Plug the other end of extension cord into a three-prong 120-volt, grounded, AC outlet in a well-ventilated area.

⚠ CAUTION

The extension cord can be any length, but *must* be rated for 15 amps at 125 volts, grounded and rated for outdoor use.

IMPORTANT: When connecting the power cord, always connect the power cord to the electric starter inlet on the engine first; then into the G.F.I. three-pronged wall outlet.

4. Move engine speed control, if equipped, in the "FAST" position.
5. If equipped, set the choke control to "FULL CHOKE" position.
6. If equipped, Prime 3 - 5 times.
   - Make sure you cover the vent hole with your thumb.
   - Hold the primer bulb in for one full second each time you press it.

   NOTE: DO NOT use the primer bulb to restart a warm engine after a short shutdown. Doing so will flood the engine and may result in difficulty starting.

   NOTE: If restarting a warm engine after a short shutdown, move the engine speed control (if equipped) to the "FAST" position and move the choke control to the "NO CHOKE" position.
7. Push the starter button to start the engine.

   IMPORTANT: DO NOT operate an electric starter for more than 5 seconds during each attempt.
8. Release the starter button.

   NOTE: If the engine fails to start after 3 attempts, repeat steps 6 through 7.
9. After the engine starts:
   - Move the choke control to 1/2 "CHOKE" position until the engine runs smoothly.
   - Next, move the choke control to the "NO CHOKE" position.

NOTE: If the engine starts but falters when the choke control is moved to the "NO CHOKE" position. Perform the following:

- Momentarily move choke control back to "FULL CHOKE" position.
- Next, move the choke control to "1/2 CHOKE" position until engine runs smoothly.
- Finally, move the choke control to the "NO CHOKE position".

NOTE: If the engine stops with the choke control in the "NO CHOKE" position, repeat steps 6-9 to restart the engine.

NOTE: If the engine fails to start after 3 attempts in the "NO CHOKE" position, move the choke control to "FULL CHOKE" position and repeat steps 6-9 to restart the engine.

10. Disconnect the extension cord from the outlet.
11. Disconnect the extension cord from the electric starter inlet on the engine.

IMPORTANT: If engine does not start after following steps 1 through 11, contact your Authorized MTD Service Dealer. DO NOT attempt to troubleshoot engine.

Engines with Recoil Starters

If you have an electric starter, see Engines with Electric Starters earlier in this section.

⚠ WARNING

DO NOT pull recoil starter with engine running. Doing so may VOID YOUR WARRANTY.

1. To avoid carbon monoxide poisoning, be sure engine is started and run outdoors in a well-ventilated area.
2. Be sure fuel valve, if present (see equipment Operator's Manual instructions) is open and all switches are in the "on" position.
3. Move the engine speed control, if equipped, to the "FAST" position.
4. If equipped, set the choke control to "FULL CHOKE" position.
5. If equipped, Prime 3 - 5 times.
   - Make sure you cover the vent hole with your thumb.
   - Hold the primer bulb in for one full second each time you press it.

   NOTE: DO NOT use the primer bulb to restart a warm engine after a short shutdown. Doing so will flood the engine and may result in difficulty starting.

   NOTE: If restarting a warm engine after a short shutdown, move the engine speed control (if equipped) to the "FAST" position and move the choke control to the "NO CHOKE" position.
6. Operate equipment control to release engine brake or clutch, if equipped (see equipment Operator's Manual).

⚠ WARNING

When pulling the starter, the handle may unexpectedly jerk back toward the engine causing serious injury. To avoid this risk, carefully follow the instructions below:

7. Grasp the recoil starter handle.
   - Pull handle out slowly until you feel resistance.
   - Pull the handle with one rapid full arm stroke.
   - Return the handle slowly to the original position, repeat if necessary.

   NOTE: Following the instructions listed in the steps above avoids potential damage to the recoil mechanism.

NOTE: If the recoil starter handle is frozen and will not operate the engine, proceed as follows:

- Pull as much rope out of the starter as possible.
- Release the recoil starter handle and let it snap back against the starter to break up ice; repeat if necessary.

8. If the engine fails to start after 3 attempts repeat steps 5 through 6 and try again.
9. When the engine starts:
   - Move the choke control to 1/2 "CHOKE" position until the engine runs smoothly.
   - Next, move the choke control to the "NO CHOKE" position.

NOTE: If the engine starts but falters when the choke control is moved to the "NO CHOKE" position:

- Momentarily move choke control back to "FULL CHOKE" position.
- Next, move the choke control to "1/2 CHOKE" position until engine runs smoothly.
- Finally, move the choke control to the "NO CHOKE" position.

NOTE: If the engine stops with the choke control in the "NO CHOKE" position, repeat steps 5-8 to restart the engine.

NOTE: If the engine fails to start after 3 attempts in the "NO CHOKE" position, move the choke control to "FULL CHOKE" position and repeat steps 5-8 to restart the engine.

IMPORTANT: If engine does not start after following steps 1 through 8, contact your Authorized MTD Service Dealer. DO NOT attempt to troubleshoot this engine in any other way.

Stopping the Engine & Short Term Storage

⚠ WARNING

To avoid unsupervised equipment operation, especially by children, NEVER leave the engine running while unattended. Always turn off the engine after use and remove the safety key, if equipped.

⚠ WARNING

NEVER store the engine with fuel in the fuel tank inside a building with potential sources of ignition such as hot water tank and space heaters, clothes drivers, electric motors, etc.

1. If operating the engine in the snow or rain, run the engine for a few minutes to help dry off any moisture.
2. If equipped, move the equipment control, engine control lever or ignition switch to "STOP" or "OFF" position (see equipment Operator's Manual).
3. If equipped, remove safety key (if necessary, see equipment Operator's Manual for safety key location).

NOTE: Removing the safety key will reduce the possibility of unauthorized starting of the engine while equipment is not in use.

After the Engine is Stopped

⚠ WARNING

To prevent the possible freeze-up of engine controls, follow instructions with engine STOPPED, listed below:

1. Wipe all snow and moisture from the engine control lever and choke areas.
2. If equipped, move the equipment control, engine control lever or ignition switch (see equipment Operator's Manual) back and forth several times and leave the control in the "STOP" or "OFF" position.
3. Move the engine choke back and forth several times and leave in the "FULL CHOKE" position.
4. Be sure the Fuel Shut-Off Valve, if present, is in the closed "OFF" position.

SERVICE AND MAINTENANCE

⚠ WARNING

Shut off the engine before performing any maintenance. To prevent accidental start-up, remove the safety key or disconnect the spark plug wire and ground against the engine.

General Recommendations

Periodic inspection and adjustment of the engine is essential if high level performance is to be maintained. Regular maintenance will also ensure a long service life. The required service intervals and the kind of maintenance to be performed are described in the table below. Follow the hourly or calendar intervals, whichever occurs first. More frequent service is required when operating in adverse conditions.

NOTE: If engine must be tipped to transport equipment or inspect, keep spark plug side of engine up. Transporting or tipping engine spark plug down may cause smoking, hard starting, spark plug fouling, or oil saturation of air cleaner.

⚠ WARNING

If the engine has been running, the muffler will be very hot. Allow engine and muffler to cool before performing any maintenance.

Maintenance Schedule

Service	First 5 Hours	Each Use or Every 5 Hrs.	Every Season or 25 Hours	Every Season or 50 Hours	Every Season or 100 Hours	Service Dates
Check Engine Oil Level		✓				
Change Engine Oil	✓			✓		
Check Spark Plug			✓			
Replace Spark Plug					✓	
Clean Engine Shroud (If Equipped)		✓				
Clean around muffler		✓				
Replace Fuel Filter (If Equipped)					✓	

Changing the Oil

To avoid engine damage, it is important to:

Check oil level before each use and every 5 operating hours when the engine is warm. See Checking Oil Level/Adding Oil on page 5.

Change the oil after the first 5 operating hours and every 50 operating hours thereafter. Engine should still be warm but NOT HOT from recent use.

⚠ WARNING

If the engine has been running the muffler, engine head and spark plug will be very hot. Be careful not to touch any of these components until they have cooled.

⚠ WARNING

Before tipping engine or equipment to drain oil, drain fuel from tank by running engine until fuel tank is empty.

1. Carefully disconnect the spark plug wire (a) and keep it away from the spark plug (b). Refer to Figure 8 for spark plug location.

   IMPORTANT: Keep the disconnected spark plug wire securely away from the metal parts where arcing could occur.

   NOTE: Carefully attach the spark plug wire to the grounding post, if provided.

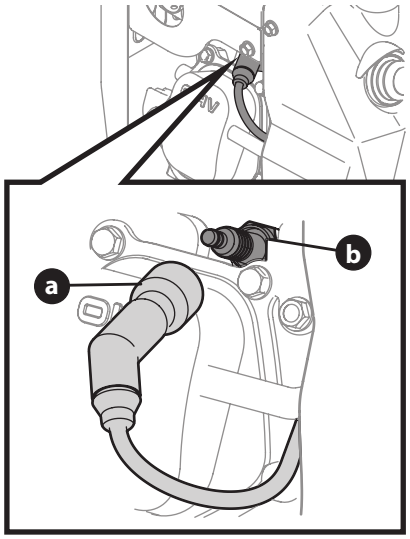


Figure 8

2. Ensure the fuel cap is on and securely tightened.
3. Clean area around the oil drain plug (a) (Figure 9).
4. Place an approved recyclable oil container under the oil drain plug.
5. Remove the oil drain plug (Figure 9).

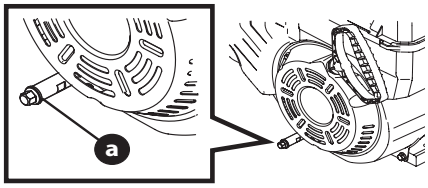


Figure 9

⚠ WARNING

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

6. Tip engine to position the oil flow so it will drain from the lowest point on the engine.
7. Drain the oil into an approved recyclable oil container.

   NOTE: Please dispose of used engine oil in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local service station or auto parts store for recycling. Do not throw it in the trash or pour it on the ground.

8. Install the oil drain plug and tighten securely.
9. Clean area around the oil drain plug.
10. Fill with the recommended oil. See Oil Recommendations and Checking Oil Level/Adding Oil on page 5.
11. Carefully disconnect spark plug wire from grounding post, if present.
12. Carefully reconnect the spark plug wire to the spark plug.

NOTE: It is advisable to recheck the oil level after you have operated the engine for a short while and the normal engine operating temperature has been achieved.

Spark Plug Service

⚠ WARNING

DO NOT check for spark with spark plug removed. DO NOT crank engine with spark plug removed.

Check the spark plug yearly or every 100 operating hours. To ensure proper engine operation, the spark plug must be properly gapped and free of deposits.

1. Remove the spark plug boot (Figure 8).
2. Clean the area around the spark plug.
3. Use a spark plug wrench to remove the spark plug.

⚠ WARNING

If the engine has been running, the muffler, engine head and spark plug will be very hot. Be careful not to touch any of these components until they have cooled.

4. Visually inspect the spark plug. Discard the spark plug if there is apparent wear, or if the insulator is cracked or chipped. Replace the spark plug if the electrodes are pitted, burned or fouled with deposits.
5. Clean the spark plug with a wire brush if it is to be reused.
6. Measure the plug gap with a feeler gauge. Correct as necessary by bending side electrode (a) (Figure 10). The gap should be set to 0.030 - .06 in. (0.76 - 1.5 mm).
7. Check that the spark plug washer is in good condition
8. Thread the spark plug in by hand to prevent cross-threading.
9. After the spark plug is seated, tighten with a spark plug wrench to compress the washer.

NOTE: When installing a new spark plug, tighten ½ turn after the spark plug seats to compress the washer. When reinstalling a used spark plug, tighten ⅛-¼ turn after the spark plug seats to compress the washer.

NOTE: The spark plug must be securely tightened. An improperly tightened spark plug can become very hot and may damage the engine.

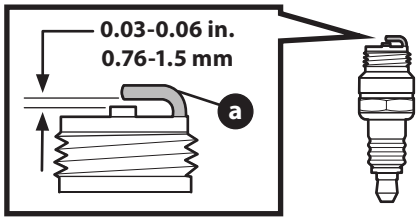


Figure 10

Adjustments

DO NOT make any engine adjustments. Factory settings are satisfactory for most conditions. If adjustments are needed, contact your Authorized MTD Servicing Dealer.

Carburetor

If you think your carburetor needs adjusting, see your nearest Authorized MTD Servicing Dealer. Engine performance should NOT be affected at altitudes up to 7,000 feet (2,134 meters). For operation at higher elevations, contact your Authorized MTD Servicing Dealer.

Alternator (if equipped)

Contact your Authorized MTD Servicing Dealer for alternator related electrical problems such as:

Inoperative Starter

Discharged Battery

Fuse Replacement

Alternator Maintenance/Repairs

Engine Speed

⚠ WARNING

To avoid serious injury or death, DO NOT modify engine in any way. Tampering with the governor setting can lead to a runaway engine and cause it to operate at unsafe speeds. NEVER tamper with the factory setting of the engine governor.

⚠ WARNING

Running the engine faster than the speed set at the factory can be dangerous and will VOID THE ENGINE WARRANTY.

Removing Snow from the Engine

After each use, remove snow from the following areas:

Oil Fill Cap & Dipstick

Fuel Cap

Recoil Starter/Flywheel Screen

Linkage

Guards

Spark Plug Connection (if visible)

Electric Starter Switch Box, if present (see the equipment Operator's Manual instructions).

NOTE: See the equipment Operator's Manual instructions for proper location of fuel cap and control lever.

Removing snow will ease operation of the recoil starter and reduce the risk of water contamination when opening the fuel cap.

NOTE: For more information about recoil starters, see Engine's with Recoil Starters in the Operation Section of this manual.

Transporting Your Engine

⚠ WARNING

NEVER transport this engine inside of another vehicle or in any enclosed space if there is any fuel in the tank. Fuel vapor or spilled fuel may ignite.

⚠ WARNING

If there is fuel in the fuel tank, close the fuel shut-off valve, if equipped, and transport the engine upright in an open vehicle, such as an open trailer or open bed of a pickup truck.

If you DO NOT have an open vehicle and have to transport the engine upright in a closed vehicle, follow these steps for emptying the fuel tank before transporting:

1. Empty fuel tank by using a commercially available suction device designed for use with gasoline.

⚠ WARNING

DO NOT pour fuel from the engine or siphon fuel by mouth.

2. Drain fuel into an approved red gasoline container, being careful to avoid spilling.
3. Run the engine until remaining fuel is consumed.

⚠ WARNING

NEVER leave the engine unattended when it is running and NEVER run the engine in an enclosed area.

Storing Your Engine
Short-Term/Seasonal Storage

If the engine has been running, allow it to cool for at least half an hour before cleaning.

Before servicing the engine, remove the carburetor cover and/or blower housing. Remove the dirt and debris from the following areas:

Cooling Fins

Air Intake Screen or Recoil Starter/Flywheel Guard Areas

Spark Plug Connection

Levers

Linkage Area

Guards

Carburetor

Head

Removing debris will insure adequate cooling, correct engine speed and reduce the risk of fire.

NOTE: Do not spray engine with water to clean because water could contaminate fuel. Using a garden hose or pressure washing equipment can also force water into the air cleaner or muffler opening. Water in the air cleaner will soak the paper element, and water that passes through the element or muffler can enter the cylinder, causing damage.

⚠ WARNING

Accumulation of debris around muffler could cause a fire. Inspect and clean before and after each use.

Fuel Storage

⚠ WARNING

NEVER store engine with fuel in the fuel tank inside a building with potential sources of ignition such as hot water heater, space heater, clothes dryer, electric motor, etc. Failure to do so may result in an explosion and result in death or serious injury.

NOTE: If engine fuel stored in the fuel tank and/or an approved fuel container is to be unused without fuel stabilizer for more than 15-30 days, prepare it for short-term/seasonal storage. See Fuel Treatment later in this section.

NOTE: If engine fuel is to be stored for more than one season, without fuel stabilizer, it will gradually deteriorate. Also, if it is stored in the engine's fuel tank without fuel stabilizer it is likely that your carburetor will have gum deposits, a clogged fuel system and will VOID YOUR WARRANTY. Prepare the fuel for extended storage.

FUEL SYSTEM

To avoid stale fuel and carburetor problems, treat the fuel system in the following manner:

NOTE: Always follow mix ratio found on the stabilizer container. Failure to do so may result in engine damage.

NOTE: It is NOT necessary to drain stabilized fuel from carburetor.

FUEL TREATMENT

1. Add a fuel stabilizer according to the manufacturer's instructions.
2. Run engine at least 10 minutes after adding the stabilizer to allow it to reach the carburetor.

NOTE: Instead of using a fuel preservative/stabilizer, you can empty the fuel tank as described in Extended Storage — Draining the Fuel.

Extended Storage

DRAINING THE FUEL

NOTE: Clean debris from the engine before draining fuel from the carburetor.

NOTE: If you have prepared your fuel for short-term storage it is NOT necessary to drain fuel that contains stabilizer from your carburetor.

⚠ WARNING

Before tipping engine or equipment to drain oil, drain fuel from tank by running engine until fuel tank is empty.

1. To prevent serious injury from fuel fires, empty fuel tank by running engine until it stops from lack of fuel. DO NOT attempt to pour fuel from engine.
2. Run the engine until the remaining fuel is consumed.

⚠ WARNING

NEVER leave the engine unattended when it is running and NEVER run the engine in an enclosed area.

3. Begin servicing the cylinder bore as per the following instructions.

OIL CYLINDER BORE

⚠ WARNING

When lubricating cylinder bore, fuel may spray from the spark plug hole. To prevent serious injury from fuel fires, follow these instructions:

1. Turn off all the engine switches.
2. Remove the safety key, if provided.
3. Carefully disconnect the spark plug wire and ground it against the engine.

- Keep the disconnected spark plug wire securely away from the spark plug and metal parts where arcing could occur.
- Carefully attach the spark plug wire to the grounding post, if provided.

4. Remove the spark plug.
5. Squirt ½ oz. (15ml) of clean engine oil into the spark plug hole.
6. Cover the spark plug hole with a rag to prevent fuel from spraying from the spark plug hole when the recoil starter is pulled.

NOTE: for engines equipped with a recoil starter, proceed to Step 7. For engines equipped with electric starters, proceed to Step 8.

7. For recoil starter engines:
   - Grasp the recoil starter handle.
   - Pull the recoil starter handle out slowly using a full arm stroke.
   - Repeat once. This will distribute the oil throughout the cylinder to prevent corrosion during storage.
   - Proceed to Step 9.
8. For electric starter engines:
   - Plug an extension cord into the three-prong connector located on the engine's surface. Plug the other end of extension cord into a three-prong 120-volt, grounded, AC outlet in a well-ventilated area.
   - Push and immediately release the starter button. This will distribute the oil throughout the cylinder to prevent corrosion during storage.
   - Disconnect the extension cord from the outlet.
   - Disconnect the extension cord from the three-prong connector on the engine.
   - Proceed to Step 9.
9. Remove the rag from spark plug hole.
10. Install the spark plug.
11. Carefully disconnect the spark plug wire from the grounding post, if provided.
12. Connect the spark plug wire plug wire to the spark plug.

Oil

Change the oil if NOT changed within the last 3 months. See Checking and Changing the Oil earlier in this section.

Off-Season Storage

⚠ CAUTION

Failure to use a fuel stabilizing additive or completely run the engine until it's out of fuel before off-season storage may result in damage to your engine's carburetor. Subsequent damage would *not* be covered under the manufacturer's warranty.

Engines stored between 30 and 90 days need to be treated with a fuel stabilizer and engines stored over 90 days need to be drained of fuel to prevent deterioration and gum from forming in fuel system or on essential carburetor parts. If the fuel in your engine deteriorates during storage, you may need to have the carburetor, and other fuel system components, serviced or replaced.

1. Remove all fuel from tank by running engine until it stops from lack of fuel.

⚠ WARNING

Never leave engine unattended while it is running.

2. Change the oil. See Changing the Oil earlier in this section.
3. Oil the cylinder bore. See Oil Cylinder Bore earlier in this section.
4. Clean debris from around the engine and the muffler. Touch up any damaged paint, and coat other areas that may rust with a light film of oil.
5. Store in a clean, dry and well ventilated area away from any appliance that operates with a flame or pilot light, 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.
6. If possible, also avoid storage areas with high humidity, because that promotes rust and corrosion.
7. Keep the engine level in storage. Tilting can cause fuel or oil leakage.

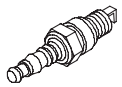
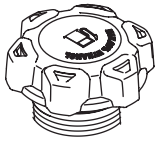
Removing From Storage

1. Check your engine as described in the Pre-Operation Check section of this manual.
2. If the fuel was drained during storage preparation, fill the tank with fresh gasoline. If you keep a container of gasoline for refueling, make certain it contains only fresh fuel. Gasoline oxidizes and deteriorates over time, causing hard starting.
3. If the cylinder was coated with oil during storage preparation, the engine will smoke briefly at startup. This is normal.

TROUBLESHOOTING

Problem	Cause	Remedy
Engine Fails to start	1. Engine flooded	1. Wait at least 10 minutes before starting
	2. Spark plug wire disconnected	2. Connect wire to spark plug
	3. Fuel tank empty	3. Fill tank with clean, fresh fuel
	4. Stale fuel	4. Use fuel siphon to drain fuel tank. Refill with fresh fuel
	5. Engine not choked	5. Choke engine
	6. Faulty spark plug	6. Clean, adjust gap or replace
	7. Throttle in STOP position	7. Move throttle to FAST/RUN position
Engine runs erratically	1. Spark plug wire loose	1. Connect and tighten spark plug wire
	2. Spark plug scorched, defective or electrode gap is set incorrectly	2. Re-adjust electrode gap or change
	3. Stale fuel	3. If necessary use fuel siphon to drain fuel tank. Refill with fresh fuel
	4. Engine running with choke on	4. Move choke to off
	5. Water or dirt in fuel system	5. If necessary use fuel siphon to drain fuel tank. Refill with fresh fuel
Engine overheats	1. Engine oil level low	1. Fill engine with proper amount of engine oil

REPLACEMENT PARTS (REPUESTOS) (PIÈCES DE RECHANGE)

Component Componente Pièce	Part Number and Description Número de pieza y Descripción N° de pièce et description	
	951-10292	• Spark Plug • Bujia • Bougie d'allumage
	951-15172	• Fuel Cap Assembly (2, 3 Stage Snow Blowers) • Tapa Del Combustible (Máquina quitanieve de dos etapas) • Bouchon de réservoir de carburant (pour souffleuses à neige à 2 et 3 phases)
	731-05632	• Safety Key (If Equipped) • Llave (Máquina quitanieve de dos etapas) • Clé (si l'appareil en est équipé)