

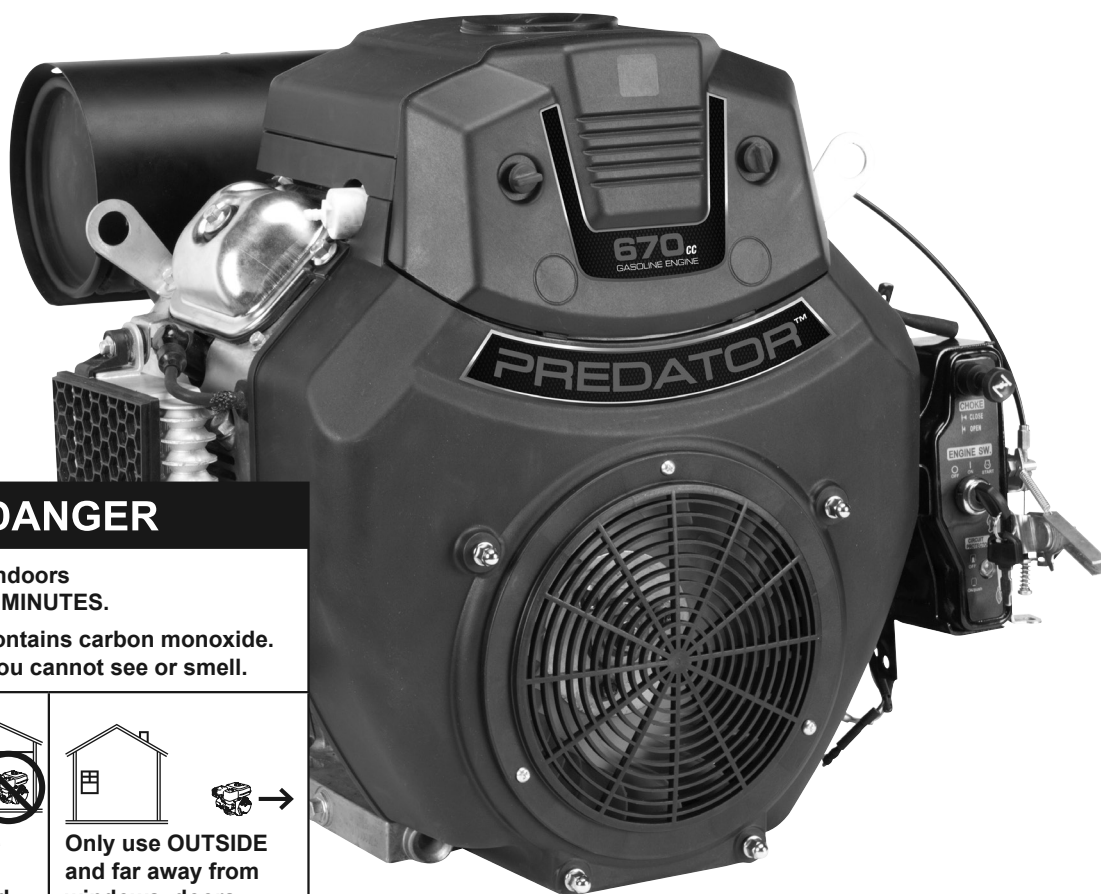
Owner's Manual & Safety Instructions

Save This Manual Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

18e

PREDATOR[®] E N G I N E S

670cc V-Twin Horizontal Engine



⚠ DANGER

Using an engine indoors
CAN KILL YOU IN MINUTES.

Engine exhaust contains carbon monoxide.
This is a poison you cannot see or smell.



NEVER use inside
a home or garage,
EVEN IF doors and
windows are open.



Only use **OUTSIDE**
and far away from
windows, doors,
and vents.

Visit our website at: <http://www.harborfreight.com>
Email our technical support at: predator@harborfreight.com
Email our engine support at: predator@harborfreight.com

61614

When unpacking, make sure that the product is intact and undamaged. If any parts are missing or broken, please call 1-888-866-5797 as soon as possible.

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No portion of this manual or any artwork contained herein may be reproduced in any shape or form without the express written consent of Harbor Freight Tools. Diagrams within this manual may not be drawn proportionally. Due to continuing improvements, actual product may differ slightly from the product described herein. Tools required for assembly and service may not be included.

⚠ WARNING

Read this material before using this product.
Failure to do so can result in serious injury.
SAVE THIS MANUAL.

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Specifications

Displacement		670cc
Engine Type		Horizontal/Vertical Double Cylinder 4-stroke
Cooling System		Forced air cooled
Fuel	Type	87+ octane stabilizer treated unleaded gasoline
Engine Oil	Type	SAE 10W-30 above 32° F SAE 5W30 at 32° F or below
	Capacity	2 Quart
Sound Level at 3 feet		88 dB
Bore x Stroke		78 mm x 70 mm
Compression Ratio		8.2:1
Rotation viewed from PTO (power takeoff - the output shaft)		Counterclockwise
Oil Filter Compatibility		STP S4967 Fram PH4967
Spark Plugs	Type	NGK® BPR5ES Torch® F5RTC
	Gap	0.027" - 0.031"
Valve Clearance	Intake	0.005" - 0.007"
	Exhaust	0.007" - 0.009"
Speed	Idle	1800 RPM
Shaft	Shaft	Ø1" x 3.56"
	Keyway	1/4"
	End Tapped	3/8" - 24 UNF

The emissions control system for this Engine is warranted for standards set by the U.S. Environmental Protection Agency and by the California Air Resources Board (also known as CARB). For warranty information, refer to the last pages of this manual.

PREDATOR® E N G I N E S

WARNING SYMBOLS AND DEFINITIONS

	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE CAUTION	Addresses practices not related to personal injury.

Symbol Definitions

Symbol	Property or Statement
RPM	Revolutions Per Minute
HP	Horsepower
	WARNING marking concerning Risk of Eye Injury. Wear ANSI-approved safety goggles with side shields.
	Read the manual before set-up and/or use.
	WARNING marking concerning Risk of Hearing Loss. Wear hearing protection.

Symbol	Property or Statement
	WARNING marking concerning Risk of Respiratory Injury. Operate engine OUTSIDE and far away from windows, doors, and vents.
	WARNING marking concerning Risk of Fire while handling fuel. Do not smoke while handling fuel.
	WARNING marking concerning Risk of Fire. Do not refuel while operating. Keep flammable objects away from engine.

IMPORTANT SAFETY INSTRUCTIONS



WARNING! Read all instructions.

Failure to follow all instructions listed below may result in fire, serious injury and/or DEATH.

The warnings and precautions discussed in this manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

SAVE THESE INSTRUCTIONS

Set up Precautions

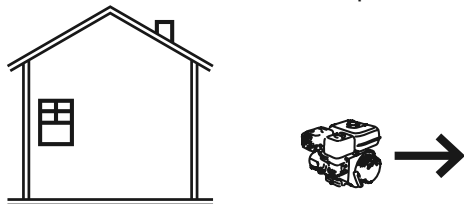
1. Gasoline fuel and fumes are flammable, and potentially explosive. Use proper fuel storage and handling procedures. Do not store fuel or other flammable materials nearby.
2. Have multiple ABC class fire extinguishers nearby.
3. Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrestor may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.
4. **KEEP LEVEL! Set up and use only on a flat, level, well-ventilated surface. Do not set up or use on a surface that is tilted 15 degrees or more.**
5. Wear ANSI-approved safety goggles, heavy-duty work gloves, and dust mask/respirator during set up.
6. Use only lubricants and fuel recommended in the Specifications chart of this manual.
7. **Fuel tank must be designed specifically for containing gasoline and must be mounted to a stable mounting frame.** Some areas may have specific gasoline vapor containment requirements; comply with local, state, and federal laws.

Operating Precautions

1.  **CARBON MONOXIDE HAZARD**
Using an engine indoors CAN KILL YOU IN MINUTES.
Engine exhaust contains carbon monoxide. This is a poison you cannot see or smell.



NEVER use inside a home or garage, EVEN IF doors and windows are open.



Only use OUTSIDE and far away from windows, doors, and vents.

2. Keep children away from the equipment, especially while it is operating.
3. Keep all spectators at least six feet from the Engine during operation.
4. Fire Hazard! Do not fill fuel tank while engine is running. Do not operate if gasoline has been spilled. Clean spilled gasoline before starting engine. Do not operate near pilot light or open flame.
5. Do not touch engine during use. Let engine cool down after use.
6. Never store fuel or other flammable materials near the engine.
7. Only use a suitable means of transport and lifting devices with sufficient weight bearing capacity when transporting the engine.
8. Secure the engine on transport vehicles to prevent it from rolling, slipping, and tilting.
9. Industrial applications must follow OSHA requirements.
10. Do not leave the engine unattended when it is running. Turn off the engine (and remove safety keys, if available) before leaving the work area.
11. The engine can produce high noise levels. Prolonged exposure to noise levels above 85 dBA is hazardous to hearing. Wear ear protection when operating the engine or when working nearby while it is operating.
12. Wear ANSI-approved safety glasses and hearing protection during use.
13. People with pacemakers should consult their physician(s) before use. Electromagnetic fields in close proximity to a heart pacemaker could cause pacemaker interference or pacemaker failure. Caution is necessary when near the engine's magneto or recoil starter.
14. Use only accessories that are recommended by Harbor Freight Tools for your model. Accessories that may be suitable for one piece of equipment may become hazardous when used on another piece of equipment.
15. Do not operate in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Gasoline-powered engines may ignite the dust or fumes.
16. Stay alert, watch what you are doing and use common sense when operating this engine. Do not use while tired or under the influence of drugs, alcohol or medication.
17. Dress properly. Do not wear loose clothing or jewelry. Keep hair, clothing and gloves away from moving parts. Loose clothes, jewelry or long hair can be caught in moving parts.
18. Parts, especially exhaust system components, get very hot during use. Stay clear of hot parts.

19. Do not cover the engine during operation.
20. Keep the engine and surrounding area clean at all times.
21. Do not smoke, or allow sparks, flames, or other sources of ignition around the equipment, especially when refuelling.
22. Use the equipment, accessories, etc., in accordance with these instructions and in the manner intended for the particular type of equipment, taking into account the working conditions and the work to be performed. Use of the equipment for operations different from those intended could result in a hazardous situation.
23. Do not operate the equipment with known leaks in the engine's fuel system.
24. When spills of fuel or oil occur, they must be cleaned up immediately. Dispose of fluids and cleaning materials as per any local, state, or federal codes and regulations. Store oil rags in a bottom-ventilated, covered, metal container.
25. Keep hands and feet away from moving parts. Do not reach over or across equipment while operating.
26. Before use, check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the equipment's operation. **If damaged, have the equipment serviced before using.** Many accidents are caused by poorly maintained equipment.
27. Use the correct equipment for the application. Do not modify the equipment and do not use the equipment for a purpose for which it is not intended.

Service Precautions

1. **Before service, maintenance, or cleaning:**
 - a. Turn the engine switch to its "OFF" position.
 - b. Allow the engine to completely cool.
 - c. Then, remove the spark plug caps from the spark plugs.
 2. Keep all safety guards in place and in proper working order. Safety guards include muffler, air cleaner, mechanical guards, and heat shields, among other guards.
 3. **Do not alter or adjust any part of the equipment or its engine that is sealed by the manufacturer or distributor. Only a qualified service technician may adjust parts that may increase or decrease governed engine speed.**
 4. Wear ANSI-approved safety goggles, heavy-duty work gloves, and dust mask/respirator during service.
 5. Maintain labels and nameplates on the equipment. These carry important information. If unreadable or missing, contact Harbor Freight Tools for a replacement.
 6. Have the equipment serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the equipment is maintained. Do not attempt any service or maintenance procedures not explained in this manual or any procedures that you are uncertain about your ability to perform safely or correctly.
 7. Store equipment out of the reach of children.
 8. Follow scheduled engine and equipment maintenance.
- Refueling:**
1. Do not refill the fuel tank while the engine is running or hot.
 2. Do not smoke, or allow sparks, flames, or other sources of ignition around the equipment, especially when refuelling.
 3. **Do not fill fuel tank to the top.** Leave a little room for the fuel to expand as needed.
 4. Refuel in a well-ventilated area only.
 5. Wipe up any spilled fuel and allow excess to evaporate before starting engine. **To prevent FIRE, do not start the engine while the smell of fuel hangs in the air.**



SAVE THESE INSTRUCTIONS.

Set Up



Read the ENTIRE IMPORTANT SAFETY INFORMATION section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

WARNING

TO PREVENT SERIOUS INJURY:

Operate only with proper spark arrestor installed.



Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrestor may be required.

The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

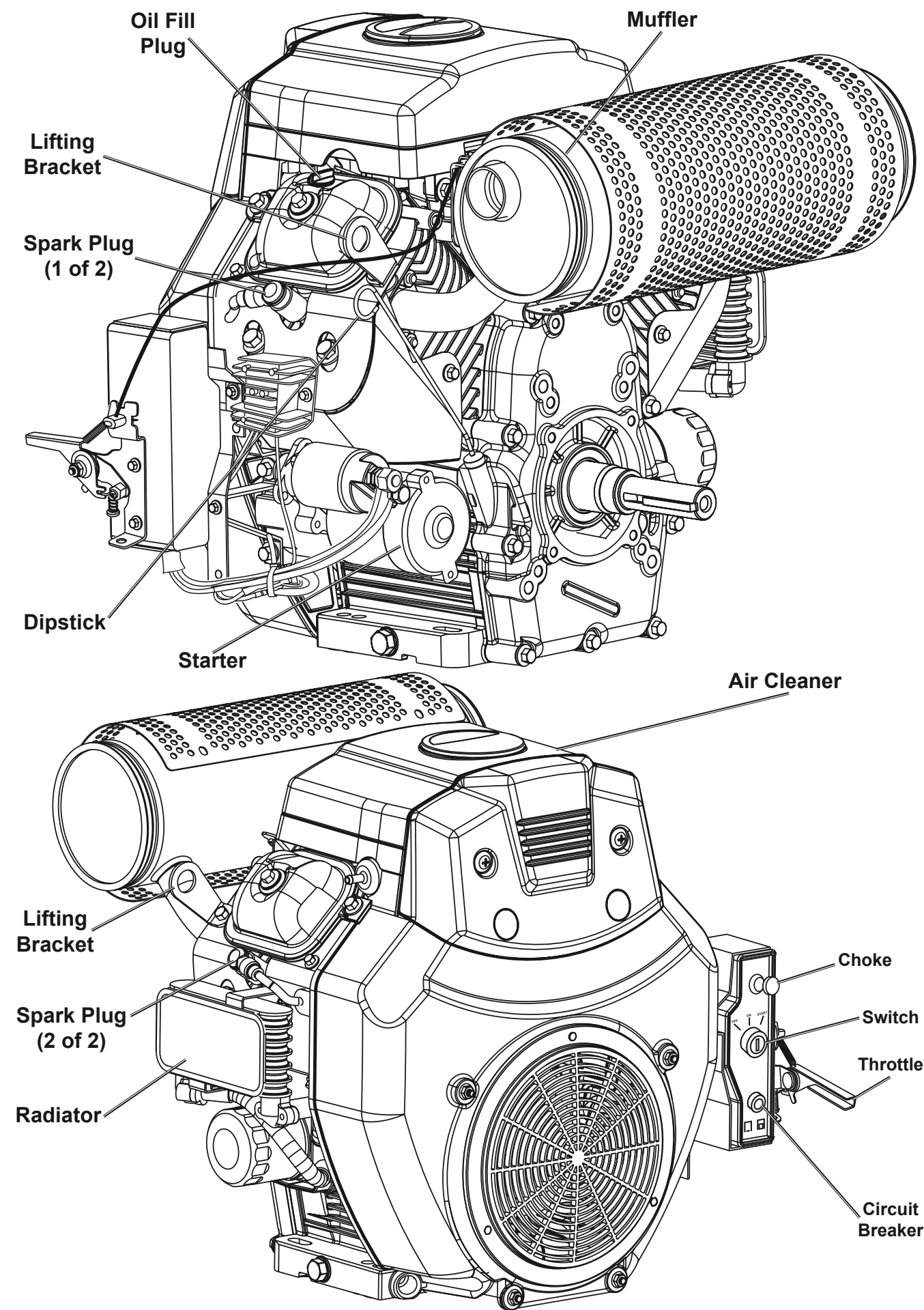
WARNING! DO NOT INSTALL THIS ENGINE ON A VEHICLE.

WARNING! INSTALL THIS ENGINE ACCORDING TO EQUIPMENT INSTRUCTIONS BEFORE USE.

WARNING! If you do not connect a battery to the positive battery cable, wrap its terminal securely with electrical tape (sold separately).

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Components and Controls



SAFETY

SETUP

OPERATION

MAINTENANCE

High Altitude Operation Above 3000 feet

⚠WARNING! TO PREVENT SERIOUS INJURY FROM FIRE:

Follow instructions in a well-ventilated area away from ignition sources.
If the engine is hot from use, shut the engine off and wait for it to cool before proceeding. Do not smoke.

NOTICE: Warranty void if necessary adjustments are not made for high altitude use.

At high altitudes, the engine’s carburetor, governor (if so equipped), and any other parts that control the fuel-air ratio will need to be adjusted by a qualified mechanic to allow efficient high-altitude use and to prevent damage to the engine and any other devices used with this product. The fuel system on this engine may be influenced by operation at higher altitudes. Proper operation can be ensured by installing an altitude kit at altitudes higher than 3000 ft. above sea level. At elevations above 8000 ft, the engine may experience decreased performance, even with the proper main jet. Operating this engine without the proper altitude kit installed may increase the engine’s emissions and decrease fuel economy and performance. The kit should be installed by a qualified mechanic.

High Altitude Kit Parts List - A

Part	Description	Qty
A1	Left Main Jet 3000-6000 ft.	1
A2	Right Main Jet 3000-6000 ft.	1
A3	Left Main Jet 6000-8000 ft.	1

Part	Description	Qty
A4	Right Main Jet 6000-8000 ft.	1
137d	Outer Bowl O-ring (replacement)	2
137e	Inner Bowl O-ring (replacement)	2

Disassembly

1. Turn off the engine.
2. Close the fuel valve, if equipped.
If no fuel valve is equipped, then clamp the fuel hose closed right before the filter.
Be careful to avoid damaging the fuel hose.
3. Remove the Air Cleaner Top Knob (142a) and the two Air Cleaner Front Knobs (102). See Figure A.
4. Remove the Air Cleaner Front Cover (101), pulling it up then out. See Figure B.

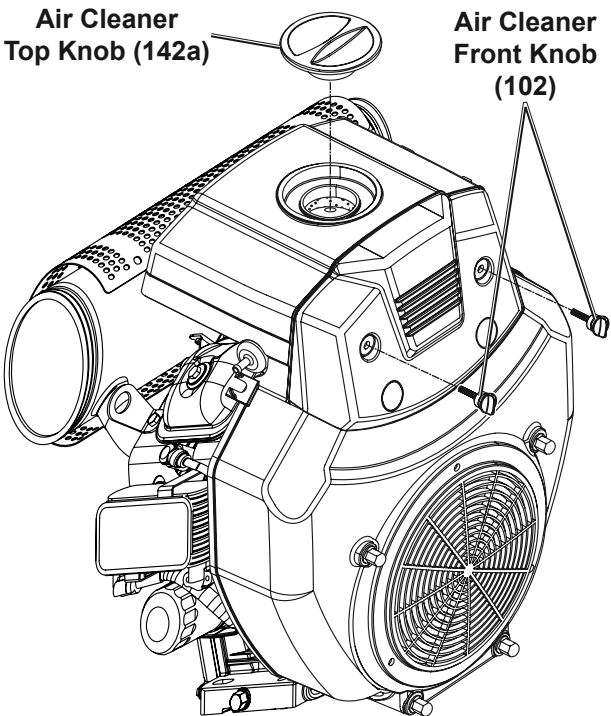


Figure A: Remove Knobs

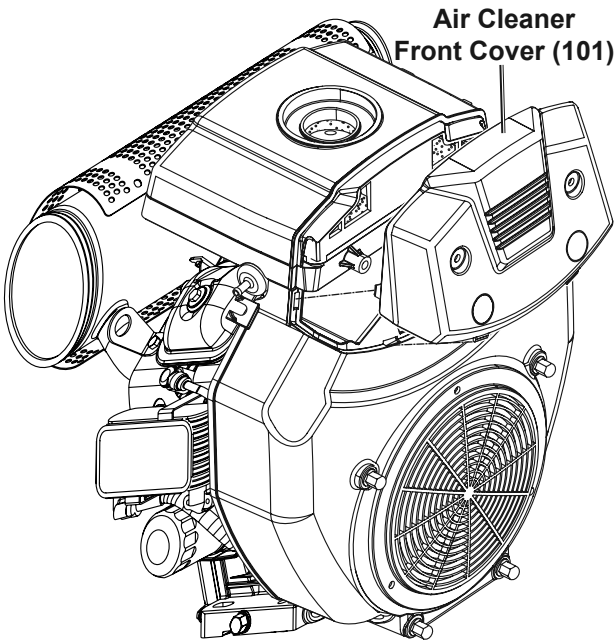


Figure B: Remove Front Cover

- Remove the Air Cleaner Top Cover (142b) and internal Air Cleaner components (Spacer, Foam and Paper Filters (142c-142e)). See Figure C.

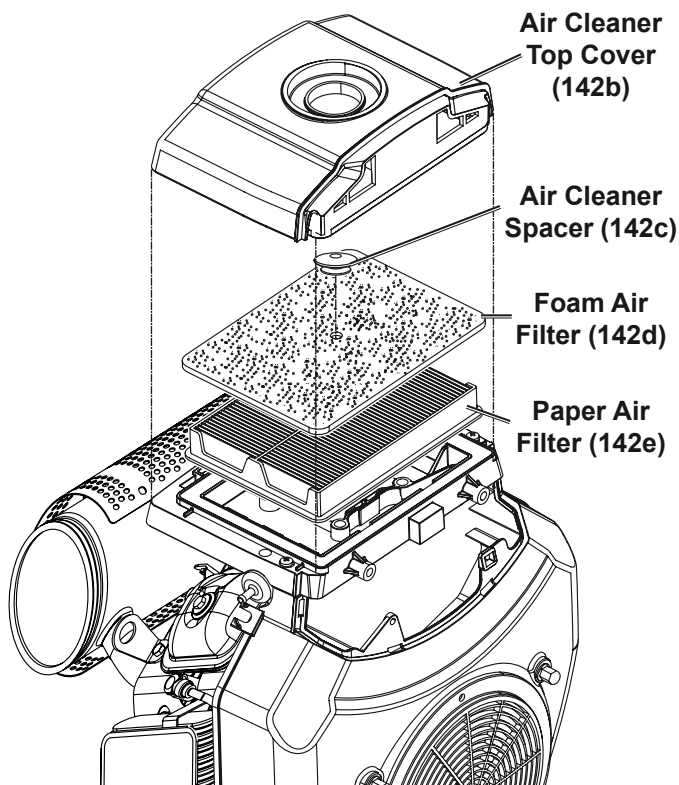


Figure C: Remove Air Cleaner Top Cover and components

- Remove the two Intake Cover Bolts (143) and the two Air Cleaner Base Bolts (146). See Figure D.
- Detach the top of the Fuel Filter Clip (147) from the Air Cleaner Base (142g).

Note: See page 19 if idle screw adjustment is desired.

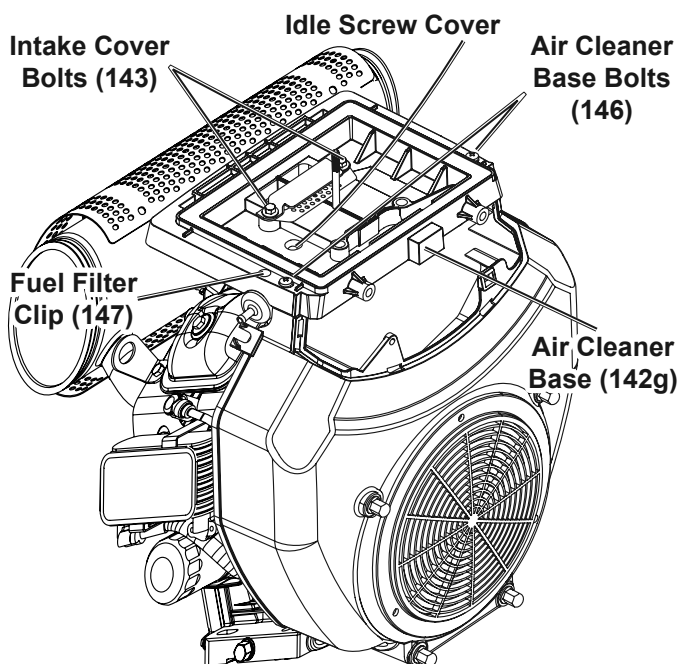
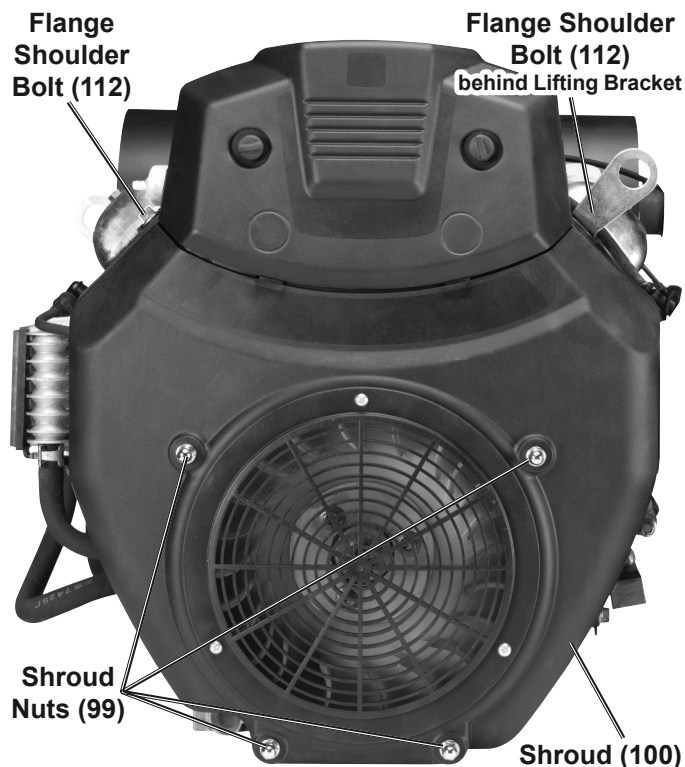


Figure D: Remove Bolts and Clip from Air Cleaner Base

- Remove the Air Cleaner Base.

- Remove the four Shroud Nuts (99) and the two Flange Shoulder Bolts (112) from the Shroud (100). The Flange Shoulder Bolt on the right holds the Lifting Bracket (111) in place. See Figure E.



Note: Air Cleaner Front Cover is still shown, although it should have been removed in step 4.

Figure E: Remove Shroud

- Remove the Shroud.

11. WARNING! TO PREVENT SERIOUS INJURY FROM FIRE, BEFORE CONTINUING:

- Make sure that the work area is well-ventilated and that there are no ignition sources.**
- Have multiple class ABC fire extinguishers available.**
- Double-check that fuel hose leading from fuel tank to Fuel Filter is clamped or fuel valve is closed.**
- Use a safe, proper means to clean up all fuel spills immediately.**



12. Squeeze the Spring Clamp (140) and slide it back. Detach the Fuel Hose (141) from the port at the top of the Carburetor. See Figure F.

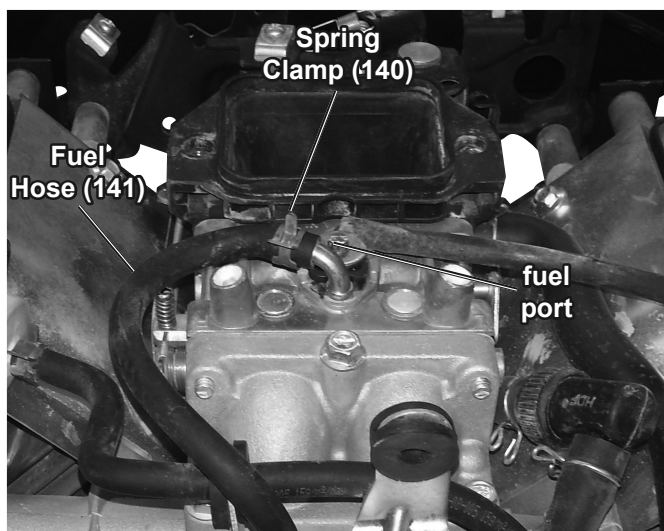


Figure F: Detach Fuel Hose

13. Locate the Throttle Rod (174) connection on the left side of the carburetor. See Figure G.

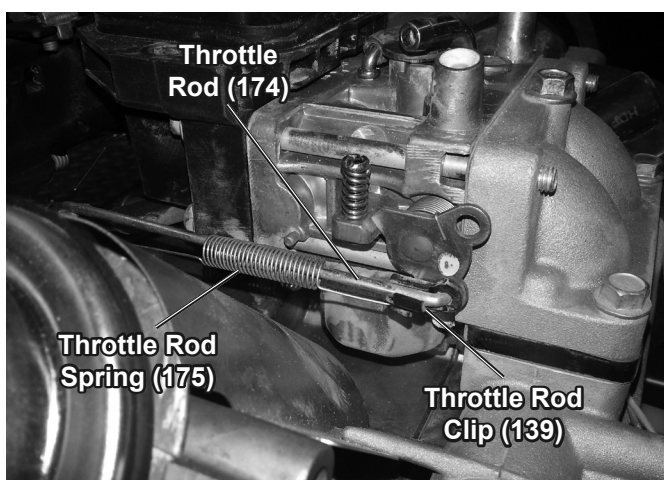


Figure G: Disconnect Throttle Rod

14. **A:** Swing the black Throttle Rod Clip (139) down to release the Throttle Rod. See Figure H.
B: Pull the Throttle Rod out of the Clip.

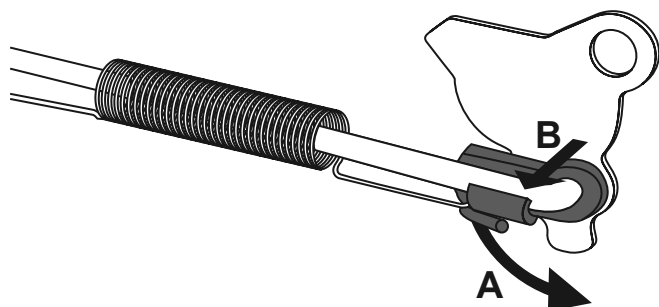


Figure H: Throttle Rod Clip

15. Disconnect the Throttle Rod Spring from the Throttle Rod Clip.

16. Squeeze the Spring Wire Clamp (32) and slide it back. Detach the Breather Hose (33) from the right side of the Carburetor. See Figure I.

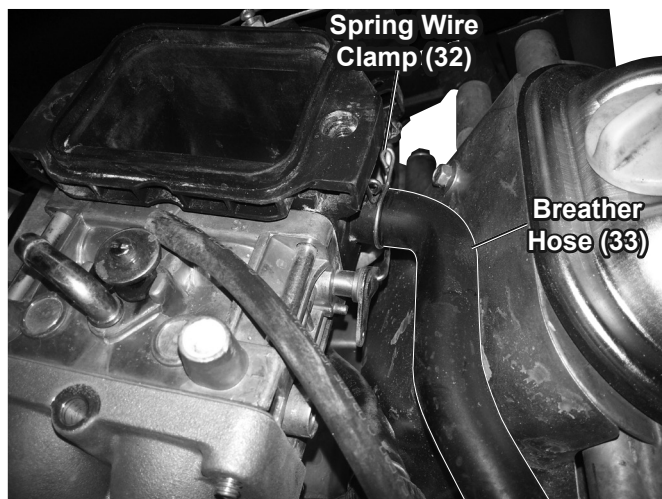


Figure I: Detach Breather Hose

17. Locate the Choke Rod (177) connection on the right side of the carburetor. See Figure J.

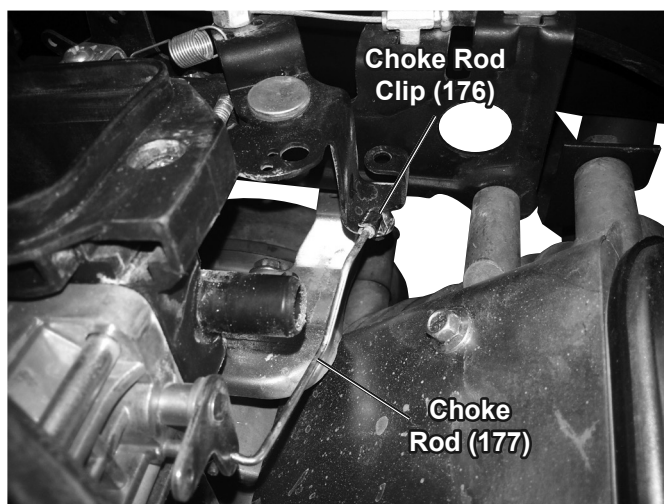


Figure J: Disconnect Choke Rod

18. Swing the black Choke Rod Clip (176) aside to release the Choke Rod. Disconnect the Choke Rod.

19. At the front of the Carburetor, remove the Bolt (38) holding the Fuel Pump Bracket (40) in place. See Figure K.

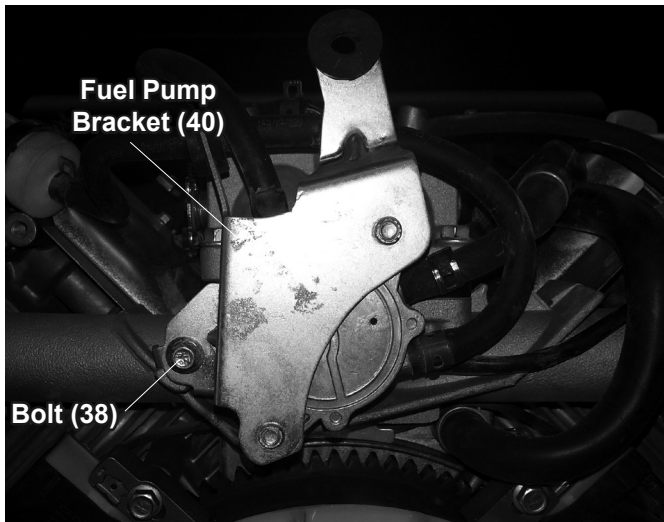


Figure K: Remove Fuel Pump Bracket

20. Underneath where the Fuel Pump Bracket was, the Solenoid Valve (138) is connected. Note the location of the green wire and green dot on the connector. Unplug the connector. See Figure L.

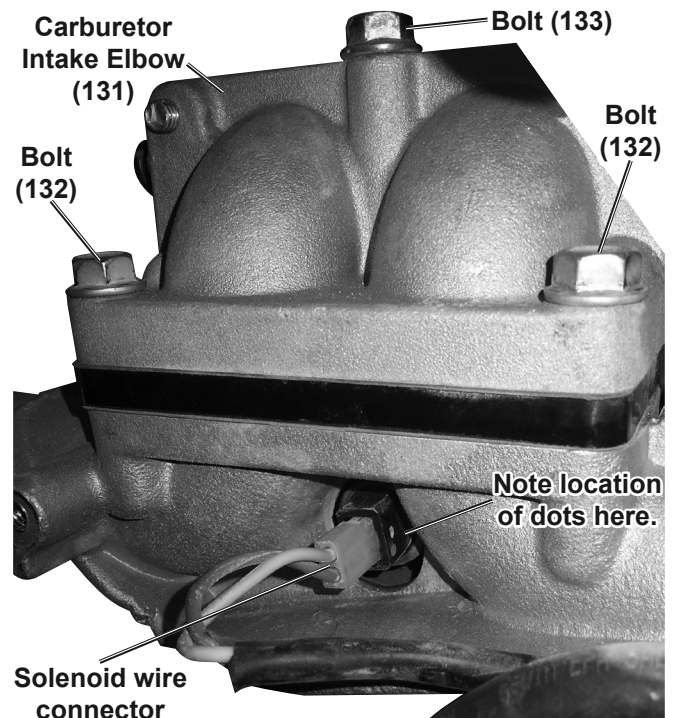


Figure L: Disconnect Solenoid Valve wire connector

21. Remove Bolt (133) and two Bolts (132) from the Carburetor Intake Elbow (131). See Figure L.
22. Remove the Carburetor assembly from the engine. Keep it upright, it may contain fuel.

23. Hold the fuel drain port over a bowl, and open the Carburetor Drain Plug (137a) to allow fuel to drain out of that port. Once the carburetor is empty, close the Carburetor Drain Plug. See Figure M.

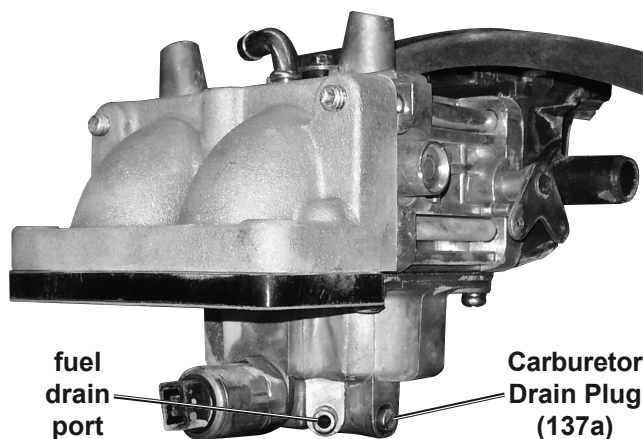


Figure M: Carburetor Drain

24. Turn the Carburetor assembly over.
25. Remove the four Carburetor Bowl Bolts (137b) and remove the Carburetor Bowl (137c). See Figure N.

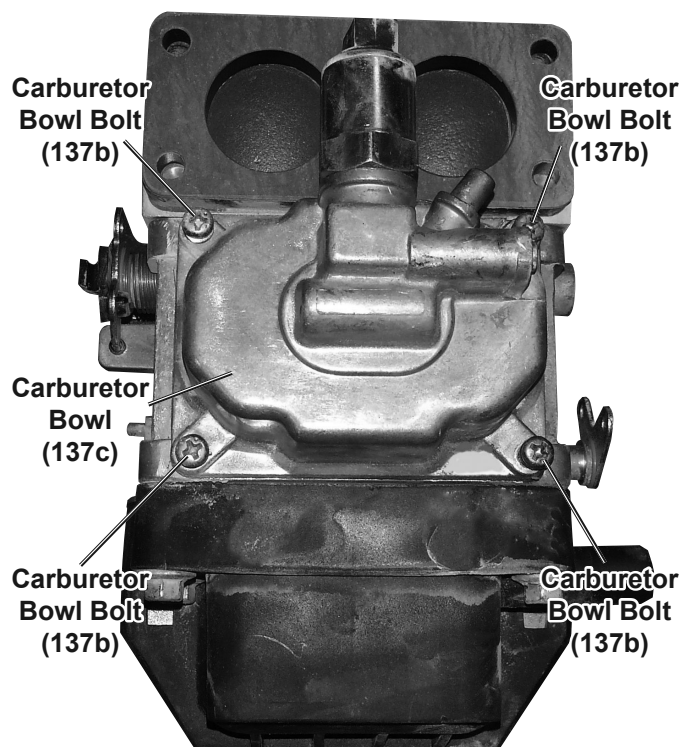
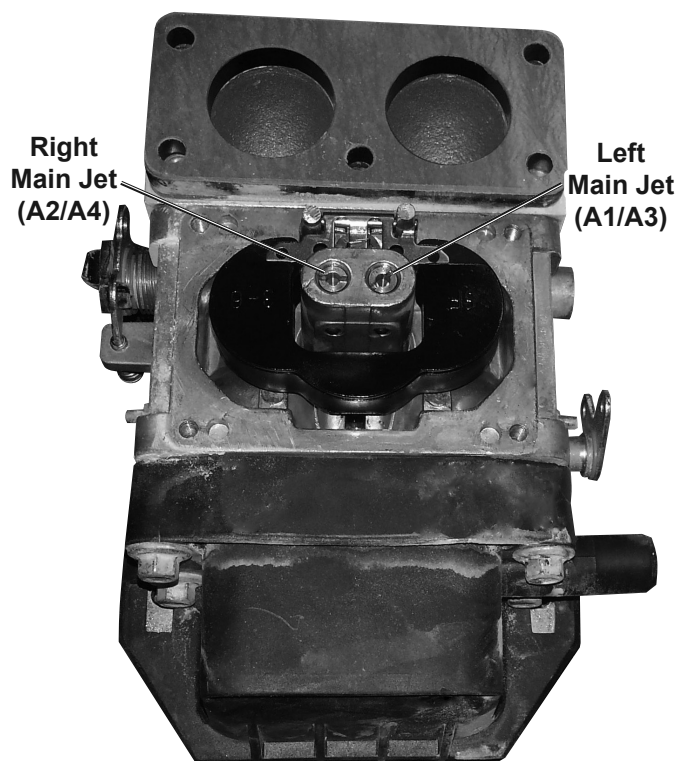


Figure N: Carburetor Bowl Bolts

26. Use a carburetor screwdriver (sold separately) to remove the Left Main Jet and replace it with the proper replacement Left Main Jet (A1 or A3) for the altitude. See Figure O.
27. Use a carburetor screwdriver to remove the Right Main Jet and replace it with the replacement Right Main Jet (A2 or A4) for the same altitude as the Left Main Jet. See Figure O.



Note: Since carburetor is upside-down, left and right sides are reversed.

Figure O: Main Jets

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Reassembly

Note: Reassembly step references shown in brackets.

1. Replace the Outer and Inner Bowl O-rings (137d, 137e) with the replacements from the altitude kit. Do not reuse existing O-rings.

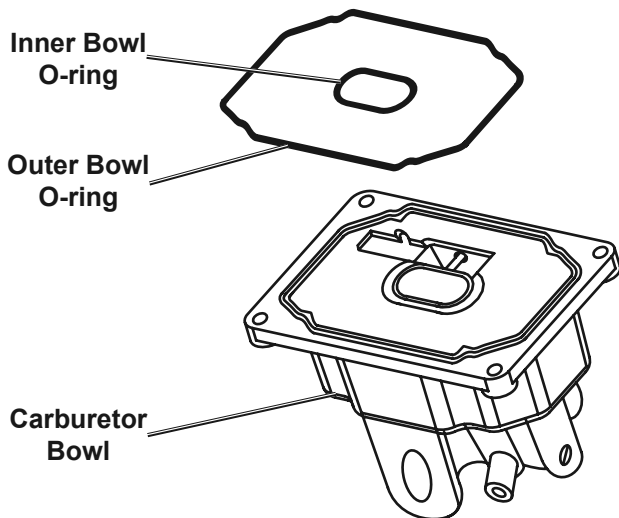


Figure P: Replace Bowl O-rings

2. Assemble the Carburetor Bowl using four Carburetor Bowl Bolts. [#25] Assemble Carburetor Intake Elbow to Intake using Bolts. [#21]
3. Attach Solenoid Valve connector, **line up green wire with the green dot on the connector**. [#20]
4. Attach Fuel Pump Bracket to front of intake using Bolt. Gently lift the Bracket after assembly to ensure proper alignment. [#19]

5. Attach the Choke Rod on the right side of the Carburetor, and secure it with its Clip. [#17,18]
6. Attach the Breather Hose to the Carburetor, and secure it with its Clamp. [#16]
7. Attach the Throttle Rod Spring to the Throttle Rod Clip on the left side of the Carburetor. [#15]
8. Insert the Throttle Rod on the left side of the Carburetor, and secure it with its Clip. [#14]
9. Attach the Fuel Hose to the port at the top of the Carburetor and attach it using its Clamp. [#12]
10. Install Shroud using four Shroud Bolts and two Flange Shoulder Bolts. [#9,10] Include the Lifting Bracket in place on the right Flange Shoulder Bolt.
11. Install Air Cleaner Base using two Air Cleaner Base Bolts. Connect Fuel Filter Clip under left side of Air Cleaner Base. Install the Intake Cover and Intake Screen using the Intake Cover Bolts. [#6-8]
12. Place the Paper Air Filter, Foam Air Filter, Air Cleaner Spacer, and Air Cleaner Top Cover into place on the Air Cleaner Base. [#5]
13. Replace the Air Cleaner Front Cover. [#4]
14. Use the Air Cleaner Top Knob and Air Cleaner Front Knobs to secure the Covers in place. [#3]
15. Once all connections are secure, open fuel valve/unclamp fuel hose.
16. Wipe up any spilled fuel and allow excess to evaporate before starting engine. To prevent FIRE, do not start the engine while the smell of fuel hangs in the air.

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Battery Setup Instructions

SAFETY

1. Place a **fully charged**, lead-acid **12 volt, 36 Ah** battery (not included) in a stable, flat location near the engine.
2. Only use cables sized to match their length according to .

Cable Gauge (lower gauge numbers mean thicker cables)	Maximum Cable Length
6	5'
4	7'
2	12'

Table A: Minimum Cable Diameters

SETUP

3. Attach the positive cable from the positive battery terminal to the outer terminal on the Starter's (164) solenoid, see Figure Q and Figure R. Connect cable securely to prevent disconnection and short circuits.
4. Attach the negative cable to the negative battery terminal.
5. Connect the negative cable securely to one of the engine **mounting bolts**, as shown in Figure Q. Connect cable securely to prevent disconnection and short circuits.
6. Coat the terminals and cable ends with a corrosion-preventive coating.

OPERATION

MAINTENANCE

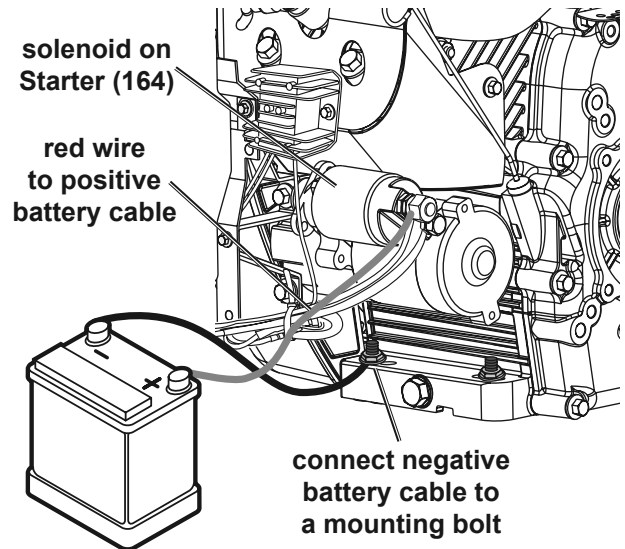


Figure Q: Battery Cable Connections

Connect Cable from Positive Battery Terminal to this Starter Terminal

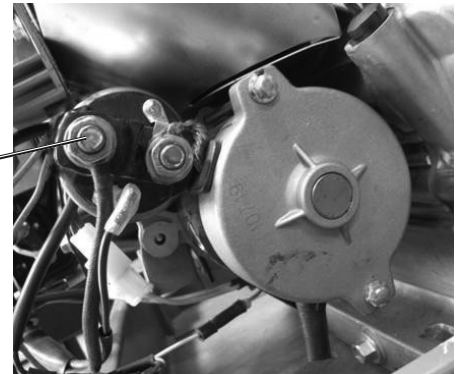


Figure R: Connect Positive to this Terminal

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Fuel Tank Setup Instructions

1. If possible, incorporate a fuel shutoff valve on the fuel hose (neither included).
2. **WARNING! Fuel tank (not included) must be designed specifically for containing gasoline and must be mounted to a stable mounting frame. Some areas may have specific gasoline vapor containment requirements; comply with local, state, and federal laws.**
3. Connect a fuel hose from the fuel tank to the exposed port of the Fuel Filter, and secure it in place with a hose clamp. See Figure S.

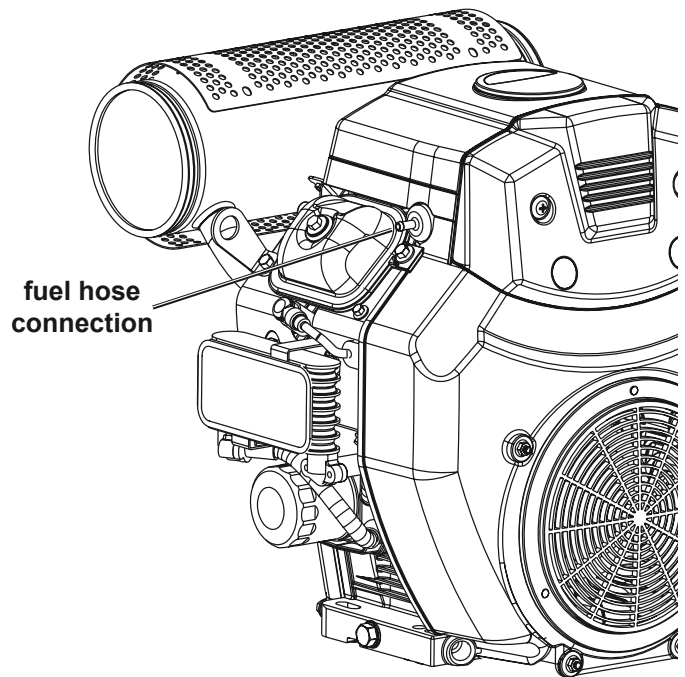


Figure S: Fuel Hose Connector

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Operation



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

Pre-Start Checks

Inspect Engine and equipment looking for damaged, loose, and missing parts before set up and starting. If any problems are found, do not use equipment until fixed properly.

Checking and Filling Engine Oil

NOTICE: Your Warranty is VOID if the engine's crankcase is not properly filled with oil before each use. Before each use, check the oil level. Engine will not start with low or no engine oil.

Adding Oil Before First Use

Engine is shipped containing approximately 300ml of residual oil. Before first use, remove the Oil Fill Plug and add 1500ml of the appropriate type of oil. Remove the Dipstick to check the oil level. The oil level should be up to the upper, FULL mark on the dipstick.

DO NOT OVERFILL PAST THE FULL MARK.



Figure T: Oil Level Indicator on Dipstick

Checking and Adding Oil Before Each Use

1. Make sure the Engine is stopped and is level.
2. Close the Fuel Valve.
3. Clean the top of the Dipstick and the area around it. Remove the Dipstick and wipe it off with a clean, lint free rag.
4. Reinsert the Dipstick fully and remove it to check the oil level. The oil level should be up to the upper, FULL mark on the Dipstick.
5. If the oil level is at or below the LOW mark, remove the Oil Fill Plug and add the appropriate type of oil until the oil level is at the full level. Refer to Figure T.

DO NOT OVERFILL PAST THE FULL MARK.

SAE 10W-30 oil is recommended for general use. The SAE Viscosity Grade chart on page 21 in the Maintenance section shows other viscosities to use in different average temperatures.

6. Replace the Oil Fill Plug and insert the Dipstick back into the housing.

NOTICE: Do not run the Engine with too little oil. Engine will shut off if engine oil level is too low.

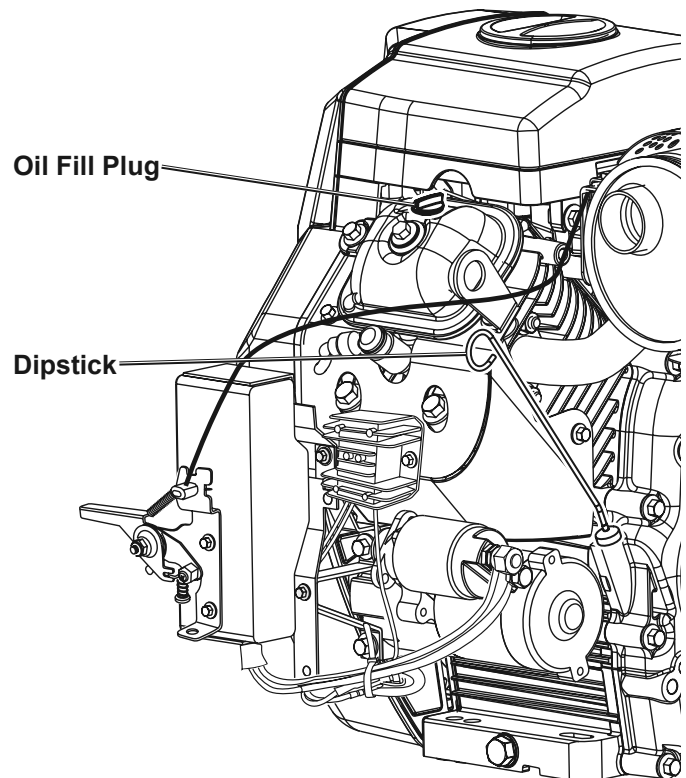


Figure U: Oil Fill and Dipstick

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Checking and Filling Fuel



⚠ WARNING! TO PREVENT SERIOUS INJURY FROM FIRE:

Fill the fuel tank in a well-ventilated area away from ignition sources. If the engine is hot from use, shut the engine off and wait for it to cool before adding fuel. Do not smoke.

1. Clean the Fuel Cap and the area around it.
2. Unscrew and remove the Fuel Cap.
3. Remove the Strainer and remove any dirt and debris. Then replace the Strainer.

Note: Do not use gasoline containing more than 10% ethanol (E10). Do not use E85 ethanol. Add fuel stabilizer to the gasoline or the Warranty is VOID.

Note: Do not use gasoline that has been stored in a metal fuel container or a dirty fuel container. It can cause particles to enter the carburetor, affecting engine performance and/or causing damage.

4. If needed, fill the Fuel Tank to about 1 inch under the fill neck of the Fuel Tank with 87 octane or higher unleaded gasoline that has been treated with a fuel stabilizer additive. Follow fuel stabilizer manufacturer's recommendations for use.
5. Replace the Fuel Cap.
6. Wipe up any spilled fuel and allow excess to evaporate before starting Engine. To prevent FIRE, do not start the Engine while the smell of fuel hangs in the air.

PREDATOR[®]
E N G I N E S

SAFETY

SETUP

OPERATION

MAINTENANCE

Starting the Engine

SAFETY

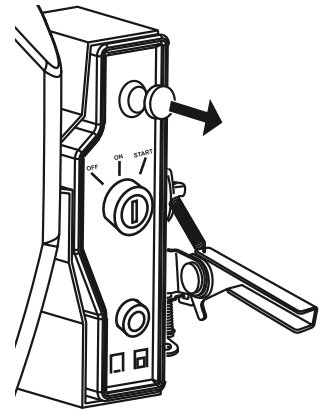
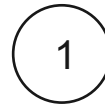


Before starting the engine:

- Follow the Set Up Instructions in this manual to prepare the Engine.
- Follow the Set Up Instructions in the equipment manual to prepare the equipment.
- Inspect the equipment and Engine.
- Make sure Engine is as level as possible, at no greater than a 15° angle.
- Fill the Engine with the proper amount and type of both unleaded gasoline and oil.
- Read the Equipment Operation section in the equipment manual.

SETUP

- To start a cold engine, pull the Choke Knob out to the START position.
To restart a warm engine, push the Choke in to the RUN position.

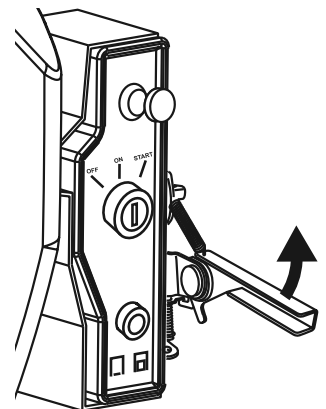
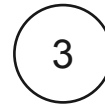


- Open the Fuel Valve, if equipped.

OPERATION

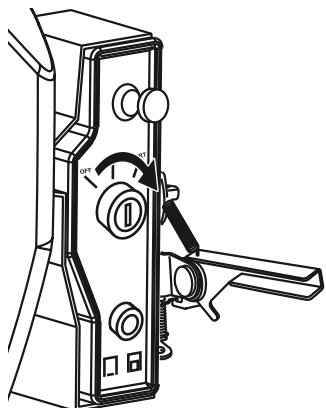
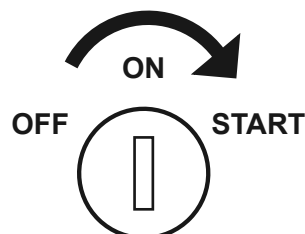
- Slide the Throttle or Speed Control Lever to 1/3 away from the SLOW position (the "turtle").

Note: Some tools have a Speed Control Lever located elsewhere on the tool which functions the same as the Throttle. Use the Speed Control Lever in place of the Throttle when the tool is so equipped.



MAINTENANCE

- Insert the Key and turn it to START until the engine starts, **no more than a few seconds**. Release the Key when the engine starts.



Note: If engine does not start, check engine oil level. Engine will not start with low or no engine oil.

5. Allow the Engine to run for several seconds. Then, if the Choke Knob is in the pulled-out START position, push the Choke Knob in very slowly to its RUN position.

Note: Moving the Choke Knob too fast could stall the engine.

IMPORTANT: Allow the engine to run at no load for five minutes after each start-up so that the engine can stabilize.

6. Adjust the Throttle as needed.

Note: Adjust idle speed with the Idle Screw (located underneath the Air Filter beneath a rubber cover, see Figure D on page 9). Actual idle speed depends on application. Refer to equipment manufacturer's recommendations. Running idle speed too low may result in performance issues, including excessive engine wear.

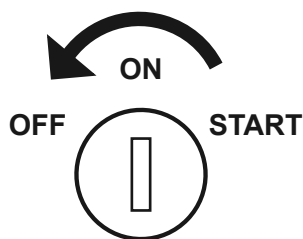
Break-in Period:

- a. Breaking-in the engine will help to ensure proper equipment and engine operation.
- b. The operational break-in period will last about 3 hours of use. During this period:
 - Do not apply a heavy load to the equipment.
 - Do not operate the engine at its maximum speed.
- c. The maintenance break-in period will last about 20 hours of use.
 - Change the engine oil after this period.

Under normal operating conditions subsequent maintenance follows the schedule explained in the MAINTENANCE section.

Stopping the Engine

1. To stop the engine in an emergency, turn the Key to OFF.

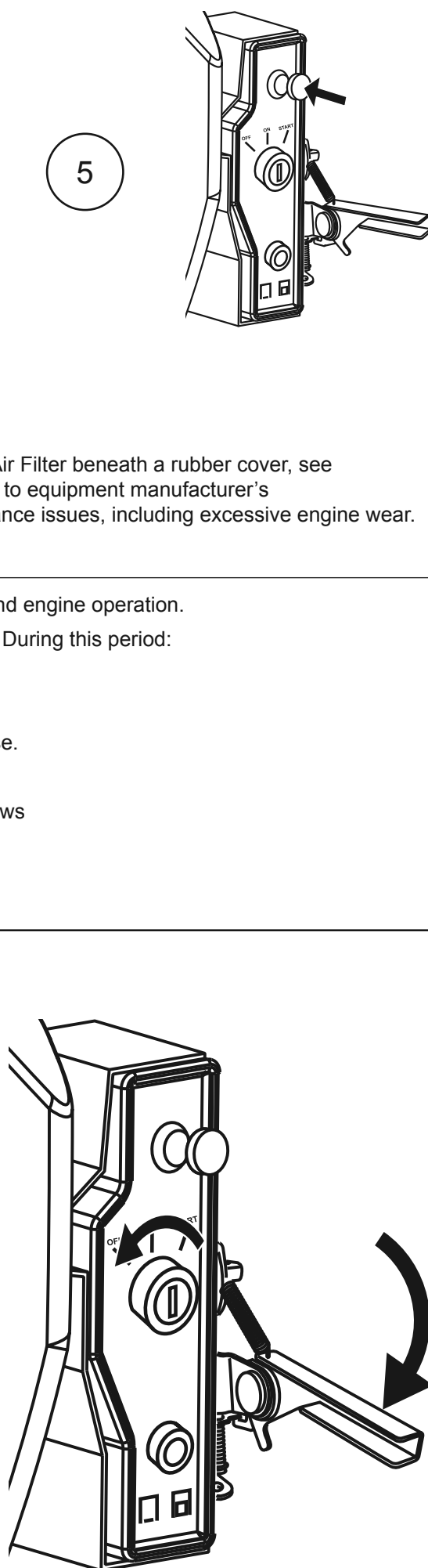


2. Under normal conditions, use the following procedure:
 - a. Slide the Throttle or Speed Control Lever to SLOW (the "turtle").
 - b. Turn the Key to OFF.
 - c. Close the Fuel Valve, if equipped.

NOTICE

Drain fuel at end of season or warranty is void.

See Storage on page 23 for complete storage instructions.



⚠ WARNING**TO PREVENT SERIOUS INJURY FROM ACCIDENTAL STARTING:**

Turn the Power Switch of the equipment to its "OFF" position, wait for the engine to cool, and disconnect the spark plug caps before performing any inspection, maintenance, or cleaning procedures.

TO PREVENT SERIOUS INJURY FROM EQUIPMENT FAILURE:

Do not use damaged equipment. If abnormal noise, vibration, or excess smoking occurs, have the problem corrected before further use.

Follow all service instructions in this manual. The engine may fail critically if not serviced properly.



Many maintenance procedures, including any not detailed in this manual, will need to be performed by a qualified technician for safety. If you have any doubts about your ability to safely service the equipment or engine, have a qualified technician service the equipment instead.

Cleaning, Maintenance, and Lubrication Schedule

Note: This maintenance schedule is intended solely as a general guide. If performance decreases or if equipment operates unusually, check systems immediately. The maintenance needs of each piece of equipment will differ depending on factors such as duty cycle, temperature, air quality, fuel quality, and other factors.

Note: The following procedures are in addition to the regular checks and maintenance explained as part of the regular operation of the engine and equipment.

Procedure	Before Each Use	Monthly or every 20 hr. of use	Every 3 mo. or 50 hr. of use	Every 6 mo. or 100 hr. of use	Yearly or every 300 hr. of use	Every 2 Years
Brush off outside of engine	✓	✓	✓	✓	✓	✓
Check engine oil level	✓	✓	✓	✓	✓	✓
Check air cleaner			✓	✓	✓	✓
Check sediment cup				✓	✓	✓
Change engine oil and oil filter		✓		✓	✓	✓
Clean/replace air filter			✓*	✓	✓	✓
1. Check and clean spark plugs 2. Replace fuel filter.				✓	✓	✓
1. Check/adjust idle speed 2. Check/adjust valve clearance 3. Clean fuel tank, strainer and carburetor 4. Clean carbon build-up from combustion chambers					✓**	✓**
Replace fuel line if necessary						✓**

*Service more frequently when used in dusty areas.

**These items should be serviced by a qualified technician.

PREDATOR[®]

E N G I N E S

Checking and Filling Fuel



⚠ WARNING! TO PREVENT SERIOUS INJURY FROM FIRE:

Fill the fuel tank in a well-ventilated area away from ignition sources. If the engine is hot from use, shut the engine off and wait for it to cool before adding fuel. Do not smoke.

1. Clean the Fuel Cap and the area around it.
2. Unscrew and remove the Fuel Cap.
3. Remove the Strainer and remove any dirt and debris. Then replace the Strainer.

Note: Do not use gasoline containing more than 10% ethanol (E10). Do not use E85 ethanol. Add fuel stabilizer to the gasoline or the Warranty is VOID.

Engine Oil Change

⚠ CAUTION! Oil is very hot during operation and can cause burns. Wait for engine to cool before changing oil.

1. Make sure the engine is stopped and is level.
2. Close the Fuel Valve.
3. Place a drain pan (not included) underneath the crankcase's drain plug.
4. Remove the drain plug and, if possible, tilt the crankcase slightly to help drain the oil out. Recycle used oil.
5. Replace the drain plug and tighten it.
6. Move the drain pan underneath the Oil Filter.
7. Unthread and remove the Oil Filter. Allow the oil to drain out of the filter completely before disposal.
8. Install a new Oil Filter of the same size and type, either STP S4967 or Fram PH4967.
9. Clean the top of the Dipstick and the area around it. Remove the Dipstick and wipe it off with a clean, lint free rag.
10. Remove the Oil Fill Plug and add the appropriate type of oil. Reinsert the Dipstick fully and remove it to check the oil level. The oil level should be up to the upper, FULL mark on the dipstick. Refer to Figure T on page 16.
DO NOT OVERFILL PAST THE FULL MARK.
SAE 10W-30 oil is recommended for general use. The SAE Viscosity Grade chart shows other viscosities to use in different average temperatures.
11. Insert the Dipstick back into the housing.

Note: Do not use gasoline that has been stored in a metal fuel container or a dirty fuel container. It can cause particles to enter the carburetor, affecting engine performance and/or causing damage.

4. If needed, fill the Fuel Tank to about 1 inch under the fill neck of the Fuel Tank with 87 octane or higher unleaded gasoline that has been treated with a fuel stabilizer additive. Follow fuel stabilizer manufacturer's recommendations for use.
5. Then replace the Fuel Cap.
6. Wipe up any spilled fuel and allow excess to evaporate before starting engine. To prevent FIRE, do not start the engine while the smell of fuel hangs in the air.

NOTICE: Do not run the engine with too little oil. Engine will not start with low or no engine oil.

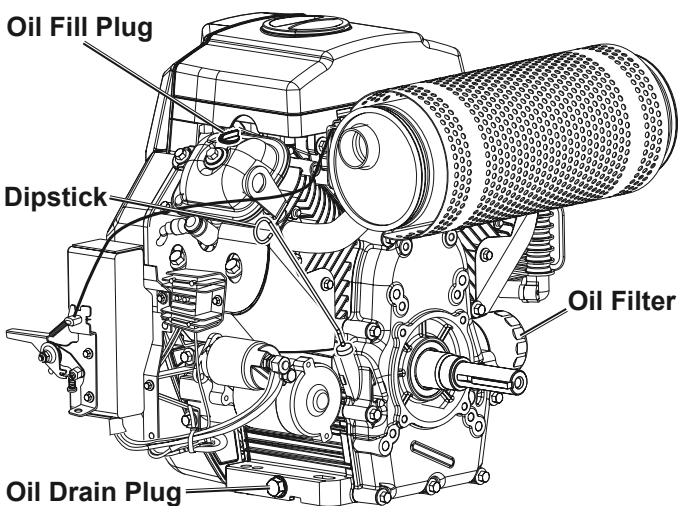
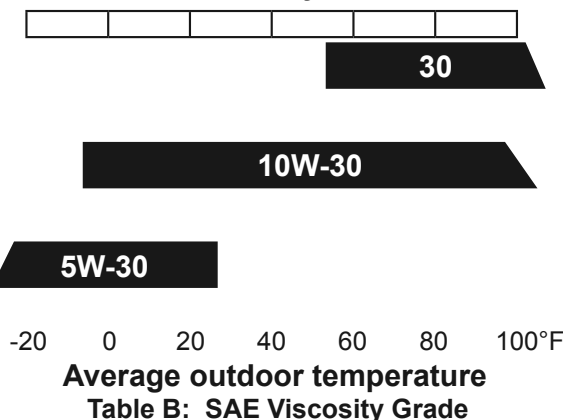


Figure V: Oil Drain and Oil Filter Location

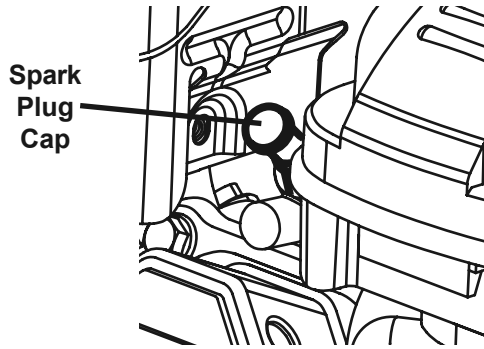
SAE Viscosity Grades



Air Filter Maintenance

1. Remove the Air Cleaner Top Cover and the air filter elements and check for dirt. Clean as described below.
2. Clean Paper Air Filter:
To prevent injury from dust and debris, wear ANSI-approved safety goggles, NIOSH-approved dust mask/respirator, and heavy-duty work gloves. In a well-ventilated area away from bystanders, use pressurized air to blow dust out of the Filter.
3. Clean Foam Air Filter:
Wash the Filter in warm water and mild detergent several times. Rinse. Squeeze out excess water and allow it to dry completely. Soak the Filter in lightweight oil briefly, then squeeze out the excess oil.
4. Install the cleaned filter. Secure the Air Cleaner Top Cover before use.

Spark Plug Maintenance



1. Disconnect spark plug caps from ends of plugs. Clean out debris from around spark plugs.
2. Using a spark plug wrench, remove the spark plugs.
3. Inspect the spark plugs:
If the electrode(s) is oily, clean it using a clean, dry rag. If the electrode(s) has deposits on it, polish it using emery paper. If the white insulator is cracked or chipped, the spark plug needs to be replaced.

Recommended Spark Plugs	
TORCH®	F5RTC
NGK®	BPR5ES

NOTICE: Using an incorrect spark plug may damage the engine.

4. When installing a new spark plug(s), adjust the plug's gap to the specification on the Specifications chart. Do not pry against the electrode, the spark plug can be damaged.
5. Install the new spark plug(s) or the cleaned spark plug(s) into the engine.

• **Gasket-style:**

Finger-tighten until the gasket contacts the cylinder head, then tighten about 1/2-2/3 turn more.

• **Non-gasket-style:**

Finger-tighten until the plug contacts the cylinder head, then tighten about 1/16 turn more.

NOTICE: Tighten the spark plugs properly. **If loose**, the spark plugs will cause the engine to overheat.

If overtightened, the threads in the engine block will be damaged.

6. Apply dielectric spark plug boot protector (not included) to the end of the spark plugs and reattach the wires securely.

Storage

When the equipment is to remain idle for longer than 20 days, prepare the Engine for storage as follows:

1. **CLEANING:**

Wait for Engine to cool, then clean Engine with dry cloth. **NOTICE: Do not clean using water.** The water will gradually enter the Engine and cause rust damage. Apply a thin coat of rust preventive oil to all metal parts.

2. **FUEL:**

To protect the fuel tank during storage, fill the tank with gasoline that has been treated with a fuel stabilizer additive. Follow fuel stabilizer manufacturer's recommendations for use. Refer to *Checking and Filling Fuel* on page 8.



⚠️ WARNING! TO PREVENT SERIOUS INJURY FROM FIRE:

Fill tank in a well-ventilated area away from ignition sources. If the engine is hot from use, shut the engine off and wait for it to cool before adding fuel. Do not smoke.

3. **LUBRICATION:**

- Change engine oil.
- Clean out area around spark plug.
Remove spark plug and pour one tablespoon of engine oil into cylinder through spark plug hole.

- Replace spark plug, but leave spark plug cap disconnected.
- Pull Starter Handle to distribute oil in cylinder. Stop after one or two revolutions when you feel the piston start the compression stroke (when you start to feel resistance).

4. **BATTERY:**

Disconnect battery cables (if equipped). Recharge batteries monthly while in storage.

5. **STORAGE AREA:**

Cover and store in a dry, level, well-ventilated area out of reach of children. Storage area should also be away from ignition sources, such as water heaters, clothes dryers, and furnaces.

NOTICE: During extended storage periods the Engine must be started every 3 months and allowed to run for 15–20 minutes or the Warranty is VOID.

6. **AFTER STORAGE:**

Before starting the Engine during or after storage, keep in mind that untreated gasoline will deteriorate quickly. Drain the fuel tank and change to fresh fuel if untreated gasoline has been sitting for a month, if treated gasoline has been sitting beyond the fuel stabilizer's recommended time period, or if the Engine does not start.

PREDATOR[®]

ENGINES

Troubleshooting

SAFETY

SETUP

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MAINTENANCE

Problem	Possible Causes	Probable Solutions
Engine will not start	FUEL RELATED: 1. No fuel in tank or fuel valve closed. 2. Choke not in START position, cold engine. 3. Gasoline with more than 10% ethanol used. (E15, E20, E85, etc.) 4. Low quality or deteriorated, old gasoline. 5. Carburetor not primed. 6. Dirty fuel passageways. 7. Carburetor needle stuck. Fuel can be smelled in the air. 8. Too much fuel in chamber. This can be caused by the carburetor needle sticking. 9. Clogged Fuel Filter.	FUEL RELATED: 1. Fill fuel tank with fresh 87+ octane stabilizer-treated unleaded gasoline and open fuel valve. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 2. Move Choke to START position. 3. Clean out ethanol rich gasoline from fuel system. Replace components damaged by ethanol. Use fresh 87+ octane stabilizer-treated unleaded gasoline only. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 4. Use fresh 87+ octane stabilizer-treated unleaded gasoline. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 5. Pull on Starter Handle to prime. 6. Clean out passageways using fuel additive. Heavy deposits may require further cleaning. 7. Gently tap side of carburetor float chamber with screwdriver handle. 8. Turn Choke to RUN position. Remove spark plug and pull the start handle several times to air out the chamber. Reinstall spark plug and set Choke to START position. 9. Replace Fuel Filter.
	IGNITION (SPARK) RELATED: 1. Spark plug cap not connected securely. 2. Spark plug electrode wet or dirty. 3. Incorrect spark plug gap. 4. Spark plug cap broken. 5. Circuit breaker tripped. 6. Incorrect spark timing or faulty ignition system.	IGNITION (SPARK) RELATED: 1. Connect spark plug cap properly. 2. Clean spark plug. 3. Correct spark plug gap. 4. Replace spark plug cap. 5. Reset circuit breaker. Check wiring and starter motor if breaker continues to trip. 6. Have qualified technician diagnose/repair ignition system.
	COMPRESSION RELATED: 1. Cylinder not lubricated. Problem after long storage periods. 2. Loose or broken spark plug. (Hissing noise will occur when trying to start.) 3. Loose cylinder head or damaged head gasket. (Hissing noise will occur when trying to start.) 4. Engine valves or tappets mis-adjusted or stuck.	COMPRESSION RELATED: 1. Pour tablespoon of oil into spark plug hole. Crank engine a few times and try to start again. 2. Tighten spark plug. If that does not work, replace spark plug. If problem persists, may have head gasket problem, see #3. 3. Tighten head. If that does not remedy problem, replace head gasket. 4. Have qualified technician adjust/repair valves and tappets.
	ENGINE OIL RELATED: 1. Low engine oil. 2. Engine mounted on slope, triggering low oil shutdown.	ENGINE OIL RELATED: 1. Fill engine oil to proper level. Check engine oil before EVERY use. 2. Operate engine on level surface. Check engine oil level.



Follow all safety precautions whenever diagnosing or servicing the equipment or engine.

Problem	Possible Causes	Probable Solutions
Engine misfires	1. Spark plug cap loose. 2. Incorrect spark plug gap or damaged spark plug. 3. Defective spark plug cap. 4. Old or low quality gasoline. 5. Incorrect compression.	1. Check cap and wire connections. 2. Re-gap or replace spark plug. 3. Replace spark plug cap. 4. Use only fresh 87+ octane stabilizer-treated unleaded gasoline. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 5. Diagnose and repair compression. (Use Engine will not start: COMPRESSION RELATED section.)
Engine stops suddenly	1. Fuel tank empty or full of impure or low quality gasoline. 2. Low oil shutdown. 3. Defective fuel tank cap creating vacuum, preventing proper fuel flow. 4. Faulty magneto. 5. Disconnected or improperly connected spark plug cap.	1. Fill fuel tank with fresh 87+ octane stabilizer-treated unleaded gasoline. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 2. Fill engine oil to proper level. Check engine oil before EVERY use. 3. Test/replace fuel tank cap. 4. Have qualified technician service magneto. 5. Secure spark plug cap.
Engine stops when under heavy load	1. Dirty air filter 2. Engine running cold.	1. Clean element. 2. Allow engine to warm up prior to operating equipment.
Engine knocks	1. Old or low quality gasoline. 2. Engine overloaded. 3. Incorrect spark timing, deposit buildup, worn engine, or other mechanical problems.	1. Fill fuel tank with fresh 87+ octane stabilizer-treated unleaded gasoline. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 2. Do not exceed equipment's load rating. 3. Have qualified technician diagnose and service engine.
Engine backfires After sudden impact, engine will run, but equipment will not operate	1. Impure or low quality gasoline. 2. Engine too cold. 3. Intake valve stuck or overheated engine. 4. Incorrect timing. Shaft key or other shear pin broken by impact to disconnect engine and limit damage.	1. Fill fuel tank with fresh 87+ octane stabilizer-treated unleaded gasoline. Do not use gasoline with more than 10% ethanol (E15, E20, E85, etc.). 2. Use cold weather fuel and oil additives to prevent backfiring. 3. Have qualified technician diagnose and service engine. 4. Check engine timing. Have qualified technician check and replace broken shaft key or other shear pins.



Follow all safety precautions whenever diagnosing or servicing the equipment or engine.

Limited 90 Day Warranty (Retail)

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of 90 days from the date of purchase. This warranty does not apply to damage due directly or indirectly, to misuse, abuse, negligence or accidents, repairs or alterations outside our facilities, criminal activity, improper installation, normal wear and tear, or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS, EXCEPT FOR THE EMISSIONS CONTROL SYSTEM WARRANTY BELOW.

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid. Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Emissions Control System Warranty

The California Air Resources Board and Harbor Freight Tools (HFT) are pleased to explain the emissions control system warranty on your 2017 Small Off-Road Engine, in addition to the Retail Warranty above. In California, new equipment that uses small off-road engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. HFT must warrant that the emissions control system on your engine will be free from defects in material and workmanship for two (2) years, provided there has been no abuse, neglect, or improper maintenance of your engine.

Your emissions control system may include parts such as the carburetor or fuel-injection system, the ignition system, catalytic converter, fuel tanks, fuel lines, fuel caps, valves, canisters, vapor hoses, clamps, connectors, and other emissions-related assemblies.

Where a warrantable condition exists, HFT will repair or replace, at our option, your engine if at no cost to you, including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE

This emissions control system is warranted for two years. If any emission-related part on your engine is defective, the part will be repaired or replaced by HFT.

OWNER'S WARRANTY RESPONSIBILITIES

As the engine owner, you are responsible for the performance of the required maintenance listed in your Owner's Manual.

As the engine owner, you should however be aware that HFT may deny you warranty coverage if your engine or a part has failed due to abuse (including failure to follow the fuel use instructions contained in this manual), neglect, improper maintenance, or unapproved modifications.

You are responsible for contacting HFT as soon as the problem exists in order to obtain warranty repair or replacement, by doing either of the following: (a) contact HFT product support at 1-888-866-5797 or predator@harborfreight.com; or (b) bring the to your nearest Harbor Freight Tools retail store. The nearest Harbor Freight Tools retail store can be found on the internet at <http://www.harborfreight.com>. The warranty repairs or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If you have a question regarding your warranty coverage, you should contact HFT product support at 1-888-866-5797 or predator@harborfreight.com.

GENERAL EMISSIONS WARRANTY COVERAGE

- a) The warranty period begins on the date the engine or equipment is delivered to an ultimate purchaser. The warranty period is two years.
- b) HFT warrants to the initial owner and each subsequent owner that the engine is:
1. Designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board; and
 2. Free from defects in materials and workmanship that causes the failure of a warranted part for a period of two years.
- c) The warranty on emissions-related parts is as follows:
1. Any warranted part that is not scheduled for replacement as required maintenance in the written instructions provided, is warranted for the warranty period stated above. If any such part fails during the period of warranty coverage, it will be repaired or replaced HFT. Any such part repaired or replaced under the warranty will be warranted for the remaining warranty period.
 2. Any warranted part that is scheduled only for regular inspection in the written instructions is warranted for the warranty period stated above. A statement in the written instructions to the effect of "repair or replace as necessary" does not reduce the period of warranty coverage. Any such part repaired or replaced under warranty will be warranted for the remaining warranty period.
 3. Any warranted part that is scheduled for replacement as required maintenance in the written instructions will be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part will be repaired or replaced by HFT. Any such part repaired or replaced under warranty will be warranted for the remainder of the period prior to the first scheduled replacement point for the part.
 4. Repair or replacement of any warranted part under the warranty will be performed at no charge to the owner at a retail store or by HFT paying for shipping the product for repair.
 5. Notwithstanding the provisions herein, warranty services or repairs will be provided at all retail stores or by contacting HFT product support at 1-888-866-5797 or predator@harborfreight.com.
 6. The owner will not be charged for diagnostic labor that leads to the determination that a warranted part is in fact defective, provided that such diagnostic work is performed at a retail store.
 7. HFT is liable for damages to other engine components proximately caused by a failure under warranty of any warranted part.
 8. Throughout the emissions warranty period stated above, HFT will maintain a supply of warranted parts sufficient to meet the expected demand for such parts.
 9. Any replacement part may be used in the performance of any warranty maintenance or repairs and will be provided without charge to the owner. Such use will not reduce the warranty obligations of HFT.
 10. Add-on or modified parts that are not approved by HFT may not be used. The use of any non-exempted add-on or modified parts will be grounds for disallowing a warranty claim. HFT is not liable to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part.
- d) Emission Warranty Parts List.
- | | |
|--|---|
| 1. Fuel Metering System | 4. Catalyst System (if so equipped) |
| a. Carburetor and its internal parts (and/or pressure regulator or fuel injection system). | a. Exhaust pipe stud/exhaust manifold. |
| b. Fuel tank. | b. Thermal reactor. |
| c. Cold start enrichment system. | c. Catalytic converter (if so equipped). |
| d. Air/fuel ratio feedback and control system. | 5. Particulate Controls |
| 2. Air Induction System | a. Traps, filters, precipitators, and any other device used to capture particulate emissions. |
| a. Controlled hot air intake system. | 6. Miscellaneous Items Used in Above Systems |
| b. Intake manifold. | a. Vacuum, temperature and time sensitive valves and switches. |
| c. Air filter. | b. Hoses, belts, connectors, and assemblies. |
| 3. Ignition System | 7. Evaporative Emission Control System |
| a. Spark plugs. | a. Fuel tank. |
| b. Magneto ignition system. | b. Fuel caps, valves, canisters, filters, vapor hoses, clamps, connectors, belts, and assemblies. |
| c. Spark advance/retard system. | |

HFT provides with each product written instructions for the maintenance and use of the product by the owner.

Parts List

SAFETY

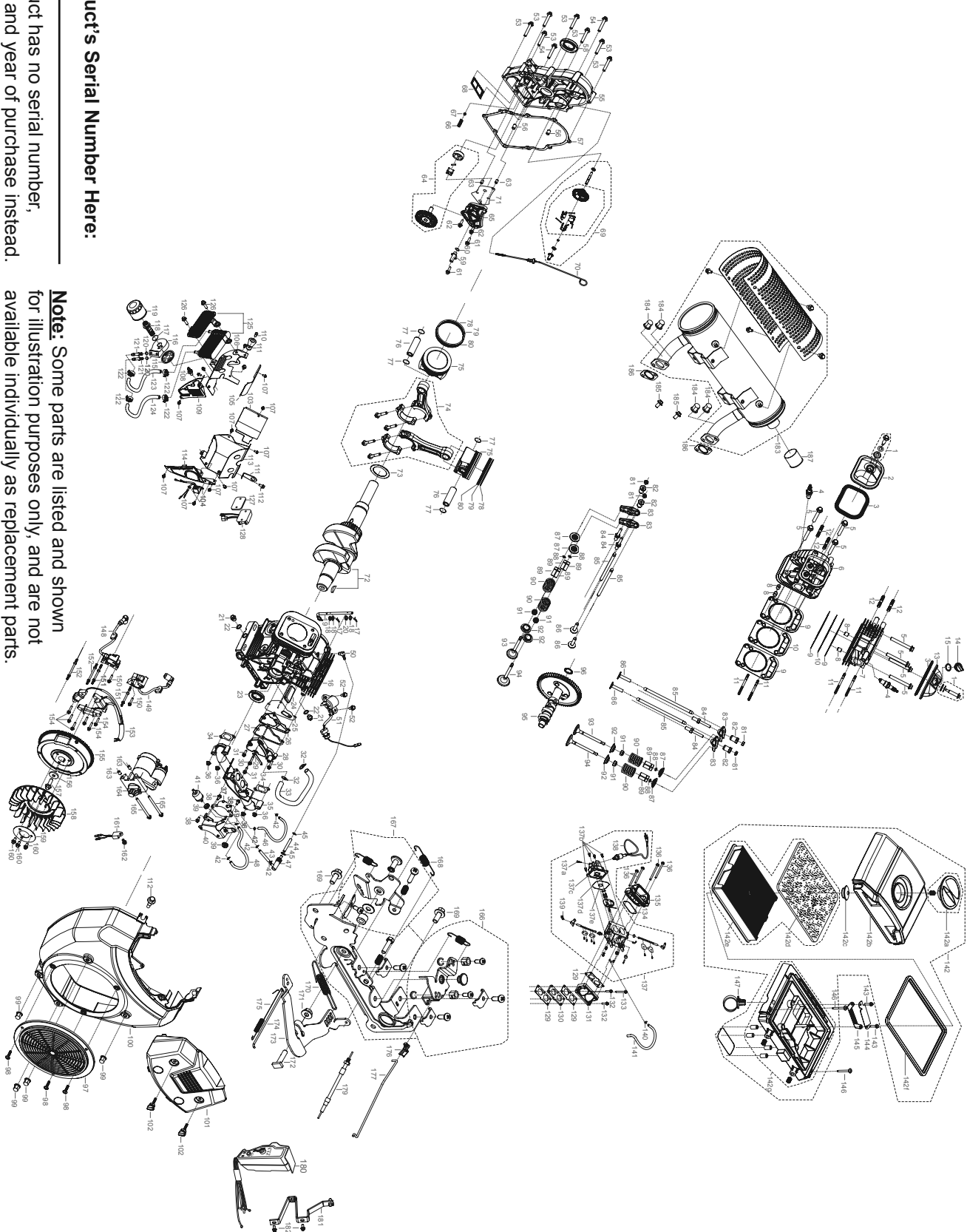
SETUP

OPERATION

MAINTENANCE

Part	Description	Qty	Part	Description	Qty	Part	Description	Qty
1	Bolt, Cylinder Head Cover	2	67	Ball, Steel	1	133	Bolt	1
2	Cover, Left Cylinder Head	1	68	Strainer, Oil	1	134	O-ring	1
3	Gasket, Cylinder Head Cover	2	69	Governor Gear Asm.	1	135	Air Cleaner Connector	1
4	Spark Plug	2	70	Dipstick, Oil	1	136	Bolt	4
5	Bolt, Cylinder Head	8	71	Gasket, Oil Pump	1	137	Carburetor Asm.	1
6	Head, Left Cylinder	1	72	Crankshaft	1	137a	Carburetor Drain Plug	1
7	Head, Right Cylinder	1	73	Washer, Thrust	1	137b	Carburetor Bowl Bolt	4
8	Pin	4	74	Rod, Connecting	2	137c	Carburetor Bowl	1
9	Gasket, Cylinder Head	4	75	Piston	2	137d	Outer Bowl O-ring	2
10	Metal Head Gasket	2	76	Pin, Piston	2	137e	Inner Bowl O-ring	2
11	Stud	4	77	Clip, Piston Pin	4	138	Solenoid Valve	1
12	Stud	4	78	Primary Ring	2	139	Throttle Rod Clip	1
13	Cover, Right Cylinder Head	1	79	Secondary Ring	2	140	Spring Clamp	1
14	Oil Fill Plug	1	80	Ring Set, Oil	2	141	Fuel Hose	1
15	Oil Fill Plug Seal	1	81	Nut, Valve Lock	4	142	Air Cleaner Asm.	1
16	Crankcase	1	82	Bolt, Valve Adjusting	4	142a	Air Cleaner Top Knob	1
17	Cotter Pin	2	83	Rocker, Valve	4	142b	Air Cleaner Top Cover	1
18	Washer	3	84	Shaft, Valve Rocker	4	142c	Air Cleaner Spacer	1
19	Governor Arm	1	85	Lifter, Valve	4	142d	Foam Air Filter	1
20	Oil Seal	1	86	Tappet, Valve	4	142e	Paper Air Filter	1
21	Drain Plug	2	87	Seat, Valve Spring	4	142f	Air Cleaner Gasket	1
22	Washer	2	88	Check Ring	4	142g	Air Cleaner Base Asm.	1
23	Oil Seal	1	89	Clamp, Valve Lock	8	143	Intake Cover Bolt	2
24	Breather Separator	1	90	Spring, Valve	4	144	Intake Cover	1
25	Breather Plate	1	91	Guide, Seal	4	145	Intake Screen	1
26	Breather Gasket	1	92	Retainer, Valve Spring	4	146	Air Cleaner Base Bolt	2
27	Breather Gasket	1	93	Valve, Exhaust	2	147	Fuel Filter Clip	1
28	Breather Cover	1	94	Valve, Intake	2	148	Coil, Ignition	1
29	Clamp	1	95	Camshaft	1	149	Coil, Ignition	1
30	Bolt	2	96	Washer, Camshaft	1	150	Bolt	2
31	Bolt	2	97	Shield, Shroud	1	151	Stud	2
32	Spring Wire Clamp	2	98	Bolt	3	152	Stud	2
33	Breather Hose	1	99	Shroud Nut	4	153	Coil, Charge	1
34	Gasket, Inlet	2	100	Shroud	1	154	Bolt	6
35	Intake	1	101	Air Cleaner Front Cover	1	155	Flywheel	1
36	Nut	4	102	Air Cleaner Front Knob	2	156	Gasket	1
37	Fuel Pump	1	103	Shroud 2, Cylinder Body	1	157	Bolt, Flywheel	1
38	Bolt	3	104	Diode	1	158	Impeller	1
39	Fuel Pump Sleeve	2	105	Shroud, Cylinder Body	1	159	Tray, Impeller Setting	1
40	Fuel Pump Bracket	1	106	Shield, Lower	1	160	Bolt	3
41	Fuel Filter	1	107	Bolt	13	161	Protector, Oil	1
42	Spring Clamp	5	108	Plug, End	1	162	Bolt	1
43	Vacuum Hose	1	109	Shield, Crankcase Side	1	163	Pin	2
44	Vacuum Hose	1	110	Bolt, Flange Shoulder	1	164	Starter	1
45	Spring Clamp	2	111	Lifting Bracket	2	165	Bolt	2
46	Fuel Hose	1	112	Flange Shoulder Bolt	2	166	Control, Throttle Asm.	1
47	Fuel/Oil Separator	1	113	Right Lower Cover	1	167	Control, Throttle Asm.	1
48	Fuel Hose	1	114	Right Shield	1	168	Spring, Governor	1
49	Clamp	1	115	Gasket, Oil Filter Cover	1	169	Bolt	2
50	PCV Valve	1	116	Oil Filter Block	1	170	Spring, Governor	1
51	Sensor, Engine Oil	1	117	Ring, Seal	1	171	Nut	2
52	Bolt	2	118	Hose, Oil Filter Installation	1	172	Bolt, Governor Support	1
53	Bolt	7	119	Oil Filter	1	173	Throttle Support	1
54	Bolt	2	120	Washer, Flat	2	174	Throttle Rod	1
55	Crankcase Cover	1	121	Cooling Pipe Adapter	2	175	Throttle Rod Spring	1
56	Pin	2	122	Clamp	4	176	Choke Rod Clip	1
57	Crankcase Gasket	1	123	Cooling Pipe	1	177	Choke Rod	1
58	Seal, Oil	1	124	Cooling Pipe	1	179	Throttle Cable	1
59	Hose, Suction Oil	1	125	Radiator	1	180	Motor Control Box	1
60	O-Ring	1	126	Bolt	2	181	Control Box Support	1
61	Bolt	2	127	Voltage Regulator Insulator	1	182	Bolt	2
62	Bolt	2	128	Regulator, Voltage	1	183	Muffler Asm.	1
63	Pin	2	129	Gasket, Carburetor	3	184	Nut	4
64	Oil Pump Asm.	1	130	Gasket, Carburetor Insulator	1	185	Bolt	2
65	Cover, Oil Pump	1	131	Carburetor Intake Elbow	1	186	Gasket, Exhaust Outlet	2
66	Spring, Pressure Relief Valve	1	132	Bolt	2	187	Spark Collector	1

Assembly Diagram



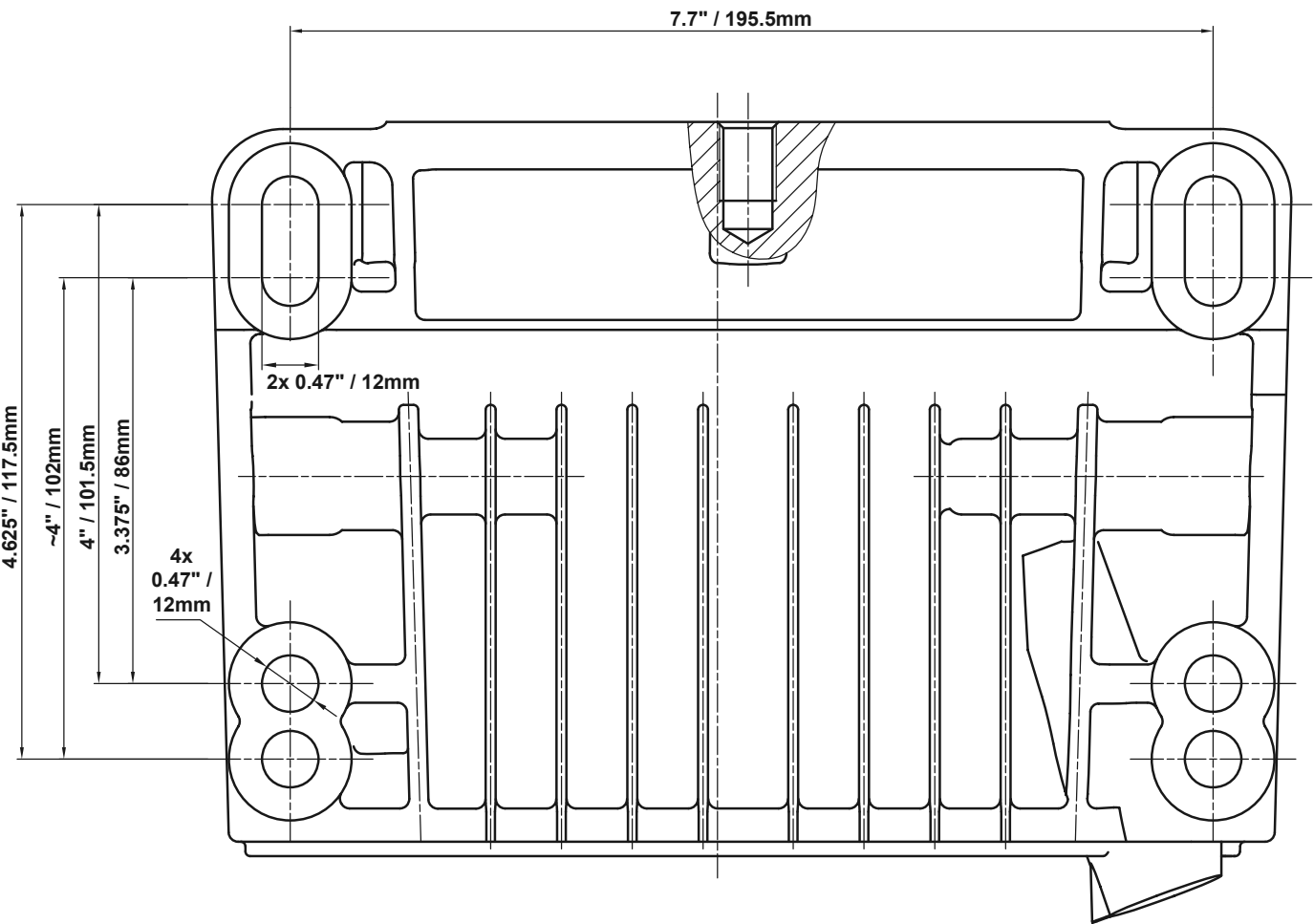
Record Product's Serial Number Here:

Note: If product has no serial number, record month and year of purchase instead.

Note: Some parts are listed and shown for illustration purposes only, and are not available individually as replacement parts.

Mounting Hole Diagram

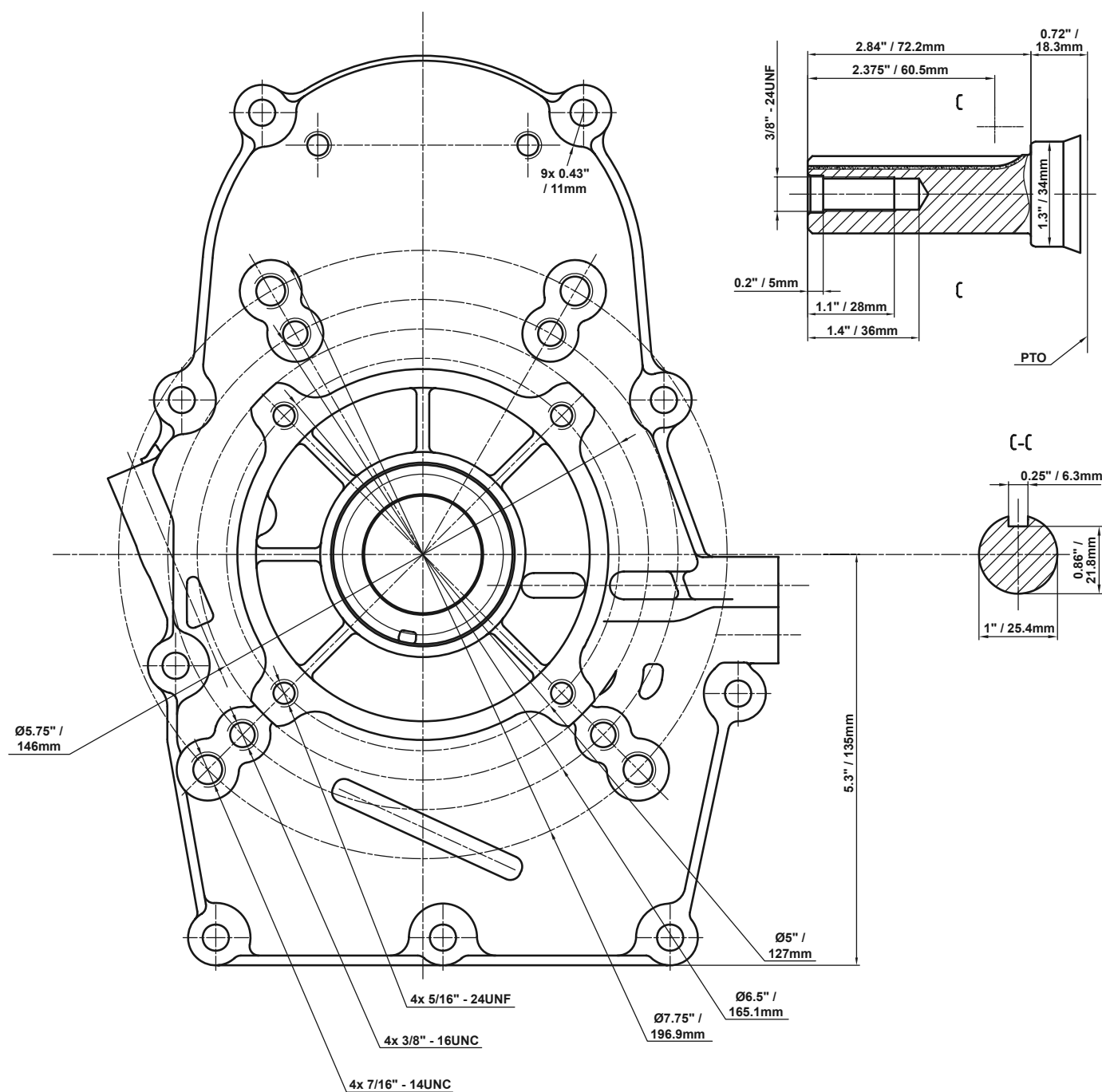
Note: Not to scale.



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Power Take-Off Diagram

Note: Not to scale.



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