Wagner Smith Equipment Co.

SERVICE FROM POLE TO POLE

OPERATOR'S AND PARTS MANUAL

MODEL POWER PACK 18HP

HYDRAULIC POWER PACK 18HP/2150PSI

CONTROL # _____

SERIAL # _____

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Revised 06/29/2017

OPERATOR'S MANUAL INDEX

SECTION “A”
SAFETY

ATTENTION:

This manual is intended to give operational, parts, and maintenance information for the unit referenced on the front cover. It is not intended to replace safe operating practice or serve as a tension/ stringing operation procedures manual. This piece of equipment is designed for use in tension/ stringing operations within its specification only. Any use other than this that is not authorized by Wagner-Smith Equipment Co. is potentially dangerous and could result in severe injury or death. Additionally, this equipment should only be operated by trained personnel who are fully aware of the proper operating procedures and potential safety hazards encountered during tension/ stringing operations.

SECTION “A”
SAFETY

RECOGNIZE SAFETY INFORMATION

This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

“DANGER” – Is used to indicate a hazardous situation which has a high probability of death or severe injury. Danger should not be considered for property damage accidents unless personal injury risk is present.

“WARNING” – Is used to indicate a hazardous situation which has some probability of death or serious injury. Warning should not be considered for property damage accidents unless personal injury risk is present.

“CAUTION” – Is used to indicate a hazardous situation which may result in minor or moderate injury. However, caution should not be used when there is a possibility of death or serious injury. Caution should not be considered for property damage accidents unless personal injury risk is present.

FOLLOW SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact Wagner-Smith Equipment Company.

SECTION “A”
SAFETY

PREPARE FOR EMERGENCIES

Be prepared if a fire or accident occurs. Keep a first aid kit and fire extinguisher handy. Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against uncomfortable loud noises.

STAY CLEAR OF ROTATING SPINDLES AND CHAIN DRIVES

Entanglement in rotating reel spindle and reel spindle drive can cause serious injury or death.

Keep all guards in place at all times.

Wear close fitting clothing. Stop the engine and be sure the drives are completely stopped before performing any type of service on the equipment.

PRACTICE SAFE MAINTENANCE

Understand service procedure before doing work. Keep area clean and dry. Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power driven parts. Disengage all power and operate controls to relieve pressure. Stop the engine. Remove the key. Allow machine to cool.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove all buildup of grease, oil, or debris.

Disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

SECTION “A”
SAFETY

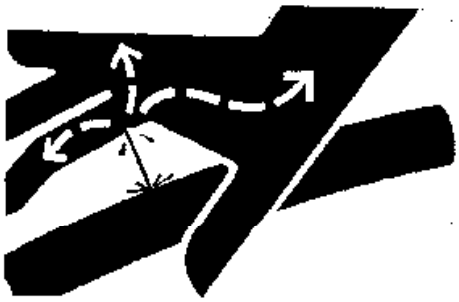
AVOID HIGH-PRESSURE FLUIDS

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately.



REMOVE PAINT BEFORE WELDING OR HEATING

Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work in a well-ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you use sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper container and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

SERVICE COOLING SYSTEM SAFELY

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

SECTION “A”
SAFETY

FILLING FUEL TANK

CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running.

DO NOT smoke while filling fuel tank or servicing fuel system.

IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

WARNING

ELECTROCUTION HAZARD

DO NOT OPERATE THIS MACHINE WITHOUT PROPER GROUNDING

SECTION “A”
SAFETY

THIS MACHINE IS A HIGHLY

SPECIALIZED PIECE OF

EQUIPMENT THAT SHOULD BE

OPERATED ONLY BY

QUALIFIED PERSONNEL

SECTION “B”
INTRODUCTION

SECTION “B”
INTRODUCTION

The Wagner-Smith Company Model POWER PACK 18HP is a portable hydraulic power unit with variable flow control and adjustable pressure control. The hydraulic power pack can supply up to 13 gpm of flow at 2,150 psi for various hydraulic applications including driving a powered reel stand. The unit is equipped with flat face quick disconnects to minimize leakage when connecting/disconnecting from the unit.

The manufacturer’s manuals, for the majority of this unit’s components, are included to facilitate repairs, should they become necessary.

SECTION “C”
SPECIFICATIONS

SECTION “C”
SPECIFICATIONS

WAGNER-SMITH MODEL POWER PACK 18HP

POWER PACK 18HP-2,150PSI

Specification No. 48018-01
Date 10/22/19

UNIT PERFORMANCE

- Max Flow ..... 13 gpm
- Max Pressure ..... 2,150 psi

POWERTRAIN

- Engine ..... Briggs & Stratton 18HP
- Fuel Type ..... Gasoline
- Fuel Capacity ..... 2.5 Gallons
- Hyd. Pump ..... Danfoss SNP 2/14-D-SC06 14.4CC
- Hyd. Reservoir ..... 20 Gallons

UNIT DIMENSIONS & WEIGHT

- Unit Length ..... 03 ft. 06 in.
- Unit Width ..... 02 ft. 09 in.
- Unit Height ..... 02 ft. 11 in.
- Net Weight (empty reels) ..... 700 lbs.

SECTION “D”
DESCRIPTION OF INDIVIDUAL FUNCTIONS

SECTION “D”
DESCRIPTION OF INDIVIDUAL FUNCTIONS

HYDRAULIC POWER

The maximum flow and pressure can be adjusted on the control panel to adapt to various hydraulic applications. Turning the knob (Fig. 1A) clockwise on the relief valve increases the maximum pressure. Turning the dial (Fig. 1B) to a higher number increases the maximum amount of flow supplied to the outgoing system. Pulling the lever (Fig. 1C) down supplies fluid to the outgoing system via the flat face quick disconnects (Fig. 2).

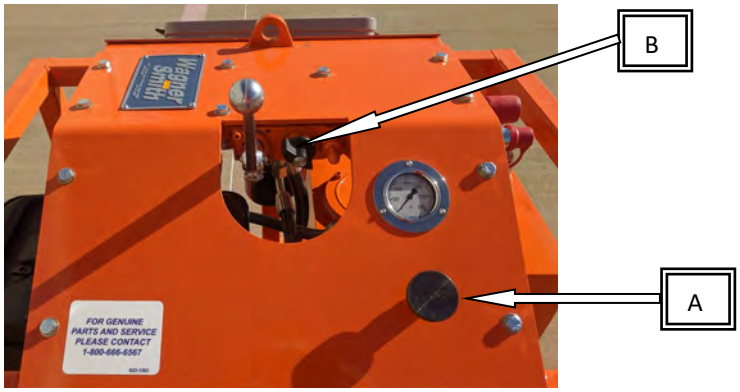


Figure 1: Control Panel

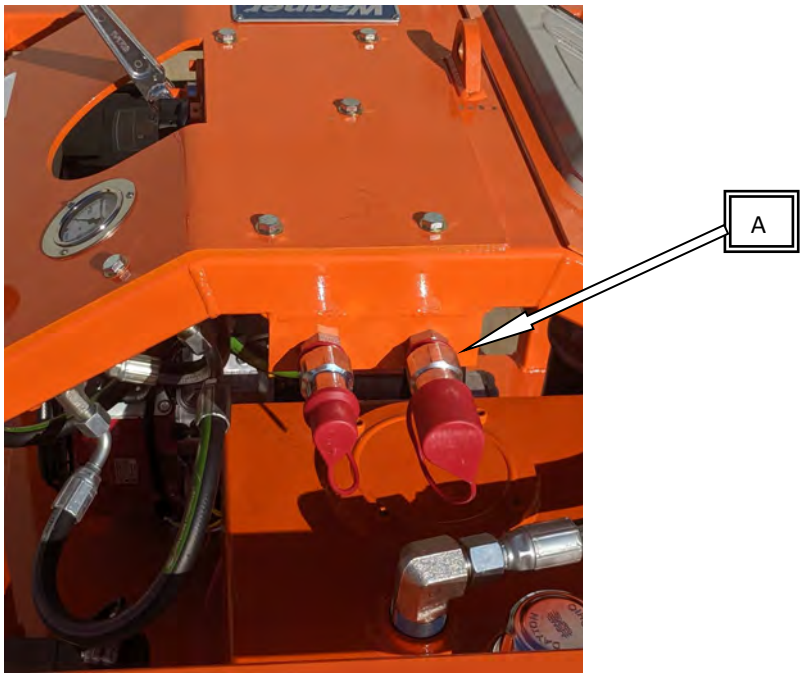


Figure 2: Flat Face Quick Disconnects

SECTION “D”
DESCRIPTION OF INDIVIDUAL FUNCTIONS

FUEL SHUT-OFF

The engine is equipped with a fuel shut-off knob that cuts off the fuel supply from the fuel tank to the engine so that the remaining fuel in the engine can be burned off. This protects the engine from clogs in the fuel system during periods without frequent use.

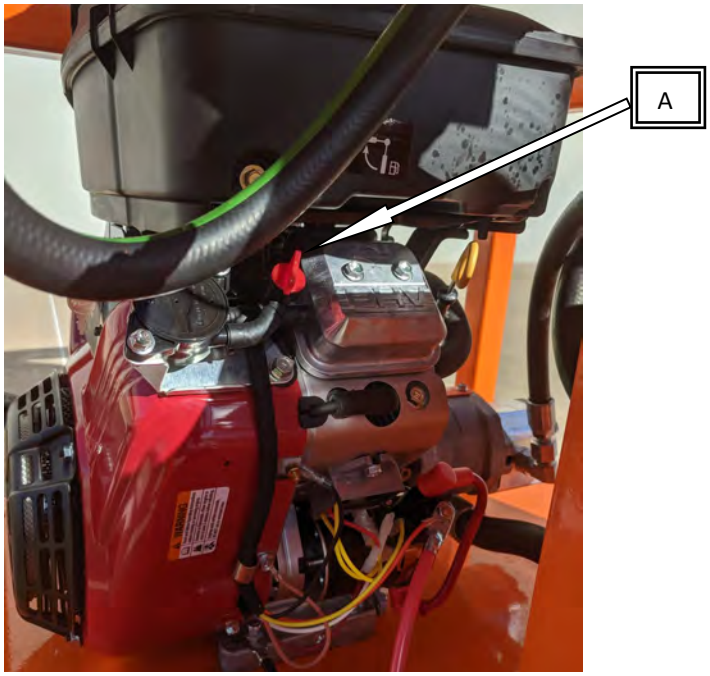


Figure 3: Fuel Shut-off Knob

SECTION “E”
OPERATIONS

SECTION “E”
OPERATIONS

FIELD SETUP

Position the power pack on a flat surface and close proximity to the reel stand. Use the forklift cutouts (Fig. 1A) or lifting eye (Fig. 1B) to position where needed.

PERFORM DAILY PREVENTATIVE MAINTENANCE

Daily Maintenance Checks are the following:

1) Before powering on, check:
    a) For any fluid leaks.
    b) Loose nuts and bolts.
    c) Hydraulic oil reservoir filler cap in place and secure.
    d) Hydraulic system oil level.
3) After running the power unit, check:
    a) Check for any fluid leaks.
    b) If there are any unusual noises shut down immediately.
4) After power off, check:
    a) For any fluid leaks.
    b) Loose nuts and bolts.
    c) Hydraulic oil reservoir filler cap in place and secure.

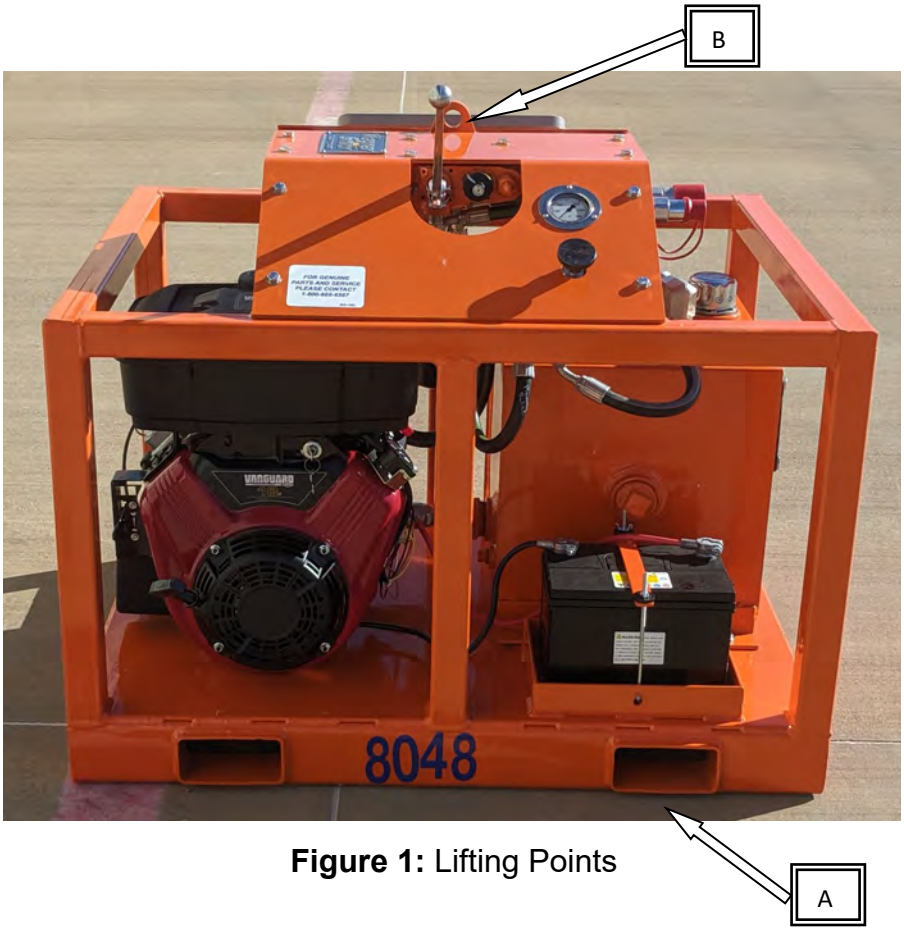


Figure 1: Lifting Points

SECTION “E”
OPERATIONS

POWERING A REEL STAND

Before Startup:

1) Place flow control knob (Fig. 2A) at zero and turn pressure knob (Fig. 2B) counter-clockwise until it stops.
2) Hook up power pack to reel stand using the supplied hoses with reel stand.
3) Make sure brake is applied on powered reel stand (Reference manual for powered reel stand).

After Startup:

1) Increase throttle to max on engine using the lower lever (Fig. 3A) on the engine.
2) Turn pressure knob (Fig. 2B) clockwise until fully opened and verify that the gauge (Fig. 2C) reads 2,150 psi.
3) Release brake on reel stand (Reference WSE Power Reel Stand Manual).
4) Adjust flow control with knob (Fig. 2A). Start with a low flow gradually increasing until the desired speed is reached on reel stand.

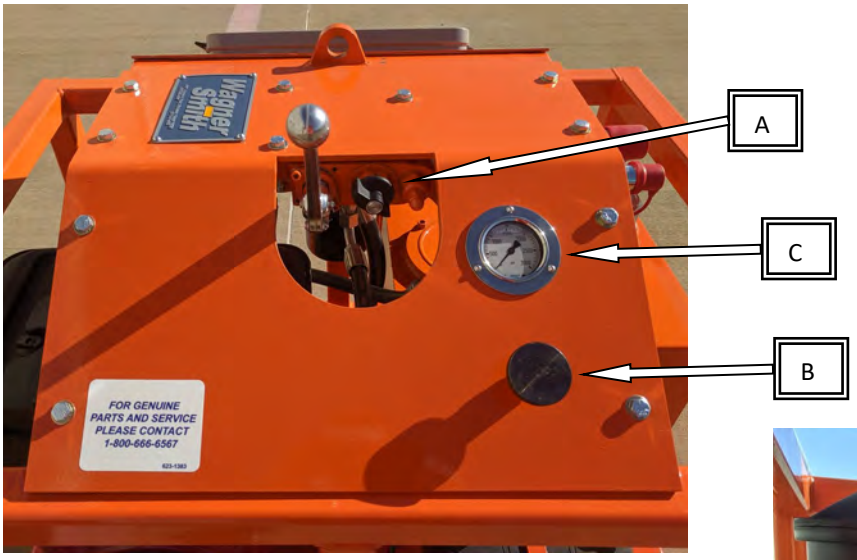


Figure 2: Control Panel

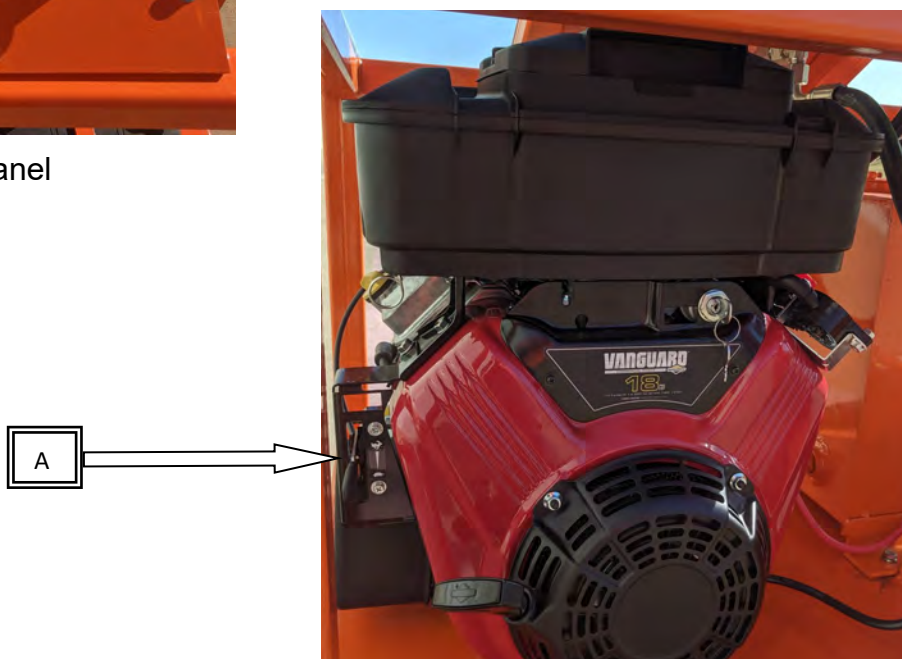


Figure 3: Engine

SECTION “F”
ROUTINE MAINTENANCE

SECTION “F”
ROUTINE MAINTENANCE

The Wagner-Smith Equipment Co. Model POWER PACK 18HP is a portable hydraulic power unit with variable flow control and adjustable pressure control. This unit must be given regular care and operated in accordance with the instructions provided in this document.

It is imperative that the advanced hydraulic system incorporated by this design be kept clean. It is suggested that a good periodic preventative maintenance schedule be followed in maintaining this unit.

Upon receipt, this unit should be checked for damage from shipping. In addition, the following checks should be made:

DAILY INSPECTION

1) Before starting the engine check:
   a) Engine oil level.
   b) Engine fuel level.
   c) Hydraulic system oil level.
   d) Hydraulic oil system pressure gauge reads zero.
2) After starting the engine check:
   a) Hydraulic system pressure gauge reads 0 psi with directional control lever in the neutral position.
   b) Check for any fluid leaks.
   c) If there is any unusual noises shut down engine immediately.
3) After engine shutdown check:
   a) For any fluid leaks.
   b) Loose nuts and bolts.
   c) Hydraulic oil reservoir filler cap in place and secure.

SECTION “F”
ROUTINE MAINTENANCE

BEFORE STARTING ENGINE

Do the following BEFORE STARTING THE ENGINE for the first time each day:

1) Check all mounting bolts and nuts for tightness.
2) Check engine oil level on dipstick (Fig. 1A).
    a) Add oil as required, using seasonal viscosity grade oil. (See GASOLINE ENGINE OIL in Fuels, Lubrications, and Coolant Section for oil specification in engine manual in Section “G” of this manual.)

IMPORTANT: NEVER operate the engine with the oil level below the lower mark or above the higher mark on the dipstick.

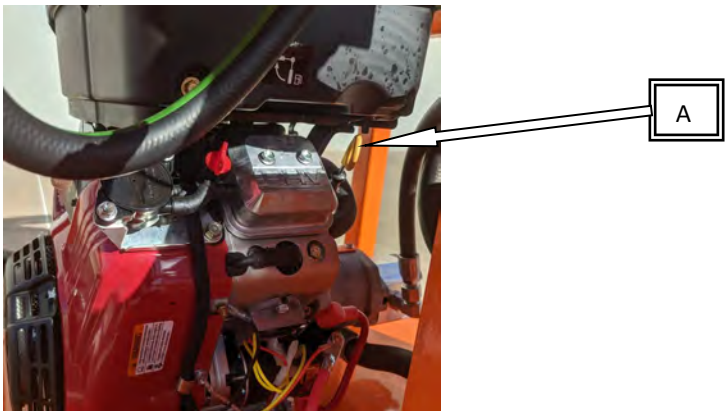


Figure 1: Engine Oil Dipstick

3) Check hydraulic system oil level (Fig. 2).
    a) Oil level must be on full mark before daily startup.
    b) Operating oil temperature should range in the following:
        1. -40°F Minimum (cold start)
        2. 140-185°F Recommended
        3. 220°F Rated
        4. 240°F Maximum intermittent

Figure 2: Hydraulic Oil Level Gauge and Temperature Indicator

4) Hydraulic pressure gauge should read zero (Fig. 3).

Figure 3: Hydraulic Pressure Gauge

SECTION “F”
ROUTINE MAINTENANCE

AFTER STARTING ENGINE

Do the following AFTER STARTING ENGINE and placing in high idle for first time each day:

1) Check for fuel leaks.
2) Check for hydraulic oil leaks.
3) Hydraulic system gauge operation:

NOTE: Disconnect power pack from outside application and increase engine speed to full throttle (3600 rpm) prior to checking the following:

a) Verify flow control lever is in neutral position (Fig. 4A). Hydraulic system pressure gauge should read approximately 0 psi (Fig. 4B).
b) Pull/push lever fully (Fig. 4A), hydraulic pressure gauge should read approximately 2,150 psi (Fig 5B).

4) Power Rewind operation.
   a) Moving the lever (Fig. 4A) slightly either direction will allow the reel drive to slowly rotate.
   b) Moving the lever further will increase the speed of the reel drive.
   c) Returning the lever to the neutral position will stop the reel drive from rotating.
   d) Moving the lever into the opposite position will allow the reel drive to rotate in the opposite direction.

   NOTE: If the reel does not come to a complete stop when the lever is returned to the neutral position, contact Wagner-Smith Equipment Co. for further troubleshooting instructions.

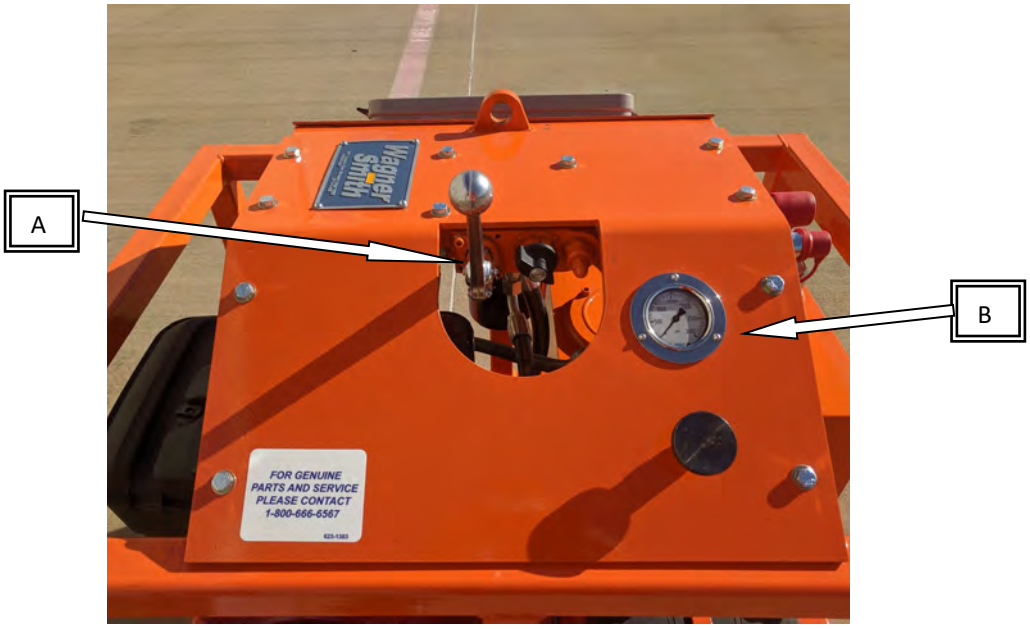


Figure 4: Control Panel

SECTION “F”
ROUTINE MAINTENANCE

AFTER FIRST 50 HOURS OPERATION

1) Refer to engine manual for break-in service in Section “G” of this manual.

EACH 50 HOURS/WEEKLY INSPECTION

1) Check for water in hydraulic oil (Fig. 5) (water will cause the oil to look milky).

EACH 100 HOUR INSPECTION

1) Perform 50 hour inspection.
2) Refer engine manual in Section “G” of this manual.
3) Perform basic battery maintenance. (Fig. 6).

Keep battery clean by wiping it with a damp cloth. Keep all connections clean and tight. Remove any corrosion, and wash the terminals with a solution of 1 part baking soda and 4 part's water. Tighten all connections securely.

Coat the battery terminals and connectors with lithium grease to retard corrosion.

CAUTION: Keep fire away from the top of open battery cells. Combustible gas is always present.

Figure 5: Hydraulic Tank

Figure 6: Battery

SECTION “F”
ROUTINE MAINTENANCE

EACH 200 HOUR/3 MONTHS INSPECTION

1) Perform 100 hour inspection.
2) Refer to engine owner’s and operator’s manual.

HYDRAULIC SYSTEM

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles that eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If any fluid is injected into the skin, a doctor familiar with this type injury must surgically remove it within a few hours or gangrene may result.

1) Fluid and Filter Maintenance
2) Change Hydraulic Fluid Filter (Fig. 7).

It is recommended that the fluid and filter be changed every 2,000 hours.

Figure 7: Hydraulic Fluid Filter

PUMPS AND MOTORS SERVICING

1) For servicing the Danfoss Pump see Danfoss Service Manual (in Section “G” of this manual).

SECTION “G”
MANUFACTURER’S SERVICE LITERATURE

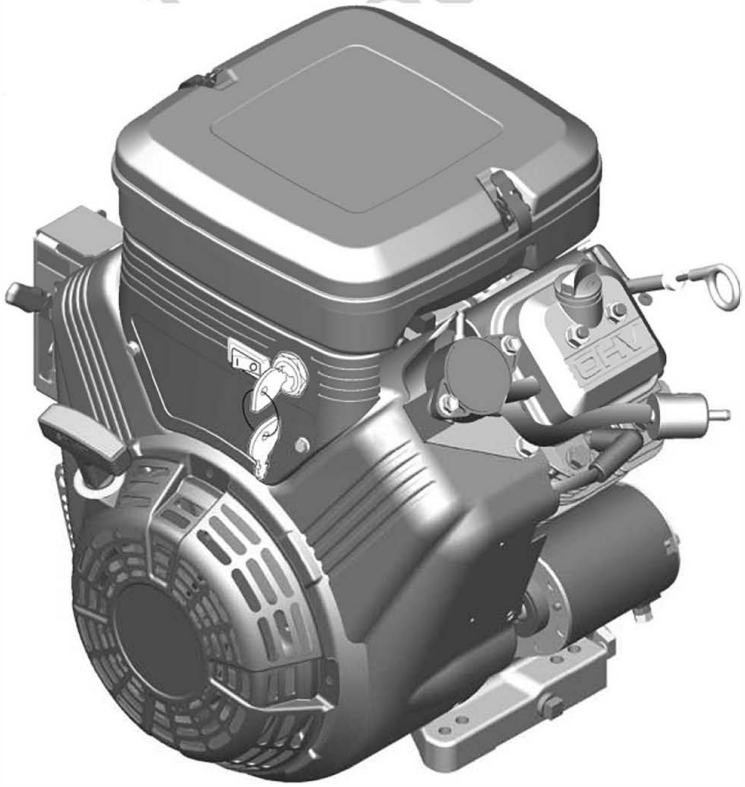
VANGUARD™
COMMERCIAL POWER
BRIGGS & STRATTON

(en) Operator's Manual

(es) Manual del Operario

(fr) Manuel d'utilisation

Models: 290000
300000
350000
380000



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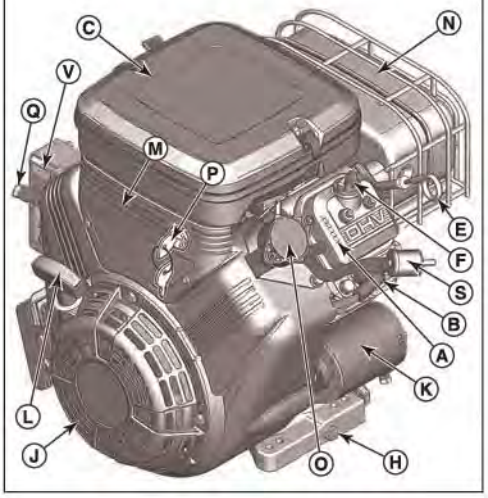

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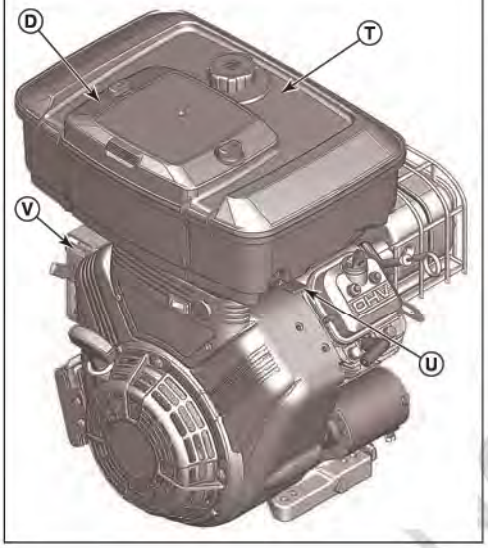

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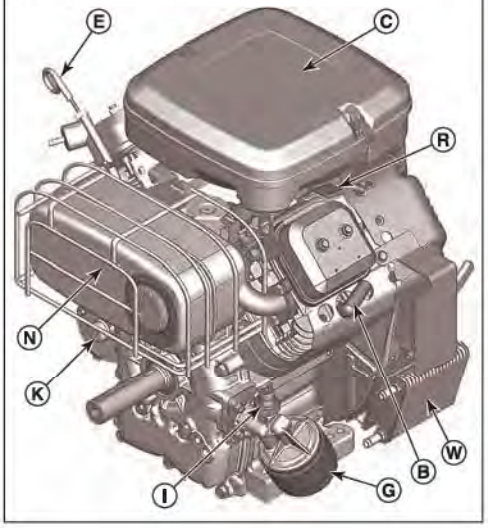

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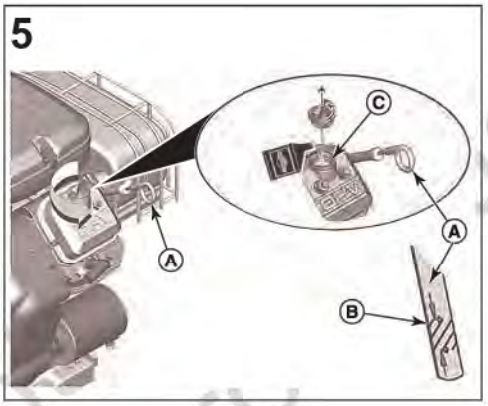

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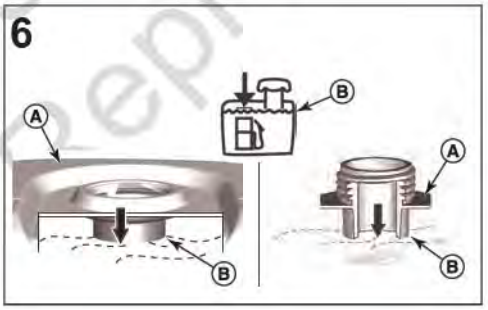

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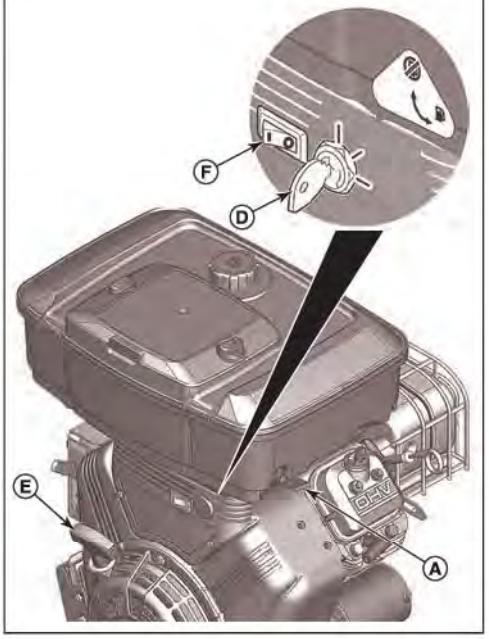

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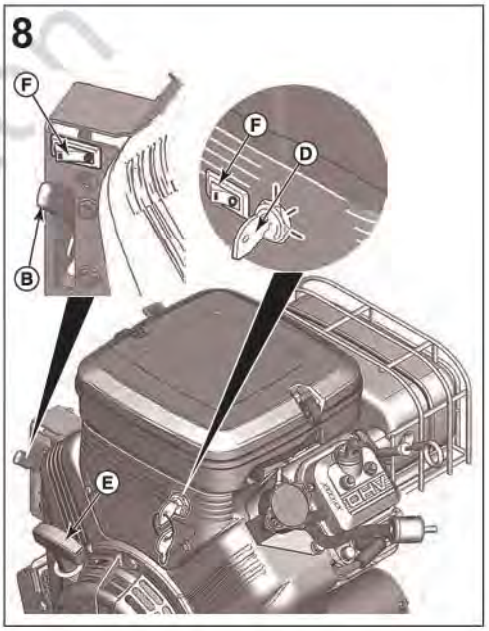

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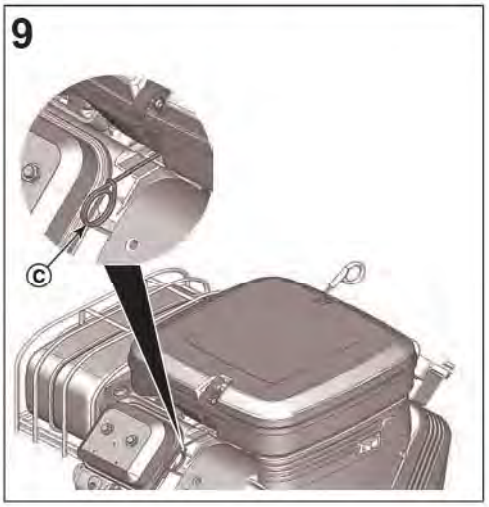

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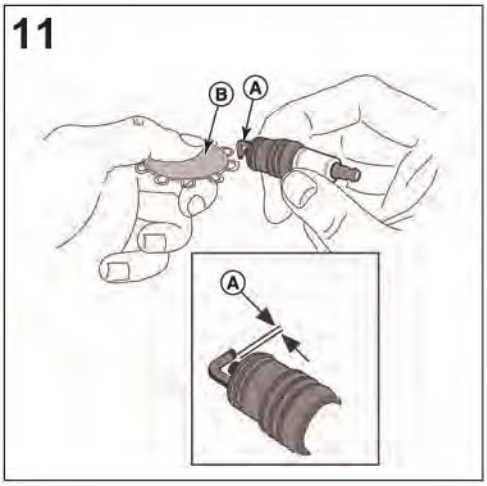

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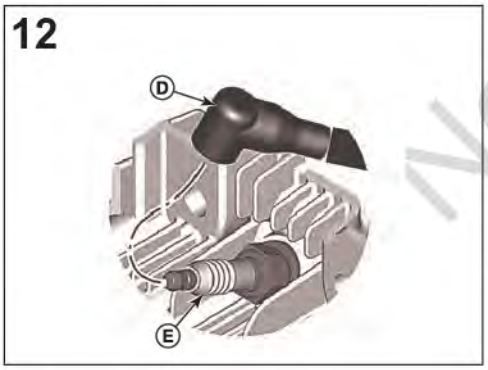

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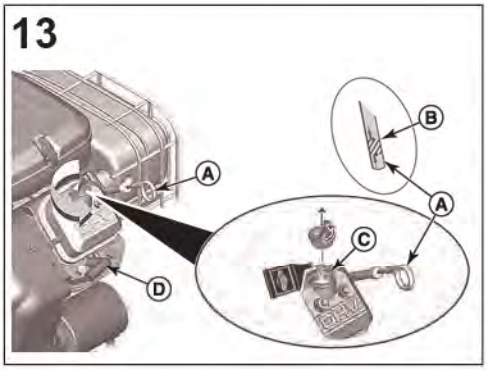

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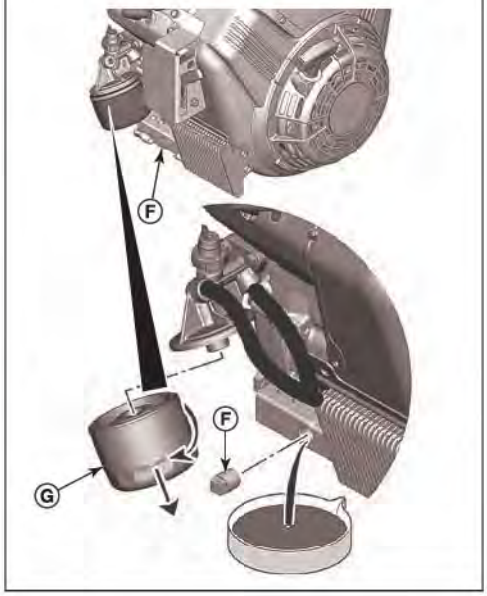

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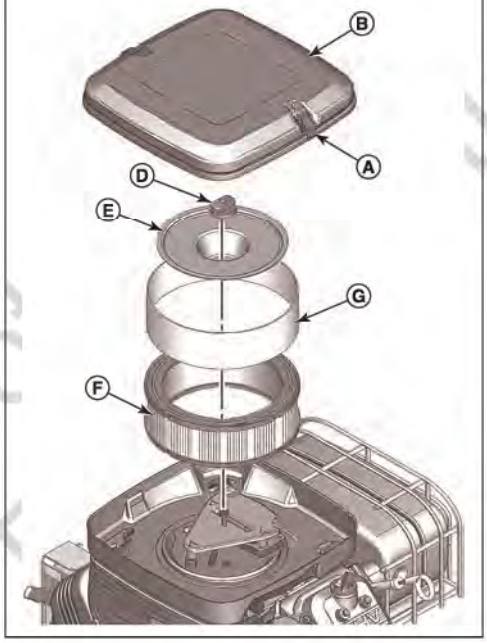

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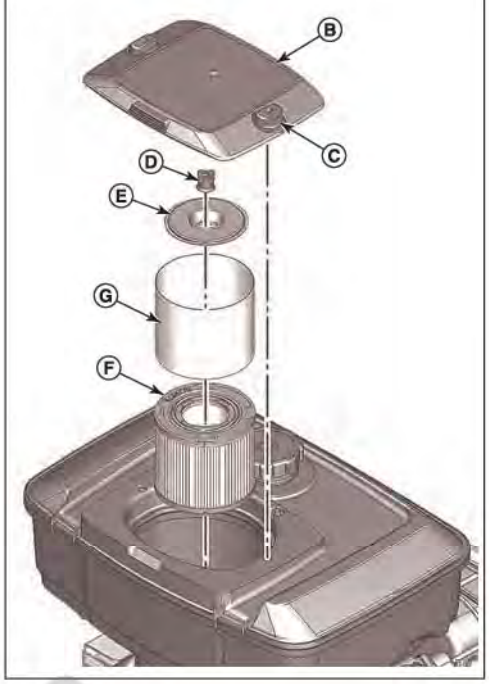

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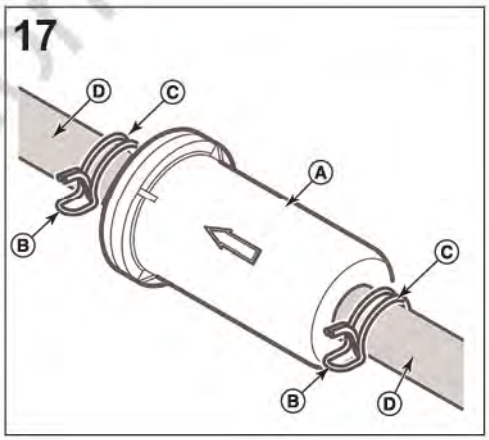

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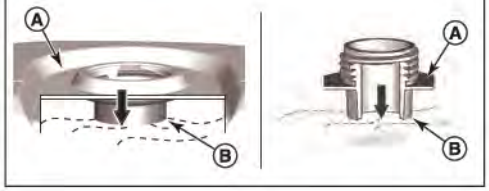


This manual contains safety information to make you aware of the hazards and risks associated with engines and how to avoid them. It also contains instructions for the proper use and care of the engine. Because Briggs & Stratton Corporation does not necessarily know what equipment this engine will power, it is important that you read and understand these instructions and the instructions for the equipment. **Save these original instructions for future reference.**

Note: The figures and illustrations in this manual are provided for reference only and may differ from your specific model. Contact your dealer if you have questions.

For replacement parts or technical assistance, record below the engine model, type, and code numbers along with the date of purchase. These numbers are located on your engine (see the ***Features and Controls*** section).

Date of Purchase	
Engine Model - Type - Trim	
Engine Serial Number	

Look for the 2D barcode located on some engines. When viewed with a 2D-capable device, the code will bring up our website where you can access support information for this product. Data rates apply. Some countries may not have online support information available.

European Office Contact Information

For questions regarding European emissions, please contact our European office at:

Max-Born-Straße 2, 68519 Viernheim, Germany.

Recycling Information

All packaging, used oil, and batteries should be recycled according to applicable government regulations.

Operator Safety

Safety Alert Symbol and Signal Words

The safety alert symbol (⚠) is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.

⚠ **DANGER** indicates a hazard which, if not avoided, **will result in death or serious injury.**

⚠ **WARNING** indicates a hazard which, if not avoided, **could result in death or serious injury.**

⚠ **CAUTION** indicates a hazard which, if not avoided, **could result in minor or moderate injury.**

NOTICE indicates a situation that **could result in damage to the product.**

Hazard Symbols and Meanings

Symbol	Meaning	Symbol	Meaning
	Safety information about hazards that can result in personal injury.		Read and understand the Operator's Manual before operating or servicing the unit.
	Fire hazard		Explosion hazard
	Shock hazard		Toxic fume hazard
	Hot surface hazard		Noise hazard - Ear protection recommended for extended use.
	Thrown object hazard - Wear eye protection.		Explosion hazard
	Frostbite hazard		Kickback hazard
	Amputation hazard - moving parts		Chemical Hazard
	Thermal heat hazard		Corrosive

Safety Messages

⚠ **WARNING**

This product can expose you to chemicals including gasoline engine exhaust, which is known to the State of California to cause cancer, and carbon monoxide, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

⚠ **WARNING**

Briggs & Stratton Engines are not designed for and are not to be used to power: fun-karts; go-karts; children's, recreational, or sport all-terrain vehicles (ATVs); motorbikes; hovercraft; aircraft products; or vehicles used in competitive events not sanctioned by Briggs & Stratton. For information about competitive racing products, see www.briggsracing.com. For use with utility and side-by-side ATVs, please contact Briggs & Stratton Power Application Center, 1-866-927-3349. Improper engine application may result in serious injury or death.

⚠ **WARNING**

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

When Adding Fuel

- Turn engine off and let engine cool at least 2 minutes before removing the fuel cap.
- Fill fuel tank outdoors or in well-ventilated area.
- Do not overfill fuel tank. To allow for expansion of the fuel, do not fill above the bottom of the fuel tank neck.
- Keep fuel away from sparks, open flames, pilot lights, heat, and other ignition sources.

- Check fuel lines, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.
- If fuel spills, wait until it evaporates before starting engine.

When Starting Engine

- Ensure that spark plug, muffler, fuel cap and air cleaner (if equipped) are in place and secured.
- Do not crank engine with spark plug removed.
- If engine floods, set choke (if equipped) to OPEN / RUN position, move throttle (if equipped) to FAST position and crank until engine starts.

When Operating Equipment

- Do not tip engine or equipment at angle which causes fuel to spill.
- Do not choke the carburetor to stop engine.
- Never start or run the engine with the air cleaner assembly (if equipped) or the air filter (if equipped) removed.

When Changing Oil

- If you drain the oil from the top oil fill tube, the fuel tank must be empty or fuel can leak out and result in a fire or explosion.

When Tipping Unit for Maintenance

- When performing maintenance that requires the unit to be tipped, the fuel tank, if mounted on the engine, must be empty or fuel can leak out and result in a fire or explosion.

When Transporting Equipment

- Transport with fuel tank EMPTY or with fuel shut-off valve in the CLOSED position.

When Storing Fuel Or Equipment With Fuel In Tank

- Store away from furnaces, stoves, water heaters or other appliances that have pilot lights or other ignition sources because they can ignite fuel vapors.

WARNING

Starting engine creates sparking.

Sparking can ignite nearby flammable gases.

Explosion and fire could result.

- If there is natural or LP gas leakage in area, do not start engine.
- Do not use pressurized starting fluids because vapors are flammable.

WARNING

POISONOUS GAS HAZARD. Engine exhaust contains carbon monoxide, a poisonous gas that could kill you in minutes. You CANNOT see it, smell it, or taste it. Even if you do not smell exhaust fumes, you could still be exposed to carbon monoxide gas. If you start to feel sick, dizzy, or weak while using this product, get to fresh air RIGHT AWAY. See a doctor. You may have carbon monoxide poisoning.

- Operate this product ONLY outside far away from windows, doors and vents to reduce the risk of carbon monoxide gas from accumulating and potentially being drawn towards occupied spaces.
- Install battery-operated carbon monoxide alarms or plug-in carbon monoxide alarms with battery back-up according to the manufacturer's instructions. Smoke alarms cannot detect carbon monoxide gas.
- DO NOT run this product inside homes, garages, basements, crawlspaces, sheds, or other partially-enclosed spaces even if using fans or opening doors and windows for ventilation. Carbon monoxide can quickly build up in these spaces and can linger for hours, even after this product has shut off.
- ALWAYS place this product downwind and point the engine exhaust away from occupied spaces.

WARNING

Rapid retraction of starter cord (kickback) will pull hand and arm toward engine faster than you can let go.

Broken bones, fractures, bruises or sprains could result.

- When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.
- Remove all external equipment / engine loads before starting engine.
- Direct-coupled equipment components such as, but not limited to, blades, impellers, pulleys, sprockets, etc., must be securely attached.

WARNING

Rotating parts can contact or entangle hands, feet, hair, clothing, or accessories.

Traumatic amputation or severe laceration can result.

- Operate equipment with guards in place.
- Keep hands and feet away from rotating parts.
- Tie up long hair and remove jewelry.
- Do not wear loose-fitting clothing, dangling drawstrings or items that could become caught.

WARNING

Running engines produce heat. Engine parts, especially muffler, become extremely hot.

Severe thermal burns can occur on contact.

Combustible debris, such as leaves, grass, brush, etc. can catch fire.

- Allow muffler, engine cylinder and fins to cool before touching.
- Remove accumulated debris from muffler area and cylinder area.
- It is a violation of California Public Resource Code, Section 4442, to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order. Other states or federal jurisdictions may have similar laws. Contact the original equipment manufacturer, retailer, or dealer to obtain a spark arrester designed for the exhaust system installed on this engine.

WARNING

Unintentional sparking can result in fire or electric shock.

Unintentional start-up can result in entanglement, traumatic amputation, or laceration.

Fire hazard

Before performing adjustments or repairs:

- Disconnect the spark plug wire and keep it away from the spark plug.
- Disconnect battery at negative terminal (only engines with electric start.)
- Use only correct tools.
- Do not tamper with governor spring, links or other parts to increase engine speed.
- Replacement parts must be of the same design and installed in the same position as the original parts. Other parts may not perform as well, may damage the unit, and may result in injury.
- Do not strike the flywheel with a hammer or hard object because the flywheel may later shatter during operation.

When testing for spark:

- Use approved spark plug tester.
- Do not check for spark with spark plug removed.

Features and Controls

Engine Controls

Compare the illustration (Figure: 1, 2, 3, 4) with your engine to familiarize yourself with the location of various features and controls.

A. Engine Identification Numbers **Model - Type - Code**
B. Spark Plug
C. Air Cleaner (without Fuel Tank)
D. Air Cleaner (with Fuel Tank)
E. Dipstick
F. Oil Fill
G. Oil Filter (if equipped)
H. Oil Drain Plug
I. Oil Pressure Sensor
J. Finger Guard
K. Electric Starter
L. Rewind Starter (if equipped)
M. Carburetor - Carburetor Models
N. Muffler (if equipped)
O. Fuel Pump
P. Starter Switch [1]
Q. Throttle Control [1]
R. Choke Control [1]
S. Fuel Filter (if equipped)
T. Fuel Tank (if equipped)
U. Fuel Shut Off (if equipped) [1]
V. Stop Switch (if equipped) [1]
W. Oil Cooler (if equipped)
X. Fuel Pump Module - EFI Models
Y. Electronic Control Module - EFI Models
Z. Fuel Injector - EFI Models

[1] Some engines and equipment have remote controls. See the equipment manual for location and operation of remote controls.

Engine Control Symbols and Meanings

Symbol	Meaning	Symbol	Meaning
	Engine speed - FAST		Engine speed - SLOW
	Engine speed - STOP		ON - OFF
	Engine start - Choke CLOSED		Engine start - Choke OPEN
	Fuel Cap Fuel Shut-off - OPEN		Fuel Shut-off - CLOSED
	Fuel level - Maximum Do not overfill		

Operation

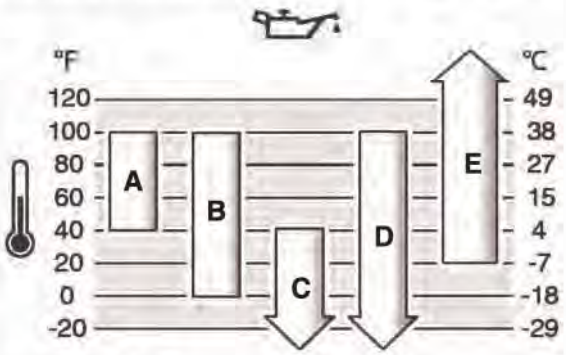
Oil Recommendations

Oil Capacity: See the ***Specifications*** section.

NOTICE
This engine was shipped from Briggs & Stratton without oil. Equipment manufacturers or dealers may have added oil to the engine. Before you start the engine for the first time, make sure to check the oil level and add oil according to the instructions in this manual. If you start the engine without oil, it will be damaged beyond repair and will not be covered under warranty.

We recommend the use of Briggs & Stratton Warranty Certified oils for best performance. Other high-quality detergent oils are acceptable if classified for service SF, SG, SH, SJ or higher. Do not use special additives.

Outdoor temperatures determine the proper oil viscosity for the engine. Use the chart to select the best viscosity for the outdoor temperature range expected. Engines on most outdoor power equipment operate well with 5W-30 Synthetic oil. For equipment operated in hot temperatures, Vanguard™ 15W-50 Synthetic oil provides the best protection.



A	**SAE 30 -** Below 40 °F (4 °C) the use of SAE 30 will result in hard starting.
B	**10W-30 -** Above 80 °F (27 °C) the use of 10W-30 may cause increased oil consumption. Check oil level more frequently.
C	**5W-30**
D	**Synthetic 5W-30**
E	**Vanguard™ Synthetic 15W-50**

Check Oil Level

See Figure: 5

Before adding or checking the oil

- Make sure the engine is level.
- Clean the oil fill area of any debris.

1. Remove the dipstick (A, Figure 5) and wipe with a clean cloth.
2. Fully install the dipstick (A, Figure 5).
3. Remove the dipstick and check the oil level. Correct oil level is at the top of the full indicator (B, Figure 5) on the dipstick.
4. If oil level is low, slowly add oil into the engine oil fill (C, Figure 5). **Do not overfill.** After adding oil, wait one minute and then recheck the oil level.
5. Fully install the dipstick (A, Figure 5).

Low Oil Protection System (if equipped)

Some engines are equipped with a low oil sensor. If the oil is low. the sensor will either activate a warning light or stop the engine. Stop the engine and follow these steps before restarting the engine.

- Make sure the engine is level.
- Check the oil level. See the ***Check Oil Level*** section.
- If the oil level is low, add the proper amount of oil. Start the engine and make sure the warning light (if equipped) is not activated.
- If the oil level is not low, do not start the engine. Contact a Briggs & Stratton Authorized Service Dealer to have the oil problem corrected.

Fuel Recommendations

Fuel must meet these requirements:

- Clean, fresh, unleaded gasoline.
- A minimum of 87 octane/87 AKI (91 RON). High altitude use, see below.
- Gasoline with up to 10% ethanol (gasohol) is acceptable.

NOTICE Do not use unapproved gasolines, such as E15 and E85. Do not mix oil in gasoline or modify the engine to run on alternate fuels. Use of unapproved fuels will damage the engine components, which will not be covered under warranty.

To protect the fuel system from gum formation, mix a fuel stabilizer into the fuel. See ***Storage.*** All fuel is not the same. If starting or performance problems occur, change fuel providers or change brands. This engine is certified to operate on gasoline. The emissions control system for this engine is EM (Engine Modifications).

High Altitude

At altitudes over 5,000 feet (1524 meters), a minimum 85 octane/85 AKI (89 RON) gasoline is acceptable.

For carbureted engines, high altitude adjustment is required to maintain performance. Operation without this adjustment will cause decreased performance, increased fuel consumption, and increased emissions. Contact a Briggs & Stratton Authorized Service Dealer for high altitude adjustment information. Operation of the engine at altitudes below 2,500 feet (762 meters) with the high altitude adjustment is not recommended.

For Electronic Fuel Injection (EFI) engines, no high altitude adjustment is necessary.

Add Fuel

See Figure: 6

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

When adding fuel

- Turn engine off and let engine cool at least 2 minutes before removing the fuel cap.
- Fill fuel tank outdoors or in well-ventilated area.
- Do not overfill fuel tank. To allow for expansion of the fuel, do not fill above the bottom of the fuel tank neck.
- Keep fuel away from sparks, open flames, pilot lights, heat, and other ignition sources.
- Check fuel lines, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.
- If fuel spills, wait until it evaporates before starting engine.

1. Clean the fuel cap area of dirt and debris. Remove the fuel cap.
2. Fill the fuel tank (A, Figure 6) with fuel. To allow for expansion of the fuel, do not fill above the bottom of the fuel tank neck (B).
3. Reinstall the fuel cap.

Start and Stop Engine

See Figure: 7, 8, 9, 10

Start Engine

WARNING

Rapid retraction of starter cord (kickback) will pull hand and arm toward engine faster than you can let go.

Broken bones, fractures, bruises or sprains could result.

- When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

When Starting Engine

- Ensure that spark plug, muffler, fuel cap and air cleaner (if equipped) are in place and secured.
- Do not crank engine with spark plug removed.
- If engine floods, set choke (if equipped) to OPEN / RUN position, move throttle (if equipped) to FAST position and crank until engine starts.

WARNING

POISONOUS GAS HAZARD. Engine exhaust contains carbon monoxide, a poisonous gas that could kill you in minutes. You CANNOT see it, smell it, or taste it. Even if you do not smell exhaust fumes, you could still be exposed to carbon monoxide gas. If you start to feel sick, dizzy, or weak while using this product, shut it off and get to fresh air RIGHT AWAY. See a doctor. You may have carbon monoxide poisoning.

- Operate this product ONLY outside far away from windows, doors and vents to reduce the risk of carbon monoxide gas from accumulating and potentially being drawn towards occupied spaces.
- Install battery-operated carbon monoxide alarms or plug-in carbon monoxide alarms with battery back-up according to the manufacturer's instructions. Smoke alarms cannot detect carbon monoxide gas.
- DO NOT run this product inside homes, garages, basements, crawlspaces, sheds, or other partially-enclosed spaces even if using fans or opening doors and windows for ventilation. Carbon monoxide can quickly build up in these spaces and can linger for hours, even after this product has shut off.
- ALWAYS place this product downwind and point the engine exhaust away from occupied spaces.

NOTICE This engine was shipped from Briggs & Stratton without oil. Before you start the engine, make sure you add oil according to the instructions in this manual. If you start the engine without oil, it will be damaged beyond repair and will not be covered under warranty.

Determine The Starting System

Before starting the engine, you must determine the type of starting system that is on your engine. Your engine will have one of the following types.

- **Electronic Fuel Injection (EFI) System:** This features Electronic Fuel Injection. It does not have a choke or a primer.
- **Electronic Fuel Management System:** This features an Electronic Control Unit that monitors engine and temperature conditions. It does not have a manual choke or a primer.
- **Choke System:** This features a choke to be used for starting in cool temperatures. Some models will have a separate choke control while others will have a combination choke and throttle control. This type does not have a primer.

Note: Equipment may have remote controls. See the equipment manual for location and operation of remote controls.

Electronic Fuel Injection (EFI) System

1. Check the engine oil. See the ***Check Oil Level*** section.
2. Make sure equipment drive controls, if equipped, are disengaged.
3. Move the fuel shut-off (A, Figure 7), if equipped, to the OPEN position.
4. Push the stop switch (F, Figure 7, 8), if equipped, to the ON position.
5. Move the throttle control (B, Figure 8), if equipped, to the FAST position. Operate the engine in the FAST position.
6. **Rewind Start, if equipped with key switch:** Turn the key switch (D, Figure 7, 8) to the ON position.
7. **Rewind Start, if equipped:** Firmly hold the starter cord handle (E, Figure 7, 8). Pull the starter cord handle slowly until resistance is felt, then pull rapidly.

WARNING

Rapid retraction of the starter cord (kickback) will pull your hand and arm toward the engine faster than you can let go. Broken bones, fractures, bruises or sprains could result. When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.

8. **Electric Start, if equipped:** Turn the electric start switch (D, Figure 7, 8) to the ON or START position.

NOTICE To extend the life of the starter, use short starting cycles (five seconds maximum). Wait one minute between starting cycles.

Note: If the engine does not start after repeated attempts, contact you local dealer or go to **VanguardEngines.com** or call **1-800-999-9333** (in USA).

Electronic Fuel Management System

1. Check the engine oil. See the ***Check Oil Level*** section.
2. Make sure equipment drive controls, if equipped, are disengaged.
3. Move the fuel shut-off (A, Figure 7), if equipped, to the OPEN position.
4. Push the stop switch (F, Figure 7, 8), if equipped, to the ON position.
5. Move the throttle control (B, Figure 8), if equipped, to the FAST position. Operate the engine in the FAST position.
6. **Rewind Start, if equipped with key switch:** Turn the key switch (D, Figure 7, 8) to the ON position.
7. **Rewind Start, if equipped:** Firmly hold the starter cord handle (E, Figure 7, 8). Pull the starter cord handle slowly until resistance is felt, then pull rapidly.

WARNING

Rapid retraction of the starter cord (kickback) will pull your hand and arm toward the engine faster than you can let go. Broken bones, fractures, bruises or sprains could result. When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.

8. **Electric Start, if equipped:** Turn the electric start switch (D, Figure 7, 8) to the ON or START position.

NOTICE To extend the life of the starter, use short starting cycles (five seconds maximum). Wait one minute between starting cycles.

Note: If the engine does not start after repeated attempts, contact your local dealer or go to **VanguardEngines.com** or call **1-800-999-9333** (in USA).

Choke System

1. Check the engine oil. See the ***Check Oil Level*** section.
2. Make sure equipment drive controls, if equipped, are disengaged.
3. Move the fuel shut-off (A, Figure 7), if equipped, to the OPEN position.
4. Push the stop switch (F, Figure 7, 8), if equipped, to the ON position.
5. Move the throttle control (B, Figure 8), if equipped, to the FAST position. Operate the engine in the FAST position.
6. Move the choke control (C, Figure 9, 10) to the CLOSED position.

Note: Choke is usually unnecessary when restarting a warm engine.

7. **Rewind Start, if equipped with key switch:** Turn the key switch (D, Figure 7, 8) to the ON position.
8. **Rewind Start, if equipped:** Firmly hold the starter cord handle (E, Figure 7, 8). Pull the starter cord handle slowly until resistance is felt, then pull rapidly.

WARNING

Rapid retraction of the starter cord (kickback) will pull your hand and arm toward the engine faster than you can let go. Broken bones, fractures, bruises or sprains could result. When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.

9. **Electric Start, if equipped:** Turn the key switch (D, Figure 7, 8) to the ON or START position.

NOTICE To extend the life of the starter, use short starting cycles (five seconds maximum). Wait one minute between starting cycles.

10. As the engine warms up, move the choke control (C, Figure 9, 10), if equipped, to the OPEN position.

Note: If the engine does not start after repeated attempts, contact you local dealer or go to **VanguardEngines.com** or call **1-800-999-9333** (in USA).

Stop Engine

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

- Do not choke the carburetor, if equipped, to stop the engine.

1. **Stop Switch, if equipped:** Move the stop switch (F, Figure 7, 8) to the OFF position. **Key Switch, if equipped:** With the throttle control, if equipped, in the SLOW position, turn the key switch (D, Figure 7, 8) to the OFF position. Remove the key and keep in a safe place out of the reach of children.
2. After the engine stops, move the fuel shut-off (A, Figure 7), if equipped, to the CLOSED position.

Maintenance

NOTICE If the engine is tipped during maintenance, the fuel tank, if mounted on engine, must be empty and the spark plug side must be up. If the fuel tank is not empty and if the engine is tipped in any other direction, it may be difficult to start due to oil or gasoline contaminating the air filter and/or the spark plug.

WARNING

When performing maintenance that requires the unit to be tipped, the fuel tank, if mounted on the engine, must be empty or fuel can leak out and result in a fire or explosion.

We recommend that you see any Briggs & Stratton Authorized Service Dealer for all maintenance and service of the engine and engine parts.

NOTICE All the components used to build this engine must remain in place for proper operation.

WARNING

Unintentional sparking can result in fire or electric shock.

Unintentional start-up can result in entanglement, traumatic amputation, or laceration.

Fire hazard

Before performing adjustments or repairs:

- Disconnect the spark plug wire and keep it away from the spark plug.
- Disconnect battery at negative terminal (only engines with electric start.)
- Use only correct tools.
- Do not tamper with governor spring, links or other parts to increase engine speed.
- Replacement parts must be of the same design and installed in the same position as the original parts. Other parts may not perform as well, may damage the unit, and may result in injury.
- Do not strike the flywheel with a hammer or hard object because the flywheel may later shatter during operation.

When testing for spark:

- Use approved spark plug tester.
- Do not check for spark with spark plug removed.

Emissions Control Service

Maintenance, replacement, or repair of the emissions control devices and systems may be performed by any off-road engine repair establishment or individual. However, to obtain "no charge" emissions control service, the work must be performed by a factory authorized dealer. See the Emissions Control Statements.

Maintenance Schedule

Every 8 Hours or Daily

• Check engine oil level • Clean area around muffler and controls
Every 100 Hours or Annually
• Replace spark plugs • Change engine oil • Replace oil filter (if equipped) • Service air filter [1] • Clean pre-cleaner (if equipped) [1] • Service exhaust system
Every 250 Hours
• Check valve clearance. Adjust if necessary.
Every 400 Hours or Annually
• Replace air filter • Replace fuel filter • Service cooling system [1] • Clean oil cooler fins [1]

[1] In dusty conditions or when airborne debris is present, clean more often.

Electronic Fuel Injection (EFI) System

The EFI System monitors engine temperature, engine speed, and battery voltage for engine starting and warm up. There are no adjustments on the system. If starting or operation problems occur, contact a Briggs & Stratton Authorized Service Dealer.

NOTICE Make sure to follow the steps below or the EFI System could be damaged.

- Never start the engine if the battery cables are loose.
- Turn the key to the off position before disconnecting, removing and or installing the battery.
- Never use a battery charger to start the engine.
- Never disconnect the battery cables while the engine is running.
- When connecting the battery cables, first connect the positive (+) cable and then connect the negative (-) cable to the battery.
- When charging the battery, turn the ignition switch to the off position and disconnect the negative (-) battery cable from the battery.
- Do not spray water directly on the Electronic Control Module.

Electronic Fuel Management System

The Electronic Fuel Management System monitors engine temperature, engine speed, and battery voltage to adjust the choke during engine starting and warm up. There are no adjustments on the system. If starting or operation problems occur, contact an Authorized Briggs & Stratton Dealer.

NOTICE Make sure to follow the steps below or the Electronic Fuel Management System could be damaged.

- Never start the engine if the battery cables are loose.
- Turn the key to the off position before disconnecting, removing and / or installing the battery.
- Never use a battery charger to start the engine.
- Never disconnect the battery cables while the engine is running.
- When connecting the battery cables, first connect the positive (+) cable and then connect the negative (-) cable to the battery.
- When charging the battery, turn the ignition switch to the off position and disconnect the negative (-) battery cable from the battery.
- Do not spray water directly on the Electronic Control Unit.

Carburetor and Engine Speed

Never make adjustments to the carburetor or engine speed. The carburetor was set at the factory to operate efficiently under most conditions. Do not tamper with the governor spring, linkages, or other parts to change the engine speed. If any adjustments are required contact a Briggs & Stratton Authorized Service Dealer for service.

NOTICE The equipment manufacturer specifies the maximum speed for the engine as installed on the equipment. **Do not exceed** this speed. If you are unsure what the equipment maximum speed is, or what the engine speed is set to from the factory, contact a Briggs & Stratton Authorized Service Dealer for assistance. For safe and proper operation of the equipment, the engine speed should be adjusted only by a qualified service technician.

Service Spark Plug

See Figure: 11

Check the gap (A, Figure 11) with a wire gauge (B). If necessary, reset the gap. Install and tighten the spark plug to the recommended torque. For gap setting or torque, see the ***Specifications*** section.

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

Service Exhaust System

WARNING

Running engines produce heat. Engine parts, especially muffler, become extremely hot.

Severe thermal burns can occur on contact.

Combustible debris, such as leaves, grass, brush, etc. can catch fire.

- Allow muffler, engine cylinder and fins to cool before touching.
- Remove accumulated debris from muffler area and cylinder area.
- It is a violation of California Public Resource Code, Section 4442, to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order. Other states or federal jurisdictions may have similar laws. Contact the original equipment manufacturer, retailer, or dealer to obtain a spark arrester designed for the exhaust system installed on this engine.

Remove accumulated debris from muffler and cylinder area. Inspect the muffler for cracks, corrosion, or other damage. Remove the deflector or the spark arrester, if equipped, and inspect for damage or carbon blockage. If damage is found, install replacement parts before operating.

WARNING

Replacement parts must be of the same design and installed in the same position as the original parts. Other parts may not perform as well, may damage the unit, and may result in injury.

Change Engine Oil

See Figure: 12, 13, 14

Used oil is a hazardous waste product and must be disposed of properly. Do not discard with household waste. Check with your local authorities, service center, or dealer for safe disposal/recycling facilities.

Remove Oil

1. With engine off but still warm, disconnect the spark plug wire(s) (D, Figure 12) and keep it away from the spark plug(s) (E).
2. Remove the dipstick (A, Figure 13).
3. Remove the oil drain plug (F, Figure 14). Drain the oil into an approved container.
4. After the oil has drained, install and tighten the oil drain plug (F, Figure 14).

Change Oil Filter, if equipped

Some models are equipped with an oil filter. For replacement intervals, see the ***Maintenance Schedule.***

1. Drain the oil from the engine. See ***Remove Oil*** section.
2. Remove the oil filter (G, Figure 14) and dispose of properly.
3. Before you install the new oil filter, lightly lubricate the oil filter gasket wil fresh, clean oil.

4. Install the oil filter by hand until the gasket contacts the oil filter adapter, then tighten the oil filter 1/2 to 3/4 turns.
5. Add oil. See ***Add Oil*** section.
6. Start and run the engine. As the engine warms up, check for oil leaks.
7. Stop the engine and check the oil level. Correct oil level is at the top of the full indicator (B, Figure 13) on the dipstick.

Add Oil

- Make sure the engine is level.
- Clean the oil fill area of any debris.
- See the ***Specifications*** section for oil capacity.

1. Remove the dipstick (A, Figure 13) and wipe with a clean cloth.
2. Slowly pour oil into the engine oil fill (C, Figure 13). **Do not overfill.** After adding oil, wait one minute and then check the oil level.
3. Install and tighten the dipstick (A, Figure 13).
4. Remove the dipstick and check the oil level. Correct oil level is at the top of the full indicator (B, Figure 13) on the dipstick.
5. Reinstall and tighten the dipstick (A, Figure 13).
6. Connect the spark plug wire(s) (D, Figure 12) to the spark plug(s) (E).

Service Air Filter

See Figure: 15, 16

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

- Never start and run the engine with the air cleaner assembly (if equipped) or the air filter (if equipped) removed.

NOTICE Do not use pressurized air or solvents to clean the filter. Pressurized air can damage the filter and solvents will dissolve the filter.

See the ***Maintenance Schedule*** for service requirements.

1. **Models without Fuel Tank:** Open the fastener(s) (A, Figure 15) and remove the cover (B).
2. **Models with Fuel Tank:** Remove the fastener(s) (C, Figure 16) and the cover (B).
3. Remove the nut (D, Figure 15, 16) and retainer (E).
4. Remove the air filter (F, Figure 15, 16).
5. Remove the pre-cleaner (G, Figure 15, 16), if equipped, from the air filter (F).
6. To loosen debris, gently tap the air filter (F, Figure 15, 16) on a hard surface. If the air filter is excessively dirty, replace with a new air filter.
7. Wash the pre-cleaner (G, Figure 15, 16) in liquid detergent and water. Allow the pre-cleaner to air dry. **Do not** oil the pre-cleaner.
8. Assemble the dry pre-cleaner (G, Figure 15, 16), if equipped, to the air filter (F).
9. Install the air filter (F, Figure 15, 16) and secure with retainer (E) and nut (D).
10. Install and secure the cover (B, Figure 15, 16).

Service Fuel System

See Figure: 17

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

- Keep fuel away from sparks, open flames, pilot lights, heat, and other ignition sources.
- Check fuel lines, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.
- Before cleaning or replacing the fuel filter, drain the fuel tank or close the fuel shut-off valve.
- If fuel spills, wait until it evaporates before starting engine.
- Replacement parts must be the same and installed in the same position as the original parts.

Fuel Filter, if equipped

1. Before replacing the fuel filter (A, Figure 17), if equipped, drain the fuel tank or close the fuel shut-off valve. Otherwise, fuel can leak out and cause a fire or explosion.
2. Use pliers to squeeze tabs (B, Figure 17) on the clamps (C), then slide the clamps away from the fuel filter (A). Twist and pull the fuel lines (D) off of the fuel filter.
3. Check the fuel lines (D, Figure 17) for cracks or leaks. Replace if necessary.
4. Replace the fuel filter (A, Figure 17) with an original equipment replacement filter.
5. Secure the fuel lines (D, Figure 17) with clamps (C) as shown.

Service Cooling System

WARNING

Running engines produce heat. Engine parts, especially muffler, become extremely hot.

Severe thermal burns can occur on contact.

Combustible debris, such as leaves, grass, brush, etc., can catch fire.

- Allow muffler, engine cylinder and fins to cool before touching.
- Remove accumulated debris from muffler area and cylinder area.

NOTICE Do not use water to clean the engine. Water could contaminate the fuel system. Use a brush or dry cloth to clean the engine.

This is an air cooled engine. Dirt or debris can restrict air flow and cause the engine to overheat, resulting in poor performance and reduced engine life.

1. Use a brush or dry cloth to remove debris from the air intake grille.
2. Keep linkage, springs and controls clean.
3. Keep the area around and behind the muffler, if equipped, free of any combustible debris.
4. Make sure the oil cooler fins, if equipped, are free of dirt and debris.

After a period of time, debris can accumulate in the cylinder cooling fins and cause the engine to overheat. This debris cannot be removed without partial disassembly of the engine. Have a Briggs & Stratton Authorized Service Dealer inspect and clean the air cooling system as recommended in the ***Maintenance Schedule.***

Storage

WARNING

Fuel and its vapors are extremely flammable and explosive.

Fire or explosion can cause severe burns or death.

When Storing Fuel Or Equipment With Fuel In Tank

- Store away from furnaces, stoves, water heaters or other appliances that have pilot lights or other ignition sources because they can ignite fuel vapors.

Fuel System

See Figure: 18

Store the engine level (normal operating position). Fill fuel tank (A, Figure 18) with fuel. To allow for expansion of fuel, do not overfill above the fuel tank neck (B).

Fuel can become stale when stored over 30 days. Stale fuel causes acid and gum deposits to form in the fuel system or on essential carburetor parts. To keep fuel fresh, use **Briggs & Stratton Advanced Formula Fuel Treatment & Stabilizer**, available wherever Briggs & Stratton genuine service parts are sold.

There is no need to drain gasoline from the engine if a fuel stabilizer is added according to instructions. Run the engine for two (2) minutes to circulate the stabilizer throughout the fuel system before storage.

If gasoline in the engine has not been treated with a fuel stabilizer, it must be drained into an approved container. Run the engine until it stops from lack of fuel. The use of a fuel stabilizer in the storage container is recommended to maintain freshness.

Engine Oil

While the engine is still warm, change the engine oil. See the ***Change Engine Oil*** section.

Troubleshooting

For assistance, contact your local dealer or go to **VanguardEngines.com** or call **1-800-999-9333** (in USA).

Specifications

Model: 290000, 300000	
Displacement	29.23 ci (479 cc)
Bore	2.677 in (68 mm)
Stroke	2.598 in (66 mm)
Oil Capacity	46 - 48 oz (1,36 - 1,42 L)
Spark Plug Gap	.030 in (,76 mm)
Spark Plug Torque	180 lb-in (20 Nm)
Armature Air Gap - Carburetor Models	.008 - .012 in (,20 - ,30 mm)
Intake Valve Clearance	.004 - .006 in (,10 - ,15 mm)
Exhaust Valve Clearance	.004 - .006 in (,10 - ,15 mm)

Model: 350000	
Displacement	34.78 ci (570 cc)
Bore	2.835 in (72 mm)
Stroke	2.756 in (70 mm)
Oil Capacity	46 - 48 oz (1,36 - 1,42 L)
Spark Plug Gap	.030 in (,76 mm)
Spark Plug Torque	180 lb-in (20 Nm)
Armature Air Gap - Carburetor Models	.008 - .012 in (,20 - ,30 mm)
Intake Valve Clearance	.004 - .006 in (,10 - ,15 mm)
Exhaust Valve Clearance	.004 - .006 in (,10 - ,15 mm)

Model: 380000	
Displacement	38.26 ci (627 cc)
Bore	2.972 in (75,5 mm)
Stroke	2.756 in (70 mm)
Oil Capacity	46 - 48 oz (1,36 - 1,42 L)
Spark Plug Gap	.030 in (,76 mm)
Spark Plug Torque	180 lb-in (20 Nm)
Armature Air Gap - Carburetor Models	.008 - .012 in (,20 - ,30 mm)
Intake Valve Clearance	.004 - .006 in (,10 - ,15 mm)
Exhaust Valve Clearance	.004 - .006 in (,10 - ,15 mm)

Engine power will decrease 3.5% for each 1,000 feet (300 meters) above sea level and 1% for each 10° F (5.6° C) above 77° F (25° C). The engine will operate satisfactorily at an angle up to 15°. Refer to the equipment operator's manual for safe allowable operating limits on slopes.

Service Parts - Model: 290000, 300000, 350000, 380000	
Service Part	**Part Number**
Air Filter (with fuel tank, Figure 16)	383857
Air Filter (except Model 380000, Figure 15)	394018
Air Filter (Model 380000, Figure 15)	692519
Air Filter Pre-cleaner (with fuel tank, Figure 16)	271794
Air Filter Pre-cleaner (except Model 380000, Figure 15)	272490
Air Filter Pre-cleaner (Model 380000, Figure 15)	692520
Oil - SAE 30	100028
Oil Filter	842921
Fuel Filter (with fuel tank)	808116
Fuel Filter (with fuel pump)	845125

Service Parts - Model: 290000, 300000, 350000, 380000	
Fuel Filter (without fuel pump)	298090
Advanced Formula Fuel Treatment & Stabilizer	100117, 100120
Resistor Spark Plug	491055
Long Life Platinum Spark Plug	696202, 5066
Spark Plug Wrench	19374
Spark Tester	19368

We recommend that you see any Briggs & Stratton Authorized Dealer for all maintenance and service of the engine and engine parts.

Power Ratings: The gross power rating for individual gasoline engine models is labeled in accordance with SAE (Society of Automotive Engineers) code J1940 Small Engine Power & Torque Rating Procedure, and is rated in accordance with SAE J1995. Torque values are derived at 2600 RPM for those engines with "rpm" called out on the label and 3060 RPM for all others; horsepower values are derived at 3600 RPM. The gross power curves can be viewed at www.BRIGGSandSTRATTON.COM. Net power values are taken with exhaust and air cleaner installed whereas gross power values are collected without these attachments. Actual gross engine power will be higher than net engine power and is affected by, among other things, ambient operating conditions and engine-to-engine variability. Given the wide array of products on which engines are placed, the gasoline engine may not develop the rated gross power when used in a given piece of power equipment. This difference is due to a variety of factors including, but not limited to, the variety of engine components (air cleaner, exhaust, charging, cooling, carburetor, fuel pump, etc.), application limitations, ambient operating conditions (temperature, humidity, altitude), and engine-to-engine variability. Due to manufacturing and capacity limitations, Briggs & Stratton may substitute an engine of higher rated power for this engine.

Warranty

Briggs & Stratton Engine Warranty

Effective January 2018

Limited Warranty

Briggs & Stratton warrants that, during the warranty period specified below, it will repair or replace, free of charge, any part that is defective in material or workmanship or both. Transportation charges on product submitted for repair or replacement under this warranty must be borne by purchaser. This warranty is effective for and is subject to the time periods and conditions stated below. For warranty service, find the nearest Authorized Service Dealer in our dealer locator map at BRIGGSandSTRATTON.COM. The purchaser must contact the Authorized Service Dealer, and then make the product available to the Authorized Service Dealer for inspection and testing.

There is no other express warranty. Implied warranties, including those of merchantability and fitness for a particular purpose, are limited to the warranty period listed below, or to the extent permitted by law. Liability for incidental or consequential damages are excluded to the extent exclusion is permitted by law. Some states or countries do not allow limitations on how long an implied warranty lasts, and some states or countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state and country to country [4].

Standard Warranty Terms [1, 2, 3]

Brand / Product Name	Consumer Use	Commercial Use
Vanguard™; Commercial Series [3]	36 months	36 months
Engines Featuring Dura-Bore™ Cast Iron Sleeve	24 months	12 months
All Other Engines	24 months	3 months

[1] These are our standard warranty terms, but occasionally there may be additional warranty coverage that was not determined at time of publication. For a listing of current warranty terms for your engine, go to BRIGGSandSTRATTON.com or contact your Briggs & Stratton Authorized Service Dealer.
[2] There is no warranty for engines on equipment used for prime power in place of a utility; standby generators used for commercial purposes, utility vehicles exceeding 25 MPH, or engines used in competitive racing or on commercial or rental tracks.
[3] Vanguard installed on standby generators: 24 months consumer use, no warranty commercial use. Commercial Series with manufacturing date before July 2017: 24 months consumer use, 24 months commercial use.
[4] In Australia - Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure. For warranty service, find the nearest Authorized Service Dealer in our dealer locator map at BRIGGSandSTRATTON.COM, or by calling 1300 274 447, or by emailing or writing

to salesenquiries@briggsandstratton.com.au, Briggs & Stratton Australia Pty Ltd, 1 Moorebank Avenue, Moorebank, NSW , Australia, 2170.

The warranty period begins on the original date of purchase by the first retail or commercial consumer. "Consumer use" means personal residential household use by a retail consumer. "Commercial use" means all other uses, including use for commercial, income producing or rental purposes. Once an engine has experienced commercial use, it shall thereafter be considered as a commercial use engine for purposes of this warranty.

Save your proof of purchase receipt. If you do not provide proof of the initial purchase date at the time warranty service is requested, the manufacturing date of the product will be used to determine the warranty period. Product registration is not required to obtain warranty service on Briggs & Stratton products.

About Your Warranty

This limited warranty covers engine-related material and/or workmanship issues only, and not replacement or refund of the equipment to which the engine may be mounted. Routine maintenance, tune-ups, adjustments, or normal wear and tear are not covered under this warranty. Similarly, warranty is not applicable if the engine has been altered or modified or if the engine serial number has been defaced or removed. This warranty does not cover engine damage or performance problems caused by:

1. The use of parts that are not original Briggs & Stratton parts;
2. Operating the engine with insufficient, contaminated, or an incorrect grade of lubricating oil;
3. The use of contaminated or stale fuel, gasoline formulated with ethanol greater than 10%, or the use of alternative fuels such as liquefied petroleum or natural gas on engines not originally designed/manufactured by Briggs & Stratton to operate on such fuels;
4. Dirt which entered the engine because of improper air cleaner maintenance or re-assembly;
5. Striking an object with the cutter blade of a rotary lawn mower, loose or improperly installed blade adapters, impellers, or other crankshaft coupled devices, or excessive v-belt tightness;
6. Associated parts or assemblies such as clutches, transmissions, equipment controls, etc., which are not supplied by Briggs & Stratton;
7. Overheating due to grass clippings, dirt and debris, or rodent nests which plug or clog the cooling fins or flywheel area, or by operating the engine without sufficient ventilation;
8. Excessive vibration due to over-speeding, loose engine mounting, loose or unbalanced cutter blades or impellers, or improper coupling of equipment components to the crankshaft;
9. Misuse, lack of routine maintenance, shipping, handling, or warehousing of equipment, or improper engine installation.

Warranty service is available only through Briggs & Stratton Authorized Service Dealers. Locate your nearest Authorized Service Dealer in our dealer locator map at BRIGGSandSTRATTON.COM or by calling 1-800-233-3723 (in USA).

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Briggs & Stratton Emissions Warranty

California, U.S. EPA, and Briggs & Stratton Corporation Emissions Control Warranty Statement - Your Warranty Rights and Obligations

For Briggs & Stratton Engine Models with "F" Trim Designation (Model-Type-Trim Representation xxxxxx xxxx Fx)

The California Air Resources Board, U.S. EPA, and Briggs & Stratton (B&S) are pleased to explain the emissions control system warranty on your Model Year 2017-2019 engine/equipment. In California, new small off-road engines and large spark ignited engines less than or equal to 1.0 liter must be designed, built, and equipped to meet the State's stringent anti-smog standards. B&S must warrant the emissions control system on your engine/equipment for the periods of time listed below provided there has been no abuse, neglect, or improper maintenance of your engine/equipment.

Your exhaust emissions control system may include parts such as the carburetor or fuel injection system, ignition system, and catalytic converter. Also included may be hoses, belts, connectors, sensors, and other emissions-related assemblies. Your evaporative emission control system may include parts such as: carburetors, fuel tanks, fuel lines, fuel caps, valves, canisters, filters, vapor hoses, clamps, connectors, and other associated components.

Where a warrantable condition exists, B&S will repair your engine/equipment at no cost to you including diagnosis, parts, and labor.

Manufacturer's Warranty Coverage:

Small off-road engines and large spark ignited engines less than or equal to 1.0 liter, and any related emissions components of the equipment, are warranted for two years, or for the time period listed in the respective engine or product warranty statement, whichever is greater. If any emissions-related part on your B&S engine/equipment is defective, the part will be repaired or replaced by B&S.

Owner's Warranty Responsibilities:

- As the engine/equipment owner, you are responsible for the performance of the required maintenance listed in your Operator's Manual. B&S recommends that you retain all receipts covering maintenance on your engine/equipment, but B&S cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.
- As the engine/equipment owner, you should however be aware that B&S may deny you warranty coverage if your engine/equipment or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications.
- You are responsible for presenting your engine/equipment to a B&S distribution center, servicing dealer, or other equivalent entity, as applicable, as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days. If you have any questions regarding your warranty rights and responsibilities, you should contact B&S at 1-800-444-7774 (in USA) or BRIGGSandSTRATTON.COM.

Briggs & Stratton Emissions Control Warranty Provisions

The following are specific provisions relative to your Emissions Control Warranty Coverage. It is in addition to the B&S engine warranty for non-regulated engines found in the Operator's Manual.

1. Warranted Emissions Parts
   Coverage under this warranty extends only to the parts listed below (the emissions control systems parts) to the extent these parts were present on the B&S engine and/or B&S supplied fuel system.

   a. Fuel Metering System
      - Cold start enrichment system (soft choke)
      - Carburetor or fuel injection system
      - Oxygen sensor
      - Electronic control unit
      - Fuel pump module
      - Fuel line, fuel line fittings, clamps
      - Fuel tank, cap and tether
      - Carbon canister

   b. Air Induction System
      - Air cleaner
      - Intake manifold
      - Purge and vent line

   c. Ignition System
      - Spark plug(s)
      - Magneto ignition system

   d. Catalyst System
      - Catalytic converter
      - Exhaust manifold
      - Air injection system or pulse value

   e. Miscellaneous Items Used in Above Systems
      - Vacuum, temperature, position, time sensitive valves and switches
      - Connectors and assemblies

2. Length of Coverage
   Coverage is for a period of two years from date of original purchase, or for the time period listed in the respective engine or product warranty statement, whichever is greater. B&S warrants to the original purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board; that it is free from defects in material and workmanship that could cause the failure of a warranted part; and that it is identical in all material respects to the engine described in the manufacturer's application for certification. The warranty period begins on the date the engine is originally purchased.

   The warranty on emissions-related parts is as follows:

   - Any warranted part that is not scheduled for replacement as required maintenance in the Operator's Manual supplied, is warranted for the warranty

period stated above. If any such part fails during the period of warranty coverage, the part will be repaired or replaced by B&S at no charge to the owner. Any such part repaired or replaced under the warranty will be warranted for the remaining warranty period.

- Any warranted part that is scheduled only for regular inspection in the Operator's Manual supplied, is warranted for the warranty period stated above. Any such part repaired or replaced under warranty will be warranted for the remaining warranty period.
- Any warranted part that is scheduled for replacement as required maintenance in the Operator's Manual supplied, is 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 B&S at no charge to the owner. 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.
- Add-on or modified parts that are not exempted by the Air Resources Board may not be used. The use of any non-exempted add-on or modified parts by the owner will be grounds for disallowing a warranty claim. The manufacturer will not be liable to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part.

3. Consequential Coverage
   Coverage shall extend to the failure of any engine components caused by the failure of any warranted emissions parts.
4. Claims and Coverage Exclusions
   Warranty claims shall be filed according to the provisions of the B&S engine warranty policy. Warranty coverage does not apply to failures of emissions parts that are not original equipment B&S parts or to parts that fail due to abuse, neglect, or improper maintenance as set forth in the B&S engine warranty policy. B&S is not liable for warranty coverage of failures of emissions parts caused by the use of add-on or modified parts.

Look For Relevant Emissions Durability Period and Air Index Information On Your Small Off-Road Engine Emissions Label

Engines that are certified to meet the California Air Resources Board (CARB) small off-road Emissions Standard must display information regarding the Emissions Durability Period and the Air Index. Briggs & Stratton makes this information available to the consumer on our emissions labels. The engine emissions label will indicate certification information.

The **Emissions Durability Period** describes the number of hours of actual running time for which the engine is certified to be emissions compliant, assuming proper maintenance in accordance with the Operator's Manual. The following categories are used:

Moderate:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 50 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 125 hours of actual engine running time.

Intermediate:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 125 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 250 hours of actual engine running time.

Extended:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 300 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 500 hours of actual engine running time.

For example, a typical walk-behind lawn mower is used 20 to 25 hours per year. Therefore, the **Emissions Durability Period** of an engine with an **intermediate** rating would equate to 10 to 12 years.

Briggs & Stratton engines are certified to meet the United States Environmental Protection Agency (USEPA) Phase 2 or Phase 3 emissions standards. The Emissions Compliance Period referred to on the Emissions Compliance label indicates the number of operating hours for which the engine has been shown to meet Federal emissions requirements.

For engines at or less than 80 cc displacement:

Category C = 50 hours, Category B = 125 hours, Category A = 300 hours

For engines greater than 80 cc displacement and less than 225 cc displacement:

Category C = 125 hours, Category B = 250 hours, Category A = 500 hours

For engines of 225 cc or more displacement:

Category C = 250 hours, Category B = 500 hours, Category A = 1000 hours

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California, U.S. EPA, and Briggs & Stratton Corporation Emissions Control Warranty Statement - Your Warranty Rights and Obligations

For Briggs & Stratton Engine Models with "B" or "G" Trim Designation (Model-Type-Trim Representation xxxxxx xxxx Bx or xxxxxx xxxx Gx)

The California Air Resources Board, U.S. EPA, and Briggs & Stratton (B&S) are pleased to explain the emissions control system warranty on your Model Year 2017-2019 engine. In California, new small off-road engines and large spark ignited engines less than or equal to 1.0 liter must be designed, built, and equipped to meet the State's stringent anti-smog standards. B&S must warrant the emissions control system on your engine for the periods of time listed below provided there has been no abuse, neglect, or improper maintenance of your engine.

Your exhaust emissions control system may include parts such as the carburetor or fuel injection system, ignition system, and catalytic converter. Also included may be hoses, belts, connectors, sensors, and other emissions-related assemblies.

Where a warrantable condition exists, B&S will repair your engine at no cost to you including diagnosis, parts, and labor.

Manufacturer's Warranty Coverage:

Small off-road engines and large spark ignited engines less than or equal to 1.0 liter, and any related emissions components of the equipment, are warranted for two years, or for the time period listed in the respective engine or product warranty statement, whichever is greater. If any emissions-related part on your B&S engine is defective, the part will be repaired or replaced by B&S.

Owner's Warranty Responsibilities:

- As the engine owner, you are responsible for the performance of the required maintenance listed in your Operator's Manual. B&S recommends that you retain all receipts covering maintenance on your engine, but B&S cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.
- As the engine owner, you should however be aware that B&S may deny you warranty coverage if your engine or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications.
- You are responsible for presenting your engine to a B&S distribution center, servicing dealer, or other equivalent entity, as applicable, as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days. If you have any questions regarding your warranty rights and responsibilities, you should contact B&S at 1-800-444-7774 (in USA) or BRIGGSandSTRATTON.COM.

Briggs & Stratton Emissions Control Warranty Provisions

The following are specific provisions relative to your Emissions Control Warranty Coverage. It is in addition to the B&S engine warranty for non-regulated engines found in the Operator's Manual.

1. Warranted Emissions Parts
   Coverage under this warranty extends only to the parts listed below (the emissions control systems parts) to the extent these parts were present on the B&S engine.

   a. Fuel Metering System
      - Cold start enrichment system (soft choke)
      - Carburetor or fuel injection system
      - Oxygen sensor
      - Electronic control unit
      - Fuel pump module

   b. Air Induction System
      - Air cleaner
      - Intake manifold

   c. Ignition System
      - Spark plug(s)
      - Magneto ignition system

   d. Catalyst System
      - Catalytic converter
      - Exhaust manifold
      - Air injection system or pulse value

   e. Miscellaneous Items Used in Above Systems

- Vacuum, temperature, position, time sensitive valves and switches
- Connectors and assemblies

2. Length of Coverage
Coverage is for a period of two years from date of original purchase, or for the time period listed in the respective engine or product warranty statement, whichever is greater. B&S warrants to the original purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board; that it is free from defects in material and workmanship that could cause the failure of a warranted part; and that it is identical in all material respects to the engine described in the manufacturer's application for certification. The warranty period begins on the date the engine is originally purchased.

   The warranty on emissions-related parts is as follows:

   - Any warranted part that is not scheduled for replacement as required maintenance in the Operator's Manual supplied, is warranted for the warranty period stated above. If any such part fails during the period of warranty coverage, the part will be repaired or replaced by B&S at no charge to the owner. Any such part repaired or replaced under the warranty will be warranted for the remaining warranty period.
   - Any warranted part that is scheduled only for regular inspection in the Operator's Manual supplied, is warranted for the warranty period stated above. Any such part repaired or replaced under warranty will be warranted for the remaining warranty period.
   - Any warranted part that is scheduled for replacement as required maintenance in the Operator's Manual supplied, is 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 B&S at no charge to the owner. 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.
   - Add-on or modified parts that are not exempted by the Air Resources Board may not be used. The use of any non-exempted add-on or modified parts by the owner will be grounds for disallowing a warranty claim. The manufacturer will not be liable to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part.

3. Consequential Coverage
Coverage shall extend to the failure of any engine components caused by the failure of any warranted emissions parts.

4. Claims and Coverage Exclusions
Warranty claims shall be filed according to the provisions of the B&S engine warranty policy. Warranty coverage does not apply to failures of emissions parts that are not original equipment B&S parts or to parts that fail due to abuse, neglect, or improper maintenance as set forth in the B&S engine warranty policy. B&S is not liable for warranty coverage of failures of emissions parts caused by the use of add-on or modified parts.

Look For Relevant Emissions Durability Period and Air Index Information On Your Small Off-Road Engine Emissions Label

Engines that are certified to meet the California Air Resources Board (CARB) small off-road Emissions Standard must display information regarding the Emissions Durability Period and the Air Index. Briggs & Stratton makes this information available to the consumer on our emissions labels. The engine emissions label will indicate certification information.

The **Emissions Durability Period** describes the number of hours of actual running time for which the engine is certified to be emissions compliant, assuming proper maintenance in accordance with the Operator's Manual. The following categories are used:

Moderate:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 50 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 125 hours of actual engine running time.

Intermediate:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 125 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 250 hours of actual engine running time.

Extended:

Engines at or less than 80 cc displacement are certified to be emissions compliant for 300 hours of actual engine running time. Engines greater than 80 cc displacement are certified to be emissions compliant for 500 hours of actual engine running time.

For example, a typical walk-behind lawn mower is used 20 to 25 hours per year. Therefore, the **Emissions Durability Period** of an engine with an **intermediate** rating would equate to 10 to 12 years.

Briggs & Stratton engines are certified to meet the United States Environmental Protection Agency (USEPA) Phase 2 or Phase 3 emissions standards. The Emissions Compliance Period referred to on the Emissions Compliance label indicates the number of operating hours for which the engine has been shown to meet Federal emissions requirements.

For engines at or less than 80 cc displacement:

Category C = 50 hours, Category B = 125 hours, Category A = 300 hours

For engines greater than 80 cc displacement and less than 225 cc displacement:

Category C = 125 hours, Category B = 250 hours, Category A = 500 hours

For engines of 225 cc or more displacement:

Category C = 250 hours, Category B = 500 hours, Category A = 1000 hours

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