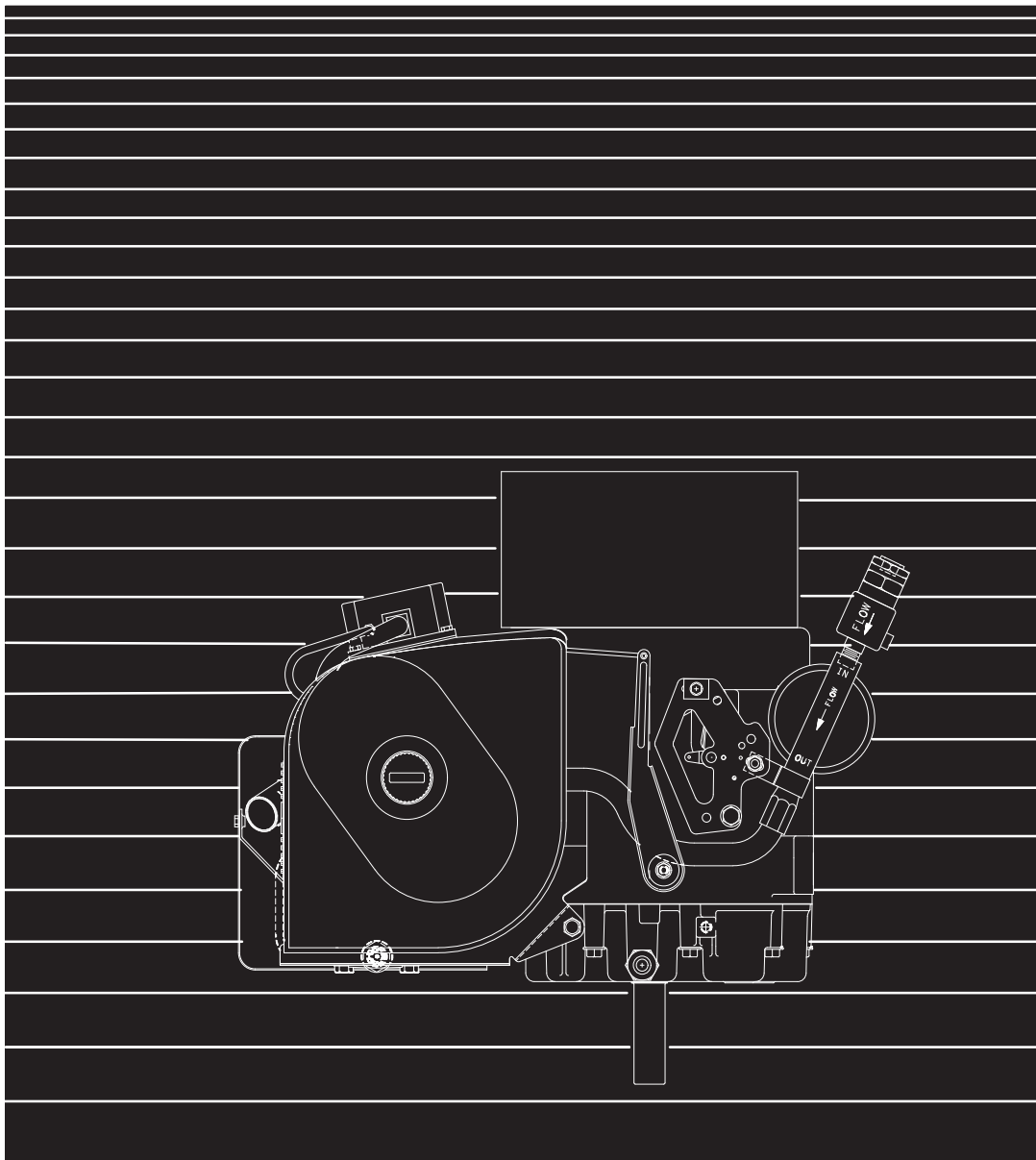




Engine Operator's Manual

E124V

Elite Floor Care



Printed in U. S. A.

965-0174B
12-00



WARNING:



The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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Safety Precautions

Thoroughly read the **OPERATOR'S MANUAL** before operating the engine. Safe operation and top performance can be obtained only with proper operation and maintenance.

The following symbols in this Manual alert you to potential hazards to the operator, service person and equipment.

⚠ DANGER *alerts you to an immediate hazard which will result in severe personal injury or death.*

⚠ WARNING *alerts you to a hazard or unsafe practice which can result in severe personal injury or death.*

⚠ CAUTION *alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.*

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- Keep the engine and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Before working on the engine, disconnect the negative (–) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the engine is running—hot, moving or electrically live parts can cause severe personal injury or death.

- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Do not work on the engine when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

FUEL IS FLAMMABLE AND EXPLOSIVE

- Keep flames, cigarettes, sparks, pilot lights, electrical arc-producing equipment and switches and all other sources of ignition well away from areas where fuel fumes are present and areas sharing ventilation.
- Do not fill the fuel tank while the engine is running.
- Use approved flexible fuel hose for LPG use for connections at the engine. If there is a possibility that the hose could become a path for battery currents, it must be of the non-conductive type.
- Fuel connections must be made only to the *vapor withdrawal* fitting on the LPG container.
- The fuel line must have a manual shutoff valve.
- LPG leaks into an inadequately ventilated space can lead to explosive accumulations of gas. LPG sinks when released into the air and can accumulate inside basements and other below-grade spaces. Precautions must be taken to prevent gas leaks and the accumulation of gaseous fuel in the event of a leak.

ENGINE EXHAUST IS DEADLY!

- Learn the symptoms of carbon monoxide poisoning in this Manual.
- Inspect the exhaust system every time the engine is started and after every eight hours of operation. If exhaust noise changes, shut down the engine immediately and have it inspected.
- The integral exhaust system must not be modified in any way.
- Do not use engine cooling air to heat a room or compartment.
- Make sure there is ample fresh air when operating the engine in a confined area.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last to reduce arcing.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.

Introduction

ABOUT THIS MANUAL

This manual covers operation and maintenance of vertical-shaft Elite Floorcare engines. Each operator should study this engine manual carefully and observe all instructions and precautions. Proper use and periodic maintenance are responsibilities of the operator(s) and are essential for top performance.

NAMEPLATE

Model and Serial Numbers: Whenever contacting an Onan dealer or distributor for information, parts or service, always provide the model number and the serial number marked on the nameplate of the engine. Figure 1 illustrates a typical engine nameplate and its location on the engine.

Genuine Onan replacement parts obtained from an Onan dealer or distributor are recommended.

⚠ WARNING *Improper service or replacement of parts can lead to severe personal injury or death and to damage to equipment and property. Service personnel must be qualified to perform electrical and mechanical service.*

Federal Emissions Compliance Period: The Federal Emissions Compliance Period referred to on the nameplate indicates the number of operating hours for which the engine has been shown to meet Federal emissions requirements. Category C = 250 hrs, B = 500 hrs, A = 1000 hrs.

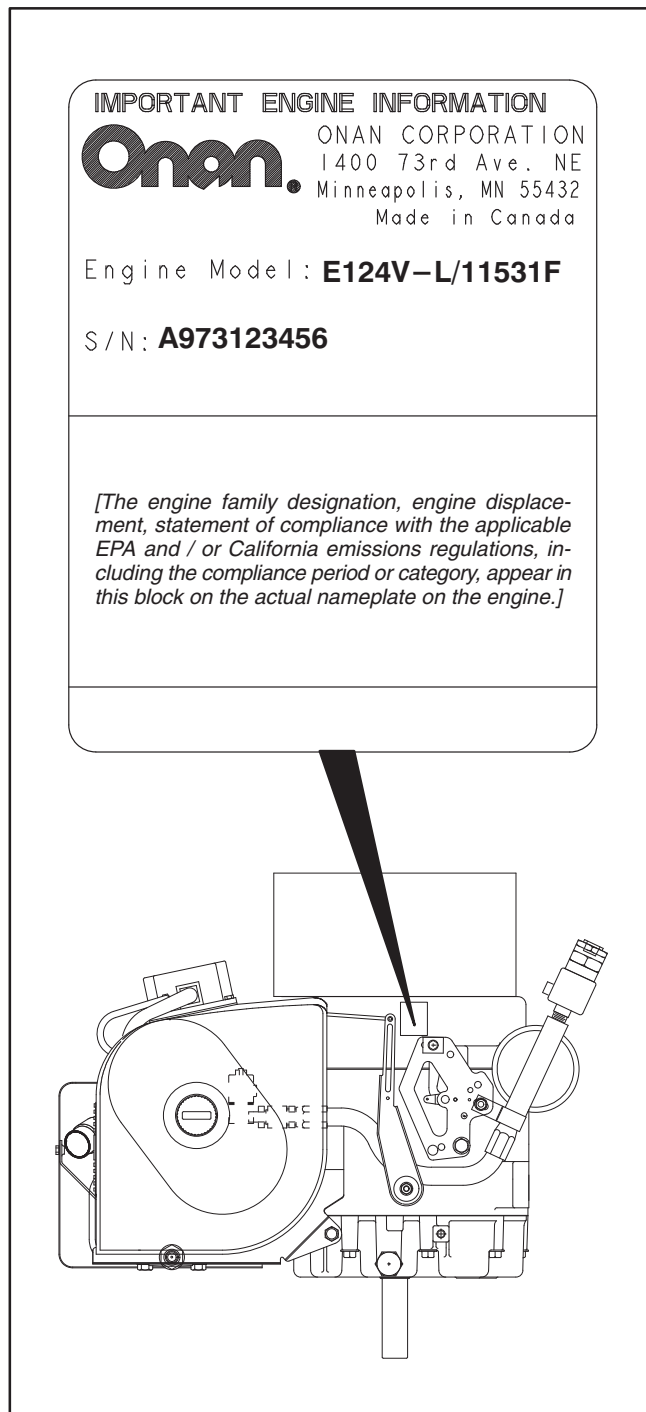


FIGURE 1. TYPICAL ENGINE NAMEPLATE

FUEL RECOMMENDATIONS

⚠ WARNING *LPG is highly flammable and explosive and can cause severe personal injury or death. Do not smoke if you smell gas or are near fuel tanks or fuel-burning equipment or are in an area sharing ventilation with such equipment. Keep flames, sparks, pilot lights, electrical switches, arc-producing equipment and all other sources of ignition well away. Keep a type ABC fire extinguisher handy.*

Use Grade HD-5 liquified petroleum gas (LPG) or equivalent product consisting of at least 90 percent propane. Commercial LPG fuels may contain more than 2.5 percent butane which can result in poor fuel vaporization and poor engine starting.

NOTE: *LPG must be supplied at container pressure from the vapor-withdrawal fitting on the LPG container to the 1/4 NPT fitting on the engine. The fuel solenoid, strainer and pressure regulator are factory-mounted on the engine.*

ENGINE OIL RECOMMENDATIONS

Use premium-quality motor oil. Look for the API (American Petroleum Institute) classification and use Class SH (SH/CE) or better. Also look for the SAE (Society of Automotive Engineers) viscosity grade. Refer to Table 1 and choose a viscosity grade appropriate for the range of ambient temper-

atures expected before the next scheduled oil change. Single-grade SAE 30 oil is recommended in ambients consistently above freezing and multi-grade oils in ambients having wide ranges in temperature.

TABLE 1. OIL VISCOSITY VS. TEMPERATURE

EXPECTED AMBIENT TEMPERATURES	SAE VISCOSITY GRADE
32° F (0° C) and higher	30
10° F to 100° F (–12° C to 38° C)	15W-40
0° F to 80° F (–18° C to 27° C)	10W-30 10W-40

STARTING BATTERIES

The engine is equipped with a 12-volt electric starter and engine control. Prompt starting requires sufficient battery capacity and battery cable size. See *Specifications*.

Regular maintenance of batteries may be required. See *Periodic Maintenance* and any instructions available from the equipment or battery manufacturer. As long as the equipment is operated regularly, the automatic battery recharging system on the engine should maintain battery charge. See OUT-OF-SERVICE PROTECTION (Page 8) regarding battery care during storage.

EXHAUST EMISSIONS SYSTEM

These engines incorporate an electronic, closed-loop LPG fuel system and 3-way catalytic muffler (Figure 2). There are no adjustments and the system must not be modified in any way.

⚠WARNING *Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California and can result in severe personal injury.*

Diagnostics Light

The diagnostics light on the electronic control unit should go off in about 30 seconds after the engine starts. Check the vacuum hose if the light blinks during the first 30 seconds and reattach it if loose. Have the engine serviced if that does not help.

The engine will shut down in a few minutes if the diagnostics light comes on and stays on. Have the engine serviced if it shuts down with the light on. Service will also be required if the light blinks or comes on intermittently while the engine is running.

⚠WARNING *If the engine shuts down with the light on, emissions of deadly carbon monoxide gas could be excessive. Do not restart the engine. Have the engine serviced to avoid serious personal injury.*

Emissions System Maintenance

- Run the equipment only in well ventilated areas. Refer to *Industrial Ventilation—A Manual of Recommended Practice* published by the American Conference of Governmental Industrial Hygienists. *The user is the one responsible for complying with indoor carbon monoxide regulations.*
- Attach a CO monitor to the equipment.
- Keep air cleaners clean. *Do not apply oil.*
- Do not run the engine if there is an exhaust leak. A leak can change control system calibration resulting in excessive emissions of CO.
- Do not tip the engine to either side. Tipping the engine can allow oil to enter the air cleaner and cause the engine to run rich and shut down.
- Do not modify or disable any engine function or system.
- Keep to the maintenance schedule (Page 9).

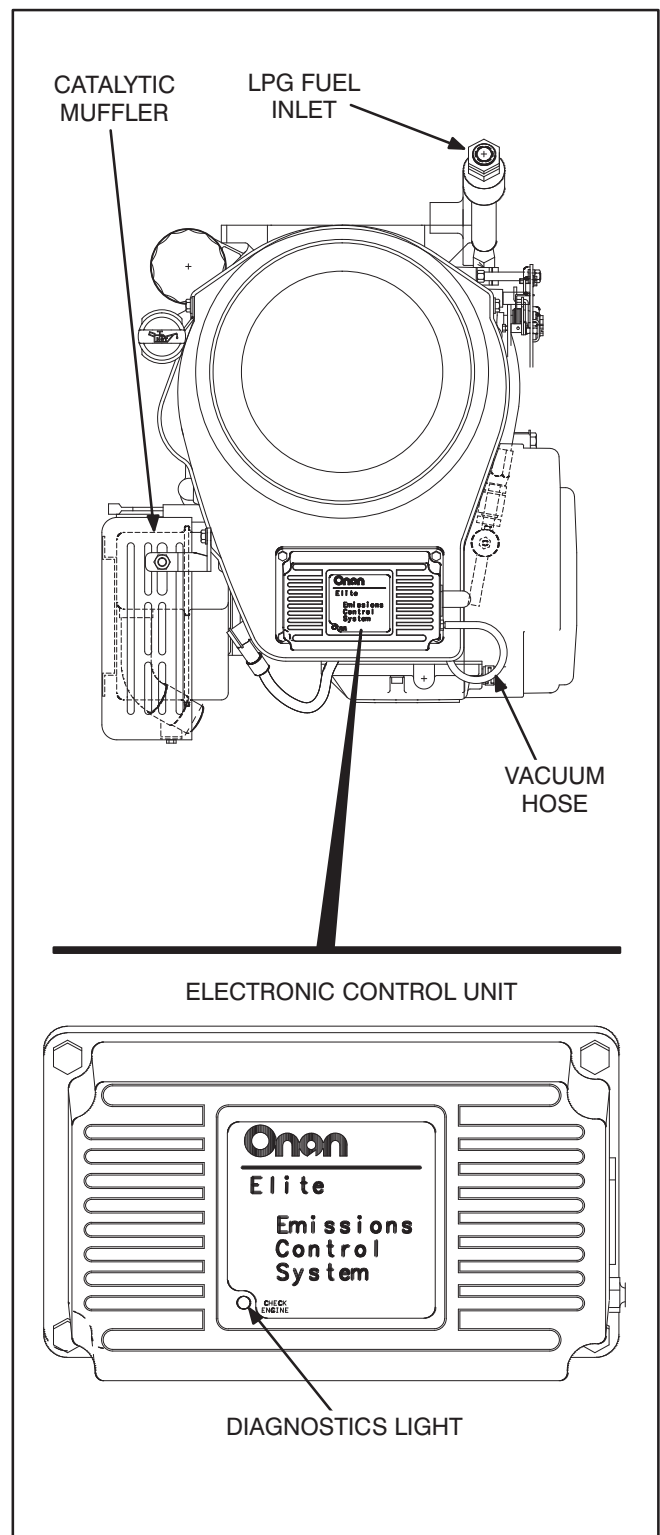


FIGURE 2. EMISSIONS SYSTEM

Operation

⚠WARNING EXHAUST GAS IS DEADLY!

All engine exhaust (including that from an LPG engine with a catalytic muffler) contains carbon monoxide—an odorless, colorless, poisonous gas that can cause unconsciousness and death. Symptoms of carbon monoxide poisoning include:

- *Dizziness*
- *Headache*
- *Weakness and Sleepiness*
- *Nausea*
- *Vomiting*
- *Inability to Think Coherently*

IF YOU EXPERIENCE ANY OF THESE SYMPTOMS, GET INTO FRESH AIR IMMEDIATELY. Get medical attention if symptoms persist. Have the air quality monitored if there is any question.

PRE-START CHECKS

⚠CAUTION *Never tip the engine on either side. Engine oil can enter the air cleaner and cause the engine to run rich and shut down.*

Before the first start of the day and after every eight hours of operation, perform the maintenance specified under *Periodic Maintenance*. Keep a log of maintenance and the hours run and perform any maintenance that may be due. Also, if the equipment has been in storage, return the engine to service as instructed under RETURNING THE ENGINE TO SERVICE.

Check for exhaust and fuel system leaks every time you start the equipment. Always follow the equipment manufacturer's operating instructions and observe all precautions when operating power equipment.

⚠WARNING *Moving parts can cause severe personal injury or death. Hot exhaust parts can cause severe burns. Stay clear of hot or moving parts. Make sure all protective shields and guards are in place and secured before starting up the equipment.*

STARTING

1. Check the oil level if this is the first start of the day and add oil as necessary.

⚠CAUTION *Starting the engine without oil will cause severe engine damage. Always keep the engine oil level between the FULL and ADD marks on the dipstick.*

2. Fill the LPG container if necessary and open any fuel line shutoff valve. (Make sure the con-

nection is to the **vapor-withdrawal** fitting on the LPG container.)

3. Release the clutch if the engine is so equipped.
4. Push the equipment throttle to the middle of its speed range.
5. Turn the ignition-start switch to its start position and hold it there until the engine starts. Do not crank for more than 30 seconds at a time and wait at least one minute between tries. See *Troubleshooting* if the engine does not start after several tries.
6. Operate the equipment as intended. The diagnostics light on the electronic control unit should go off in about 30 seconds after the engine starts. Check the vacuum hose if the light blinks during the first 30 seconds and reattach it if loose. Have the engine serviced if that does not help.

The engine will shut down in a few minutes if the diagnostics light comes on and stays on. Have the engine serviced if it shuts down with the light on. Service will also be required if the light blinks or comes on intermittently while the engine is running.

⚠WARNING *If the engine shuts down with the light on, emissions of deadly carbon monoxide gas could be excessive. Do not restart the engine. Have the engine serviced to avoid serious personal injury.*

STOPPING

Turn the ignition-start switch to OFF and **close the LPG tank shutoff valve.**

ENGINE BREAK-IN

Operate the equipment as it is intended to be operated. During the first 25 hours of use check the oil level at least twice a day or after every 4 hours. Change the engine oil and oil filter after the first 25 hours and have the engine valve clearance adjusted.

OUT-OF-SERVICE PROTECTION

⚠ CAUTION *Never tip the engine on either side. Engine oil can enter the air filter and cause the engine to run rich and shut down.*

Protect an engine that will be out of service for more than 30 days as follows:

1. Run the engine until it reaches normal operating temperature. Then close the LPG container shutoff valve and let the engine run until it stops. Store the LPG container as required by local ordinance.

⚠ WARNING *LPG “sinks” when released into the air. LPG leaks inside a garage or other inadequately ventilated space or near a pit or basement or other below-grade space can lead to explosive accumulations of gas. Check for and comply with all local ordinances regarding the storage of LPG containers.*

2. Drain the oil from the engine while it is still warm. Refill with fresh oil and attach a tag stating the viscosity of the oil used.
3. Perform air cleaner maintenance as instructed in *Periodic Maintenance*.
4. Clean the governor linkage and wrap it with a clean cloth for protection.
5. Plug the exhaust outlet to prevent moisture, dirt, bugs, etc. from entering.
6. Provide a suitable cover for the entire unit.
7. Disconnect the battery (negative [–] cable first) and follow the battery or equipment manufacturer’s storage instructions.

RETURNING THE ENGINE TO SERVICE

1. Remove the cover and all protective wrapping and the plug from the exhaust outlet.
2. Check the tag on the oil base. Change the oil if the viscosity is not appropriate for the expected ambient temperatures (Table 1).
3. Check to see that the throttle and governor linkages move freely.
4. Clean and check the battery according to the battery or equipment manufacturer’s instructions and connect the battery cables (positive [+] cable first).
5. Start the engine.

Periodic Maintenance

⚠ CAUTION *Never tip the engine on either side. Engine oil can enter the air cleaner and cause the engine to run rich and shut down.*

Periodic maintenance is essential for top engine performance. Keep a log of maintenance performed and the hours run. Recording maintenance will help you keep it regular and provide a basis for

supporting warranty claims. Use Table 2 as a guide.

Maintenance, replacement, or repair of emission control devices and systems may be performed by any nonroad engine repair establishment or individual. However, warranty work must be completed by an authorized Onan dealer or distributor.

TABLE 2. PERIODIC ENGINE MAINTENANCE SCHEDULE

MAINTENANCE OPERATION	MAINTENANCE FREQUENCY								Page
	Every Day or Every 8 Hours	After First 25 Hours ²	Every 50 Hours	Every Month	Every 100 Hours	Every 200 Hours	Every 400 Hours	Every 1000 Hours	
Inspect Engine	• ¹								10
Check Oil Level	•								11
Clean Cooling Air Precleaner (Foam Wrapper ⁵)	•								10
Clean Air Cleaner Foam Wrapper ⁵ and Inspect Air Cleaner Element	•								12
Clean Cylinder Cooling Fins			•						13
Check Battery				• ³					—
Change Engine Oil, Oil Filter		•			•				11
Replace Air Cleaner Element and Foam Wrapper ⁵						•			12
Adjust Engine Valve Clearance		• ⁴				• ⁴			—
Clean Spark Arrestor						•			13
Replace LPG Filter						• ⁴			—
Clean Duty Solenoid						• ⁴			—
Replace Spark Plug							•		13
Replace Duty Solenoid							• ⁴		—
Replace Oxygen Sensor								• ⁴	—
Replace Catalytic Muffler								• ⁴	—

1. Check for oil, fuel and exhaust leaks, loose parts and unusual noises and vibrations.
2. Perform as part of engine break-in.
3. See instructions for battery care provided by the equipment or battery manufacturer.
4. Must be performed by a qualified mechanic (equipment or Onan dealer).
5. Do not oil.

DAILY (8 HOUR) MAINTENANCE

Check the following before the first start of the day and after every eight hours of operation:

1. Check the fuel gas lines and fittings for leaks. Shut off the container valve immediately if there is a gas leak and have the leak repaired.
2. Look and listen for exhaust system leaks while the engine is running. Look for cracks and rust-through in the muffler and tailpipe. Do not operate the equipment if there is an exhaust leak.

⚠ WARNING *A leaky exhaust system can result in higher levels of deadly carbon monoxide gas emissions. Do not operate the equipment if there is an exhaust leak.*

3. Remove the cooling air precleaner (foam wrapper, Figure 3) every 4 to 8 hours of operation and wash it in warm water and mild detergent. Thoroughly rinse and dry the foam wrapper before reusing it. **Do not oil.**

⚠ CAUTION *A clogged or oily air precleaner can cause the engine to overheat or run rich and shut down. Do not operate the equipment without the air precleaner in place. Wash the air precleaner regularly as prescribed.*

4. Check the engine oil level with the oil dipstick (Figure 3). First park the equipment on a level surface, stop the engine and wait a minute or so to allow the oil to settle in the crankcase.

⚠ WARNING *Crankcase pressure can blow hot engine oil out the fill tube causing severe burns. Always stop the engine before removing the oil fill cap.*

When checking oil level, wipe the dipstick clean, reinsert it fully by turning the cap clockwise, and withdraw it again to take the reading. Add oil if the level is below the ADD mark. See ENGINE OIL RECOMMENDATIONS (Page 5). Drain oil if the level is above the FULL mark. Secure the cap when done.

⚠ CAUTION *Too much oil can cause high oil consumption, high operating temperatures and oil foaming. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks on the dipstick.*

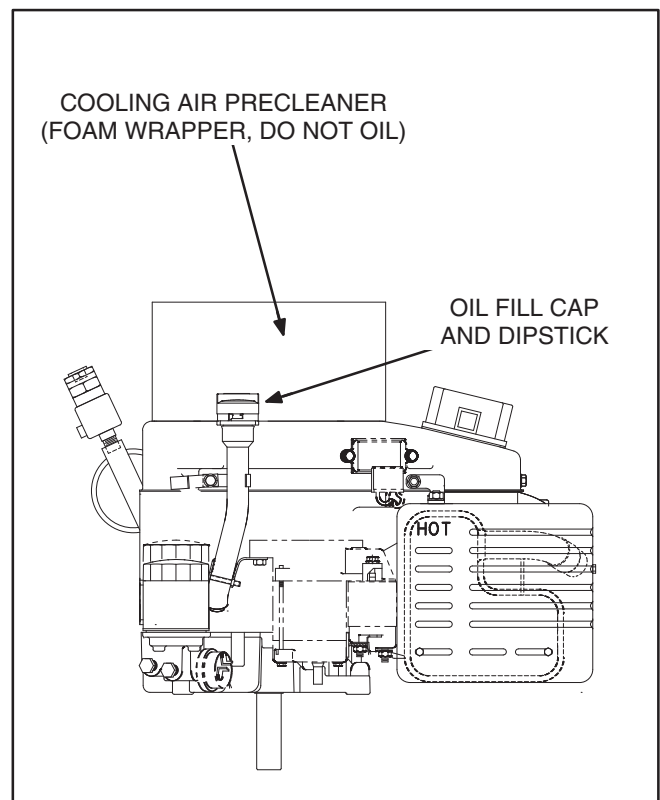


FIGURE 3. OIL FILL CAP/DIPSTICK AND COOLING AIR PRECLEANER ELEMENT

ENGINE OIL AND FILTER CHANGE

Refer to Table 2 (Page 9) for scheduled oil change and filter replacement.

⚠ WARNING *State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Take care to limit skin contact and breathing of vapors as much as possible. Use rubber gloves and wash exposed skin.*

1. Run the engine until it is warm, stop it, and disconnect the spark plug and the battery (negative [-] cable).

⚠ WARNING *Accidental starting of the engine can result in severe personal injury or death. Always disconnect the spark plug and the battery (negative [-] cable) before changing oil.*

2. Remove the oil fill cap, place a pan under the oil drain hose and open the drain valve. Close the drain valve after the oil has drained completely.
3. Spin off the oil filter canister and dispose of it and the used oil according to local regulations. Used oil is harmful to the environment unless disposed of properly.
4. Thoroughly wipe off the filter mounting surface on the engine, make sure the filter gasket is in place on the canister, apply a thin film of oil to the gasket and spin the filter canister on by hand until the gasket just touches the mounting pad. Then turn it an additional 1/2 to 3/4 turn.
5. Refill with the recommended oil (Page 5) and check the level (Page 10). See *Specifications* for oil capacity.

⚠ CAUTION *Too much oil can cause high oil consumption, high operating temperatures and oil foaming. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks on the dipstick.*

6. Reconnect the spark plug and battery, start the engine and run it for a short time while checking for oil leaks at the drain valve and oil filter. Tighten only as necessary to eliminate leaks.

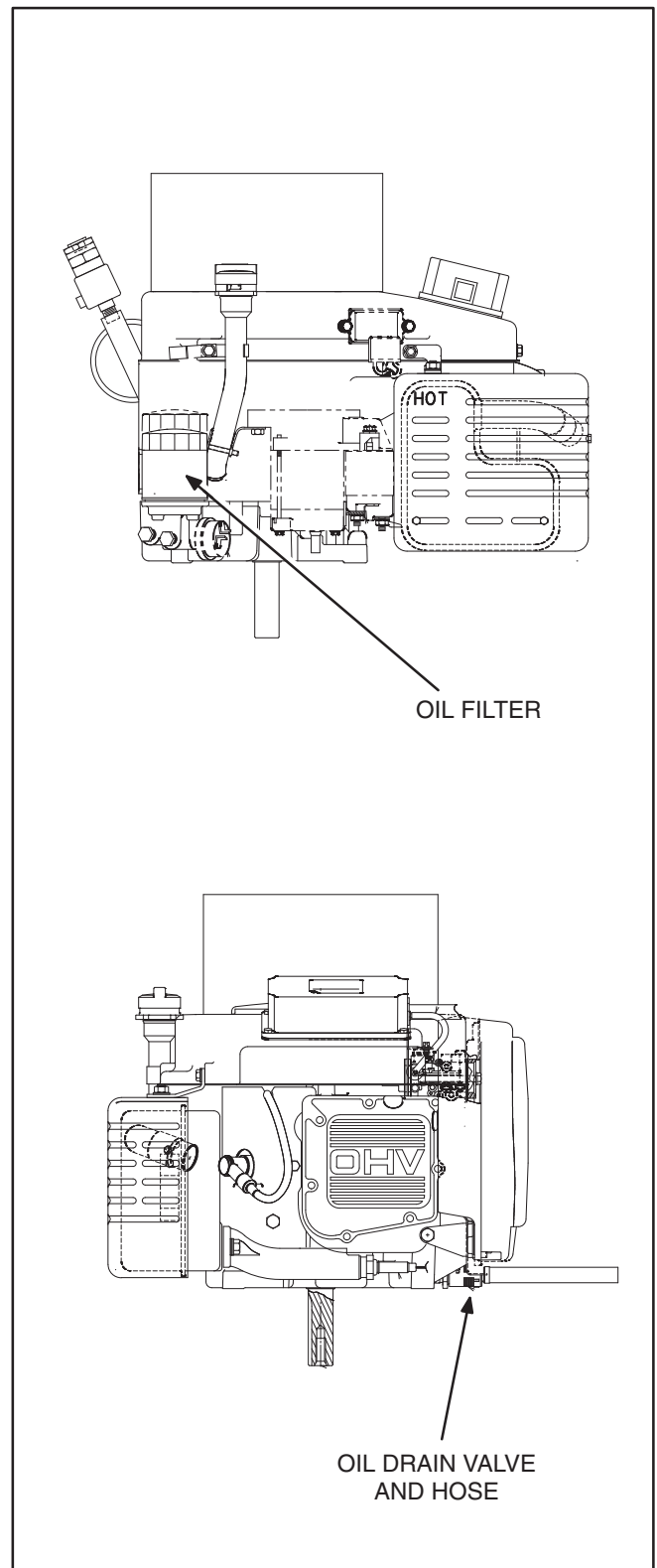


FIGURE 4. OIL FILTER AND DRAIN

AIR CLEANER MAINTENANCE

Refer to Table 2 (Page 9) for scheduled foam wrapper maintenance and air cleaner element replacement. See Figure 5.

Foam Wrapper Maintenance

When performing maintenance on the foam wrapper only, do not remove the inner air cleaner cover. Remove and wash the foam wrapper in water and detergent. Squeeze the foam wrapper dry like a sponge. Rinse with clean water and allow it to dry.

⚠ CAUTION *Do not oil the foam wrapper. Oil can cause the engine to run rich and shut down.*

Install the foam wrapper over the paper air cleaner element by stretching it over the inner cover. Completely cover all exposed paper pleats on the air

cleaner paper element. Replace the foam wrapper when it becomes torn or stretched.

Air Cleaner Element Replacement

Remove the outer cover and wipe away loose dust and debris from the air cleaner assembly. Remove the inner air cleaner mounting nut and cover. Remove the air filter paper element and foam wrapper from the engine. Wipe off dust and debris from the air cleaner base. ***To keep anything from entering the carburetor and engine while the air cleaner element is off, place a piece of duct tape over the opening.***

Remove any duct tape over the opening and install the new paper element and secure it with the inner cover and mounting nut. Tighten the nut 1-1/2 turns after seating it on the cover. Install a new foam wrapper and secure the outer cover.

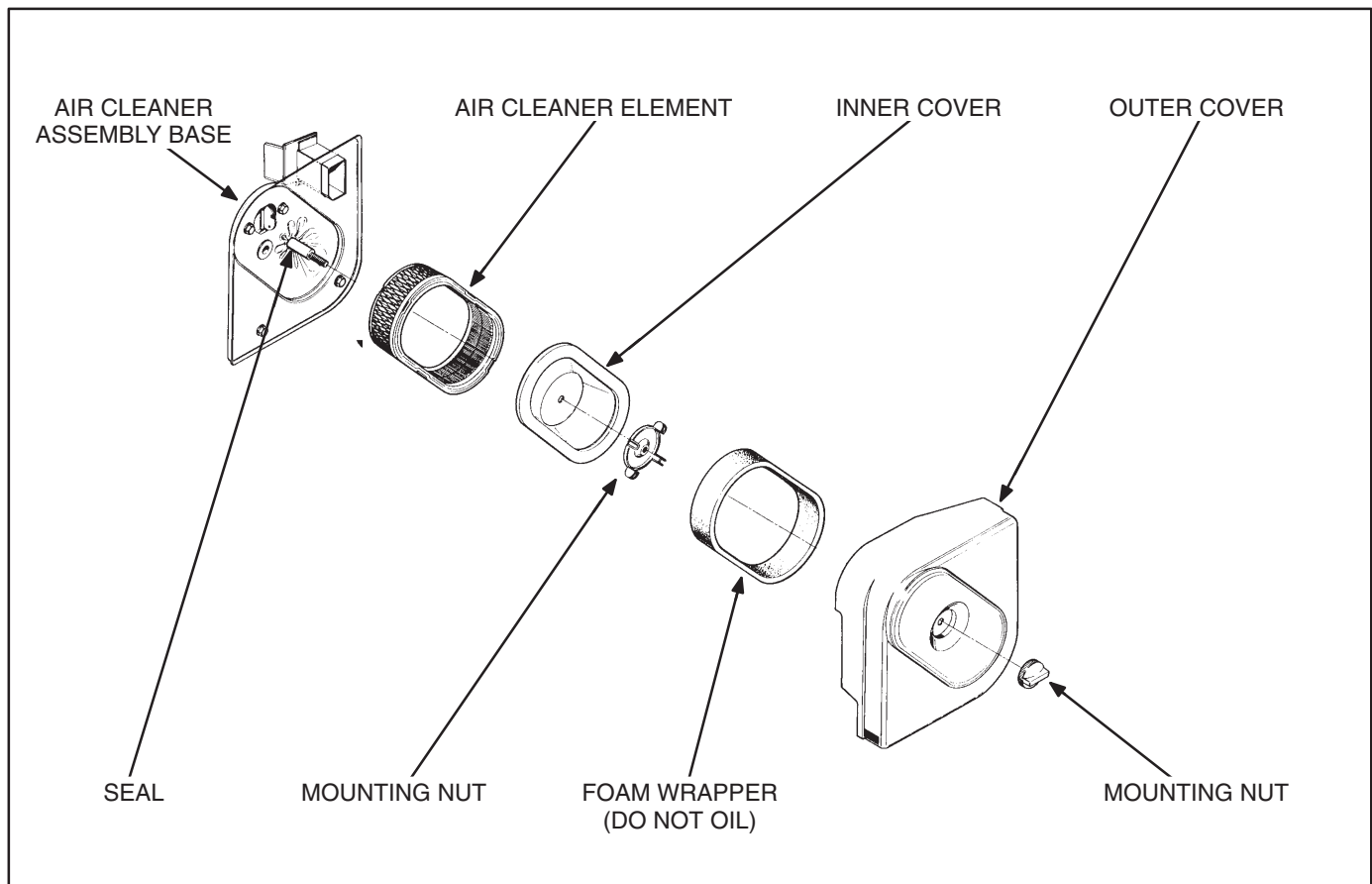


FIGURE 5. AIR CLEANER ASSEMBLY

COOLING SYSTEM MAINTENANCE

Refer to Table 2 (Page 9) for scheduled cleaning of the cylinder cooling fins.

Use compressed air to clean the cylinder cooling fins. Take the following precautions.

1. Wear safety glasses.

⚠ WARNING *Always wear safety glasses when using compressed air to avoid severe eye damage.*

2. Let the engine cool. The temperature stresses caused by cleaning a hot engine can crack the cylinder.
3. Make sure the air cleaner element is in place to keep dirt out of the engine.

SPARK PLUG REPLACEMENT

Refer to Table 2 (Page 9) for scheduled spark plug replacement and to *Specifications* for gap specifications. See Figure 6.

To prevent crossthreading the spark plug, always thread it in by hand until it seats. If the spark plug is being reused, turn it with a wrench an additional 1/4 turn. If the spark plug is new, turn it an additional 3/8 to 1/2 turn. If you have a torque wrench, tighten the spark plug to 20 lbs-ft (26 N-m).

SPARK ARRESTOR CLEANING

Refer to Table 2 (Page 9) for scheduled spark arrestor cleaning. To clean the spark arrestor, remove the retaining screw and pull it from the muffler tail pipe. Use a wire brush or compressed air to clean the spark arrestor. See Figure 7. The spark arrestor must be reinstalled before running the engine.

⚠ WARNING *Always wear safety glasses when using compressed air to avoid severe eye damage.*

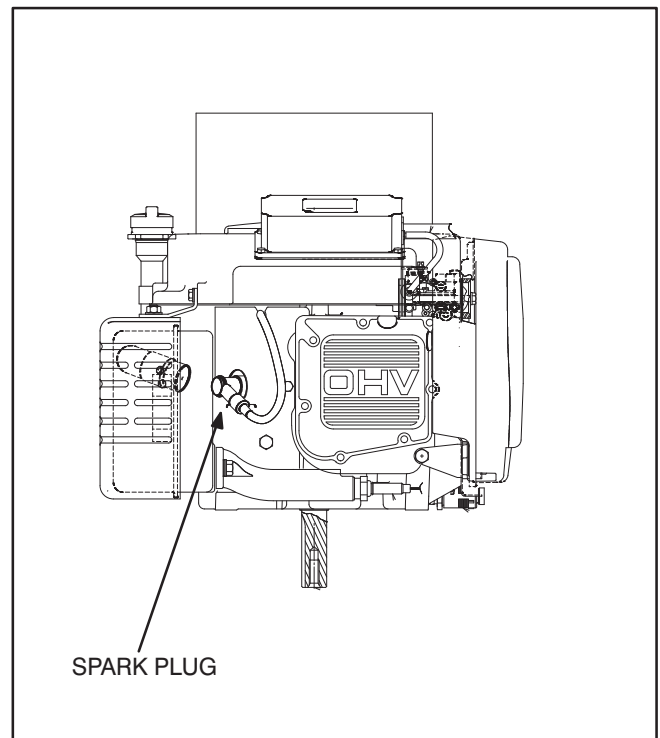


FIGURE 6. SPARK PLUG

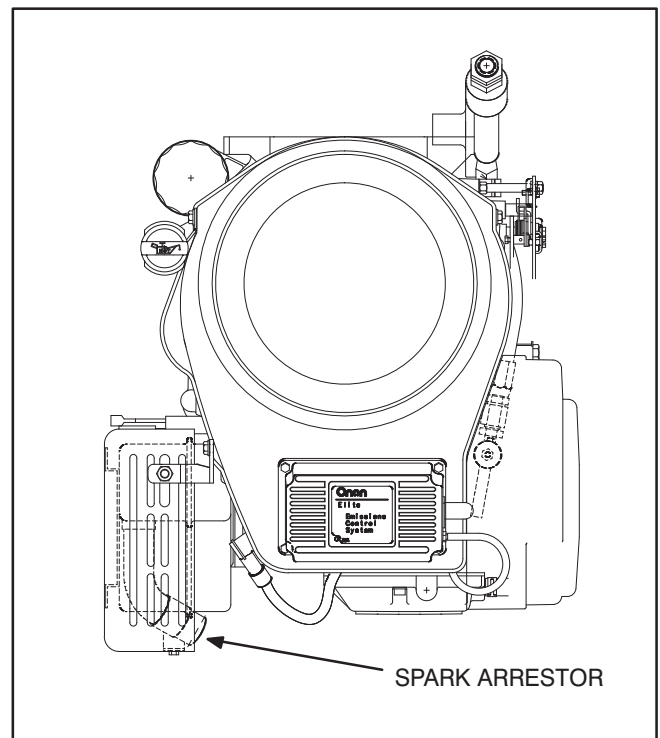


FIGURE 7. SPARK ARRESTOR

Adjustments

CARBURETOR ADJUSTMENTS

These engines have precision-manufactured carburetors which are not adjustable.

THROTTLE CABLE ADJUSTMENT

1. Shut off the engine and loosen the throttle cable clamp on the speed control plate (Figure 8).
2. Hook the throttle cable into the throttle control lever.
3. Lock the throttle control lever in the high-idle position with a 1/8 inch diameter pin (drill bit) inserted as shown.
4. Push the equipment speed lever to its high position and tighten the throttle cable clamp.
5. Check for binding. Travel between high-idle and low-idle positions should be approximately 0.72 inch (18 mm).

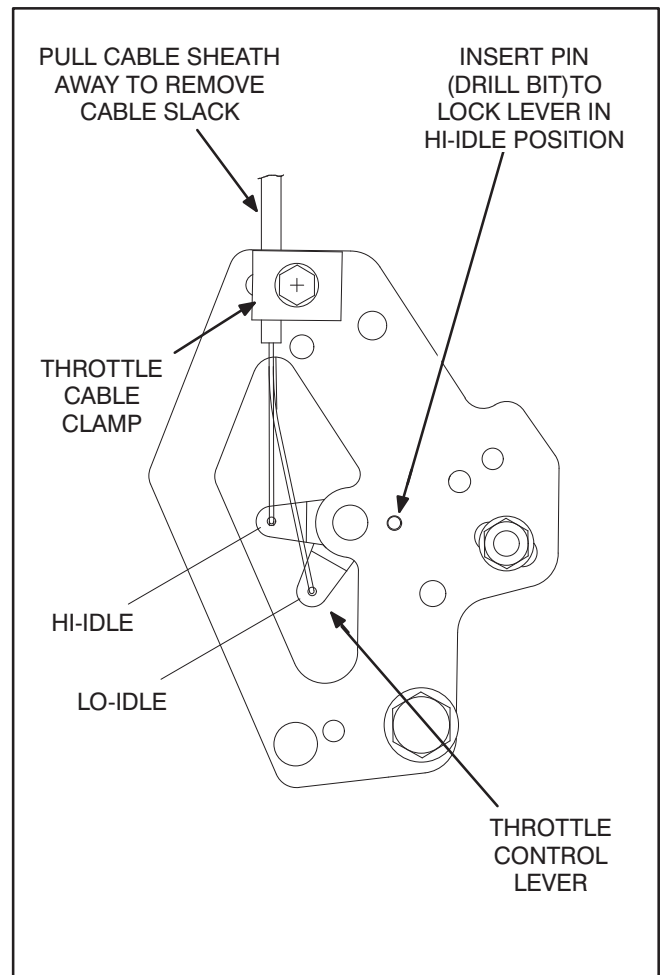


FIGURE 8. THROTTLE CABLE ADJUSTMENT AT SPEED CONTROL PLATE

ENGINE SPEED ADJUSTMENTS

Normally there is no need to adjust engine speed. These instructions are to the equipment manufacturer for setting up and adjusting the equipment.

Engine speed adjustment must be attempted only by a qualified mechanic and the adjustments must be made using an accurate tachometer. Set the low-idle and high-idle speeds to the values specified by the equipment manufacturer. In the absence of such specifications, it is recommended that low-idle speed be adjusted to 1500 rpm and high-idle speed to 3400 rpm.

⚠ WARNING *Adjusting the engine speed to a value above that specified by the equipment manufacturer could cause the equipment to operate at speeds in violation of Federal and State Standards for Safety for the equipment.*

⚠ WARNING *Moving parts can cause severe personal injury or death. Take care when measuring engine speed with a tachometer and follow the meter instructions. You must be a qualified mechanic.*

1. Remove the outer air cleaner cover (Page 12) for access to the low-idle speed screw (Figure 9).
2. Disconnect all loads and start the engine, observing all of the equipment manufacturer's instructions and precautions.
3. While holding the throttle lever against the low-idle speed stop screw on the top of the carburetor (Figure 9), turn the screw to obtain the specified low-idle speed.
4. Loosen the throttle cable clamp, the speed control plate pivot bolt and the control plate position lock nut.
5. Lock the throttle control lever in the high-idle position with a 1/8 inch diameter pin (drill bit) inserted as shown.
6. Pivot the speed control plate clockwise to increase or counterclockwise to decrease engine speed. Tighten the pivot bolt and lock nut when the specified high-idle speed is obtained.
7. Adjust the throttle cable (Page 8).

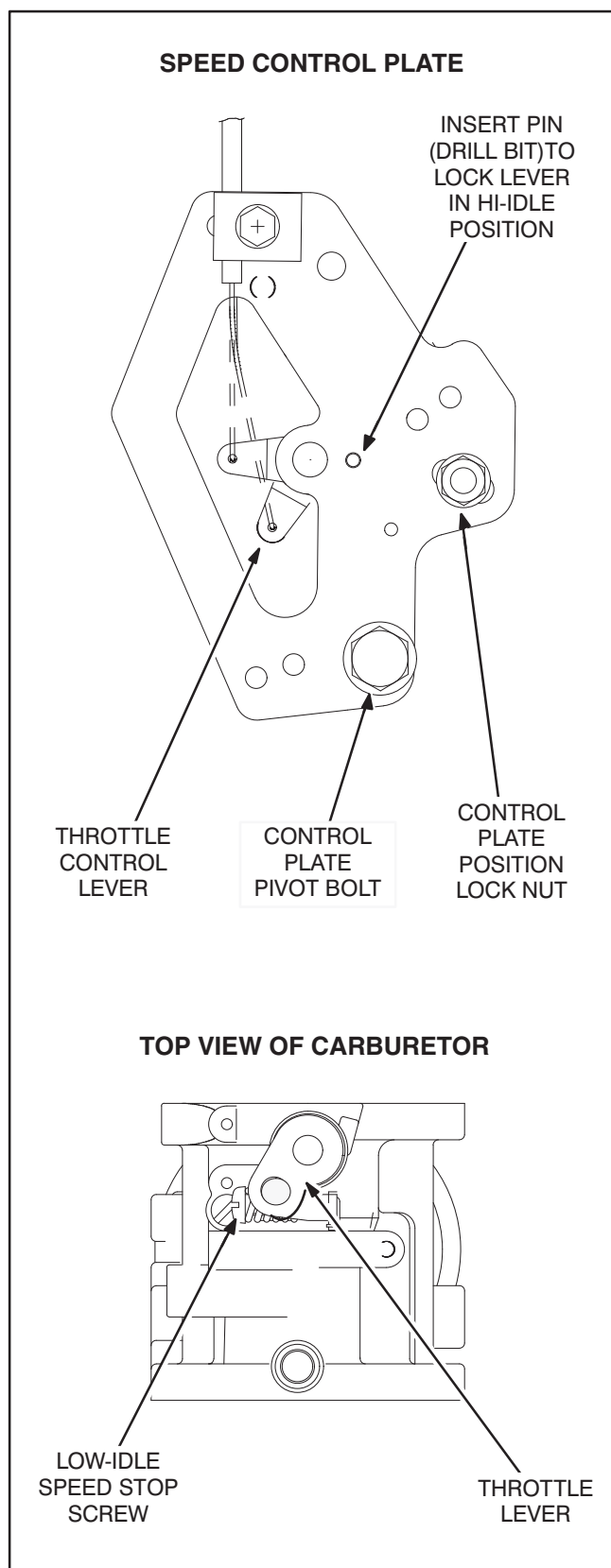


FIGURE 9. ENGINE SPEED ADJUSTMENTS

Troubleshooting

⚠WARNING *Many troubleshooting procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review Safety Precautions.*

Table 3 provides basic troubleshooting guidance. If you fail to resolve the problem after taking the corrective actions suggested, contact the equipment dealer or Onan dealer.

Diagnostics Light

The diagnostics light on the electronic control unit should go off in about 30 seconds after the engine

starts. Check the vacuum hose if the light blinks during the first 30 seconds and reattach it if loose. Have the engine serviced if that does not help.

The engine will shut down in a few minutes if the diagnostics light comes on and stays on. Have the engine serviced if it shuts down with the light on. Service will also be required if the light blinks or comes on intermittently while the engine is running.

⚠WARNING *If the engine shuts down with the light on, emissions of deadly carbon monoxide gas could be excessive. Do not restart the engine. Have the engine serviced to avoid serious personal injury.*

TABLE 3. TROUBLESHOOTING

PROBLEM	CORRECTIVE ACTION
1. The engine fails to crank.	a. Release the clutch (if so equipped). b. Clean and tighten the positive (+) and negative (–) battery cable connections at the battery and at the engine. c. Recharge the battery. Refer to the equipment or battery manufacturer's recommendations.
2. The engine cranks slowly.	a. Release the clutch (if so equipped). b. Clean and tighten the positive (+) and negative (–) battery cable connections at the battery and at the engine. c. Recharge the battery. Refer to the equipment or battery manufacturer's recommendations. d. Change to engine oil having the proper viscosity for the ambient temperature (Page 11).
3. The engine cranks but fails to start.	a. Fill the LPG container if low on fuel. b. Open any closed fuel shut-off valve. c. Reconnect the spark plug cable if loose (Page 13). d. Service the air cleaner (Page 12). e. Clean the cooling air precleaner (Page 10). f. Replace the spark plug (Page 13). g. Reconnect the vacuum hose if loose on either end (Page 6). h. Reconnect any loose wiring. i. Make sure the proper type of LPG container is being used. The container must have a <i>vapor withdrawal fitting</i> to supply the engine.
4. The engine runs and then stops.	a. Fill the LPG container. <i>A cold LPG container may have to warm up inside or to be kept at least half full to provide the rate of vaporization necessary to keep up with engine fuel demand.</i> b. Add engine oil as necessary (Page 10). Drain the excess if too full.
5. The engine lacks power.	a. Service the air cleaner (Page 12). b. Fill the LPG container. <i>A cold LPG container may have to warm up inside or be kept at least half full to provide the rate of vaporization necessary to keep up with engine fuel demand.</i> c. Clean the spark arrestor (Page 13).

Specifications

Engine Type	1-Cylinder, 4-Stroke Cycle, Spark-Ignited, OHV, Air-Cooled, Vertical-Shaft
Bore	3.31 inches (84.2 mm)
Stroke	2.76 inches (70.0 mm)
Displacement	23.7 inches ³ (390 cc)
Compression Ratio	8.5 : 1
Oil Capacity (with Filter)*	1.5 quart (1.4 l)
Intake Valve Clearance (Cold)	0.006 inches (0.15 mm)
Exhaust Valve Clearance (Cold)	0.006 inches (0.15 mm)
Spark Plug Gap	0.035 inches (0.89 mm)
Spark Plug Tightening Torque	20 lbs-ft (26 N-m)
Ignition Timing (Non-adjustable, magneto ignition)	23° BTDC
LPG Fuel Supply (at the inlet to the engine gas pressure regulator)	Vapor Withdrawal at LPG Container Pressure (20-200 psi [138-1380 kPa])
Fuel Consumption @ wide open throttle (WOT)	3.6 lb/hr (1.6 kg/hr) @ 2700 rpm 4.1 lb/hr (1.8 kg/hr) @ 3000 rpm 4.4 lb/hr (2.0 kg/hr) @ 3300 rpm
Minimum Battery Capacity	220 CCA
* –See <i>Periodic Maintenance</i> for oil filling instructions.	

Information for California Engine Users

These engines meet the requirements of California's Exhaust Emissions Standards for 1995 and later for Utility and Lawn and Garden Equipment Engines.

As a California user of these engines, please be aware that unauthorized modifications or replacement of fuel, exhaust, air intake, or speed control system components that affect engine emissions are prohibited. Unauthorized modification, removal or replacement of the engine label is prohibited.

You should carefully review Operator (Owner),

Installation, and other manuals and information you receive with your engine or equipment. If you are unsure that the installation, use, maintenance, or service of your engine or equipment is authorized, you should seek assistance from an approved Onan engine dealer or an approved dealer for your equipment.

California engine users may use Table 4 as an aid in locating the information related to the California Air Resources Board requirements for emissions control.

TABLE 4. CALIFORNIA EMISSIONS CONTROL INFORMATION

Engine Warranty Information	The California emissions control warranty statement is located in the same packet of information as this manual when the engine is shipped from the factory.
Engine Valve Lash	See <i>Specifications</i> .
Engine Fuel Requirements	LPG floorcare engines are certified to operate on LPG vapor. See Fuel Recommendations in <i>Introduction</i> .
Engine Lubricating Oil Requirements	See Engine Oil Recommendations in <i>Introduction</i> .
Engine Fuel Mixture Settings	This engine has an electronically managed fuel system, which is not adjustable.
Engine Adjustments	See <i>Adjustments</i> .
Engine Emission Control System	The engine emissions control system consists of an electronically managed fuel system and a catalytic muffler on LPG floorcare engines. (TWC, O2S, TBI)



Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
763-574-5000
Fax: 763-528-7229

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