

MAINTENANCE

## Section 4 – Maintenance

### Guardian Air-cooled 7 kW, 12 kW and 15 kW Generators

1. Verify that the Auto/Off/Manual switch is set to AUTO.
2. Hold down the “Set Exercise Time” switch until the generator starts (approximately 10 seconds) and then release.
3. The generator will start and run for approximately 12 minutes and then shut down on its own. The exerciser will then be set to run at that time of day every week.

#### NOTE:

The exerciser will only work in the AUTO mode and will not work unless this procedure is performed. The exerciser will need to be reset every time the 12-volt battery is disconnected and then reconnected. The exerciser WILL NOT work if dip switch 2 on the controller printed circuit board (Remote Not Auto) is ON.

## 3.7 PROTECTION SYSTEMS

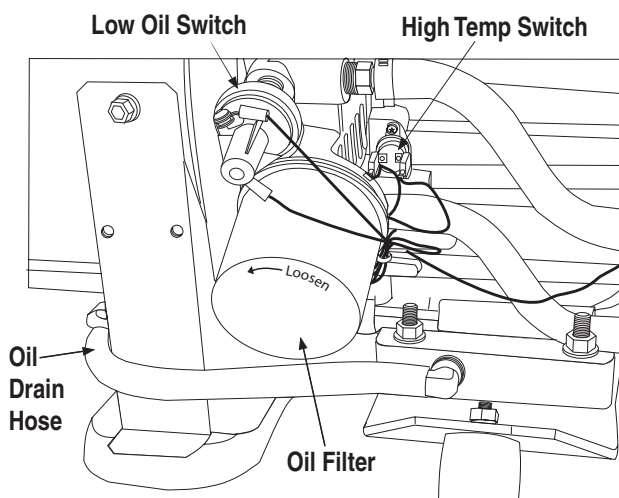
### ◆ 3.7.1 LOW OIL PRESSURE SWITCH

This switch (Figure 3.3) has normally closed contacts that are held open by engine oil pressure during cranking and operating. Should oil pressure drop below the 8 psi range, switch contacts close, and the engine shuts down. The unit should not be restarted until oil is added. The Auto/Off/Manual switch must then be turned to OFF and then back to AUTO.

### ◆ 3.7.2 HIGH TEMPERATURE SWITCH

This switch's contacts (Figure 3.3) close if the temperature should exceed approximately 140° C (284° F), initiating an engine shutdown. Your generator will automatically restart and the LED on the generator control panel will reset once the temperature has returned to a safe operating level.

**Figure 3.3 – Low Oil Pressure and High Temperature Switches**



### ◆ 3.7.3 OVERCRANK

This feature prevents the generator from damaging itself when it continually attempts to start and another problem, such as no fuel supply, prevents it from starting. The unit will crank and rest for a preset time limit. Then, it will stop cranking, and the LED on the generator control panel will light indicating an overcrank failure. The Auto/Off/Manual switch will need to be set to OFF and then back to AUTO to reset the generator control board.

#### NOTE:

If the fault is not repaired, the overcrank feature will continue to activate.

#### 3.7.3.1 Approximate Crank Cycle Times

- 15 seconds ON
  - 7 seconds OFF
  - 7 seconds ON
  - 7 seconds OFF
  - Repeat for 45 seconds
- Approximately 90 seconds total

### ◆ 3.7.4 OVERSPEED

This feature protects the generator from damage by shutting it down if it happens to run faster than the preset limit. This protection also prevents the generator from supplying an output that could potentially damage appliances connected to the generator circuit. Contact your nearest Generac/Guardian Authorized Dealer if this failure occurs.

## 4.1 FUSE

The generator panel's 15 amp fuse (Figure 4.1) protects the DC control circuit against overload. The fuse is wired in series with the battery output lead to the panel. If the fuse element has melted open, you cannot crank or start the engine. You should replace the fuse using only an identical 15-amp replacement.

The generator panel's 5 amp fuse protects the battery charge circuit against overload. If the fuse element has melted open, you will not have battery charging capability. You should replace the fuse using only an identical 5 amp replacement. To remove fuse, push cap down and rotate counterclockwise.

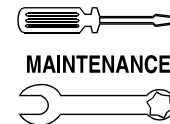
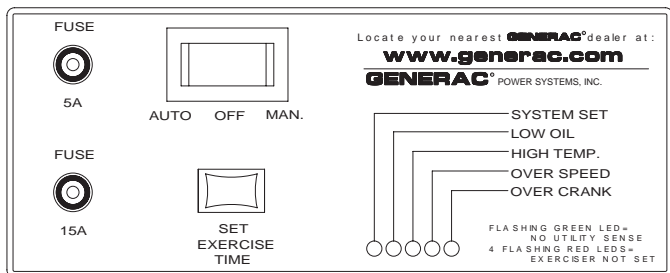


Figure 4.1 – Generator Control Panel



## 4.2 CHECKING THE ENGINE OIL LEVEL

For oil capacities, see “Specifications,” Section 1.5 (Page 6). For engine oil recommendations, see Section 4.3.1. To check the engine oil level, proceed as follows (Figures 4.2 and 4.3):

1. Start the generator by moving the Auto/Off/Manual switch to the MANUAL position. Allow it to run for a short while and then shut it down by moving the switch to the OFF position.
2. Remove the dipstick and wipe it dry with a clean cloth.
3. Install the dipstick; then, remove it again. The oil level should be at the dipstick “Full” mark. If necessary, add oil to the “Full” mark only. DO NOT FILL ABOVE THE “FULL” MARK.



Never operate the engine with the oil level below the “Add” mark on the dipstick. Doing this could damage the engine.

4. Install the dipstick.
5. Reset the Auto/Off/Manual switch to its original position.

Figure 4.2 — Oil Dipstick and Fill, 7 kW

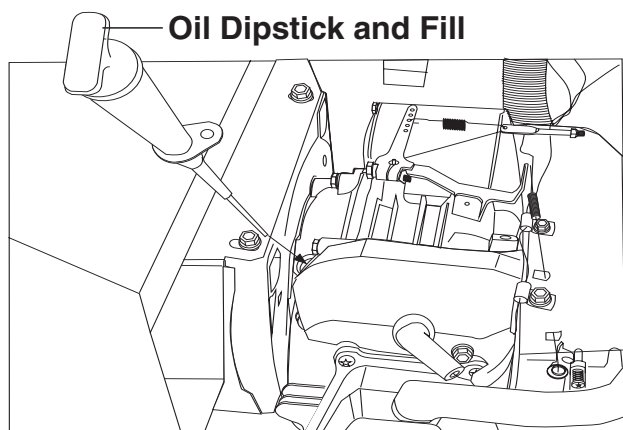
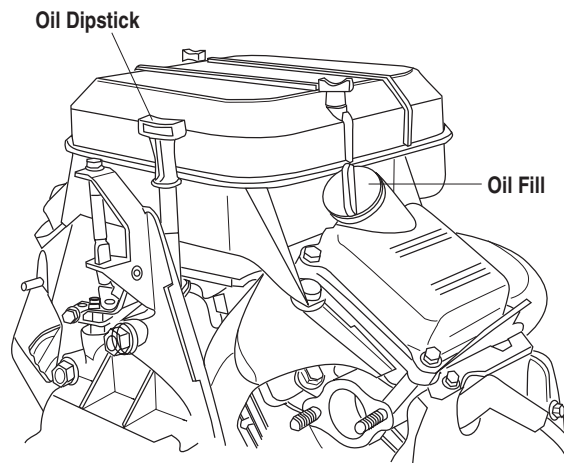


Figure 4.3 — Oil Dipstick and Fill, 12 kW and 15 kW



## 4.3 CHANGING THE ENGINE OIL

### ◆ 4.3.1 ENGINE OIL RECOMMENDATIONS

Use oil of American Petroleum Institute (API) Service Class SG, SH or SJ. Use all season SAE 5W-30 Synthetic oil. Organic break-in oil is required before using synthetic oil.

#### NOTE:

The unit is supplied with “break-in” oil. See the “Break-in Procedure,” Section 3.1 (Page 14), for the first required oil change.

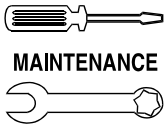


Any attempt to crank or start the engine before it has been properly serviced with the recommended oil may result in an engine failure.

### ◆ 4.3.2 OIL CHANGE PROCEDURE

To change the oil, proceed as follows:

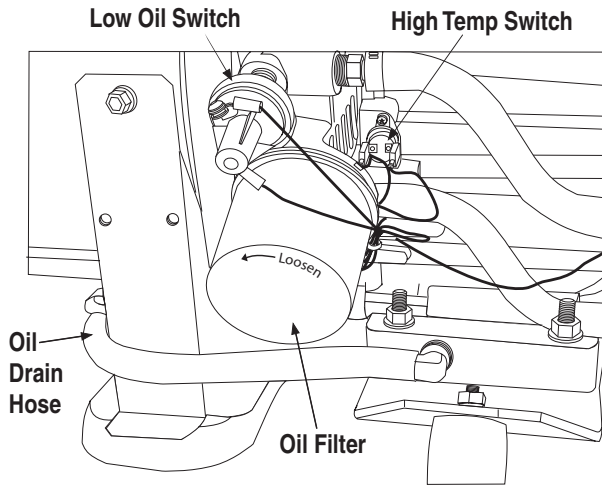
1. Run the engine until it is thoroughly warmed up then shut OFF the engine.
2. Immediately after the engine shuts OFF, pull the oil drain hose (Figure 4.4 on page 18) free of its retaining clip. Remove the cap from the hose and drain the oil into a suitable container.
3. After the oil has drained, replace the cap onto the end of the oil drain hose. Retain the hose in the clip.
4. Refill with the proper recommended oil (see Section 4.3.1). See Section 1.5.2 (Page 6) for oil capacities.



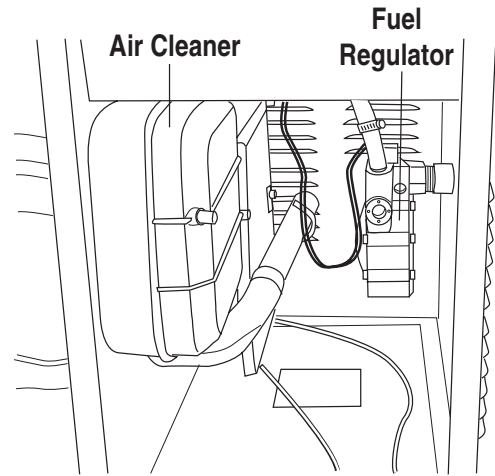
## Section 4 – Maintenance

### Guardian Air-cooled 7 kW, 12 kW and 15 kW Generators

**Figure 4.4 – Oil Drain Hose and Filter**



**Figure 4.6 — 7 kW, Engine Air Cleaner Location**



**Figure 4.7 — 12 kW and 15 kW Engine Air Cleaner**

## 4.4 CHANGING THE OIL FILTER

Change the engine oil filter as follows:

1. With the oil drained, remove the old oil filter by turning it counterclockwise.
2. Apply a light coating of clean engine oil to the gasket of the new filter. See Section 1.5.1 (Page 6) for recommended filter.
3. Screw the new filter on by hand until its gasket lightly contacts the oil filter adapter. Then, tighten the filter an additional 3/4 to one turn (Figure 4.4).
4. Refill with the proper recommended oil (see Section 4.3.1, Page 17). See Section 1.5.2 (Page 6) for oil capacities.
5. Start the engine and check for leaks.

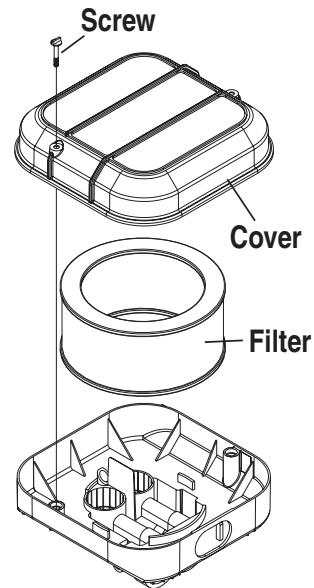
## 4.5 CHANGING THE ENGINE AIR CLEANER

### ◆ 4.5.1 7 KW, 12 KW AND 15 KW GENERATORS

See Figures 1.1 and 1.2, (Page 5), for the location of your air cleaner. Use the following procedure (Figure 4.6):

1. Turn the two screws counterclockwise to loosen.
2. Remove the cover and air filter.
3. Wipe away dust or debris from inside of the air box and around edges.
4. Install the new air cleaner into the air box.
5. Install the cover. Turn the two cover screws clockwise to tighten.

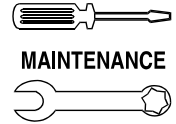
See the “Service Schedule,” Section 4.13 (Page 22) for air cleaner maintenance. See Section 1.5.1 (Page 6) for air filter replacement part number.



## 4.6 SPARK PLUG(S)

Reset the spark plug(s) gap or replace the spark plug(s) as necessary. See Section 4.13 (Page 22) for maintenance requirements.

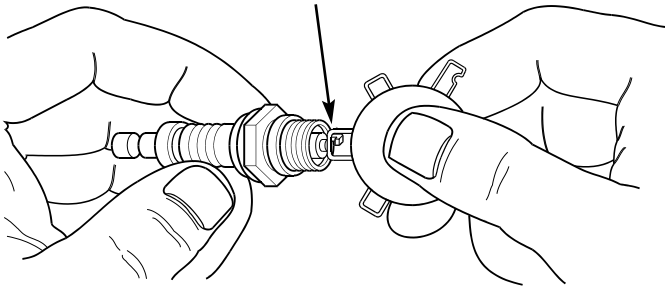
1. Clean the area around the base of the spark plug(s) to keep dirt and debris out of the engine. Clean by scraping or washing using a wire brush and commercial solvent. Do not blast the spark plug(s) to clean.
2. Remove the spark plug(s) and check the condition. Replace the spark plug(s) if worn or if reuse is questionable. See Section 4.13 (Page 22) for recommended inspection.



3. Check the spark plug gap using a wire feeler gauge. Adjust the gap to 0.76 mm (0.030 inch) for 7 kW and 0.50 mm (0.020 inch) for 12/15 kW by carefully bending the ground electrode (Figure 4.8).

**Figure 4.8 – Setting the Spark Plug Gap**

SET PLUG GAP AT 0.76 mm / 0.50 mm  
(0.030 inch / 0.020 inch)



## 4.7 BATTERY MAINTENANCE

The battery should be inspected per the “Service Schedule,” Section 4.13 (Page 22). The following procedure should be followed for inspection:

1. Inspect the battery posts and cables for tightness and corrosion. Tighten and clean as necessary.
2. Check the battery fluid level of unsealed batteries and, if necessary, fill with **DISTILLED WATER ONLY. DO NOT USE TAP WATER IN BATTERIES.**
3. Have the state of charge and condition checked. This should be done with an automotive-type battery hydrometer.



**DANGER**

⚠ Do not dispose of the battery in a fire. The battery is capable of exploding.

⚠ A battery presents a risk of electrical shock and high short circuit current. The following precautions are to be observed when working on batteries:

- Remove the 5A and 15A fuses from the generator control panel.
- Remove watches, rings or other metal objects;
- Use tools with insulated handles;
- Wear rubber gloves and boots;
- Do not lay tools or metal parts on top of the battery; and
- Disconnect charging source prior to connecting or disconnecting battery terminals.



**WARNING**

⚠ Do not open or mutilate the battery. Released electrolyte has been known to be harmful to the skin and eyes, and to be toxic.

⚠ The electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive. The following procedures are to be observed:

- Wear full eye protection and protective clothing;
- Where electrolyte contacts the skin, wash it off immediately with water;
- Where electrolyte contacts the eyes, flush thoroughly and immediately with water and seek medical attention; and
- Spilled electrolyte is to be washed down with an acid neutralizing agent. A common practice is to use a solution of 1 pound (500 grams) bicarbonate of soda to 1 gallon (4 liters) of water. The bicarbonate of soda solution is to be added until the evidence of reaction (foaming) has ceased. The resulting liquid is to be flushed with water and the area dried.

⚠ Lead-acid batteries present a risk of fire because they generate hydrogen gas. The following procedures are to be followed:

- **DO NOT SMOKE** when near the battery;
- **DO NOT** cause flame or spark in battery area; and
- Discharge static electricity from your body before touching the battery by first touching a grounded metal surface.

⚠ Be sure the Auto/Off/Manual switch is set to the OFF position before connecting the battery cables. If the switch is set to AUTO or MANUAL, the generator can crank and start as soon as the battery cables are connected.

⚠ Be sure the utility power supply is turned off and the 5A and 15A fuses are removed from the generator control panel, or sparking may occur at the battery posts as you attach the cables and cause an explosion.

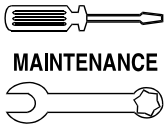
## 4.8 ADJUSTING GH-410/GT-990 VALVE CLEARANCE

After the first 50 hours of operation, you should adjust the valve clearance in the engine.

**Important:** If you feel uncomfortable about doing this procedure or you don't have the proper tools, please contact your Generac Authorized dealer for service assistance. This is a very important step to insure longest life for your engine.

**To adjust valve clearance:**

- Make sure the engine is at room temperature.
- Make sure that the spark plug wire is removed from the spark plug and out of the way.
- Remove the four screws attaching the valve cover with a #2 or #3 phillips screwdriver.



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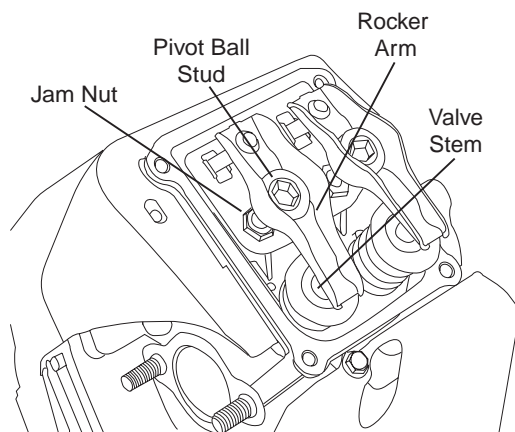
- Make sure the piston is at Top Dead Center (TDC) of its compression stroke (both valves closed). To get the piston at TDC, remove the intake screen at the front of the engine to gain access to the flywheel nut. Use a large socket and socket wrench to rotate the nut and hence the engine. While watching the piston through the spark plug hole. The piston should move up and down. The piston is at TDC when it is up as high as it can go.
- Loosen the rocker jam nut. Use an 10mm allen wrench to turn the pivot ball stud while checking clearance between the rocker arm and the valve stem with a feeler gauge. Correct clearance is 0.002-0.004 inch (0.05-0.1 mm).

#### NOTE:

**You must hold the rocker arm jam nut in place as you turn the pivot ball stud.**

When valve clearance is correct, hold the pivot ball stud in place with the allen wrench and tighten the rocker arm jam nut to 174 in/lbs. torque. After tightening the jam nut, recheck valve clearance to make sure it did not change.

**Figure 4.10 - Valve Clearance Adjustment**



- Install new valve cover gasket.
- Re-attach the valve cover.

#### NOTE:

**Start all four screws before tightening or you will not be able to get all the screws in place. Make sure the valve cover gasket is in place.**

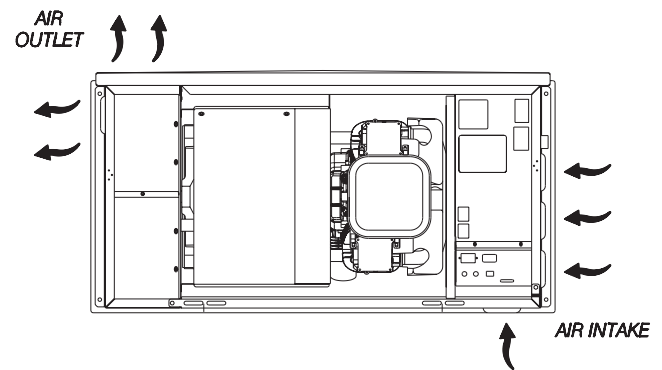
- Re-attach the spark plug wire to the spark plug.
- On GT-990, Repeat the process for the other cylinder.

## 4.9 COOLING SYSTEM

Air inlet and outlet openings in the generator compartment must be open and unobstructed for continued proper operation. This includes such obstructions as high grass, weeds, brush, leaves and snow.

Without sufficient cooling and ventilating air flow, the engine/generator quickly overheats, which causes it to quickly shut down. (See Figure 4.9 for vent locations.)

**Figure 4.9 – Cooling Vent Locations**



#### WARNING

- ⚠ The exhaust from this product gets extremely hot and remains hot after shutdown. High grass, weeds, brush, leaves, etc. must remain clear of the exhaust. Such materials may ignite and burn from the heat of the exhaust system.

#### CAUTION

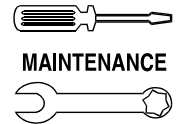
- ⚠ The maximum ambient temperature for your generator is 40° C (104° F).

## 4.10 ATTENTION AFTER SUBMERSION

If the generator has been submerged in water, it **MUST NOT** be started and operated. Following any submersion in water, have a Generac/Guardian Authorized Dealer thoroughly clean and dry the generator.

## 4.11 CORROSION PROTECTION

Periodically wash and wax the enclosure using automotive type products. Frequent washing is recommended in salt water/coastal areas. Spray engine linkages with a light oil such as WD-40.



## 4.12 OUT OF SERVICE PROCEDURE

### ◆ 4.12.1 REMOVAL FROM SERVICE

If you cannot exercise the generator every seven days, and it is to be out of service longer than 90 days, prepare the generator for storage as follows:

1. Start the engine and let it warm up.
2. Close the fuel shutoff valve in the fuel supply line and allow the unit to shut down.
3. Once the unit has shut down, it will signal a low oil fault.
4. Set the Auto/Off/Manual switch to OFF and turn off the utility power to the transfer switch. Remove the 5A and 15A fuses from the generator control panel. Disconnect the battery cables as outlined in "General Hazards" (page 2).
5. While the engine is still warm from running, drain the oil completely. Refill the crankcase with oil. See "Engine Oil Recommendations," Section 4.3.1 (Page 17).
6. Attach a tag to the engine indicating the viscosity and classification of the oil in the crankcase.
7. Remove the spark plug(s) and spray fogging agent into the spark plug(s) threaded openings. Reinstall and tighten the spark plug(s).
8. Remove the battery and store it in a cool, dry room on a wooden board. Never store the battery on any concrete or earthen floor.
9. Clean and wipe the entire generator.

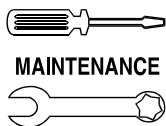
### ◆ 4.12.2 RETURN TO SERVICE

To return the unit to service after storage, proceed as follows:

1. Verify that utility power is turned off and that the Auto/Off/Manual switch is set to OFF.
2. Check the tag on the engine for oil viscosity and classification. Verify that the correct recommended oil is used in the engine (see Section 4.3.1, Page 17). If necessary, drain and refill with the proper oil.
3. Check the state of the battery. Fill all cells of unsealed batteries to the proper level with distilled water. DO NOT USE TAP WATER IN THE BATTERY. Recharge the battery to 100 percent state of charge, or, if defective, replace the battery. See "Specifications," Section 1.5 (Page 6), for type and size.
4. Clean and wipe the entire generator.
5. Remove the 5A and 15A fuses from the generator control panel. Reconnect the battery. Observe battery polarity. Damage may occur if the battery is connected incorrectly.
6. Open the fuel shutoff valve.
7. Insert the 5A and 15A fuses into the generator control panel. Start the unit by moving the Auto/Off/Manual switch to MANUAL. Allow the unit to warm up thoroughly.
8. Stop the unit by setting the Auto/Off/Manual switch to OFF.
9. Turn on the utility power to the transfer switch.
10. Set the Auto/Off/Manual switch to AUTO.
11. Your generator is now ready for service.

#### **NOTE:**

**If the battery was dead or disconnected, you must reset the exercise timer.**



MAINTENANCE

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**Guardian Air-cooled 7 kW, 12 kW and 15 kW Generators**

**4.13 SERVICE SCHEDULE**

**ATTENTION: It is recommended that all service work be performed by your nearest Generac/Guardian Authorized Dealer.**

<b>SYSTEM/COMPONENT</b>	<b>PROCEDURE</b>			<b>FREQUENCY</b>
X = Action R = Replace as Necessary * = Notify Dealer if Repair is Needed.	Inspect	Change	Clean	W = Weekly M = Monthly Y = Yearly
<b>FUEL</b>				
Fuel lines and connections*	X			M
<b>LUBRICATION</b>				
Oil level	X			M
Oil		X		AFTER BREAK-IN, AND Y
Oil filter		X		AFTER BREAK-IN, AND Y
<b>COOLING</b>				
Enclosure louvers	X		X	W
<b>BATTERY</b>				
Remove corrosion, ensure dryness	X		X	M
Clean and tighten battery terminals	X		X	M
Check charge state	X	R		EVERY 6 M
Electrolyte level (unsealed batteries only)*	X	R		EVERY 6 M
<b>ENGINE AND MOUNTING</b>				
Air cleaner	X	R		Y
Spark plug(s)	X	R		Y
<b>GENERAL CONDITION</b>				
Vibration, Noise, Leakage, Temperature*	X			M
<b>COMPLETE TUNE-UP*</b>	TO BE COMPLETED BY A GENERAC/ GUARDIAN AUTHORIZED DEALER			Y



## 5.1 TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	CORRECTION
The engine will not crank.	<ol style="list-style-type: none"> <li>1. Fuse blown.</li> <li>2. Loose, corroded or defective battery cables.</li> <li>3. Defective starter contactor. (7 kW)</li> <li>4. Defective starter motor.</li> <li>5. Dead Battery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace 15A fuse in generator control panel.</li> <li>2. Tighten, clean or replace as necessary.</li> <li>3. *</li> <li>4. *</li> <li>5. Charge or replace battery.</li> </ol>
The engine cranks but will not start.	<ol style="list-style-type: none"> <li>1. Out of fuel.</li> <li>2. Defective fuel solenoid (FS).</li> <li>3. Open #14 wire from engine control board.</li> <li>4. Defective spark plug(s).</li> <li>5. Valve lash out of adjustment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replenish fuel.</li> <li>2. *</li> <li>3. *</li> <li>4. Clean, re-gap or replace plug(s).</li> <li>5. Reset valve lash.</li> </ol>
The engine starts hard and runs rough.	<ol style="list-style-type: none"> <li>1. Air cleaner plugged or damaged.</li> <li>2. Defective spark plug(s).</li> <li>3. Fuel Regulator not set.</li> <li>4. Fuel Pressure incorrect.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check, replace air cleaner.</li> <li>2. Clean, re-gap or replace plug(s).</li> <li>3. Set Fuel Regulator.</li> <li>4. Confirm fuel pressure to regulator is 11-14" water column (0.6 psi).</li> </ol>
The Auto/Off/Manual switch is set to OFF, but the engine continues to run.	<ol style="list-style-type: none"> <li>1. Defective switch.</li> <li>2. Auto/Off/Manual switch wired incorrectly.</li> <li>3. Defective control board.</li> </ol>	<ol style="list-style-type: none"> <li>1. *</li> <li>2. *</li> <li>3. *</li> </ol>
There is no AC output from the generator.	<ol style="list-style-type: none"> <li>1. Main line circuit breaker open.</li> <li>2. Generator internal failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset circuit breaker to ON (or closed).</li> <li>2. *</li> </ol>
There is no transfer to standby after utility source failure.	<ol style="list-style-type: none"> <li>1. Defective transfer switch coil.</li> <li>2. Defective transfer relay.</li> <li>3. Transfer relay circuit open.</li> <li>4. Defective control logic board.</li> </ol>	<ol style="list-style-type: none"> <li>1. *</li> <li>2. *</li> <li>3. *</li> <li>4. *</li> </ol>
Unit consumes large amounts of oil.	<ol style="list-style-type: none"> <li>1. Break-in procedure not followed (see Section 2.1).</li> </ol>	<ol style="list-style-type: none"> <li>1. *</li> </ol>

**\*Contact your nearest Generac/Guardian Authorized Dealer for assistance.**