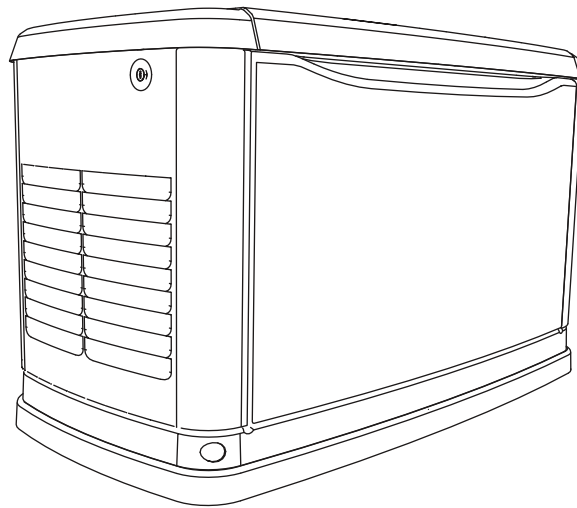




# *Owner's Manual*

## *60 Hz Air-Cooled Generators*

**20 kW Synergy™**



### **⚠ WARNING**

This product is not intended to be used in a critical life support application. Failure to adhere to this warning could result in death or serious injury.

(000209a)

Register your Generac product at:  
**WWW.GENERAC.COM**  
1-888-GENERAC  
(888-436-3722)

Para español , visita: <http://www.generac.com/service-support/product-support-lookup>

Pour le français, visiter : <http://www.generac.com/service-support/product-support-lookup>

# ***SAVE THIS MANUAL FOR FUTURE REFERENCE***

---

**Use this page to record important information about your generator set.**

Model:	
Serial:	
Prod Date Week:	
Volts:	
LPV Amps:	
NG Amps:	
Hz:	
Phase:	
Controller P/N:	

Record the information found on your unit data label on this page. For the location of the unit data label, see [General Information](#). The unit has a label plate affixed to the inside partition, to the left of the control panel console as shown in [Figure 2-1](#). For directions on how to open the top lid and remove the front panel, see [Operation](#).

When contacting an Independent Authorized Service Dealer (IASD) about parts and service, always supply the complete model number and serial number of the unit.

**Operation and Maintenance:** Proper maintenance and care of the generator ensures a minimum number of problems and keeps operating expenses at a minimum. It is the operator's responsibility to perform all safety checks, to make sure that all maintenance for safe operation is performed promptly. Generac recommends that the equipment be checked periodically by an Independent Authorized Service Dealer. Normal maintenance, service and replacement of parts are the responsibility of the owner/operator and, as such, are not considered defects in materials or workmanship within the terms of the warranty. Individual operating habits and usage may contribute to the need for additional maintenance or service.

When the generator requires servicing or repairs, Generac recommends contacting an Independent Authorized Service Dealer for assistance. Authorized service technicians are factory-trained and are capable of handling all service needs. To locate the nearest Independent Authorized Service Dealer, please visit the dealer locator at:

[www.generac.com/Service/DealerLocator/](http://www.generac.com/Service/DealerLocator/)

---

**! WARNING**

California Proposition 65. Engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm. (000004)

---

**! WARNING**

California Proposition 65. This product contains or emits chemicals known to the state of California to cause cancer, birth defects, and other reproductive harm. (000005)

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# Section 1: Safety Rules

## Introduction

Thank you for purchasing this compact, high performance, variable speed, air-cooled, engine-driven stationary automatic standby generator. It is designed to automatically supply electrical power to operate critical loads during a utility power failure.

This unit is factory installed in an all-weather, metal enclosure that is intended exclusively for outdoor installation. This generator will operate using either vapor withdrawn liquid propane (LP) or natural gas (NG).

**NOTE:** When sized properly, this generator is suitable for supplying typical residential loads such as induction motors (sump pumps, refrigerators, air conditioners, furnaces, etc.), electronic components (computer, monitor, TV, etc.), lighting loads and microwaves.

## Read This Manual Thoroughly



### **WARNING**

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury. (000100a)

If any portion of this manual is not understood, contact the nearest Independent Authorized Service Dealer for starting, operating and servicing procedures.

This manual must be used in conjunction with the appropriate Owner's Manual.

**SAVE THESE INSTRUCTIONS:** The manufacturer suggests that this manual and the rules for safe operation be copied and posted near the unit installation site. Safety should be stressed to all operators and potential operators of this equipment.

Throughout this publication and on tags and decals affixed to the generator, DANGER, WARNING, and CAUTION blocks are used to alert personnel to special instructions about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. Their definitions are as follows:

### **DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

(000001)

### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

(000002)

### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

(000003)

**NOTE:** Notes provide additional information important to a procedure or component.

These safety warnings cannot eliminate the hazards they indicate. Observing safety precautions and strict compliance with the special instructions while performing the action or service are essential to preventing accidents.

The operator is responsible for proper and safe use of the equipment. The manufacturer strongly recommends that if the operator is also the owner, to read the Owner's Manual and thoroughly understand all instructions before using this equipment. The manufacturer also strongly recommends instructing other users to properly start and operate the unit. This prepares them if they need to operate the equipment in an emergency.

## How to Obtain Service

When the generator requires servicing or repairs, Generac recommends contacting an Independent Authorized Service Dealer (IASD) for assistance. Service technicians are factory-trained and are capable of handling all service needs. For assistance locating a dealer, go to [www.generac.com/Service/DealerLocator/](http://www.generac.com/Service/DealerLocator/).

When contacting an IASD about parts and service, always supply the complete model number and serial number of the unit as given on its data decal, which is located on the generator. Refer to [Figure 2-1](#) for decal location. Record the model number and serial numbers in the spaces provided on the inside front cover of this manual.

## Safety Rules

Study these SAFETY RULES carefully before installing, operating or servicing this equipment. Become familiar with this Owner's Manual and with the unit. The generator can operate safely, efficiently and reliably only if it is properly installed, operated and maintained. Many accidents are caused by failing to follow simple and fundamental rules or precautions.

The manufacturer cannot anticipate every possible circumstance that might involve a hazard. The warnings in this manual and on tags and decals affixed to the unit are, therefore, not all-inclusive. If using a procedure, work method, or operating technique the manufacturer does not specifically recommend, verify that it is safe for others. Also, make sure the procedure, work method or operating technique utilized does not render the generator unsafe.

### General Hazards

#### **DANGER**

Loss of life. Property damage. Installation must always comply with applicable codes, standards, laws and regulations. Failure to do so will result in death or serious injury. (000190)

#### **DANGER**

Automatic start-up. Disconnect utility power and render unit inoperable before working on unit. Failure to do so will result in death or serious injury. (000191)

#### **WARNING**

This unit is not intended for use as a prime power source. It is intended for use as an intermediate power supply in the event of temporary power outage only. See individual unit specifications for required maintenance and run times pertaining to use. (000247)



#### **WARNING**

This product is not intended to be used in a critical life support application. Failure to adhere to this warning could result in death or serious injury. (000209a)



#### **WARNING**

Electrocution. Potentially lethal voltages are generated by this equipment. Render the equipment safe before attempting repairs or maintenance. Failure to do so could result in death or serious injury. (000187)

#### **WARNING**

Accidental Start-up. Disconnect the negative battery cable, then the positive battery cable when working on unit. Failure to do so could result in death or serious injury. (000130)

#### **WARNING**

Only qualified service personnel may install, operate and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and damage to equipment or property. (000182)

#### **WARNING**

Only a trained and licensed electrician should perform wiring and connections to unit. Failure to follow proper installation requirements could result in death, serious injury, and damage to equipment or property. (000155)



#### **WARNING**

Moving Parts. Do not wear jewelry when starting or operating this product. Wearing jewelry while starting or operating this product could result in death or serious injury. (000115)



#### **WARNING**

Moving Parts. Keep clothing, hair, and appendages away from moving parts. Failure to do so could result in death or serious injury. (000111)



#### **WARNING**

Hot Surfaces. When operating machine, do not touch hot surfaces. Keep machine away from combustibles during use. Hot surfaces could result in severe burns or fire. (000108)

#### **WARNING**

Equipment and property damage. Do not alter construction of, installation, or block ventilation for generator. Failure to do so could result in unsafe operation or damage to the generator. (000146)

**⚠ WARNING**

Risk of injury. Do not operate or service this machine if not fully alert. Fatigue can impair the ability to service this equipment and could result in death or serious injury. (000215)

**⚠ WARNING**

Environmental Hazard. Always recycle batteries at an official recycling center in accordance with all local laws and regulations. Failure to do so could result in environmental damage, death or serious injury. (000228)

**⚠ WARNING**

Injury and equipment damage. Do not use generator as a step. Doing so could result in falling, damaged parts, unsafe equipment operation, and could result in death or serious injury. (000216)

Inspect the generator regularly, and contact the nearest Independent Authorized Service Dealer for parts needing repair or replacement.

**Exhaust Hazards****⚠ DANGER**

Asphyxiation. Running engines produce carbon monoxide, a colorless, odorless, poisonous gas. Carbon monoxide, if not avoided, will result in death or serious injury. (000103)

**⚠ WARNING**

Asphyxiation. Always use a battery operated carbon monoxide alarm indoors and installed according to the manufacturer's instructions. Failure to do so could result in death or serious injury. (000178a)

- Adequate, unobstructed flow of cooling and ventilating air is critical to correct generator operation. Do not alter the installation or permit even partial blockage of ventilation provisions, as this can seriously affect safe operation of the generator. The generator must be installed and operated outdoors only.

**Electrical Hazards****⚠ DANGER**

Electrocution. Contact with bare wires, terminals, and connections while generator is running will result in death or serious injury. (000144)

**⚠ DANGER**

Electrocution. Never connect this unit to the electrical system of any building unless a licensed electrician has installed an approved transfer switch. Failure to do so will result in death or serious injury. (000150)

**⚠ DANGER**

Electrical backfeed. Use only approved switchgear to isolate generator when electrical utility is the primary power source. Failure to do so will result in death, serious injury, and equipment damage. (000131a)

**⚠ DANGER**

Electrocution. Verify electrical system is properly grounded before applying power. Failure to do so will result in death or serious injury. (000152)

**⚠ DANGER**

Electrocution. Do not wear jewelry while working on this equipment. Doing so will result in death or serious injury. (000188)

**⚠ DANGER**

Electrocution. Water contact with a power source, if not avoided, will result in death or serious injury. (000104)

**⚠ DANGER**

Electrocution. Contact with bare wires, terminals, and connections while generator is running will result in death or serious injury. (000144)

**⚠ DANGER**

Electrocution. In the event of electrical accident, immediately shut power OFF. Use non-conductive implements to free victim from live conductor. Apply first aid and get medical help. Failure to do so will result in death or serious injury. (000145)

## Fire Hazards



### ⚠️ WARNING

Fire hazard. Do not obstruct cooling and ventilating airflow around the generator. Inadequate ventilation could result in fire hazard, possible equipment damage, death or serious injury. (000217)



### ⚠️ WARNING

Fire and explosion. Installation must comply with all local, state, and national electrical building codes. Noncompliance could result in unsafe operation, equipment damage, death or serious injury. (000218)



### ⚠️ WARNING

Fire hazard. Use only fully-charged fire extinguishers rated "ABC" by the NFPA. Discharged or improperly rated fire extinguishers will not extinguish electrical fires in automatic standby generators. (000219)



### ⚠️ WARNING

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury. (000100a)



### ⚠️ WARNING

Risk of electrocution. Refer to NFPA 70E for safety equipment required when working with with a live electrical system. Failure to use required safety equipment could result in death or serious injury. (000221)



### ⚠️ WARNING

Risk of Fire. Unit must be positioned in a manner that prevents combustible material accumulation underneath. Failure to do so could result in death or serious injury. (000147)

Comply with regulations the Occupational Safety and Health Administration (OSHA) has established. Also, verify that the generator is installed in accordance with the manufacturer's instructions and recommendations. Following proper installation, do nothing that might alter a safe installation and render the unit in noncompliance with the aforementioned codes, standards, laws and regulations.

## Explosion Hazards



### ⚠️ DANGER

Explosion and Fire. Fuel and vapors are extremely flammable and explosive. No leakage of fuel is permitted. Keep fire and spark away. Failure to do so will result in death or serious injury. (000192)

### ⚠️ DANGER

Connection of fuel source must be done by a qualified professional technician or contractor. Incorrect installation of this unit will result in death, serious injury, and damage to equipment and property damage. (000151)



### ⚠️ DANGER

Risk of fire. Allow fuel spills to completely dry before starting engine. Failure to do so will result in death or serious injury. (000174)



### ⚠️ WARNING

Risk of Fire. Hot surfaces could ignite combustibles, resulting in fire. Fire could result in death or serious injury. (000110)



## Section 2: General Information

### Synergy Operating Principle

#### Benefits

The Synergy 20 kW generator brings exciting new technology to the Home Standby Generator. The generator is significantly more fuel-efficient than constant speed generators at normal loads, provides premium power quality, and is significantly quieter while operating at exercise and normal loads.

- Exceptionally quiet exercise at 57 dB
- Quieter operation; 3 dB sound reduction with improved tonal qualities at exercise and under normal loads
- Cleanest Standby power available with 1.5 THD
- Significant fuel savings: more fuel efficient under normal loads
- Lower operating speed at 2700 rpm at low loads
- Tuned Helmholtz resonator and muffler to further reduce sound levels
- Variable Speed / Constant Frequency operation

#### Start Up

When the generator starts, the engine speed increases to 3600 RPM to produce maximum power. This optimizes power to carry the load when the transfer switch operates. The engine RPM then gradually decreases to a speed appropriate for the attached load.

For example: If there is no load, the engine speed decreases to approximately 2700 RPM. The time it takes to decrease to 2700 RPM is approximately 4–5 minutes. Since the rate of decrease is linear, less time would be required for it to decrease to only 3400 RPM.

During startup, as the engine speed increases to 3600 RPM, the Automatic Voltage Regulator (AVR) electronics perform a self test (before transfer) involving an overall system check of the unit. If a fault is detected, the unit shuts down and displays an alarm.

#### Normal Running

The engine operates between 2700 RPM–3600 RPM depending on the attached load. When the load increases or decreases, the speed increases or decreases accordingly.

#### Small Load Changes

The system is designed to maintain the current engine speed for small load changes. Larger load changes result in a change in engine speed to appropriately handle the load.

#### Large Load (Not Overload)

The engine always runs at a speed appropriate for the attached load. When a large load is applied, the fast loadshed signal is activated. All loads attached to the loadshed controller in the transfer switch are dropped and the engine speed immediately increases to 3600 RPM. Five seconds later, the loadshed signal is deactivated and Loads 3 and 4 are sequenced back on, spaced 15 seconds apart. Loads 1 and 2, which are designed for air conditioners, are sequenced back on after five minutes.

The engine speed remains at 3600 RPM for a programmable time (20 minutes default) and then slows to the speed appropriate for the attached load. The programmable time can be changed by the dealer to prevent annoying increases and decreases in engine speed if large loads turn on and off frequently.

#### Overload

If a load is sensed that is too large for the engine, that load will be locked out for a period of 30 minutes. If the load is not connected through a fast loadshed-enabled controller and module, the generator will shut down with an “Overload” alarm.

#### Low Speed Exercise

Low speed exercise operates at 1950 RPM for five minutes. The output voltage and frequency will not be at the rated voltage and frequency during exercise.

#### Normal Exercise

Normal exercise is at 3600 RPM at normal voltage and frequency levels for 5 minutes.

#### Automatic Voltage Regulator (AVR) Cooling Fans

The system is equipped with two fans to cool the AVR electronics. The primary fan is powered by AC during operation. The secondary fan is powered by 12V DC through the controller. The fans are monitored during operation and, if a failure occurs, an alarm is displayed.



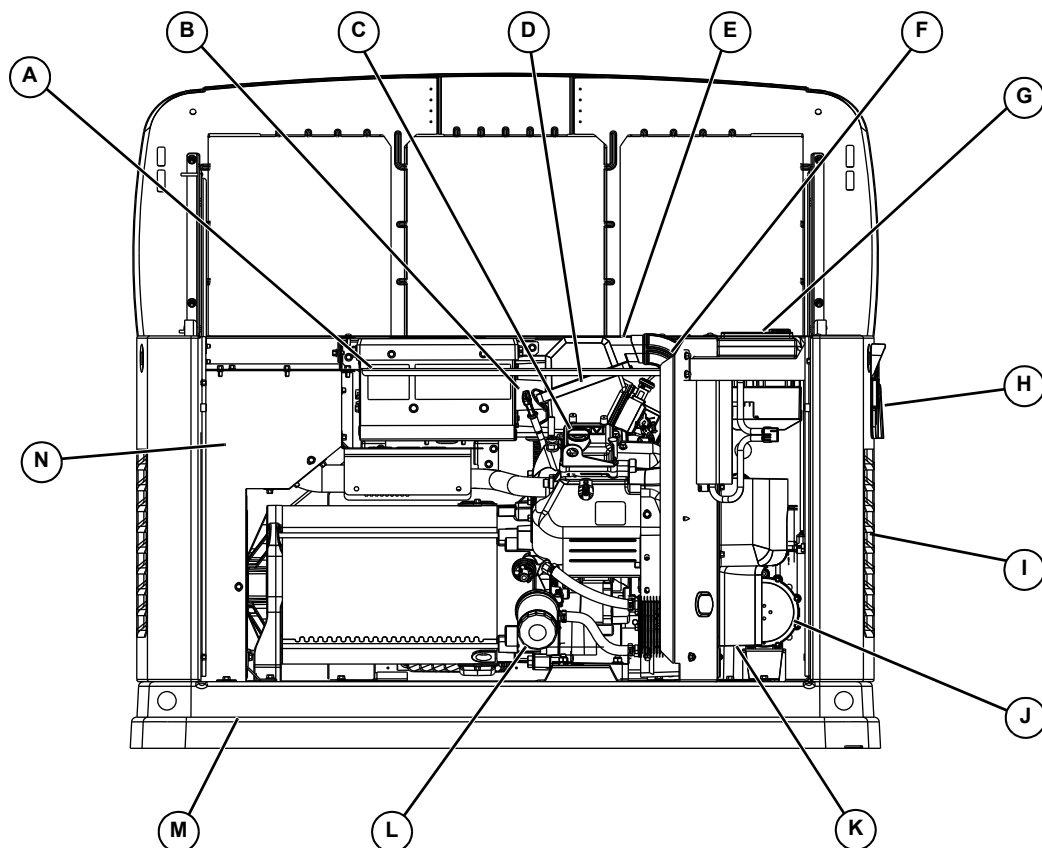
#### WARNING

Moving Parts. Keep clothing, hair, and appendages away from moving parts. Failure to do so could result in death or serious injury.

(000111)

The secondary fan continues to operate for up to **one hour** after the generator is shut down (even if the 7.5 amp ATO fuse is removed). Proper cooling must occur before removing battery connections for maintenance or other service activity. Be extremely careful when working near the AVR fan housing.

**NOTE:** The AVR cooling air inlet includes a filter. Verify the filter is installed and properly seated at time the unit is installed. Check the filter at regular maintenance intervals to verify proper airflow.



001402

**Figure 2-1. Component Locations**

- |                                      |                        |
|--------------------------------------|------------------------|
| A. Automatic Voltage Regulator (AVR) | H. Circuit Breakers    |
| B. Oil Dipstick                      | I. Fuel Inlet (Back)   |
| C. Oil Fill Cap                      | J. Fuel Regulator      |
| D. Engine Air Filter                 | K. Battery Compartment |
| E. AVR Air Filter                    | L. Oil Filter          |
| F. Data Label                        | M. Composite Base      |
| G. Control Pad                       | N. Exhaust Enclosure   |

## Protection Systems

The generator may have to run for long periods of time with no operator present to monitor the engine/generator conditions. Therefore, the generator is equipped with a number of systems to automatically shut down the unit to protect it against potentially damaging conditions. Some of these systems are as follows:

### Alarms:

- High Temperature
- Low Oil Pressure
- Overcrank
- Overspeed
- Overvoltage
- Undervoltage
- Overload
- Underspeed
- RPM Sensor Loss
- Controller Fault
- Wiring Error
- Fuse Problem
- Stepper Overcurrent

### Warnings:

- Charger Warning
- Charger Missing AC
- Low Battery
- Battery Problem
- Exercise Set Error
- USB Warning
- Download Failure

The control panel contains a display which alerts the operator when a fault condition occurs. The above list is not all inclusive. For more information about alarms and control panel operation, see [Operation](#).

**NOTE:** A warning will indicate a condition, on the generator, that should be addressed but not shut the generator down. An alarm will shut the generator down to protect the system from any damage. In the event of an alarm, an owner can clear the alarm and restart the generator prior to contacting an Independent Authorized Service Dealer. If the intermittent issue occurs again, contact an Independent Authorized Service Dealer.

NOTE: For Synergy-specific alarms, see [General Troubleshooting](#).

## Emissions

The United States Environmental Protection Agency (US EPA) (and California Air Resources Board (CARB), for engines/equipment certified to California standards) requires that this engine/equipment complies with exhaust and evaporative emissions standards. Locate the emissions compliance decal on the engine to determine applicable standards. For emissions warranty information, please reference the included emissions warranty. It is important to follow the maintenance specifications in the manual to ensure that the engine complies with the applicable emissions standards for the duration of the product's life.

This generator is certified to operate on Liquid Propane Vapor fuel or pipeline Natural Gas.

The Emission Control System code is EM (Engine Modification). The Emission Control System on this generator may consist of the following components:

### Air Induction System

- Intake Pipe / Manifold
- Air Cleaner

### Ignition System

- Spark Plug
- Ignition Module

### Fuel Metering System

- Carburetor / Mixer Assembly
- Fuel Regulator

### Exhaust System

- Exhaust Manifold
- Muffler

# Specifications

## Generator

Model	20 kW Synergy
Rated Voltage	240
Rated Maximum Load Current (Amps) at rated voltage (LP)*	83.3
Main Circuit Breaker	90 Amp
Phase	1
Rated AC Frequency	60 Hz
Battery Requirement	Group 26R, 12 Volts and 540 CCA Minimum (see <a href="#">Replacement Parts</a> )
Enclosure	Aluminum
Unit Weight (lbs/kilos)	481 / 218
Normal Operating Range	This unit is tested in accordance to UL 2200 standards with an operating temperature of -20 °F (-29 °C) to 122 °F (50 °C). For areas where temperatures fall below 32 °F (0 °C) a cold weather kit is recommended. When operated above 77 °F (25 °C) there may be a decrease in engine power. (Please reference the engine specifications.)
<p>These generators are rated in accordance with UL 2200, Safety Standard for Stationary Engine Generator Assemblies, and CSA-C22.2 No. 100-04 Standard for Motors and Generators.</p> <p>* Natural Gas ratings will depend on specific fuel joules/Btu content. Typical derates are between 10-20% off the LP gas rating.</p> <p>** Circuits to be moved must be protected by same size breaker. For example, a 15 amp circuit in the main panel must be a 15 amp circuit in the transfer switch.</p>	

## Engine

Model	20 kW Synergy
Type of Engine	GT-999
Number of Cylinders	2
Displacement	999 cc
Cylinder Block	Aluminum w/ cast iron sleeve
Recommended Spark Plug	see <a href="#">Replacement Parts</a>
Spark Plug Gap	1.02 mm (0.040 in)
Valve Clearance	0.05 - 0.1 mm (0.002 - 0.004 in)
Starter	12 VDC
Oil Capacity Including Filter	Approx. 1.9 qt (1.8 L)
Recommended Oil Filter	see <a href="#">Replacement Parts</a>
Recommended Air Filter	see <a href="#">Replacement Parts</a>
<p>Engine power is subject to and limited by such factors as fuel Btu/joules, ambient temperature and altitude. Engine power decreases about 3.5 percent for each 1000 feet (304.8 meters) above sea level, and also will decrease about 1 percent for each 6 °C (10 °F) above 15 °C (60 °F) ambient temperature.</p>	

The specification sheet for your generator was included in the documentation provided with the unit at the time of purchase. For additional copies, consult your local Independent Authorized Service Dealer for your specific generator model.

## Fuel Requirements



**⚠ DANGER**

Explosion and Fire. Fuel and vapors are extremely flammable and explosive. Add fuel in a well ventilated area. Keep fire and spark away. Failure to do so will result in death or serious injury. (000105)

The engine has been fitted with a dual fuel carburetion system. The unit will run on natural gas or LP gas (vapor), but it has been factory set to run on natural gas. The fuel system will be configured for the available fuel source during installation.

Recommended fuels should have a BTU content of at least 1000 Btus per cubic foot (37.26 megajoules per cubic meter) for natural gas, or at least 2500 BTUs per cubic foot (93.15 megajoules per cubic meter) for LP gas (vapor).

**NOTE:** If converting to LP gas from natural gas, a minimum LP tank size of 250 gallons (946 liters) is recommended. See the Installation Manual for complete procedures and details.

## Battery Requirements

Group 26R, 12V, minimum 540 CCA.

For proper battery maintenance procedures, see Section 4 [Maintenance](#).

## Battery Charger

The battery charger is integrated into the control panel module in all models. It operates as a Smart Charger which ensures output charging levels are safe and continuously optimized to promote maximum battery life.

## Engine Oil Requirements

For proper oil viscosity, see chart in [Figure 4-1](#).

## Replacement Parts

Description	20 kW Synergy
26R Exide Battery	0H3421S
Spark Plug	0G0767A
Oil Filter	070185E
Air Filter	0J8478
Control Panel Fuse	0D7178T
Transfer Switch Fuses	073590A

## Accessories

Performance enhancing accessories are available for air-cooled generators.

Accessory	Description
Cold Weather Kit	Recommended in areas where temperatures fall below 32 °F (0 °C).
Scheduled Maintenance Kit	Includes all pieces necessary to perform maintenance on the generator along with oil recommendations.
Auxiliary Transfer Switch Lockout	Enables any of the transfer switches to completely lock out one large electrical load by tying into its control system.
Fascia Base Wrap	The fascia base wrap snaps together around the bottom of new air-cooled generators. This offers a sleek, contoured appearance as well as offering protection from rodents and insects by covering the lifting holes located in the base. Requires use of the mounting pad shipped with the generator.
Mobile Link™ (USA only)	Provides a personalized web portal that displays the generator status, maintenance schedule, event history and much more. This portal is accessible via computer, tablet or smart phone. Sends emails and/or text notifications the moment there is any change in the generator's status. Notification settings can be customized to what type of alert is sent and how often. For more information, visit <a href="http://www.MobileLinkGen.com">www.MobileLinkGen.com</a> .
Touch-Up Paint Kit	Very important to maintain the look and integrity of the generator enclosure. This kit includes touch-up paint and instructions.
Wireless Local Monitor	Completely wireless and battery powered, the Wireless Local Monitor provides you with instant status without ever leaving the house. Status lights (red, yellow and green) alert owners when the generator needs attention. Magnetic backing permits refrigerator mounting and gives a 600 foot line of sight communication.
Power Management Module (PMM) Starter Kit	Includes one module with transformer. The transformer, which is mounted inside the ATS enclosure, interfaces with the OPCB to generate the 24 VAV signal needed for control of the contactor (Load 1 on the OPCB).
Power Management Module (PMM)	Includes one module only. To achieve full system functionality, a total of three kits are required to allow control of the three remaining contactors (Loads 2/3/4 on the OPCB).
Extended Warranty Coverage	<p>Extend your generator warranty coverage by purchasing extended warranty coverage. Covers both parts and labor. Extended coverage can be purchased within 12 months of the end-users purchase date.</p> <p>This extended coverage is applicable to registered units and end-user proof of purchase must be available upon request.</p> <p>Available for Generac®, Guardian®, Centurion®, and Synergy™ products. Not available for EcoGen™ products or all international purchases.</p>

**NOTE:** Contact an Independent Authorized Service Dealer or visit [www.generac.com](http://www.generac.com) for additional information on replacement parts, accessories, and extended warranties.

## Section 3: Operation

### Site Prep Verification

It is important that the generator is installed in such a way that the airflow into and out of the generator is not impeded. Verify that all shrubs or tall grasses have been removed within 3 ft. (0.91 m) of the intake and discharge louvers on the sides of the enclosure. It is also important that the generator is not subject to water intrusion. Verify that all potential sources such as water sprinklers, roof run-off, rain gutter down spouts and sump pump discharges are directed away from the generator enclosure.



#### **WARNING**

Risk of fire. Keep air inlet and exhaust areas free from leaves, grass, snow and other debris. Failure to do so could result in death, serious injury, property, and equipment damage. (000251)

#### **DANGER**

Automatic start-up. Disconnect utility power and render unit inoperable before working on unit. Failure to do so will result in death or serious injury. (000191)

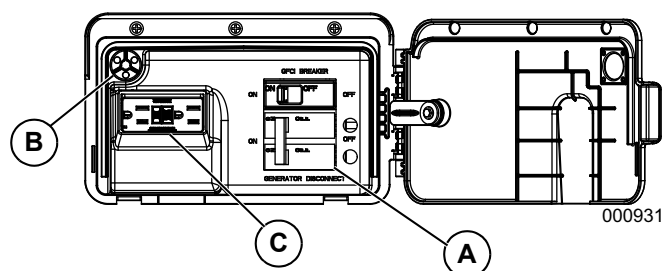
Turn the generator OFF before performing maintenance. Remove 7.5 Amp fuse, T1 and T2 battery charge fuses, and disconnect battery cables to prevent accidental start up. Disconnect the NEGATIVE (-) cable first, then disconnect the POSITIVE (+) cable. When connecting the cables, connect the POSITIVE cable first, the NEGATIVE cable last.

#### **WARNING**

Only qualified service personnel may install, operate and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and damage to equipment or property. (000182)

### Side Compartment

Local codes may require that the side compartment be locked. A hasp is provided so the owner/operator can secure the side compartment with a padlock. Check local codes for side compartment locking requirements.



**Figure 3-1. Open Side Compartment**

#### Main Circuit Breaker (Generator Disconnect)

This is a 2-pole breaker rated according to relevant specifications. See “A” in [Figure 3-1](#).

#### LED Indicator Lights

See “B” in [Figure 3-1](#).

- Green LED “Ready” light is on when utility is present and the control panel button is in the AUTO position. This also indicates when the generator is running.
- Red LED “Alarm” light is on when the generator is OFF or a fault is detected. Contact an Independent Authorized Servicing Dealer.
- Yellow LED “Maintenance” light.

**NOTE:** Yellow LED may be on at the same time as either the Red or Green LED.

#### 120V GFCI Outlet/15 Amp Breaker

See “C” in [Figure 3-1](#). This generator is equipped with an external 15 Amp, 120 volt GFCI convenience outlet located in the top corner of the compartment.

When the generator is running in the absence of utility power, this outlet may also be used to power items outside the home such as lights or power tools. This outlet may also be used when utility power is present by running the generator in manual mode.

This outlet does not provide power if the generator is not running. Do not use this outlet when the generator is in Exercise mode. This outlet is protected by a 15 Amp circuit breaker in the side compartment.

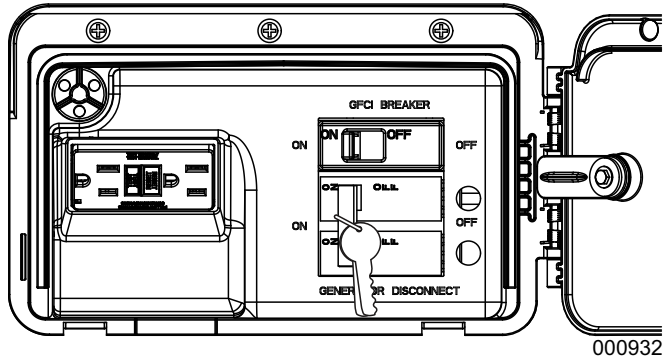


## Generator Enclosure

The lid is locked for shipping and remains locked while the generator is in normal operation. A set of keys is attached to the circuit breaker box door with a cable tie.

1. Cut the cable tie to remove the keys.
2. Use the keys to open the lid of the generator.

**NOTE:** The enclosed keys provided with this unit are intended for service personnel use only.



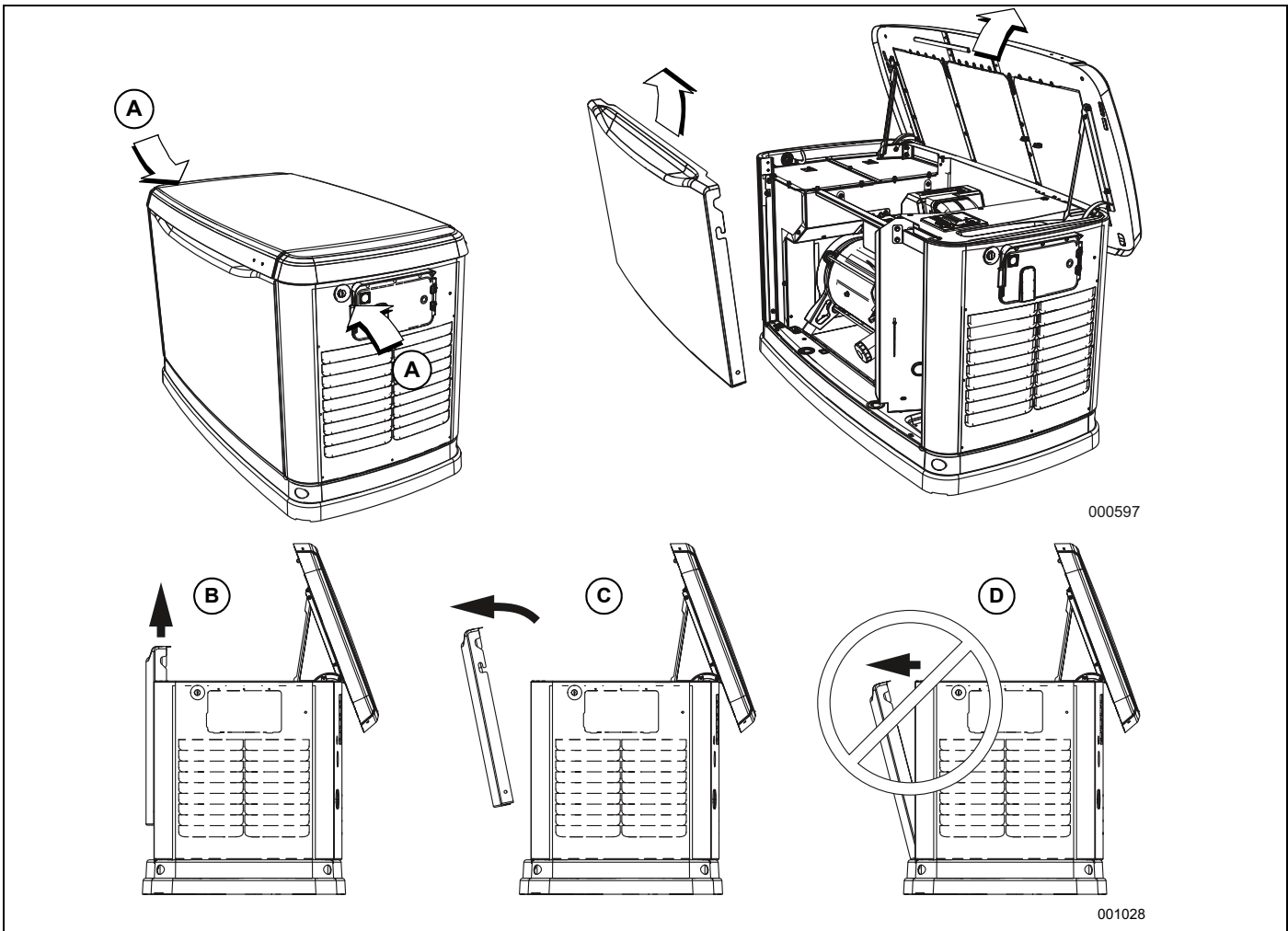
3. There are two locks securing the lid, one on each side (A in [Figure 3-3](#)). To properly open the lid, press down, on the lid, above the side lock and unlock the latch.
4. Repeat for the other side. If pressure is not applied from the top, the lid may appear stuck.

**NOTE:** Always verify that the side locks are unlocked before attempting to lift the lid.

5. Once the lid is open, remove the front access panel by lifting it up and out.

**NOTE:** Always the lift the front access panel up before pulling away from enclosure (B and C in [Figure 3-3](#)). Do not pull the panel away from the enclosure before lifting up (D in [Figure 3-3](#)).

**Figure 3-2. Circuit Breaker Box and Keys (As Shipped)**



**Figure 3-3. Side Lock Location and Front Panel Removal**

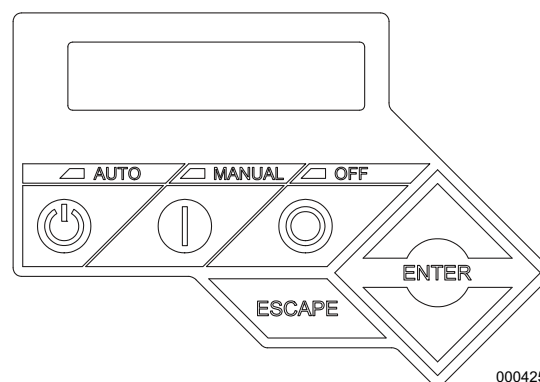


## Control Panel Interface

The Control Panel Interface is located under the lid of the enclosure. Before attempting to lift the lid of the enclosure, verify that both left and right side locks are unlocked. To remove the front cover, lift the cover straight up to disengage the side hooks, then tilt and lift it away from the unit.

When closing the unit, verify that both left and right side locks are securely locked.

**NOTE:** All appropriate panels must be in place during any operation of the generator. This includes operation by a servicing technician while conducting troubleshooting procedures.



**Figure 3-4. Generator Control Panel**

## Using the Auto/Off/Manual Interface

Button	Description of Operation
AUTO	Selecting this button activates fully automatic system operation. It also allows the unit to automatically start and exercise the generator according to the exercise timer (see the Setting the Exercise Timer section).
OFF	This button shuts down the engine and also prevents automatic operation of the unit.
MANUAL	This button will crank and start the generator. Transfer to standby power will not occur unless there is a utility failure.

**NOTE:** Damage caused by mis-wiring of the interconnect wires is not warrantable.

## Interface Menu Displays

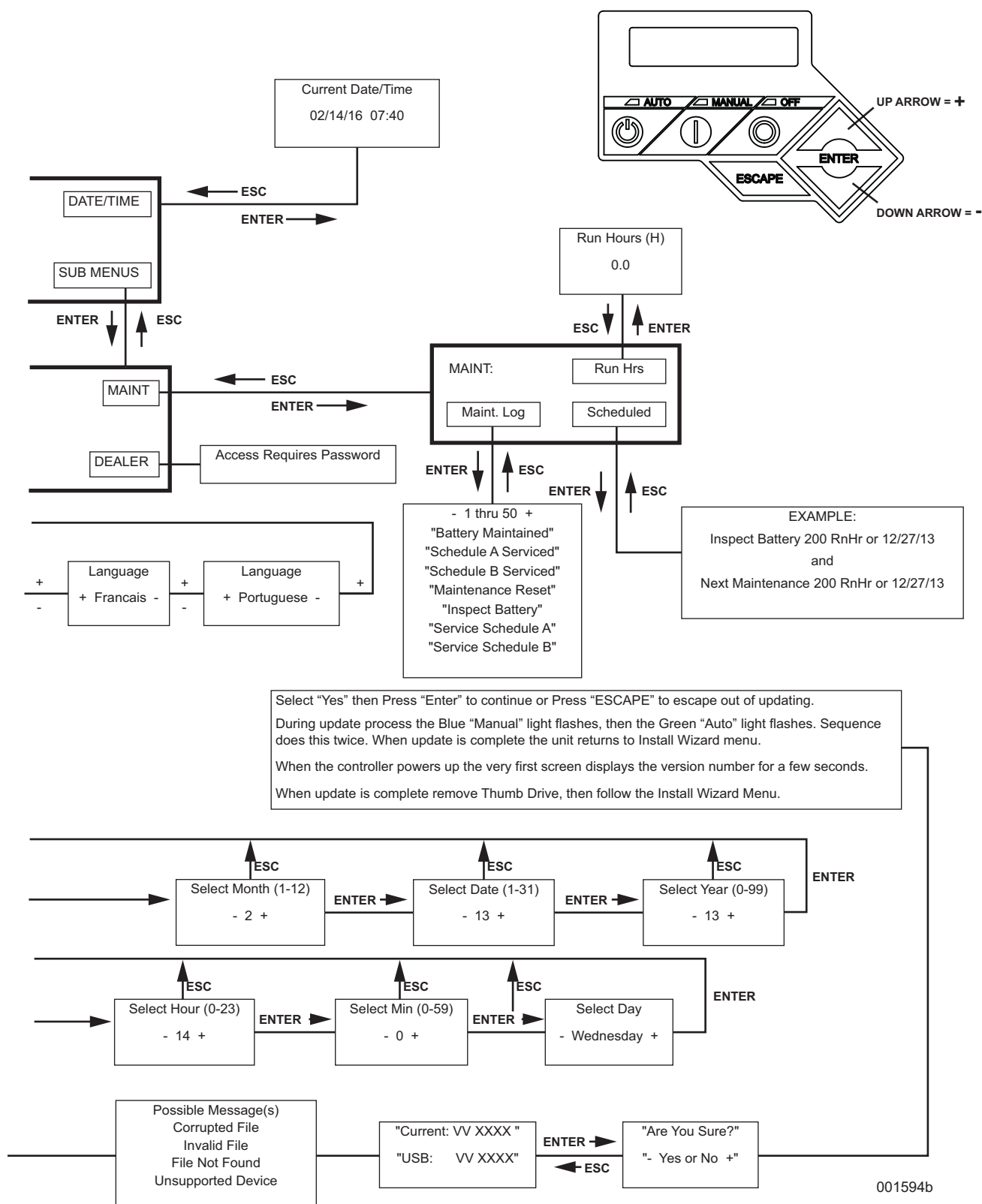
### The LCD display

Feature	Description
HOME page	The default page which will be displayed if no buttons are pressed for 60 seconds. This page normally shows the current Status message and the current date and time. The highest priority active Alarm/Warning will be automatically posted on this page as well as flashing the backlight when such a condition is detected. In the case of multiple Alarms/Warnings, only the first message will be displayed. To clear an Alarm or Warning, press the OFF button and then press the ENTER key.
Display Backlight	Normally off. If the operator presses any button, the backlight will automatically light and remain on for 30 seconds.
MAIN MENU page	Allows the operator to navigate to all other pages or sub-menus by using the Arrows and Enter buttons. This page can be accessed at any time with several presses of the dedicated Escape button. Each press of the Escape button takes the operator to the previous menu until the MAIN MENU displays. This page contains information for - History; Status; Edit; Debug.

### Menu System Navigation

See [Figure 3-5: Navigation Menu](#). To get to the navigation menu, use the “Escape” button from any page. It may require pressing it several times before getting to the MENU page. Navigate to the desired menu by using the ↑/↓ buttons. When the desired menu is displayed and flashing, press the “Enter” button.





## Setting the Exercise Timer

This generator is equipped with a configurable exercise timer. There are two settings for the exercise timer.

**Day/Time:** Once set, the generator will start and exercise at a predetermined day and time. During this exercise period, the unit runs for approximately 5 or 12 minutes, depending on the model, and then shuts down.

**Exercise frequency (how often the exercise will take place):** Exercise frequency can be set to Weekly, Biweekly or Monthly. If Monthly is selected, the day of the month must be selected from 1–28. The generator will exercise on that day each month. Transfer of loads to the generator output does not occur during the exercise cycle unless utility power is lost.

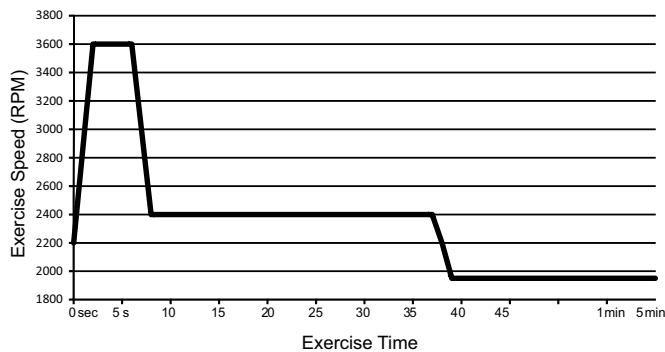
**NOTE:** If the installer tests the generator prior to installation, press the “enter” button to skip setting up the exercise timer.

**NOTE:** The exercise feature will operate only when the generator is placed in the AUTO mode and will not work unless this procedure is performed. The current date/time will need to be reset every time the 12 volt battery is disconnected and then reconnected, and/or when the fuse is removed.

**Table 3-1** details the exercise information and programming options for all Home Standby generators. **Figure 3-7** shows the engine speed profile during a typical low speed exercise cycle. While providing the necessary periodic exercise operation, the lower rpm also reduces fuel consumption, engine wear and noise.

**Table 3-1. Generator Exercise Characteristics**

Generator Size	20 kW Synergy
Low Speed Exercise	1950 rpm
Exercise Frequency Options	Weekly/Bi-Weekly/Monthly
Exercise Time Length	5 minutes



001403

**Figure 3-7. Low Speed Exercise Profile**

## Battery Charger

**NOTE:** The battery charger is integrated into the control module in all models.

The battery charger operates as a Smart Charger that ensures:

- Output is continually optimized to promote maximum battery life.
- Charging levels are safe.

**NOTE:** A warning is displayed on the LCD when the battery needs service.

## Manual Transfer Operation



**⚠ DANGER**

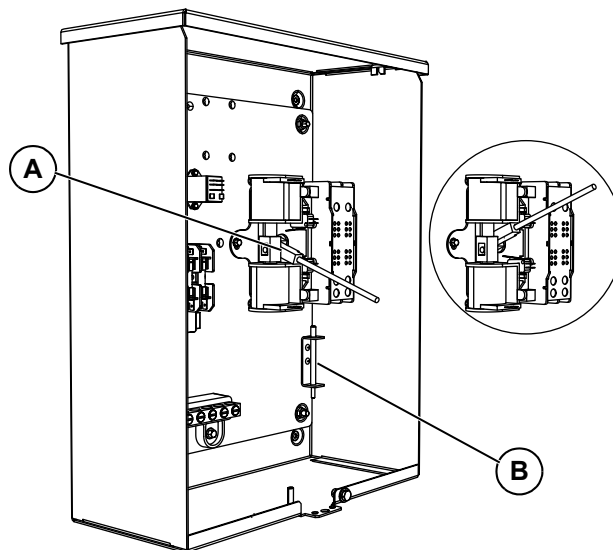
Electrocution. Do not manually transfer under load. Disconnect transfer switch from all power sources prior to manual transfer. Failure to do so will result in death or serious injury, and equipment damage. (000132)

Prior to automatic operation, manually exercise the transfer switch to verify that there is no interference with proper operation of the mechanism. Manual operation of the transfer switch is required if electronic operation should fail.

### Transfer to Generator Power Source

1. Verify generator is in the OFF mode.
2. Set the main circuit breaker (Generator Disconnect) to OFF or OPEN.
3. Turn off the utility power supply to the transfer switch using the means provided (such as a utility main line circuit breaker).
4. Use the manual transfer handle (A in [Figure 3-8](#)) inside the transfer switch to move the main contacts to the STANDBY position (loads connected to the standby power source).

5. To crank and start the engine, press the control panel MANUAL button.
6. Allow the engine to stabilize and warm up for a few minutes.
7. Set the main circuit breaker (Generator Disconnect) to ON or CLOSED. The standby power source now powers the loads.



000228

**Figure 3-8. Manual Transfer Switch Operation**

MANUAL	<ul style="list-style-type: none"> <li>• Will not transfer to generator if utility is present.</li> <li>• Will transfer to generator if utility fails (below 65% of nominal for five consecutive seconds).</li> <li>• Will transfer back when utility returns for 15 consecutive seconds. The engine will continue to run until removed from the MANUAL mode.</li> </ul>
AUTO	<ul style="list-style-type: none"> <li>• Will start and run if utility fails for five consecutive seconds. (factory default)</li> <li>• Will start a 5 second engine warm-up timer (or 30 seconds; refer to <a href="#">Cold Smart Start</a>):               <ul style="list-style-type: none"> <li>–Will not transfer if utility subsequently returns.</li> <li>–Will transfer to generator if utility is not present.</li> </ul> </li> <li>• Will transfer back to utility once utility returns (above 80% of nominal) for 15 seconds.</li> <li>• Will not transfer back to utility unless utility returns. The generator will shut down if the OFF button is pressed or a shutdown alarm is present.</li> <li>• Once utility power is returned, the generator will shut down after 1 minute cool-down time.</li> </ul>
EXERCISE	<ul style="list-style-type: none"> <li>• Will not exercise if generator is already running in either AUTO or MANUAL mode.</li> <li>• During exercise, the controller will only transfer if utility fails during exercise for 10 seconds (or 30 seconds; refer to <a href="#">Cold Smart Start</a>) and will switch to AUTO.</li> </ul>

### Transfer Back to Utility Power Source

When utility power has been restored, transfer back to utility source and shut down the generator. To manually transfer back to utility power and shut down the generator:

1. Set the Main Circuit Breaker (Generator Disconnect) to OFF or OPEN.

2. Allow the engine to run for two minutes at no-load to stabilize the internal temperatures.
3. Press the control panel OFF button. The engine should shut down.
4. Verify that utility power supply to the transfer switch is turned OFF.

5. Use the manual transfer handle (A in [Figure 3-8](#)) inside the transfer switch to move the main contacts back to the UTILITY position (loads connected to the utility power source).
6. Turn on the utility power supply to the transfer switch using the means provided.
7. Press the control panel AUTO button.

## Automatic Transfer Operation

To select automatic operation:

1. Make sure the transfer switch main contacts are set to the UTILITY position (loads connected to the utility power source).
2. Be sure that normal UTILITY power source voltage is available to transfer switch terminal lugs N1 and N2.
3. Press the AUTO button on the control panel interface.
4. Set the main circuit breaker (Generator Disconnect) to the ON (Closed) position.

With these steps complete, the generator will start automatically when utility source voltage drops below a preset level. After the unit starts, loads are transferred to the standby power source.

## Automatic Sequence of Operation

### Utility Failure

With the generator set to AUTO, when utility fails (below 65% of nominal) a 5 second (dealer programmable) line interrupt delay time is started. If utility is still gone when the timer expires, the engine will crank and start. Once started, a five second engine warm-up timer will be initiated (or a 30 second warm-up timer; refer to [Cold Smart Start](#)). When the warm-up time expires, the controller will transfer the load to the generator. If the utility power is restored (above 80% nominal) at any time from the initiation of the engine start until the generator is ready to accept load (5 second warm-up time has not elapsed), the controller will complete the start cycle and run the generator through its normal cool down cycle, however, the load will remain on the utility source.

### Cranking

The system will control the cyclic cranking as follows:

- Five cranking cycles as follows: 16 second crank, seven (7) second rest, 16 second crank, seven (7) second rest, followed by three (3) additional cycles of seven (7) second cranks followed by seven (7) second rests.

### Cold Smart Start

The Cold Smart Start feature can be enabled in the EDIT menu. With Cold Smart Start enabled, the generator will monitor ambient temperature and the warm-up delay will be adjusted based on prevailing conditions.

On a startup in AUTO mode, if the ambient temperature is below a fixed temperature (based on model) the generator will warm up for 30 seconds. This allows the engine to warm before a load is applied. If the ambient temperature is at or above the fixed temperature, the generator will startup with the normal warm-up delay of five seconds.

When the generator engine is started, a check for proper output voltage build up will be performed.

If some condition impedes normal voltage creation, such as frost crystals, dust, or dirt preventing a good electrical connection, the start sequence will be interrupted so that a cleaning cycle of the internal electrical connections can be attempted.

The cleaning cycle is an extended “Warming Up” period which lasts for several minutes while the normal generator voltage output is determined to be low. During this cycle, the generator controller will display the “Warming Up” on the display screen.

If the cleaning cycle fails to clear the obstruction, the generator controller display will show the “Under Voltage” message.

After several minutes, the alarm message can be cleared, and a restart of the generator attempted.

If the problem persists, make no further attempts to start. Contact an Independent Authorized Service Dealer.

### Load Transfer

The transfer of load when the generator is running is dependent upon the operating mode:

## Shutting Generator Down While Under Load

**IMPORTANT NOTE:** To turn the generator off during utility outages to perform maintenance, or conserve fuel, follow these steps:

### To turn the generator OFF (while running in AUTO and online):

1. Turn the main utility disconnect OFF.
2. Turn the main line circuit breaker (MLCB) on the generator to OFF (OPEN).
3. Turn the generator OFF.

### To turn the generator back ON:

1. Put the generator back into AUTO and allow to start and warm-up for a few minutes.
2. Set the MLCB on the generator to ON.

The system will now be operating in automatic mode. The main utility disconnect can be turned ON (CLOSED). To shut the unit OFF, this complete process must be repeated.

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## Section 4: Maintenance

### Maintenance

Regular maintenance will improve performance and extend engine/equipment life. Generac Power Systems, Inc. recommends that all maintenance work be performed by an Independent Authorized Service Dealer (IASD). Regular maintenance, replacement or repair of the emissions control devices and systems may be performed by any repair shop or person of the owner's choosing. However, to obtain emissions control warranty service free of charge, the work must be performed by an IASD. See the emissions warranty.

#### **⚠ WARNING**

Only qualified service personnel may install, operate and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and damage to equipment or property. (000182)

### Performing Scheduled Maintenance

It is important to perform maintenance as specified in the [Service Schedule](#) for proper generator operation and to ensure that the generator complies with the applicable emission standards for the duration of its useful life. Service and repairs may be performed by any qualified service person or repair shop.

Engine oil and filter must be changed and valve clearance adjusted after the first 25 hours of operation.

Additionally, emissions critical maintenance must be performed as scheduled in order for the Emissions Warranty to be valid. Emissions-critical maintenance consists of servicing the air filter and spark plugs in accordance with the [Service Schedule](#).

The controller will prompt for Schedule A or Schedule B maintenance to be performed. Schedule A maintenance consists of the oil, oil filter and tune-up. Schedule B maintenance includes the oil, oil filter, tune-up, air cleaner, spark plug(s) and valve clearance.

**NOTE:** Since most maintenance alerts will occur at the same time (most have two year intervals), only one will appear on the control panel display at any one time. Once the first alert is cleared, the next active alert will be displayed.

### Before Servicing



#### **⚠ WARNING**

Moving Parts. Avoid AVR fan housing for one hour after generator shutdown. Fan operates even if fuse is removed. Rotating fan blades could result in death or serious injury. (000222)

If utility is present, the secondary 12V DC fan continues to operate for up to one hour after the generator is shut down, even if the 7.5 Amp ATO fuse is removed. Avoid the AVR fan housing until fan rotation stops.

Follow the steps below prior to inspecting, maintaining, or servicing this unit:

1. Allow the generator to cool thoroughly before removing battery connections for maintenance or other service.
2. Unlock left and right side locks. Open lid.  
**NOTE:** For best results, press down on lid directly above each side lock, and while holding the lid down, use key to unlock latches.
3. Press OFF on the control pad. A red LED illuminates to confirm that the system is in the OFF mode.
4. Move the Generator Disconnect Circuit Breaker switch to the OFF (Open) position.
5. Pull up rubber flap covering fuse holder and remove 7.5 Amp fuse.
6. Remove T1 fuse from transfer switch.

### Maintenance Kits

To maintain the product warranty, the engine oil should be serviced in accordance with the recommendations of this manual. For your convenience, Generac Maintenance Kits are available that include engine oil, oil filter, air filter, spark plug(s), a shop towel and funnel. These kits can be obtained from an Independent Authorized Service Dealer (IASD).

To purchase on-line, access the maintenance kits page through [www.generac.com](http://www.generac.com). Follow the prompts to enter delivery information and complete the purchase.

All Generac oil kits meet minimum American Petroleum Institute (API) Service Class SJ, SL, or better. Use no special additives. Select the appropriate viscosity oil grade according to the expected operating temperature. Synthetic oil also can be used in the appropriate weight as standard.

## Service Schedule

**Table 4-1. Service Maintenance Schedule**

Service	Daily If Running Continuously or Before Each Use	Every Year	Schedule A Every Two Years or 200 Hours	Schedule B Every Four Years or 400 Hours	Every 1000 hours
Check Enclosure Louvers for Dirt and Debris *	•				
Check Lines and Connections for Fuel or Oil Leaks	•				
Check Engine Oil Level	•				
Check for Water Intrusion **		•			
Check Battery Condition, Electrolyte Level, and State of Charge		•	•	•	
Replace AVR Filter ***			•	•	
Replace Engine Oil and Oil Filter †			•	•	
Replace Engine Air Filter				•	
Maintain Spark Plugs				•	
Inspect/Adjust Valve Clearance ‡				•	
Replace Brushes					•
<p><b>Contact the nearest Independent Authorized Service Dealer for assistance if necessary.</b></p> <p>* Remove any shrubs or tall grasses which have grown within 3 ft. (0.91m) of the intake and discharge louvers on the sides of the enclosure. Clean any debris (dirt, grass clippings, etc.) which have accumulated inside the enclosure.</p> <p>** Verify that all sources of potential water intrusion such as water sprinklers, roof run-off, rain gutter down spouts and sump pump discharges are directed away from the generator enclosure.</p> <p>*** Replace AVR filter more often if operating in dusty conditions.</p> <p>† Change engine oil and filter after the first 25 hours of operation. In cold weather conditions (ambient below 40 °F / 4.4 °C), or if unit is operated continuously in hot weather conditions (ambient above 85 °F / 29.4 °C), change engine oil and filter every year or 100 hours of operation.</p> <p>‡ Check/adjust valve clearance after the first 25 hours of operation.</p>					

**NOTE:** Contact an Independent Authorized Service Dealer or visit [www.generac.com](http://www.generac.com) for additional information on replacement parts.

## Maintenance Log

### Battery inspection and charge check

Dates Performed:


### Oil, oil filter, air filter and spark plug replacement

Dates Performed:


### Valve Adjustment

Dates Performed:


## Checking Engine Oil Level



### ⚠ WARNING

Risk of burns. Allow engine to cool before draining oil or coolant. Failure to do so could result in death or serious injury.

(000139)

### ⚠ WARNING

Skin irritation. Avoid prolonged or repeated contact with used motor oil. Used motor oil has been shown to cause skin cancer in laboratory animals. Thoroughly wash exposed areas with soap and water.

(000210)

### ⚠ CAUTION

Engine damage. Verify proper type and quantity of engine oil prior to starting engine. Failure to do so could result in engine damage.

(000135)

When power outages necessitate running the generator for extended periods, the oil level should be checked daily. To check the engine oil level:

1. If the generator is running during a utility outage, first turn OFF all associated loads running in the residence using the electrical panel main

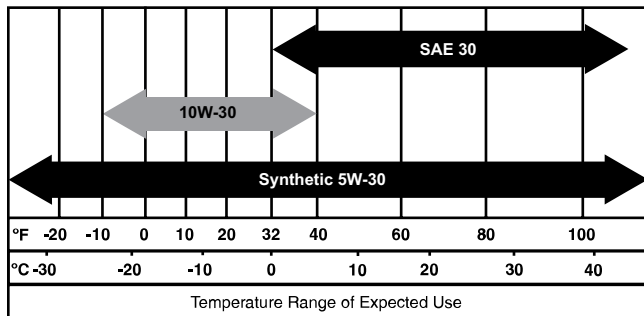
disconnect. Then, turn the generator main circuit breaker to the OFF position.

2. Press the control panel OFF button. Wait five minutes.
3. Remove the dipstick and wipe it dry with a clean cloth.
4. Completely insert the dipstick and again remove it.
5. Observe the oil level. The level should be at the "FULL" mark on the dipstick.
6. If necessary, remove the oil fill cap and add oil to the engine until the level reaches the "FULL" mark and reinsert the dipstick and fill cap.
7. Press the control panel AUTO button.
8. If the generator was running during a utility outage, first turn the main circuit breaker to the ON position. Then, turn ON the needed loads in the residence.

## Engine Oil Recommendations

To maintain the product warranty, the engine oil should be serviced in accordance with the recommendations of this manual. For your convenience, Generac Maintenance Kits are available that include engine oil, oil filter, air filter, spark plug(s), a shop towel and funnel. These kits can be obtained from an Independent Authorized Service Dealer (IASD).

All Generac oil kits meet minimum American Petroleum Institute (API) Service Class SJ, SL, or better. Use no special additives. Select the appropriate viscosity oil grade according to the expected operating temperature. Synthetic oil also can be used in the appropriate weight as standard.



000399

**Figure 4-1. Recommended Oil Based on Temperature**

- SAE 30 above 32 °F (0 °C)
- SAE 10W-30 between 40 ° and -10 °F (4 ° and -23 °C)
- Synthetic SAE 5W-30 for all temperature ranges

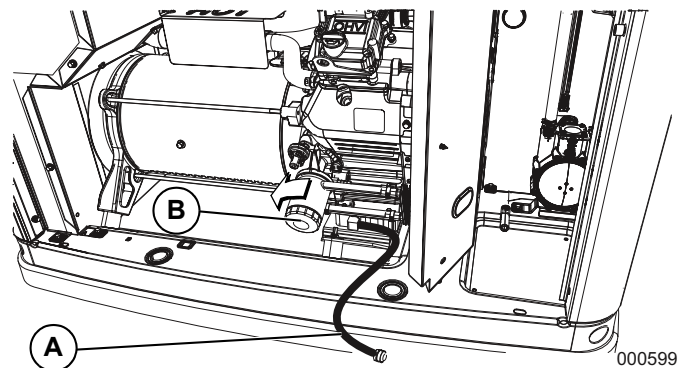
### **CAUTION**

Engine damage. Verify proper type and quantity of engine oil prior to starting engine. Failure to do so could result in engine damage.

(000135)

## Changing the Oil and Oil Filter

1. Start the engine by pressing the MANUAL button on the control panel and allow the engine to run until it is thoroughly warmed up. Then, press the Control Panel OFF button to shut down the engine.
2. A few minutes after the engine shuts OFF, when it has cooled slightly, lift the lid and remove the front panel. Pull the oil drain hose free of its retaining clip. See (A) in [Figure 4-2](#). 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. Reposition and secure the hose with the retaining clip.
4. With the oil drained, remove the old oil filter by turning it counterclockwise. For filter location, see (B) in [Figure 4-2](#).
5. Apply a light coating of clean engine oil to the gasket of the new filter.
6. 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 full turn.
7. Refill the engine with the proper recommended oil. For recommended oil, see [Figure 4-1](#).
8. Start the engine, run for one minute, and check for leaks.
9. Shut down the engine and recheck the oil level. Add oil as needed. DO NOT OVERFILL.
10. Re-insert dipstick and/or reattach fill cap.
11. Press the Control Panel AUTO button.
12. Dispose of the used oil and filter at a proper collection center.

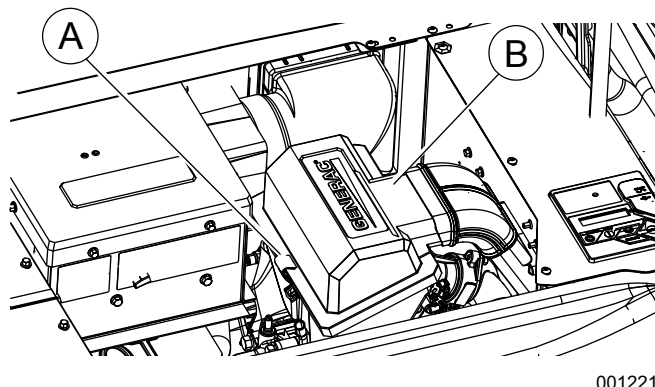


000599

**Figure 4-2. Oil Filter and Drain Location**

## Replacing the Engine Air Filter

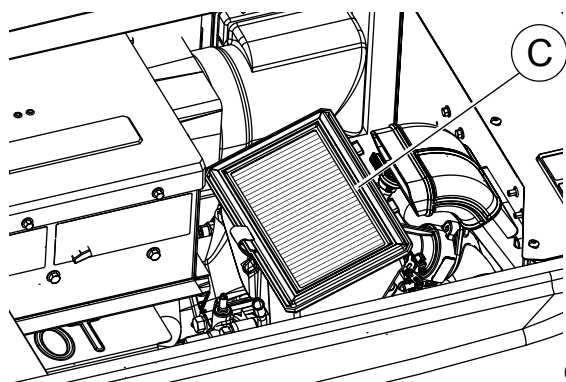
1. With the generator shut down, lift the lid and remove the front panel.
2. See [Figure 4-3](#). Remove the cover clip (A) and air cleaner cover (B).



001221

**Figure 4-3. Removing the Air Cleaner Cover**

3. See [Figure 4-4](#). Pull out the old air filter (C) and discard.



001222

**Figure 4-4. Removing the Air Filter**

4. Thoroughly clean the air cleaner enclosure of any dust or debris.
5. Install a new air filter.
6. Install the air cleaner cover and cover clip.

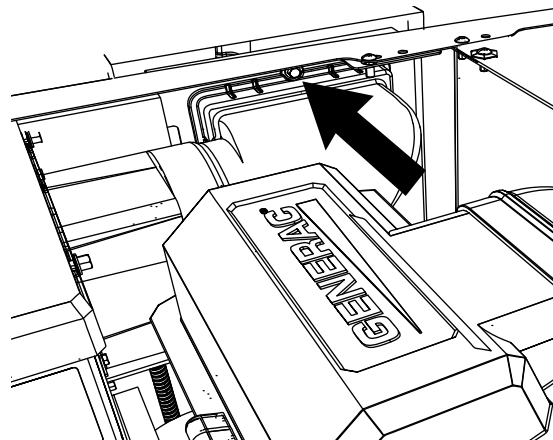
## Replacing the AVR Filter



### ⚠ WARNING

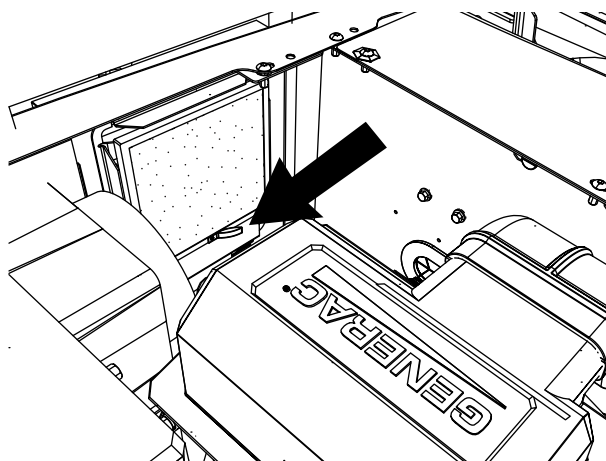
Electric shock. AVR maintains electrical charge after generator shutdown. Wait five minutes before AVR removal. Failure to do so could result in death or serious injury.

(000223)



001219

**Figure 4-5. Removing the AVR Filter Screw**



001220

**Figure 4-6. Replacing the AVR Filter**

1. See [Figure 4-5](#). Remove screw to release AVR filter housing from back panel.
2. Remove AVR filter housing.
3. See [Figure 4-6](#). Grasp rubber lifting strap and remove filter from filter housing.
4. Install new filter, so that edge is positioned inboard of two tabs on filter housing.
5. Install AVR filter housing so the bottom drops into the slots, ensuring that the rubber boot is completely around the fan opening. Install screw to fasten AVR filter housing to back panel and torque to 50–96 in-lbs (6–11 Nm).

## Maintaining the Spark Plugs

Check the spark plug gaps or replace the spark plugs as necessary.



### ⚠ WARNING

Electrical shock. Do not disconnect spark plug wires with engine running. Doing so could result in death or serious injury.

(000140)



### ⚠ WARNING

Moving Parts. Avoid AVR fan housing for one hour after generator shutdown. Fan operates even if fuse is removed. Rotating fan blades could result in death or serious injury.

(000222)

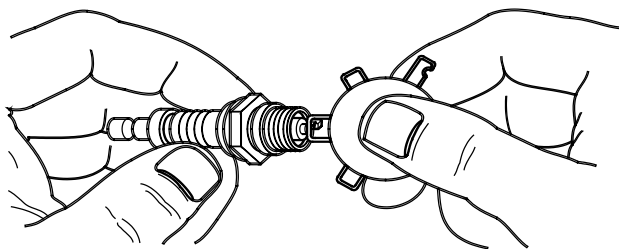


### ⚠ WARNING

Electric shock. AVR maintains electrical charge after generator shutdown. Wait five minutes before AVR removal. Failure to do so could result in death or serious injury.

(000223)

1. With the generator shut down, lift the lid and remove the front panel.
2. See "A" in [Figure 4-5](#). Remove screw to release AVR filter housing from back panel.
3. Remove spark plug cables from spark plug terminals.
4. Clean the area around the base of the spark plugs to keep dirt and debris out of the engine.
5. Remove the spark plugs and check the condition. Install new plugs if the old spark plugs are worn or if reuse is questionable.
6. Clean the spark plugs by scraping or washing with a wire brush and commercial solvent. Do not blast the spark plugs to clean.
7. See [Figure 4-7](#). Check spark plug gap using a wire feeler gauge. Replace the spark plug if the gap is not within specification as provided in Section 2 — [Engine](#).



000211

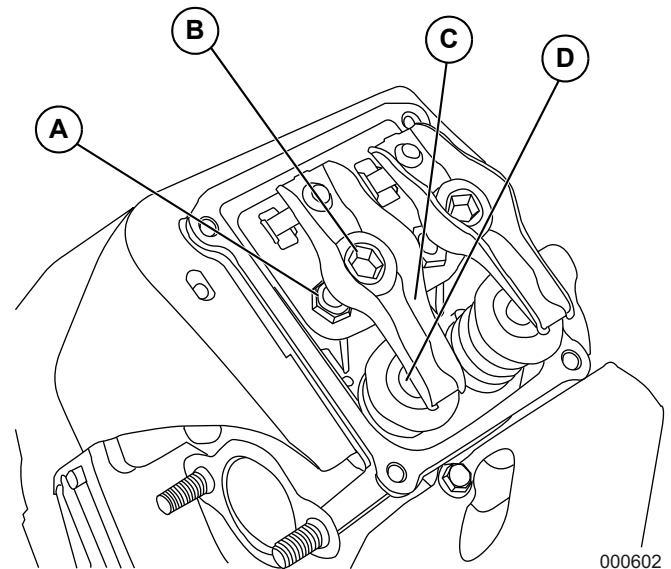
**Figure 4-7. Checking Spark Plug Gap**

8. Reattach spark plug cables to spark plug terminals.
9. Install AVR filter housing.
10. Install front panel and lower the generator lid.

## Valve Clearance Adjustment

Check the valve clearance after the first 25 hours of operation, then after 400 hour intervals. Adjust if necessary.

**Important:** Please contact an Independent Authorized Service Dealer for service assistance. Proper valve clearance is essential for prolonging the life of the engine.



000602

**Figure 4-8. Valve Clearance Adjustment**

### Check Valve Clearance

1. Verify that engine is at ambient air temperature.



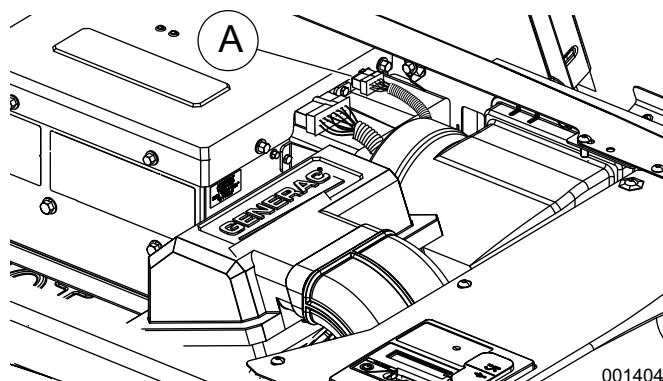
### ⚠ WARNING

Electric shock. AVR maintains electrical charge after generator shutdown. Wait five minutes before AVR removal. Failure to do so could result in death or serious injury.

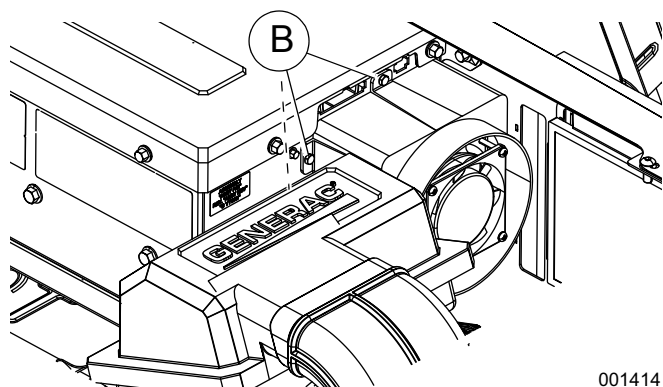
(000223)

2. See [Figure 4-5](#). Remove screw to release AVR filter housing from back panel. Remove AVR filter housing.
3. See [Figure 4-9](#). Depress external latch to disconnect 4-pin connector (A) from AVR.
4. See [Figure 4-10](#). Remove three screws (B) to release AVR fan from AVR.





**Figure 4-9. Remove AVR Fan Connector**



**Figure 4-10. Remove AVR Fan Screws**

5. Remove spark plug cables from spark plug terminals.

**NOTE: When disconnecting spark plug cable from spark plug terminal, always grasp and pull on the boot at the terminal end of the cable. Pulling on cable portion can result in parts damage.**

6. Thoroughly clean area around spark plugs.
7. Remove spark plugs from cylinder head using a 5/8 inch spark plug socket.
8. Remove four screws to release valve cover.
9. Move piston to Top Dead Center (TDC) of compression stroke (both valves closed). Proceed as follows:
  - a. Remove intake screen at front of engine to gain access to flywheel nut.
  - b. Place large socket and socket wrench on flywheel nut and rotate engine in a clockwise direction while watching piston through spark plug hole.

**NOTE: Piston is at TDC when it is at the highest point of travel.**

10. Insert a 0.002 - 0.004 inch (0.05 - 0.1mm) feeler gauge between rocker arm and valve stem. Clearance is correct when a slight drag is felt while sliding feeler gauge back and forth. Verify that clearances are within the following specification:

- Intake and Exhaust: 0.002 - 0.004 inch (0.05 - 0.1mm)

11. Proceed as follows:

- a. If valve clearance adjustment is required, see [Adjust Valve Clearance](#).
- b. If valve clearance is within specification, see steps 5-12 under [Adjust Valve Clearance](#).

### Adjust Valve Clearance

1. Loosen rocker arm jam nut. Use an Allen wrench to turn the pivot ball stud, while also checking clearance between rocker arm and valve stem with the feeler gauge.

**NOTE: Hold the rocker arm jam nut in place as the pivot ball stud is turned.**

2. When the correct valve clearance is obtained, hold the pivot ball stud in place with the Allen wrench and tighten rocker arm jam nut until snug.
3. Using a torque wrench, tighten jam nut to 174 in-lbs (20 N-m).
4. Recheck valve clearance to verify that it did not change during tightening of the jam nut.
5. Install **new** valve cover gasket.
6. Start four screws to install valve cover.
7. Verify that valve cover gasket is properly positioned, and then alternately tighten screws to 6-9 ft-lbs (8-12 Nm) using a crosswise pattern
8. Finger tighten spark plugs into cylinder head, and then using a spark plug socket, tighten to 15-18 ft-lbs (20-25 Nm).
9. Install spark plug cables onto spark plug terminals.

## Battery Maintenance

Regularly inspect the battery per the **Service Schedule**:

1. With the generator shut down, lift the lid and remove the front panel.
2. Inspect the battery posts and cables for tightness and corrosion. Tighten and clean as necessary.
3. Check the battery fluid level of unsealed batteries, and if necessary, fill with distilled water only. DO NOT use tap water. Also, have the Independent Authorized Service Dealer or a qualified Service Technician check the state of charge and condition.



### ⚠ WARNING

Explosion. Do not dispose of batteries in a fire. Batteries are explosive. Electrolyte solution can cause burns and blindness. If electrolyte contacts skin or eyes, flush with water and seek immediate medical attention. (000162)



### ⚠ WARNING

Explosion. Batteries emit explosive gases while charging. Keep fire and spark away. Wear protective gear when working with batteries. Failure to do so could result in death or serious injury. (000137a)



### ⚠ WARNING

Electrical shock. Disconnect battery ground terminal before working on battery or battery wires. Failure to do so could result in death or serious injury. (000164)



### ⚠ WARNING

Risk of burns. Batteries contain sulfuric acid and can cause severe chemical burns. Wear protective gear when working with batteries. Failure to do so could result in death or serious injury. (000138a)

### ⚠ WARNING

Environmental Hazard. Always recycle batteries at an official recycling center in accordance with all local laws and regulations. Failure to do so could result in environmental damage, death or serious injury. (000228)

Always recycle batteries in accordance with local laws and regulations. Contact your local solid waste collection site or recycling facility to obtain information on local recycling processes. For more information on battery recycling, visit the Battery Council International website at: <http://batteryCouncil.org>.

Strictly observe the following precautions when working on batteries:

- Remove the 7.5 Amp fuse from the generator control panel.
- Remove all jewelry—watches, rings, metal objects, etc.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not place tools or metallic objects on top of the battery.
- Disconnect the charging source prior to connecting or disconnecting battery terminals.
- 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.
- Wash down spilled electrolyte with an aid 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.
- DO NOT smoke when near the battery.
- DO NOT cause flame or spark in the battery area.
- Discharge static electricity from the body before touching the battery by first touching a grounded metal surface.

## Attention After Submersion

If the generator has been submerged in water, it **MUST NOT** be started and operated. Following any submersion in water, have an Independent Authorized Service Dealer thoroughly clean, dry, and inspect the generator. If the structure (home) has been flooded, it should be inspected by a certified electrician to verify that there won't be any electrical problems during generator operation or when utility power is returned.



## Corrosion Protection

Inspect the unit regularly for visible signs of corrosion. Inspect all metal components of the generator; for example: base frame, enclosure, brackets, alternator can, the entire fuel system (inside and outside of the generator) and fastener locations. If there is corrosion found on generator components (e.g. regulator, engine/alternator mounts, fuel plenum, etc.), replace parts as necessary.

Periodically wash and wax the enclosure using automotive type products. Do not spray the unit with a hose or power washer. Use warm, soapy water and a soft cloth. Frequent washing is recommended in salt water/coastal areas. Spray engine linkages with a light oil such as WD-40.

## Remove From, and Return To Service Procedure

### Remove From Service

If the generator cannot be exercised every 7 days and will be out of service longer than 90 days, prepare the generator for storage:

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, set the generator main circuit breaker (Generator Disconnect) to OFF (OPEN).
4. Turn off the utility power to the transfer switch.
5. Remove the 7.5 Amp fuse from the generator's control panel.
6. Disconnect the battery cables. Remove negative cable first.
7. Remove battery charger AC input T1/Neutral cable (has white sleeve) at controller.
8. While the engine is still warm, drain the oil completely, and then refill the crankcase with oil.
9. Attach a tag to the engine indicating the viscosity and classification of the new oil in the crankcase.

10. Remove the spark plug(s) and spray a fogging agent into the spark plug(s) threaded openings. Reinstall and tighten the spark plug(s).
11. Remove the battery and store it in a cool, dry room on a wooden board.
12. Clean and wipe down the entire generator.

### Return to Service

To return the unit to service after storage:

1. Verify utility power is OFF.
2. Check the tag on the engine for oil viscosity and classification. If necessary, drain and refill with 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. Recharge the battery to 100% state of charge. If defective, replace the battery.
4. Clean and wipe down the entire generator.
5. Make sure the 7.5 Amp fuse is removed from the generator Control Panel.
6. Reconnect the battery. Observe battery polarity. Damage may occur if the battery is connected incorrectly. Install positive cable first.
7. Reconnect the battery charger AC input T1/Neutral cable (has white sleeve) at controller.
8. Open the fuel shutoff valve.
9. Insert the 7.5 Amp fuse into the generator control panel.
10. Start the unit by pressing the MANUAL button. Allow the unit to warm up for a few minutes.
11. Stop the unit by pressing the control panel OFF button.
12. Turn on the utility power to the transfer switch.
13. Set the control panel to AUTO.

The generator is ready for service.

**NOTE:** When a battery is dead or has been disconnected, the exercise timer and current date and time must be reset.

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## Section 5: Troubleshooting / Quick Reference Guide

### General Troubleshooting

**Table 5-1. General Troubleshooting**

Problem	Cause	Correction
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 contact.</li> <li>4. Defective starter motor.</li> <li>5. Dead battery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct short circuit condition by replacing 7.5 Amp fuse in generator control panel.</li> <li>2. Tighten, clean or replace as necessary.*</li> <li>3. *See #2.</li> <li>4. *See #2.</li> <li>5. Charge or replace battery.</li> </ol>
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 Wire 14 from engine control board.</li> <li>4. Defective spark plug(s).</li> <li>5. valve clearance out of adjustment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replenish fuel / Turn on fuel valve.</li> <li>2. *</li> <li>3. *</li> <li>4. Clean, re-gap or replace plug(s).</li> <li>5. Reset valve clearance.</li> </ol>
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 pressure incorrect.</li> <li>4. Fuel selector in wrong position.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check / replace air cleaner.</li> <li>2. Clean or replace spark plug.</li> <li>3. Confirm fuel pressure to regulator is 10–12 in. water column (19–22 mm mercury) for LP, and 3.5–7 in. water column (9–13 mm mercury) for natural gas.</li> <li>4. Turn fuel conversion valve to correct position.</li> </ol>
Generator is set to OFF, but the engine continues to run.	<ol style="list-style-type: none"> <li>1. Controller wired incorrectly</li> <li>2. Defective control board.</li> </ol>	<ol style="list-style-type: none"> <li>1. *</li> <li>2. *</li> </ol>
No AC output from generator.	<ol style="list-style-type: none"> <li>1. Main line circuit breaker is in the OFF (or OPEN) position.</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>
No transfer to standby after utility source failure.	<ol style="list-style-type: none"> <li>1. Main line circuit breaker is in the OFF (or OPEN) position.</li> <li>2. Defective transfer switch coil.</li> <li>3. Defective transfer relay.</li> <li>4. Transfer relay circuit open.</li> <li>5. Defective control logic board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset circuit breaker to ON (or CLOSED).</li> <li>2. *</li> <li>3. *</li> <li>4. *</li> <li>5. *</li> </ol>
Unit consumes large amounts of oil.	<ol style="list-style-type: none"> <li>1. Engine over filled with oil.</li> <li>2. Engine breather defective.</li> <li>3. Improper type or viscosity of oil.</li> <li>4. Damaged gasket, seal or hose.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust oil to proper level.</li> <li>2. *</li> <li>3. See <a href="#">Engine Oil Requirements</a>.</li> <li>4. Check for oil leaks.</li> </ol>
* Contact an Independent Authorized Service Dealer for assistance.		

# Synergy Troubleshooting

**Table 5-2. Synergy Troubleshooting**

Ecode/Active Alarm	LED	Problem	Things to Check	Possible Causes/Solution
1048 VSCF Overload	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Alternator, AVR or wiring is damaged. Contact an Independent Authorized Servicing Dealer.
1049 VSCF Overload	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Generator output is shorted or severely overloaded. Identify and clear the overload, and then restart.
1051 VSCF High Battery	YELLOW	Yellow LED illuminated in any state.	Check the LEDs/Screen for alarms.	Voltage supply to the AVR is high. If an external battery charger is in use, contact installing dealer to correct installation. If an external battery charger is NOT in use, contact an Independent Authorized Servicing Dealer.
1052 VSCF DC Overvoltage	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Probable causes are: 1) The generator was temporarily overloaded. 2) The output was temporarily shorted. Try to restart the unit.
1053 VSCF Gate Fault	RED	Unit shuts down during operation or starting.	Check the LEDs/Screen for alarms.	AVR is damaged. Contact an Independent Authorized Servicing Dealer.
1054 VSCF IGBT Overtemp.	RED	Unit shuts down during operation or starting.	Check the LEDs/Screen for alarms.	Probable causes are: 1) Replace AVR filter. Inspect fan. 2) Intake or exhaust air path is blocked. Check intake and exhaust. 3) The BIG fan is not running (only runs when the engine is running). KEEP FINGERS AWAY FROM FAN HOUSING—PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING. Contact an Independent Authorized Servicing Dealer. 4) Air leak in AVR enclosure. Contact an Independent Authorized Servicing Dealer. 5) Engine running too hot. Inspect air intake and exhaust. 6) Ambient temperature has risen above 60 °F (15.5 °C). Derate the generator output per specifications.
1055 VSCF Phase Error	RED	Unit shuts down during starting.	Check the LEDs/Screen for alarms.	An incorrect voltage and frequency has been detected during starting. Probable causes are: 1) Alternator damage. Contact an Independent Authorized Servicing Dealer. 2) Generator has started into a severe load. Manually operate transfer switch back to utility position and try to restart unit. If problem persists, remove load and attempt to restart unit again. 3) The engine may not be reaching its prescribed speed. Proceed as follows: <ul style="list-style-type: none"> <li>• Verify stepper motor is moving and linkage is free.</li> <li>• Verify stepper motor is plugged in.</li> <li>• Verify gas pressure is within specified limits.</li> </ul>
1056 VSCF Undervoltage	RED	Unit shuts down during operation or starting.	Check the LEDs/Screen for alarms.	The generator output voltage is too low. Probable causes are: 1) The load is too large. Remove load and attempt to restart unit. 2) Alternator or AVR damage. Contact an Independent Authorized Servicing Dealer.

**Table 5-2. Synergy Troubleshooting**

<b>Ecode/Active Alarm</b>	<b>LED</b>	<b>Problem</b>	<b>Things to Check</b>	<b>Possible Causes/Solution</b>
1057 VSCF Overvoltage	RED	Unit shuts down during operation or starting.	Check the LEDs/Screen for alarms.	Probable causes are: 1) The generator has been overloaded. Remove load and attempt to restart unit. 2) Generator has started into a severe load. Manually operate transfer switch back to utility position and try to restart unit. If problem persists, remove load and attempt to restart unit again.
1058 VSCF DC Undervoltage	RED	Unit shuts down during operation or starting.	Check the LEDs/Screen for alarms.	The DPE winding supplies this voltage. 1) Alternator damage. Contact an Independent Authorized Servicing Dealer.
1059 VSCF Field Loss	RED	Unit shuts down during starting.	Check the LEDs/Screen for alarms.	Unit detects no output voltage while starting. 1) Alternator damage. Contact an Independent Authorized Servicing Dealer.
1061 VSCF Field Loss	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Unit detects loss of output voltage while running. 1) Alternator damage. Contact an Independent Authorized Servicing Dealer.
1060 Big Fan Failure	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	This alarm occurs when the AVR electronics temperature exceeds 158 °F (70 °C). Possible causes are: 1) AVR filter faulty. Replace AVR filter. 2) Intake or exhaust air path is blocked. Check intake and exhaust. 3) The BIG fan is not running (only runs when the engine is running). <b>KEEP FINGERS AWAY FROM FAN HOUSING— PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING.</b> Contact an Independent Authorized Servicing Dealer. 4) Air leak in AVR enclosure. Contact an Independent Authorized Servicing Dealer. 5) Engine running too hot. Inspect air intake and exhaust. 6) Ambient temperature has risen above 60 °F (15.6 °C). Derate the generator output per specifications. If message is displayed when generator is stopped, also check SMALL fan. Small fan RUNS for 60 minutes after generator is stopped and keeps electronics cool during heat soak.
1065 Overfrequency	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Probable causes are: 1) Overload. Remove load and attempt to restart unit. 2) RPM sensor has failed. Contact an Independent Authorized Servicing Dealer. 3) Stepper motor problem. Contact an Independent Authorized Servicing Dealer.

**Table 5-2. Synergy Troubleshooting**

<b>Ecode/Active Alarm</b>	<b>LED</b>	<b>Problem</b>	<b>Things to Check</b>	<b>Possible Causes/Solution</b>
1066 VSCF Speed mismatch	RED	Unit shuts down during Operation or starting.	Check the LEDs/Screen for alarms.	1) Fuel problem (pressure loss). Check fuel supply and attempt to restart unit. 2) A large load is not wired through the load shed module. Contact installing dealer to correct installation. 3) Large overload. Remove load and attempt to restart unit. 4) Throttle or engine problem. Contact an Independent Authorized Servicing Dealer.
1070 Small fan failure	YELLOW	"Small fan failure" is displayed. If unit was running in AUTO and utility returns, it will continue to run for one hour to cool electronics without fan.	Check the LEDs/Screen for alarms.	Small fan current incorrect. Probable causes are: 1) Fan wiring or mechanical problem. Contact an Independent Authorized Servicing Dealer. 2) Air path is blocked. Check AVR filter. <b>KEEP FINGERS AWAY FROM FAN HOUSING—PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING.</b>

## Load Shed Troubleshooting

**Table 5-3. Load Shed Troubleshooting**

<b>Symptom</b>	<b>Possible Causes</b>
Generator stalls when large load is supplied.	1) Total load is too big for the generator and fuel type. Contact installing dealer to correct installation. 2) A large load is not wired through the load shed module. Contact installing dealer to correct installation.
Large loads keep getting shed and locked out (load LED goes out for 30 minutes).	Total load is too big for generator. Contact installing dealer to correct installation.
Output voltage is low/high.	Voltage calibration incorrect. Contact an Independent Authorized Servicing Dealer.
Generator does not pull full power.	Current calibration incorrect. Contact an Independent Authorized Servicing Dealer.

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## Quick Reference Guide

To clear an active alarm, press the ENTER button twice and then press AUTO. If the alarm reoccurs, contact an Independent Authorized Service Dealer.

**Table 5-4. Quick Reference Guide**

Active Alarm	LED	Problem	Things to Check	Solution
NONE	GREEN	Unit running in AUTO but no power in house.	Check MLCB.	Check MLCB if the MLCB is in the ON position. If it is in the ON position contact the Independent Authorized Service Dealer.
HIGH TEMPERATURE	RED	Unit shuts down during operation.	Check the LEDs / Screen for alarms.	Check ventilation around the generator, intake, exhaust and rear of generator. If no obstruction contact Independent Authorized Service Dealer.
OVERLOAD REMOVE LOAD	RED	Unit shuts down during operation.	Check the LEDs / Screen for alarms.	Clear alarm and remove household loads from the generator. Put back in AUTO and restart.
RPM SENSE LOSS	RED	Unit was running and shuts down, attempts to restart.	Check the LEDs / Screen for alarms.	Clear alarm and remove household loads from the generator. Put back in AUTO and restart. If generator does not start, contact Independent Authorized Service Dealer.
NOT ACTIVATED	NONE	Unit will not start in AUTO with utility loss.	See if screen says unit not activated.	Refer to activation section in Installation Guidelines Manual.
NONE	GREEN	Unit will not start in AUTO with utility loss.	Check screen for start delay countdown.	If the start up delay is greater than expected, contact Independent Authorized Service Dealer to adjust from 2 to 1500 seconds.
LOW OIL PRESSURE	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Check oil and add oil per Owners Manual. If oil level is correct, contact Independent Authorized Service Dealer.
RPM SENSE LOSS	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Clear alarm. Using the control panel, check the battery by navigating to the BATTERY MENU option from the MAIN MENU. If it states battery is GOOD, contact Independent Authorized Service Dealer. If it states CHECK BATTERY, replace the battery.
OVERCRANK	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Check fuel line shutoff valve is in the ON position. Clear alarm. Attempt to start the unit in MANUAL. If it does not start or starts and runs rough, contact Independent Authorized Service Dealer.
LOW VOLTS REMOVE LOAD	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Clear alarm and remove household loads from the generator. Put back in AUTO and restart.
FUSE PROBLEM	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Check the 7.5 Amp fuse. If it is bad replace it with an ATO 7.5 Amp fuse, if not contact Independent Authorized Service Dealer.
OVERSPEED	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.
UNDERVOLTAGE	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.



**Table 5-4. Quick Reference Guide**

Active Alarm	LED	Problem	Things to Check	Solution
UNDERSPEED	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.
STEPPER OVERCURRENT	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.
MISWIRE	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.
OVERVOLTAGE	RED	Unit will not start in AUTO with utility loss.	Check the LEDs / Screen for alarms.	Contact Independent Authorized Service Dealer.
LOW BATTERY	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Clear alarm. Using the control panel, check the battery by navigating to the BATTERY MENU option from the MAIN MENU. If it states battery is GOOD contact Independent Authorized Service Dealer. If it states CHECK BATTERY, replace the battery.
BATTERY PROBLEM	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Contact Independent Authorized Service Dealer.
CHARGER WARNING	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Contact Independent Authorized Service Dealer.
SERVICE A	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Perform SERVICE A maintenance. Press ENTER to clear.
SERVICE B	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Perform SERVICE B maintenance. Press ENTER to clear.
INSPECT BATTERY	YELLOW	Yellow LED illuminated in any state.	Check the screen for additional information.	Inspect Battery. Press ENTER to clear.

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