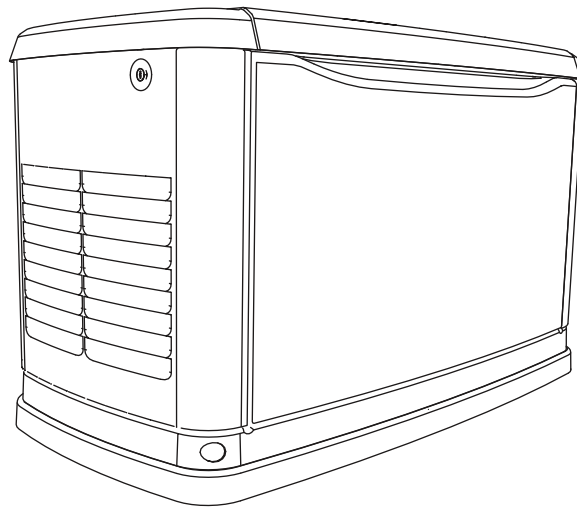


Owner's Manual 60 Hz Air-Cooled Generators

15 kW EcoGen™



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 **Component Locations**. The unit has a label plate affixed to the inside partition, to the left of the control panel console as shown in **Component Locations**. For directions on how to open the top lid and remove the front panel, see **Operation**.

When contacting an Independent Authorized Service Dealer 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, and to have the equipment 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/

! 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 & General Information

Introduction

Thank you for purchasing this compact, high performance, air-cooled, engine-driven generator. It is designed to automatically supply electrical power to operate critical loads during a normal power source failure.

As supplied from the factory, this generator is designed to work in off-grid applications.

In off-grid applications as a part of an alternative energy system, the generator starts when the inverter/battery charger detects the normal power source voltage has dropped below a preset level. The generator powers the inverter, and once the voltage level of the normal power source rises to an acceptable level, the generator is shut down. Another off-grid application would be for use in remote locations such as for pumping water for a village or campground, or for livestock.

The unit is factory installed in an all-weather metal enclosure and is intended for outdoor installation only. The generator can be operated using either natural gas (NG) or vapor withdrawn liquid propane (LP).

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



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 Installation 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:



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

(000001)



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

(000002)



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, contact an Independent Authorized Service Dealer 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/.

When contacting a dealer 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 normal power source and render unit inoperable before working on unit. Failure to do so will result in death or serious injury. (000236)



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

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

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

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)

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)

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 from the normal power source. Failure to do so will result in death, serious injury, and equipment damage. (000237)



⚠ 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

EcoGen Operating Principle

Benefits

The 15 kW EcoGen generator brings exciting new technology to the Home Standby generator product. 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 normal loads.

- Quieter operation - 3 dB with improved tonal qualities under normal loads
- Cleanest Standby power available with 1.5% THD
- Significant fuel savings: more fuel efficient under normal loads
- Lower operating speed of 2700 rpm at low loads
- Tuned exhaust system to further lower sound levels
- Variable Speed / Constant Frequency operation

How It Works

In an off-grid solution, the generator is an important source of backup power when other resources are insufficient for the demand, improving overall system reliability.

1. Sun (solar cells) and/or wind (turbines) generate DC current.
2. This is fed to the inverter charger and then on to the battery bank.
3. The inverter takes DC power from the battery bank, converts it to AC, and then sends the current to the AC electrical panel.
4. If there is no solar or wind gain and the battery bank level drops below a preset threshold, the inverter automatically signals the generator to start.
5. The generator feeds AC power to the inverter, which in turn sends power to the electric panel and recharges the battery bank to an acceptable level.

Startup

When the generator starts, the engine speed gradually increases to 3600 RPM to produce maximum power. This ensures that there is sufficient power to carry the load on start-up. 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 ramp rate 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 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. Typical loads up to 10 kW or 2 hp can be wired directly. The engine speed remains at 3600 RPM for a programmable time (20 minutes default) and then decreases 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.

If natural gas is the selected fuel type, then all loads up to 9 kW can be wired directly.

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

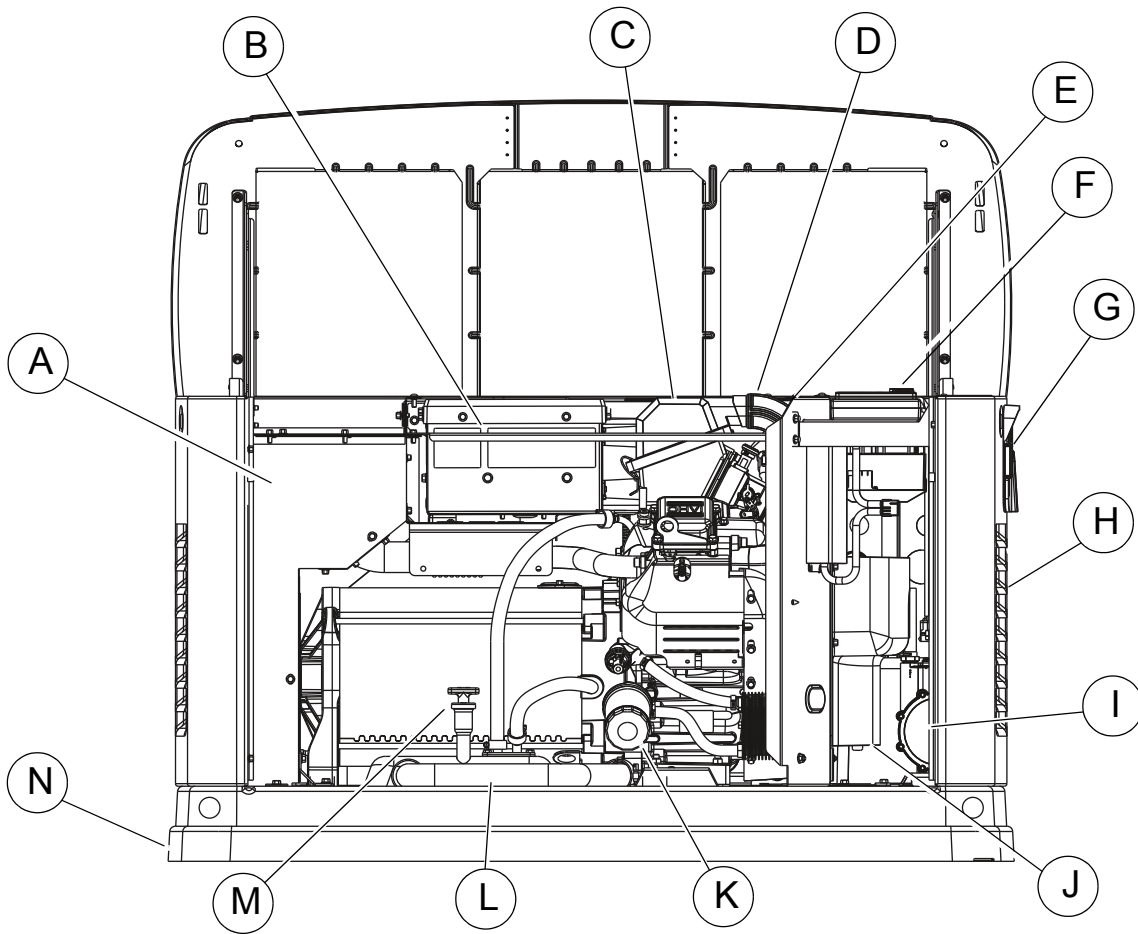
Moving Parts. Keep clothing, hair, and appendages away from moving parts. Failure to do so could result in death or serious injury.

(000111)

The secondary fan continues to operate for up to one hour after the generator is shut down. Proper cooling must occur before removing battery connections for maintenance or other service activity.

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.

The Generator



001380

Figure 2-1. Component Locations

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

Specifications

Generator

Model	15 kW EcoGen
Rated Voltage	240
Rated Maximum Load Current (Amps) at 240 Volts (LP and NG)*	62.5
Main Circuit Breaker	65 Amp
Phase	1
Rated AC Frequency	60 Hz
Battery Requirement	Group 26R, 12 Volts and 525 CCA Minimum (Generac Part No. 0H3421S)
Unit Weight in Lbs. (kilos)	536 (243)
Enclosure	Aluminum
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 section.
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.	

Engine

Model	15 kW EcoGen
Type of Engine	GT-999
Number of Cylinders	2
Displacement	999 cc
Cylinder Block	Aluminum w/Cast Iron Sleeve
Recommended Spark Plug	RC12YC
Spark Plug Gap	0.040 in. (1.02 mm)
Starter	12 VDC
Oil Capacity Including Filter	Approx. 3.75 Quarts / 3.55 Liters
Recommended Oil Filter	Part #070185E
Recommended Air Filter	Part #0J8478
Maximum wattage and current is subject to and limited by such factors as fuel BTU/joules content, ambient temperature and altitude. Maximum power decreases about 3.5 percent for each 1,000 feet (304.8 meters) above sea level, and also will decrease about 1 percent for each 10° F (6° C) above 60° F (15° C) ambient temperature.	

The specification sheet for this 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.

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
- Wiring Error
- Fuse Problem
- Stepper Overcurrent

Warnings:

- Charger Warning
- Charger Missing AC
- Low Battery
- 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 Section 3 [Operation](#).

NOTE: A warning indicates a condition on the generator that should be addressed but will 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.

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 consists of the following:

System	Components
Air Induction	- Intake Pipe and Manifold - Air Cleaner
Fuel Metering	- Carburetor and Mixer Assembly - Fuel Regulator
Ignition	- Spark Plug - Ignition Module
Exhaust	- Exhaust Manifold - Muffler

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 525 CCA (Generac part no. 0H34215).

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

Battery Charger

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

Engine Oil Requirements

For proper oil viscosity, see chart in [Figure 4-2](#).

Replacement Parts

Description	15 kW EcoGen
26R Exide Battery	0H34215
Spark Plug	0G0767A
Oil Filter	070185E
Air Filter	0J8478
Control Panel Fuse	0D7178T

Accessories

Performance enhancing accessories are available for air-cooled generators.

Accessory	Description
Cold Weather Kit 006212-0	Recommended in areas where temperatures fall below 32 °F (0 °C).
Scheduled Maintenance Kit 006829-0	Includes all pieces necessary to perform maintenance on the generator along with oil recommendations.
Mobile Link™ (USA only) 006463-0	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 www.MobileLinkGen.com .
Touch-Up Paint Kit 005704-0	Very important to maintain the look and integrity of the generator enclosure. This kit includes touch-up paint and instructions.
Wireless Local Monitor 006664-0	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.

NOTE: Contact an Independent Authorized Service Dealer or visit www.generac.com for additional information on replacement parts, accessories, and extended warranties.

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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. (0.91m) 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 downspouts and sump pump discharges are directed away from the generator enclosure.

⚠ DANGER

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

(000236)

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

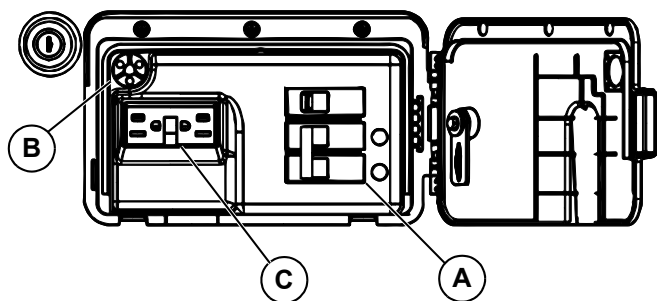


Figure 3-1. Open Side Compartment

Main Circuit Breaker (Generator Disconnect)

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

LED Indicator Lights

See “B” in [Figure 3-1](#).

- Green LED “Ready” light is on when battery pack power 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 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](#). Some units are 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 the normal power source, 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 the normal power source 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 will be locked. 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.

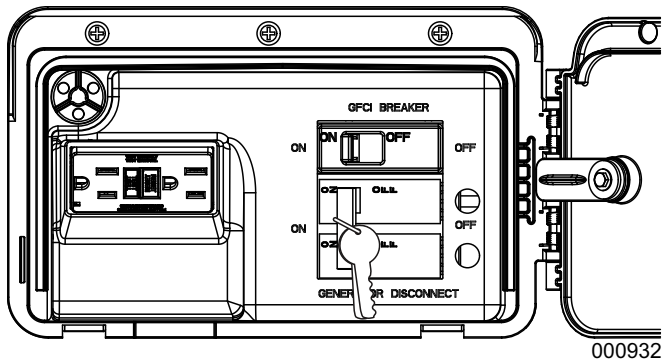


Figure 3-2. Circuit Breaker Box and Keys (As Shipped)

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](#)).

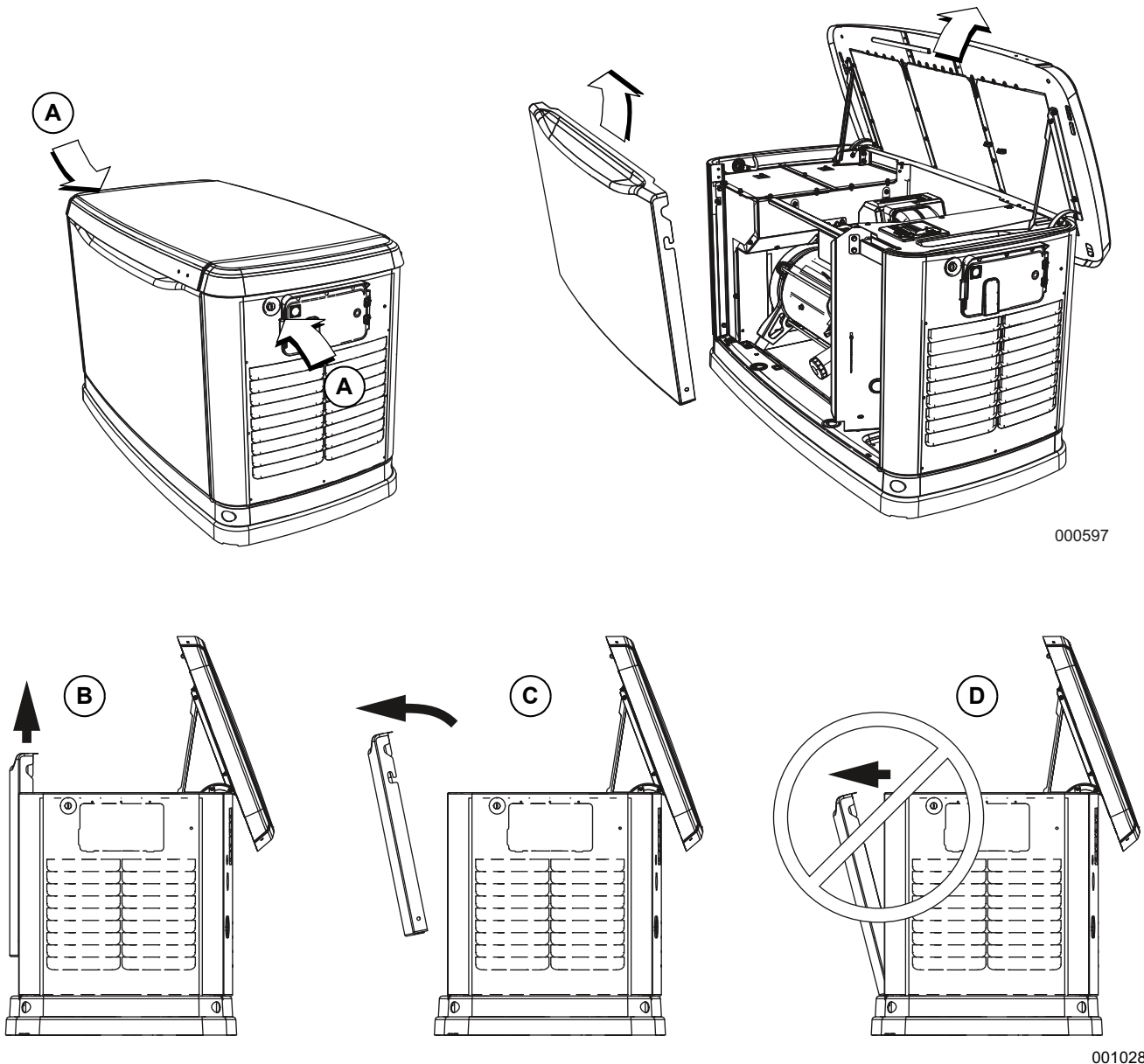


Figure 3-3. Side Lock Location and Front Panel Removal

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.

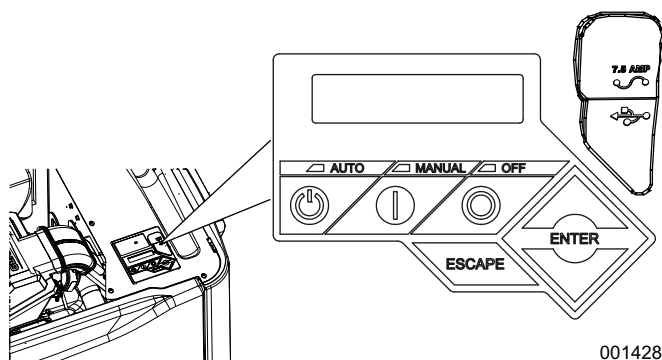


Figure 3-4. Generator Control Panel

With the control pad set to AUTO, the engine may crank and start at any time without warning. To prevent possible injury that might occur during sudden starts, always set the control pad to OFF and remove the 7.5 amp fuse before working on or around the generator or the electrical loads that are to be powered by the generator. For added security, place a DO NOT OPERATE tag or placard at the control pad and the electrical loads that are to be powered by the generator.

Never run the generator with any access panel removed.

Activation

To receive an activation code, you must have the unit serial number and go to: www.generac.com, “Service & Support” Tab and then “Activate Your Home Standby” under the “Generac Owners” list. You can also receive an activation code by calling 1-888-9ACTIVATE (1-888-922-8482).

Activating the generator is a simple, one-time process that is guided by the controller screen prompts. Once the product is activated, the controller screen will not prompt you to activate again, even if you disconnect the generator battery, fuse and battery charge circuit (T1 60 Hz / T1 & T2 50 Hz).

After obtaining your activation code, please complete the following steps at the generator’s control panel:

1. Upon first power up of the generator, the display interface will begin an installation wizard.

NOTE: If the unit has already been powered up, it will be necessary to disconnect the generator battery, fuse and battery charge circuit (T1 60 Hz / T1 & T2 50Hz).

2. The installation wizard will prompt the user to set the fuel type and after choosing fuel type and “Enter”, the display will then announce “Activate me (ENT) or ESC” to run in MANUAL.
3. Press Enter and use the up/down arrows and the enter keys to put the activation code in.

NOTE: If you push ESC to run in MANUAL, the unit will not function in AUTO. To enter the activation code at a later time, it will be necessary to disconnect the generator battery, fuse and battery charge circuit (T1).

If the unit is not activated, the install wizard will only allow the programming to operate the generator. These settings are: Current Date/Time and Exercise Day/Time and announce “NOT ACTIVATED”.

If the unit is activated, the install wizard will allow further programming parameters and Auto operation. The maintenance intervals will be initialized when the exercise time is entered. The exercise settings can be changed at any time via the EDIT menu. If the 12 volt battery is disconnected or the fuse removed, the installation wizard will operate upon power restoration. The only difference is the display will only prompt the customer for the current Time and Date.

Cold Smart Start

The Cold Smart Start feature can be enabled in the EDIT menu. When enabled, the generator will monitor ambient temperature and adjust its warm-up delay based on temperature. If the ambient temperature conditions are below 50 °F (10 °C) upon startup in AUTO mode, the generator will warm up for 30 seconds allowing the engine to warm before the load is applied. If the temperature is at or above 50 °F (10 °C), the generator will startup with the normal warm-up delay of six seconds.

Using the Auto/Off/Manual Interface Menu

Button	Description of Operation
AUTO	Press to activate fully automatic operation. Green LED illuminates to confirm that system is in AUTO mode. Transfer to standby power occurs if 2-wire start signal is enabled.
MANUAL	Press to crank and start engine. Blue LED illuminates to confirm that system is in MANUAL mode.
OFF	Press to shut down engine, if running. Red LED illuminates to confirm that system is in OFF mode.

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

Menu Navigation

Feature	Description
System Menus	
HOME Screen	The system returns to the Home screen if the control pad is not used for five minutes. The screen normally displays a Status message, such as Ready to Run (Auto mode) or Switched to OFF (Off mode), and the total Hours of Protection. If an active alarm/warning condition occurs, the associated Alarm/Warning message is displayed. To clear the Alarm/Warning message, press OFF on the control pad followed by ENTER. In the event of multiple Alarms/Warnings, the next message is then displayed. The highest priority alarm is always displayed first.
MAIN MENU	Enables the operator to navigate the software using UP ARROW, DOWN ARROW, ENTER and ESCAPE. The Main Menu can be accessed from any sub menu by consecutively pressing ESCAPE. Each time ESCAPE is pressed, the preceding menu is displayed. The Main Menu is reached when the System, Date/Time, Battery, and Sub Menus are displayed.
Navigation	
ESCAPE	Used to abort a routine or back up to the preceding menu.
ENTER	Used to make a selection or save an entry.
UP ARROW DOWN ARROW	Used to move forward or backward from menu to menu or to scroll forward or backward (increment or decrement) through available selections.
NOTE: Pressing the control pad illuminates the backlight for 30 seconds. The backlight also illuminates for 30 seconds whenever an active Alarm/Warning message is displayed.	

Menu System Navigation

To get to the 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. See [Figure 3-5](#) Navigation Menu.

Change Time and Date

To change the time and date after activation, see [Figure 3-5](#) Navigation Menu. If power is lost (battery is disconnected/reconnected, 7.5 amp control pad fuse is removed/installed, etc.), the display automatically prompts the user for the Time and Date. All other information is retained in memory.

Programmable Timers

Dealer Programmable

NOTE: A dealer pass code is required.

High Run Speed Timer

A programmable high run speed timer is provided. The timer controls the length of time the generator runs at maximum speed after application of a large load (such as an air conditioner). The time can be increased to prevent the potential cycling of engine RPM as loads turn on and off. For example, if the timer is currently set to **ten** minutes, and the normal AC cycling time is 15 minutes, increasing the timer to 20 minutes would prevent the

engine speed from ramping up and down every ten minutes between AC cycles (even though fuel consumption would increase).

Cooldown

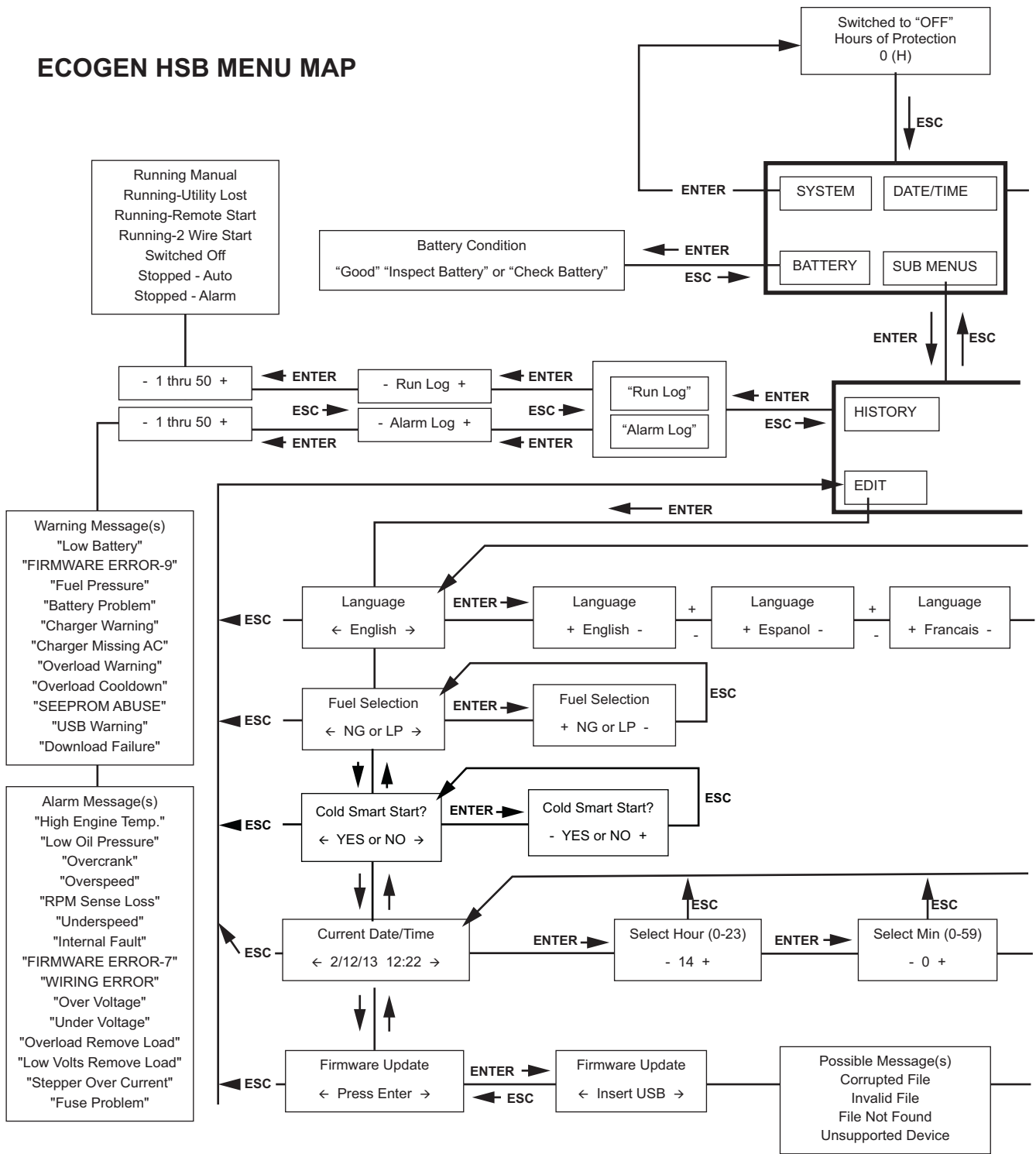
Cooldown can be set to YES or NO for compatibility with installation configurations. The default setting is NO.

USB Port for Firmware Updates

A USB port is located beneath the rubber flap adjacent to the control pad, and is provided for firmware updates. Firmware updates must be performed by an Independent Authorized Service Dealer.

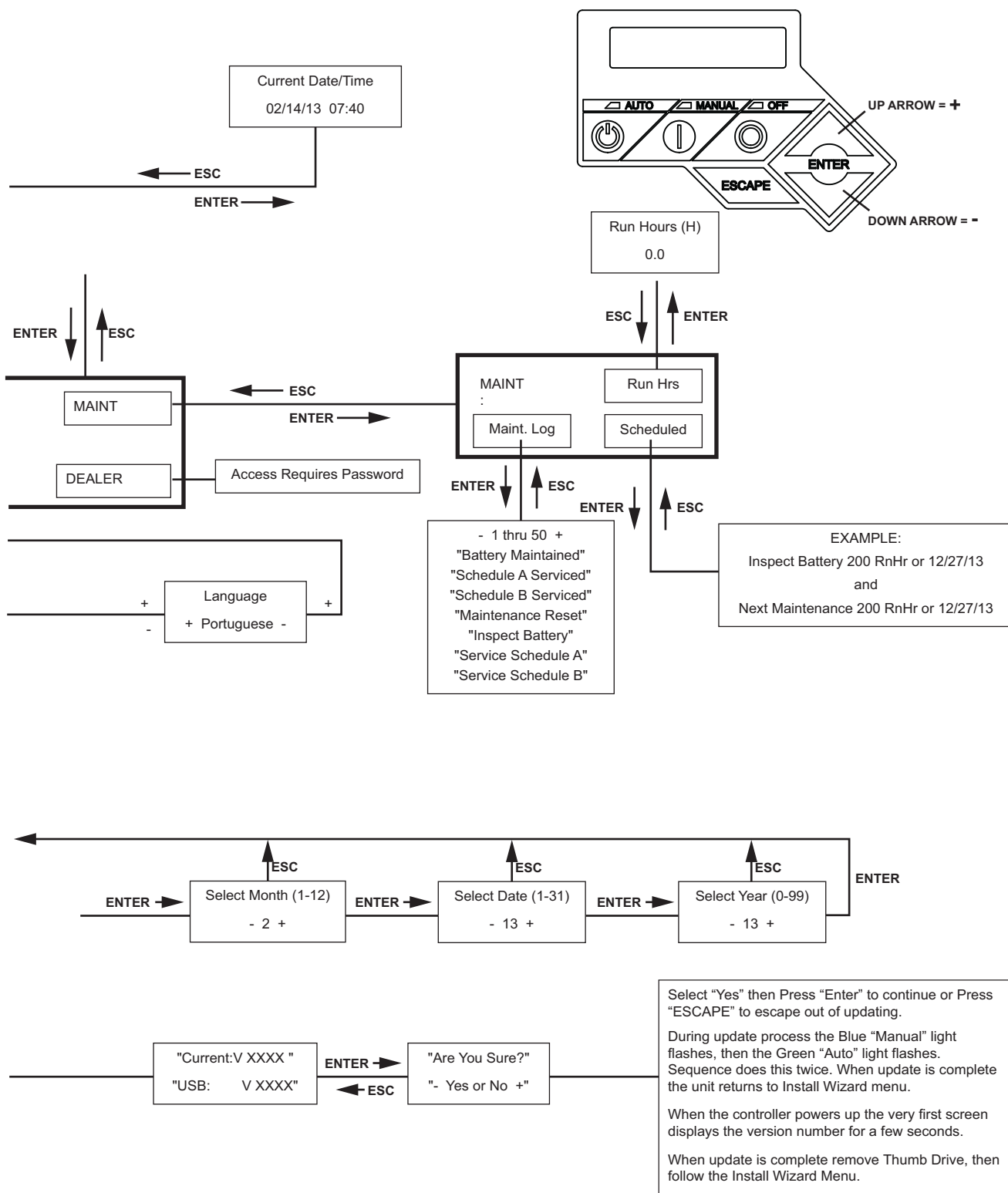
NOTE: The USB port is intended for use with a USB thumb drive only. The USB port is not intended for charging devices such as phones or laptops. Do not connect any consumer electronics to the USB port.

ECOGEN HSB MENU MAP



001382a

Figure 3-5. Navigation Menu



001382b

Figure 3-6. Navigation Menu

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



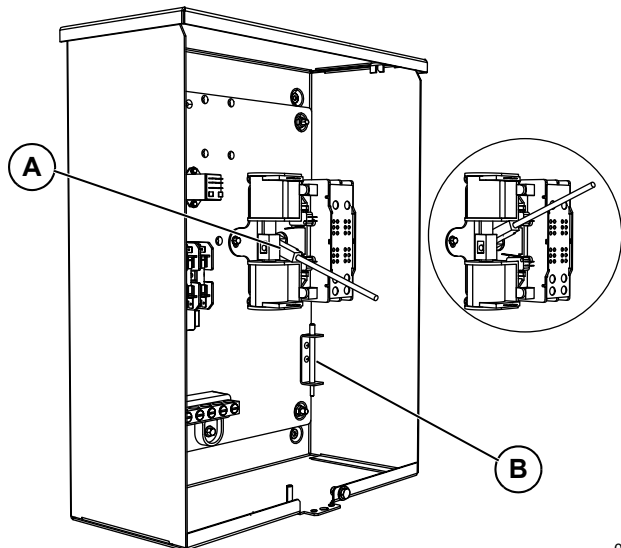
⚠ DANGER

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 normal power source supply to the transfer switch using the means provided (such as a main line circuit breaker).
4. Use the manual transfer handle (A in [Figure 3-7](#)) 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 3-7. Manual Transfer Switch Operation

Transfer Back to Normal Power Source

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

1. Set the Main Circuit Breaker (Generator Disconnect) to OFF or OPEN.
2. Allow the engine to run for 2 minutes at no-load to stabilize the internal temperatures.
3. Press the control panel OFF button. The engine should shut down.
4. Verify that the normal power source supply to the transfer switch is turned OFF.
5. Use the manual transfer handle (A in [Figure 3-7](#)) inside the transfer switch to move the main contacts back to the normal power source position (loads connected to the normal power source).
6. Turn on the normal power source 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 normal power source position (loads connected to the normal power source).
2. Be sure that normal 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 normal power source voltage drops below a preset level. After the unit starts, loads are transferred to the standby power source.

Automatic Sequence of Operation

Normal Source Power Failure

With the generator set to AUTO, when normal source power fails (below 65% of nominal) a five second (dealer programmable) line interrupt delay time is started. If normal source power 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. When the warm-up time expires, the controller will transfer the load to the generator. If the normal source power is restored (above 80% nominal) at any time from the initiation of the engine start until the generator is ready to accept load (five 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 normal power source.

Cranking

The system will control the cyclic cranking 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 or dust/dirt prevent 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 normal power source 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 normal source power 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 normal source power 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.



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

Service Schedule

Service	Weekly	Every Three Months	Every Year	Schedule A Every Two Years or 500 Hours	Schedule B Every Four Years or 1000 Hours
Check Enclosure Louvers for Dirt and Debris	●				
Check AVR and Engine Filter		●			
Check Lines and Connections for Fuel or Oil Leaks		●			
Check Engine Oil Level		●			
Check Spark Plugs		●			
Check Battery Condition,			●	●	●
Replace AVR Filter*				●	●
Replace Engine Oil Filter and Oil in Oil Tank**				●	●
Replace Engine Air Filter				●	●
Replace Spark Plugs				●	●
Adjust Valve Clearance***				●	●
Replace Rotor Brushes****					●

Contact the nearest independent Authorized Service Dealer for assistance if necessary.

* Replace AVR filter more frequently if operating in dusty conditions.

** Change engine oil and filter after the first 25 hours of operation.

*** Check/adjust valve clearance after the first 25 hours of operation.

**** Should be performed only by an Independent Authorized Service Dealer.

verify 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 lash 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.

NOTE: Contact an Independent Authorized Service Dealer or visit 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:

Check Enclosure Louvers

1. Verify that intake and exhaust louvers and openings are clean and unobstructed.
2. Wipe exterior surfaces clean using a damp cloth.
3. Loosen dirt, oil, etc. with a soft bristle brush.
4. Remove loose dirt and debris using a vacuum cleaner, or low pressure compressed air (not exceeding 25 psi [172 kPa]).

NOTE: Periodically wash and wax enclosure using automotive type products. Frequent washing is recommended in salt water/coastal areas.

Check Lines and Connections

Perform a general inspection as follows:

- Check Fuel Lines and Connections for Leaks
- Check Oil Lines and Connections for Leaks

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)

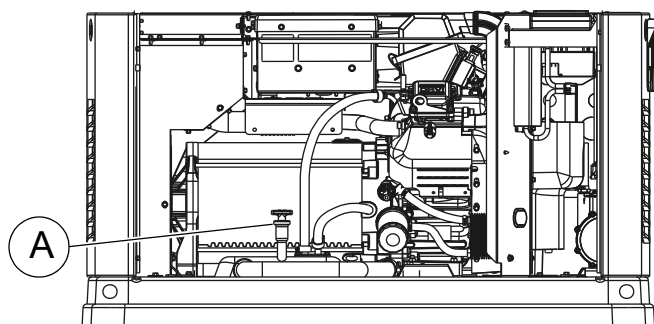
⚠ CAUTION

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 normal source power 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.



001384

Figure 4-1. Dipstick Location

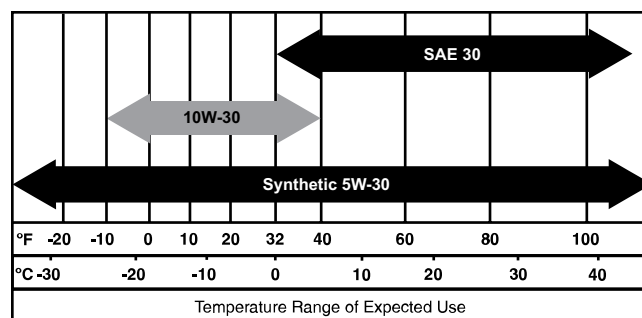
3. See [Figure 4-1](#). Remove the dipstick (A) and wipe it dry with a clean cloth.
4. Completely insert the dipstick and again remove it.
5. Observe the oil level. The level should be at the "FULL" mark on the dipstick.
6. If necessary, remove the oil fill cap and add oil to the engine until the level 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 normal power source 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 4-2. Recommended Oil Based on Temperature

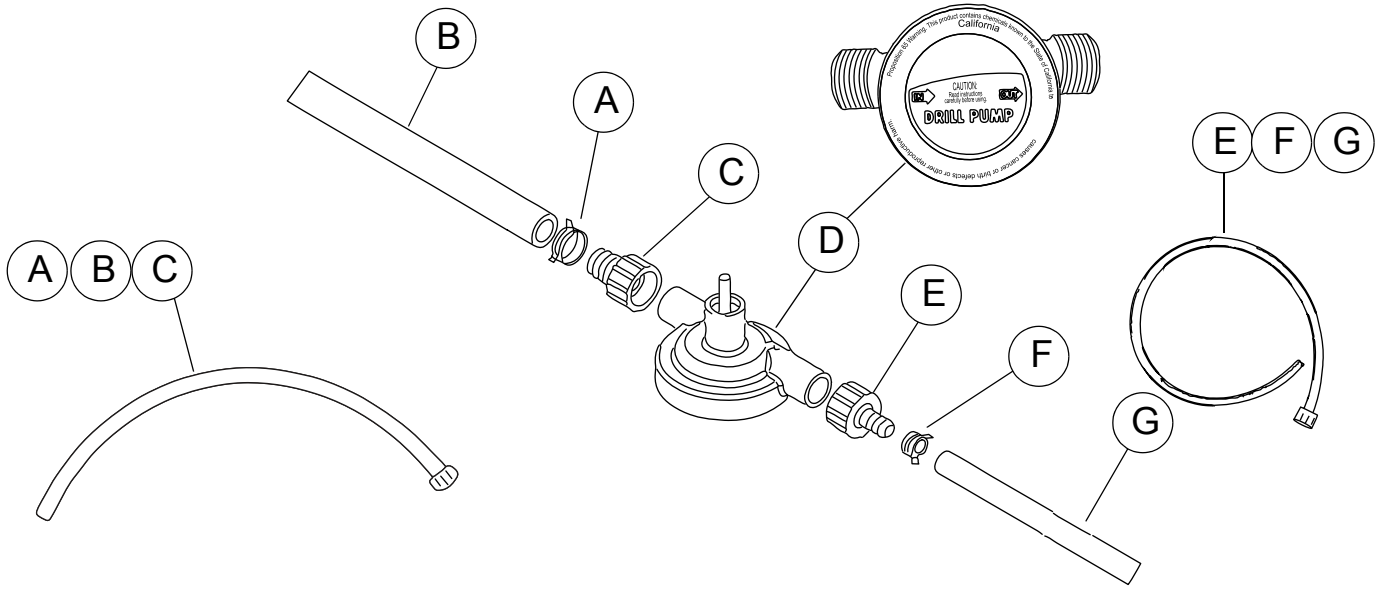
- SAE 30 above 32 °F (0 °C)
- SAE 10W-30 between 40 ° and -10 °F (4 ° and -23 °C)
- Synthetic SAE 5W-30 for all temperature ranges

⚠ 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



001385

Figure 4-3. Exploded View – EcoGen Oil System Drain Pump Kit

An Oil System Drain Pump Kit (P/N 0K3717) has been shipped with this unit. Refer to the instructions included with that kit for assembly and use of the Oil System Drain Pump. If the Oil System Drain Pump has become lost, or is unavailable, use a suitable suction pump to perform the following oil change procedure.

EcoGen Oil System Drain Pump Assembly

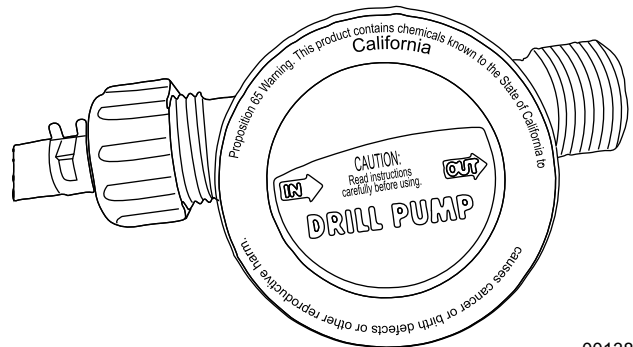
1. See [Figure 4-4](#). Install the ¼ in. Hose Assembly onto the inlet side of the Drill Pump. Twist the fitting clockwise until it is snug. Do not over-tighten.

EcoGen Oil System Drain Pump Kit Parts List

(Kit Part No. 0K3717)

A	¾ in. Spring Clamp**
B	½ in. Rubber Hose**
C	½ in. Barb Hose Fitting with ¾ in. Hose Thread**
D	Drill Pump
E	¼ in. Barb Hose Fitting w/¾ in. Hose Thread*
F	½ in. Spring Clamp*
G	¼ in. Rubber Hose*

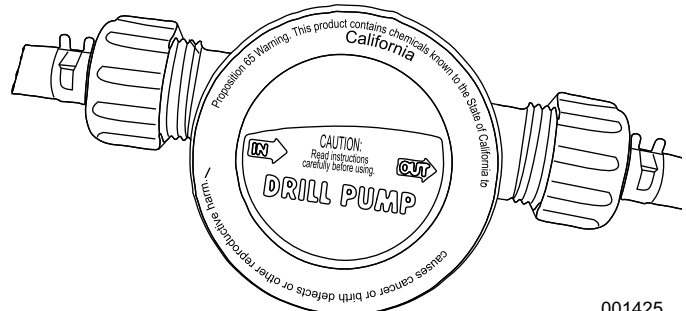
* Parts 1, 2, and 6 come assembled from the supplier.
 ** Parts 3, 4, and 7 come assembled from the supplier.



001386

Figure 4-4. Pump Assembly Step 1

2. See [Figure 4-5](#). Install the ½ in. Hose Assembly onto the outlet side of the Drill Pump. Twist the fitting clockwise until it is snug. Do not over-tighten.



001425

Figure 4-5. Pump Assembly Step 2

EcoGen Oil Change Procedure

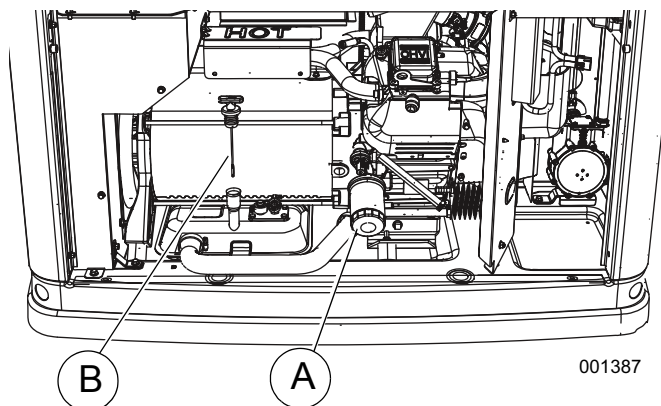
WARNING

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)

1. Verify the engine is at operating temperature by operating the unit for a minimum of 20 minutes.
2. Press the Control Panel OFF button to shut down the engine.
3. Allow the oil to settle for 10 minutes.

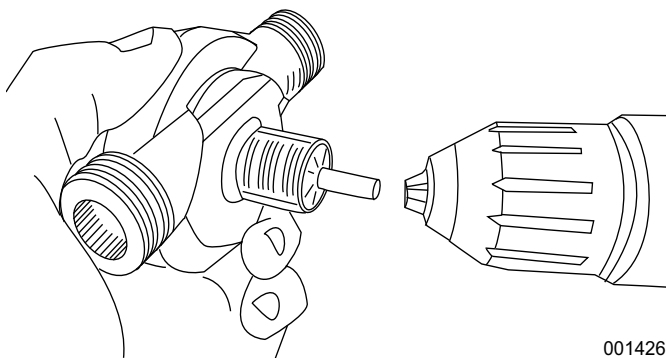
NOTE: Allowing the engine to run at operating temperature increases engine oil viscosity so that it can be easily drawn out of the system. Allowing the oil to settle ensures that the oil has thoroughly drained to the tank and that the equipment is cool enough to handle during the procedure. Always follow proper safety precautions when working with this equipment.



001387

Figure 4-6. Oil Filter and Dipstick

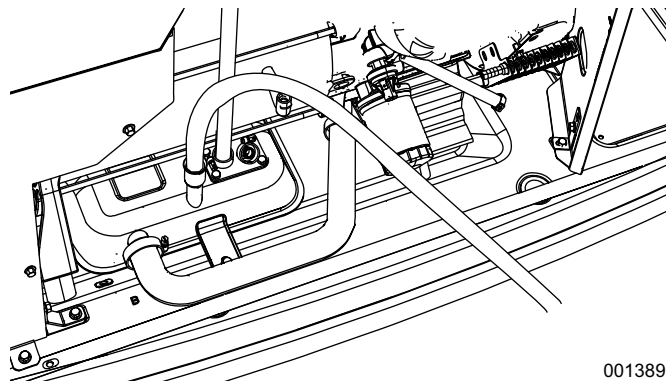
4. See [Figure 4-6](#). Remove the used oil filter (A) by turning it counterclockwise. A towel or small container may be used to catch any residual oil when removing the filter.
5. Remove the oil dipstick (B) from the tank.
6. Set a drill to spin in the clockwise direction.
7. See [Figure 4-7](#). Attach the drill to the drive shaft of the Drill Pump.



001426

Figure 4-7. Attaching Drill Pump

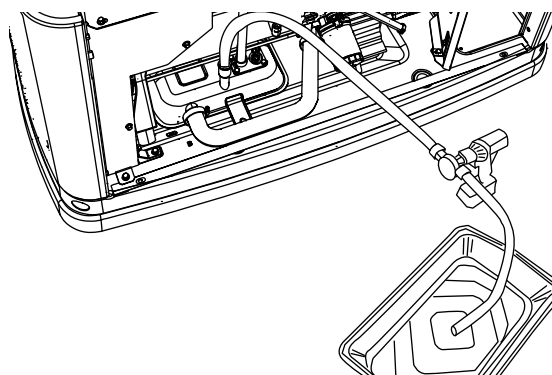
8. See [Figure 4-8](#). Insert the ¼ in. hose free end into the unit's oil tank.



001389

Figure 4-8. Drain Hose In Oil Tank

9. See [Figure 4-9](#). Insert the ½ in. hose free end in to a suitable oil catch container. Make sure there are no kinks or obstructions in either hose.



001390

Figure 4-9. Draining Into Oil Catch Container

10. Spin the pump on the high speed setting of the drill.

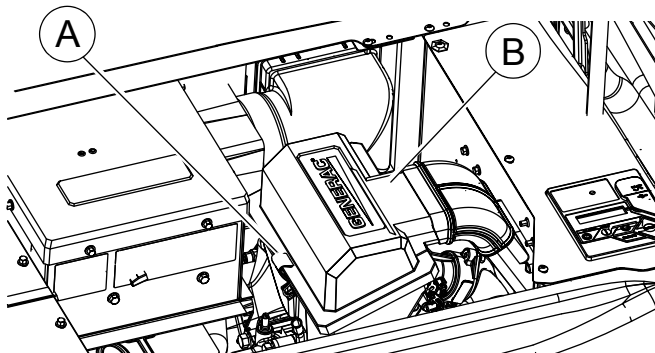
NOTE: It may take up to 2 minutes to prime the pump.

11. After oil begins pumping, draw out as much oil as possible. A total of 2.5–3.5 quarts (2.37– 3.31 L) of oil should be removed from the system.
12. Remove the ¼ in. hose from the tank and drain remaining oil from the drill pump and hoses.
13. Apply a light coating of new oil to the gasket of the new oil filter.
14. Screw the new oil filter on by hand until the filter gasket contacts the oil filter adapter. Tighten the new oil filter ¾ to one full turn more.
15. Refill the oil tank with the proper recommended oil. Do not fill above the full mark on the dipstick.
16. Start the engine, run for one minute and check for leaks.
17. Stop the engine for a minimum of 10 minutes.
18. Recheck the oil level and add oil if necessary.

Dispose of used engine oil and oil filter at a proper collection center.

Replacing the Engine Air Filter

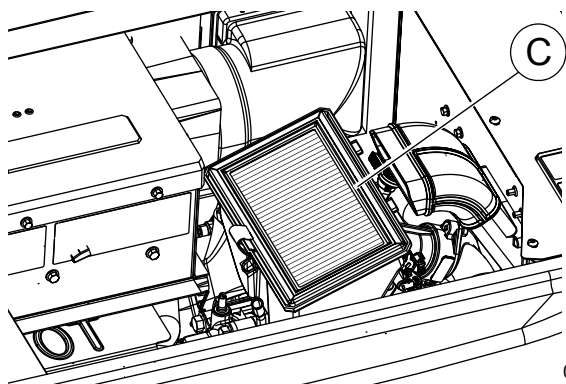
1. With the generator shut down, lift the lid and remove the front panel.
2. See [Figure 4-10](#). Remove the cover clip (A) and air cleaner cover (B).



001221

Figure 4-10. Removing the Air Cleaner Cover

3. See [Figure 4-11](#). Pull out the old air filter (C) and discard.



001222

Figure 4-11. 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.

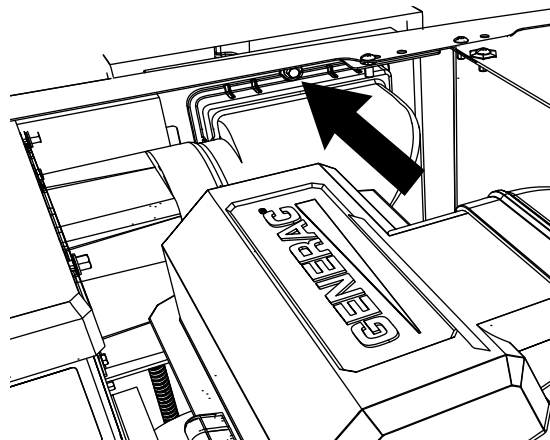
Replacing the AVR Filter



WARNING

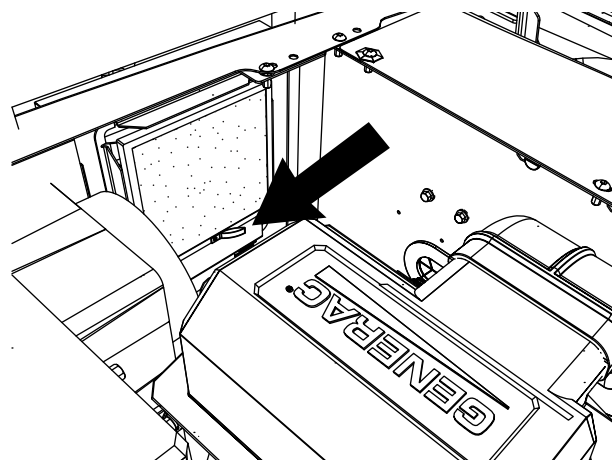
Electric shock. AVR maintains electrical charge after generator shutdown. Wait five minutes before AVR removal. Failure to do so could result in death or serious injury.

(000223)



001219

Figure 4-12. Removing the AVR Filter Screw



001220

Figure 4-13. Replacing the AVR Filter

1. See [Figure 4-12](#). Remove screw to release AVR filter housing from back panel.
2. Remove AVR filter housing.
3. See [Figure 4-13](#). 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 and 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)

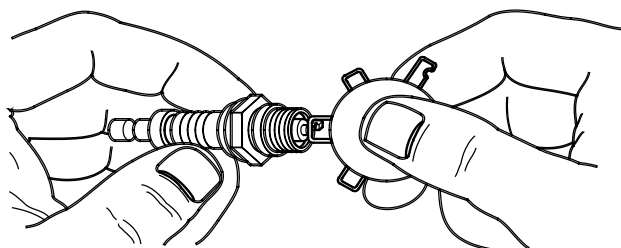


⚠ WARNING

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 4-12](#). 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 4-14](#). 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 — [Specifications](#).



000211

Figure 4-14. 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

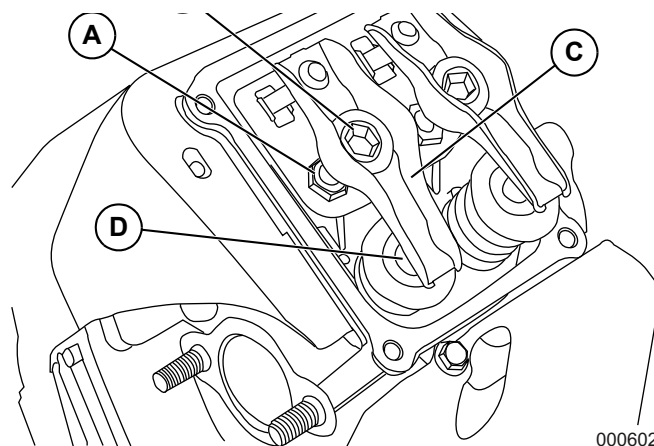
Check the valve clearance after the first 25 hours of operation, then after 500 hour intervals. Adjust if necessary.

Important: Please contact an Independent Authorized Service Dealer for service assistance. This is a very important step in prolonging engine life.

Check Valve Clearance

1. The engine should be cool before checking. Adjustment is not needed if valve clearance is within the specification in Section 2 — [Specifications](#).
2. Remove spark plug wires and position wires away from plugs.
3. Remove spark plugs.
4. 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 in a clockwise direction. While watching the piston through the spark plug hole. The piston should move up and down. The piston is at TDC when it is at its highest point of travel.

Adjust Valve Clearance



000602

Figure 4-15. Valve Clearance Adjustment

See [Figure 4-15](#):

1. The engine should be cool before adjustment.
2. Remove spark plug wires and position wires away from plugs.
3. Remove spark plugs.
4. Remove the four screws attaching the valve cover. Remove and discard gasket.
5. Loosen the rocker jam nut (A) using a 10mm Allen or 13mm Allen wrench.

- Turn the pivot ball stud (B) while checking clearance between the rocker arm (C) and the valve stem (D) with a feeler gauge. Correct clearance is in the specification in Section 2 — **Specifications**.

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

- When valve clearance is correct, hold the pivot ball stud in place with the Allen wrench and tighten the rocker arm jam nut. Tighten the jam nut to **174 in-lbs** (19.68 Nm) torque. After tightening the jam nut, recheck valve clearance to make sure it did not change.
- Install new valve cover gasket.
- Install the valve cover. Tighten fasteners in a cross pattern, torquing to **48 in-lbs** (5.4 Nm).

NOTE: Start all four screws before tightening or it will not be possible to get all the screws in place. Make sure the valve cover gasket is in place.

- Install spark plugs.
- Re-attach the spark plug wire to the spark plug.
- Repeat the process for the other cylinder, if necessary.

Battery Maintenance

The battery should be regularly inspected per the **Service Schedule**:

- With the generator shut down, lift the lid and remove the front panel.
- Inspect the battery posts and cables for tightness and corrosion. Tighten and clean as necessary.
- 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)

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 rest 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 acid neutralizing agent. A common practice is to use a solution of 500 grams (1 pound) bicarbonate of soda to 4 liters (1 gallon) 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.

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>

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 normal source power is returned.

Corrosion Protection

Regular scheduled maintenance should be conducted to perform a visual inspection of the unit for corrosion. Inspect all metal components of the generator: 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 normal source 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 normal source 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. Follow Install Wizard instructions using LCD screen and control pad.
11. Press **MANUAL** on the control pad to start the engine. A blue LED illuminates to confirm that the system is in the **MANUAL** mode.
12. Allow the unit to warm up for a few minutes.
13. Press **OFF** on the control pad to stop the engine. A red LED illuminates to confirm that the system is in the **OFF** mode.
14. Move the Generator Disconnect Circuit Breaker switch to the **ON (Closed)** position.
15. Press **AUTO** on the control pad to stop the engine. A green LED illuminates to confirm that the system is in the **AUTO** mode.

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 / Diagnostics

Engine Troubleshooting

Table 5-1. Engine Troubleshooting

Problem	Cause	Correction
Engine will not crank.	<ol style="list-style-type: none"> 1) Fuse blown. 2) Loose, corroded or defective battery cables. 3) Defective starter contact. 4) Defective starter motor. 5) Dead Battery. 	<ol style="list-style-type: none"> 1) Correct short circuit condition by replacing 7.5 Amp fuse. 2) Tighten, clean or replace as necessary.* 3) Tighten, clean or replace as necessary.* 4) Tighten, clean or replace as necessary.* 5) Charge or replace battery.
Engine cranks but will not start.	<ol style="list-style-type: none"> 1) Out of fuel. 2) Defective fuel solenoid (FS). 3) Defective spark plug(s). 4) Valve clearance needs adjustment. 	<ol style="list-style-type: none"> 1) Replenish fuel / Turn on fuel valve. 2) * 3) Clean, re-gap or replace plug(s). 4) Adjust valve clearance.
Engine starts hard and runs rough.	<ol style="list-style-type: none"> 1) Air cleaner plugged or damaged. 2) Defective spark plug(s). 3) Fuel regulator not set. 4) Fuel pressure incorrect. 5) Fuel selector in wrong position. 	<ol style="list-style-type: none"> 1) Check / replace air cleaner. 2) Clean, re-gap or replace plug(s). 3) Set fuel regulator. 4) 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. 5) Move selector to correct position.
Generator is set to OFF, but the engine continues to run.	<ol style="list-style-type: none"> 1) Control board wired incorrectly. 2) Defective control board. 	<ol style="list-style-type: none"> 1) Repair wiring or replace control board.* 2) Replace control board.
No AC output from generator.	<ol style="list-style-type: none"> 1) Main line circuit breaker is in the OFF (or OPEN) position. 2) Generator internal failure. 	<ol style="list-style-type: none"> 1) Reset circuit breaker to ON (or CLOSED). 2) *
Unit consumes large amounts of oil.	<ol style="list-style-type: none"> 1) Oil tank is over filled with oil. 2) Engine breather defective. 3) Improper type or viscosity of oil. 4) Damaged gasket, seal or hose. 	<ol style="list-style-type: none"> 1) Adjust oil to proper level. 2) * 3) See Engine Oil Requirements. 4) Check for oil leaks.
* Contact an Authorized Independent Service Dealer for assistance.		

Generator Troubleshooting

Table 5-2. Generator Troubleshooting

Active Alarm	LED	Problem	Things to Check	Solution
NONE	GREEN	Unit running in AUTO but no power in house.	Check Generator Disconnect circuit breaker.	Contact servicing dealer if Generator Disconnect circuit breaker is in the ON position.
HIGH TEMPERATURE	RED	Unit shuts down during operation.	Check the LEDs/Screen for alarms.	Check ventilation around the intake, exhaust and rear of generator. Contact servicing dealer if no obstruction is found.
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 problem returns, contact servicing dealer to investigate possible fuel issue.
NOT ACTIVATED	NONE	Unit will not start in AUTO with 2-wire start signal.	See if screen says unit not activated.	Refer to activation section in Owner's Manual.
LOW OIL PRESSURE	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Check oil level. Add oil per Owner's Manual. Contact servicing dealer if oil level is correct.
RPM SENSE LOSS	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Clear alarm. Navigate to the BATTERY MENU on the control pad LCD. Contact servicing dealer if battery is GOOD. Replace battery if CHECK BATTERY is displayed.
OVERCRANK	RED	Unit will not start in AUTO with 2-wire start signal.	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 servicing dealer.
LOW VOLTS REMOVE LOAD	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Clear alarm and remove household loads from the generator. Set back to AUTO and restart.
FUSE PROBLEM	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Check ATO 7.5 Amp fuse. Replace with same type fuse if bad. Contact servicing dealer if fuse is good.
OVERSPEED	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.
UNDER VOLTAGE	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.
UNDERSPEED	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.
STEPPER OVERCURRENT	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.
MISWIRE	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.

Table 5-2. Generator Troubleshooting (Continued)

Active Alarm	LED	Problem	Things to Check	Solution
OVERVOLTAGE	RED	Unit will not start in AUTO with 2-wire start signal.	Check the LEDs/Screen for alarms.	Contact servicing dealer.
LOW BATTERY	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Clear alarm. Navigate to the BATTERY MENU on the control pad LCD. Contact servicing dealer if battery is GOOD. Replace battery If CHECK BATTERY is displayed.
BATTERY PROBLEM	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Contact servicing dealer.
CHARGER WARNING	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Contact servicing dealer
SERVICE A	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Perform SCHEDULE A maintenance. Press ENTER to clear.
SERVICE B	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Perform SCHEDULE B maintenance. Press ENTER to clear.
INSPECT BATTERY	YELLOW	Yellow LED illuminated in any state.	Check screen for additional information.	Inspect battery. Press ENTER to clear.

G-Flex™ Troubleshooting

Table 5-3. G-Flex™ 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 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 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 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 (Note: only runs when the engine is running). KEEP FINGERS AWAY FROM FAN HOUSING- PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING. Contact servicing dealer. 4) Air leak in AVR enclosure. Contact servicing dealer. 5) Engine running too hot. Inspect air intake and exhaust. 6) Ambient temperature has risen above 60° F. 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 servicing dealer. 2) Generator has started into a severe load. Manually operate generator breaker 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"> • Verify stepper motor is moving and linkage is free. • Verify stepper motor is plugged in. • Verify gas pressure is within specified limits.
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 servicing dealer.

Table 5-3. G-Flex™ Troubleshooting

Ecode/Active Alarm	LED	Problem	Things to Check	Possible Causes/Solution
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 generator breaker 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 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 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 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 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 (Note: only runs when the engine is running). KEEP FINGERS AWAY FROM FAN HOUSING- PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING. Contact servicing dealer. 4) Air leak in AVR enclosure. Contact servicing dealer. 5) Engine running too hot. Inspect air intake and exhaust. 6) Ambient temperature has risen above 60° F. 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 servicing dealer. 3) Stepper motor problem. Contact servicing dealer.
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) Large overload. Remove load and attempt to restart unit. 3) Throttle or engine problem. Contact servicing dealer.
1070 Small fan failure	YELLOW	“Small fan failure” is displayed. If unit was running in AUTO, 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 servicing dealer. 2) Air path is blocked. Check AVR filter. KEEP FINGERS AWAY FROM FAN HOUSING- PERSONAL INJURY CAN OCCUR IF FAN IS RUNNING.

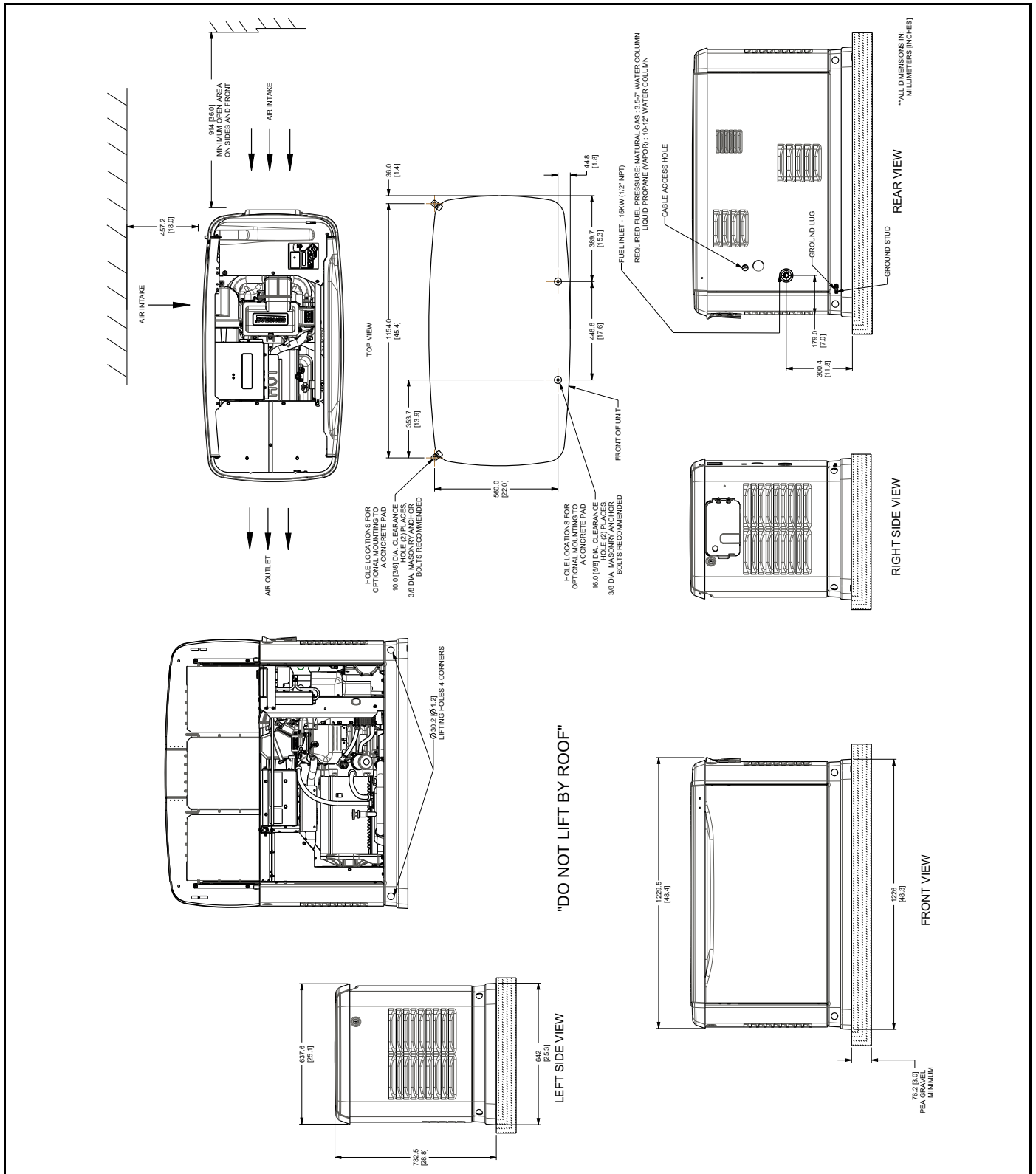
G-Flex™ Diagnostics

Table 5-4. G-Flex™ Diagnostics

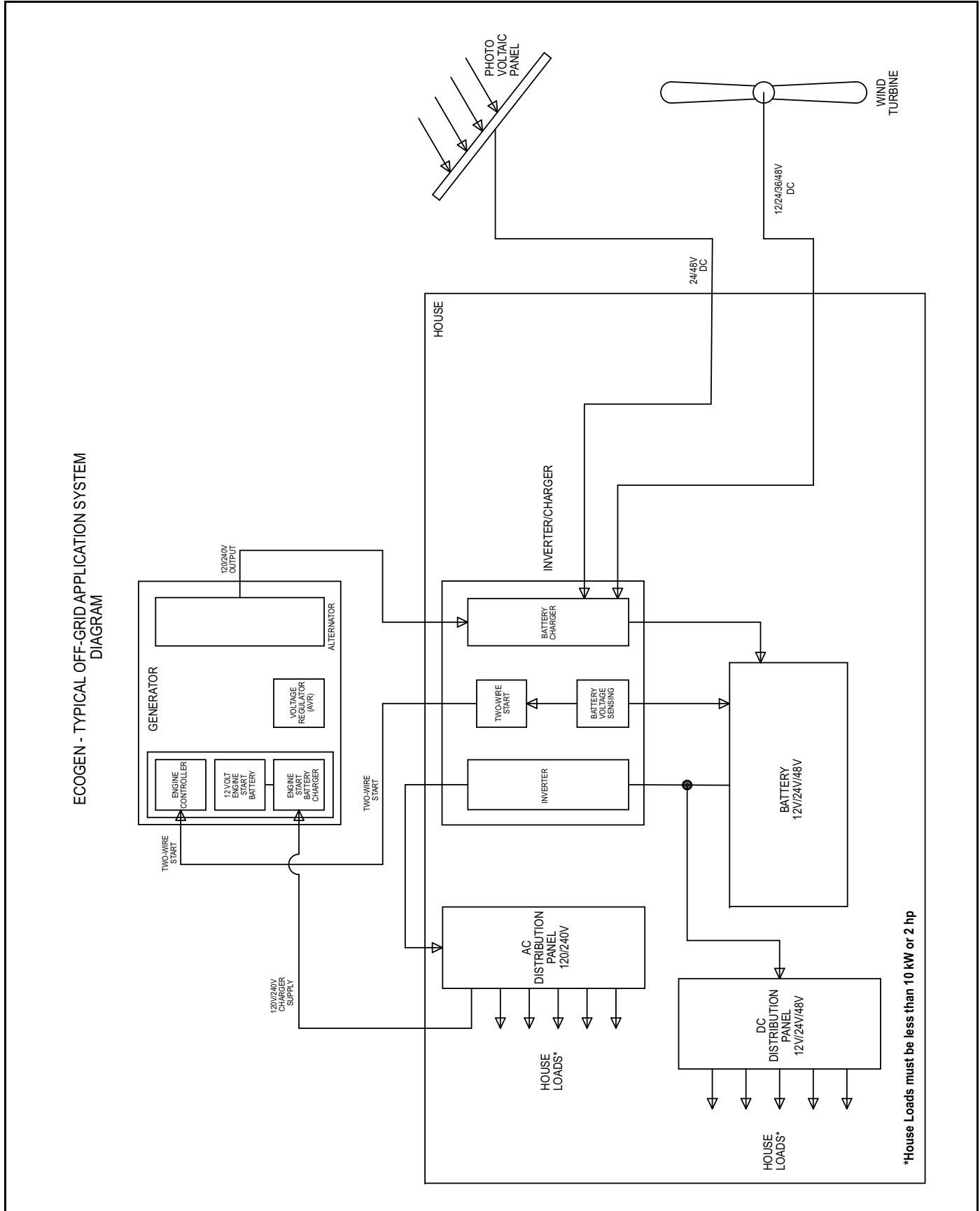
Symptom	Possible Causes
Generator stalls when large load is supplied.	Total load is too big for the generator. Loads must be less than 10 kW or 2 hp when operating under 3600 rpm. Contact installing dealer to correct installation.
Output voltage is low/high.	Voltage calibration incorrect. Contact servicing dealer.
Generator does not pull full power.	Current calibration incorrect. Contact servicing dealer.

Section 6 Installation Diagrams

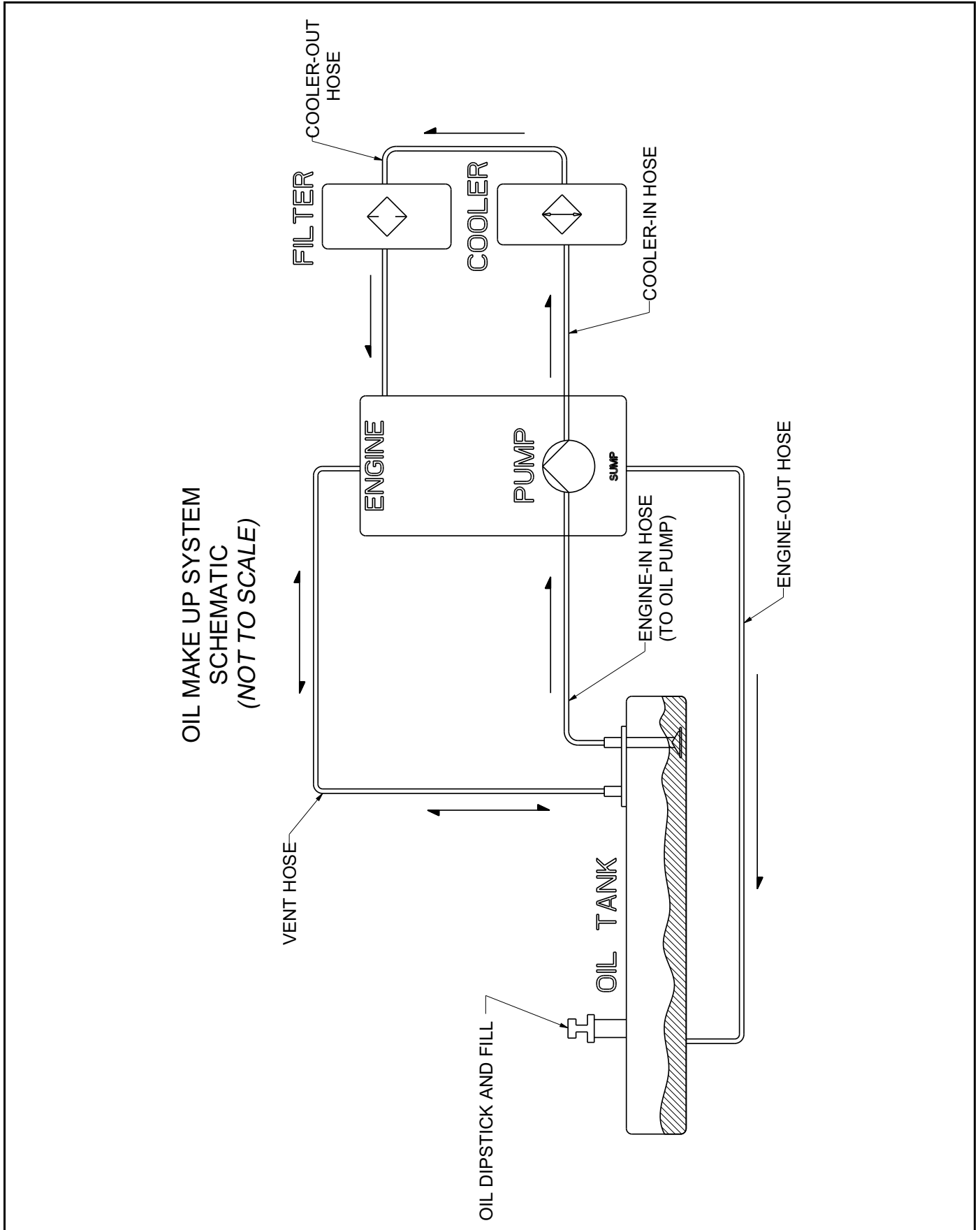
Installation Drawing



Off Grid Mode Application Schematic



Oil Make Up System Schematic



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