GENERAC®

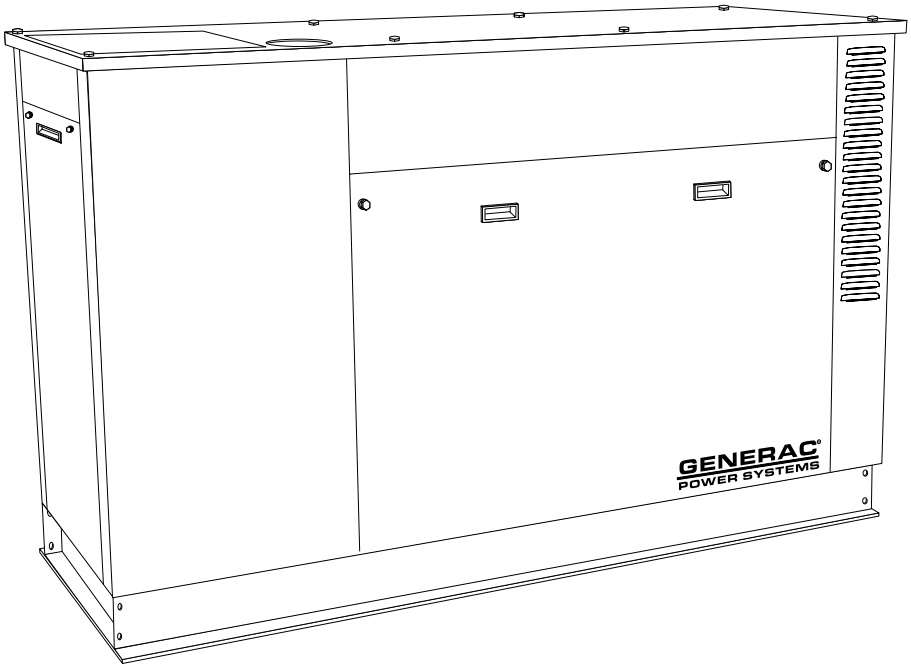
POWER SYSTEMS, INC.

Owner's Manual

DG 50 S Genset

Liquid-cooled, Gas Engine Generator Set

Models:
004595-0 (50 kW/208V/Three-phase)
004596-0 (50 kW/480V/Three-phase)



⚠ DANGER ⚠

ONLY QUALIFIED ELECTRICIANS OR CONTRACTORS SHOULD ATTEMPT INSTALLATION!!

INTRODUCTION

The DG 50 S is an Ultra-quiet standby and prime duty genset. It is similar to the DG 50 paralleling genset so far as the enclosure design and sound levels but without the paralleling capabilities.

The information in this manual was accurate and current at the time of printing. However, the manufacturer reserves the right to change, alter, or otherwise improve this product at any time without prior notice.

◆ READ THIS MANUAL THOROUGHLY

If you do not understand any portion of this manual, contact Generac or the nearest Generac Authorized Dealer for starting, operating and servicing procedures.

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

⚠ DANGER ⚠

After this heading, read instructions that, if not strictly complied with, will result in personal injury or property damage.

⚠ WARNING ⚠

After this heading, read instructions that, if not strictly complied with, may result in personal injury or property damage.

⚠ CAUTION ⚠

After this heading, read instructions that, if not strictly complied with, could result in damage to equipment and/or property.

NOTE:

After this heading, read explanatory statements that require special emphasis.

These safety warnings cannot eliminate the hazards that they indicate. Common sense and strict compliance with the special instructions while performing the service are essential to preventing accidents.

Four commonly used safety symbols accompany the Danger, Warning and Caution blocks. The type of information each indicates is as follows:

This symbol points out important safety information that, if not followed, could endanger personal safety and/or property.

This symbol points out potential explosion hazard.

This symbol points out potential fire hazard.

This symbol points out potential electrical shock hazard.

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

◆ CONTENTS

This manual contains pertinent owner's information, including warranty, electrical diagrams, exploded views and lists of repair parts, for the following models:

004595-0 and 004596-0

◆ OPERATION AND MAINTENANCE

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 a Generac 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 contribute to the need for maintenance service.

Proper maintenance and care of this generator ensures a minimum number of problems and keep operating expenses at a minimum. See the Generac Authorized Service Dealer for service aids and accessories.

Operating instructions presented in this manual assume that the standby electric system has been installed by a Generac Authorized Service Dealer or other competent, qualified contractor. Installation of this equipment is not a "do-it-yourself" project.

◆ HOW TO OBTAIN SERVICE

When the generator requires servicing or repairs, simply contact a Generac Authorized Service Dealer for assistance. Service technicians are factory-trained and are capable of handling all of the service needs.

When contacting a Generac Authorized Service Dealer or the factory about parts and service, always supply the complete model number of the unit as given on the front cover of this manual or on the DATA CARD affixed to the unit.

Model No. _____ **Serial No.** _____

AUTHORIZED DEALER LOCATION

To locate the nearest GENERAC AUTHORIZED DEALER, please call:

1-800-333-1322

or visit our website at:
www.GENERAC.com

SAVE THESE INSTRUCTIONS – This manual contains important instructions that should be followed during installation and maintenance of the generator and battery. The manufacturer suggests that these rules for safe operation be copied and posted in potential hazard areas. Safety should be stressed to all operators and potential operators of this equipment.

DANGER

Utility voltage is present within the control cabinets of this unit. Unit should only be serviced by authorized personnel.

WARNING:

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

WARNING:

This product contains or emits chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

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.

Generac cannot possibly 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 a procedure, work method or operating technique Generac does not specifically recommend is used, you must satisfy yourself that it is safe for you and others. Also make sure the procedure, work method or operating technique chosen does not render the generator unsafe.

DANGER

Despite the safe design of this generator, operating this equipment imprudently, neglecting its maintenance or being careless can cause possible injury or death. Permit only responsible and capable persons to operate or maintain this equipment.

Potentially lethal voltages are generated by these machines. Ensure all steps are taken to render the machine safe before attempting to work on the generator.

Parts of the generator are rotating and/or hot during operation. Exercise care near running generators.

GENERAL HAZARDS

- For safety reasons, Generac requires that the installation, initial start-up and maintenance of this equipment is carried out by a Generac Authorized Dealer.
- The engine exhaust fumes contain carbon monoxide, which can be DEADLY. This dangerous gas, if breathed in sufficient concentrations, can cause unconsciousness or even death. This exhaust system must be installed properly, in strict compliance with applicable codes and standards. Following installation, do nothing that might render the system unsafe or in noncompliance with such codes and standards.
- Keep hands, feet, clothing, etc., away from drive belts, fans, and other moving or hot parts. Never operate the unit with any drive belt or fan guard removed.
- 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.
- When working on this equipment, remain alert at all times. Never work on the equipment when physically or mentally fatigued.
- Inspect the generator regularly, and repair or replace all damaged or defective parts immediately. Always use factory-authorized parts.
- Turn off the AC power to the battery charger before disconnecting the battery to minimize the chance of equipment damage.
- Before performing any maintenance on the generator, disconnect its battery cables to prevent accidental start-up. Disconnect the cable from the battery post indicated by a NEGATIVE, NEG or (–) first. Reconnect that cable last.
- Never use the generator or any of its parts as a step. Stepping on the unit can stress and break parts, and may result in dangerous operating conditions from leaking exhaust gases, fuel leakage, oil leakage, etc.

ELECTRICAL HAZARDS

- All generators covered by this manual produce dangerous electrical voltages and can cause fatal electrical shock. Utility power delivers extremely high and dangerous voltages to the transfer switch as does the standby generator when it is in operation. Avoid contact with bare wires, terminals, connections, etc., while the unit is running. Ensure all appropriate covers, guards and barriers are in place before operating the generator. If work must be done around an operating unit, stand on an insulated, dry surface to reduce shock hazard.
- Do not handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.
- The National Electrical Code (NEC) requires the frame and external electrically conductive parts of the generator to be connected to an approved earth ground. Local electrical codes also may require proper grounding of the generator electrical system.
- After installing this standby electrical system, the generator may crank and start at any time without warning. When this occurs, load circuits are transferred to the STANDBY (GENERATOR) power source. To prevent possible injury if such a start and transfer occur, always set the generator's AUTO/OFF/MANUAL switch to its OFF position before working on equipment and remove the 15 amp fuse in front panel.
- In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.
- Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock, or may get caught in moving components causing injury.
- The enclosure panels on the DG 50 S are grounded to the chassis with wires using quick disconnect connectors. These grounding wires must be reconnected when the panels are replaced to reduce the risk of electric shock.

FIRE HAZARDS

- For fire safety, the generator must be installed and maintained properly. Installation always must comply with applicable codes, standards, laws and regulations. Adhere strictly to local, state and national electrical and building codes. Comply with regulations the Occupational Safety and Health Administration (OSHA) has established. Also, ensure 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.
- Keep a fire extinguisher near the generator at all times. Extinguishers rated "ABC" by the National Fire Protection Association are appropriate for use on the standby electric system. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, consult the local fire department.

EXPLOSION HAZARDS

- Do not smoke around the generator. Wipe up any fuel or oil spills immediately. Ensure that no combustible materials are left in the generator compartment, or on or near the generator, as FIRE or EXPLOSION may result. Keep the area surrounding the generator clean and free from debris.
- Gaseous fluids such as natural gas are extremely EXPLOSIVE. Install the fuel supply system according to applicable fuel-gas codes. Before placing the standby electric system into service, fuel system lines must be properly purged and leak tested according to applicable code. After installation, inspect the fuel system periodically for leaks. No leakage is permitted.

1.1 EQUIPMENT DESCRIPTION

This equipment is a revolving field, alternating current generator set. The generator was designed to supply electrical power for the operation of compatible electrical loads when the UTILITY power supply is not available or has dropped to an unacceptable level.

The generator's revolving field is directly connected to and driven by an engine by means of flexible discs. Generators with a four-pole rotor are driven at rated speeds of 1,800 rpm to supply a frequency of 60 Hz, or at 1,500 rpm for a frequency of 50 Hz.

Refer to the data plate on the generator or to the data card affixed to the unit for rated AC voltage, wattage, amperage, number of phases, etc.

◆ 1.1.1 STANDARD GENERATOR FEATURES

This generator incorporates the following generator features:

- The rotor insulation system is Class "H" rated, and the stator insulation is Class "H" rated as defined by NEMA MG1-22.4 and NEMA MG1-1.65.
- The generator is self-ventilated and drip-proof constructed.
- The voltage waveform deviation, total harmonic content of the AC waveform and "telephone influence factor" have been evaluated and are acceptable according to NEMA MG1-22.
- All prototype tested models have passed three-phase symmetrical short circuit test to ensure system protection and reliability.
- This standby generator set has been factory installed in an all-weather, metal enclosure that is intended exclusively for outdoor installation.

1.2 UNPACKING/INSPECTION

After unpacking, carefully inspect the contents for damage.

If any loss or damage is noted at time of delivery, have the person(s) making the delivery note all damage on the freight bill or affix their signature under the consignor's memo of loss or damage. Consignee is responsible to claim any shipping loss or damage with the shipper.

If there is loss or damage after delivery, separate the damaged materials and contact the carrier for claim procedures.

"Concealed damage" is understood to mean damage to the contents of a package that is not in evidence at the time of delivery, but is discovered later.

◆ 1.2.1 LIFTING THE GENERATOR

WARNING

When lifting or hoisting equipment is used, be careful not to touch overhead power lines.

The generator's weight of more than 2,000 pounds requires proper tools and equipment, and qualified personnel to be used in all phases of handling and unpacking.

1.3 STANDBY GENERATOR INSTALLATION

DANGER

Connecting this generator to an electrical system normally supplied by an electric utility shall be by means of a transfer switch (such as the Generac "GTS" type transfer switch), so as to isolate the electric system from the utility distribution system when the generator is operating. Failure to isolate the electric system by these means will result in damage to the generator and may also result in injury or death to utility workers due to backfeed of electrical energy.

CAUTION

If an open bottom is used, the engine-generator is to be installed over non-combustible materials and should be located such that combustible materials are not capable of accumulating under the generator set.

Only qualified, competent installation contractors or electricians thoroughly familiar with applicable codes, standards and regulations should install this standby electric power system. The installation must comply strictly with all codes, standards and regulations pertaining to the installation.

Connect the grounding lug to a code-compliant building ground system.

The three-phase alternator is shipped from the factory with the stator output leads connected either parallel wye (for 120/208 Volts AC) or series wye (for 277/480 Volts AC).

1.4 CUSTOMER TERMINAL BLOCK CONNECTIONS

There are two terminal blocks for customer connections. One terminal block is located inside the customer connection enclosure immediately beneath the connection panel (TB1). DO NOT ENTER THIS ENCLOSURE WITH UTILITY VOLTAGE PRESENT OR WITH BATTERY POWER ON THE GENERATOR. Terminal 1 is at the left hand end of the terminal block. The following user connections can be made to this terminal block for 120 VAC utility for the jacket water heater and battery charger:

- Terminal 14 - Earth
- Terminal 15 - Neutral
- Terminal 16 - Live

The second terminal block is located on the left wall of the same enclosure (TB3) with terminal 1 located at the bottom. The following user connections can be made to this terminal block:

- Terminal 1, 2, 3, 4, - Two fused 12 VDC and two ground connections
- Terminal 6, 7 - Connection for a remote start switch
- Terminal 9, 10, 11 - RS485+, RS485- and RS485 Shield. Use twisted pair shielded cable for connecting to a remote annunciator panel or GenLink®.

1.5 ENGINE PROTECTIVE DEVICES

The standby generator may be required to operate for long periods of time without an operator on hand to monitor such engine conditions as coolant temperature, oil pressure or rpm. For that reason, the engine has several devices designed to protect it against potentially damaging conditions by automatically shutting down the unit when the oil pressure is too low, the coolant temperature is too high, the coolant level is too low, or the engine is running too fast.

NOTE:

Engine protective switches and sensors are mentioned here for the reader's convenience. Also refer to the applicable control panel manual for additional automatic engine shutdown information.

◆ 1.5.1 HIGH COOLANT TEMPERATURE SWITCH

This normally open (N.O.) switch closes to automatically shut down the engine if the engine coolant temperature rises above a safe level.

◆ 1.5.2 LOW COOLANT LEVEL SENSOR

Should the engine coolant level drop below the level of the high coolant temperature switch, it is possible for the engine to overheat without automatic shutdown. To prevent such overheating, the engine has a low coolant level sensor. If the level of engine coolant drops below the level of the low coolant level sensor, the engine automatically shuts down.

◆ 1.5.3 OVERSPEED SHUTDOWN

A speed circuit controls engine cranking, start-up, operation and shutdown. Engine speed signals are delivered to the circuit board whenever the unit is running. Should the engine overspeed above a safe, preset value, the circuit board initiates an automatic engine shutdown.

◆ 1.5.4 OVERCRANK SHUTDOWN

After a prespecified duration of cranking, this function ends the cranking if the engine has failed to start.

◆ 1.5.5 RPM SENSOR LOSS SHUTDOWN

If the speed signal to the control panel is lost, engine shutdown will occur.

1.6 DC FUSE

This clearly labeled fuse is located on the front panel of the control system. It protects the panel wiring and components from damaging overload. Always remove this fuse before commencing work on the generator. The unit will not start or crank if the fuse is blown. Replace the fuse with one of the same size, type, and rating. Generac uses an AGC fuse rated at 15 amps.

1.7 SPECIFICATIONS

◆ 1.7.1 GENERATOR

Model.....004595-0/004596-0
Rated Maximum Continuous
AC Power Output (kW)* 50
Rated Voltage (volts) .....120/208 or 277/480
Rated Maximum Continuous
Current at
208 Volts, Three-phase (amps) 173
480 Volts, Three-phase (amps) 75
Number of Rotor Poles 4
Driven Speed of Rotor (rpm) 1,800
Type of Stator .....12-wire Reconnectable
Rotor Excitation System .....Brushless
Rotor and Stator Insulation .....Class "H"

*Rated power of generator is subject to and limited by such factors as ambient temperature, altitude, engine condition and other factors. Engine power will decrease about 3.5 percent for each 1,000 feet above sea level; and also will decrease an additional 1 percent for each 12° C (10° F) above 15.5° C (60° F). Maximum output power of the generator is limited by maximum engine power.

◆ 1.7.2 ENGINE

Make .....Generac
Displacement .....5.7 liters (350 cu. in.)
Cylinder Arrangement V-8
Bore .....4.0 in. (101.6 mm)
Stroke .....3.48 in. (88.4 mm)
Firing Order 1-8-4-3-6-5-7-2
Number of Main Bearings 5
Compression Ratio 9.4-to-1
No. of Teeth on Flywheel 168
Intake Air .....Naturally Aspirated
Connecting Rods .....Steel
Cylinder Head .....Cast Iron
Pistons.....Aluminum Alloy
Crankshaft .....Iron
Ignition System .....Electronic
Ignition Timing at 1,800 rpm .....35 degrees BTDC
Rated Horsepower at 1,800 rpm (Gross) 74
Spark Plug Gap .....0.035 inch (.89 mm)
Recommended Spark Plugs.....A/C Delco
Oil Pressure .....50 psi
Total Oil Capacity .....5 U.S. quarts (4.75 L)
Recommended Engine Oil.....15W-40
Type of Cooling System .....Pressurized, closed recovery
Cooling Fan .....Puller Type
Cooling System Capacity.....5.5 U.S. gallons (20.8 L)
Recommended Coolant .....Use a 50-50 mixture of ethylene glycol and deionized water.
Coolant Flow Rate (1800 rpm) .....24 gpm (90 Lpm)
Fuel Consumption
Natural Gas
004595-0 .....850 cfh
004596-0 .....850 cfh

NOTE:

Fuel consumption is given at rated maximum continuous power output when using natural gas rated at 1,000 Btu per cubic foot. Actual fuel consumption obtained may vary depending on such variables as applied load, ambient temperature, engine conditions and other environmental factors.

◆ 1.7.3 AMBIENT TEMPERATURE LIMITS

-22° F to +110° F (-30° C to +43° C)

1.8 FUEL REQUIREMENTS AND RECOMMENDATIONS

Recommended fuels should have a Btu content of at least 1,000 Btus per cubic foot for natural gas. Ask the fuel supplier for the Btu content of the fuel.

Fuel pressure for natural gas is 11 inches to 14 inches of water column (0.6 psi) at all load ranges. If fuel pressure falls below these specifications, the emissions control system may not function properly. Periodically check fuel inlet pressure to ensure proper operation. See Chapter 9 of Engine-Generator Standby Electric Power Systems Installer's Guide and Reference Manual (P/N 046622) for more information.

⚠ WARNING ⚠

Gaseous fuels such as natural gas are highly explosive. Even the slightest spark can ignite such fuels and cause an explosion. No leakage of fuel is permitted. Natural gas, which is lighter than air, tends to collect in high areas; LP gas is heavier than air and tends to settle in low areas – install and use leak detectors accordingly.

1.9 ENGINE OIL RECOMMENDATIONS

The unit has been filled with 15W-40 engine oil at the factory. Use a high-quality detergent oil classified "For Service CC, SD, SE or SF." Detergent oils keep the engine cleaner and reduce carbon deposits. Use oil having the following SAE viscosity rating, based on the ambient temperature range anticipated before the next oil change:

Temperature	Oil Grade (Recommended)
Above 86° F (30° C)	SAE 40 or 15W-40
32° to 86° F (0° to 30° C)	SAE 30 or 15W-40
Below 32° F (0° C)	SAE 20W or 15W-40
All Seasons	SAE 15W-40

◆ 1.9.1 COOLANT

Use a mixture of half low silicate, ethylene glycol base antifreeze and half soft water. Use only soft water and only low silicate antifreeze. If desired, add a high quality rust inhibitor to the recommended coolant mixture. When adding coolant, always add the recommended 50-50 mixture.

DANGER

Do not remove the radiator pressure cap while the engine is hot or serious burns from boiling liquid or steam could result.

Ethylene glycol base antifreeze is poisonous. Do not use mouth to siphon coolant from the radiator, recovery bottle or any container. Wash hands thoroughly after handling. Never store used antifreeze in an open container because animals are attracted to the smell and taste of antifreeze even though it is poisonous to them.

CAUTION

Do not use any chromate base rust inhibitor with ethylene glycol base antifreeze, or chromium hydroxide ("green slime") will form and cause overheating. Engines that have been operated with a chromate base rust inhibitor must be chemically cleaned before adding ethylene glycol base antifreeze. Using any high silicate antifreeze boosters or additives also will cause overheating. DO NOT use any soluble oil inhibitor for this equipment.

CAUTION

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

1.10 THE BATTERY

Use a 12-volt, automotive-type storage battery (Group 3ET) capable of a minimum of 460 cold-cranking amps at -18° C (0° F). Check the specific gravity and electrolyte levels at the intervals specified in the service schedule (Section 3.12). When using maintenance free batteries these procedures are not necessary. A negative ground system is used. Battery connections are shown on the wiring diagrams. Make sure the battery is correctly connected and terminals are tight. Observe battery polarity when connecting the battery to the generator set.

NOTE:

Disconnect the cable from the negative (-) terminal first. Reconnect the negative (-) terminal last. Damage may result if the battery connections are made in reverse.

The generator is equipped with a battery trickle charger that is active when the unit is set up for automatic operation. The trickle charge is designed to help extend the life of the battery by maintaining the battery when the unit is not running.

CAUTION

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

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

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

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

Battery electrolyte fluid is an extremely caustic sulfuric acid solution that can cause severe burns. Do not permit fluid to contact eyes, skin, clothing, painted surfaces, etc. Wear protective goggles, protective clothing and gloves when handling a battery. If fluid is spilled, flush the affected area immediately with clear water.

WARNING

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

Do not open or mutilate the battery. Released electrolyte can be toxic and harmful to the skin and eyes.

The battery represents a risk of electric shock and high short circuit current. When working on the battery, always remove watches, rings or other metal objects, and only use tools that have insulated handles.

1.11 THE GOVERNOR CONTROLLER

This module is located above the connection box, on the left side of the panel. The governor controller operates the throttle for the engine and controls the engine speed and stability.

1.12 THE BATTERY CHARGER

This module is located in the connection box mounted to the subplate above and to the right of the connection blocks.

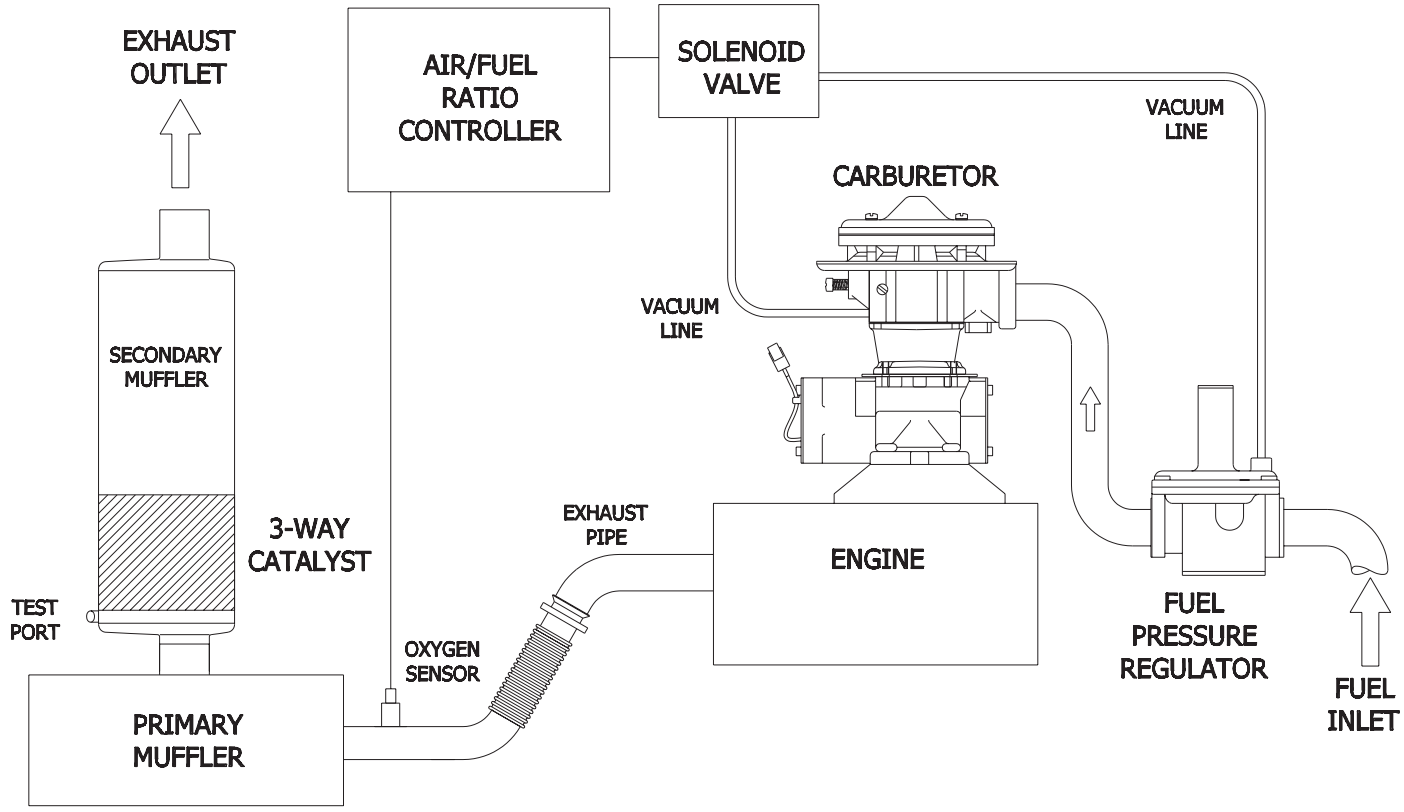
It is capable of supplying up to 2.5A into the battery. It is powered from a 120 VAC standard utility supply which has to be wired into the generator on the customer terminal block connections.

1.13 EMISSIONS SYSTEM

The DG 50 S, when equipped for ultra-low emissions, includes a catalytic muffler and active air/fuel ratio controller (Figure 1.1). This system consists of an oxygen sensor in the exhaust pipe, a microprocessor controller, an air control solenoid and necessary vacuum lines and wiring. The system is self-contained and does not normally need any maintenance or adjustment. The air/fuel ratio controller continuously monitors the exhaust stream and adjusts the air/fuel ratio to maintain the lowest possible emissions.

The catalytic muffler has a test port just before the catalyst so that it can readily be checked for performance. Normally, the catalyst does not need any maintenance. However, if the engine emissions are excessively high and/or contain engine lubrication oil, the catalyst may be deactivated. Engine misfire is also harmful and will damage the catalyst. All engine problems must be promptly corrected to attain long catalyst life.

Figure 1.1 — Emissions System



2.1 STANDBY GENERATOR INSTALLATION

DANGER

Connecting this generator to an electrical system normally supplied by an electric utility shall be by means of a transfer switch (such as the Generac "GTS" type transfer switch), so as to isolate the electric system from the utility distribution system when the generator is operating. Failure to isolate the electric system by these means will result in damage to the generator and may also result in injury or death to utility workers due to backfeed of electrical energy.

CAUTION

If an open bottom is used, the engine-generator is to be installed over non-combustible materials and should be located such that combustible materials are not capable of accumulating under the generator set.

Only qualified, competent installation contractors or electricians thoroughly familiar with applicable codes, standards and regulations should install this standby electric power system. The installation must comply strictly with all codes, standards and regulations pertaining to the installation.

This genset must be installed on a level surface. The base frame must be level within two inches all around.

CAUTION

After the system has been installed, do nothing that might render the installation in noncompliance with such codes, standards and regulations.

NOTE:

For more information about the installation of a standby system, order *Engine-Generator Standby Electric Power Systems Installer's Guide and Reference Manual* (part #046622) from a Generac Authorized Service Dealer.

◆ 2.1.1 NFPA STANDARDS

The following published standards booklets pertaining to standby electric systems are available form the National Fire Protection Association (NFPA), Batterymarch Park, Quincy, MA 02269:

- NFPA No. 37, STATIONARY COMBUSTION ENGINES AND GAS TURBINES.
- NFPA No. 76A, ESSENTIAL ELECTRICAL SYSTEMS FOR HEALTH CARE FACILITIES.
- NFPA No. 220, STANDARD TYPES OF BUILDING CONSTRUCTION
- NFPA No. 68, GUIDE FOR EXPLOSION VENTING
- NFPA No. 70, NATIONAL ELECTRICAL CODE.
- NFPA No. 30, FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE.
- NFPA No. 10, INSTALLATION, MAINTENANCE AND USE OF PORTABLE FIRE EXTINGUISHERS.

◆ 2.1.2 OTHER PUBLISHED STANDARDS

In addition to NFPA standards, the following information pertaining to the installation and use of standby electric systems is available:

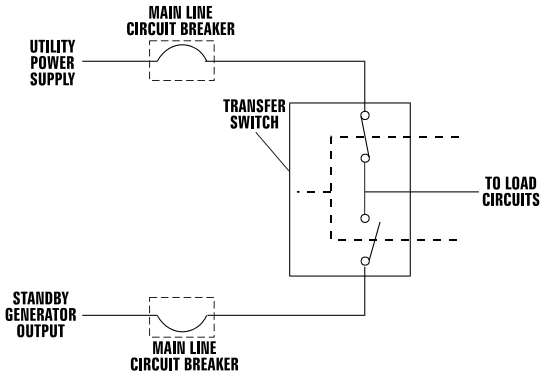
- Article X, NATIONAL BUILDING CODE, available from the American Insurance Association, 85 John Street, New York, N.Y. 10038.
- AGRICULTURAL WIRING HANDBOOK, obtainable from the Food and Energy Council, 909 University Avenue, Columbia, MO, 65201.
- ASAE EP-364.2, INSTALLATION AND MAINTENANCE OF FARM STANDBY ELECTRIC POWER, available from the American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085.
- A52.1, AMERICAN NATIONAL STANDARD FOR CHIMNEYS, FIREPLACES AND VENTING SYSTEMS, available from the American National Standard Institute, 1430 Broadway, New York, N.Y. 10018.

2.2 BASIC STANDBY ELECTRIC SYSTEM

Figure 2.1 shows a schematic diagram of a basic standby electric system. Both the UTILITY power supply and the STANDBY (GENERATOR) output are connected to an approved transfer switch. The transfer switch is required by electrical code and serves the following functions:

- Permits the LOAD circuits to be connected to only one power supply at a time.
- Prevents electrical backfeed between the generator and the UTILITY power circuits.

Figure 2.1 – Basic Standby Electric System



Notice that both the STANDBY and the UTILITY power supplies to the transfer switch are protected against overload by a main line circuit breaker.

NOTE:

Generac recommends the use of a Generac Power Systems "GTS" type transfer switch in conjunction with this generator.

2.3 EMERGENCY CIRCUIT ISOLATION METHOD

This prevents overloading the generator by keeping electrical loads below the wattage/amperage capacity of the generator. If the generator is powering only critical loads, within the wattage/amperage capacity, during utility power outages, you might consider using the emergency circuit isolation method.

Critical electrical loads are grouped together and wired into a separate "Emergency Distribution Panel." Load circuits powered by that panel are within the wattage/amperage capacity of the generator set. When this method is used, it is difficult to overload the generator. The transfer switch must meet the following requirements:

- It must have an ampere rating equal to, or greater than, the total amperage rating of the emergency distribution panel circuit.
- Have it installed between the building's main distribution panel and the emergency distribution panel.

2.4 TOTAL CIRCUIT ISOLATION METHOD

When a generator capable of powering all electrical loads in the circuit is to be installed, use the "Total Circuit Isolation Method." It is possible for the generator to be overloaded when this isolation method is employed. The following apply to the transfer switch in this type of system:

- Ampere rating of the transfer switch must be equal to, or greater than, the ampere rating of the normal incoming utility service.
- The transfer switch is installed between the utility service entrance and the building distribution panel.

2.5 GROUNDING THE GENERATOR

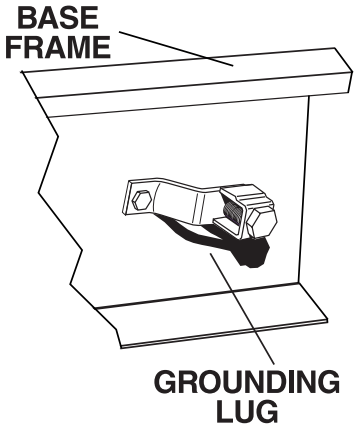
The National Electrical Code requires the frame and external electrically conductive parts of this equipment to be properly connected to an approved earth ground and/or grounding rods. For that purpose, a GROUND LUG (Figure 2.2) is provided on the generator mounting base. Consult a qualified electrician for grounding requirements in the area. Grounding procedures must meet local regulations.

⚠ DANGER ⚠

Do not connect the ground wire to any pipe that carries a flammable or explosive substance – FIRE or an EXPLOSION may result.

Proper grounding helps protect personnel against electrical shock in the event of a ground fault condition in the generator or in connected electrical devices. In addition, grounding helps dissipate static electricity that often builds up in ungrounded devices.

Figure 2.2 – Generator Grounding Lug (typical)



2.6 GENERATOR AC NEUTRAL CONNECTIONS

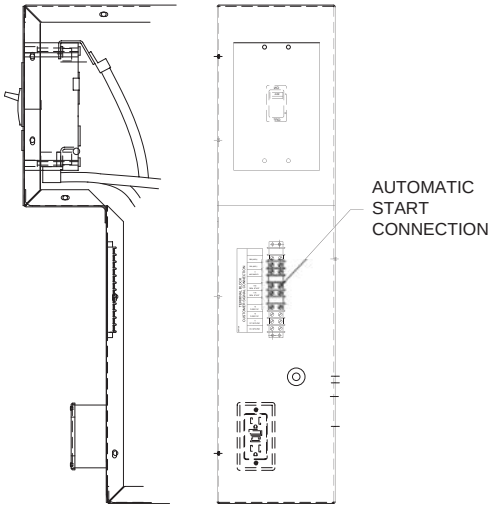
Generac uses an UNGROUNDED AC neutral. Grounding is recommended only at the main service entrance. If the neutral wire is grounded and one of the phase loads becomes grounded, the excessive current opens the load circuit breaker or collapses the generator field. The actual result depends on the electrical characteristics of the particular installed generator.

2.7 TRANSFER SWITCH START SIGNAL CONNECTIONS

If the generator is to be installed with an automatic transfer switch, such as a Generac GTS switch, it will be necessary to connect the two-wire start control system.

Connect the two-wire start signal from the automatic transfer switch to the automatic start connection, which is located in the upper right hand corner of the AC connection panel (see Figure 2.3). Match wires 178 and 183 in the transfer switch to 178 and 183 on the terminal strip in the connection box. The conductors for the two-wire start circuit must be in their own conduit.

Figure 2.3 – Start Signal Connections



2.8 BATTERY INSTALLATION

DANGER

Standby generators installed with automatic transfer switches will crank and start automatically when normal (UTILITY) source voltage is removed or is below an acceptable preset level. To prevent such automatic start-up and possible injury to personnel, do not connect battery cables until normal source voltage at the transfer switch is correct and the system is ready to be put into operation.

Storage batteries give off explosive hydrogen gas. This gas can form an explosive mixture around the battery for several hours after charging. The slightest spark can ignite the gas and cause an explosion. Such an explosion can shatter the battery and cause blindness or other injury. Any area that houses a storage battery must be properly ventilated. Do not allow smoking, open flame, sparks or any spark producing tools or equipment near the battery.

Battery electrolyte fluid is an extremely caustic sulfuric acid solution that can cause severe burns. Do not permit fluid to contact eyes, skin, clothing, painted surfaces, etc. Wear protective goggles, protective clothing and gloves when handling a battery. If fluid is spilled, flush the affected area immediately with clear water.

WARNING

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

Do not open or mutilate the battery. Released electrolyte can be toxic and harmful to the skin and eyes.

The battery represents a risk of high short circuit current. When working on the battery, always remove watches, rings or other metal objects, and only use tools that have insulated handles.

◆ 2.8.1 VENTED BATTERIES

CAUTION

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

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

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

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

Servicing of batteries is to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

For recommended batteries, see Section 1.10. All batteries must be at 100 percent state-of-charge before they are installed on the generator.

When using maintenance-free batteries, it is not necessary to check the specific gravity or electrolyte level. Have these procedures performed at the intervals specified in Section 4, “Maintenance.” A negative ground system is used. Battery connections are shown on the wiring diagrams. Make sure all batteries are correctly connected and terminals are tight. Observe battery polarity when connecting batteries to the generator set.

NOTE:

Damage will result if the battery connections are made in reverse.

2.9 PREPARATION BEFORE START-UP

The instructions in this section assume that the standby generator has been properly installed, serviced, tested, adjusted and otherwise prepared for use by a competent, qualified installation contractor. Be sure to read the "Safety Rules" on Pages 2 and 3, as well as all other safety information in this manual, before attempting to operate this (and related) equipment.

◆ 2.9.1 PRIOR TO INITIAL START-UP

CAUTION

Prior to initially starting the generator, it must be properly prepared for use. Any attempt to crank or start the engine before it has been properly serviced with the recommended types and quantities of engine fluids (oil, coolant, fuel, etc.) may result in an engine failure.

Before starting the generator for the first time, the installer must complete the following procedures. For follow-up maintenance information and/or service intervals, please refer to Section 4, "Maintenance," and the "Service Schedule" on Page 52.

▶ 2.9.1.1 Transfer Switch

If this generator is used to supply power to any electrical system normally powered by an electric utility, the National Electrical Code requires that a transfer switch be installed. The transfer switch prevents electrical backfeed between two different electrical systems. (For additional information, see the applicable transfer switch manual for this unit.) The transfer switch, as well as the generator and other standby components, must be properly located and mounted in strict compliance with applicable codes, standards and regulations.

▶ 2.9.1.2 Fuel System

Make sure the fuel supply system to the generator (a) delivers the correct fuel at the correct pressure and (b) is properly purged and leak tested according to code. No fuel leakage is permitted. See "Specifications" (Page 6) for more information.

If the unit has been idle for a long period of time, or if the fuel lines or system components have been removed and reinstalled, the fuel system may require bleeding to remove air from the system. Air in the fuel system causes hard starting and rough operation. All fuel system lines must be installed and must be tight. A loose line may show no sign of leakage, but may draw air into the system.

CAUTION

Use a suitable container to catch the fuel that will spill during system bleeding process. Clean up all spilled fuel after bleeding.

▶ 2.9.1.3 Generator Set Lubrication

Check the engine crankcase oil level before operating and add oil to the proper level – the dipstick "FULL" mark. Never operate the engine with the oil level below the dipstick "ADD" mark. See "Specifications" and "Engine Oil Recommendations" (Page 6).

NOTE:

This engine is shipped from the manufacturer with 15W-40 oil. This oil should be changed after 30 hours of operation.

▶ 2.9.1.4 Engine Coolant

Have the engine cooling system properly filled with the recommended coolant mixture. Check the system for leaks and other problems. See "Specifications" (Page 6) and "Coolant" (Page 7).

▶ 2.9.1.5 Belt Tension

Check the engine fan belt tension and condition prior to placing the unit into service and at recommended intervals. Belt tension is correct when a force of approximately 22 pounds (10 kg), applied midway between pulleys, deflects the belt about 3/8 to 5/8 inch (10 to 16 mm).

▶ 2.9.1.6 Electrical System

Make sure the generator is properly connected to an approved earth ground.

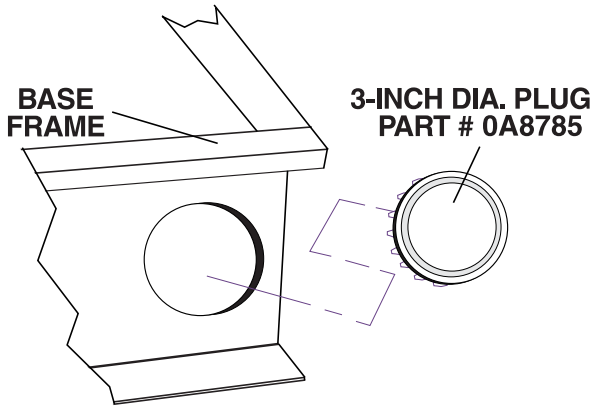
Make sure the generator battery is fully charged, properly installed and interconnected, and ready for use.

Check to ensure that there are no loose electrical connections. Restrain any loose wires to keep them clear of any moving generator set components.

▶ 2.9.1.7 Rodent Protection

- Make sure the four three inch diameter cap plugs (part # 0A8785) are properly installed in the tie-down holes (if so equipped) in the side rails of the unit's base frame (Figure 2.4). The cap plugs are shipped in a plastic bag located in the lower connection box. These plugs are needed to prevent rodents from accessing the interior of the generator set. On acoustic units, cap plugs also are needed to stay within noise specification limits.

Figure 2.4 – Base Frame Cap Plugs



◆ 2.9.2 START-UP INSPECTION

A standard three-part form titled "Start-up Inspection for Standby Power Systems" (part # 067377) should be completed by the installation technician or engineer. As stated on the form, inspections are to be accomplished only by factory-trained personnel. The installer should complete the form and disseminate copies as follows:

- White copy: Mail to Generac Warranty Department, P.O. Box 8, Waukesha, WI 53187.
- Pink Copy: For service file of installing dealer.
- Yellow Copy: For the customer's records.

3.1 OPERATING UNIT WITH MANUAL TRANSFER SWITCH

If the generator was installed in conjunction with a transfer switch capable of manual operation only, the following procedure applies. A manually operated transfer switch is one that will not provide automatic start-up and does not include an intelligence circuit.

◆ 3.1.1 ENGINE START-UP AND TRANSFER

For additional information, refer to the applicable section for this unit, as well as any literature pertaining to the specific transfer switch.

⚠ DANGER ⚠

⚠ The Safety Disconnect Switch and the AUTO/OFF/MANUAL switches (if so equipped) must be set properly, or the generator will crank and start as soon as the utility power to the transfer switch is turned off. Refer to applicable control panel and transfer switch manuals for more information.

⚠ Do not proceed until certain that utility source voltage is available to the transfer switch and the transfer switch main contacts are set to "UTILITY."

⚠ Do not attempt manual operation until all power supplies to the transfer switch have been positively turned off, or extremely dangerous — possibly lethal — electrical shock will result.

⚠ Transfer switch enclosure doors should be kept closed and locked. Only authorized personnel should be allowed access to the transfer switch interior. Extremely high and dangerous voltages are present in the transfer switch.

In order to transfer load from the utility source to the generator, follow these directions:

- Turn OFF or disconnect the utility power circuit to the transfer switch, using the means provided (such as the utility source main line circuit breaker).
- Set the transfer handle to its UTILITY (NORMAL) position with load circuits connected to the utility power supply.
- Set the standby generator's main line circuit breaker to its OFF (or open) position.
- Start the generator.

⚠ CAUTION ⚠

⚠ Do not crank the engine continuously for longer than 30 seconds, or the heat may damage the starter motor.

- Let engine stabilize and warm up.
- Check all applicable instrument and gauge readings. When certain that all readings are correct, move the transfer switch manual handle to its STANDBY (generator) position, i.e., load circuits supplied by the generator.
- Set the standby generator's main line circuit breaker to its ON (or closed) position.
- Load circuits are now powered by the standby generator.

◆ 3.1.2 RETRANSFER AND SHUTDOWN

For additional information, refer to the applicable section for this unit, as well as any literature pertaining to the specific transfer switch.

To transfer the load back to the utility power source and shut down the generator, follow these directions:

- Set the standby generator's main line circuit breaker to its OFF (or open) position.
- Set the utility main line circuit breaker to its OFF position.
- Manually move the transfer switch handle to its UTILITY (NORMAL) position, i.e., load circuits connected to the utility.
- Turn ON the utility power supply to the transfer switch, using the means provided (such as the utility power source main line circuit breaker).
- Let the generator run at no load for a few minutes to stabilize internal temperatures.
- Shut down the generator.

3.2 OPERATING UNIT WITH AUTOMATIC TRANSFER SWITCH

If the generator has been installed along with an automatic transfer switch, such as a Generac GTS switch, the engine may be started and stopped automatically or manually.

NOTE:

Refer to the applicable manual for the transfer switch and to "Transfer Switch Start Signal Connections" (Page 13). In addition, please note the dangers under "Engine Start-up and Transfer."

3.3 E OPTION CONTROL PANEL

The "E" option control panel is a programmable engine control and monitoring system. It allows the user to customize the generator starting and running sequence, monitor engine parameters and configure the alarms. This can be done either through its own control module, featuring liquid-crystal display (LCD) and keypad, or using a PC and RS232 serial communications. The module includes user programmable inputs and outputs that allow it to be tailored to a vast range of applications. All of the setup information is stored in nonvolatile (permanent) memory.

3.4 ENGINE CONTROL

The module has a three-position selector switch that selects between AUTO mode, OFF and MANUAL start mode. When the switch is in the OFF position, the generator will not start, and it will stop if it is running. When the switch is turned to MANUAL, the generator will start immediately and will continue to run until the switch is turned to the OFF position or a shutdown alarm is activated. With the switch in the AUTO position, the generator will wait for either the remote start contacts to close or for a start command to be sent from the serial link. The generator will run until the remote start contacts open, a stop command is sent down the serial link, a shutdown alarm is activated or the switch is turned to the OFF position. The remote start contacts always will have priority over the serial link commands so that the serial link cannot stop the generator if the remote start contacts are closed. When GenLink® software, which may be obtained from a Generac Authorized Service Dealer, is connected to the E panel via modem, the panel will monitor the connection to ensure that the line has not dropped. If the E panel detects that the line has been dropped, it will disconnect the modem so that it is ready for another incoming call. If the generator had been started via the modem connection, then it will be stopped immediately unless the remote start contacts are closed or the generator is in manual. However, if the GenLink® software disconnected cleanly (as a result of a user command) with the generator running, then the generator will continue to run for a another three hours unless it receives a stop command.

When a start command is received, the engine preheat will be engaged, if it is selected. The user can program the preheat to engage for a programmable time before engaging the starter motor, to engage while the engine is attempting to start, or to do both. In order to protect the engine from trying to start while it is already running (if the rpm sensor is damaged), an alarm is generated if there is oil pressure when the start command is sent. An alarm also is generated if there is a voltage output from the generator but the rpm sensor detects zero engine speed.

The user can program the length of time that the starter motor is engaged during a start attempt. After the first attempt, the generator will pause for a programmable length of time before the next attempt. The number of attempts also is programmable, after which the failed to start alarm is activated.

The user can program a warm up time that is active after the generator has started. This could be used in conjunction with a programmable relay output to inhibit the transfer switch from applying load until the generator is ready. The warm-up time can be set to zero if this function is not required. This timer is

separate from the alarm hold off timer, which allows the generator to run for a time before certain alarms (such as low oil pressure) are active.

If the generator is in the AUTO mode and a stop command is received, a programmable cool down timer can be used to keep the generator running with no load for a fixed time. This also can work in conjunction with a relay output to inhibit the transfer switch. If the timer is set to zero, this function is disabled. If the selector switch is turned to OFF, then the generator will stop immediately without waiting for the cool-down time.

Certain alarm functions are designated as shutdown alarms. These alarms will stop the generator and inhibit it from starting until the alarm condition has cleared and the alarm has been reset.

3.5 E OPTION CONTROL MODULE

◆ 3.5.1 OVERVIEW

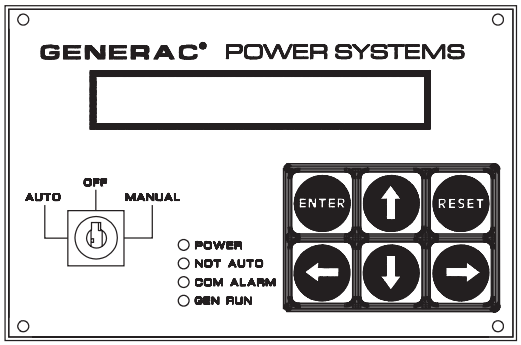
The LCD on the front of the module (Figure 3.1) features a 24-character by two-line display screen that will show one of seven pages. There is a keypad with six keys that are used for operating the display and selecting the various pages. A key activated switch allows the user to select whether the generator is in the AUTO mode, OFF mode or MANUAL run mode. Four LEDs indicate the following conditions:

- POWER – Battery power is OK.
- NOT AUTO – The generator is not in the automatic mode.
- COM ALARM – A common alarm condition has occurred.
- GEN RUN – The generator is running.

NOTE:

The POWER LED will go out immediately if the battery voltage dips below the alarm limit, but the alarm will not be triggered unless the voltage is low for more than five minutes.

Figure 3.1 – Control Module Layout



◆ 3.5.2 KEYPAD

The keypad consists of six keys labeled as follows: ↑ (up), ↓ (down), ← (left), → (right), ENTER, and RESET. The left and right arrow keys are used to select the different pages on the display. The up and down arrow keys are used to scroll between options within a page. They also are used for selecting characters when entering messages or parameters for the alarms. The left and right arrow keys move the cursor when entering data. The enter key takes the user into a page on the display to change data (when applicable) and also accepts data that has been entered. It also is used to accept an alarm. The reset key ignores data that has been entered and returns the original value. It also is used to return from the parameter entry mode once the user has finished changing the data, and to reset any latched alarms that have cleared.

◆ 3.5.3 DISPLAY

The display is organized into a series of pages, each page displays information about the status of the generator. For example, the "Alarm Status Message Page" displays the highest priority current alarm or status condition. The user will be able to scroll between the pages using the left and right arrow keys. Certain actions also cause the display to change pages, for example, when an alarm becomes active, the display automatically will go to the alarm status page and display the alarm message.

The back light for the display is normally off. If the user presses any key, the back light will come on automatically and remain on for five minutes after the last key was pressed. It also will come on if any status message is current, which means the display will switch to the alarm status page. The back light will flash when an alarm or shutdown message is active, and the audible alarm will sound.

When the display is showing certain pages, the user is able to scroll between relevant items within the page using the up and down arrow keys. For example, if the display is showing the "Alarm Log Page," the user can use the up and down arrow keys to scroll between the entries on the alarm log. A description of each page is given below.

✧ 3.5.3.1 Generator Status Page

This page displays the current status of the generator. Options will be as follows:

- Stopped – ready to run
- Stopped – start inhibit active
- Pre-heating (with timer counting down)
- Attempting to start (with timer counting down and number of attempts)

- Pausing before start attempt (with timer counting down and number of attempts)
- Started – running up to speed
- Warming up
- Ready to accept load
- All alarms enabled
- Cooling down
- Stopping
- Stopped due to alarm

If a key has not been pressed for some time, any change in status will cause this page to be displayed provided that there are no active alarms or status messages from other inputs. If an alarm condition occurs, the alarm status page will be displayed automatically.

✧ 3.5.3.2 Alarm Status Message Page

This page displays alarm messages and programmable status messages. Messages are displayed according to priority, with the shutdown alarms having highest priority, and status messages having lowest priority.

If an alarm becomes active, the display will switch to this page and display the highest priority alarm message. The back light and alarm LED will flash, and the audible alarm will be activated. The user must press the enter key to accept the alarm, at which time the back light will be on continuously. If the alarm is non-latching, the alarm message will clear as soon as the condition is cleared. If the alarm is a latching alarm, then the user must press the reset key to clear the message. Once a message has cleared, the display will show the next priority alarm message.

After an alarm has been accepted, the user is able to scroll through other active alarm and message screens using the up and down arrow keys.

✧ 3.5.3.3 Alarm Log Page

This page displays the last 50 alarm messages. When the user selects this page, it displays the latest alarm message. Pressing the up or down arrow keys will allow the user to scroll up and down the list of messages.

✧ 3.5.3.4 Instrumentation Page

This page displays one of the analog signal values. Pressing the up or down arrow keys will scroll to other analog display screens.

✧ 3.5.3.5 Parameter Entry Page

This page allows the user to modify the various set points and programmable options. See the "Programmable Parameters" section of this manual for more specific option information. The user must press the ENTER key when this page is displayed and will then be prompted for a password. The password is a six digit number and the default value is 000000. However, the user will be able to change the password. Digits are selected by using the up and down arrow keys, and the cursor will be moved by the left and right arrow keys. When the user presses the ENTER key, the password will be checked. If the password is correct, the display will show one of the data entry screens.

There are four parameter entry menus: ENGINE PARAMETER, SYSTEM ALARM, DIGITAL I/O and ANALOG INPUT. The user will be able to scroll through the various parameters in each menu using the up and down arrow keys. The left and right arrow keys are used to switch between the four menus. When a parameter that requires changing is displayed, the user presses the ENTER key to enable data entry. A cursor will appear at the first character that can be altered. The user can then change the character using the up and down arrow keys. The user can move to the next character or previous character using the left and right arrow keys. Pressing the ENTER key will accept the new setting. Pressing the RESET key will ignore the new setting.

If an alarm condition occurs when the user is entering data, the data will be ignored, and the display will show the alarm screen. If a status condition occurs when data is being entered, the display will not change.

Once the user has finished entering data by pressing the ENTER key, pressing the RESET key will allow the user to select other pages using the left and right arrow keys.

✧ 3.5.3.6 Software Version Page

This page displays the software revision. Pressing the enter key in this page will perform a display and LED test.

✧ 3.5.3.7 Generator Command Page

This page displays the command sent to the generator. The commands are as follows:

- Generator switched off
- Generator in manual mode
- Generator in auto mode – stop command
- Generator in auto mode – remote run command
- Generator in auto mode – serial link run command

3.6 ALARMS

All analog channels have alarms associated with them. There is also a coolant level alarm, an emergency stop alarm and eight user definable inputs that can be used to generate alarms. Alarms can be status messages, non-latching alarms, latching alarms or shutdown alarms. When a new alarm condition occurs, the alarm LED and the display back light will flash. Also, the alarm relay contacts will close (operating the audible alarm), and the display will show the alarm message. The user will be able to accept the alarm (turn off the audible alarm) from the keypad, and if the alarm condition has cleared, they also will be able to clear the alarm. Non-latching alarms will clear themselves if the alarm condition is no longer present. Latching alarms require the user to clear the alarm from the keypad even if the alarm condition is no longer present. Shutdown alarms are similar to latched alarms, but they also cause the generator to stop and will not allow it to start again until the key switch has been turned to the OFF position to reset the alarm. Status messages are similar to non-latching alarms except that they do not activate the alarm relay or the alarm LED and are not recorded on the alarm log.

Alarms can be always active, immediately active when the generator is commanded to run, or active after the hold off timer has expired. This timer delays the operation of certain alarms until a programmable time after the engine has started. Some alarms allow the user to define the type of alarm and when it is active.

The following chart at the bottom of the page is a summary of the alarms and the programmable options.

3.7 ALARM PROCESSING

◆ 3.7.1 INPUT ALARM FUNCTIONS

The E option panel monitors the status of the analog and digital inputs, and generate alarm messages as required. Digital alarms and user defined analog alarms are fully programmable. The user is able to select the type of alarm, the state of the input that will trigger the alarm, and the alarm message when it is active.

Alarm Message	Alarm Active Options	Alarm Type Options
Pre-Low Oil Pressure Warning	Hold Off	Non-Latch
Low Oil Pressure Shutdown Alarm	Hold Off	Shutdown
Pre-High Coolant Temp. Warning	Hold Off	Non-Latch
High Coolant Temp. Shutdown Alarm	Hold Off	Shutdown
Low Coolant Temp. Warning	Always	Non-Latch
Pre-High Oil Temp. Warning	Immediate, Hold Off, Disabled	Non-Latch
High Oil Temp. Shutdown Alarm	Immediate, Hold Off, Disabled	Shutdown
Low Battery Voltage Warning*	Always	Non-Latch
Overspeed Alarm	Immediate	Shutdown
Underspeed	Hold Off	Status, Non-Latch, Latch, or Shutdown
Overcrank Alarm	Immediate	Shutdown
Over Voltage	Hold Off	Status, Non-Latch, Latch, or Shutdown
Under Voltage	Hold Off	Status, Non-Latch, Latch, or Shutdown
Over Frequency	Hold Off	Status, Non-Latch, Latch, or Shutdown
Under Frequency	Hold Off	Status, Non-Latch, Latch, or Shutdown
High Fuel Warning	Always, Disabled	Non-Latch
Low Fuel Warning	Always, Disabled	Non-Latch
Low Fuel Shutdown Alarm	Always, Disabled	Shutdown
User Analog Alarms**	All Options Available	All Options Available
Low Coolant Level Alarm	Hold Off	Shutdown
Emergency Stop	Always	Shutdown
RPM Sensor Failure Alarm	Always	Shutdown
Start Inhibit – Oil Pressure	Immediate	Shutdown
Oil Pressure Sensor Failure	Always	Shutdown
Oil Temp. Sensor Failure	Always, Disabled	Shutdown
Coolant Temp. Sensor Failure	Always	Shutdown
User Digital Input Alarms***	All Options Available	All Options Available
High Battery Voltage Warning	Always	Non-Latch

* Battery voltage must be below alarm limit for 5 minutes to trigger alarm.
** Each user analog input channel has a high and low alarm.
*** Each user digital input can be programmed to trigger an alarm on high or low level.

✧ 3.7.1.1 Alarm Active

The user is able to select when the alarm is active. The options are as follows:

- **Disabled:** If this option is selected, the alarm is disabled and has no effect.
- **Always:** With this option selected, the alarm is active regardless of the state of the generator.
- **Immediate:** In this mode, the alarm is not active when the generator is stationary. It becomes active as soon as the generator starts to crank and remains active until the generator stops.
- **Hold Off:** This option waits until a preset time after the generator is running before becoming active. The hold off time can be set by the user. Note that the hold off time is common to all alarms.

◆ 3.7.2 ALARM TYPE

✧ 3.7.2.1 Status

This type of alarm will display a message on the screen. The message will not be logged. This is the lowest priority of alarm types.

✧ 3.7.2.2 Warning – Non-Latched

This type of warning will activate the audible alarm, and flash the alarm LED and display back light. The associated message will be displayed on the screen. When the user accepts the warning (by pressing the ENTER key), the back light will stop flashing, and the alarm LED will be on continuously. The message will be displayed on the alarm screen, but the user will be able to scroll through other screens. The LED and message will clear when the warning condition clears. This type of warning is logged.

✧ 3.7.2.3 Alarm – Latched

This type of alarm will act similarly to the non-latched warning, except that the alarm does not clear when the alarm condition clears. When the alarm condition occurs, the audible alarm sounds, the LED and back light flash as before, and the user must accept the alarm to stop them. The alarm will continue to be displayed on the screen even after the alarm condition has cleared. The user must either press the RESET key or turn the key switch to the OFF position to clear the alarm after the alarm condition has cleared. This type of alarm is logged.

✧ 3.7.2.4 Shutdown

This type of alarm will act similar to the latched alarm, but it also will stop the engine when the alarm condition occurs. It can be reset only by turning the key switch to the OFF position. All shutdown alarms are latching, and this type of alarm is logged.

✧ 3.7.2.5 Alarm Status

This is the value at which the alarm is active. For analog alarms, it is a number corresponding to the alarm limit. Digital alarms are either “normally open” or “normally closed,” and an alarm is generated when the input is not in the normal state.

✧ 3.7.2.6 Alarm Message

Each alarm will have a message associated with it. The analog alarm messages will be preset, and the digital alarm messages and user defined analog messages will be entered via the keypad or the serial link.

◆ 3.7.3 OTHER ALARMS

✧ 3.7.3.1 Overcrank

This alarm is unlike other alarms as it is not associated with an analog or digital signal. The user is able to define the number of crank attempts, the length of each crank attempt and the rest time between cranks. After the last attempt has been made, an overcrank alarm will be generated. The user must turn the key switch to the OFF position to clear the alarm.

✧ 3.7.3.2 Coolant Level

This alarm is generated by the coolant level detector. This device senses whether coolant is present or not. It has no user definable level setting and is a shutdown alarm that is active after the hold off time. There are no user definable parameters for this alarm.

3.8 PROGRAMMABLE PARAMETERS

The E option panel allows the user to configure various options to control the generator starting and stopping cycles, and the way that the alarms operate. Parameters are entered either from the control module or via the serial link.

◆ 3.8.1 PREHEAT ENABLED

This parameter determines how the preheat function works. The preheat can be fully disabled, enabled before starting only (for the duration of the preheat time), or before and during starting (for the duration of the preheat time and also while the starter is engaged). Note that if the user wishes to engage the preheat during starting but not to have a preheat before starting, it is possible to set the preheat time to zero.

◆ 3.8.2 PREHEAT TIME

When a start command is received, some engines require preheating before the generator attempts to start. When the preheat function is enabled, this parameter allows the user to determine the time that the preheat contact closes before activating the starter solenoid.

◆ 3.8.3 START TIME

Once a start command has been received and the preheat time has expired (if enabled), the starter solenoid will be engaged. This parameter allows the user to determine how long the starter solenoid is engaged before the start attempt is regarded as having failed. If the generator does not start within this time, the generator will wait for a preset time before attempting to start again. The user also can program the number of start attempts the generator tries.

◆ 3.8.4 PAUSE TIME

If the generator does not start within the programmed start time, it will pause before trying to start again. This parameter determines the length of that pause.

◆ 3.8.5 START ATTEMPTS

This parameter determines the number of times that the generator tries to start. If the generator has not started after this number of attempts, an alarm is generated.

◆ 3.8.6 STARTER DISENGAGE SPEED

While the starter is engaged, the engine speed is monitored. Once it reaches this value, the starter motor is disengaged, and the engine is regarded as having started.

◆ 3.8.7 HOLD OFF TIME

Once the engine has started, some alarm functions (such as low oil pressure and under speed) are not activated immediately since the engine must be given time to reach a stable condition. This parameter determines the time that elapses before the hold off alarms are activated.

◆ 3.8.8 COOL DOWN TIME

It is sometimes desirable to run the generator for a given time with no load before stopping to allow the engine to cool down. This parameter determines the length of time that the generator continues to run after a stop command is sent in AUTO mode. Note that if the key switch is turned to the OFF position when the generator is running, it will stop immediately regardless of this setting. This value also should be set to zero if this function is controlled by the transfer switch.

◆ 3.8.9 LOAD ACCEPT VOLTAGE AND FREQUENCY

Once the generator has started, the voltage and frequency will ramp up until they reach the values at which the generator can accept load. These parameters allow the user to set the values. The values should be set slightly lower than the nominal values to allow for a margin of error in the regulator and governor settings. Once the values have been reached, the warm-up timer is started.

◆ 3.8.10 WARM UP TIME

Some applications require that the generator is allowed to run for a given time before a load is applied. This parameter allows the user to set that time. Note that if this function is controlled elsewhere (for example, within a transfer switch), this time should be set to zero. The generator is ready to accept load when this timer expires. This parameter can be assigned to an output relay.

◆ 3.8.11 VOLTAGE SCALING FACTOR

The voltage scaling factor is used to scale the sensing voltage applied to CON4-4 and CON4-6.

On generators manufactured prior to the second quarter of 2000: Sensing voltage was measured from line-to-line, so the scaling factor was primarily set to 1.0. On generators manufactured starting the second quarter of 2000: Sensing voltage is measured from the frequency meter, in this case the scaling factor is used so the “E” panel displays line-to-line voltage. This scaling factor can also be used to “calibrate” the “E” panel display.

◆ 3.8.12 FLYWHEEL TEETH

This parameter holds the number of flywheel teeth. This value is used to determine the engine speed from the magnetic pickup signal.

◆ 3.8.13 USER DEFINED OUTPUT FUNCTIONS

There are three user defined outputs, and the preheat output also can be used as a user defined output if the preheat function is disabled. Each output can be programmed to signal that an alarm is active, to indicate one specific alarm or input condition, to indicate the status of the key switch, or to indicate the current status of the generator. These relay contacts can be used to switch up to 30 volts AC or DC at 1 amp.

Programming example for user output #2 to be active on any generator alarm shutdown:

1. Press the left or right arrow key until the display reads PARAMETER ENTRY and press ENTER.
2. Enter the password and press ENTER.

3. Use the left and right arrow keys to find the DIGITAL I/O MENU.
4. Use the up and down arrow keys to locate OUTPUT 2 FUNCTION. The bottom line of the display will read the current setting. Press ENTER.
5. Use the up and down arrows to scroll through the list until GENERATOR ALARM SHUTDOWN is displayed in the bottom line. Press ENTER.
6. User output 2 is now programmed to become active (relay energized) on any generator shutdown alarm.
7. Press RESET. This exits the programming mode and returns you back to the parameter entry screen.

NOTE:

See the "Output Function Table" on Page 27 and the "E" Panel Display Map on pages 30-31 for more detail.

◆ 3.8.14 ANALOG INPUT SCALING FACTORS

The two user defined analog inputs can be scaled so that the display uses meaningful values rather than the voltage level at the input. The user enters the value to be displayed when the input voltage is zero and when it is at the maximum value. (An analog input to the E panel is a voltage sourced input with a zero to 10-volt range.) All alarm settings are based on this scaling, and the instrumentation display shows the input value based on this scaling too.

◆ 3.8.15 ANALOG INPUT MESSAGES

This is a message up to 24 characters long that is displayed on the instrumentation display when the corresponding value is being shown.

◆ 3.8.16 ANALOG INPUT ALARM MESSAGES

There is a user definable message for each alarm condition on each analog input. This message is shown on the alarm display when the alarm condition is active and is stored in the alarm log.

◆ 3.8.17 ANALOG INPUT ALARM SETTINGS

Each analog input has two alarms associated with it. One is activated when the input value is higher than the high set point, and the other is active when the input is lower than the low set point. The user also can define when the alarm is active (or disable it) and the severity of the alarm (from simply displaying a status message to shutting down the generator – see "Alarm Processing" on Page 17).

◆ 3.8.18 DIGITAL INPUT ALARM SETTINGS

Each digital input also can generate an alarm. The user can program the alarm message, the input state that generates the alarm, when the alarm is active, and the alarm type. A digital input to the E panel is NOT a voltage sourced input, but a dry contact closure to ground. Voltage never should be sourced to a digital input. The signal options to a digital input are as follows:

- **Open:** This signal is an open circuit.
- **Closed:** This signal is a contact closure to ground.

◆ 3.8.19 OIL PRESSURE ALARMS

The oil pressure input has two associated alarm functions. The pre-low oil pressure warning is a non-latched, hold off alarm with a user definable set point. The low oil pressure shutdown is a shutdown, hold off alarm with a user definable set point. The shutdown alarm set point should be the lowest of the two settings so that the user will have some warning of a low oil condition before the generator is shut down.

◆ 3.8.20 OIL TEMPERATURE ALARMS

The oil temperature has a non-latched warning and a shutdown alarm associated with it. The set points are programmable, and the alarms can be immediate, hold off or disabled.

◆ 3.8.21 COOLANT TEMPERATURE ALARMS

The coolant temperature input has three associated alarms. The pre-high coolant temperature alarm is a non-latched, hold off alarm. The high coolant temperature alarm is a shutdown, hold off alarm. The low coolant temperature warning is a non-latched, always active alarm. Set points for each alarm are programmable.

◆ 3.8.22 BATTERY VOLTAGE ALARMS

The low battery voltage warning set point is programmable. The warning will be activated if the battery voltage is below this value for more than five minutes. This is a non-latched, always active alarm. Note that the POWER LED on the front panel is extinguished immediately if the battery voltage is less than this value. The high battery voltage alarm set point is also programmable. The warning is active immediately when the battery voltage is higher than this value.

◆ 3.8.23 ENGINE SPEED ALARMS

The user can program the overspeed and the underspeed alarm. The overspeed alarm is an immediate shutdown alarm. Underspeed is a hold off alarm that can either be non-latched, latched or shutdown.

◆ 3.8.24 GENERATOR VOLTAGE ALARMS

An alarm can be generated for high voltage and low voltage. The set points are user definable, and the alarms can be either non-latching, latching or shutdown.

◆ 3.8.25 GENERATOR FREQUENCY ALARMS

An alarm can be generated for high frequency and low frequency. The set points are user definable, and the alarms can be either non-latching, latching or shutdown.

◆ 3.8.26 FUEL LEVEL ALARMS

Alarms can be generated by an optional fuel level sensor. The high fuel level warning is non-latching. There is also a low fuel level warning that is non-latching and a low fuel shutdown alarm. Each of these alarms has a set point and can be always active or disabled.

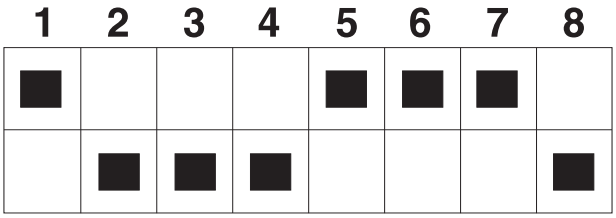
3.9 E PANEL MODEM SETUP PROCEDURE

NOTE:

Generac only supports the US Robotics 56k V90 Sportster modem for connection of the "E" Panel to the phone line. Other modems may work in this application, but have not been tested by Generac.

1. Set modem Dip switches as shown in Figure 3.2. Power cycle the modem (turn modem off, then on).
2. Connect the cable between the "E" panel and the modem (see Figure 3.4).
3. Set the "E" panel for MODEM CONNECTION AND SETUP. Power cycle the "E" panel (remove and relace front panel fuse).
4. In GenLink, select the proper setup string for the modem at the PC end (not the "E" panel).

Figure 3.2 — US Robotics 56k V90 Sportster Dip Switch Settings



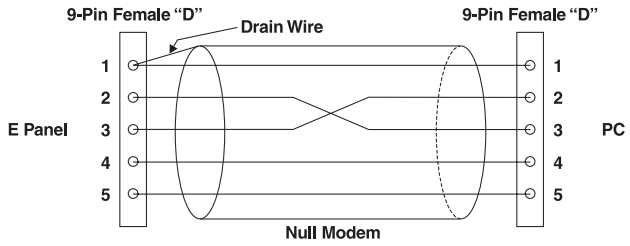
3.10 E PANEL RS232 CABLES

The "E" panel can communicate via its RS232 port to a remote PC. The connection is made either directly to the serial port on a PC, or via a modem and telephone line.

The "E" panel has a 9 pin male "D" type connector, and is configured as DTE (Data Terminal Equipment). The serial ports on most PCs also have a DTE configuration, and are usually 9 pin "D" type male connectors. Most modems have a DCE configuration (Data Communication Equipment) and a 25 pin female connector.

Connecting an "E" panel directly to a PC requires a "Null Modem" connection. This can be achieved with either a null modem cable, or a standard serial cable with a null modem adapter. Figure 3.3 shows the required pin connections between the two cables for a 9 pin serial connector on the PC.

Figure 3.3 — "E" Panel to PC Cable Configuration

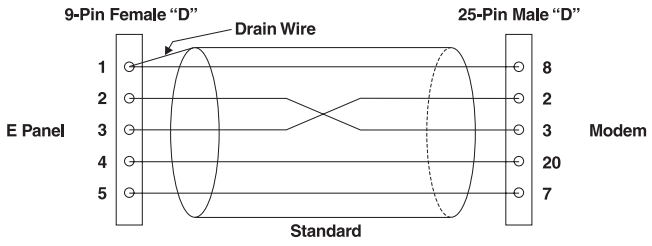


NOTE:

Use shielded cable, 100 feet maximum in length. Connect the shield drain wire to Pin 1 on the E panel end only.

Connecting the "E" panel to a modem requires a standard modem cable. The cable supplied with the modem should work. If a longer cable is required, the connectors should be wired as shown in Figure 3.4.

Figure 3.4 — "E" Panel to Modem Cable Configuration



NOTE:

The modem is not intended to be mounted inside the control panel. It should be mounted inside the enclosure (no vibration) or inside a nearby building or shelter if the generator does not have an enclosure.

NOTE:

Use shielded cable, 100 feet maximum in length. Connect the shield drain wire to Pin 1 on the E panel end only.

◆ 3.10.1 SERIAL COMMUNICATIONS

✧ 3.10.1.1 Serial Communication Via Modem

(Also refer to the appropriate Genlink Manual)

The control panel has the ability to communicate to a PC via an RS232 serial port. The PC software will be able to interrogate the module. The user also will be able to program the parameters on the PC and download them to the module if using the Pro version. The user will be able to start and stop the generator if it is in AUTO mode.

The module does not have a built-in modem. However, software will include the ability to interface with an external modem. The user can initialize the modem from the panel. Generac offers a remote annunciator (models #'s 004391-0, 004392-0 and 004391-1, 004392-1) which allows the E panel to communicate with both a modem and a remote annunciator. See the Remote Annunciator Panel manual (part number 0A7450) for a complete description of these panels.

✧ 3.10.1.2 Remote Annunciator Panel

(Refer to manuals 0A7450 and 0A9825)

The serial connections can be configured to allow the control panel to connect to a remote annunciator/ remote relay panel, which is configured as RS485, to meet NFPA 110. Only one communication port is available for either a modem or remote annunciator.

NOTE:

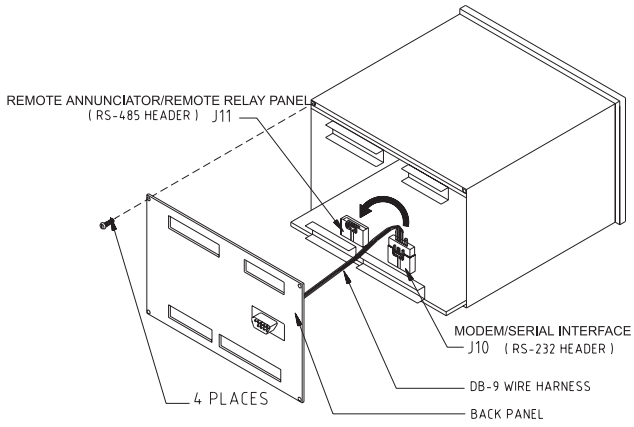
The following diagram and instructions apply only to those units manufactured before January 2000. Units manufactured after January 2000 incorporate a selector switch on the back of the control module. This switch will allow selection of either RS232 or RS485 without opening the module.

✧ 3.10.1.3 Altering the Serial Communications Setup

The E option control panel is capable of being used with either a modem or a remote annunciator/ remote relay panel, depending on the configuration of the serial connections. The unit comes set up for connection to a modem (RS232). In order to use the control panel with a remote annunciator/remote relay panel (RS485), adhere to Figure 3.5 and the instructions that follow.

1. Remove harness retaining screws, then unplug all five wire harnesses from the back of the E panel control module.
2. Remove the four phillips head screws retaining the rear cover of the control module.
3. Open the back of the control module.
4. Locate the DB-9 wire harness that runs from the DB-9 connector on the back panel to the black header on the lower circuit board inside the control module.
5. Carefully remove the black connector from the header by pressing the locking tab and lifting up.
6. Insert the black connector into the RS485 header (J11). Make sure that the connector is fully inserted and that the locking tab snaps into place.
7. Replace the back panel and the four screws.

Figure 3.5 – E Panel Serial Communications Setup Modification



◆ 3.10.2 USER PASSWORD

The user can set the password. This is a six digit number and is initially set to 000000.

3.11 ADDITIONAL PANEL COMPONENTS

In addition to the control module, the E option panel contains the following components (see Figure 3.6):

◆ 3.11.1 AC VOLTMETER

This meter indicates the generator AC output voltage. To determine the nominal rated AC voltage of the unit, refer to the unit's data plate.

◆ 3.11.2 AC AMMETER

This meter indicates the current draw of connected electrical loads, in amps. Also see "Line-phase Selector Switch." For continuous operation, never exceed the rated maximum continuous current capacity of the generator.

◆ 3.11.3 FREQUENCY METER

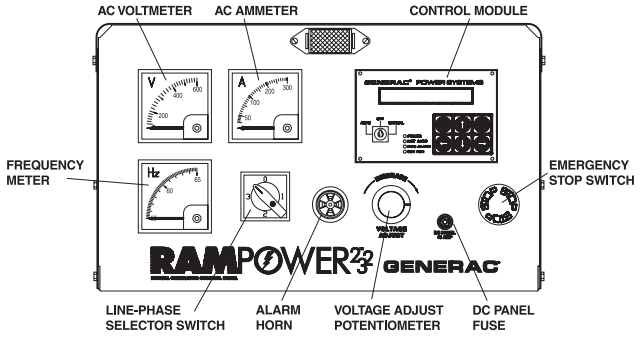
This meter indicates the generator's AC output frequency in "Hertz" (cycles per second).

◆ 3.11.4 LINE-PHASE SELECTOR SWITCH

This four position switch permits selection of line-to-line readings on the panel voltmeter and ammeter. Switch positions are as follows:

Switch	Three Phase Units
1	Line E1 to E2
2	Line E2 to E3
3	Line E3 to E1
OFF	No Reading

Figure 3.6 – E Option Panel Components



◆ 3.11.5 VOLTAGE ADJUST POTENTIOMETER

This potentiometer permits the operator to "fine adjust" the generator's AC output voltage. Adjustment range is plus or minus five percent. Turn the knob clockwise to increase voltage, counterclockwise to decrease voltage.

◆ 3.11.6 ALARM HORN

This horn sounds an audible warning when an alarm condition exists. See the "Alarms" section for further information.

◆ 3.11.7 DC PANEL FUSE

A 15-amp fuse protects the panel components. This fuse is not to be confused with the control module internal fuse discussed in "Checking/Replacing the E Panel Control Module Internal Fuse."

◆ 3.11.8 EMERGENCY STOP SWITCH

When pressed, this switch will automatically shut down the entire generator set. The operator must pull the switch out to its original position to reset it and allow for generator operation.

3.12 CHECKING/REPLACING THE E PANEL CONTROL MODULE INTERNAL FUSE

Typically, the main indication of fuse failure is the absence of any illuminated front panel LEDs (even with the key in the OFF position, the POWER LED will be illuminated) and no text visible on the module display. It should be noted however, that these conditions can exist if either:

1. The generator start battery is dead (less than five volts) or disconnected.
2. The main panel fuse (15 amp) is blown.
3. The battery supply wires (#13 and #0) to the panel control module are open circuit (disconnected).
4. The Power connector (CON4) is disconnected from the rear of the control module.
5. The generator start battery connections have been reversed. Reversal of the battery connections WILL blow the internal fuse and is the most likely reason for its failure.

Before removing or disconnecting the E panel control module, check that none of the above conditions (one through five) exist.

If you are satisfied that the problem lies with the control module:

1. Disconnect the generator start battery.
2. Unplug all four wire harnesses from the back of the control module.
3. Loosen, then detach, the two retaining clips securing the control module and remove the module.
4. Using a multimeter (for example, Fluke 87) set to the diode range, measure between pins 1 (BAT+) and 2 (BAT-) of connector CON4 on the module.
   - With the **positive** meter lead connected to **pin 2** and the **negative** lead to **pin 1**, the meter should read between 0.4 and 0.6 volts, which indicates that the internal fuse is OK.
   - Reversing the meter leads would give a slowly increasing voltage reading on the meter, which also indicates a good fuse.
   - An open circuit fuse will give an open circuit meter reading (.OL on Fluke 87).

If the meter reads open circuit:

5. Remove the four phillips head screws retaining the rear cover of the control module.
6. Open the back of the control module.
7. Locate the internal printed circuit board mounted fuse, which is behind and to the left of CON4.
8. Remove the white plastic cover from the fuse holder and remove the fuse.
9. If the fuse has blown, replace the fuse (part #0A5705), reassemble the control module, and reinstall the control module and its connections.
10. Reconnect the generator start battery and check if the control module now functions.

If the fuse blows again, or was not blown when the module was opened, or the module still does not function, the E panel control module must be replaced.

3.13 USER PROGRAMMABLE INPUTS

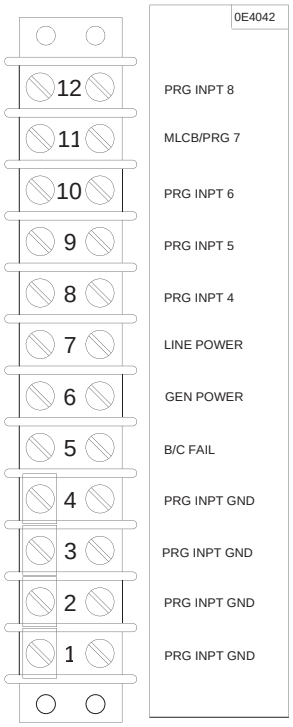
The E panel has eight (8) user programmable inputs. These inputs can be used for annunciation, prealarm, or shutdown alarms. Four of the inputs, Battery Charge Fail, Gen Power, Line Power, and Programmable Input 4 are set up to annunciate on the control panel display and at the optional 20 Light Remote Annunciator (Programmable Input 4 will light the unlabeled "spare" LED). These four inputs can be used for other connections if a remote annunciator is not used. The other four inputs, if utilized, will annunciate at the control panel only.

The user programmable input connection points are located inside the control panel on a 12 position strip refer to Figure 3.7). The first four terminals are labeled PROG INPUT GND. These are the common ground connection points for the user supplied switch devices to be used for the programmable annunciation.

NOTE:

These ground terminals are for user programmable input use only. The are not to be used for grounding any other circuits.

Figure 3.7 — User Programmable Input Connection Points



The remaining eight terminals on Terminal Strip 3 are for the "positive" side of each user programmable input switch circuit. These eight terminals have a five VDC potential available in an open circuit condition (whether the control panel key switch is in the off, manual, or auto position). The inputs can be programmed to annunciate upon either an open circuit condition (five VDC potential at the terminal) or a grounded condition (zero VDC potential at the terminal). This voltage state is determined by the user supplied switch either opening or closing to cause an annunciation.

Program setup for the user programmable inputs is carried out in the DIGITAL I/O MENU of the E module (please refer to the Display Map on pages 30-31). Each of the eight inputs has four parameters in which specific options must be selected to make the annunciation function properly. These four parameters are labeled INPUT CHANNEL MESSAGE, INPUT CHANNEL SETTING, INPUT CHANNEL ALARM ENABLE, and INPUT CHANNEL ALARM TYPE. Definitions are as follows:

- INPUT CHANNEL MESSAGE — for selecting letters and numbers to spell out what the display will read upon activation of that specific input.
- INPUT CHANNEL SETTING — for selecting whether annunciation should activate upon that specific circuit opening or closing to ground.

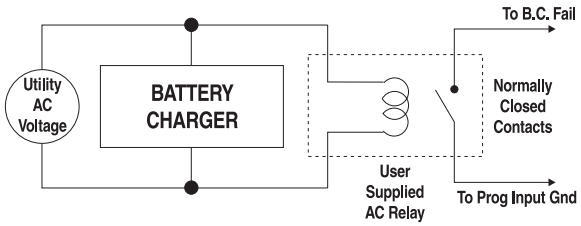
- INPUT CHANNEL ALARM ENABLE — for enabling or disabling annunciation function of that specific input. Also, if enabled, for selecting when annunciation will be active. The choices are: DISABLED, ALWAYS, IMMEDIATE and HOLD OFF. See E Control Panel Definitions on page 48.
- INPUT CHANNEL ALARM TYPE — for selecting the type of alarm annunciation and the effect it has on the generators control system. The four choices are: STATUS, NON-LATCHED, LATCHED and SHUTDOWN. See E Control Panel Definitions on page 48.

3.14 WIRING EXAMPLES

◆ 3.14.1 USER PROGRAMMABLE INPUT NUMBER 1

Input number 1 is programmed for BATTERY CHARGE FAIL annunciation at the control panel display, and the LED on the 20 Light Remote Annunciator (if used). A user supplied AC relay is wired in to be powered up by AC voltage that supplies the unit Battery Charger (see Figure 3.8).

Figure 3.8 — Battery Charge Fail Wiring



Upon loss of this AC supply voltage, the relay will de-energize. The normally closed contacts on the relay are to be connected to TB3 in the control panel. One wire connects to any of the four PROG INPUT GND terminals, the other wire connects to terminal number 5 (B/C Fail). With the relay de-energized, terminal 5 will be grounded, signaling the E module to activate on Programmable Input 1.

◆ 3.14.2 USER PROGRAMMABLE INPUTS NUMBERS 2 AND 3

Input numbers 2 and 3 are programmed for GEN POWER and LINE POWER respectively, indicating the transfer switch position (Standby or Utility). Annunciation will occur at the control panel display and at the Remote Annunciator (if used). These signals will come from a set of spare auxiliary contacts located on the main contactor assembly in the transfer switch. The auxiliary contact switch is a set of dry contacts with three terminals: COMMON, NORMALLY OPEN, and NORMALLY CLOSED. Wires must be connected to these three terminals and routed to the generator control panel. These three wires must not be run in the same conduit as the generator's main output conductors. The wire connected to the COMMON terminal on the auxiliary contacts will connect to any of the PROG INPUT GND terminals on TB3. The wire connected to the NORMALLY OPEN terminal on the auxiliary contacts will connect to terminal 6 (GEN POWER) on TB3. The wire connected to the NORMALLY CLOSED terminal on the auxiliary contacts will connect to terminal 7 (LINE POWER) on TB3.

◆ 3.14.3 ALL USER PROGRAMMABLE INPUTS

Input numbers 4 through 8. Proper wiring consists of two wires from the user supplied switch: one wire connects to one of the PRG INPT GND terminals (1 through 4 on TB3), the other wire connects to a Programmable Input terminal on TB3.

3.15 PROGRAMMING EXAMPLES

◆ 3.15.1 USER PROGRAMMABLE INPUT NUMBER 1

This input is used for Battery Charge Fail annunciation. After properly wiring the circuit as described in Wiring Examples, program as follows:

1. Power up the E panel by connecting unit battery and inserting control panel fuse. The module will run through a self test mode. Once it has completed its self test, it will display the generator status (STOPPED, READY TO RUN).
2. Use the Left or Right arrow keys to scroll over to the PARAMETER ENTRY column.
3. Once at the PARAMETER ENTRY column, press ENTER. Enter the password (if different from the factory set password 000000) and press ENTER. From the ENGINE PARAMETER MENU, press the RIGHT arrow to get to the DIGITAL I/O MENU.
4. Using the UP or DOWN arrows (the column is a continuous loop), scroll to INPUT CHANNEL 1 MESSAGE and press ENTER. Up to 24 letters, numbers and other characters can be entered to spell out what will be displayed upon this input becoming active. In this case, enter Battery Charge Fail. After entering the message, press ENTER.
5. Press the UP arrow to display INPUT CHANNEL 1 SETTING. Press ENTER, the display will read Input Function, OPEN=ALARM. The Battery Charge Fail annunciation should occur upon the user supplied relay de-energizing and its normally-closed contact closing, therefore, select CLOSED=ALARM by pressing the UP or DOWN arrow. Press ENTER, the display will read Input Channel 1 Setting, CLOSED=ALARM.

6. Press the UP arrow, the display will read Input 1 Alarm Enable, DISABLED, press ENTER. The choices are DISABLED, ALWAYS, IMMEDIATE, and HOLD OFF. This alarm should always be active, therefore, scroll up or down and select ALWAYS, and press ENTER.
7. Press the UP arrow, the display will read Input Channel 1 Alarm Type, STATUS MESSAGE, press ENTER. The choices are STATUS MESSAGE, NON LATCHING ALARM, LATCHING ALARM and SHUTDOWN ALARM. This annunciation for Battery Charge Fail should be a STATUS message, therefore, scroll up or down and select STATUS MESSAGE by pressing ENTER.

Programming for User Input Channel 1, Battery Charge Fail is now complete. The E module has been programmed for a STATUS alarm message that is ALWAYS active. Upon loss of AC supply voltage to the generators battery charger, the user supplied relay will de-energize, its normally closed contacts will close, grounding TB3 terminal 5 to Prg Input Gnd. The E module will display BATTERY CHARGE FAIL. Because it was programmed as a STATUS alarm and not a LATCHING or SHUTDOWN alarm, the status message will clear when AC power is restored to the battery charger.

NOTE:

The Battery Charger Fail LED on the 20 Light Remote Annunciator (if connected) will also turn on when Input Channel 1 is activated.

3.16 OUTPUT FUNCTION TABLE

Output Function ID	Function Name	Description
00	Output Disabled	Output not in use
01	Common Alarm	Active for all latched, non-latched and shutdown alarms
02	Low Oil Pressure Warning	Active after hold off time
03	Oil Pressure Shutdown	Active after hold off time, low oil pressure
04	High Coolant Temp. Warning	Active after hold off time
05	Coolant Temp. Shutdown	Active after hold off time, high coolant temperature
06	Low Coolant Temp. Alarm	
07	High Oil Temp. Warning	
08	Oil Temp. Shutdown	High oil temperature
09	Low Battery Voltage	Must be below set value for five minutes
10	High Battery Voltage	
11	Overspeed Shutdown	
12	Underspeed Alarm	Active after hold off time
13	Over Voltage Alarm	Active after hold off time
14	Under Voltage Alarm	Active after hold off time
15	Over Frequency Alarm	Active after hold off time
16	Under Frequency Alarm	Active after hold off time
17	High Fuel Alarm	Above the warning set point
18	Low Fuel Alarm	Below the warning set point
19	Low Fuel & Shutdown	Below the shutdown set point
20	Failed to Start Alarm	Overcrank
21	Coolant Level Alarm	Low coolant level
22	RPM Sensor Failed Alarm	Magnetic pickup failure
23	Start Inhibit Alarm	Oil pressure was present at start request
24	Emergency Stop Alarm	Emergency stop active
25	Oil Press. Sense Fault	Sensor is either open or short circuit
26	Oil Temp. Sense Fault	Sensor is either open or short circuit
27	Coolant Temp. Sense Fault	Sensor is either open or short circuit
28	Analog Channel 1 High	Input at user analog channel 1 is above programmed high set point
29	Analog Channel 1 Low	Input at user analog channel 1 is below programmed low set point
30	Analog Channel 2 High	Input at user analog channel 2 is above programmed high set point
31	Analog Channel 2 Low	Input at user analog channel 2 is below programmed low set point
32	Digital Channel 1 Active	User programmable digital input 1 is active
33	Digital Channel 2 Active	User programmable digital input 2 is active
34	Digital Channel 3 Active	User programmable digital input 3 is active
35	Digital Channel 4 Active	User programmable digital input 4 is active
36	Digital Channel 5 Active	User programmable digital input 5 is active
37	Digital Channel 6 Active	User programmable digital input 6 is active
38	Digital Channel 7 Active	User programmable digital input 7 is active
39	Digital Channel 8 Active	User programmable digital input 8 is active
40	Generator in Auto	Key switch in auto position
41	Generator in Manual	Key switch in manual position
42	Generator Off	Key switch in off position
43	Stopped	Generator stopped
44	Shutdown Due to Alarm	Generator shutdown
45	Stopped Ready to Run	Generator ready to start
46	Running	Generator running
47	Ready to Accept Load	Generator has reached load accept voltage and frequency set points, and the warm-up timer has expired
48	All Alarms Active	Generator running

3.17 E PANEL MASTER CONTROL BOX CONFIGURATION SETTINGS

ENGINE PARAMETER MENU

Parameter	Value			Units
RS232 Port	Connection Mode (C1)			
or RS485 Port	Direct Connection Only			
Restore All Values to	Master Password			
Default Settings	Required (Factory Only)			
Voltage Scaling Factor	.05	to	300	
Flywheel Teeth	30	to	200	Number
Panel I.D.	000000	to	999999	
User Password	000000	to	999999	
Preheat Option		(P1)		
Load Accept Frequency	0	to	90	Hz
Load Accept Voltage	0	to	2000	V
Starter Disengage Speed	0	to	4000	RPM
Number of Start Attempts	0	to	10	Number
Generator Cool Down Time	0	to	600	min.
Generator Warm Up Time	0	to	600	sec.
Alarm Hold Off Time	0	to	15	sec.
Start Attempt Pause Time	5	to	600	sec.
Start Timer	3	to	15	sec.
Preheat Timer	0	to	30	sec.

Available Options: P1 = No Preheat, Before Start, Before and During Start
C1 = Direct Connection, Modem Connection, Modem Connection & Setup

SYSTEM ALARM MENU

Parameter	Value			Units	Active	Type
Low Fuel Shutdown Alarm	0	to	100	%	(A2)	Shutdown Alarm
Fuel Level Low Warning	0	to	100	%	(A2)	Non-latching Alarm
Fuel Level High Warning	0	to	100	%	(A2)	Non-latching Alarm
Under Freq.	0	to	100	Hz	Hold Off	(T1)
Over Freq.	0	to	100	Hz	Hold Off	(T1)
Under Voltage	0	to	2000	V	Hold Off	(T1)
Over Voltage	0	to	2000	V	Hold Off	(T1)
Engine Underspeed Alarm	0	to	4500	RPM	Hold Off	(T1)
Engine Overspeed Alarm	1000	to	4500	RPM	Immediate	Shutdown Alarm
Battery Volts High Warning	4	to	30	V	Always	Non-latching Alarm
Battery Volts Low Warning	4	to	30	V	Always	Non-latching Alarm
Oil Temp. Shutdown Alarm	-5	to	275	Deg. F	(A1)	Shutdown Alarm
Oil Temp. Warning	-5	to	275	Deg. F	(A1)	Non-latching Alarm
Coolant Temp. Shutdown Alarm	-5	to	275	Deg. F	Hold Off	Shutdown Alarm
Coolant Temp. High Warning	-5	to	275	Deg. F	Hold Off	Non-latching Alarm
Coolant Temp. Low Warning	0	to	245	Deg. F	Always	Non-latching Alarm
Oil Press. Shutdown Alarm	0	to	100	PSI	Hold Off	Shutdown Alarm
Oil Press. Warning	0	to	100	PSI	Hold Off	Non-latching Alarm

Available Options: A1 = Disable, Holdoff, Immediate
A2 = Disable, Always
T1 = Shutdown Alarm, Latching Alarm, Non-latching Alarm, Status Message

DIGITAL I/O MENU

Channel		Message	Setting	Alarm Enable	Alarm Type
Output 1			(F1)		
Output 2			(F1)		
Output 3			(F1)		
Preheat Output Function			(F1)		
User Input 1	*1	Battery Charge Fail	(S1)	(A1)	(T1)
User Input 2	*1	Generator Power	(S1)	(A1)	(T1)
User Input 3	*1	Line Power	(S1)	(A1)	(T1)
User Input 4	*2	Backup Low Oil Pressure	(S1)	(A1)	(T1)
User Input 5	*2	Backup High Engine Temp.	(S1)	(A1)	(T1)
User Input 6	*2	Oil Filter Blocked	(S1)	(A1)	(T1)
User Input 7	*2	MLCB	(S1)	(A1)	(T1)
User Input 8	*2	Ruptured Tank	(S1)	(A1)	(T1)

Messages can be a maximum of 24 characters including spaces.

Available Options: A1 = Disabled, Hold Off, Immediate, Always
F1 = See output function table for available options.
S1 = Closed (Low Signal/Contact Closure to Ground), Open (High signal/Open Circuit)
T1 = Shutdown Alarm, Latching Alarm, Non-latching alarm, Status Message

*1 Assigned if used with 20 light Remote Annunciator or Remote Relay Panel Otherwise available for any customer options.
*2 Factory wired if unit is equipped with these options. Otherwise these inputs are available for any customer requirements.

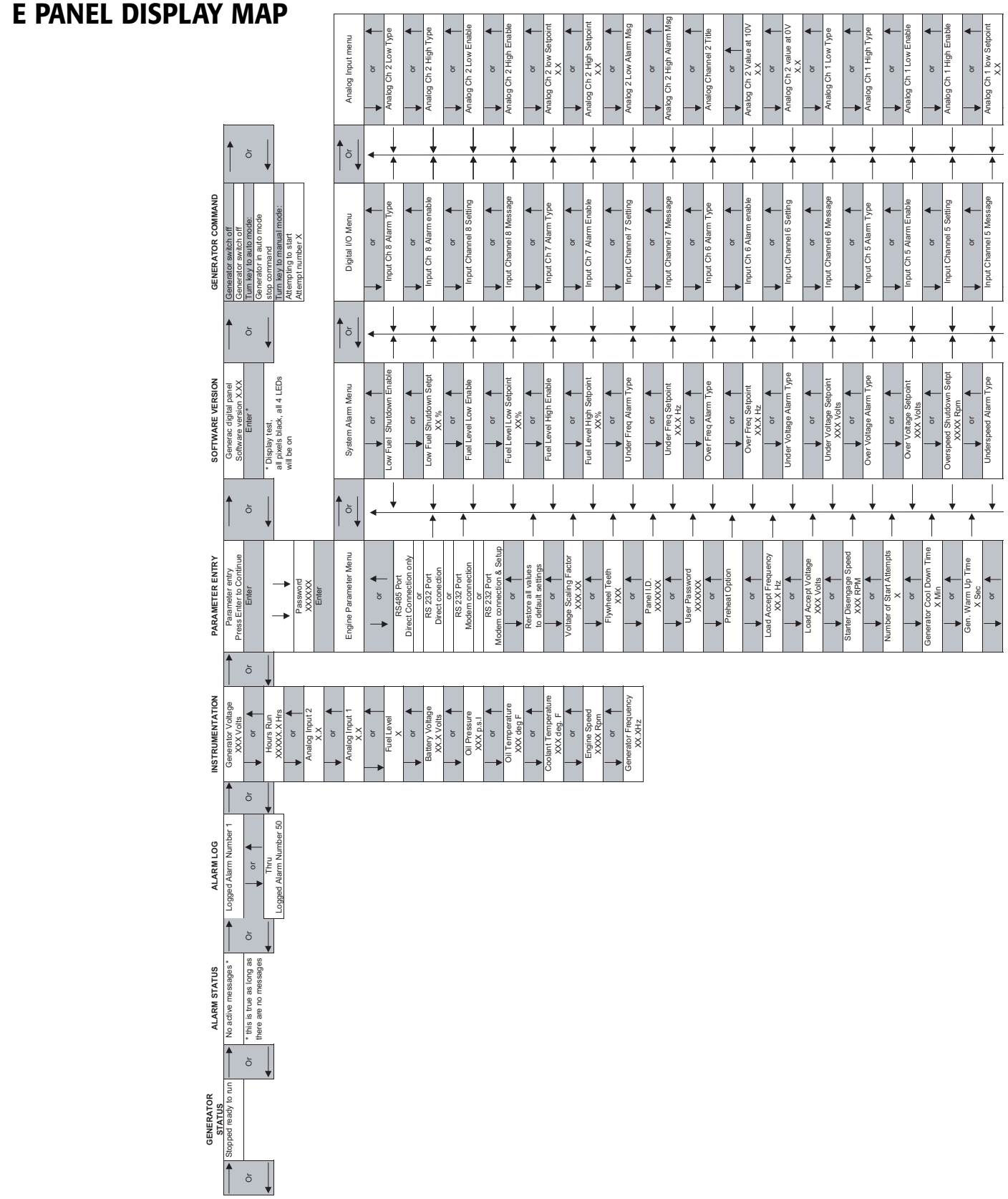
ANALOG INPUT MENU

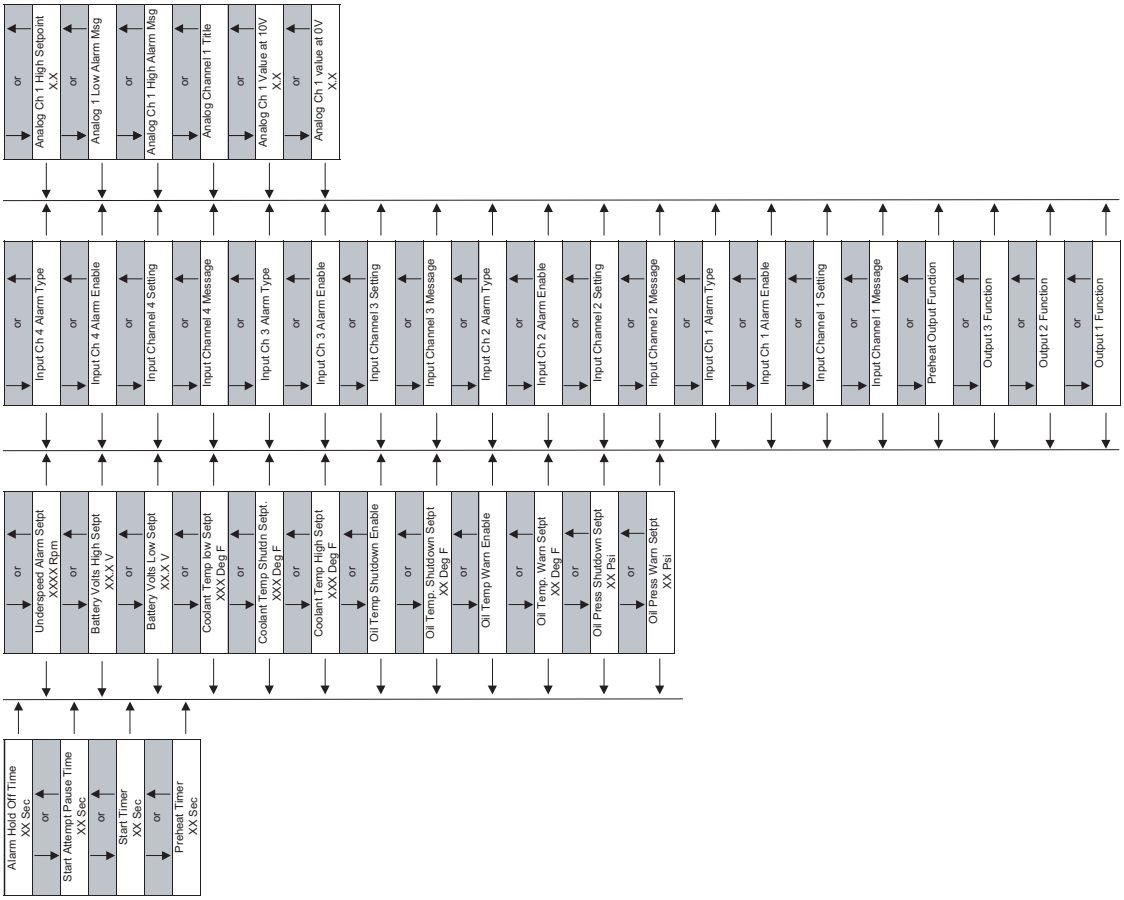
	Value at 0V	Value at 10V	(Display) Title	Alarm Msg. Message High	Alarm Msg. Message Low	Setpoint High	Setpoint Low	(Alarm) Enable High	(Alarm) Enable Low	(Alarm) Type High	(Alarm) Type Low
Analog Channel 1								(A1)	(A1)	(T1)	(T1)
Analog Channel 1								(A1)	(A1)	(T1)	(T1)

Messages can be a maximum of 24 characters including spaces.

Available Options: A1 = Disabled, Hold Off, Immediate, Always
T1 = Shutdown Alarm, Latching Alarm, Non-latching alarm, Status Message

3.18 E PANEL DISPLAY MAP




Alarm Hold Off Time XX Sec
Start Attempt Pause Time XX Sec
Start Timer XX Sec
Preheat Timer XX Sec
Underspeed Alarm Setpt XXXX Rpm
Battery Volts High Setpt XX.X V
Battery Volts Low Setpt XX.X V
Coolant Temp low Setpt XXX Deg F
Coolant Temp Shutdn Setpt. XXX Deg F
Coolant Temp High Setpt XXX Deg F
Oil Temp Shutdown Enable
Oil Temp. Shutdown Setpt XX Deg F
Oil Temp Warn Enable
Oil Temp. Warn Setpt XX Deg F
Oil Press Shutdown Setpt XX Psi
Oil Press Warn Setpt XX Psi
Input Ch 4 Alarm Type
Input Ch 4 Alarm Enable
Input Channel 4 Setting
Input Channel 4 Message
Input Ch 3 Alarm Type
Input Ch 3 Alarm Enable
Input Channel 3 Setting
Input Channel 3 Message
Input Ch 2 Alarm Type
Input Ch 2 Alarm Enable
Input Channel 2 Setting
Input Channel 2 Message
Input Ch 1 Alarm Type
Input Ch 1 Alarm Enable
Input Channel 1 Setting
Input Channel 1 Message
Preheat Output Function
Output 3 Function
Output 2 Function
Output 1 Function
Analog Ch 1 High Setpoint X.X
Analog 1 Low Alarm Msg
Analog Ch 1 High Alarm Msg
Analog Channel 1 Title
Analog Ch 1 Value at 10V X.X
Analog Ch 1 value at 0V X.X
or

3.19 E PANEL OPERATIONS FLOW CHART

TABLE A

Dip Switch	Setting
1	Up
2	Down
3	Down
4	Down
5	Up
6	Up
7	Up
8	Down

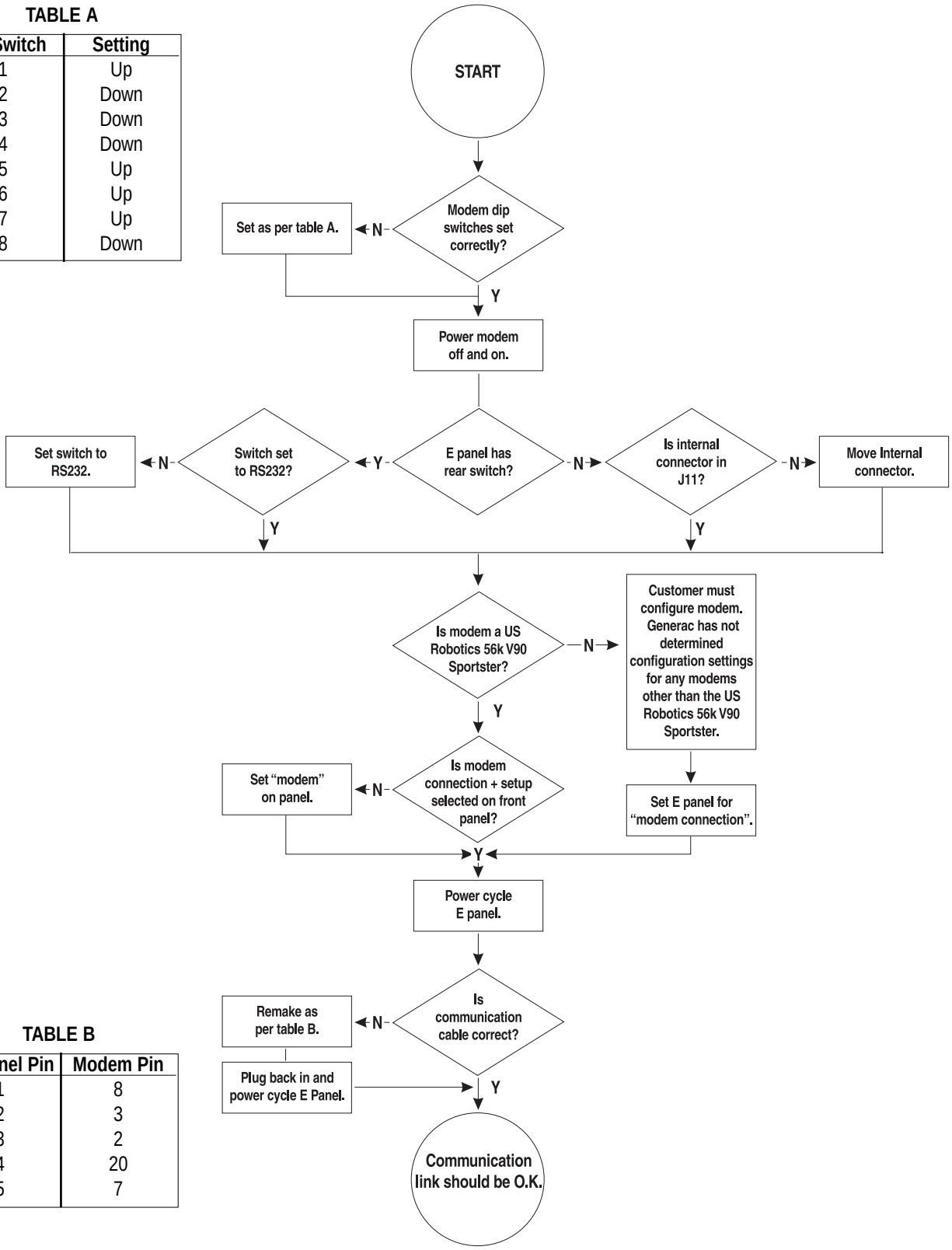


TABLE B

"E" Panel Pin	Modem Pin
1	8
2	3
3	2
4	20
5	7

3.20 OIL PRESSURE SENSING

(Refer to Figure 3.9)

◆ 3.20.1 OVERVIEW

An analog Oil Pressure Sender (OPS) is used for monitoring the engine oil pressure. This sender allows the E panel to measure and display the Engine oil pressure.

Refer to the owners manual for the OPS part number and mounting location.

Wire number 69 is used to connect the OPS to the E Panel. The Ground for the OPS is made through the engine block.

The OPS is a resistive device, whose resistance changes based on engine oil pressure. The resistance of the sender results in a voltage being developed across the sender. As the oil pressure increases, the resistance will decrease, causing the voltage to decrease. This changing voltage is read by the E Panel and converted into the engine Oil Pressure.

The E Panel will monitor and display oil pressure anytime the DC input to the E Panel is present.

◆ 3.20.2 TROUBLESHOOTING

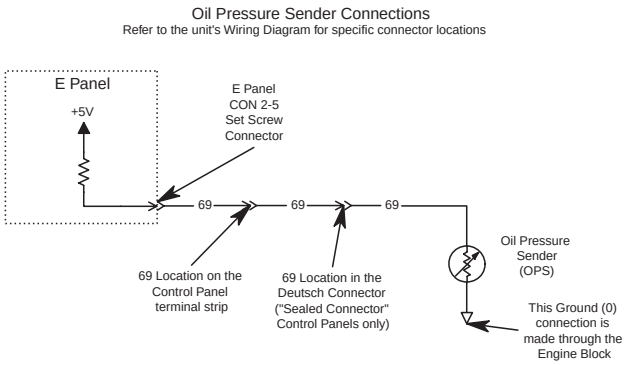
Prior to any troubleshooting, the oil pressure parameters programmed into the E Panel should be checked and verified. The oil pressure input has two different set points associated with it. They are:

Pre-Low Oil Pressure Warning: This is the warning set point. The generator's alarm will sound, but the generator will continue to run.

Critical Low Oil Pressure Alarm: This is the alarm set point. The generator will shut down and sound the alarm.

It is important to verify that these parameters are set correctly for the specific unit. Check the E Panel settings against the Generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the recommended settings.

Figure 3.9 — Oil Pressure Sender Connections



◆ 3.20.3 TESTING THE CONTROL PANEL

It is relatively easy to do a thorough test of the E Panel's Oil Pressure input.

Place the AUTO/OFF/MANUAL switch to the OFF position during this testing.

✧ 3.20.3.1 Open circuit testing

This test checks the high end of the oil pressure input of the E Panel.

1. Remove the 69 wire from the control panel terminal strip. This simulates a sender open circuit condition.
2. Look for the following response from the E Panel: The back light will flash, the Com Alarm LED will flash, and the display will read as follows:

   OIL PRESS SENSE FAULT
   PRESS ENTER TO ACCEPT

3. Press enter to accept the alarm.

✧ 3.20.3.2 Short circuit testing

This test checks the low end of the oil pressure input of the E Panel.

1. Reconnect the 69 wire to the control panel terminal strip.
   Connect a jumper wire between the 69 and 0 positions on the control panel terminal strip. This simulates a sender short circuit condition
2. Look for the following response from the E Panel
   2.1 For units with software version V1.11 and earlier: The back light will flash, the Com Alarm LED will flash, and the display will read as follows:

   OIL PRESS SENSE FAULT
   PRESS ENTER TO ACCEPT

   Press enter to accept the alarm.
   2.2 For units with software version V1.12 and later:
   Use the arrow keys to go to the Oil pressure display screen.
   The screen should display oil pressure as 125 p.s.i.

✧ 3.20.3.3 Control panel testing complete

1. Remove the jumper between the 69 and 0 locations on the control panel terminal strip.
2. If any E Panel alarms are present, press enter to accept.

✧ 3.20.3.4 Test Results

1. Tests 1and 2 Pass:
   Move on to the next test "Testing the Oil Pressure Sender".

2. If either test 1 or 2 failed:
   2.1 Repeat the open and short circuit testing directly at the back of the E Panel as follows:
   Open: The 69 wire should be removed from CON2-5
   Short: With the 69 wire still removed, insert a jumper wire into CON2-5. Connect the other end of the jumper to ground (0).
   After testing, remove the jumper wire from CON2-5 and insert the 69 wire back into CON2-5
   2.2 Test results:
   2.2.1 If these tests fail again directly at the back of the E Panel, then the E Panel has failed and should be replaced.
   2.2.2 If these tests pass at the back of the E Panel, but failed at the terminal strip, then there is a wiring error between the E Panel and the terminal strip. Check this wiring carefully.

◆ 3.20.4 TESTING THE OIL PRESSURE SENDER

The resistance of the OPS can be checked in a power down state as follows:

1. Remove the control panel fuse to power down the E panel.
2. Unplug CON2 from the E Panel.
3. Measure the resistance of the oil pressure sender. This measurement should be made between the sender terminal and the sender body.

The sender resistance should measure between 225 and 260 Ohms at 0 PSI.

NOTE:

If the engine has just been stopped, allow sufficient time for the oil pressure to drop to zero before making this measurement.

If the resistance measurement is not in this range, the sender has failed. Replace the sender.

If the resistance measurement is in this range, move on to the next test.

◆ 3.20.5 TESTING THE OIL PRESSURE SENDER CONNECTIONS

✧ 3.20.5.1 Visual Inspection

Carefully check the wiring between the oil pressure sender and the E Panel.

1. Check the 69 wire connection to the OPS.
   1.1 Check for a proper crimp on the lug.
   1.2 Check to see if the sender nut is tightened securely. Be careful not to over tighten the nut. If the nut is over tightened, the stud will break free and cause incorrect sender readings. This nut should be tightened to 14 to 18 inch pounds.
   1.3 Check for any environmental corrosion on the lug or the sender terminal. Generac recommends the following actions if corrosion is found:
   1.3.1 Replace the lug.
   1.3.2 Replace the sender if possible. If not possible, thoroughly remove all of the corrosion from the sender terminal.
   1.3.3 Protect the lug and sender terminal with an approved automotive dielectric grease.
2. Check the 69 wire in the Deutsch connector (only used on the "water tight connector" panels.)
   2.1 Refer to appendix A for information on the Deutsch connectors used.
   2.2 Refer to the unit's wire diagram for the 69 location in the Deutsch plug.
3. Check the 69 wire on the control panel terminal strip.
   3.1 Check for a proper crimp on both lugs.
   3.2 Check to see if both screws are tightened securely. These screws should be tightened to 12 inch pounds.
4. Check the 69 wire going into CON2 on the back of the E Panel.
   4.1 Check to see if the wire is stripped properly inside the green plug. The wire conductor should be trapped inside the metal wire clamp. The wire insulation should not be trapped inside the metal wire clamp.
   4.2 Check to see if the set screw is tightened securely, but do not over tighten. This screw should be set to 2 to 4 inch pounds.
5. Check for any wire damage along the entire run between the E Panel and the sender.
   5.1 Check for any areas along the wire with missing insulation. This could allow the 69 line to momentarily come into contact with ground causing a false shut down.
   5.2 Check to see if the wire is pinched anywhere along the run. A wire that is pinched between the sheet metal can cause the 69 wire to momentarily come into contact with ground resulting in a shut down fault. A pinched wire may also cause the wire to break inside the insulation. This could cause the 69 line to monetarily "open" while running. This will also result in a shut down fault.

✧ 3.20.5.2 Check the OPS mounting

The ground return (0) connection for the OPS is made by the physical connection of the sender to the engine block. This connection may be made directly, or through a series of adapters or fittings.

Check for the following at each junction point:

1. Check for a tight mechanical connection.
2. Check for a good electrical connection.

✧ 3.20.5.3 Resistance measurement

The resistance of the OPS was measured in "Testing the Oil Pressure Sender."

In that test, the resistance was measured directly across the OPS. This test will now measure that same resistance inside the control panel. This will provide an additional test of the wiring and connections used to connect the sender to the control panel.

1. Remove the control panel fuse to power down the E Panel.
2. Unplug CON2 from the E Panel.
3. Measure the resistance between the 69 and 0 locations on the control panel terminal strip.
4. Compare this measurement to the measurement taken directly across the OPS.
   - 4.1 If this measurement is more than 2-3 Ohms greater than the one taken directly across the OPS, there is a problem with the sender connections. Determine if the problem is the 69 connection or the 0 connection as follows:
     - 4.1.1 Measure the resistance between the OPS stud and the 69 wire inside the control panel. If this measurement is greater than 2-3 Ohms, replace the entire wire running between the control panel and the OPS stud.

       Repeat step 3, measuring the resistance between the 69 and 0 locations on the control panel terminal strip and comparing it to the earlier reading.
     - 4.1.2 Measure the resistance between the body of the sender and the 0 location on the control panel terminal strip. If this measurement is greater than 2-3 Ohms, go back and carefully check the following:
       - 4.1.2.1 OPS mounting, including all fittings and adapters.
       - 4.1.2.2 Remove the OPS and check the conditions of the threads. Check for an excessive amount of pipe sealant on the threads. Ensure there is no pipe sealant on the end of the sender covering the oil inlet hole. Repeat step 3, measuring the resistance between the 69 and 0 locations on the control panel terminal strip and comparing it to the earlier reading.
   - 4.2 If this measurement is less than 2-3 Ohms greater than the one taken directly across the OPS, and a thorough visual inspection was performed, the wiring is OK.

3.21 LOW COOLANT LEVEL

(Refer to Figure 3.10, page 36)

◆ 3.21.1 OVERVIEW

A Low Coolant Level (LCL) sensor is placed in the generator's coolant system. This sensor allows the E Panel to detect a Low Coolant Level condition.

Wire number 85 is used to connect the LCL to the E Panel. The Ground for the LCL is made through the radiator frame or engine block (depending on where the LCL is located). The LCL is a resistive device whose resistance changes based on the temperature of the LCL.

The resistance of the LCL results in a voltage being developed across the LCL. This voltage changes as the resistance changes. This changing voltage is read by the E Panel.

The LCL is supplied with current from the E Panel. This current will cause the LCL to generate heat. If the LCL is in coolant, the coolant will keep the LCL from heating up. If the LCL is in air, it will heat up telling the E panel there is a low coolant condition.

In most systems, a back up High Water Temperature (HWT) switch is wired in parallel with the LCL. This switch is a normally open switch whose contacts will close at a predetermined temperature setting. If this HWT switch closes, it will result in the E Panel shutting down with a "Low Coolant Level" display.

Refer to owners manual for the LCL and HWT part numbers and mounting locations.

The E Panel checks for low coolant level as follows:

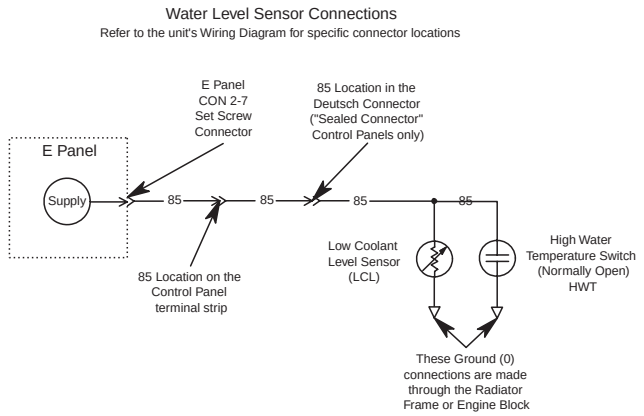
Software version V1.03 and earlier: Will check for a low coolant level anytime the DC input to the E Panel is present.

Software version V1.04 and later: Will only check for a low coolant level once the engine has started and the hold off timer has expired.

There are no user definable parameters for the Low Coolant Level.

◆ 3.21.2 TROUBLESHOOTING

Figure 3.10 — Water Level Sensor Connections



◆ 3.21.3 TESTING THE CONTROL PANEL

It is relatively easy to do a thorough test of the E Panel's Low Coolant Level input.

In most cases it is necessary to run the engine while doing this testing.

⚠ WARNING ⚠

⚠ Once the engine has started, there will be high voltage inside the generator's control panel and at CON4 of the E Panel.

✧ 3.21.3.1 Open circuit testing

This test checks the high end of the low coolant level input.

1. With the generator stopped, remove the 85 wire from the control panel terminal strip. This simulates a sender open circuit condition.
2. Start the Generator.
   - 2.1 The generator should not shut down on Low Coolant Level with the 85 wire disconnected. If the generator does shutdown on low coolant level, there is a fault with the E Panel.
   - 2.2 With the 85 wire still disconnected, use a DC volt meter to measure the voltage between the 85 wire (the end still connected to the E Panel) and ground. This voltage should be 10 volts DC or greater.

     If this voltage is below 10 volts DC, there is a fault with the E Panel. Replace the E Panel.
   - 2.3 Stop the generator.

✧ 3.21.3.2 Short circuit testing

This test checks the low end of the low coolant level input.

1. Reconnect the 85 wire to the control panel terminal strip. Connect a jumper wire between the 85 and 0 locations on the control panel terminal strip. This simulates the HWT switch closing to ground.
2. The E panel should respond as follows:
   - 2.1 E Panels with V1.03 and earlier software:

     The E Panel will sound the alarm and display a low coolant level fault.
   - 2.2 E Panels with V1.04 and later software: Start the generator and observe the following:
     - 2.2.1 The E Panel should start normally.
     - 2.2.2 Once the engine has started, the hold off timer will start.
     - 2.2.3 Once the hold off timer expires, the E Panel will shut the engine down and display a low coolant alarm.

✧ 3.21.3.3 Control panel testing complete

1. Shut down the generator engine.
2. Remove the jumper between the 85 and 0 locations.

✧ 3.21.3.4 Test Results

1. Tests 1 and 2 Pass:

   Move on to the next test "Checking the wiring between the E Panel and the LCL/HWT".
2. If either test 1 or 2 failed:
   - 2.1 Repeat the open and short circuit testing directly at the back of the E Panel as follows:

     Open: The 85 wire should be removed from CON2-7.

     Short: With the 85 wire still removed, insert a jumper wire into CON2-7. Connect the other end of the jumper to ground (0).

     After testing, remove the jumper wire from CON2-7 and insert the 85 wire back into CON2-7.
   - 2.2 Test results:
     - 2.2.1 If these tests fail again directly at the back of the E Panel, then the E Panel has failed and needs to be replaced.
     - 2.2.2 If these tests pass at the back of the E Panel, but failed at the terminal strip, then there is a wiring error between the E Panel and the terminal strip. Check this wiring carefully.

◆ 3.21.4 CHECK THE WIRING BETWEEN THE E PANEL AND THE LCL/HWT

The Low coolant level input is active low. This means that a short to ground on the 85 line will cause the E Panel to shut down for Low coolant level.

Very carefully check the 85 wire from the back of the E Panel out to the LCL and HWT. Check for the following:

1. Check for any areas along the wire with missing insulation. This could allow the 85 line to momentarily come into contact with ground causing a shut down.
2. Check to see if the wire is pinched anywhere along the run. A wire that is pinched against sheet metal can cause the 85 wire to momentarily come into contact with ground resulting in a shut down.

   A pinched wire may also cause the wire to break inside the insulation. This could cause the 85 line to momentarily "open" while running. This "open" condition would not result in a false shutdown, but it could prevent the E Panel from shutting down the generator in the event of a true failure.
3. Check the 85 wire connection to the LCL
   - 3.1. Check for a proper crimp on the lug.
   - 3.2 Check for any environmental corrosion on the lug or the switch terminal. Generac recommends the following actions if corrosion is found:
     - 3.2.1 Replace the lug.
     - 3.2.2 Replace the sender if possible. If not possible, thoroughly remove all of the corrosion from the sender terminal.
     - 3.3.3 Protect the lug and sender terminal with an approved automotive dielectric grease.
4. Check the 85 wire connection to the HWT switch.
   - 4.1 Check for a proper crimp on the lug.
   - 4.2 Check for any environmental corrosion on the lug or the switch terminal. We recommend the following actions if corrosion is found:
     - 4.2.1 Replace the lug.
     - 4.2.2 Replace the switch if possible. If not possible, thoroughly remove all of the corrosion from the sender terminal.
     - 4.2.3 Protect the lug and switch terminal with an approved automotive dielectric grease.
5. Check the 85 wire in the Deutsch connector (only used on "water tight connector" panels.)
   - 5.1 Refer appendix A for information on the Deutsch connectors used.
   - 5.2 Refer to the unit's wiring diagram for the specific wire location.
6. Check the 85 wire on the control panel terminal strip.
   - 6.1 Check for a proper crimp on both lugs.
   - 6.2 Check to see that both screws are tightened securely. These screws should be tightened to 12 inch pounds.
7. Check the 85 wire going into CON2 on the back of the E Panel.
   - 7.1 Check to see the wire is stripped correctly. The wire conductor should be trapped inside the metal wire clamp. The wire insulation should not be inside the metal wire clamp.
   - 7.2 Check to see if the set screw is tightened securely. This screw should be set to 2 to 4 inch pounds.
8. Check the LCL and the HWT mounting. The ground return (0) connection for these devices is made by the physical connection of the device body to the engine block/radiator frame. These connections can be made directly or through a series of adapters or fittings. Check for a good mechanical and electrical connection at each junction point.

◆ 3.21.5 TESTING THE LCL/HWT

1. Check the devices while the generator is not running.
   - 1.1 Test the resistance of the LCL.
     - 1.1.1 Remove the front panel fuse to power down the E Panel.
     - 1.1.2 Unplug CON2 from the E Panel.
     - 1.1.3 Disconnect the 85 wire from the LCL.
     - 1.1.4 Measure the resistance of the LCL. This measurement should be taken from the sender terminal to the sender body. The sender should measure between 40 and 65 ohms. This resistance will vary with temperature. It will be closer to 40 ohms at 30F, and closer to 65 ohms at 120F.

       If the resistance measurement is not in this range, the sender has failed and needs to be replaced.
     - 1.1.5 Reconnect the 85 wire to the LCL.
   - 1.2 Test the HWT switch.
     - 1.2.1 Disconnect the 85 wire from the HWT switch.
     - 1.2.2 Measure the resistance of the HWT switch. This resistance should be taken from the switch terminal to the switch body.
     - 1.2.3 This resistance should measure "infinity" or "open circuit". If not, the switch has failed and needs to be replaced.
     - 1.2.4 Reconnect the 85 wire to the HWT switch. Plug CON2 back into the E Panel. Replace the front panel fuse.

2. Check the devices while the generator is running.
   If the E Panel is still shutting down on low coolant level, and both devices check good in the power down state, the devices can be checked while the engine is running. The following tests will isolate the two different senders and determine which sender is causing the shutdown.

NOTE:

It is very important that the wiring between the E Panel and the LCL/HWT was carefully checked as described above. Incorrect wiring or damage to any of the wiring can result in false test results.

2.1 Test the HWT switch.

2.1.1 Disconnect the 85 wire connected to the LCL. Position the wire such that the lug will not come into contact with any metal surface.

2.2.2 Start and run the generator. If the generator shuts down with a low coolant level alarm, the HWT switch is the cause. Replace the HWT switch.

If the generator does not shut down on alarm, stop the generator and proceed to the next test.

2.2 Test the LCL sender.

2.2.1 Reconnect the 85 wire to the LCL.

2.2.2 Disconnect the 85 wire connected to the HWT switch. Position the wire such that the lug will not come into contact with any metal surface.

2.2.3 Start and run the generator. If the generator shuts down with a low coolant level alarm, the LCL is the cause. Replace the LCL.

If the generator does not shut down on alarm, stop the generator manually.

2.2.4 Reconnect the 85 wire to the HWT.

3.22 COOLANT TEMPERATURE SENSING (Refer to Figure 3.11)

◆ 3.22.1 OVERVIEW

An analog Water Temperature Sender (WTS) is located in the engine's cooling system. This sender is connected to the E Panel and allows the E Panel to monitor and display the temperature of the Coolant system. Wire number 68 is used to connect the WTS to the E Panel. The ground for the WTS is made through the radiator frame or engine block (depending on where the WTS is located).

Refer to the owners manual for the WTS part number and mounting location.

The WTS is a resistive device whose resistance changes based on coolant temperature. The resistance of the sender results in a voltage being developed across the sender. As the Coolant temperature increases, the resistance will decrease, causing the voltage to decrease. This changing voltage is read by the E Panel and converted into coolant temperature.

The E Panel will monitor and display the coolant temperature anytime the DC input to the E Panel is present.

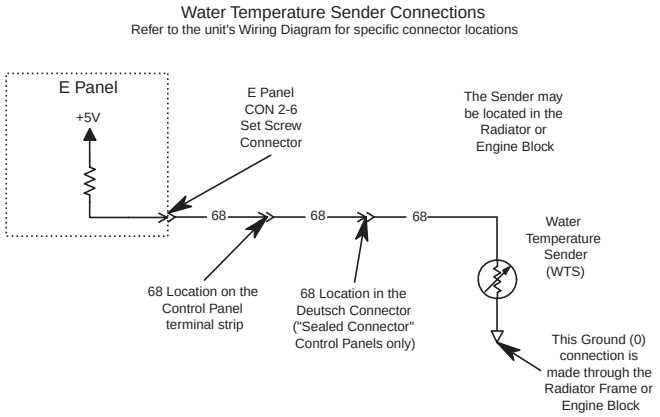
◆ 3.22.2 TROUBLESHOOTING

Prior to any troubleshooting, the Coolant Temperature parameters programmed into the E Panel should be checked and verified. The coolant temperature has three different set points associated with it. They are:

- **Low Coolant Temp Warning:** This is a warning set point. The generator's alarm will sound, but the unit will continue to run.
- **Pre-High Coolant Temp Warning:** This is a warning set point. The generator's alarm will sound, but the unit will continue to run.
- **High Coolant Temp Alarm:** This is the alarm set point. The generator will shut down and sound the alarm.

It is important to verify that these parameters are set correctly for the specific unit. Check the E Panel settings against the generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the recommended settings.

Figure 3.11 — Water Temperature Sender Connections



◆ 3.22.3 TESTING THE CONTROL PANEL

It is relatively easy to do a thorough test of the E Panel's Coolant Temperature input.

Place the AUTO/OFF/MANUAL switch to the OFF position during this testing.

✧ 3.22.3.1 Open circuit testing

This test checks the high end of the coolant temperature input of the E Panel.

1. Remove the 68 wire from the control panel terminal strip. This simulates a sender open circuit condition.
2. Look for the following response from the E Panel. The E Panel should respond in either one of the following ways:
   2.1 The Coolant temperature display will read less than 20 F.
   OR
   2.2 The back light will flash, the com alarm LED will flash, and the display will read as follows:

COOLANT TEMP SENSE FAULT
PRESS ENTER TO ACCEPT

✧ 3.22.3.2 Short circuit testing

This test checks the low end of the coolant temperature input of the E Panel.

1. If any E Panel alarms are present, press enter to accept.
2. Reconnect the 68 wire to the control panel terminal strip.
3. Connect a jumper wire between the 68 and 0 positions on the control panel terminal strip. This simulates a sender short circuit condition.
4. Look for the following response from the E Panel. The back light will flash, the Com Alarm LED will flash, and the display will read as follows:

COOLANT TEMP SENSE FAULT
PRESS ENTER TO ACCEPT

Press enter to accept the alarm.

✧ 3.22.3.3 Control panel testing complete

1. Remove the jumper between the 68 and 0 locations.
2. If any E Panel alarms are present, press enter to accept.

✧ 3.22.3.4 Test Results

1. Tests 1 and 2 pass:
   Move on to the next test "Testing the coolant temperature sender connections".
2. If either Test 1 or 2 failed:
   2.1 Repeat the open and short circuit testing at the back of the E Panel as follows:
   Open: The 68 wire should be removed from CON2-6.
   Short: With the 68 wire still removed, insert a jumper wire into CON2-6. Connect the other end of the jumper to ground (0).
   After testing, remove the jumper wire from CON2-6 and insert the 68 wire back into CON2-6.
   2.2 Test results:
   2.2.1 If these tests fail again directly at the back of the E Panel, then the E Panel has failed and should be replaced.
   2.2.2 If these test pass at the back of the E Panel, but failed at the terminal strip, then there is a wiring error between the E Panel and the terminal strip. Check this wiring carefully.

◆ 3.22.4 TESTING THE COOLANT TEMPERATURE SENDER CONNECTIONS

✧ 3.22.4.1 Visual Inspection

Carefully check the wiring between the coolant temperature sender and the E Panel.

1. Check the 68 wire connection to the WTS.
   1.1 Check for a proper crimp on the lug.
   1.2 Check to see if the sender nut it tightened securely. Be careful not to over tighten the nut. If the nut is over tightened the stud will break free and cause incorrect sender readings. This nut should be tightened to 6 to 7 inch pounds.
   1.3 Check for any environmental corrosion on the lug or sender terminal. Generac recommends the following actions if corrosion is found:
   1.3.1 Replace the lug.
   1.3.2 Replace the sender if possible. If not possible, thoroughly remove all of the corrosion from the sender terminal.
   1.3.3 Protect the lug and sender terminal with an approved automotive dielectric grease.
2. Check the 68 wire in the Deutsch connector (only used on the "water tight connector" panels.)
   2.1 Refer to appendix A for information on the Deutsch connectors used.
   2.2 Refer to the units wiring diagram for the 68 location in the Deutsch plug.
3. Check the 68 wire on the control panel terminal strip.
   3.1 Check for a proper crimp on both lugs.
   3.2 Check to see if both screws are tightened securely. These screws should be tightened to 12 inch pounds.
4. Check the 68 wire going into CON2 on the back of the E Panel.
   4.1 Check to see if the wire is stripped properly inside the green plug. The wire conductor should be trapped inside the metal wire clamp. The wire insulation should not be trapped inside the metal wire clamp.

4.2 Check to see if the set screw is tightened securely, but do not over tighten. This screw should be set to 2 to 4 inch pounds.

5. Check for any wire damage along the entire run between the E Panel and the sender.
   5.1 Check for any areas along the wire with missing insulation. This could allow the 68 line to momentarily come into contact with ground causing a false shut down.
   5.2 Check to see if the wire is pinched anywhere along the run. A wire that is pinched between the sheet metal can cause the 68 wire to momentarily come into contact with ground causing a false shut down. A pinched wire may also cause the wire to break inside the insulation, this could cause the 68 line to momentarily "open" while running. This will also result in a false shut down.

✧ 3.22.4.2 Check the WTS mounting

The ground return (0) connection for the WTS is made by the physical connection of the sender to the engine block. This connection may be made directly, or through a series of adapters or fittings.

Check for the following at each junction point:

1. Check for a tight mechanical connection.
2. Check for a good electrical connection.

✧ 3.22.4.3 Resistance measurements

Power down the E Panel by removing the front panel fuse.

Remove CON2 from the back of the E Panel.

1. Measure the resistance between the WTS stud and the 68 wire inside the control panel. If this measurement is greater than 2-3 Ohms, replace the entire wire running between the control panel and the WTS stud.
2. Measure the resistance between the body of the sender and the 0 location on the control panel terminal strip. If this measurement is greater than 2 -3 Ohms, go back and carefully check the WTS mounting and the star ground connections on the engine block.

3.23 OIL TEMPERATURE SENSING

(Refer to Figure 3.12)

◆ 3.23.1 OVERVIEW

Oil Temperature sensing is an OPTION offered with the E Panel. When ordered, an analog Oil Temperature Sender (OTS) is mounted in the oil pan. This sender is connected to the E Panel and allows the E Panel to monitor and display the temperature of the engine oil. Wire number 523 is used to connect the OTS to the E Panel. The ground for the OTS is made through the oil pan/engine block.

The OTS is a resistive device, whose resistance changes based on oil temperature. The resistance of the sender results in a voltage being developed across the sender. As the oil temperature increases, the resistance will decrease, causing the voltage to decrease. This changing voltage is read by the E Panel and converted to oil temperature.

◆ 3.23.2 TROUBLESHOOTING

Prior to any troubleshooting, verify the following:

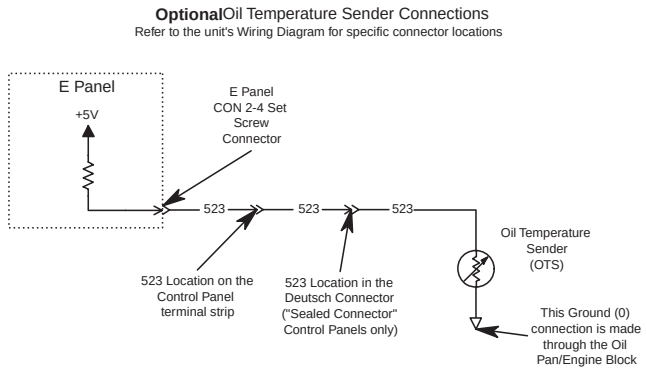
1. Verify the oil temperature option has been ordered and installed on the generator.
2. Check and verify the Oil Temperature parameters programmed into the E Panel. The oil temperature has two different set points associated with it.

   Pre-High Oil Temp Warning: This is a warning set point. The generator's alarm will sound but the generator will continue to run. This parameter should be Disabled if no sender was fitted.

   High Oil Temp Alarm: This is an alarm set point. The generator will shut down and sound the alarm. This parameter should be Disabled if no sender was fitted.

It is important to verify that these parameters are set correctly for the specific unit. Check the E Panel settings against the Generator setup sheet. If the generator setup sheet is not available, contact Generac's service department for the recommended settings.

Figure 3.12 — Optional Oil Temperature Sender Connections



◆ 3.23.3 TESTING THE CONTROL PANEL

It is relatively easy to do a thorough test of the E Panel's Oil Temperature input.

Place the Auto/Off/Manual switch to the Off position during this testing.

✧ 3.23.3.1 Open circuit testing

This test checks the high end of the oil Temperature input of the E Panel.

1. Remove the 523 wire from the control panel terminal strip. This simulates a sender open circuit condition.
2. The E Panel should respond in either one of the following ways:
   2.1 The Oil temperature display will read less than 20 F.
   OR
   2.2 The back light will flash, the com alarm LED will flash, and the display will read as follows:

OIL TEMP SENSE FAULT
PRESS ENTER TO ACCEPT

✧ 3.23.3.2 Short circuit testing

This test checks the low end of the oil temperature input of the E Panel.

1. Reconnect the 523 wire to the control panel terminal strip.
2. Connect a jumper wire between the 523 and 0 locations on the control panel terminal strip. This simulates a sender short circuit condition.
3. Look for the following response from the E Panel. The back light will flash, the Com Alarm LED will flash, and the display will read as follows:

OIL TEMP SENSE FAULT
PRESS ENTER TO ACCEPT

Press enter to accept the alarm.

✧ 3.23.3.3 Control Panel testing complete

1. Remove the jumper between the 523 and the 0 locations on the control panel terminal strip.
2. If any E Panel alarms are present, press enter to accept.

✧ 3.23.3.4 Test results

1. Tests 1 and 2 pass:
   Move on to the next test "testing the oil temperature sender connections".
2. If either test 1 or test 2 failed:
   2.1 Repeat the open and short circuit testing directly at the back of the E Panel as follows:
   Open: The 523 wire should be removed from CON2-4.
   Short: With the 523 wire still removed, insert a jumper wire into CON2-4. Connect the other end of the jumper to ground (0).
   After testing, remove the jumper wire from CON2-4 and insert the 523 wire back into CON2-4.
   2.2 Test results:
      2.2.1 If these tests fail again directly at the back of the E Panel, then the E Panel has failed and should be replaced.
      2.2.2 If these tests pass at the back of the E Panel, but failed at the terminal strip, then there is a wiring error between the E Panel and the terminal strip. Check this wiring carefully.

◆ 3.23.4 TESTING THE OIL TEMPERATURE SENDER CONNECTIONS

✧ 3.23.4.1 Visual Inspection

Carefully check the wiring between the oil temperature sender and the E Panel.

1. Check the 523 wire connection to the OTS.
   1.1 Check for a proper crimp on the lug.
   1.2 Check to see if the sender nut is tightened securely. Be careful not to over tighten the nut. If the nut is over tightened the stud will break free and cause incorrect sender readings. This nut should be tightened to 6 to 7 inch pounds.
   1.3 Check for any environmental corrosion on the lug or sender terminal. Generac recommends the following actions if corrosion is found:
      1.3.1 Replace the lug.
      1.3.2 Replace the sender if possible. If not possible, thoroughly remove all of the corrosion from the sender terminal.
      1.3.3 Protect the lug and sender terminal with an approved automotive dielectric grease.
2. Check the 523 wire in the Deutsch connector (only used on the "water tight connector" panels.)
   2.1 Refer to appendix A for information on the Deutsch connectors used.
   2.2 Refer to the unit's wiring diagram for the 523 location in the Deutsch plug.
3. Check the 523 wire on the control panel terminal strip.
   3.1 Check for a proper crimp on both lugs.
   3.2 Check to see if both screws are tightened securely. These screws should be tightened to 12 inch pounds.
4. Check the 523 wire going into CON2 on the back of the E Panel.
   4.1 Check to see if the wire is stripped properly inside the green plug. The wire conductor should be trapped inside the metal wire clamp. The wire insulation should not be trapped inside the metal wire clamp.

4.2 Check to see if the set screw is tightened securely, but do not over tighten. This screw should be set to 2 to 4 inch pounds.

5. Check for any wire damage along the entire run between the E Panel and the sender.
   5.1 Check for any areas along the wire with missing insulation. This could allow the 523 line to momentarily come into contact with ground causing a false shut down.
   5.2 Check to see if the wire is pinched anywhere along the run. A wire that is pinched between the sheet metal can cause the 523 wire to momentarily come into ground causing a false shut down. A pinched wire may also cause the wire to break inside the insulation, this could cause the 523 line to momentarily "open" while running. This will also result in a false shut down.

✧ 3.23.4.2 Check the OTS mounting

The ground return (0) connection for the OTS is made by the physical connection of the sender to the engine block. This connection may be made directly, or through a series of adapters or fittings.

Check for the following at each junction point:

1. Check for a tight mechanical connection.
2. Check for a good electrical connection.

✧ 3.23.4.3 Resistance measurements

Power down the E Panel by removing the front panel fuse.

Remove CON2 from the back of the E Panel.

1. Measure the resistance between the OTS stud and the 523 wire inside the control panel. If this measurement is greater than 2-3 Ohms, replace the entire wire running between the control panel and the OTS stud.
2. Measure the resistance between the body of the sender and the 0 location on the control panel terminal strip. If this measurement is greater than 2 -3 Ohms, go back and carefully check the OTS mounting and the star ground connections on the engine block.

3.24 AC VOLTAGE DISPLAY

The E Panel monitors the generator's AC output voltage. This voltage can be viewed locally on the E Panel's display, or remotely using Genlink.

There are two user programmable set points for the Generator output voltage: over voltage and under voltage. Both parameters are active after the hold off timer has expired. They can be programmed to be a status message, non-latched alarm, latched alarm, or shut down alarm.

The voltage displayed on the E Panel, and the over/under voltage set points are all based on the generators full line to line output voltage. However, in most cases full line to line voltage is not connected to the E Panel. (Please refer to the unit's wiring diagram and schematic for complete wiring details.)

The E Panel has a programmable voltage scaling factor that is used to scale the sensing voltage applied to CON4-4 and CON4-6. This allows the E Panel to display full line to line voltage.

The scaling factor should be checked if the E Panel is not displaying the line to line voltage correctly.

Check the scaling factor against the generators set up sheet. If the set up sheet is not available, contact Generac's service department for the recommended setting.

The voltage scaling factor can also be used to "calibrate" the voltage display.

Example:

A 480 volt unit has 240 volts sensing voltage applied to E Panel CON4-4 and CON4-6.

The E Panels scaling factor should be set to 2.0 to provide a proper line to line display voltage.

If, however, the E Panel displays 490 volts with a scaling factor of 2.0, the scale factor may be adjusted slightly to "calibrate" the voltage display. In this case, the displayed voltage is roughly 2% high, so the scaling factor should be reduced by 2% to 1.96. Change the scaling factor and recheck the voltage display. If necessary, readjust the scaling factor until the voltage display is properly "calibrated".

Please note the following:

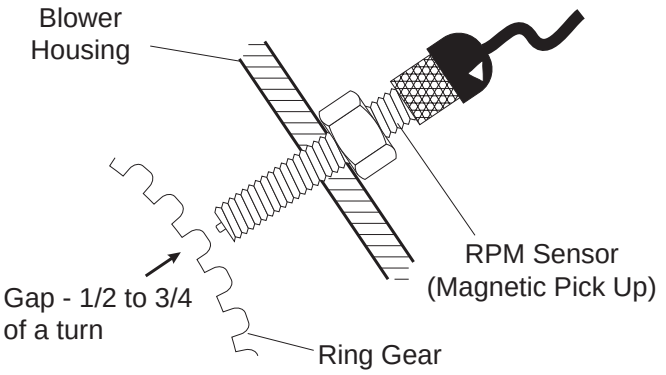
1. Software versions V1.07 and earlier had a one decimal point scale factor.
   Software versions V1.08 and later have a two decimal point scale factor.
2. The E Panel displayed voltage is not used in any way to regulate the generators output voltage. The voltage regulator is responsible for regulating generator voltage.

3.25 RPM SENSOR AND ENGINE SPEED ALARMS (Refer to Figures 3.13, 3.14 & 3.15)

◆ 3.25.1 OVERVIEW

The E Panel uses an RPM sensor to monitor engine speed. The RPM sensor is mounted in the blower housing and positioned so the tip of the sensor is directly above the engine flywheel teeth. As the flywheel rotates, the sensor will send an electrical pulse to the E Panel each time a tooth passes the sensor. The E Panel will count these pulses and convert them into engine speed.

Figure 3.13 — RPM Sensor



If the magnetic pickup is removed for any reason, it must be installed properly.

◆ 3.25.2 INSTALLATION

1. Rotate the ring gear until a gear tooth face is directly in the center of the tapped hole on the blower housing.

NOTE:

Do NOT use the alternator fan to rotate the engine.

2. Gently turn the magnetic pick up clockwise into the tapped hole until it bottoms on the gear tooth.
3. Use a marker to mark a line on the magnetic pick up threads and blower housing.
4. Using the lines marked in Step 3 as a guide, turn the magnetic pick up 1/2 to 3/4 of a turn counterclockwise.
5. Tighten the jam nut securely.

◆ 3.25.3 RELATED ALARMS

✧ 3.25.3.1 RPM Sensor Loss

RPM sensor loss is a shut down alarm. There are two conditions that will result in RPM sensor loss.

1. No RPM signal at crank. The E Panel will monitor the RPM sensor during the crank cycle. If no signal is detected within a few seconds of cranking, the E Panel will display RPM Sensor Failure and shut down the engine.
2. RPM sensor loss while running. The E Panel continues to monitor the RPM sensor while running. If the signal is lost while running, the E Panel will display RPM sensor failure and shut down the engine.

✧ 3.25.3.2 Engine Under Speed

Engine under speed is a hold off alarm with a programmable set point. The alarm type is programmable as shutdown, latched, non-latched or status.

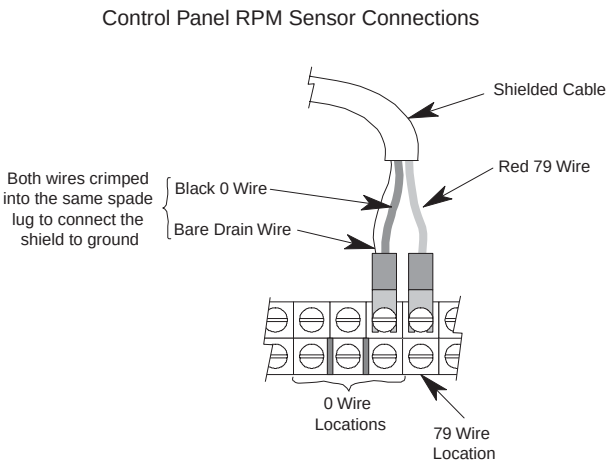
✧ 3.25.3.3 Engine Over Speed

Engine over speed is an immediate alarm with a programmable set point. Engine over speed is a shut down alarm.

◆ 3.25.4 TROUBLESHOOTING

1. Verify that all the following parameters have been correctly programmed into the E Panel.
   1.1 Number of flywheel teeth. The number of flywheel teeth is used by the E Panel to convert the electrical pulses from the RPM sensor, into engine speed. If this parameter is not programmed correctly, the E Panel will not be able to monitor engine speed correctly. Verify the number of flywheel teeth against the generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the REQUIRED setting.
   1.2 Over speed and under speed settings. Verify these settings against the generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the recommended settings.
2. Check the RPM sensor wiring. A two conductor shielded cable is used to connect the RPM sensor to the E Panel. It is important to very carefully check this wiring and all connections, including the shield connections.
   2.1 Cable description:
      2.1.1 Red wire (wire 79). The red wire inside the cable is wire number 79. This wire is used to connect the RPM signal from the sender to the E Panel.
      2.1.2 Black wire (wire 0). The black wire inside the cable is the 0 wire that connects the RPM sensor to the E Panel.

Figure 3.14 — Control Panel RPM Sensor Connections



2.1.3 Shield/Drain wire. The shield is an aluminum foil shield that surrounds the two conductors and runs the entire length of the cable. The foil shield will be cut even with the cable jacket.

The drain wire is a non insulated wire that is in physical contact with the shield and also runs the entire length of the cable. The drain wire is used to make the shield connections.

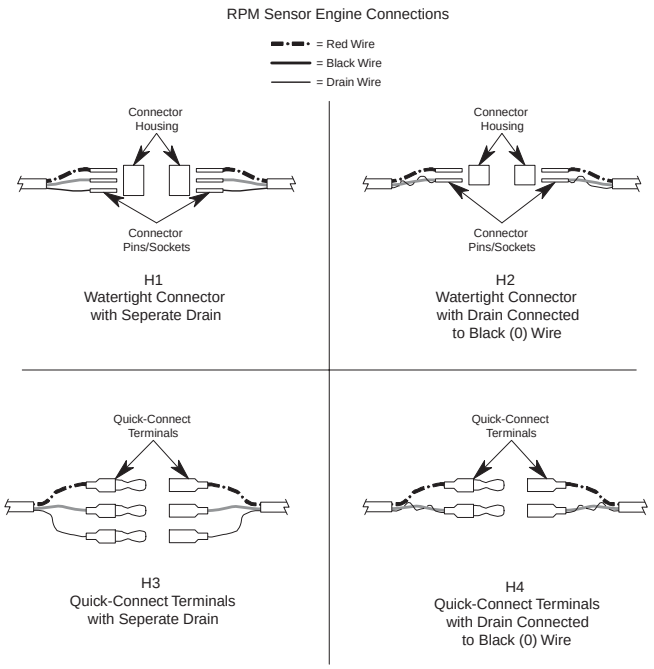
The drain wire MUST be connected to system ground to shield the sensitive RPM sensor signal from noise. This ground connection is typically made at the control panel main terminal strip. Refer to Figure 3.14.

2.2 Check the cable at the RPM sensor. Look for breaks, signs of over stress, excessive tension, etc.

2.3 Check all of the connection points along the entire cable run (refer to the unit's wiring diagrams.) At each connection point, check for proper wire stripping, lugging, etc.

2.4 Drain wire connections. Carefully check the drain wire connections at each connection point. Figure 3.15 shows the different methods that may be used for connecting the drain wire. Note that the drain can be connected to the 0 wire at a connection point, or it can be run separately.

Figure 3.15 — RPM Sensor Engine Connections



3. RPM sensor voltage measurement. The RPM sensor voltage can be measured at the control panel's main terminal strip. This voltage should be measured during crank and run.

⚠ WARNING ⚠

⚠ Once the engine has started, there will be high voltage inside the generators control panel.

3.1 Using an AC volt meter, measure the voltage at terminal positions 79 and 0.

This voltage should measure as follows:

During crank: 150 milli volts or greater (0.150V)

During run: 500 milli volts or greater (0.500V)

3.2 If the voltages measured are lower than what is listed above do the following:

3.2.1 Reset the RPM sensor. Refer to Figure 3.15 for the proper setting.

NOTE:

The RPM sensor will have to be removed in order to be set properly. Do not strain (twist) the sender cable during this process. Units that have a connector at the sender can simply be disconnected. If a connector is not available, the cable will have to be removed from the wire harness and disconnected at the control panel.

3.2.2 Retake the voltage measurements. If the voltages are still low, then the RPM sender is faulty and should be replaced.

3.26 ENGINE DOES NOT CRANK

This section provides troubleshooting techniques that should be used if the engine fails to crank when a start signal is given.

◆ 3.26.1 CHECK THE E PANEL START SETTINGS

All of the following start related parameters will be found in the Engine Parameters Menu.

These settings should be checked against the Generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the recommended settings.

1. Number of start attempts. This number defines the maximum number of times the E Panel will engage the starter. Verify this number is not set to zero.
2. Start timer. This number (in seconds) defines the length of time the E Panel will keep the starter energized during a start attempt. Verify this number is not set to zero.
3. Start attempt pause time. This number (in seconds) defines the length of time the E Panel will pause between start attempts.

4. Preheat option. Check to see how the Preheat option is set. If it is set as either "before start" or "before and during start" the preheat timer becomes active.
5. Preheat timer. This number (in seconds) defines the length of time the E Panel will preheat prior to cranking.

Example:

Preheat options: the preheat option is set to before start, and the preheat timer is set to 10.

Result: When a start signal is given, the E Panel will activate the preheat output for 10 seconds. Once that 10 seconds is over, it will activate the start and fuel outputs.

◆ 3.26.2 TEST THE E PANEL KEY SWITCH

NOTE:

Leave the key switch in each position for a few seconds. Turning the key too quickly may cause false test results.

⚠ WARNING ⚠

⚠ The following steps will signal the generator to start and run.

1. Place the key switch in the off position.
2. Use the left and right arrow keys to go to the Generator Command page.
   With the key switch in the off position, the display should read "Generator switch off".
3. Turn the key switch to the AUTO position. The top line of the display should read "Generator in auto mode".
4. Turn the key switch to the MANUAL position. In the manual position, the E Panel should begin the engine starting sequence. The display will continue updating to show the user the progress. This is discussed in detail in the next test.
   If however, the E Panel display shows the key switch is in either the OFF or AUTO positions, the E Panel has failed and needs to be replaced.

◆ 3.26.3 WATCH THE E PANEL DISPLAY DURING THE START ATTEMPT

⚠ WARNING ⚠

⚠ Warning: the following steps will signal the generator to start and run.

1. Set the key switch to the OFF mode.
2. Use the left and right arrow keys to go to the screen "Generator switch off".
3. Turn the key switch to the MANUAL position.
4. The E Panel display will begin displaying the start sequence as follows:
   - 4.1 "Preheating": The E Panel is preheating the engine. (Only occurs if preheat is enabled.) The start output will not be active during this time, and the engine should not be cranking.
   - 4.2 "Attempting to start": The E Panel is activating all the following outputs:
     - 4.2.1 Start solenoid output at CON3-2.
     - 4.2.2 Fuel solenoid output at CON3-1.
     - 4.2.3 Preheat output at CON3-4 and 3-3 (Only if preheat is enabled.)
   - 4.3 "Pausing before start": This indicates the E Panel is in a rest cycle between start attempts.
     - 4.3.1 The start solenoid output will not be active.
     - 4.3.2 The fuel solenoid output will not be active.
     - 4.3.3 The Preheat output will be active (Only if preheat is enabled).
   - 4.4 The start sequence will now begin cycling between "attempting to start" and "pause before start". This cycling will continue for the programmed number of cycles.
     If the engine has not started by the end of the final cycle, the display will read "failed to start" and issue a shutdown alarm. This fault condition is referred to as over crank.
5. TEST RESULTS: Did the E Panel display "attempting to start" during the start cycle?
   - 5.1 NO.
     - 5.1.1 Go back and carefully check the start settings programmed into the E Panel.
     - 5.1.2 Is there an alarm condition present which is preventing the E Panel from initiating the start sequence? If yes, they must be cleared before the E Panel will attempt to start.
     - 5.1.3 If all of the programmable start parameters are correct, and there are no alarms present, then the E Panel has failed and needs to be replaced.
   - 5.2 YES. — If the E Panel displayed "attempting to start" but the engine did not crank, move on to the next test.

◆ 3.26.4 MEASURE THE START SIGNAL IN THE CONTROL PANEL (REFER TO FIGURE 3.16)

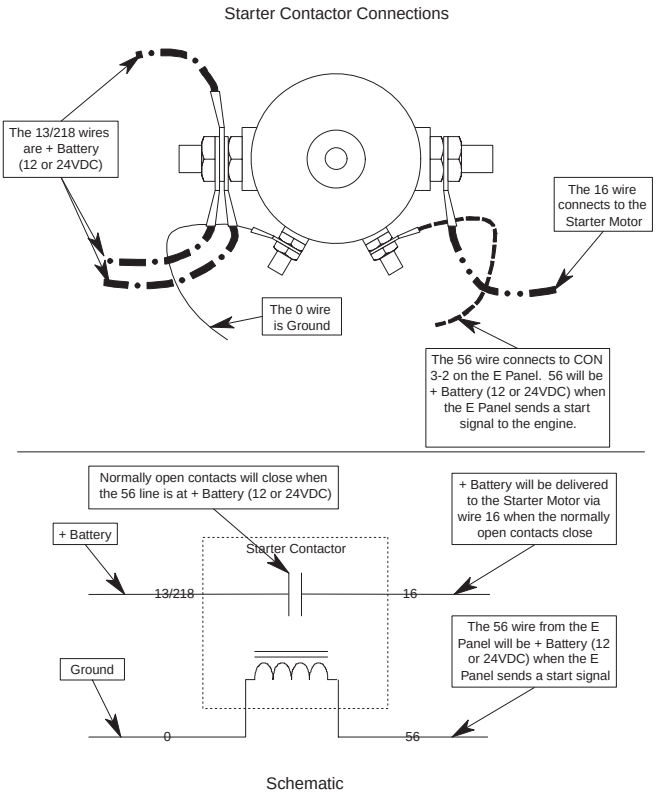
CON3-2 is the start output from the E Panel and should be at +battery (+12V or +24V) whenever the E Panel display reads "attempting to start."

Wire #56 is used to connect CON3-2 from the E Panel to the starter contactor.

All measurements in this test are DC volts with respect to ground (0) unless otherwise noted.

1. Measure the start output directly at CON3-2 on the back of the E Panel. This should read +12/24V DC whenever the E Panel display reads "attempting to start."
   1.1 If it does not, then the E Panel has failed and needs to be replaced.

Figure 3.16 — Starter Contactor Connections



   1.2 If it does read +12/24V DC, but the engine does not crank, then there is nothing wrong with the E Panel. Proceed to the next test.
2. Measure the 56 location on the control panels main terminal strip. This should read +12/24V DC whenever the E Panel display reads "attempting to start."
   2.1 If it does not, then carefully check the 56 wire between the E panel and the terminal strip.
   2.2 If it does read +12/24V DC, but the engine does not crank, move on to the next test.

◆ 3.26.5 CHECK THE CONDITION OF THE STARTER CONTACTOR CONNECTIONS

1. Check for environmental corrosion on the terminals, nuts, or lugs. Generac recommends the following actions if corrosion is found:
   1.1 Replace the lugs.
   1.2 Thoroughly remove all of the corrosion from the contactor terminals.
   1.3 Protect the lugs and terminals with an approved automotive dielectric grease.
2. Check to see if the terminal nuts are tightened securely, but be careful not to over tighten them.
   2.1 Coil terminals (10-32 studs and nuts). These nuts should be tightened to 12 to 15 inch pounds.
   2.2 Contact terminals (5/16-24 studs and nuts). These nuts should be tightened to 30 to 36 inch pounds.

◆ 3.26.6 MEASURE THE START SIGNAL AT THE STARTER CONTACTOR

1. Measure the 56 connection at the start contactor. This should read +12/24V DC whenever the E Panel display reads "attempting to start."
   1.1 If it does not, then carefully check the 56 wire between the terminal strip and the starter contactor.
   1.2 If it does read +12/24V DC, but the engine does not crank, move on to the next test.
2. Check the 0 connection at the starter contactor. The 0 connection at the starter contactor can be checked as follows:
   2.1 Connect the negative volt meter lead to the 0 at the starter contactor.
   2.2 Connect the positive volt meter lead to the a 13/218 location inside the control panel.
   2.3 The voltmeter should read +12/24V DC. If it does not, there is a problem with the 0 connection to the starter contactor. Very carefully check all 0 connections including the star ground on the engine block.
3. Measure the 13/218 wire at the starter contactor. This should read +12/24V DC any time the battery is connected.
   3.1 If it does not, then carefully check the 13/218 wiring between the battery and the starter contactor.
   3.2 If it does read +12/24V DC, but the engine does not crank, move on to the next test.
4. Measure the 16 wire at the starter contactor. This should read +12/24V DC whenever the E Panel reads "attempting to start".
   4.1 If it does not, then the starter contactor is bad and needs to be replaced.
   4.2 If it does read +12/24V DC, but the engine does not crank, move on to the next test.
5. Measure the 16 wire at the starter motor. This should read +12/24V DC whenever the E Panel reads "attempting to start".
   5.1 If it does not, then carefully check the 16 wire running between the starter contactor and the starter itself.

5.2 If it does read +12/24V DC, but the engine does not crank, then test the starter solenoid and the starter motor as outlined in the appropriate engine service manual.

3.27 OVERCRANK

◆ 3.27.1 FAILED TO START

When the E Panel receives a start signal, it initiates the programmed starting sequence. The start sequence consists of the number of crank attempts, the length of each crank attempt, and the rest time between each crank attempt. If the engine has not started by the end of the final crank attempt, an Overcrank alarm is generated, the E Panel will sound the alarm and display the message "Failed to start".

✧ 3.27.1.1 Check the E Panel start settings

All of the following start related parameters will be found in the Engine Parameters Menu.

These settings should be checked against the Generator setup sheet. If the generator setup sheet is not available, contact Generac's Service Department for the recommended settings.

1. Number of start attempts: This number defines the maximum number of times the E Panel will engage the starter. Verify this number is not set to zero.
2. Start timer: This number (in seconds) defines the length of time the E Panel will keep the starter energized during a start attempt. Verify this number is not set to zero.
3. Start attempt pause time: This number (in seconds) defines the length of time the E Panel will pause between start attempts.
4. Preheat option: Check to see how the Preheat option is set. If it is set as either "before start" or "before and during start" the preheat timer becomes active.
5. Preheat timer: This number (in seconds) defines the length of time the E Panel will preheat prior to cranking.

Example:

Preheat options: The preheat option is set to before and during, and the preheat timer is set to 5.

Result: When a start signal is given, the E Panel will activate the preheat output for 5 seconds. Once that 5 seconds is over, it will activate the start, fuel and preheat outputs.

✧ 3.27.1.2 Check the fuel output from the E Panel

CON3-1 is the fuel output from the E Panel and should be high (+12 or +24V DC) whenever the E Panel is displaying "attempting to start."

Wire number 14/219 is used to connect CON3-1 from the E Panel to the fuel solenoid. (Wire #14 used in a 12 volt system, wire #219 used in a 24 volt system.)

All measurements in this test are DC volts with respect to ground (0) unless otherwise noted.

1. Measure the fuel output directly at CON3-1 on the back of the E Panel. This should read +12/24V DC whenever the E Panel display reads "attempting to start." (crank cycle). This will not read +12/24V DC when the E Panel display reads "Pausing before start." (rest cycle).
   1.1 If it does not, then the E Panel has failed and needs to be replaced.
   1.2 If it does, then there is nothing wrong with the E Panel, proceed to the next test.
2. Measure the 14/219 location on the control panels main terminal strip. This measurement should be the same as in step 1.
   2.1 If it is not, then carefully check the wiring between the E Panel and the terminal strip. There are two basic methods for the 14/219 wiring between the E Panel and the terminal strip. Refer to the unit's wiring diagram for the method used.
      2.1.1 Direct wiring: In this method, a wire is run from CON3-1 on the back of the E Panel directly to the 14/219 location on the terminal strip.
      2.1.2 Secondary relay: In this method, a secondary relay is used between the E Panel and the terminal strip. Refer to Figure 3.8 for a typical wiring schematic.
   2.2 If it does read correctly: If the 14/219 location on the control panel terminal strip reads correctly, there is nothing wrong with the control system.

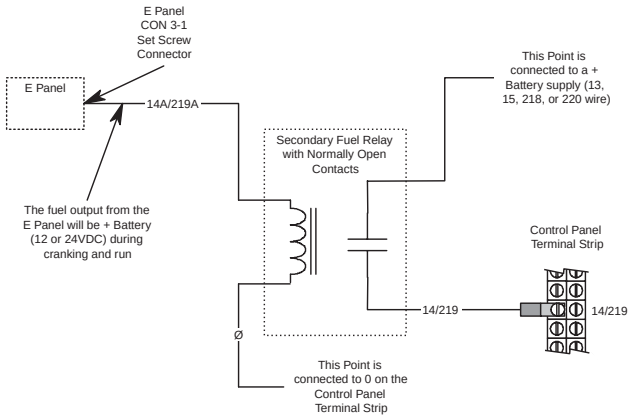
   This means the problem is external to the control panel and may include the fuel supply, fuel solenoid/injector pump, ignition system, or the wiring connecting these components.

   Refer to the appropriate engine service manual for further troubleshooting techniques.

Figure 3.17 is a typical wiring schematic using a secondary relay for the E Panel fuel output. Refer to the unit's wiring schematics and diagrams to determine if a secondary relay is used and for specific connections.

When the E Panel supplies + battery voltage (12 or 24VDC) from CON3-1 through wire 14A/219A, the secondary relay is energized. The relay's normally open contacts will close, delivering + battery voltage to the 14/219 location on the control panel terminal strip.

Figure 3.17 — Typical Wiring Schematic Using a Secondary Fuel Relay

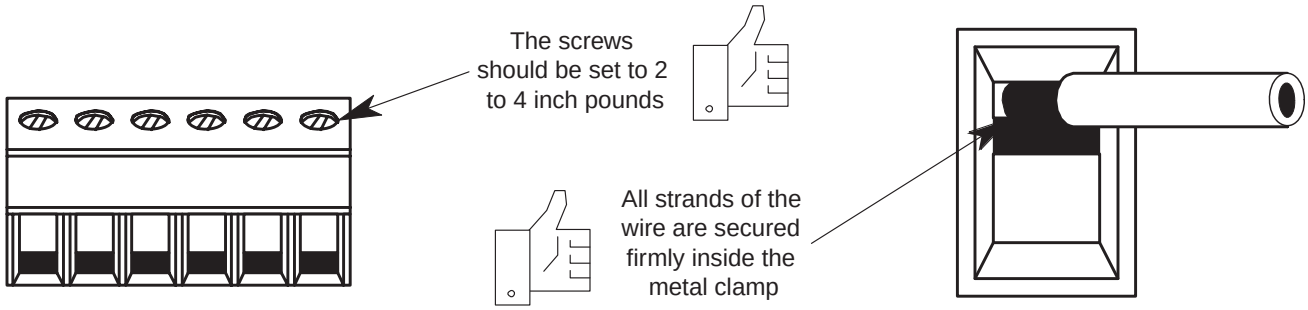


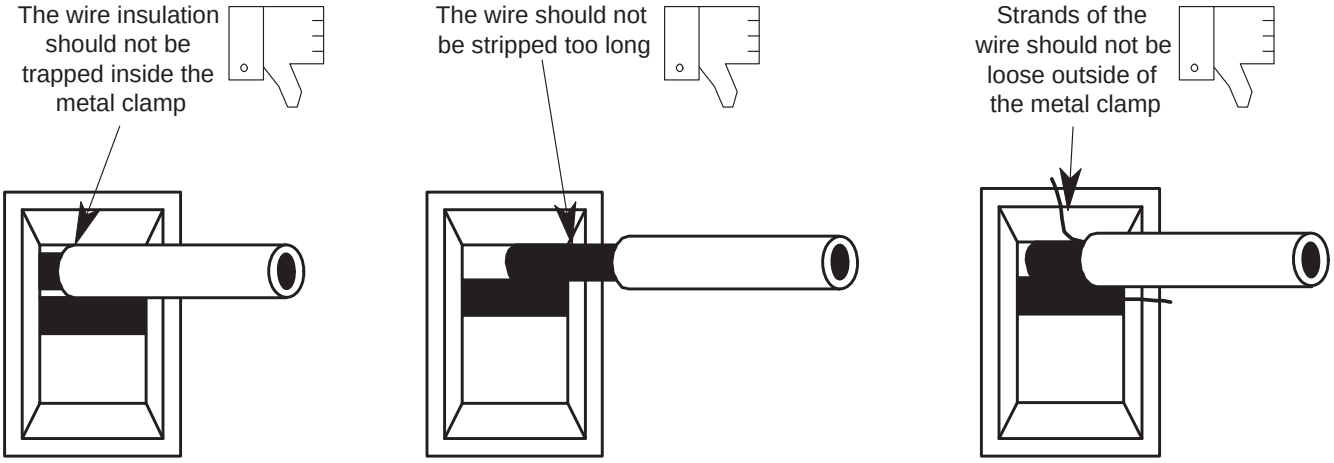
3.28 E CONTROL PANEL DEFINITIONS

Please refer to the following list for an explanation of terms used in various charts throughout the manual:

- **ALWAYS:** With this option selected, the alarm is active regardless of the state of the generator.
- **ANALOG INPUT:** An analog input to the E control panel is a voltage sourced input with a zero volt to 10 volt range.
- **DIGITAL INPUT:** A digital input to the E control panel is NOT a voltage sourced input, but a dry contact closure to ground. Voltage should never be sourced to a digital input.
- **DISABLED:** If this option is selected, the alarm is disabled and has no effect.
- **HIGH:** A high signal to a digital input is open circuit.
- **HOLD OFF:** This option waits until a preset time after the generator is running before becoming active. The hold off time can be set by the user. Note that the hold off time is common to all alarms.
- **IMMEDIATE:** In this mode, the alarm is not active when the generator is stationary. It becomes active as soon as the generator starts to crank and remains active until the generator stops.
- **LATCHED:** When the alarm condition occurs, the audible alarm sounds, the LED and back light flash as before, and the user must accept the alarm to stop them. The alarm will continue to be displayed on the screen even after the alarm condition has cleared. The user must either press the Reset key or turn the key switch to the OFF position to clear the alarm after the alarm condition has cleared. This type of alarm is logged.
- **LOW:** A low signal to a digital input is a contact closure to ground.
- **NON-LATCHED:** This type of warning will activate the audible alarm, and flash the alarm LED and display back light. The associated message will be displayed on the screen. When the user accepts the warning (by pressing the Enter key), the back light will stop flashing, and the alarm LED will be on continuously. The message will be displayed on the alarm screen, but the user will be able to scroll through other screens. The LED and message will clear when the warning condition clears. This type of warning is logged.
- **SHUTDOWN:** This type of alarm will act similar to the latched alarm, but it also will stop the engine when the alarm condition occurs. It can be reset only by turning the key switch to the OFF position. All shutdown alarms are latching, and this type of alarm is logged.
- **STATUS:** This type of alarm will display a message on the screen. The message will not be logged. This is the lowest priority of alarm types.
- **USER INPUT:** Any of the eight digital or two analog inputs reserved for customer options.

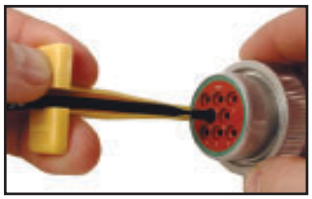
Phoenix Combicon Connections





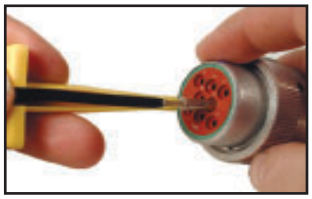
HD30 Type

Step 1: Contact Removal



1. With rear insert toward you, snap appropriate size extractor tool over the wire of contact to be removed.

2. Slide tool along into the insert cavity until it engages contact and resistance is felt.



3. Pull contact–wire assembly out of connector. **NOTE:** Do not twist tool or insert at an angle.

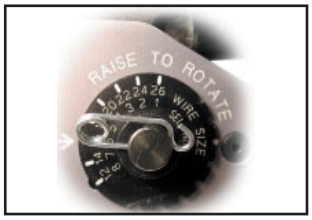
Step 2: Wire Stripping

Solid Contacts

Contact Part Number	Wire Gauge Range	Strip Length (inches)
0460-202-20141 0462-201-20141	20 AWG 20 AWG	.156-.218 .156-.218
0460-202-16141 0462-201-16141	16, 18 & 20 AWG 16, 18 & 20 AWG	.250-.312 .250-.312
0460-215-16141 0462-209-16141	14 AWG 14 AWG	.250-.312 .250-.312
0460-204-12141 0462-203-12141	12 & 14 AWG 12 & 14 AWG	.222-.284 .222-.284
0460-204-08141 0462-203-08141	8 & 10 AWG 8 & 10 AWG	.430-.492 .430-.492
0460-204-0490 0462-203-04141	6 AWG 6 AWG	.430-.492 .430-.492

Step 3: Contact Crimping

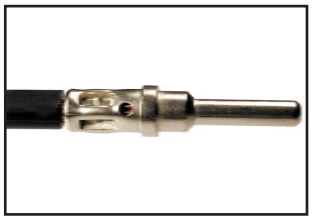
Use Crimp Tool #HDT48-00



1. Strip insulation from wire. (See Step 2).
2. Raise selector knob and rotate until arrow is aligned with wire size to be crimped.
3. Loosen locknut, turn adjusting screw in until it stops.

4. Insert contact with barrel up. Turn adjusting screw counter–clockwise until contact is flush with indentor cover. Tighten locknut.

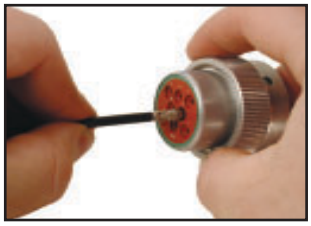
5. Insert wire into contact. Contact must be centered between indicators. Close handles until crimp cycle is completed.
6. Release handles and remove crimped contact.



7. Inspect terminal to ensure that all strands are in crimp barrel. **NOTE:** Tool must be readjusted for each type/size of contact. Use HDT04-08 for size 8 and 4 contacts.

Step 4: Contact Insertion

1. Grasp contact approximately (25.4 mm) one inch behind the contact crimp barrel.



2. Hold connector with rear grommet facing you.

3. Push contact straight into connector grommet until a positive stop is felt. A slight tug will confirm that the contact is properly locked in place. **NOTE:** For unused wire cavities, insert sealing plugs for full environmental sealing

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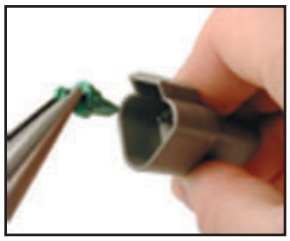
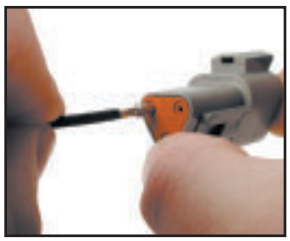
DT Type

Step 1: Contact Removal



1. Remove wedgelock using needlenose pliers or a hook shaped wire. Pull wedge straight out.

2. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.



3. Hold the rear seal in place, as removing the contact may displace the seal.

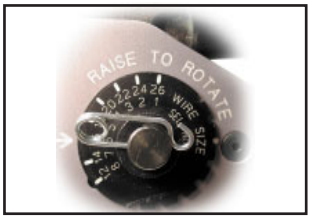
Step 2: Wire Stripping

Solid Contacts

Contact Part Number	Wire Gauge Range	Strip Length (inches)
0460-202-20141 0462-201-20141	20AWG 20AWG	.156-.218 .156-.218
0460-202-16141 0462-201-16141	16, 18 & 20AWG 16, 18 & 20AWG	.250-.312 .250-.312
0460-215-16141 0462-209-16141	14AWG 14AWG	.250-.312 .250-.312
0460-204-12141 0462-203-12141	12 & 14AWG 12 & 14AWG	.222-.284 .222-.284
0460-204-08141 0462-203-08141	8 & 10AWG 8 & 10AWG	.430-.492 .430-.492
0460-204-0490 0462-203-04141	6AWG 6AWG	.430-.492 .430-.492

Step 3: Contact Crimping

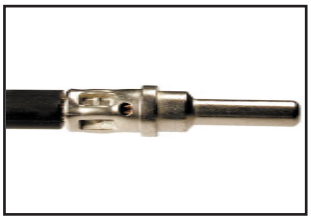
Use Crimp Tool #HDT48-00



1. Strip insulation from wire. (See Step 2).
2. Raise selector knob and rotate until arrow is aligned with wire size to be crimped.
3. Loosen locknut, turn adjusting screw in until it stops.

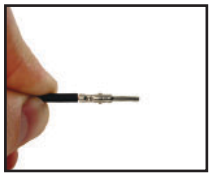
4. Insert contact with barrel up. Turn adjusting screw counter–clockwise until contact is flush with indentor cover. Tighten locknut.

5. Insert wire into contact. Contact must be centered between indicators. Close handles until crimp cycle is completed.
6. Release handles and remove crimped contact.



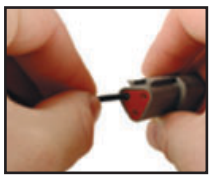
7. Inspect terminal to ensure that all strands are in crimp barrel.**NOTE:** Tool must be readjusted for each type/size of contact. Use HDT04-08 for size 8 and 4 contacts.

Step 4: Contact Insertion



1. Grasp crimped contact approximately (25.2 mm) one inch behind the contact barrel.

2. Hold connector with rear grommet facing you.



3. Push contact straight into connector grommet until a click is felt. A slight tug will confirm that contact is properly locked in place.

4. Once all contacts are in place, insert wedgelock with arrow pointing toward exterior locking mechanism. The wedgelock will snap into place. Rectangular wedges are not oriented. They may go in either way. NOTE: The receptacle is shown –use the same procedure for plug.

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4.1 SERVICE SCHEDULE

◆ 4.1.1 AUTHORIZED OPERATOR MAINTENANCE FUNCTIONS

Every Month or 100 Hours

(whichever comes first)

- Test standby generator system.
- Inspect battery and cables.
- Check engine oil level.
- Check engine coolant level.
- Check generator ground connections.
- Test/inspect starting aids.

Every Three Months or Every 120 Hours

(whichever comes first)

- Inspect and test fuel system and connections.
- Inspect exhaust system.
- Inspect/test fuel supply system.

◆ 4.1.2 AUTHORIZED SERVICE TECHNICIAN MAINTENANCE FUNCTIONS

After First 30 Hours of Operation

- Inspect wiring.
- Change engine crankcase oil and oil filter.
- Inspect engine fan belts.
- Inspect battery and cables.

Every Six Months or Every 200 Hours

(whichever comes first)

- Change engine oil and filter.
- Lubricate engine controls.
- Service engine air cleaner.
- Service engine fuel filter.
- Inspect AC generator.
- Test engine safety controls.
- Inspect fan belts.
- Check engine coolant level.
- Inspect engine cooling system hoses.
- Check optional starting aids.
- Check battery.
- Check engine compression.
- Check electrical connections.
- Check/test annunciator panel.
- Perform operational test.

Annually or Every 600 Hours

(whichever comes first)

- Inspect spark plugs, replace if necessary.
- Inspect all wiring.
- Test engine starter operation.
- Retorque fan bolts.
- Check ignition timing.
- Lubricate fan drive components.

Every Two Years

- Replace all rubber hoses.
- Replace engine fan belts.
- Inspect the Standby Generator System.
- Drain, flush, refill cooling system.

Every 1,000 Operating Hours

- Replace spark plugs.
- Inspect and lubricate engine DC alternator.
- Inspect engine starter.
- Retorque engine mounting brackets.
- Remove/test cooling system thermostat.
- Inspect complete ignition system.

4.2 PERIODIC MAINTENANCE

A rigorous program of scheduled periodic maintenance should be established and maintained. Such a program, if adhered to diligently, will provide added assurance that your power system functions properly when it is needed.

Keeping a “Maintenance Log” is highly recommended. Such a log should be a continuous record of repairs, parts replacements, gauge and instrument readings during operational tests, etc.

Generac recommends that a “Customer Maintenance Inspection Agreement” be established between the user of this equipment and the installing Generac Authorized Service Dealer. Under this agreement, (Part No. 053263), a Generac Authorized Service Technician performs prestart and engine running tests and checks at six-month and one-year intervals. Ask your Generac Authorized Service Dealer (or consult the factory) about this agreement.

The tasks listed in the “Service Schedule” (Page 52) cover the minimum recommended maintenance requirements for this equipment.

Note that many of the tests and checks listed in the schedule are to be performed only by a Generac Authorized Service Technician. Fluid capacities and recommendations, as well as other applicable specifications, are listed in “Specifications” (Page 6).

◆ 4.2.1 TEST STANDBY GENERATOR SYSTEM OPERATION AND COMPONENTS

An authorized operator should test the operation of the standby generator system and inspect its components monthly (or 100 hours). This should include inspecting the transfer switch for evidence of arcing, and pitted or burned contacts; inspecting wiring and grounding connections (see "Grounding the Generator," Page 13); and ensuring that starting devices are operational. During this operational test, all instrument and gauge readings should be recorded in a "Maintenance Log." The transfer system also should be tested at this time; the engine should be run at least 30 minutes and any discrepancies corrected immediately.

Every six months (or 200 hours), a Generac Authorized Service Technician should perform a system operational test.

◆ 4.2.2 INSPECT BATTERY

DANGER

Standby generators installed with automatic transfer switches will crank and start automatically when normal (UTILITY) source voltage is removed or is below an acceptable preset level. To prevent such automatic start-up and possible injury to personnel, do not connect battery cables until you are certain that normal source voltage at the transfer switch is correct and you are ready to place the system into operation.

Storage batteries give off explosive hydrogen gas. This gas can form an explosive mixture around the battery for several hours after charging. The slightest spark can ignite the gas and cause an explosion. Such an explosion can shatter the battery and cause blindness or other injury. Any area that houses a storage battery must be properly ventilated. Do not allow smoking, open flame, sparks or any spark producing tools or equipment near the battery.

Battery electrolyte fluid is an extremely caustic sulfuric acid solution that can cause severe burns. Do not permit fluid to contact eyes, skin, clothing, painted surfaces, etc. Wear protective goggles, protective clothing and gloves when handling a battery. If you spill the fluid, flush the affected area immediately with clear water.

WARNING

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

Do not open or mutilate the battery. Released electrolyte can be toxic and harmful to the skin and eyes.

The battery represents a risk of high short circuit current. When working on the battery, always remove watches, rings or other metal objects, and only use tools that have insulated handles.

An authorized operator should inspect the engine battery system monthly (or 100 hours). At this time, the battery fluid level should be checked and distilled water added if needed. Battery cables and connections also should be inspected for cleanliness and corrosion.

Once every six months (or 200 hours), a Generac Authorized Service Technician should inspect the battery system. At this time the battery condition and state of charge should be checked using a battery hydrometer. The battery should be recharge or replaced as required.

◆ 4.2.3 CHECK FLUIDS

An authorized operator should check the levels of engine oil, and engine coolant monthly (or 100 hours). The oil level should be maintained between the "FULL" and "ADD" marks on the engine dipstick. Recommended fluids are listed on page 6 of this manual.

◆ 4.2.4 INSPECT EXHAUST SYSTEM

Every three months (or 120 hours), an authorized operator should inspect the entire exhaust system. Abnormal noise levels heard during each operational test may indicate a defective exhaust pipe or muffler. Any defective or leaking component should be repaired or replaced immediately by a Generac Authorized Service Technician.

◆ 4.2.5 INSPECT /TEST FUEL SUPPLY SYSTEM

Every three months (or 120 hours), an authorized operator should inspect and test the the fuel supply system, as well as all fuel system connections. All connections must be tight and in good condition. A loose fuel system line may show no signs of leakage, but may draw air into the system causing rough operation and starting difficulties. Any defective or leaking component should be repaired or replaced immediately by a Generac Authorized Service Technician.

4.3 REPAIR PARTS

The latter portion of this manual consist of exploded views, parts lists and electrical data pertaining to this generator set. The parts lists consist of (a) an item number, (b) a part number, (c) the quantity required, and (d) a description of the part. The item number corresponds to an identical number on the exploded view drawing.

◆ 4.3.1 GENERATOR SET DATA CARD

Every generator set has a DATA CARD affixed to the connection box. A second, matching card is located inside the control panel.

When requesting information, ordering replacement parts, asking for service, etc., have the following information:

- Generator Model Number
- Date of Manufacture
- Generator Identification Code
- Generator Assembly Groups

◆ 4.3.2 HOW TO ORDER PARTS

To order a replacement part, locate the part in the applicable exploded view. Contact a Generac Authorized Service Dealer (call 800-333-1322 to locate one in the area) and provide the following information:

- The generator model number.
- The generator identification code, which indicates the specific generator assembly for each unit.
- The part number and corresponding description from the applicable parts list in this manual.
- The applicable exploded view “Group” letter (A-H) and drawing number (five digit number), which can be found on the exploded view drawing.

NOTE:

In most cases, repair parts can be obtained by providing a Generac Authorized Service Dealer with the data card information and a description of the required part. If unable to locate either the data card or the construction document, simply describe the part needed and provide the unit’s model number. This number can be found on the metal DATA PLATE attached to the generator’s lower connection box.

5.1 TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	CORRECTION
The engine will not crank.	1. Fuse blown 2. Loose, corroded or defective battery cables 3. Defective starter contactor 4. Defective starter motor 5. Dead Battery	1. Replace fuse. 2. Tighten, clean or replace as necessary. 3. * 4. * 5. Charge or replace battery.
The engine cranks but will not start.	1. Out of fuel 2. Defective fuel solenoid (FS) 3. Open #14 wire from engine control board 4. Defective spark plug(s) 5. Dirty/Blocked air filter	1. Replenish fuel. 2. * 3. * 4. Clean, re-gap or replace plug(s). 5. Clean or replace as required.
The engine starts hard and runs rough.	1. Clogged or damaged air cleaner 2. Defective spark plug(s)	1. Check, clean or replace air cleaner. 2. Clean, re-gap or replace plug(s).
The engine starts, but then shuts down.	1. Engine oil level low 2. Defective low oil pressure switch 3. Defective high temperature switch 4. Defective control board 5. Low coolant level	1. Check oil and add oil as needed. 2. * 3. * 4. * 5. Check coolant level, repair leaks and refill.
The Auto/Off/Manual switch is set to OFF, but the engine continues to run.	1. Defective switch 2. Defective control board	1. * 2. *
There is no AC output from the generator.	1. Generator main line circuit breaker open 2. Generator internal failure	1. Reset circuit breaker to ON (or closed). 2. *
There is no transfer to standby after utility source failure.	1. Generator main line circuit breaker open 2. Defective transfer switch coil 3. Defective transfer relay 4. Transfer relay circuit open 5. Defective control logic board	1. Reset circuit breaker to ON (or closed). 2. * 3. * 4. * 5. *

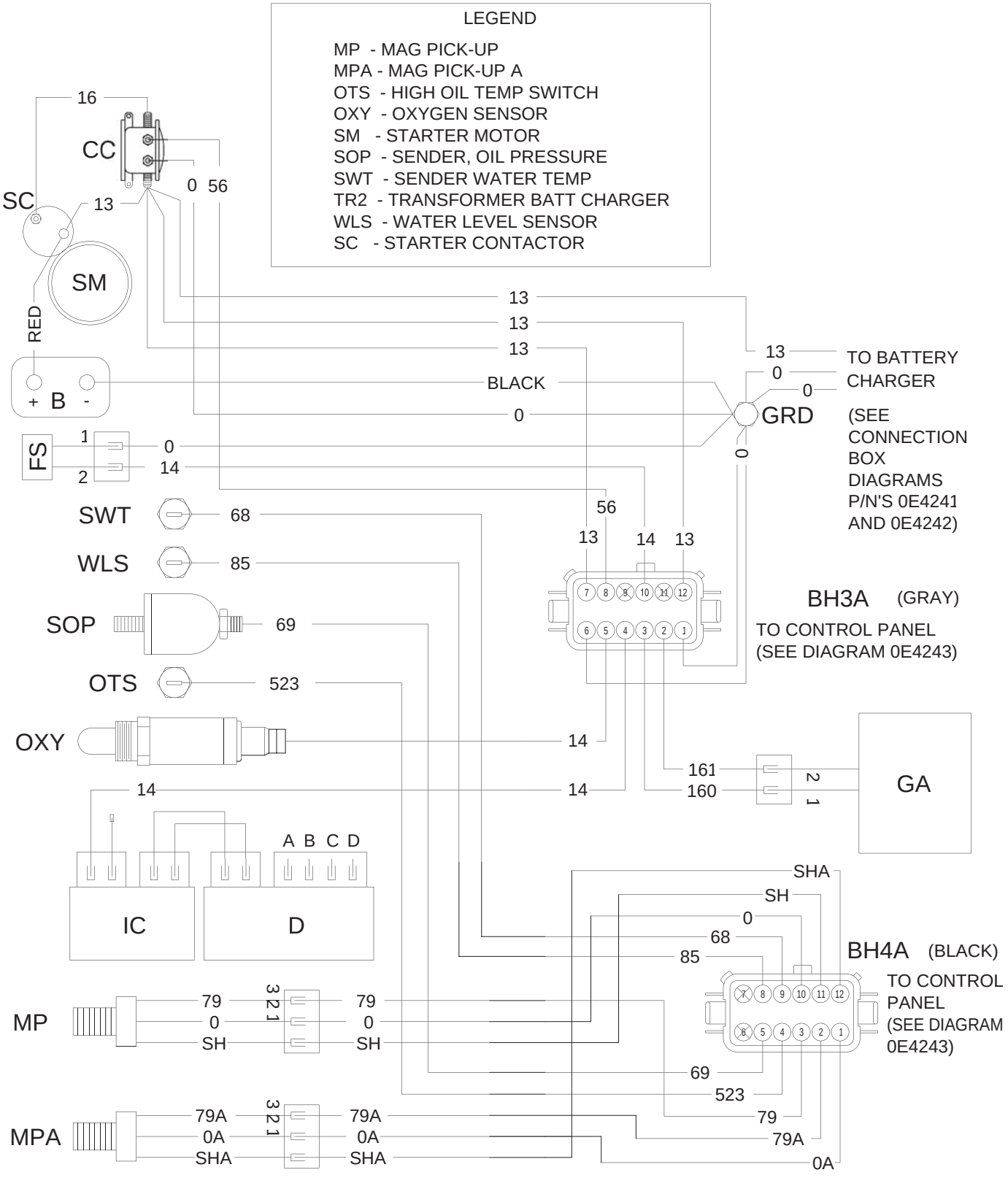
***Contact your nearest Generac Authorized Dealer for assistance.**

STANDARD CONFIGURATIONS

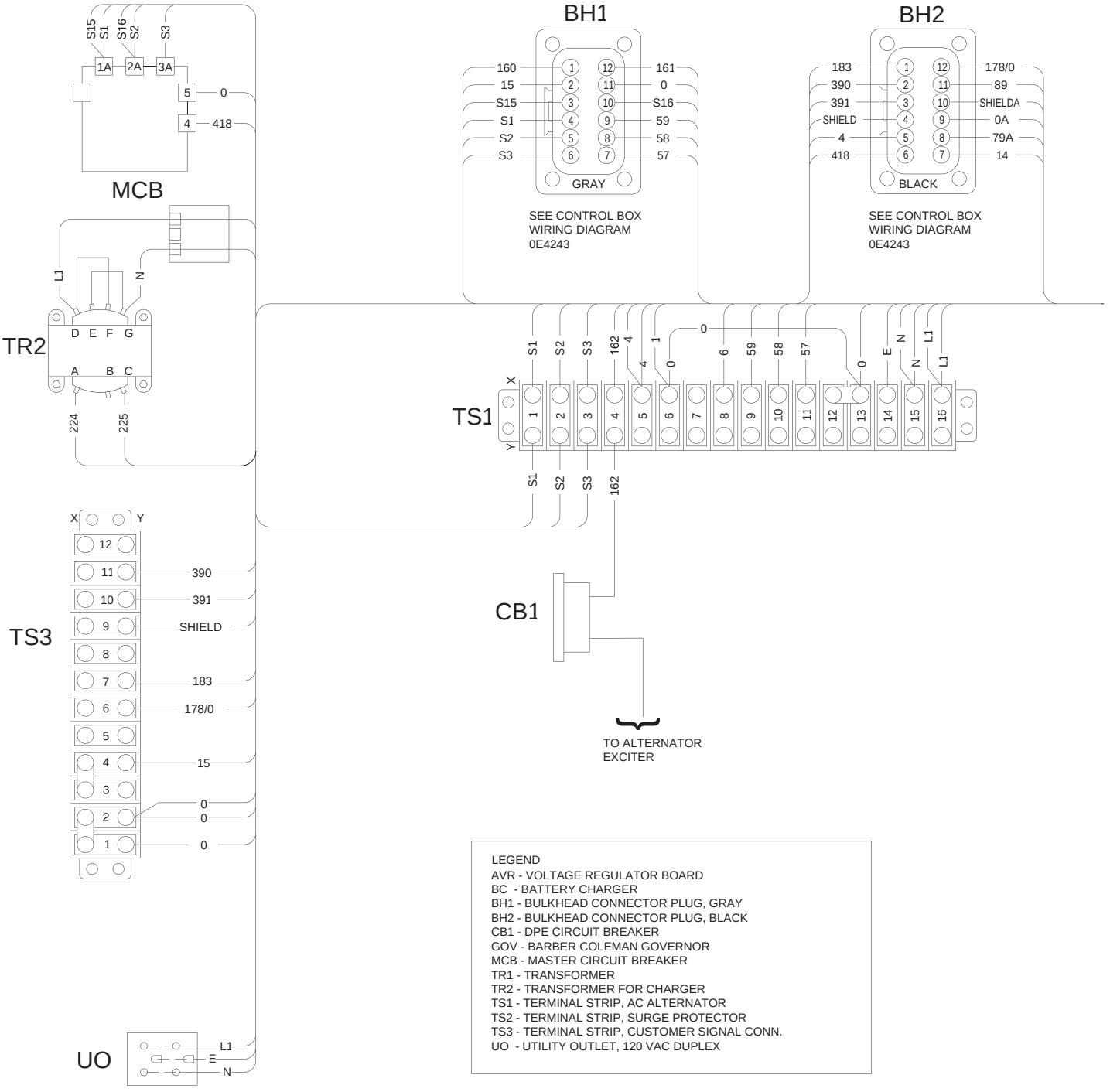
SETTING NAME	120/208 VALUE	277/480V VALUE	ACTIVE	TYPE
Pre-low Oil Pressure Warning	015		Hold Off	Non-latch
Critical Low Oil Pressure Alarm	010		Hold Off	Shutdown
Low Coolant Temp Warning	040		Always	Non-latch
Pre-high Coolant Temp Warning	235		Hold Off	Non-latch
High Coolant Temp Alarm	245		Hold Off	Shutdown
Low Battery Level Warning	12.0		Always	Non-latch
High Battery Level Warning	17.0		Always	Non-latch
Engine Overspeed Alarm	2175		Immediate	Shutdown
Engine Underspeed	1200		Hold Off	Non-latch
Generator Over Voltage	0250	530	Hold Off	Non-latch
Generator Under Voltage	0130	350	Hold Off	Non-latch
Generator Over Frequency	72.0		Hold Off	Non-latch
Generator Under Frequency	40.0		Hold Off	Non-latch
High Fuel Level Warning	80		Disabled	Non-latch
Low Fuel Level Warning	20		Disabled	Non-latch
Critical Low Fuel Level Alarm	10		Disabled	Shutdown
High Oil Temp Alarm	245		Disabled	Shutdown
Pre-high Oil Temp Warning	245		Disabled	Non-latch

ENGINE CONFIGURATIONS

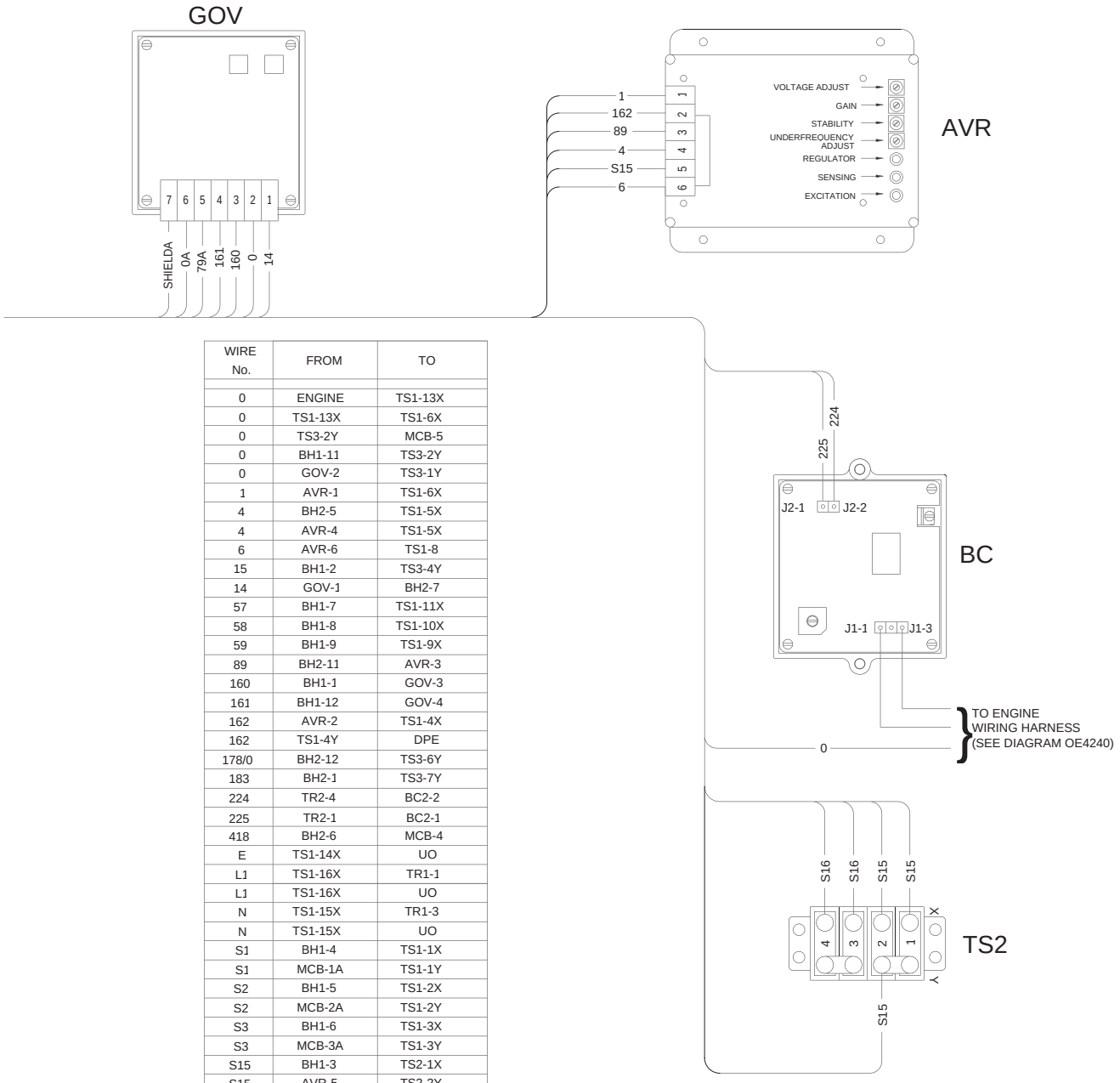
Flywheel Teeth	168	Alarm Hold Off Time	015
Preheat Time	000	Warm Up Time	000
Engine Started RPM	0500	Cool Down Time	000
Start Motor Timer	010	Preheat Enable	Preheat Before and During
Pause Between Start Attempts	005	Preheat Alternative	Output Not Used
Number of Start Attempts	03	Output 1	Common Alarm
Voltage for Accepting Load	187	Output 2	Generator Ready to Accept Load
Frequency for Accepting Load	58	Output 3	Output Not Used


LEGEND
MP - MAG PICK-UP
MPA - MAG PICK-UP A
OTS - HIGH OIL TEMP SWITCH
OXY - OXYGEN SENSOR
SM - STARTER MOTOR
SOP - SENDER, OIL PRESSURE
SWT - SENDER WATER TEMP
TR2 - TRANSFORMER BATT CHARGER
WLS - WATER LEVEL SENSOR
SC - STARTER CONTACTOR
16
CC
SC
13
0
56
SM
RED
+ B -
FS
1
2
0
14
13
13
13
BLACK
0
13
0
0
GRD
0
TO BATTERY CHARGER
(SEE CONNECTION BOX DIAGRAMS P/N'S 0E4241 AND 0E4242)
SWT
68
WLS
85
SOP
69
OTS
523
OXY
14
56
13
14
13
BH3A (GRAY)
TO CONTROL PANEL (SEE DIAGRAM 0E4243)
14
14
161
160
2
1
GA
A B C D
IC
D
SHA
SH
0
68
85
BH4A (BLACK)
TO CONTROL PANEL (SEE DIAGRAM 0E4243)
MP
79
0
SH
3 2 1
79
0
SH
69
523
79
79A
0A
MPA
79A
0A
SHA
3 2 1
79A
0A
SHA

DG 50 S Generator Set
Wiring Diagram (Control Panel 120/208V) – Drawing No. 0E4242-A

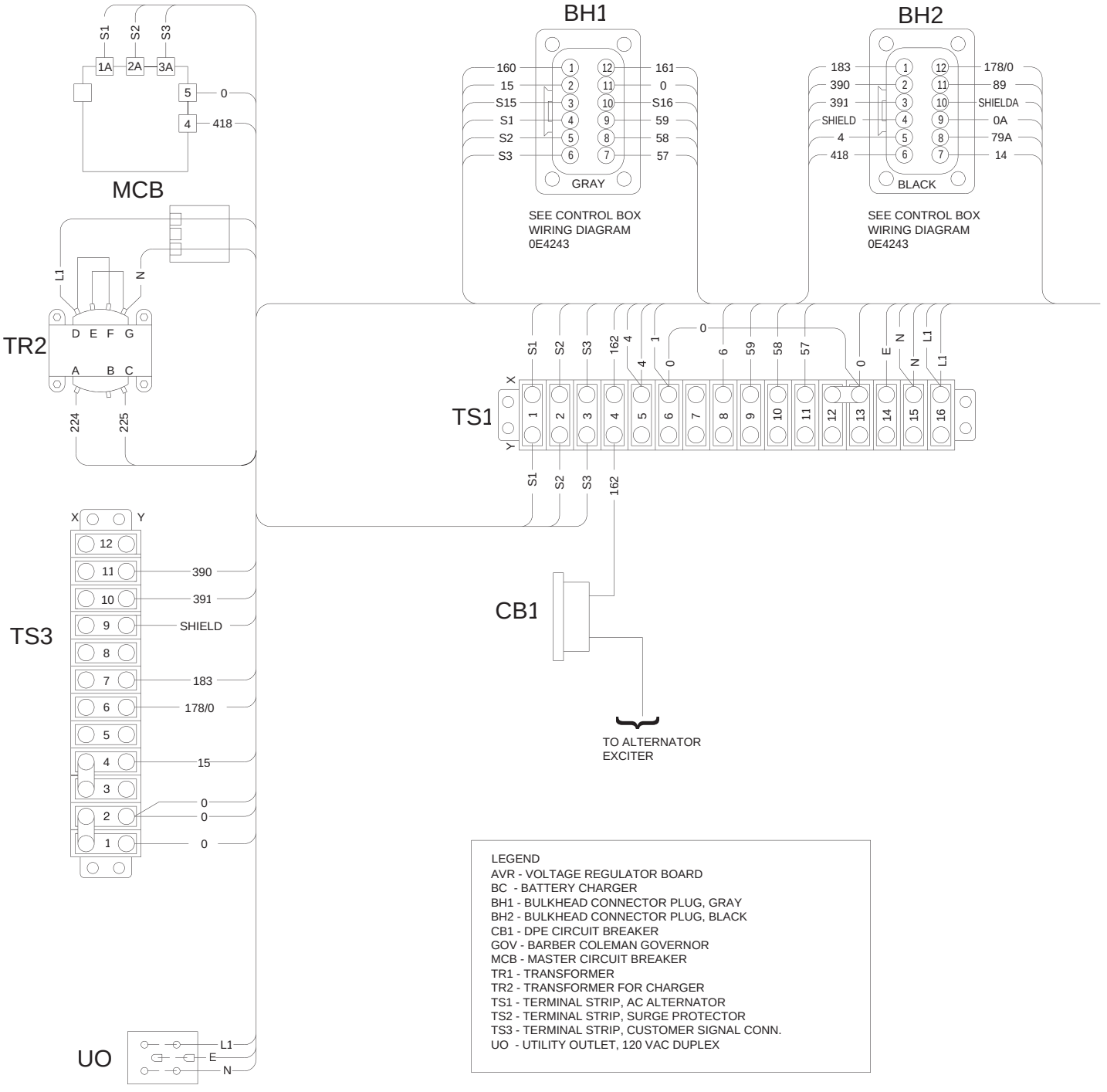


LEGEND
AVR - VOLTAGE REGULATOR BOARD
BC - BATTERY CHARGER
BH1 - BULKHEAD CONNECTOR PLUG, GRAY
BH2 - BULKHEAD CONNECTOR PLUG, BLACK
CB1 - DPE CIRCUIT BREAKER
GOV - BARBER COLEMAN GOVERNOR
MCB - MASTER CIRCUIT BREAKER
TR1 - TRANSFORMER
TR2 - TRANSFORMER FOR CHARGER
TS1 - TERMINAL STRIP, AC ALTERNATOR
TS2 - TERMINAL STRIP, SURGE PROTECTOR
TS3 - TERMINAL STRIP, CUSTOMER SIGNAL CONN.
UO - UTILITY OUTLET, 120 VAC DUPLEX

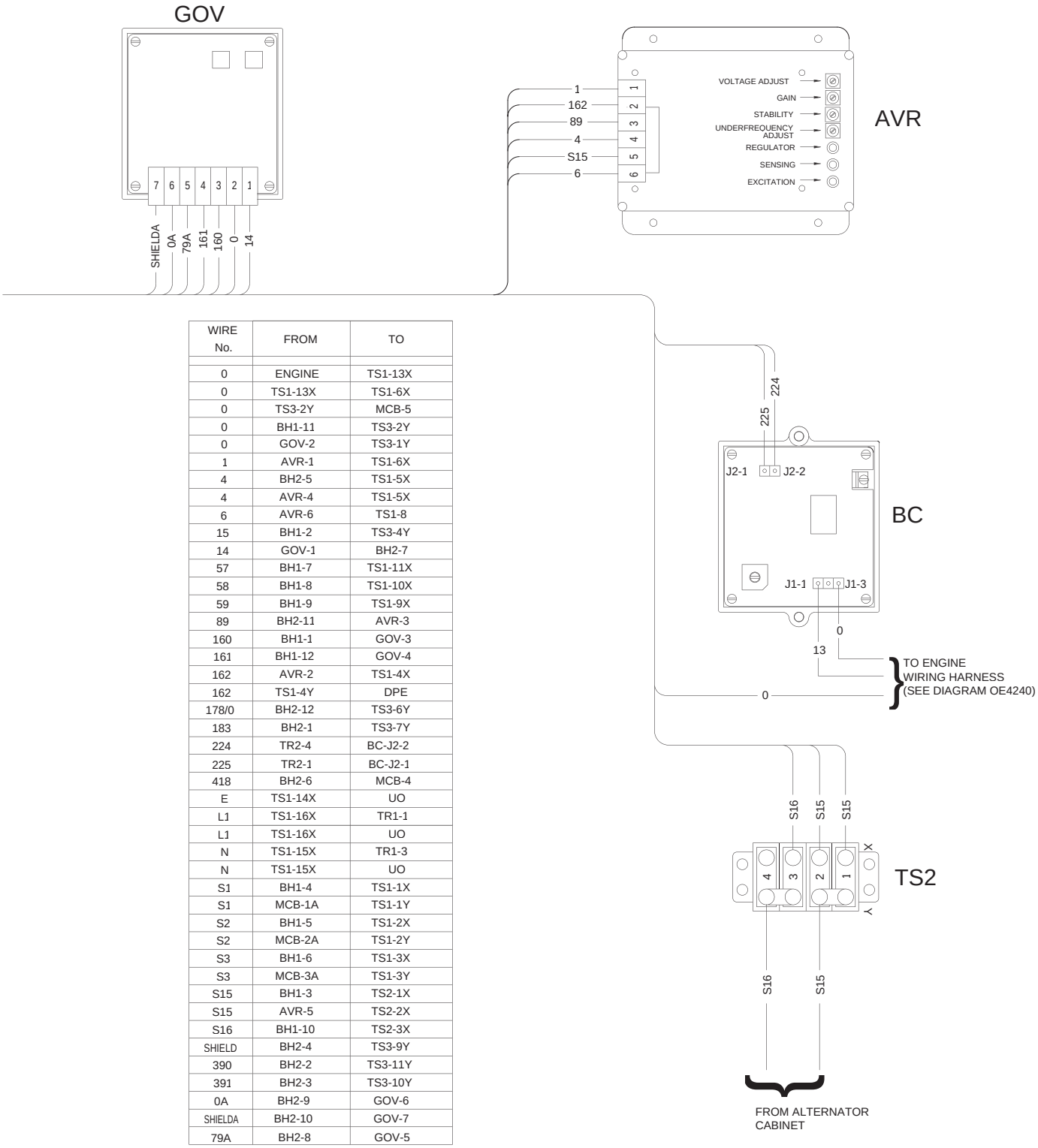


WIRE No.	FROM	TO
0	ENGINE	TS1-13X
0	TS1-13X	TS1-6X
0	TS3-2Y	MCB-5
0	BH1-11	TS3-2Y
0	GOV-2	TS3-1Y
1	AVR-1	TS1-6X
4	BH2-5	TS1-5X
4	AVR-4	TS1-5X
6	AVR-6	TS1-8
15	BH1-2	TS3-4Y
14	GOV-1	BH2-7
57	BH1-7	TS1-11X
58	BH1-8	TS1-10X
59	BH1-9	TS1-9X
89	BH2-11	AVR-3
160	BH1-1	GOV-3
161	BH1-12	GOV-4
162	AVR-2	TS1-4X
162	TS1-4Y	DPE
178/0	BH2-12	TS3-6Y
183	BH2-1	TS3-7Y
224	TR2-4	BC2-2
225	TR2-1	BC2-1
418	BH2-6	MCB-4
E	TS1-14X	UO
L1	TS1-16X	TR1-1
L1	TS1-16X	UO
N	TS1-15X	TR1-3
N	TS1-15X	UO
S1	BH1-4	TS1-1X
S1	MCB-1A	TS1-1Y
S2	BH1-5	TS1-2X
S2	MCB-2A	TS1-2Y
S3	BH1-6	TS1-3X
S3	MCB-3A	TS1-3Y
S15	BH1-3	TS2-1X
S15	AVR-5	TS2-2Y
S15	MCB-1A	TS2-2X
S16	MCB-2A	TS2-4X
S16	BH1-10	TS2-3X
SHIELD	BH2-4	TS3-9Y
390	BH2-2	TS3-11Y
391	BH2-3	TS3-10Y
0A	BH2-9	GOV-6
SHIELDA	BH2-10	GOV-7
79A	BH2-8	GOV-5

DG 50 S Generator Set
Wiring Diagram (Control Panel 277/480V) – Drawing No. 0E4241-A

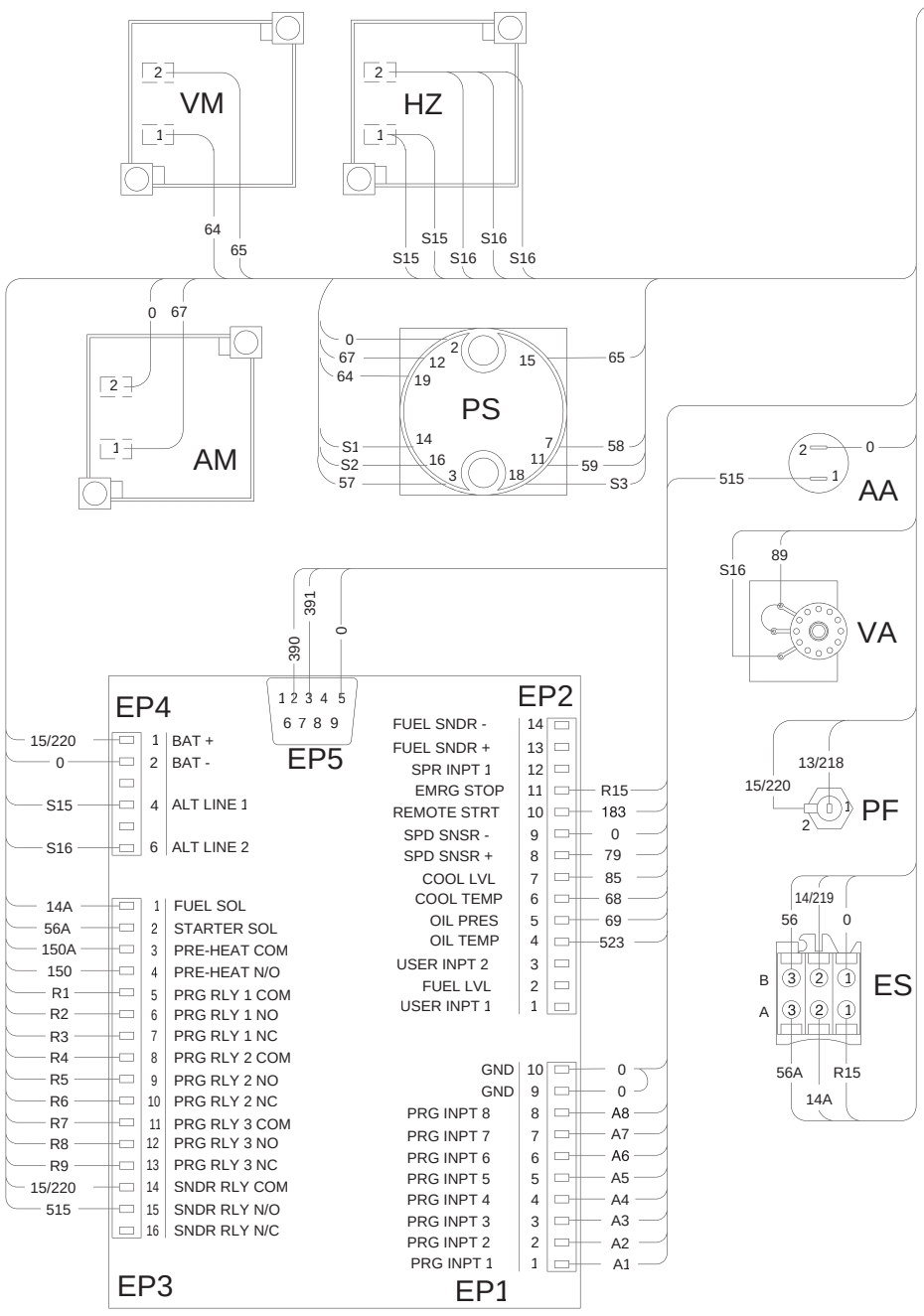


LEGEND
AVR - VOLTAGE REGULATOR BOARD
BC - BATTERY CHARGER
BH1 - BULKHEAD CONNECTOR PLUG, GRAY
BH2 - BULKHEAD CONNECTOR PLUG, BLACK
CB1 - DPE CIRCUIT BREAKER
GOV - BARBER COLEMAN GOVERNOR
MCB - MASTER CIRCUIT BREAKER
TR1 - TRANSFORMER
TR2 - TRANSFORMER FOR CHARGER
TS1 - TERMINAL STRIP, AC ALTERNATOR
TS2 - TERMINAL STRIP, SURGE PROTECTOR
TS3 - TERMINAL STRIP, CUSTOMER SIGNAL CONN.
UO - UTILITY OUTLET, 120 VAC DUPLEX



WIRE No.	FROM	TO
0	ENGINE	TS1-13X
0	TS1-13X	TS1-6X
0	TS3-2Y	MCB-5
0	BH1-11	TS3-2Y
0	GOV-2	TS3-1Y
1	AVR-1	TS1-6X
4	BH2-5	TS1-5X
4	AVR-4	TS1-5X
6	AVR-6	TS1-8
15	BH1-2	TS3-4Y
14	GOV-1	BH2-7
57	BH1-7	TS1-11X
58	BH1-8	TS1-10X
59	BH1-9	TS1-9X
89	BH2-11	AVR-3
160	BH1-1	GOV-3
161	BH1-12	GOV-4
162	AVR-2	TS1-4X
162	TS1-4Y	DPE
178/0	BH2-12	TS3-6Y
183	BH2-1	TS3-7Y
224	TR2-4	BC-J2-2
225	TR2-1	BC-J2-1
418	BH2-6	MCB-4
E	TS1-14X	UO
L1	TS1-16X	TR1-1
L1	TS1-16X	UO
N	TS1-15X	TR1-3
N	TS1-15X	UO
S1	BH1-4	TS1-1X
S1	MCB-1A	TS1-1Y
S2	BH1-5	TS1-2X
S2	MCB-2A	TS1-2Y
S3	BH1-6	TS1-3X
S3	MCB-3A	TS1-3Y
S15	BH1-3	TS2-1X
S15	AVR-5	TS2-2X
S16	BH1-10	TS2-3X
SHIELD	BH2-4	TS3-9Y
390	BH2-2	TS3-11Y
391	BH2-3	TS3-10Y
0A	BH2-9	GOV-6
SHIELDA	BH2-10	GOV-7
79A	BH2-8	GOV-5

DG 50 S Generator Set
Wiring Diagram (Control Panel) – Drawing No. 0E4243

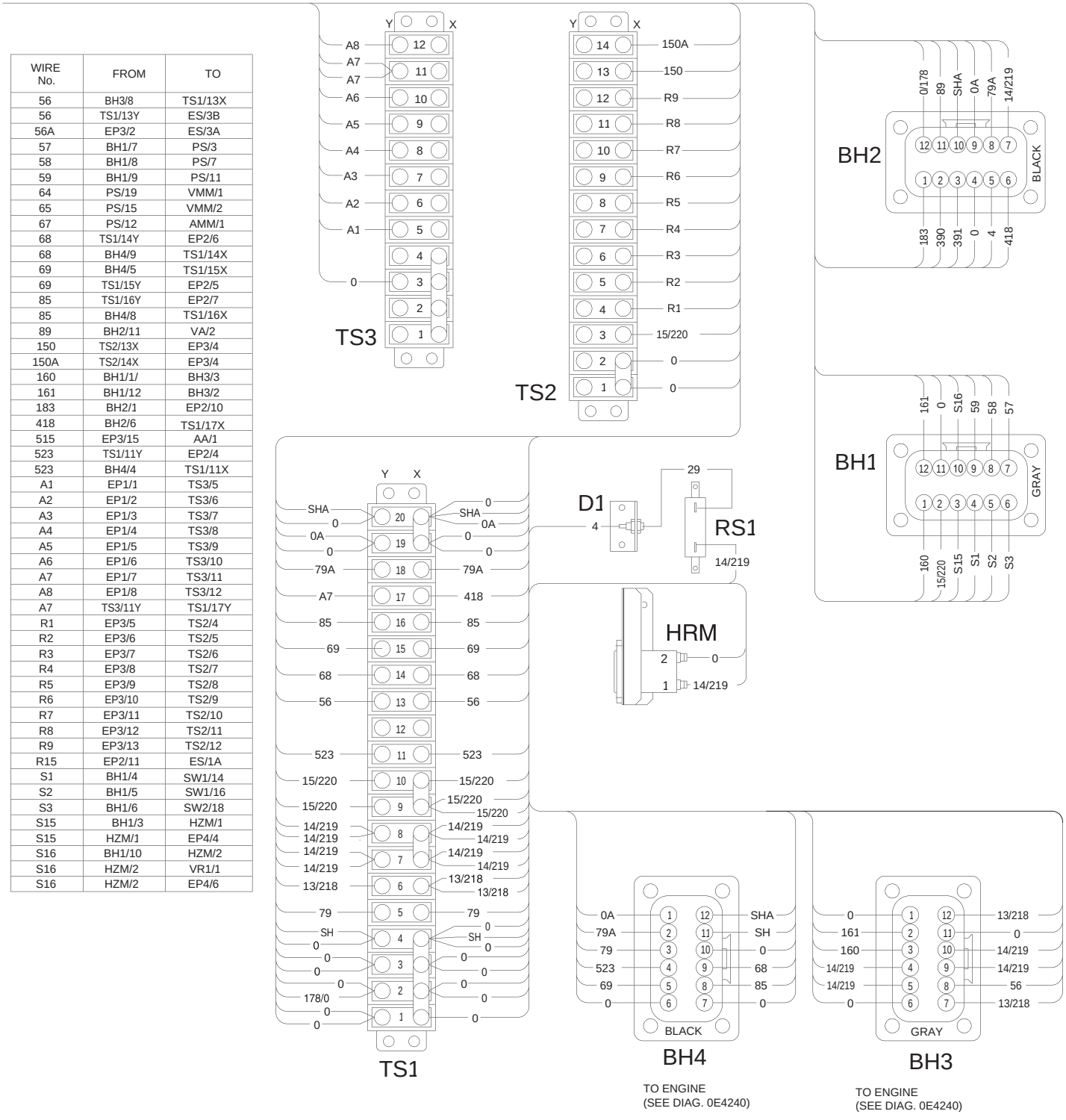


WIRE No.	FROM	TO
0	BH1/11	TS1/3Y
0	BH3/1	TS1/1X
0	BH3/6	TS1/3X
0	BH3/11	TS1/3X
0	BH4/6	TS1/19X
0	EP1/9	EP1/10
0	ES/1B	EP1/9
0	TS1/1Y	EP4/2
0	TS1/1Y	AA/2
0	TS1/2X	HRM/2
0	TS1/2X	BH4/7
0	TS1/2Y	AM/2
0	TS1/4X	TS1/19X
0	TS1/19Y	PS/2
0	TS1/20X	TS2/1X
0	TS1/20Y	TS3/3Y
0	TS2/2X	ES/1B
0	BH2/4	EP5/5
390	BH2/2	EP5/2
391	BH2/3	EP5/3
0A	BH2/9	TS1/19Y
79A	BH2/8	TS1/18Y
SHA	BH2/10	TS1/20Y
79A	BH4/2	TS1/18X
0A	BH4/1	TS1/20X
SHA	BH4/12	
79	BH4/3	TS1/5X
0	BH4/10	TS1/4X
SH	BH4/11	
0	TS1/3Y	EP2/9
79	TS1-5Y	EP2-8
SH	TS1/4Y	N/C
0/178	BH2/12	TS1/2Y
4	BH2/5	DI/2
13/218	BH3/7	TS1/6X
13/218	BH3/12	TS1/6Y
13/218	TS1/6X	PF/1
14/219	BH2/7	TS1/8Y
14/219	BH3/4	TS1/8X
14/219	BH3/5	TS1/7Y
14/219	BH3/9	TS1/7X
14/219	BH3/10	TS1/7X
14/219	TS1/7Y	HRM/1
14/219	TS1/8X	RS1/1
14/219	TS1/8Y	ES/2B
14A	ES/2A	EP3/1
15/220	BH1/2	TS1/10Y
15/220	TS1/9X	PF/2
15/220	TS1/9X	EP4/1
15/220	TS1/9Y	EP3/14
15/220	TS1/10X	TS2/3
29	RS1/2	DI/1

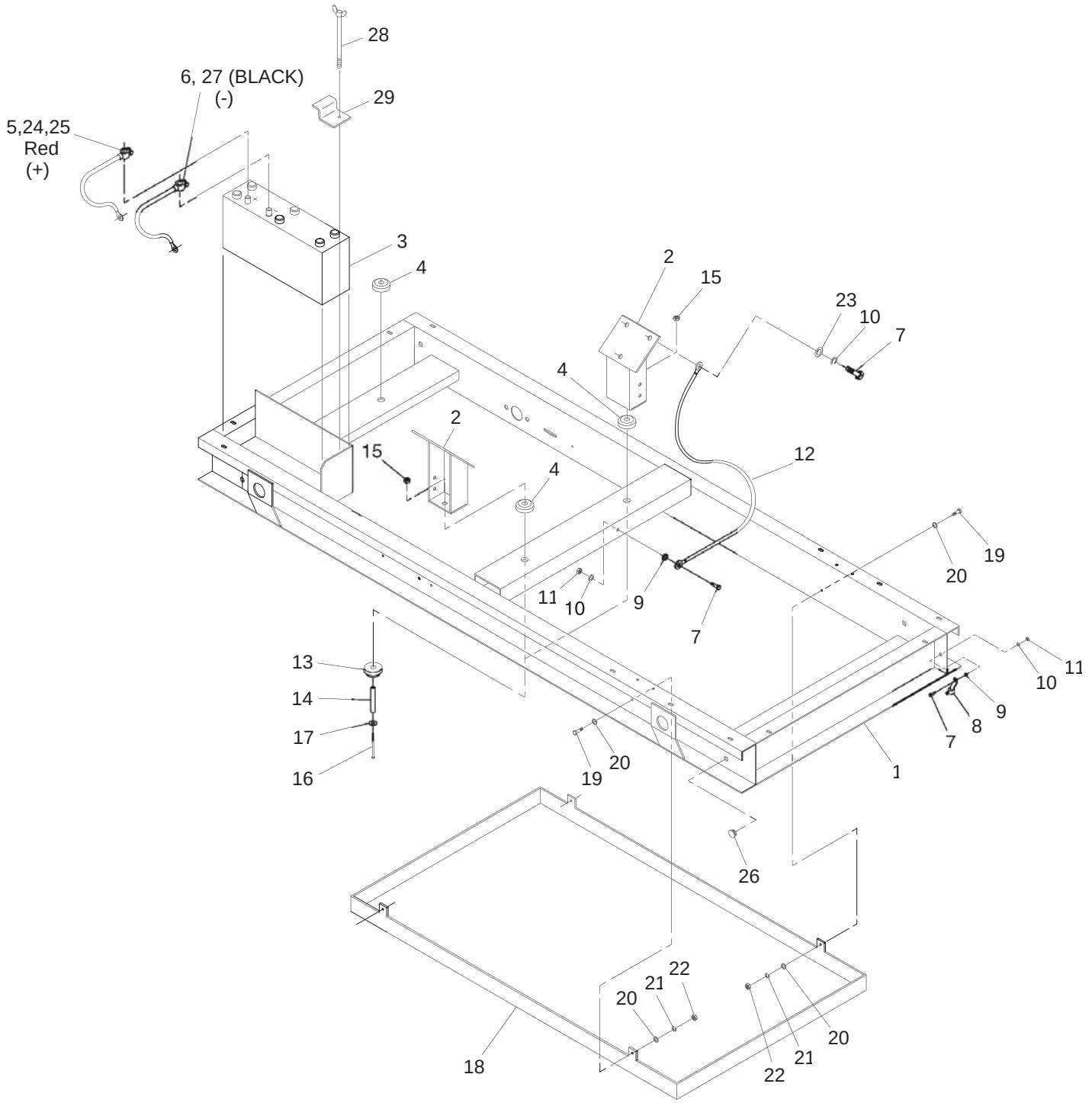
LEGEND

AA-AUDIBLE ALARM
AM-AMMETER
BH1-BULKHEAD CONNECTOR (GRAY)
BH2-BULKHEAD CONNECTOR (BLACK)
BH3-BULKHEAD CONNECTOR (GRAY)
BH4-BULKHEAD CONNECTOR (BLACK)
D1-FIELD BOOST DIODE
EP1-E-PANEL CONNECTOR 1
EP2-E-PANEL CONNECTOR 2
EP3-E-PANEL CONNECTOR 3
EP4-E-PANEL CONNECTOR 4
EP5-E-PANEL CONNECTOR 5
ES-EMERGENCY STOP SWITCH
HRM-HOUR METER
HZ-FREQUENCY METER
PF-PANEL FUSE
PS-PHASE SELECTION SWITCH
RS1-FIELD BOOST RESISTOR
TS1-TERMINAL STRIP 1
TS2-CUSTOMER CONN TERMINAL STRIP 2
TS3-CUSTOMER CONN TERMINAL STRIP 3
VA-VOLTAGE ADJUST POTENTIOMETER
VM-VOLT METER

WIRE No.	FROM	TO
56	BH3/8	TS1/13X
56	TS1/13Y	ES/3B
56A	EP3/2	ES/3A
57	BH1/7	PS/3
58	BH1/8	PS/7
59	BH1/9	PS/11
64	PS/19	VMM/1
65	PS/15	VMM/2
67	PS/12	AMM/1
68	TS1/14Y	EP2/6
68	BH4/9	TS1/14X
69	BH4/5	TS1/15X
69	TS1/15Y	EP2/5
85	TS1/16Y	EP2/7
85	BH4/8	TS1/16X
89	BH2/11	VA/2
150	TS2/13X	EP3/4
150A	TS2/14X	EP3/4
160	BH1/1/	BH3/3
161	BH1/12	BH3/2
183	BH2/1	EP2/10
418	BH2/6	TS1/17X
515	EP3/15	AA/1
523	TS1/11Y	EP2/4
523	BH4/4	TS1/11X
A1	EP1/1	TS3/5
A2	EP1/2	TS3/6
A3	EP1/3	TS3/7
A4	EP1/4	TS3/8
A5	EP1/5	TS3/9
A6	EP1/6	TS3/10
A7	EP1/7	TS3/11
A8	EP1/8	TS3/12
A7	TS3/11Y	TS1/17Y
R1	EP3/5	TS2/4
R2	EP3/6	TS2/5
R3	EP3/7	TS2/6
R4	EP3/8	TS2/7
R5	EP3/9	TS2/8
R6	EP3/10	TS2/9
R7	EP3/11	TS2/10
R8	EP3/12	TS2/11
R9	EP3/13	TS2/12
R15	EP2/11	ES/1A
S1	BH1/4	SW1/14
S2	BH1/5	SW1/16
S3	BH1/6	SW2/18
S15	BH1/3	HZM/1
S15	HZM/1	EP4/4
S16	BH1/10	HZM/2
S16	HZM/2	VR1/1
S16	HZM/2	EP4/6

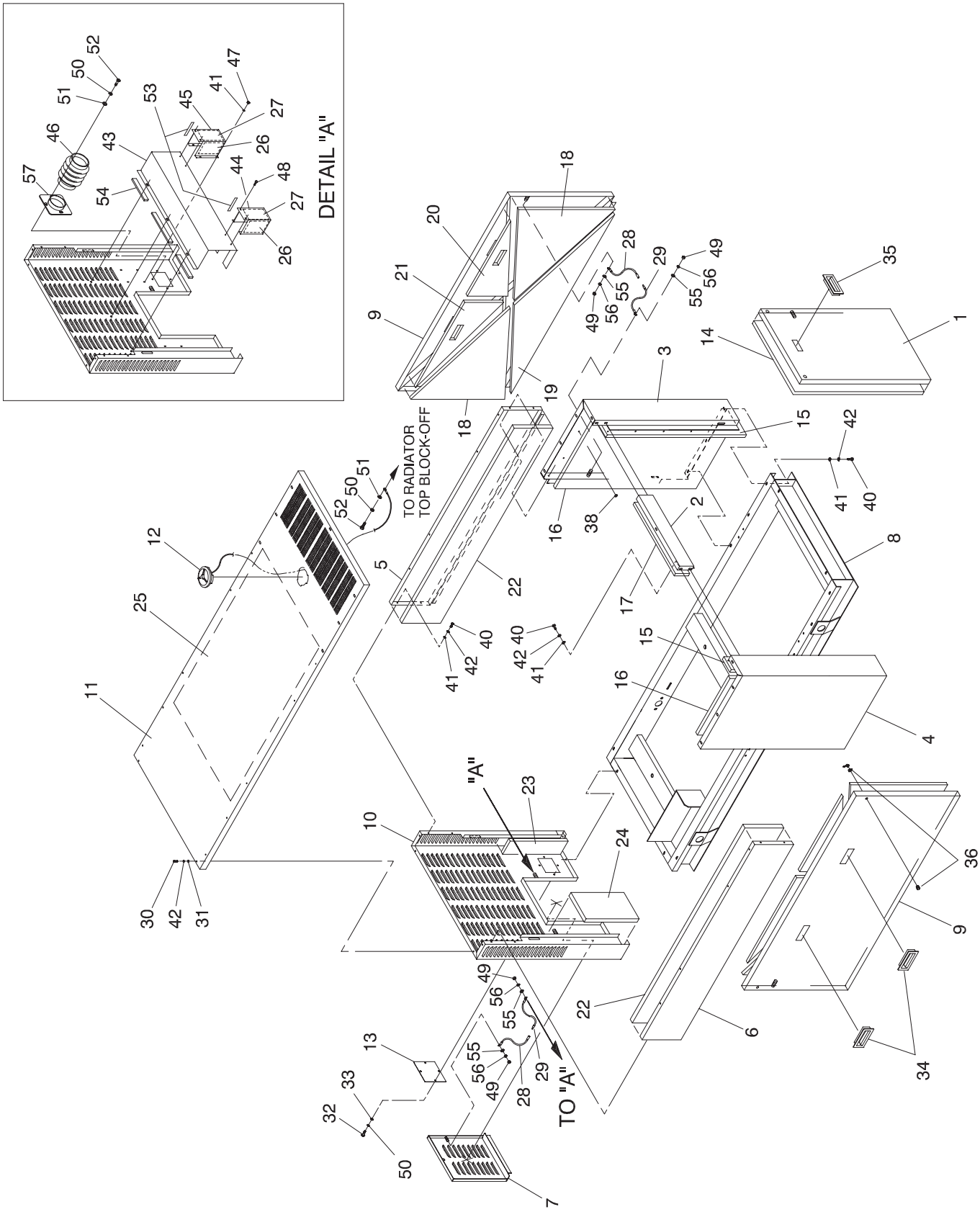


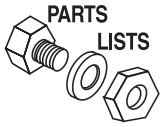
DG 50 S Generator Set
Mounting Base – Drawing No. 0C5714-H



ITEM	PART NO.	QTY.	DESCRIPTION
1	0A9658	1	BASE MOUNTING 50KW UTILITY
2	0C4743	2	ENGINE MOUNT 5.7L
3	0C3100	1	BATTERY 12VDC 460A F-3ET
4	052251A	4	VIB DAMPENER 50 WHITE
5	038804U	1	CABLE BATT RED #1 X 28.00
6	038805J	1	CABLE BATT BLK #1 X 30.00
7	029745	8	SCREW HHC 3/8-16 X 1 G5
8	061383	1	LUG SLDLSS 3/0-#4 X 13/32 CU
9	025507	2	WASHER SHAKEPROOF EXT 7/16 STL
10	022237	8	WASHER LOCK 3/8
11	022241	2	NUT HEX 3/8-16 STEEL
12	0536210760	1	WIRE ASSY QJ CIR BKR
13	052252	4	VIBRATION DAMPNER
14	052257	4	SPACER .49 X .62 X 1.87 PWDR/ZINC
15	052860	4	NUT LOCKING M12-1.75
16	055597	4	SCREW HHC M12-1.75 X 85 G8.8
17	052259	4	WASHER FLAT M12
18	0C3288	1	SPILL PAN SHEET MTL
19	047411	4	SCREW HHC M6-1.0 X 16 G8.8
20	022473	8	WASHER FLAT 1/4 ZINC
21	022097	4	WASHER LOCK M6-1/4
22	049813	4	NUT HEX M6 -1.0 G8 YEL CHR
23	022131	6	WASHER FLAT 3/8-M10 ZINC
24	050331A	1	BATT POST COV RED + (NOT SHOWN)
25	075763	1	BOOT BATT CABLE (NOT SHOWN)
26	0C4753	8	PLUG 3/4" BUTTON
27	050331	1	BATT POST COV BLK (NOT SHOWN)
28	0C7366	1	BOLT WING 1/4-20 X 8.5
29	0E0311	1	BRACKET, BATTERY

DG 50 S Generator Set
Compartment – Drawing No. 0D3578-B



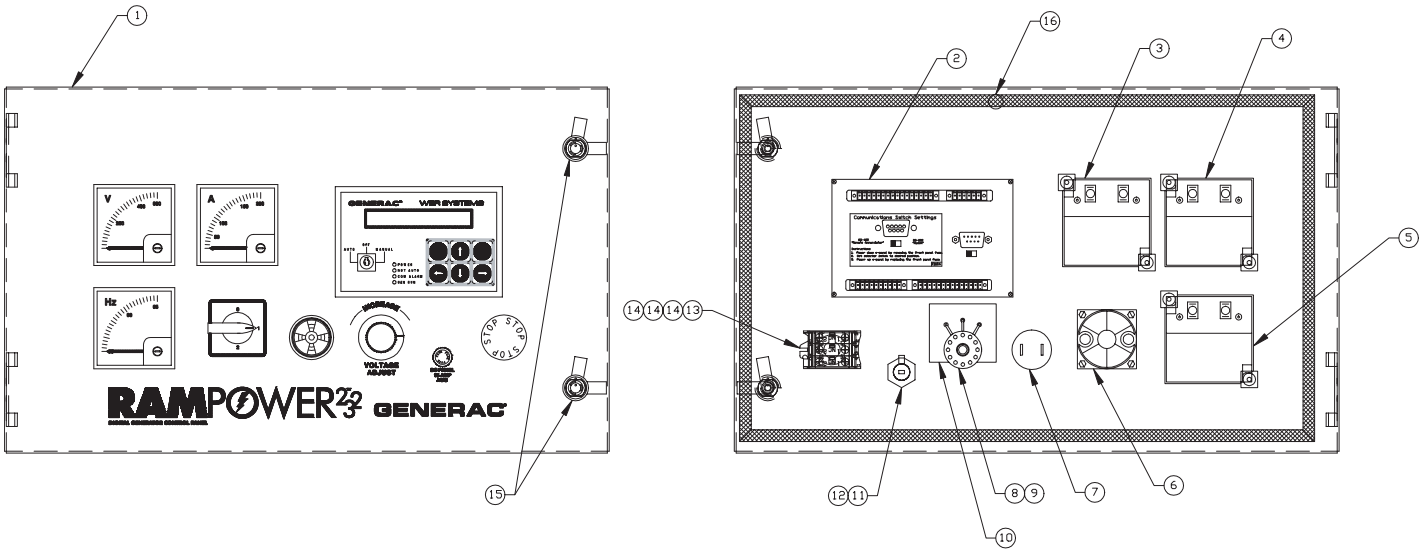


ITEM	PART NO.	QTY.	DESCRIPTION
1	0C2916	1	DOOR FRONT 5.7L
2	0C2911	1	SUPPORT FRONT 5.7L
3	0C1499	1	POST CORNER LH FRONT
4	0C1499A	1	POST CORNER RH FRONT
5	0C1202	1	SUPPORT LH TOP
6	0C1202A	1	SUPPORT RH TOP
7	0C9444	1	DOOR REAR ACCESS
8	0A9658	REF.	BASE MOUNTING 50 KW UTILITY
9	0C1447	2	WELDMENT 5.7 UTILITY DOOR
10	0C4277	1	WELDMENT PANEL REAR
11	0C1953	1	ROOF 5.7L
12	0C2634A	1	ASSY COVER ACCESS
13	0C5029	1	PLATE UTILITY-IN GLAND
14 *	0C4334	1	CERWOOL FRONT DOOR
15 *	0C4334A	2	CERWOOL C-POST FRONT
16 *	0C4334B	2	CERWOOL C POST SIDE
17 *	0C4334C	1	CERWOOL FRONT DOOR
18 *	0C4334D	4	CERWOOL SIDE DOOR UPPER
19 *	0C4334E	2	CERWOOL SIDE DOOR LOWER
20 **	0C3201K	2	INSULATION SIDE DOOR
21 **	0C3201J	2	INSULATION SIDE DOOR
22 **	0C3201B	2	INSULATION SUPPORT TOP
23 **	0C3201H	2	INSULATION REAR PANEL SIDE
24 **	0C3201G	1	INSULATION REAR PANEL BOTTOM
25 **	0C3201A	1	INSULATION ROOF
26 **	0C3201C	4	INSULATION ALT AIR INLET SIDE
27 **	0C3201D	2	INSULATION ALT AIR INLET BACK
28	0536210208	4	ASSY WIRE 14 AWG 6" PLUG
29	0536210145	4	ASSY WIRE 14 AWG 6" RECPT
30	0C3181	17	SCREW BHSC M8-1.25 X 20 SS
31	027756	17	WASHER NYLON .312
32	0A3359	4	SCREW BHSC M6-1.0 X 16 SS
33	0A2115	4	WASHER NYLON .250
34	0C3180	4	HANDLE DOOR
35	020823	1	HANDLE PVC BLACK
36	020825	7	LATCH VICE ACTION
37	020826	2	KEY VICE ACTION LATCH (NOT SHOWN)
38	078115	100	WASHER SELF LOCKING DOME
39	0C8150	33.5'	SEAL RUBBER DOOR (NOT SHOWN)
40	042907	24	SCREW HHC M8-1.25 X 16 G8.8
41	022129	35	WASHER LOCK M8-5/16
42	022145	24	WASHER FLAT 5/16 ZINC
43	0C3707	1	DUCT ALTERNATOR TOP
44	0C3708	1	DUCT RH SIDE ALT AIR INLET
45	0C4961	1	DUCT LH SIDE ALT AIR INLET
46	0C8043	1	BELLOWS UTILITY-IN
47	022259	11	NUT HEX 5/16-18 STEEL
48	086292	4	SCREW DRILLTITE #10-16 X 3/4
49	028430	8	NUT HEX #10-24 STEEL
50	022097	5	WASHER LOCK M6-1/4
51	022473	5	WASHER FLAT 1/4 ZINC
52	047411	5	SCREW HHC M6-1.0 X 16 G8.8
53	056326	1 FT.	TRIM VINYL BLACK 1/8 GP
54	029451	7.5 FT.	TAPE ELEC UL FOAM 1/8 X 1/2
55	023897	8	WASHER FLAT #10 ZINC
56	023762	8	WASHER SHAKEPROOF EXT #10 STL
57	0C8591	2	WLDMNT UTIL-IN FLANG

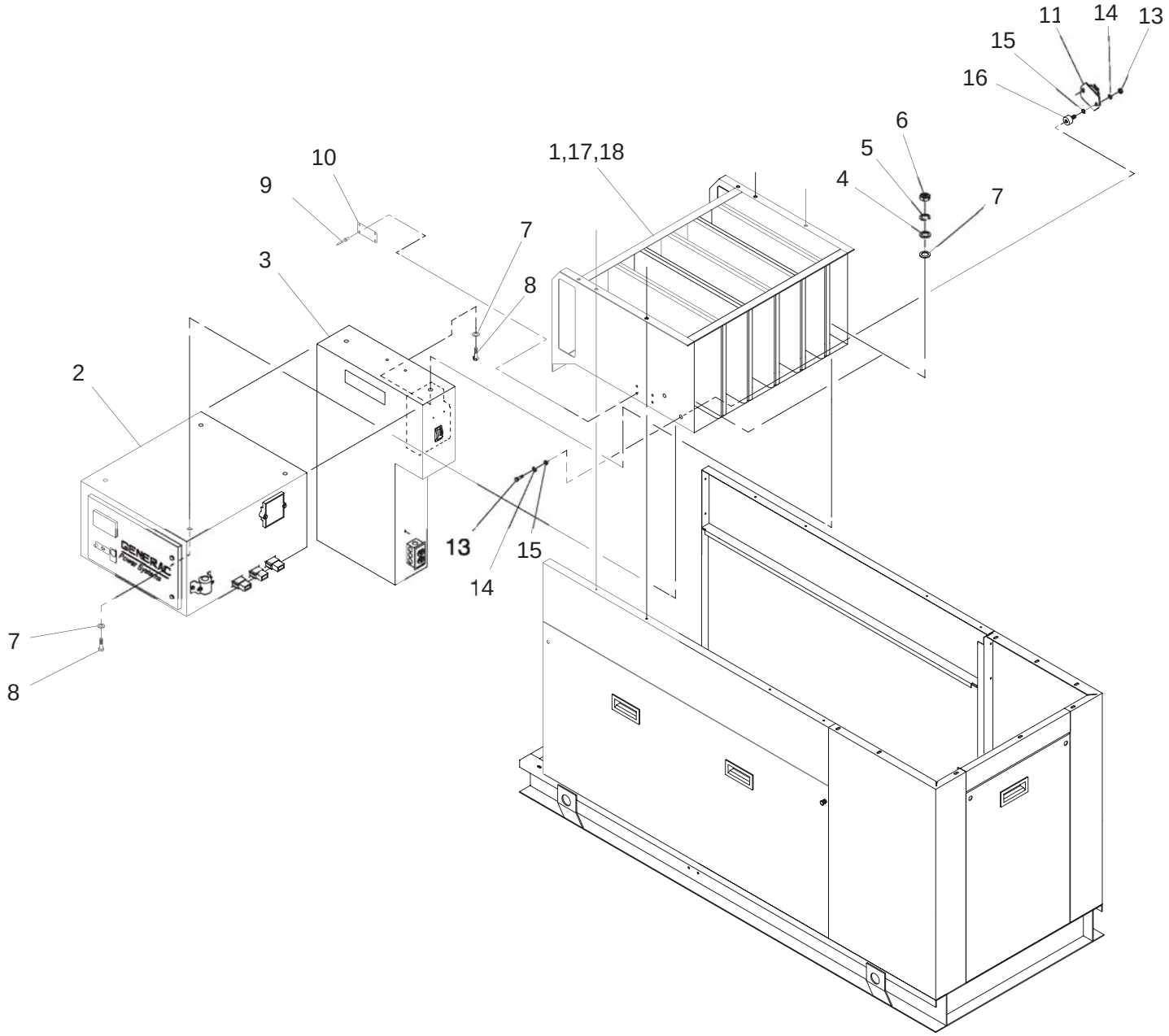
* HEAT INSULATION KIT P/N 0C3788

** INSULATION KIT P/N 0C3201

DG 50 S Generator Set
Control Panel Door – Drawing No. 0E4031-A



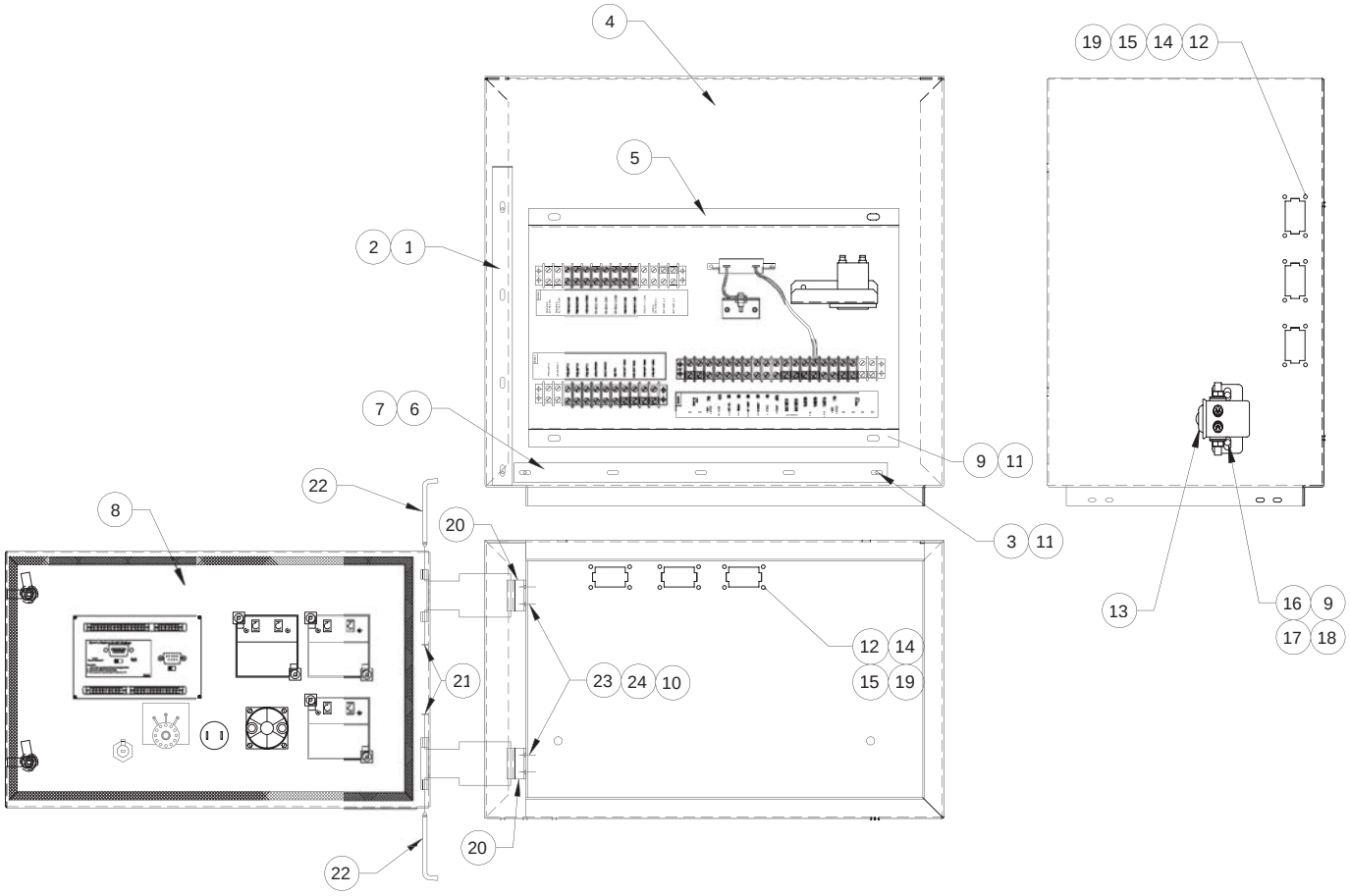
ITEM	PART NO.	QTY.	DESCRIPTION
1	0E3893	1	'E' PANEL FRONT W/SILKSCREEN
2	0A4087	1	MSTR CTRL BOX E-PNL
3	070045	1	AMMETER AC 0-200
4	070044	1	VOLTMETER AC 0-600
5	070042	1	FREQUENCY METER 240V 55-65HZ
6	061945	1	SWITCH SELECTOR 6A AMP/V
7	061286	1	SOUNALERT, BUZZER
8	071361	1	POT PNL 5K 10% 2W
9	050123	1	KNOB PLASTIC .25 SHAFT
10	055349	1	INSULATOR
11	032300	1	HOLDER FUSE
12	022676	1	FUSE 15A X AGC15
13	0E2693A	1	SWITCH MUSHRM HEAD/ARROWS 40MM
14	0E2693C	3	CONTACT BLOCK NC
15	020825	2	LATCH VICE ACTION
16	0C5123	1	SEAL DOOR 3/8"X 1/4" (30"LG)



ITEM	PART NO.	QTY.	DESCRIPTION
1	0C3630	1	WELDMENT AIR INLET DUCT
2	0E4015	1	ASSY CTL PNL DG50S 120/208
	0E4598	1	ASSY CTL PNL DG50S 277/480
3	0E3937	1	ASSY CONN BOX 120/208 SG50C
	0E4029	1	ASSY CONN BOX 277/480
4	022131	6	WASHER FLAT 3/8-M10 ZINC
5	022237	6	WASHER LOCK 3/8
6	022241	6	NUT HEX 3/8-16 STEEL
7	090977	12	WASHER FLAT .375ID X .875OD
8	031578	6	SCREW HHC 3/8-16 X 1-1/2 G8
9	036261	4	RIVET POP .125 X .129-.133/#30

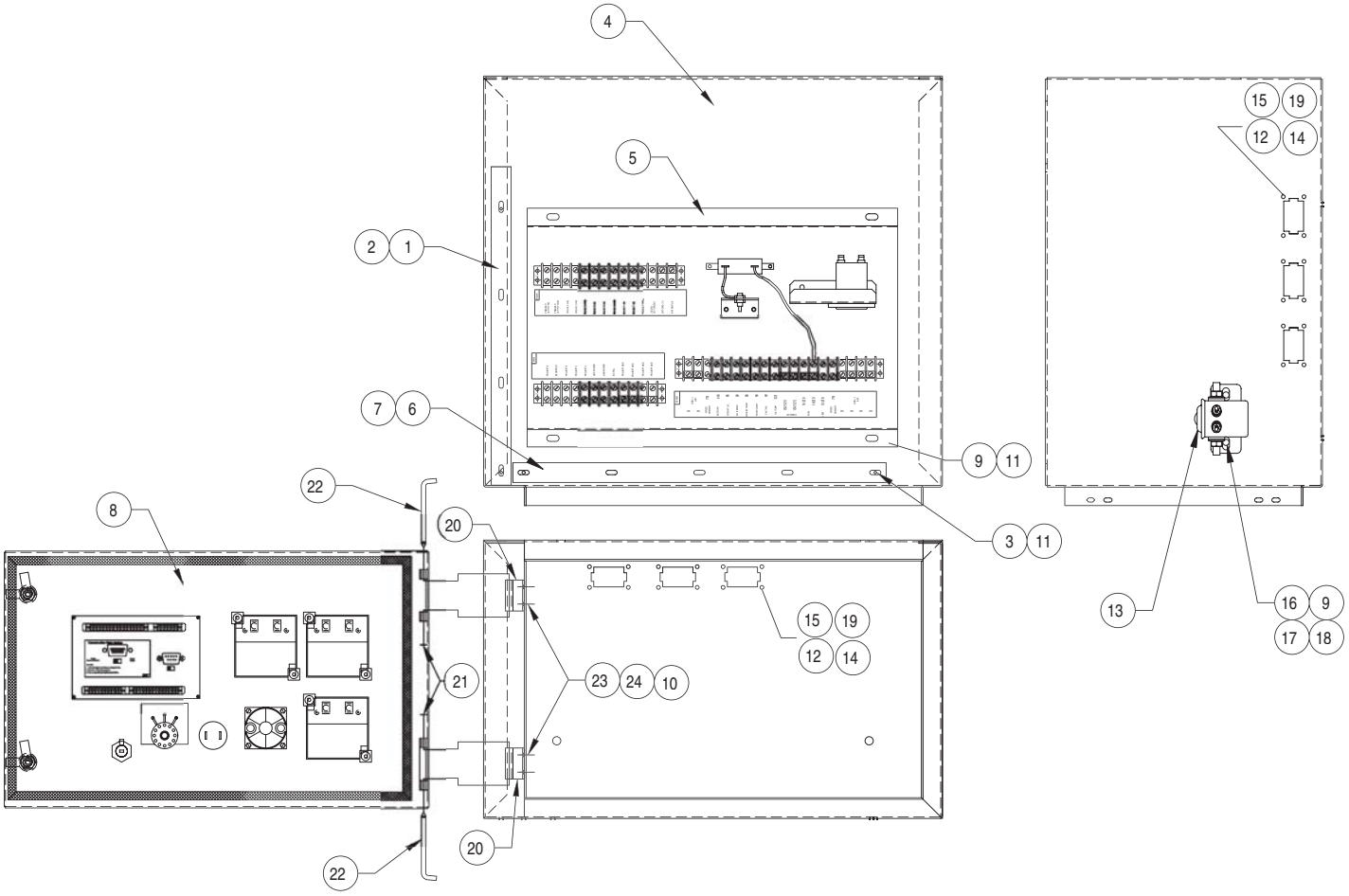
ITEM	PART NO.	QTY.	DESCRIPTION
10	045452S	1	PLATE DATA NAME
11	0A2702	1	REGULATOR VOLTAGE (20A.)
12	0C7599	1	HARNESS D.C. ALT (NOT SHOWN)
13	022127	4	NUT HEX 1/4-20 STEEL
14	022097	4	WASHER LOCK M6-1/4
15	022473	4	WASHER FLAT 1/4 ZINC
16	027831	2	VIB MOUNT .50 X 1.0 X 1/4-20
17	0C3201E	2	INSULATION AIR INLET DUCT SIDE
18	0C3201F	5	INSULATION AIR INLET DUCT MIDDLE

DG 50 S Generator Set
Control Panel Assembly – Drawing No. 0E4598



ITEM	PART NO.	QTY.	DESCRIPTION
1	0C3988	1	BASE WIRE DUCT 1
2	0C3988A	1	COVER WIRE DUCT 1
3	0C3990	4	SCREW TAPTITE PH M4-0.7X10 ZYC
4	0C5794	1	WELDMENT C-PNL TOP
5	0E4038	1	ASSY CONN SUBPLATE SG50C
6	0C5925	1	DUCT WIRE F-PNL
7	0C5925A	1	DUCT WIRE COVER F-PNL
8	0E4509	1	SUBASSY DOOR DG50S 277/480 CP
9	022097	6	WASHER LOCK M6-1/4
10	022264	8	WASHER LOCK M4
11	045756	4	SCREW TAPTITE M6X10 YEL CHR
12	0C5141	6	GASKET CONN BLKHD

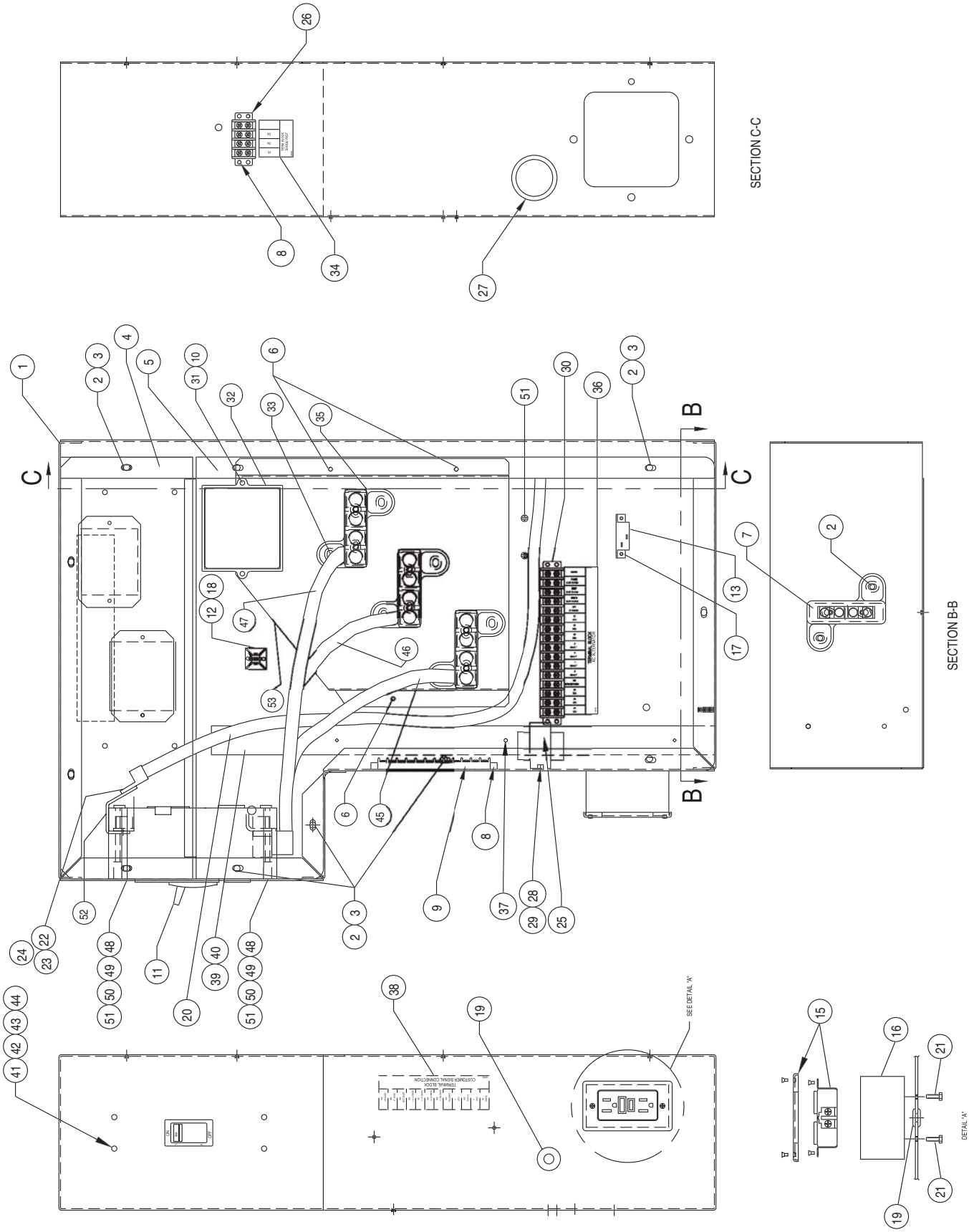
ITEM	PART NO.	QTY.	DESCRIPTION
13	056739	1	RELAY SOLENOID 12VDC PNL MNT
14	022188	24	NUT HEX #6-32 STEEL
15	022155	24	WASHER LOCK #6
16	022473	2	WASHER FLAT 1/4 ZINC
17	049813	2	NUT HEX M6 -1.0 G8 YEL CHR
18	049815	2	SCREW HHC M5-0.8 X 16 G8.8
19	036902	24	SCREW PPHM #6-32 X 1/2
20	0C5719	2	HINGE FASTENED HALF
21	0C5721	2	RING SNAP HINGE
22	0C5722	2	PIN HINGE
23	043180	4	WASHER FLAT M4
24	049819	4	SCREW HHC M4-0.7 X 6 G8.8



ITEM	PART NO.	QTY.	DESCRIPTION
1	0C3988	1	BASE WIRE DUCT 1
2	0C3988A	1	COVER WIRE DUCT 1
3	0C3990	4	SCREW TAPTITE PH M4-0.7X10 ZYC
4	0C5794	1	WELDMENT,C-PNL TOP
5	0E4038	1	ASSY CONN SUBPLATE SG50C
6	0C5925	1	DUCT WIRE F-PNL
7	0C5925A	1	DUCT WIRE COVER F-PNL
8	0E4031	1	ASSY CTL PNL DG50S 120/208
9	022097	6	WASHER LOCK M6-1/4
10	022264	8	WASHER LOCK M4
11	045756	4	SCREW TAPTITE M6X10 YEL CHR
12	0C5141	6	GASKET CONN BLKHD

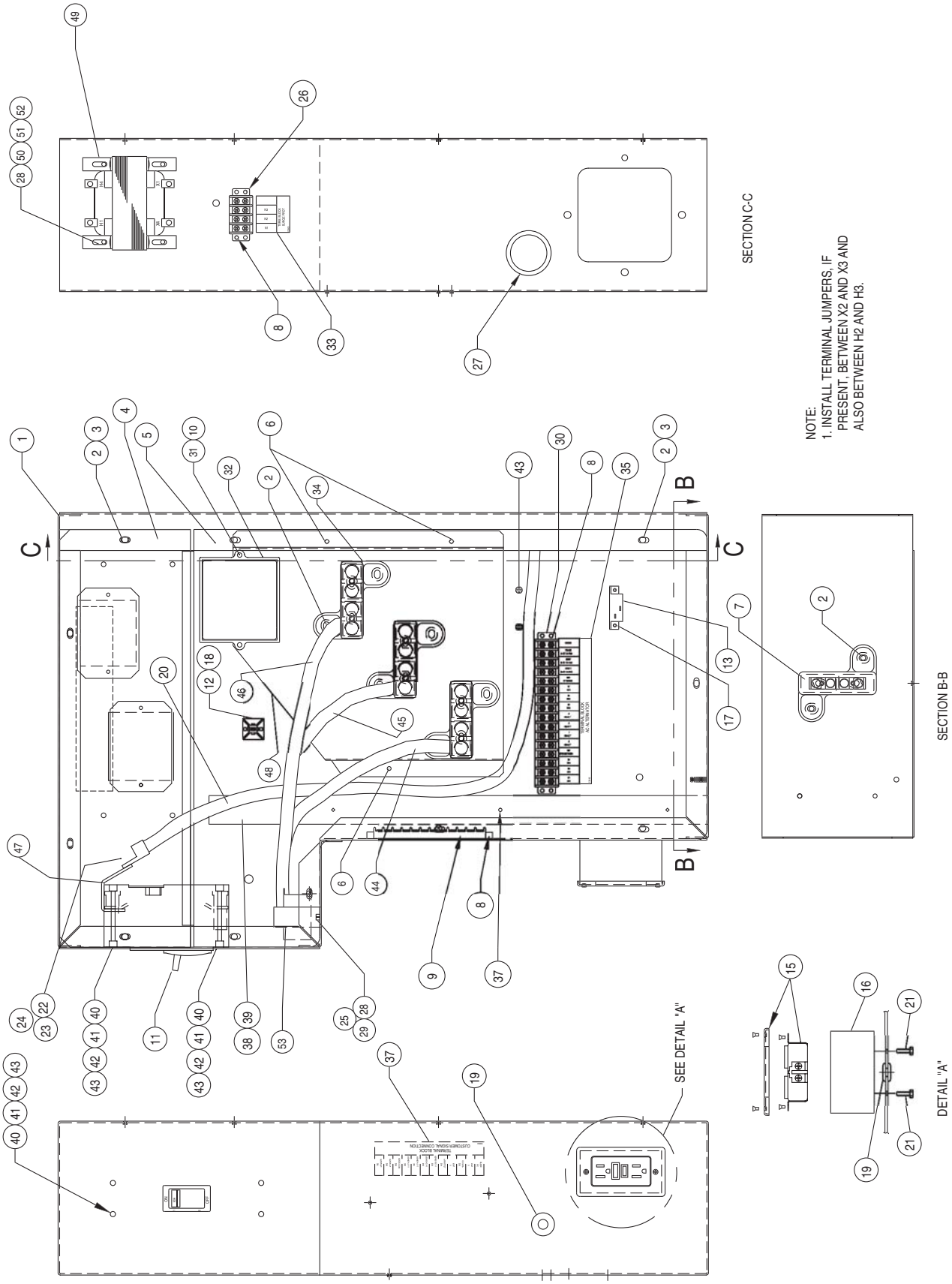
ITEM	PART NO.	QTY.	DESCRIPTION
13	056739	1	RELAY SOLENOID 12VDC PNL MNT
14	022188	24	NUT HEX #6-32 STEEL
15	022155	24	WASHER LOCK #6
16	022473	2	WASHER FLAT 1/4 ZINC
17	049813	2	NUT HEX M6 -1.0 G8 YEL CHR
18	049815	2	SCREW HHC M5-0.8 X 16 G8.8
19	036902	24	SCREW PPHM #6-32 X 1/2
20	0C5719	2	HINGE FASTENED HALF
21	0C5721	2	RING SNAP HINGE
22	0C5722	2	PIN HINGE
23	043180	4	WASHER FLAT M4
24	049819	4	SCREW HHC M4-0.7 X 6 G8.8

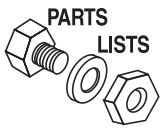
DG 50 S Generator Set
120/208 Connection Box Assembly – Drawing No. 0E3937-A



ITEM	PART NO.	QTY.	DESCRIPTION
1	0C4903A	1	WLDMNT CONN BOX 120
2	090388	14	SCREW TAPTITE M6-1.0 X 12 BP
3	0A2115	12	WASHER NYLON .250
4	0E4025	1	ASSY, SG50C CONN BOX SUBPLATE
5	0C4969	1	COVER PLATE CONN BOX
6	074908	3	SCREW TAPTITE M5-0.8 X 10 BP
7	0C4449	1	ASSEMBLY NEUTRAL BLOCK 100A
8	0A1661	6	RIVET POP .156 X .160-.164/#20
9	055911	REF	BLOCK TERM 20A 12 X 6 X 1100V
10	0E4030	2	SCREW HHTT M5-0.8 X 45 BP
11	0C7595	REF	ASSEMBLY CIRC BRKR 120 / 208
12	028739A	2	TIE WRAP 3.9" X .10" BLK UL
13	048476	1	CIRCT BRK 4.5X1 AUT30KW CNT45K
14	0E4235	1	CONNPNL HARN 208/120 UQSG50 (NOT SHOWN)
15	080409	1	RECEP DUPLEX GFCI20A
16	0D2759	1	GFCI BOX WEATHER PROOF
17	0C2428	2	SCREW PHTT #6-32 X 1/2 ZYC
18	057593	2	MOUNT TIE CABLE BLACK
19	089685	2	GROMMET .75 X .12 X .50
20	0536210206	REF	CABLE CB TO TS 5.7L
21	045756	2	SCREW TAPTITE M6-1 X 10 YEL CHR
22	023152	3	SCREW HHC 3/8-16 X 3/4 G5
23	022241	3	NUT HEX 3/8-16 STEEL
24	022237	3	WASHER LOCK 3/8
25	0C8105	1	ASSY56VA TRANSFORMER
26	046689	REF	BLOCK TERM 20A 4 X 6 X 1100V
27	036654	1	GROMMET 1-3/4 X 1/16 X 1-1/2
28	022264	2	WASHER LOCK M4
29	0A1495	2	SCREW TAPTITE M4-0.7 X 10 BP
30	043365	REF	BLOCK TERM 20A 16 X 6 X 1100V
31	029187	2	SPACER .19 X .31 X .50 PL
32	0A1801	1	ASSY BATTERY CHARGER ENGINE
33	090388	6	SCREW HHTT M6-1.0 X 12 ZINC
34	0E4133	1	DECAL, UTILITY SURGE PROTECTOR
35	0C4449A	3	ASS'Y-NTRL BL150-200A
36	0C8062	1	DECAL-UTIL ALT CONN
37	091477	3	RIVET WIRE DUCT MNT
38	0E4136	1	DECAL-CUSTOMER SIGNAL CONNS
39	091472	2 FT	DUCT WIRING 1 X 1.5 6 FT
40	091472A	2 FT	COVER WIRE DUCT 1 IN
41	042419	4	SCREW RHM 10-32 X 4
42	023897	4	WASHER FLAT #10 ZINC
43	022152	4	WASHER LOCK #10
44	022158	4	NUT HEX #10-32 STEEL
45	0536210247	1	WIRELEAD CB TO NBLK
46	0536210248	1	WIRELEAD CB TO NBLK
47	0536210249	1	WIRELEAD CB TO NBLK
48	042419	4	SCREW RHM 10-32 X 4
49	023897	4	WASHER FLAT #10 ZINC
50	022152	4	WASHER LOCK #10
51	022158	4	NUT HEX #10-32 STEEL
52	0C9213	1	PLATED, BUS BAR
53	0E3908	1	SUBPLATE, CUSTOMER CONNECTION

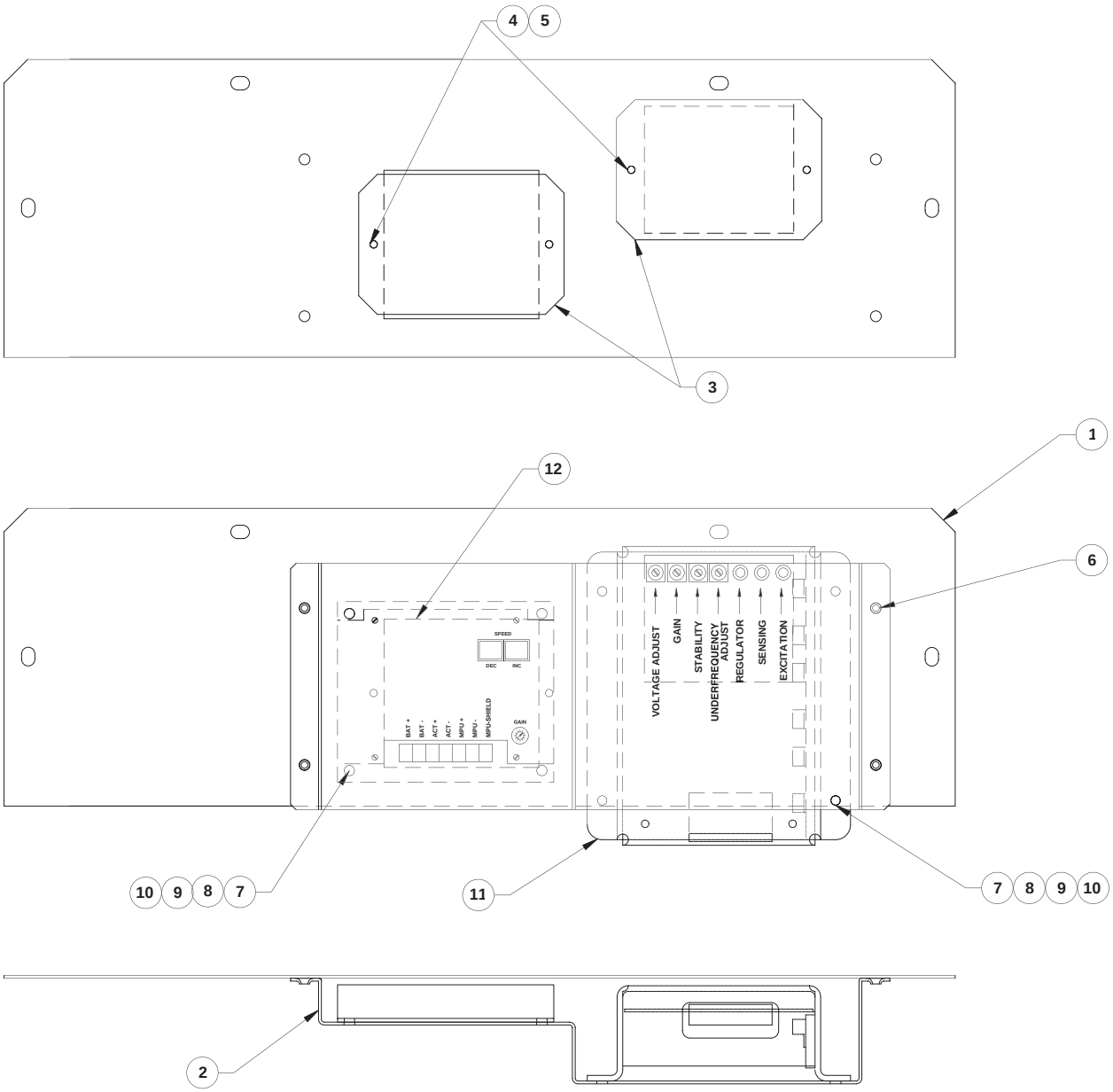
DG 50 S Generator Set
277/480 Connection Box Assembly – Drawing No. 0E4029-B



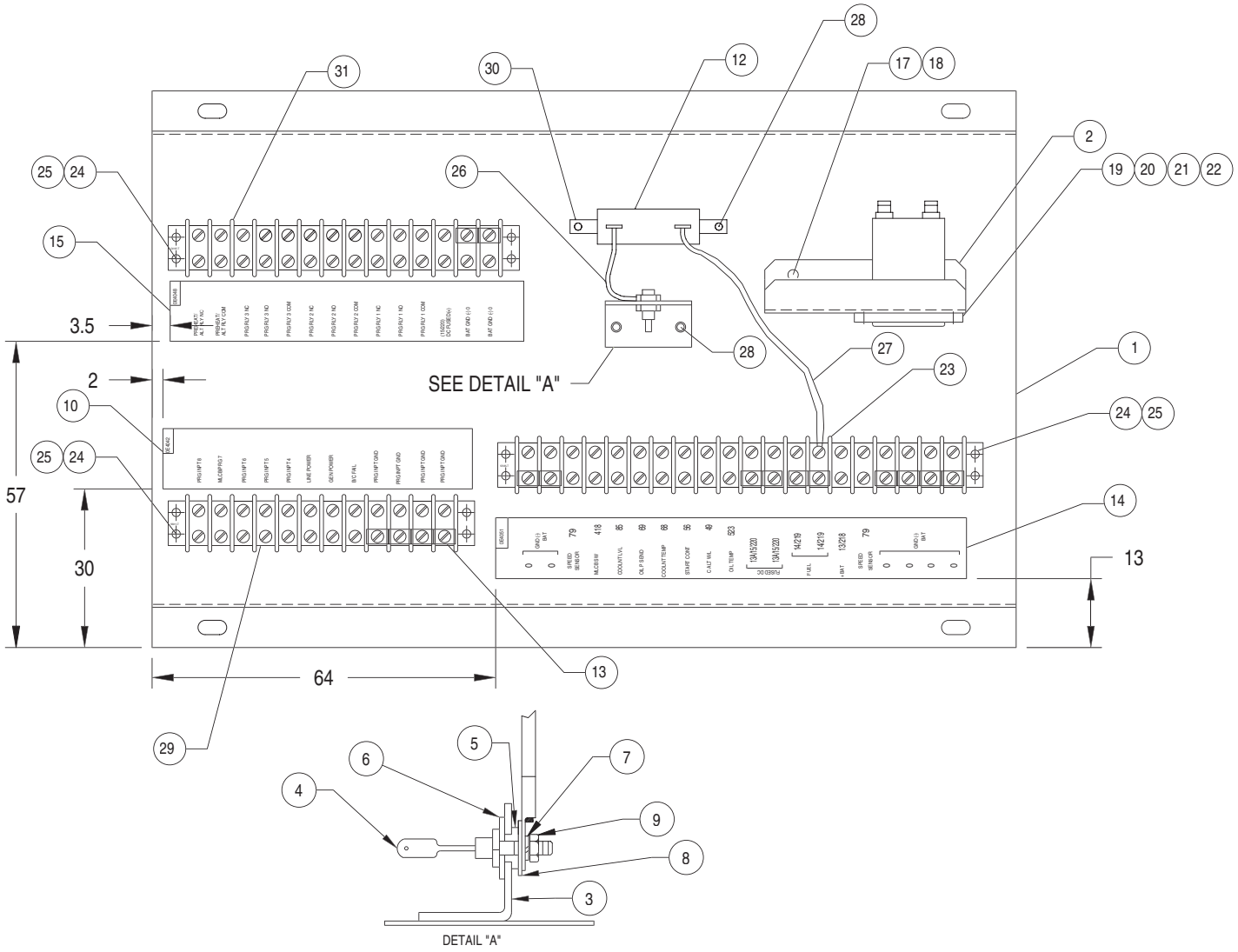


ITEM	PART NO.	QTY.	DESCRIPTION
1	0C4903A	1	WLDMNT CONN BOX 120
2	090388	20	SCREW TAPTITE M6-1.0 X 12 BP
3	0A2115	12	WASHER NYLON .250
4	0E4025	1	ASSY, SG50C CONN BOX SUBPLATE
5	0C4969	1	COVER PLATE CONN BOX
6	074908	3	SCREW TAPTITE M5-0.8 X 10 BP
7	0C4449	1	ASSEMBLY NEUTRAL BLOCK 100A
8	0A1661	6	RIVET POP .156 X .160-.164/#20
9	055911	REF	BLOCK TERM 20A 12 X 6 X 1100V
10	0E4030	2	SCREW HHTT M5-0.8 X 45 BP
11	0C7958	REF	ASSY CIRCUIT BREAKER
12	028739A	2	TIE WRAP 3.9" X .10" BLK UL
13	048476	1	CIRCT BRK 4.5X1 AUT30KW CNT45K
14	0E3777	1	CONNPNL HARN 277/480 UQSG50 (NOT SHOWN)
15	080409	1	RECEP DUPLEX GFCI20A
16	0D2759	1	GFCI BOX WEATHER PROOF
17	0C2428	2	SCREW PHTT #6-32 X 1/2 ZYC
18	057593	2	MOUNT TIE CABLE BLACK
19	089685	2	GROMMET .75 X .12 X .50
20	0536210206	REF	CABLE CB TO TS 5.7L
21	045756	2	SCREW TAPTITE M6-1 X 10 YEL CHR
22	023152	3	SCREW HHC 3/8-16 X 3/4 G5
23	022241	3	NUT HEX 3/8-16 STEEL
24	022237	3	WASHER LOCK 3/8
25	0C8105	1	ASSY56VA TRANSFORMER
26	046689	REF	BLOCK TERM 20A 4 X 6 X 1100V
27	036654	1	GROMMET 1-3/4 X 1/16 X 1-1/2
28	022264	6	WASHER LOCK M4
29	0A1495	2	SCREW TAPTITE M4-0.7 X 10 BP
30	043365	REF	BLOCK TERM 20A 16 X 6 X 1100V
31	029187	2	SPACER .19 X .31 X .50 PL
32	0A1801	1	ASSY BATTERY CHARGER ENGINE
33	0E4133	1	DECAL, UTILITY SURGE PROTECTOR
34	0C4449A	3	ASS'Y-NTRL BL150-200A
35	0C8062	1	DECAL-UTIL ALT CONN
36	091477	3	RIVET WIRE DUCT MNT
37	0E4136	1	DECAL-CUSTOMER SIGNAL CONNS
38	091472	2 FT	DUCT WIRING 1 X 1.5 6 FT
39	091472A	2 FT	COVER WIRE DUCT 1 IN
40	042419	8	SCREW RHM 10-32 X 4
41	023897	8	WASHER FLAT #10 ZINC
42	022152	8	WASHER LOCK #10
43	022158	8	NUT HEX #10-32 STEEL
44	0536210247	1	WIRELEAD CB TO NBLK
45	0536210248	1	WIRELEAD CB TO NBLK
46	0536210249	1	WIRELEAD CB TO NBLK
47	0C9213	1	PLATED, BUS BAR
48	0E3908	1	SUBPLATE, CUSTOMER CONNECTION
49	064126	1	TRANSFRM 240/480V-120/240V
50	043180	4	WASHER FLAT M4
51	051715	4	NUT HEX M4-0.7 G8 YEL CHR
52	051787	4	SCREW HHC M4-0.7 X 16 G8.8
53	0C8105	1	ASSY 56VA TRANSFORMER

DG 50 S Generator Set
Connection Box Subplate Assembly – Drawing No. 0E4025



ITEM	PART NO.	QTY.	DESCRIPTION
1	0E3775	1	PANEL, CONTROLLER MOUNT
2	0E3771	1	E PANEL CHASSIS
3	0A1441B	2	COVER PLATE, AVR
4	022155	4	WASHER LOCK #6
5	0C2428	4	SCREW PHTT #6-32 X 1/2 ZYC
6	0C2267	4	SCREW HHTT M5-0.8 X 12 BP
7	091526	8	SCREW PPHM M5-0.8 X 12 ZNC
8	051713	8	WASHER FLAT M5
9	051716	8	NUT HEX M5-0.8 G8 YEL CHR
10	049226	8	WASHER LOCK M5
11	067680	1	ASSY VOLTAGE REGULATOR 60HZ
12	0D3440	1	CONTROLLER, B-C #DPG-2103

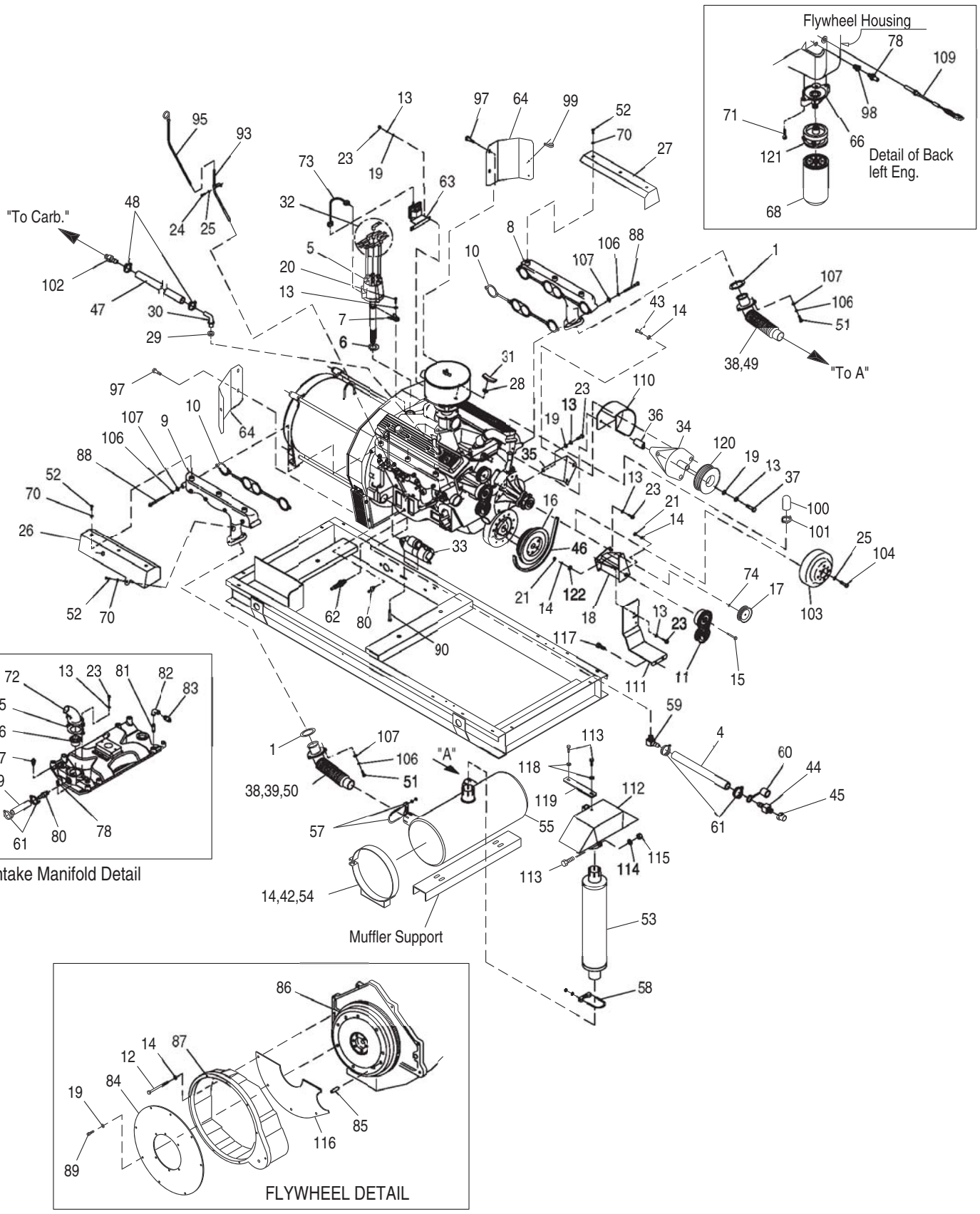


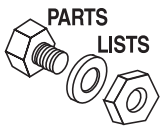
ITEM	PART NO.	QTY.	DESCRIPTION
1	0E4039	1	RELAY SUBPLATE SG50C CON PANEL
2	0E3126	1	BRACKET, XRP RESET SWITCH
3	055444	1	HEATSINK
4	049939	1	RECTIFIER MSC 12A 600V 1N1206R
5	030468	1	WASHER STEP NYLON .20
6	070370	1	WASHER MICA .203
7	023762	1	WASHER SHAKEPROOF EXT #10 STL
8	023897	1	WASHER FLAT #10 ZINC
9	022158	1	NUT HEX #10-32 STEEL
10	0E4042	1	DECAL TSTRIP 3 SG50C PANEL
12	057405	1	RES 25R 5% 25W
13	046669	REF.	BLOCK TERM JUMPER
14	0E4051	1	DECAL TERMINAL BLOCK
15	0E4048	1	DECAL SG50C TS#2 (W/FS)
17	024911	2	SCREW HHTT #8-32 X 3/8 CZ
18	038150	2	WASHER FLAT #8 ZINC
19	077604	1	METER, HOUR

ITEM	PART NO.	QTY.	DESCRIPTION
20	043181	2	SCREW PHM M3-0.5 X 10MM
21	022159	2	WASHER LOCK #4
22	051714	2	NUT HEX M3-0.5 G8 YEL CHR
23	057335	REF.	BLOCK TERM 20A 20 X 6 X 1100V
24	022155	6	WASHER LOCK #6
25	0C2323	6	SCREW PHTT #6-32 X 5/8 ZYC
26	0536210199	1	WIREASS'Y-#29: D1-R1
27	0536210251	REF	WIRE ASS'Y-#14 TS-R1
28	0C2428	4	SCREW PHTT #6-32 X 1/2 ZYC
29	055911	REF.	BLOCK TERM 20A 12 X 6 X 1100V
30	064733	2	RES MTG BRACKET
31	0C4167	REF.	BLOCK TERM 20A 14 X 6 X 1100V
32	0E4072	1	HARNESS SG50C E-PNL (NOT SHOWN)

NOTE: "REF." QTY'S REFER TO P/N: 0E4072

DG 50 S Generator Set
Engine – Drawing No. 0E4017-D

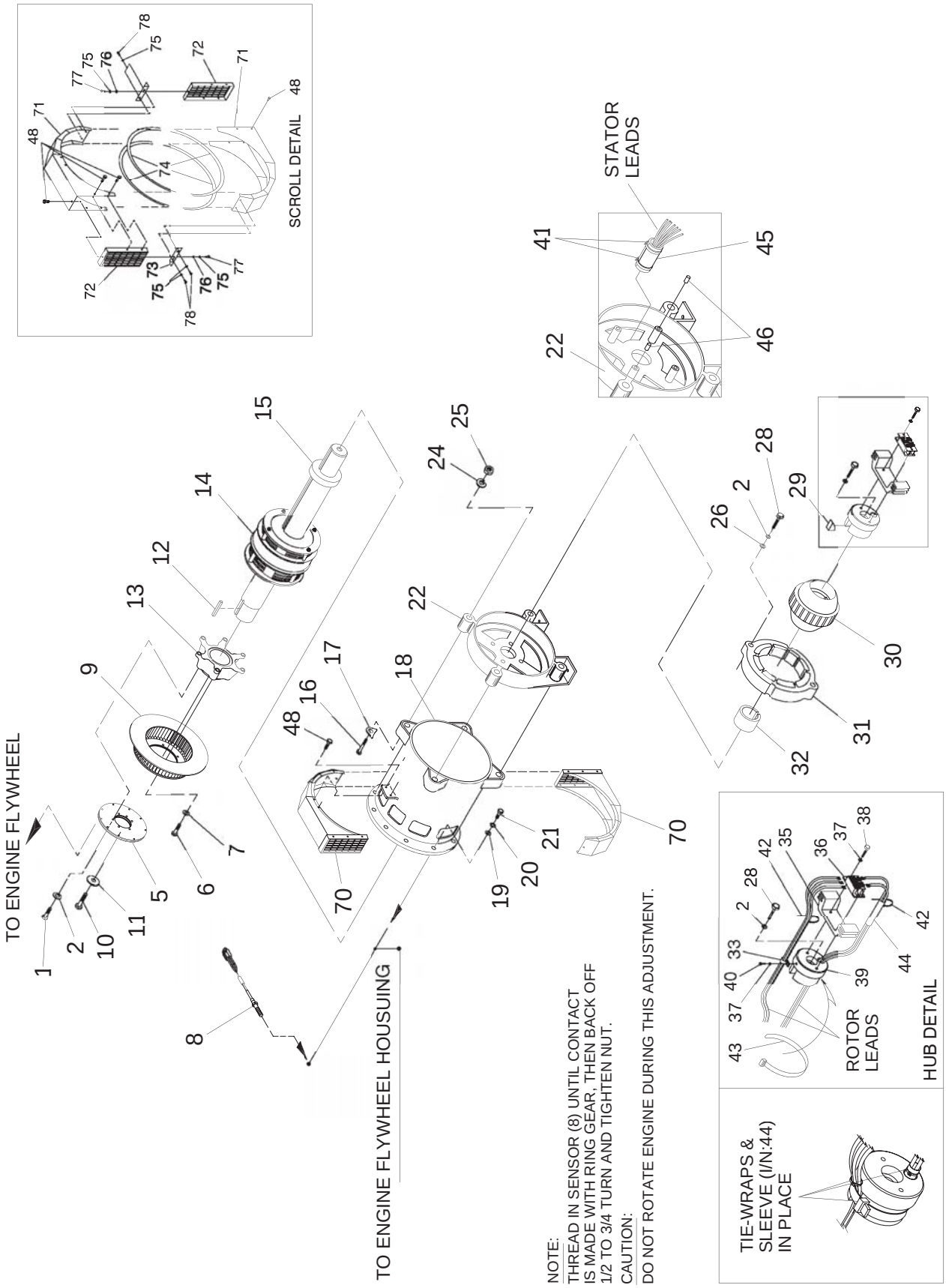




ITEM	PART NO.	QTY.	DESCRIPTION
1	044149	2	GASKET EXHAUST RING
2	0E4853	1	HARNESS DG50S ENGINE (NOT SHOWN)
4	050967	1	HOSE RES 5/8 RIA 250F (24" LG)
5	0C4386	1	DISTRIBUTOR EST
6	0C4389	1	GASKET DISTRIBUTOR
7	0C4254	1	HOLD-DOWN DISTRIBUTOR
8	0C3061	1	MANIFOLD EXH 5.7 LH
9	0C3061A	1	MANIFOLD EXH 5.7 RH
10	055489	2	GASKET EXH. MANIFOLD
11	0C2885A	1	TENSIONER HI TEMP GREASE
12	0D6585	6	SCREW SHC 3/8-16 X 3.0 BLK OX
13	022237	8	WASHER LOCK 3/8
14	046526	14	WASHER LOCK M10
15	0C3756	1	BOLT TENSIONER PULLEY
16	REF.	1	PULLEY CRANK SHAFT
17	0A4241A	1	PULLEY HI TEMP GREASE
18	0C6239	1	ASSY MOUNTING BRACKET
19	022131	16	WASHER FLAT M10-3/8 ZINC
20	025017	1	SCREW HHC 3/8-16 X 1/2 G5
21	045772	2	NUT HEX M10-1.5 G8 YEL CHR
23	029745	6	SCREW HHC 3/8-16 X 1 G5
24	022142	1	SCREW HHC 5/16-18 X 3/4 G5
25	022129	5	WASHER LOCK M8-5/16
26	0C4967A	1	SHIELD HEAT RH
27	0C4967	1	SHIELD HEAT LH
28	0C5320	1	GROMMET BREATHER 5.7
29	0C5318	1	GROMMET PCV 5.7L
30	0A4121	1	VALVE PCV
31	069870	1	BREATHER CRANK CASE
32	0C4701	1	WIRE SET SPARK PLUG
33	059056A	1	MOTOR STARTER
34	0C6234	1	ALTERNATOR DC ASSEMBLY
35	0D6200	1	BRACKET ALTERNATOR SUPPORT
36	0A5737C	1	SPACER DC ALTERNATOR
37	033819	1	SCREW HHC 3/8-16 X 4 G5
38	0D3508	2	INSULATION EXH PIPE (NOT SHOWN)
39	0C9748	1	PLUG M18 - 1.50
42	094194	2	BAND-10" CLEANER MTG
43	049814	2	SCREW HHC M10-1.5 X 25 G8.8
44	044118	1	BARBED STR 1/2NPT X 5/8
45	0C4993	1	DISCONNECT QUICK 1/2 NPT FEMALE
46	0C9617	1	BELT SERPENTINE
47	047290	1	HOSE 3/8 ID SINGLE BRAID (12" LG)
48	0C7649	2	CLAMP HOSE .38 - .87
49	0D1596	1	PIPE EXHAUST MANIFOLD LH
50	0D1597	1	PIPE EXHAUST MANIFOLD RH
51	0D2611	6	SCREW HHC 3/8-16 X 1-3/4 SSTL
52	0D2608	8	SCREW HHC 5/16-18 X 1/2 SSTL
53 *	0D3389	1	MUFFLER CATALYTIC 3" PIPE
	0D3476	1	MUFFLER CATALYTIC 3" PIPE
54	051755	4	SCREW HHC M10-1.5 X 16 G8.8
55	0C1551	1	MUFFLER HORIZONTAL 5.7L
57	0C7947	2	BOLT U 3/8-16 X 2.50
58	055978	1	BOLT U 3/8-16 X 3.25
59	056460	1	BARBED EL 90 1/2 NPT X 5/8
60	0D2787	1	PLUG DUST FEMALE QUICK COUPLNG
61	035472	4	CLAMP HOSE #6 .43 - .78
62	0D2514	8	SPARK PLUG 5.7L GM
63	0C4385	1	COIL IGNITION
64	0C4288	2	DEFLECT ALT AIR EXIT
66	058008	1	ADAPTOR OIL FILTER
68	0C3784	1	FILTER OIL 5.7L
70	070006	8	WASHER LOCK M8 SSTL
71	058007	2	BOLT OIL FILTER
72	069939	1	HOUSING THERMOSTAT
73	0A4244	1	CONNECT COIL TO DIST
74	052259	1	WASHER FLAT M12
75	048665	1	GASKET THERMOSTAT
76	075885	1	THERMOSTAT 195 DEG F
77	057522	1	SENSOR COOLANT LEVEL
78	053667	2	SENDER WATER TEMP
79	0A6283	1	HOSE PREFORMED BLOCK HEATER
80	044117	2	BARBED STR 3/8 NPT X 5/8
81	039558	1	NIPPLE PIPE 1/8 NPT X 1-3/4
82	028405	1	ELBOW 90D 1/8 NPT
83	053666	1	SENDER OIL PRESSURE
84	0A3852	3	PLATE FLEX GM
85	048191	2	PIN MET DOWEL M10 X 24
86	0C3154	1	FLYWHEEL REWORK
87	098239	1	CASTING ADAPTOR
88	0D2610	12	SCREW HHC 3/8-16 X 3-3/4 SSTL
89	043097	8	SCREW SHC 3/8-16 X 1 G8.8 NZ
90	058385A	2	STRT BLT GM 4-1/4"
93	058365	1	TUBE DIPSTICK OIL
95	058366	1	DIPSTICK OIL
97	0A2110	4	SCREW SWAGE 1/4-20 X 1/2 Z/YC
98	035579	1	BUSHING REDUCER 1/4 TO 1/8
99	055934N	1	CLAMP VINYL 1.31 X .281 Z
100	077996	1	CAP HOSE
101	057822	1	CLAMP HOSE #8 .53 - 1.00
102	035461	1	BARBED STR 1/4 NPT X 3/8
103	0A4240	1	PULLEY WATER PUMP
104	042907	4	SCREW HHC M8-1.25 X 16 G8.8
106	085917	18	WASHER LOCK 3/8 SS
107	088775	18	WASHER FLAT 3/8 SS
109	0D2244M	2	ASSY MAGPICKUP (3/8-24 MALE)
110	0C9327	1	SHIELD HEAT EXHAUST LH
111	0C9326	1	SHIELD HEAT EXHAUST RH
112	0C3199	1	HAT MUFFLER 5.7L
113	051767	3	SCREW HHC M6-1.0 X 45 G8.8
114	022097	1	WASHER LOCK M6-1/4
115	049813	1	NUT HEX M6-1.0 G8 YEL CHR
116	055474	1	FLYWHEEL COVER
117	090388	2	SCREW HHTT M6-1.0 X 12 YC
118	049811	2	WASHER FLAT M6
119	0D6518	1	BRACE MUFFLER
120	0A7801C	REF.	PULLEY POLY-V 97 OD.
121	0A6767	1	ADAPT OIL COOLER 80-100
122	0A1646	1	WASHER FLAT M16

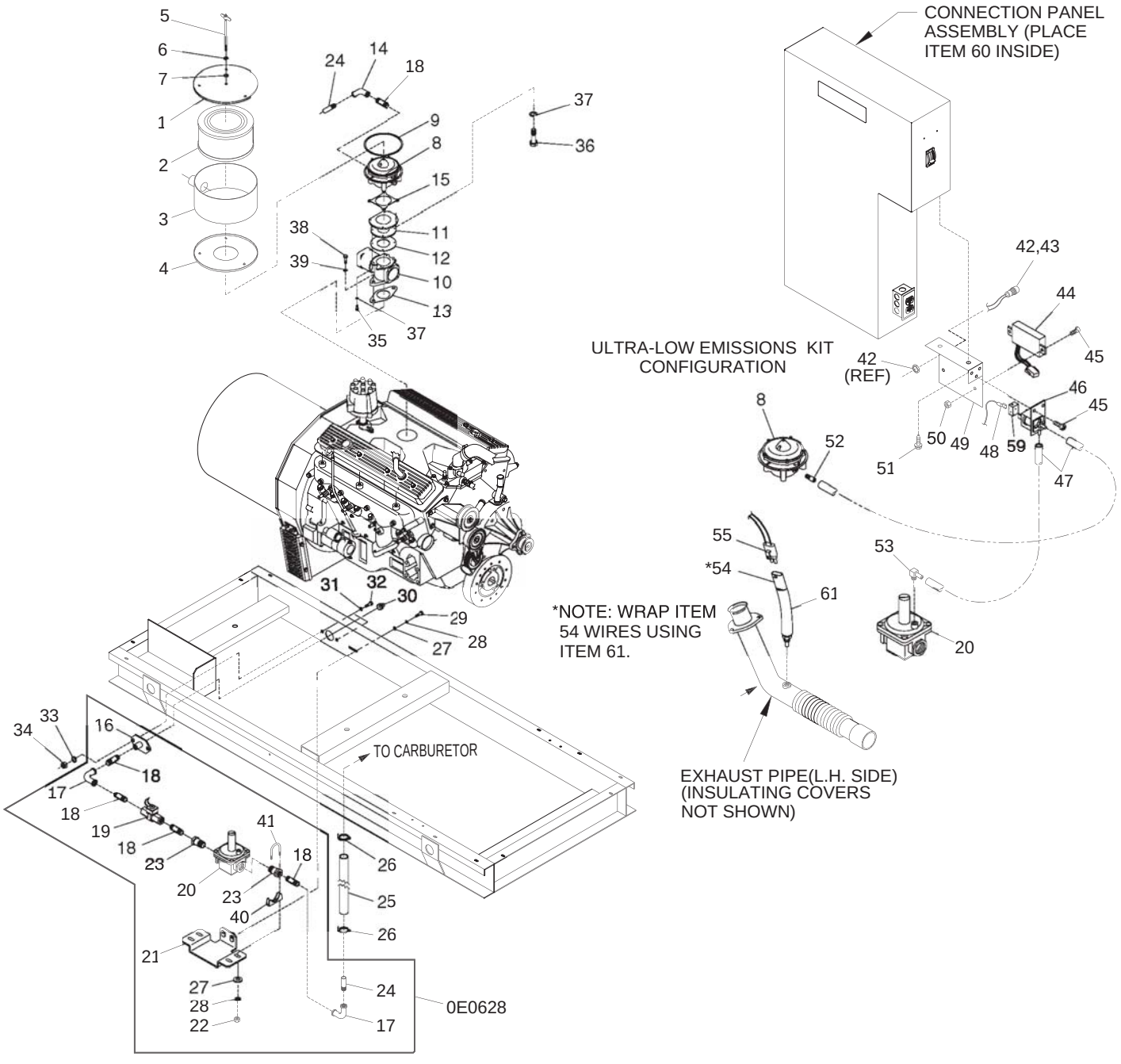
* NOTE: 0D3389 IS FOR ULTRA-LOW EMISSIONS APPLICATIONS AND FOR COMPLIANCE WITH SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT REGULATIONS FOR NON-EMERGENCY NATURAL GAS ENGINES.

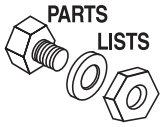
DG 50 S Generator Set
Alternator – Drawing No. 0C9060-F



ITEM	PART NO.	QTY.	DESCRIPTION
1	055420	6	SCREW HHC M12-1.75 X 25 G10.9
2	051769	9	WASHER LOCK M12
5	0A3852	3	PLATE FLEX GM
6	055173	6	SCREW HHC M8-1.25 X 20 G10.9
7	022129	6	WASHER LOCK M8-5/16
8	0D2244M	1	ASSY MAGPICKUP (3/8-24 MALE)
9	0C4286	1	ASSY FAN W/PRESS DISC 10.75 X 3
10	0A2601	1	SCREW HHC M16-2.0 X 45 G8.8
11	0A2602	1	WASHER FLAT .688 ID X 3.25 OD
12	0A1138	1	KEY SQ 3/8 X 2-1/2 STEEL
13	021941	1	COUPLER 390 SAE
14	0C4746	1	ASSY ROTOR 50KW 4 POLE
15	052624	1	BEARING BALL 6212 SEALED
16	0A5580	4	SCREW HHC M14-2.0 X 140 G8.8
17	0A1633	4	WASHER 390 SAE ALT.
18	0C4747	1	ASSY STATOR 50KW 277/480V
	0D3228	1	ASSY STATOR 50KW 120/208V
19	022131	12	WASHER FLAT 3/8-M10 ZINC
20	046526	12	WASHER LOCK M10
21	057642	12	SCREW HHC M10-1.5 X 40 G10.9
22	068113	1	CARRIER REAR BRG 15"
24	043123	4	WASHER LOCK M14
25	051779	4	NUT HEX M14-2 G8 YEL CHR
26	052259	2	WASHER FLAT M12
28	068406	3	SCREW HHC M12-1.75 X 60 G10.9
29	072878	1	KEY SQ 3/8 X 3-1/4 STEEL
30	087272	1	ASSY EXCITER 2.00" STK
31	068405	1	EXCITER FIELD 15" 2" LG
32	092950	1	COLLAR SLIP FIT 390 MM
33	020151	1	CLAMP VINYL .312 X .203 Z
35	090063	1	BRIDGE SUPPORT DIODE 15"
36	090152	1	ASSY BRIDGE RECTIFIER
37	023365	3	WASHER SHAKEPROOF INT #8
38	033143	2	SCREW HHM #8-32 X 7/8
39	090064	1	CAP END ROTOR 390MM
40	033133	1	SCREW HHM #8-32 X 3/8
41	031980	2	TIE WRAP 14.6" X .14" NATL UL
42	028739A	2	TIE WRAP 3.9" X .10" BLK UL
43	085662D	1	WRAP TIE 17.7" X .35" BLK UL
44	022661L	1	SLEEVING UL #0 .330 ID
45	083549	1	SLEEVE-RUBBER
46	022392	2	PIN DOWEL 1/2 X 1-1/4
48	0A2110	12	SCREW SWAGE 1/4-20 X 1/2 Z/YC
53	0C8026	1	COATING PROTECTIVE (NOT SHOWN)
70	0A4089	1	ASSY SCROLL 390 SAE
71	0A2491	2	SHROUD ALT SHEET METAL
72	0A2497	2	SCREEN SHROUD SAE
73	0A2496	2	BRKT TENSIONER SAE SCROLL
74	056326	8.4'	TRIM VINYL BLACK 1/8GP
75	022097	6	WASHER LOCK M6-1/4
76	049811	2	WASHER FLAT M6
77	045757	2	SCREW HHC M6-1.0 X 25 G8.8
78	043116	4	SCREW HHC M6-1.0 X 12 G8.8

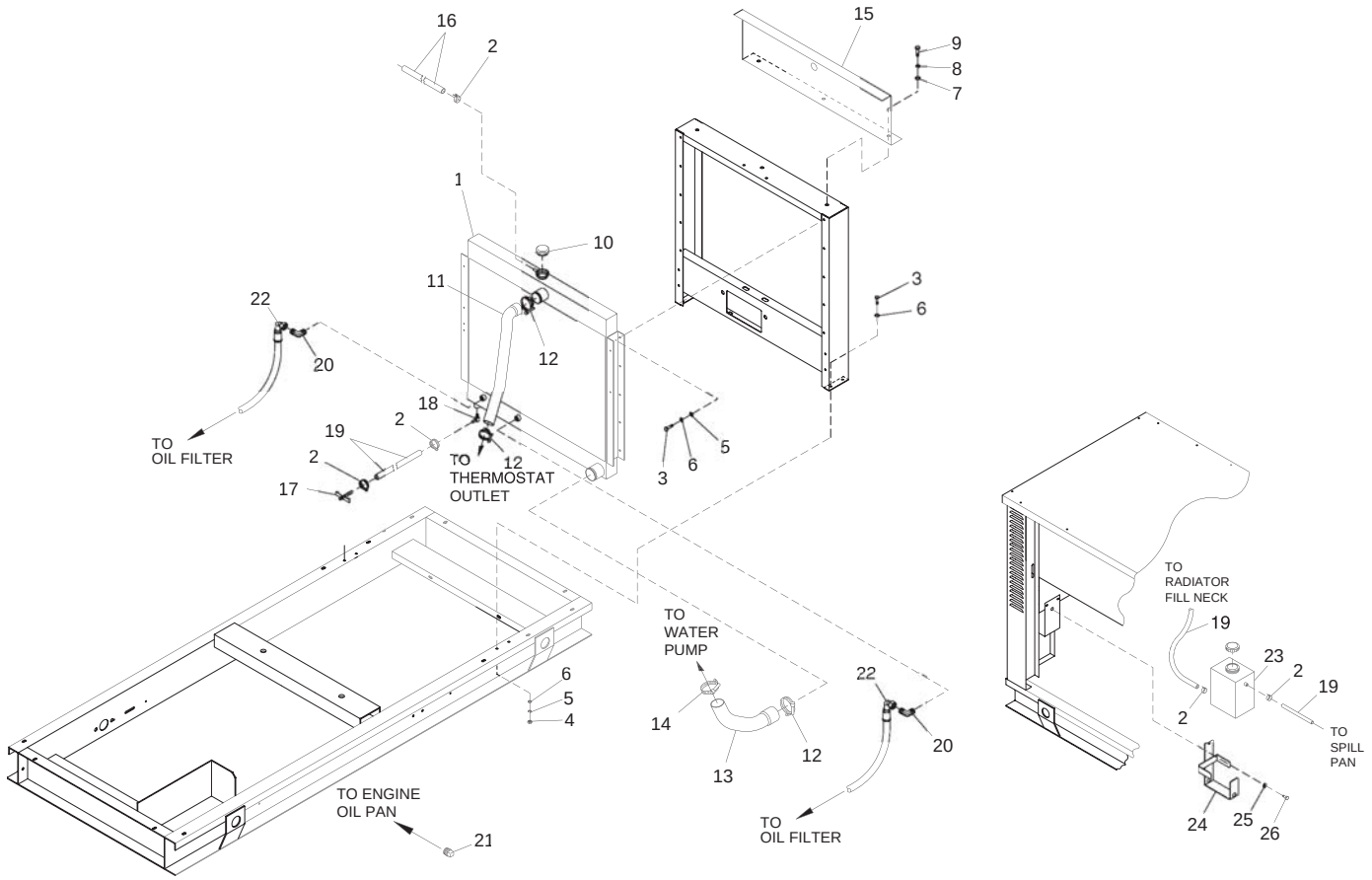
DG 50 S Generator Set
Fuel System – Drawing No. 0D3566-C





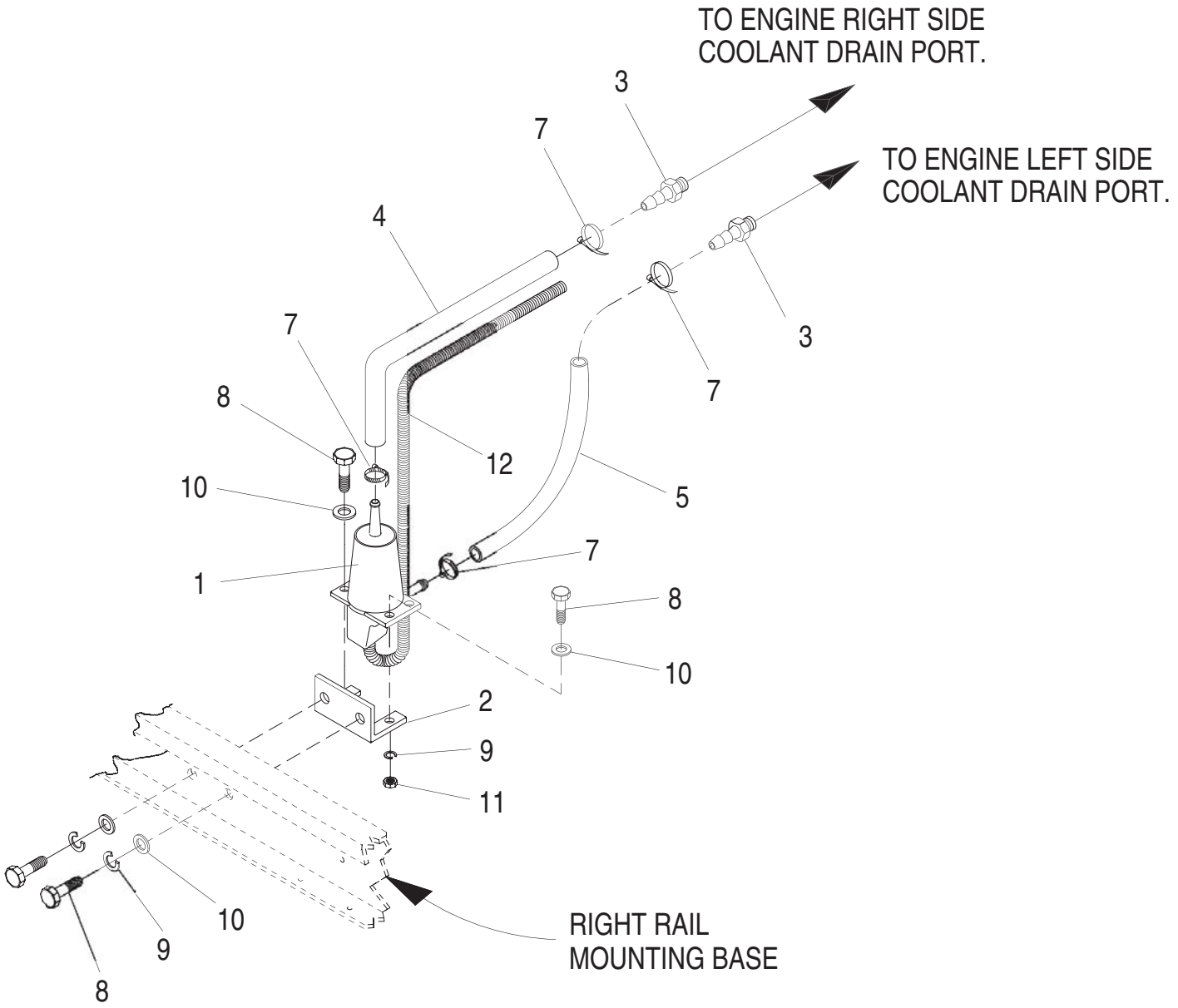
ITEM	PART NO.	QTY.	DESCRIPTION
1	0C4236	1	PLATE AIR CLEANER TOP
2	0C3197	1	AIR CLEANER 50KW5.7
3	0C4240	1	WELDMENT AIR CLEANER HOUSING
4	0C4236A	1	PLATE AIR CLEANER BOTTOM
5	0C7366	1	BOLT WING 1/4-20 X 8.5
6	022097	1	WASHER LOCK M6-1/4
7	022473	1	WASHER FLAT 1/4 ZINC
8	0C7650A	1	MIXER (ONLY) NATURAL GAS
9	061258	1	GASKET AIR CLEANER
10	0D3485	1	ASSY THROTTLE PF42 WIRE CONN
11	0C7820	1	CASTING CARB ADAPTOR
12	0C7060	1	GASKET CARBURETOR ADAPTOR
13	0C7059	1	GASKET GOVERNOR THROTTLE BODY
14	026488	1	ELBOW 45D 3/4 NPT
15	0A6613	1	GASKET CARB
16	065907	1	SUPPORT SOLENOID NAT GAS
17	026812	2	ELBOW 90D 3/4 NPT
18	026915	5	NIPPLE CLOSE 3/4 X 1.375
19	0C7598	1	ASSY NATURAL GAS SOLENOID
20	0D2758	1	REGULATOR N/G (R600S)
21	0E0521	1	SUPPORT REGULATOR
22	022259	4	NUT HEX 5/16-18 STEEL
23	026577	2	BUSHING REDUCER 1 TO 3/4
24	028641	2	NIPPLE TOE 3/4 NPT X 2
25	057422	1	HOSE 1IN ID LP GAS (38" LONG)
26	057824	2	CLAMP HOSE #16 .87 - 1.50
27	022145	6	WASHER FLAT 5/16 ZINC
28	022129	6	WASHER LOCK M8-5/16
29	022142	2	SCREW HHC 5/16-18 X 3/4 G5
30	025655	1	PLUG STD PIPE 3/4 STEEL SQ HD
31	022132	2	WASHER FLAT 9/16 ZINC
32	051778	2	SCREW HHC M14-2.0 X 25 G8.8
33	043123	2	WASHER LOCK M14
34	051779	2	NUT HEX M14-2 G8 YEL CHR
35	0C7908	4	SCREW SHC #10-32 X 5/8 G8.8 NZ
36	064090	4	SCREW PHM SEMS #12-24 X 5/8 EX
37	022152	8	WASHER LOCK #10
38	029745	2	SCREW HHC 3/8-16 X 1 G5
39	022237	2	WASHER LOCK 3/8
40	028237	2	SADDLE 1-3/8
41	028238	2	BOLT U 5/16-18 X 1.53
42	0D3442N	1	LIGHT WARNING
43	0D3442P	1	DECAL
44	0D3442A	1	CONTROLLER AIR/FUEL RATIO
45	036906	4	SCREW PPHM #6-32 X 1
46	0D3442H	1	VALVE SOLENOID
47	0D3442K	1	VACUUM LINE 3/16
48	0D3442D	2	CONNECTOR SPADE
49	0D3796	1	BRACKET AIR/FUEL CONTROLLER
50	082625	4	NUT LOCK HEX #6-32 NYL INSERT
51	090388	2	SCREW TAPTITE M6-1.0 X 12 BP
52	0D3442M	1	VACUUM FITTING (BRASS)
53	0D3442L	1	VACUUM ELBOW (PLASTIC)
54	0D3442G	1	SENSOR OXYGEN
55	0D3442F	1	CONNECTOR OXYGEN SENSOR
56	0D3442B	1	HARNESS WIRING 6 PIN CONNECTOR (NOT SHOWN)
57	0D3442C	1	WIRE LOOM (NOT SHOWN)
58	0D3442E	1	CONNECTOR RING (NOT SHOWN)
59	0D3442J	1	FILTER FOAM
60	0D3442Q	1	MANUAL TECHNICAL (NOT SHOWN)
61	067053	1	SLEEVING UL 7/8 ID (11" LONG)

DG 50 S Generator Set
Radiator – Drawing No. 0E4014-A



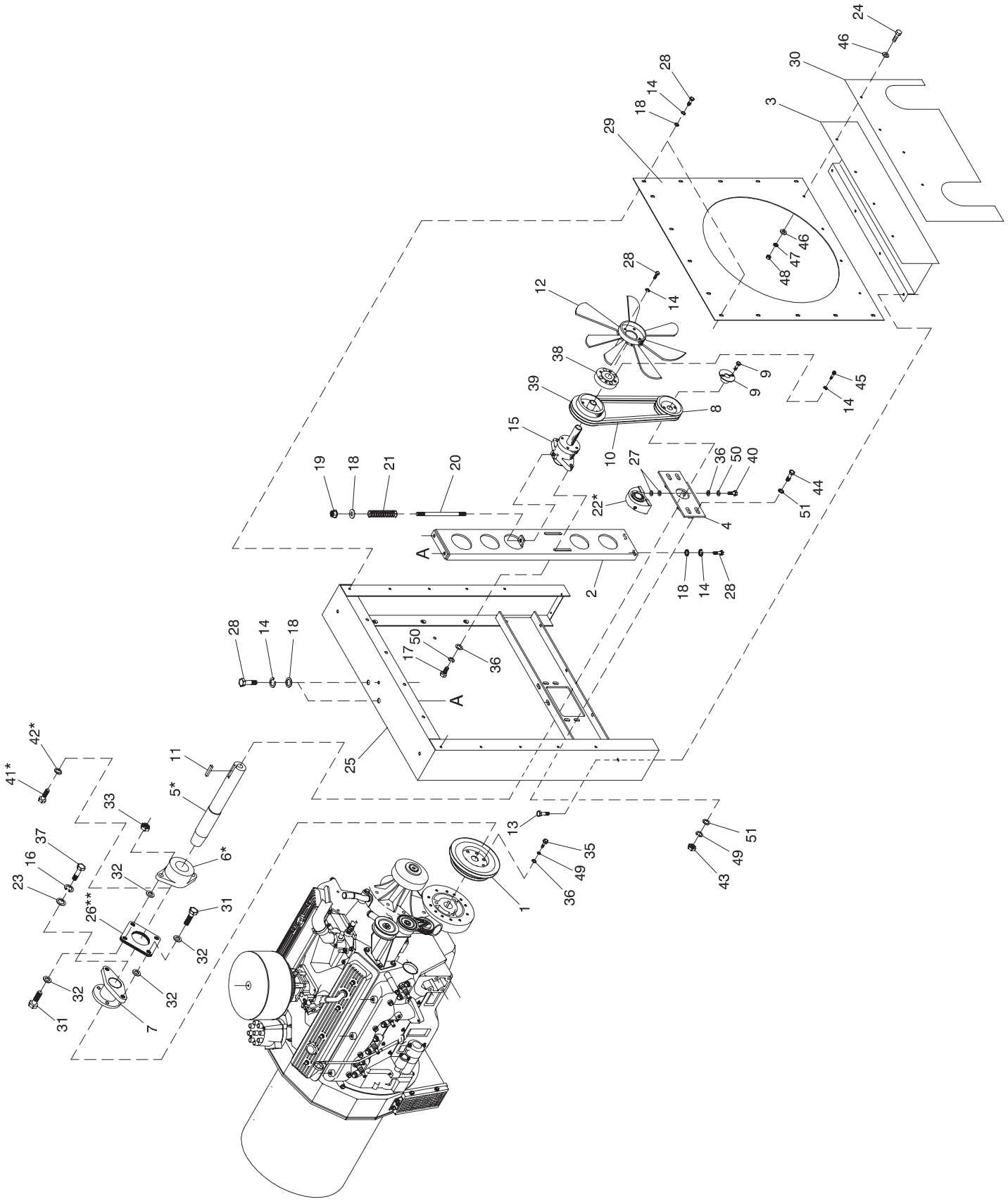
ITEM	PART NO.	QTY.	DESCRIPTION
1	0A9847	1	RADIATOR 29" X 29" 5.7L
2	0C7649	5	CLAMP HOSE .38-.87
3	042907	14	SCREW HHC M8-1.25 X 16 G8.8
4	045771	4	NUT HEX M8-1.25 G8 YEL CHR
5	022129	14	WASHER LOCK M8-5/16
6	022145	18	WASHER FLAT 5/16 ZINC
7	022473	3	WASHER FLAT 1/4 ZINC
8	022097	3	WASHER LOCK M6-1/4
9	047411	3	SCREW HHC M6-1.0 X 16 G8.8
10	046627	1	CAP RADIATOR
11	0C5373	1	HOSE UPPER RADIATOR 5.7L
12	042561	3	CLAMP HOSE #36 1.88 - 2.75
13	0C8016	1	HOSE LOWER RAD. 5.7L
14	035685	1	CLAMP HOSE #28 1.32 - 2.25

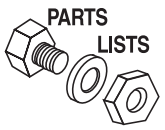
ITEM	PART NO.	QTY.	DESCRIPTION
15	0C3183	1	BLOCK OFF AIR TOP
16	029032	1	HOSE 9/32 ID (60" LG)
17	036865	1	DRAINCOCK
18	049340	1	BARBED EL 90 1/4 NPT X 3/8
19	047290	1	HOSE RES 3/8 SINGLE BRAID (208"LG)
20	0C4973	2	MALE ELBOW 90DEG
21	026925	1	PLUG STD PIPE 3/8 STEEL SQ HD
22	0C4814C	2	OIL LINE (1125MM)
23	060091	1	WATER BOTTLE
24	080713	1	BRACKET COOLANT TANK
25	049811	1	WASHER FLAT M6
26	092978	1	SCREW TAPTITE M6 X 20



ITEM	PART NO.	QTY.	DESCRIPTION
1	084918A	1	HEATER ENG 1000W 120V
2	084427	1	BRACKET HEATER
3	053660	2	BARBED STRAIGHT 1/4 NPT X 5/8
4	0E4711	1	HOSE, PREFORMED BLOCK HEATER
5	050967	1	HOSE RES 5/8 RIA 250F (20"LG)
7	057823	4	CLAMP HOSE #10 .56 - 1.06
8	047411	4	SCREW HHC M6-1.0 X 16 G8.8
9	022097	4	WASHER LOCK M6-1/4
10	022473	4	WASHER FLAT 1/4 ZINC
11	049813	2	NUT HEX M6 -1.0 G8 YEL CHR
12	077043A	1	CONDUIT FLEX .38 ID (30"LG)

DG 50 S Generator Set
5.7L Fan Drive – Drawing No. 0C4849-K





ITEM	PART NO.	QTY.	DESCRIPTION
1	0A4239	1	PULLEY CRANKSHAFT
2	0C1726	1	BRACKET BELT TENSIONER
3	0C4349	1	SUPPORT VENTURI BOTTOM
4	0D5136	1	BRACKET BEARING SUPPORT
5 *	0C6475	1	SHAFT FLEX DRIVE 5.7
6 *	0C8309	1	HUB FLEX COUPLING
7	0C8310	1	HUB FLEX COUPLING
8	0C2737	1	SHEAVE TWO-GROOVE 5.7L
9	0C4326	1	SHEAVE HUB H 1.125
10	0C6549B	2	V-BELT GREEN 50"
11	023138	1	KEY SQ 1/4 X 1 STEEL
12	098184	1	FAN-COOLING 26"
13	074908	4	SCREW TAPTITE M5-0.8X10 BP
14	022129	26	WASHER LOCK M8-5/16
15	0C4649	1	ASSY FAN SUPPORT
16	022250	1	WASHER FLAT 7/16
17	057642	2	SCREW HHC M10-1.5 X 40 G10.9
18	022145	19	WASHER FLAT 5/16 ZINC
19	052858	1	NUT LOCK FLANGE M8-1.25
20	04576100BY	1	STUD M8-1.25 X 200 G5 ZINC
21	042962	1	SPRING COMPRESSION
22 *	0C8364	1	ASSY PILLOW BLOCK
23	022302	1	WASHER LOCK 7/16
24	049815	4	SCREW HHC M5-0.8 X 16 G8.8
25	0D5135	1	SUPPORT RADIATOR WELDMENT
26 **	0C7043	12	DISK FLEX
27	0C8126	4	WASHER BELLVILLE .442 I.D.
28	042907	22	SCREW HHC M8-1.25 X 16 G8.8
29	0A9853	1	VENTURI 50KW 5.7L
30	0C3202	1	BLOCKOFF BOTTOM 5.7
31	0C8146	4	BOLT 5/16-24X1.25
32	0C8145	8	WASHER FLEX (THIN)
33	0C8165	2	NUT LOCK HEX 5/16-24 NYL INS
35	0C5713	3	SCREW SHC 3/8-24X1-1/2
36	022131	7	WASHER FLAT 3/8-M10 ZINC
37	0A7814	1	SCREW HHC 7/16-20 X 3-1/4 G5
38	0A7885	1	ADAPTOR FAN 7.4
39	058793	1	PULLEY AUTO 7.00 PD
40	049814	2	SCREW HHC M10-1.5 X 25 G8.8
41 *	049814	1	SCREW HHC M10-1.5 X 25 G8.8
42 *	052644	1	SPACER .5 X 1.5 X .25 ST/ZNC
43	022241	4	NUT HEX 3/8-16 STEEL
44	029745	4	SCREW HHC 3/8-16 X 1 G5
45	049821	4	SCREW SHC M8-1.25 X 30 G12.9
46	023897	8	WASHER FLAT #10 ZINC
47	022152	4	WASHER LOCK #10
48	051716	4	NUT HEX M5-0.8 G8 YEL CHR
49	022237	7	WASHER LOCK 3/8
50	046526	4	WASHER LOCK M10
51	0A5768	8	WASHER FLAT HEAVY DUTY

* KIT, DRIVE SHAFT P/N 0E3395A
** KIT, FLEX DISK P/N 0E3394 (SERVICE KIT)

CALIFORNIA AND FEDERAL EMISSION CONTROL WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board (CARB) and the United States Environmental Protection Agency (EPA), together with Generac® Power Systems, Inc. (Generac), are pleased to explain the Emission Control System Warranty on your new engine.* New utility, and lawn and garden equipment engines must be designed, built and equipped to meet stringent anti-smog standards for the state of California and the federal government. Generac will warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect, unapproved modification or improper maintenance of your engine.

Your emission control system may include parts such as the carburetor, ignition and exhaust systems. Generac will repair your engine at no cost to you for diagnosis, replacement parts and labor, should a warrantable condition occur.

MANUFACTURER'S EMISSION CONTROL SYSTEM WARRANTY COVERAGE:

Emissions control systems on 1997 and later model year engines are warranted for two years as hereinafter noted. If, during such warranty period, any emission-related component or system on your engine is found to be defective in materials or workmanship, repairs or replacement will be performed by a Generac Authorized Warranty Service Facility.

PURCHASER'S/OWNER'S WARRANTY RESPONSIBILITIES:

As the engine purchaser/owner, you are responsible for the completion of all required maintenance as listed in your factory supplied Owner's Manual. For warranty purposes, Generac recommends that you retain all receipts covering maintenance on your engine. However, Generac cannot deny warranty solely because of the lack of receipts or for your failure to ensure the completion of all scheduled maintenance.

As the engine purchaser/owner, you should, however, be aware that Generac may deny any and/or all warranty coverage or responsibility if your engine, or a part/component thereof, has failed due to abuse, neglect, improper maintenance or unapproved modifications, or the use of counterfeit and/or "grey market" parts not made, supplied or approved by Generac.

You are responsible for presenting your engine to a Generac Authorized Warranty Service Facility as soon as a problem occurs. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

Warranty service can be arranged by contacting either your selling dealer or a Generac Authorized Warranty Service Facility. To locate the Generac Authorized Warranty Service Facility nearest you, call our toll-free number:

1-800-333-1322

IMPORTANT NOTE: This warranty statement explains your rights and obligations under the Emission Control System Warranty (ECS Warranty), which is provided to you by Generac pursuant to California and federal law. See also the "Generac Limited Warranties for Generac® Power Systems, Inc.," which is enclosed herewith on a separate sheet, also provided to you by Generac. The ECS Warranty applies **only** to the emission control system of your new engine. If there is any conflict in terms between the ECS Warranty and the Generac Warranty, the ECS Warranty shall apply except in circumstances where the Generac Warranty may provide a longer warranty period. Both the ECS Warranty and the Generac Warranty describe important rights and obligations with respect to your new engine.

Warranty service can be performed only by a Generac Authorized Warranty Service Facility. When requesting warranty service, evidence must be presented showing the date of the sale to the original purchaser/owner. The purchaser/owner shall be responsible for any expenses or other charges incurred for service calls and/or transportation of the product to/from the inspection or repair facilities. The purchaser/owner also shall be responsible for any and/or all damages or losses incurred while the engine is being transported/shipped for inspection or warranty repairs.

If you have any questions regarding your warranty rights and responsibilities, you should contact Generac at the following address:

ATTENTION WARRANTY DEPARTMENT
GENERAC POWER SYSTEMS, INC.
P.O. BOX 8
WAUKESHA, WI 53187

Part 1

EMISSION CONTROL SYSTEM WARRANTY

Emission Control System Warranty (ECS Warranty) for 1997 and later model year engines:

(a) Applicability: This warranty shall apply to 1997 and later model year engines. The ECS Warranty Period shall begin on the date the new engine or equipment is purchased by/delivered to its original, end-use purchaser/owner and shall continue for 24 consecutive months thereafter.

(b) General Emissions Warranty Coverage: Generac warrants to the original, end-use purchaser/owner of the new engine or equipment, and to each subsequent purchaser/owner, that each of its engines is ...

(1) Designed, built and equipped so as to conform with all applicable regulations adopted by the EPA and CARB pursuant to their respective authority, and

(2) Free from defects in materials and workmanship which, at any time during the ECS Warranty Period, may cause a warranted emissions-related part to fail to be identical in all material respects to the part as described in the engine manufacturer's application for certification.

(c) The ECS Warranty only pertains to emissions-related parts on your engine, as follows:

(1) Any warranted, emissions-related parts that are not scheduled for replacement as required maintenance in the Owner's Manual shall be warranted for the ECS Warranty Period. If any such part fails during the ECS Warranty Period, it shall be repaired or replaced by Generac according to Subsection (4) below. Any such part repaired or replaced under the ECS Warranty shall be warranted for the remainder of the ECS Warranty Period.

(2) Any warranted, emissions-related part that is scheduled only for regular inspection as specified in the Owner's Manual shall be warranted for the ECS Warranty Period. A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the ECS Warranty Period. Any such part repaired or replaced under the ECS Warranty shall be warranted for the remainder of the ECS Warranty Period.

(3) Any warranted, emissions-related part that is scheduled for replacement as required maintenance in the Owner's Manual shall be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by Generac according to Subsection (4) below. Any such emissions-related part repaired or replaced under the ECS Warranty shall be warranted for the remainder of the ECS Warranty Period prior to the first scheduled replacement point for such emissions-related part.

(4) Repair or replacement of any warranted, emissions-related part under this ECS Warranty shall be performed at no charge to the owner at a Generac Authorized Warranty Service Facility.

(5) When the engine is inspected by a Generac Authorized Warranty Service Facility, the owner shall not be held responsible for diagnostic costs if the repair is deemed warrantable.

(6) Generac shall be liable for damages to other original engine components or approved modifications proximately caused by a failure under warranty of any emission-related part covered by the ECS Warranty.

(7) Throughout the ECS Warranty Period, Generac shall maintain a supply of warranted emission-related parts sufficient to meet the expected demand for such emission-related parts.

(8) Any Generac authorized and approved emission-related replacement part may be used in the performance of any ECS Warranty maintenance or repairs and will be provided without charge to the purchaser/owner. Such use shall not reduce Generac's ECS Warranty obligations.

(9) Unapproved, add-on, modified, counterfeit and/or "grey market" parts may not be used to modify or repair a Generac engine. Such use voids this ECS Warranty and shall be sufficient grounds for disallowing an ECS Warranty claim. Generac shall not be held liable hereunder for failures of any warranted parts of a Generac engine caused by the use of such an unapproved, add-on, modified, counterfeit and/or "grey market" part.

EMISSION RELATED PARTS INCLUDE THE FOLLOWING:

1) Fuel Metering System:

1.1) Gasoline carburetor assembly and its internal components (if so equipped).
a) Fuel filter (if so equipped)
b) Carburetor gaskets
c) Fuel pump (if so equipped)

1.2) LPG carburetion assembly and its internal components (if so equipped).
a) Fuel controller (if so equipped)
b) Mixer and its gaskets (if so equipped)
c) Carburetor and its gaskets (if so equipped)
d) Primary gas regulator (if so equipped)
e) LP liquid vaporizer (if so equipped)

2) Air Induction System including:
a) Intake pipe/manifold
b) Air cleaner

3) Ignition System including:
a) Spark plug
b) Ignition module

4) Catalytic Muffler Assembly (if so equipped) including:
a) Muffler gasket
b) Exhaust manifold

5) Crankcase Breather Assembly including:
a) Breather connection tube

*Generac engine types covered by this warranty statement include the following:

1) Utility
2) Lawn and Garden Equipment
3) Recreational Vehicle (RV) Generator
4) Industrial Mobile (IM) Generator

Part 2

GENERAC POWER SYSTEMS STANDARD TWO-YEAR LIMITED WARRANTY FOR STANDBY POWER SYSTEMS

NOTE: ALL UNITS MUST HAVE A STARTUP INSPECTION PERFORMED BY AN AUTHORIZED GENERAC DEALER.
For a period of 2 (two) years or 2,000 (two thousand) hours of operation from the date of sale, which ever occurs first, Generac Power Systems, Inc. will, at its option, repair or replace any part(s) which, upon examination, inspection, and testing by Generac Power Systems or a Generac Power Systems Authorized Warranty Service Facility, is found to be defective under normal use and service, in accordance with the warranty schedule set forth below. Any equipment that the purchaser/owner claims to be defective must be returned to, and examined by the nearest Generac Power Systems Authorized Warranty Service Facility. All transportation costs under the warranty, including return to the factory, are to be borne and prepaid by the purchaser/owner. This warranty applies only to Generac Power Systems Generators used in "Standby" applications, as Generac Power Systems, Inc. have defined Standby, provided said generator has been initially installed and inspected on-site by a Generac Power Systems Authorized Service Dealer or branch thereof. A scheduled maintenance agreement with a local Authorized Generac Power Systems Dealer is highly recommended to verify adequate service has been performed on the unit throughout the warranty period. Limited to, and available only on Liquid-cooled units.

WARRANTY SCHEDULE

YEAR ONE — 100% (one hundred percent) coverage on mileage*, labor, and parts listed.

- **ALL COMPONENTS**

YEAR TWO — 100% (one hundred percent) coverage on parts listed.

- **ALL COMPONENTS — *PARTS ONLY**
- *Travel allowance is limited to 300 miles maximum, or 7.5 hours maximum (per occurrence), **round trip**, to the nearest authorized Generac Service Facility, and only applies to permanently wired and mounted units.
- A Generac Power Systems, Inc. Transfer Switch is highly recommended to be used in conjunction with the genset. If a Non - Generac Power Systems, Inc. Transfer Switch is substituted for use and directly causes damage to the genset, no warranty coverage shall apply.
- All warranty expense allowances **are** subject to the conditions defined in Generac Power Systems Warranty, Policies, and Procedures Flat Rate Manual.
- Units that have been resold **are not** covered under the Generac Power Systems Warranty, as this Warranty **is not** transferable.

GEAR BOX EQUIPPED UNITS — Limited Gearbox Coverage

YEARS ONE THROUGH FIVE — Parts and labor coverage on gearbox and components.

YEARS SIX THROUGH TEN — Parts only coverage on gearbox and components.

THIS WARRANTY SHALL NOT APPLY TO THE FOLLOWING:

1. Any unit built/manufactured prior to January 1, 2002.
2. Unit enclosure is only covered against rust or corrosion the first year of the warranty provision.
3. Costs of normal maintenance i.e. tune-ups, associated part(s), adjustments, loose/leaking clamps, installation and start-up.
4. Use of Non-Generac replacement part(s) will void the warranty in its entirety.
5. Any failure caused by contaminated fuels, oils, coolants/antifreeze or lack of proper fuels, oils or coolants/antifreeze.
6. Units sold, rated or used for "Prime Power", "Trailer Mounted" or "Rental Unit" applications as Generac Power Systems have defined Prime Power, Trailer Mounted or Rental Unit. Contact a Generac Power Systems Distributor for Prime Power, Trailer Mounted or Rental Unit definition and warranty.
7. Failures due, but not limited to, normal wear and tear, accident, misuse, abuse, negligence, or improper installation or sizing.
8. Failures caused by any external cause or act of God such as collision, fire, theft, freezing, vandalism, riot or wars, lightning, earthquake, windstorm, hail, volcanic eruption, water or flood, tornado, hurricane, terrorist acts or nuclear holocaust.
9. Products that are modified or altered in a manner not authorized by Generac Power Systems in writing.
10. Any incidental, consequential or indirect damages caused by defects in materials or workmanship, or any delay in repair or replacement of the defective part(s).
11. Failure due to misapplication, misrepresentation, or bi-fuel conversion.
12. Telephone, telegraph, teletype or other communication expenses.
13. Living or travel expenses of person(s) performing service, except as specifically included within the terms of a specific unit warranty period.
14. Rental equipment used while warranty repairs are being performed i.e. rental generators, cranes, etc..
15. Overtime labor or more than one person performing repairs.
16. Any and all expenses incurred investigating performance complaints unless defective Generac materials and or workmanship were the direct cause of the problem.
17. *Engine coolant heaters (block-heaters), heater controls and circulating pumps after the first year.
18. *Starting batteries, fuses, light bulbs, engine fluids, and overnight freight cost for replacement part(s).

THIS WARRANTY IS IN PLACE OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, SPECIFICALLY, GENERAC POWER SYSTEMS MAKES NO OTHER WARRANTIES AS TO THE MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

GENERAC POWER SYSTEMS ONLY LIABILITY SHALL BE THE REPAIR OR REPLACEMENT OF PART(S) AS STATED ABOVE. IN NO EVENT SHALL GENERAC POWER SYSTEMS BE LIABLE FOR ANY INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF SUCH DAMAGES ARE A DIRECT RESULT OF GENERAC POWER SYSTEMS, INC. NEGLIGENCE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you. Purchaser/owner agrees to make no claims against Generac Power Systems, Inc. based on negligence. This warranty gives you specific legal rights. You also may have other rights that vary from state to state.

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