GENERAC®

DIAGNOSTIC REPAIR MANUAL

CorePower™ Home Standby Generator

50 & 60 Hz PowerPact™ Home Standby Generator

MODELS:
CorePower 6/7 kW 60 Hz
PowerPact 6/7 kW 60 Hz
PowerPact 6/7.5 kW 60 Hz
PowerPact 5.6 kVA 50 Hz

STANDBY GENERATORS

Foreword

SAFETY

Throughout this publication, DANGER, WARNING, and CAUTION blocks are used to alert the operator to special instructions concerning a particular service or operation that might be hazardous if performed incorrectly or carelessly. Observe them carefully. Their definitions are as follows:

⚠DANGER

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

(000001)

⚠WARNING

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

(000002)

⚠CAUTION

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

(000003)

Four commonly used safety symbols accompany the DANGER, WARNING and CAUTION blocks. The type of information each indicates follows:

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

This symbol points out potential explosion hazard.

This symbol points out potential fire hazard.

This symbol points out potential electrical shock hazard.

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance with these special instructions plus “common sense” are major accident prevention measures.

READ THIS MANUAL THOROUGHLY

This diagnostic manual has been written and published by Generac to aid our dealers' technicians and company service personnel when servicing the products described herein.

It is assumed that these personnel are familiar with the servicing procedures for these products, or like or similar products manufactured and marketed by Generac, and that they have been trained in the recommended servicing procedures for these products, including the use of common hand tools and any special Generac tools or tools from other suppliers.

Generac could not possibly know of and advise the service trade of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a procedure or tool not recommended by Generac must first satisfy themselves that neither his nor the product’s safety will be endangered by the service procedure selected.

All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication.

When working on these products, remember that the electrical system and engine ignition system are capable of violent and damaging short circuits or severe electrical shocks. If you intend to perform work where electrical terminals could be grounded or touched, the battery cables should be disconnected at the battery.

Any time the intake or exhaust openings of the engine are exposed during service, they should be covered to prevent accidental entry of foreign material. Entry of such materials will result in extensive damage when the engine is started.

During any maintenance procedure, replacement fasteners must have the same measurements and strength as the fasteners that were removed. Metric bolts and nuts have numbers that indicate their strength. Customary bolts use radial lines to indicate strength while most customary nuts do not have strength markings. Mismatched or incorrect fasteners can cause damage, malfunction and possible injury.

Note: Special Notes appear in bold type throughout this publication. While not pertaining to safety, they emphasize procedures, circumstances or specifications that require special attention.

REPLACEMENT PARTS

When servicing this equipment, it is extremely important that all components be properly installed and tightened. If improperly installed and tightened, sparks could ignite fuel vapors from fuel system leaks.

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⚠ CAUTION!

Note: Specifications are for reference only. For actual installations always use the most recent version available online. These specifications are subject to change without notice.

Generator				
	CorePower 6/7 kW	**PowerPact 6/7 kW**	**PowerPact 6/7.5 kW**	**PowerPact 5.6 kVA**
Rated Voltage	240	240	240	220
Rated Maximum Load Current (Amps) at Rated Voltage (LP)*	29.2	29.2	31.25	25.5
Main Circuit Breaker	30 Amp	30 Amp	35 Amp	32 Amp
Transfer Switch Load Center Circuits**				
30A, 240V	1	1	1	1
20A, 120V	3	1	1	1
15A, 120V	3	5	5	5
Phase	1	1	1	1
Number of Rotor Poles	2	2	2	2
Rated AC Frequency	60 Hz	60 Hz	60 Hz	50 Hz
Battery Requirement	Group 26R, 12 Volts and 525 CCA Minimum	Group U1, 12 Volts and 300 CCA Minimum	Group U1, 12 Volts and 300 CCA Minimum	Group U1, 12 Volts and 300 CCA Minimum
Weight (unit only in lbs.)	225	330	330	330
Enclosure	Composite	Galvanneal Steel	Galvanneal Steel	Galvanneal Steel

Normal Operating Range: This unit is tested in accordance to UL 2200 standards with an operating temperature of -20 °F (-29 °C) to 122 °F. (50 °C). For areas where temperatures fall below 32 °F (0 °C), a cold weather kit is highly recommended. When operated above 77º F (25º C) there may be a decrease in engine power. (Please reference the engine specifications section).

These generators are rated in accordance with UL2200, Safety Standard for Stationary Engine Generator Assemblies; and CSA-C22.2 No. 100-04 Standard for Motors and Generators.

* Natural Gas ratings will depend on specific fuel Btu content. Typical derates are between 10-20% off the LP gas rating.

** Circuits to be moved must be protected by same size breaker. For example, a 15 amp circuit in the main panel must be a 15 amp circuit in the transfer switch.

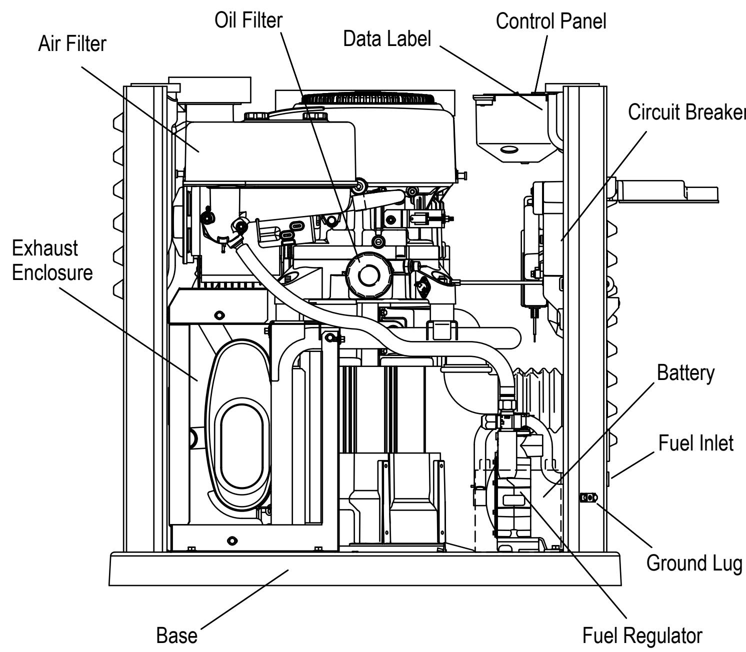
Engine				
	CorePower 6/7 kW	**PowerPact 6/7 kW**	**PowerPact 6/7.5 kW**	**PowerPact 5.6 kVA**
Type of Engine	OHV-432	OHV GA-420	OHV GA-420	OHV GA-420
Number of Cylinders	1	1	1	1
Rated Horsepower @ 3,600 rpm*	14.8	11.56	11.56	11.56
Displacement	432 cc	420 cc	420 cc	420 cc
Cylinder Block	Aluminum w/Cast Iron Sleeve	Aluminum w/Cast Iron Sleeve	Aluminum w/Cast Iron Sleeve	Aluminum w/Cast Iron Sleeve
Valve Arrangement	Overhead Valves	Overhead Valves	Overhead Valves	Overhead Valves
Ignition System	Solid-state w/Magneto	Solid-state w/Magneto	Solid-state w/Magneto	Solid-state w/Magneto
Recommended Spark Plug	0G0767A (RC12YC)	0L3059 (RC9YC)	0L3059 (RC9YC)	0L3059 (RC9YC)
Spark Plug Gap	0.76 mm (0.030 inch)	0.76 mm (0.030 inch)	0.76 mm (0.030 inch)	0.76 mm (0.030 inch)
Compression Ratio	8.2:1	8.3:1	8.3:1	8.3:1
Starter	12 VDC	12 VDC	12 VDC	12 VDC
Oil Capacity Including Filter	Approx. 1.1 Qts (1.0L)	Approx. 1.2 Qts (1.1 L)	Approx. 1.2 Qts (1.1 L)	Approx. 1.2 Qts (1.1 L)
Recommended Oil Filter	Part # 0H9039	—	—	—
Recommended Air Filter	Part # 0H6104	Part # 0E9371A	Part # 0E9371A	Part # 0E9371A
Operating RPM	3,600	3,600	3,600	3,000

* Engine power is subject to and limited by such factors as fuel Btu content, ambient temperature and altitude. Engine power decreases about 3.5 percent for each 1,000 feet above sea level; and also will decrease about 1 percent for each 6 C (10 F) above 16 C (60 F) ambient temperature.

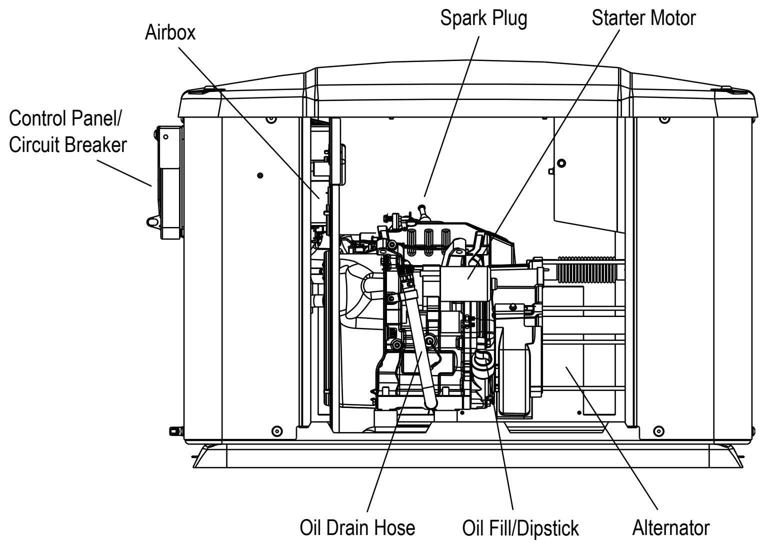
Fuel Consumption				
Unit	Natural Gas*		LP Vapor**	
	1/2 Load	Full Load	1/2 Load	Full Load
CorePower 6/7 kW	66/1.87	119/3.37	0.82/30/3.10	1.47/53/5.56
PowerPact 6/7 kW PowerPact 6/7.5 kW	73/2.07	117/3.31	0.73/26.2/2.75	1.3/46.8/4.9
PowerPact 5.6 kVA	81/2.29	120/3.42	0.67/ 24.4/ 2.54	1.14/ 41.5/ 4.32

* Natural gas is in cubic feet/cubic meters per hour. **LP is in gallons/cubic feet/liters per hour Values given are approximate.

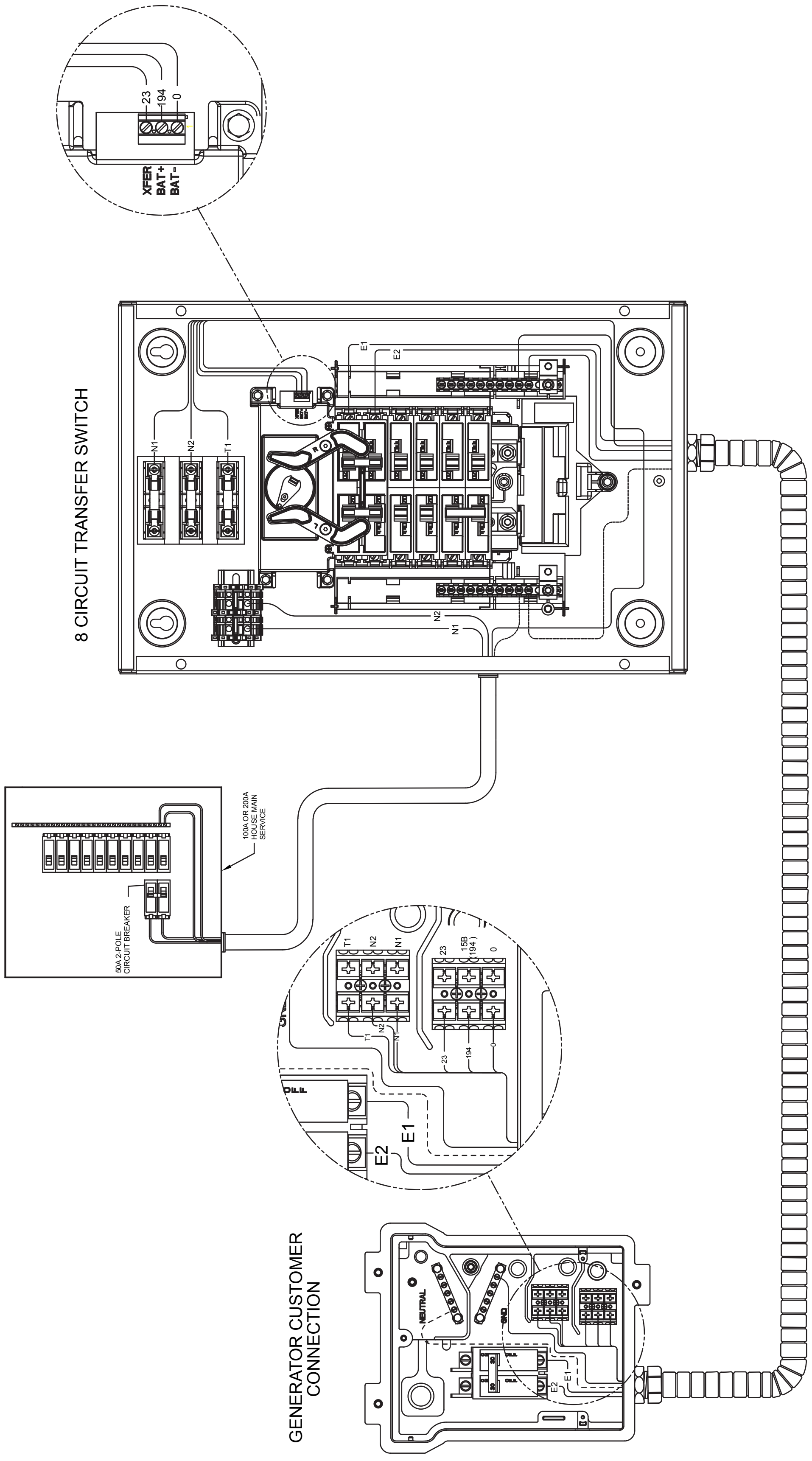
MAJOR FEATURES - COREPOWER



MAJOR FEATURES - POWERPACT

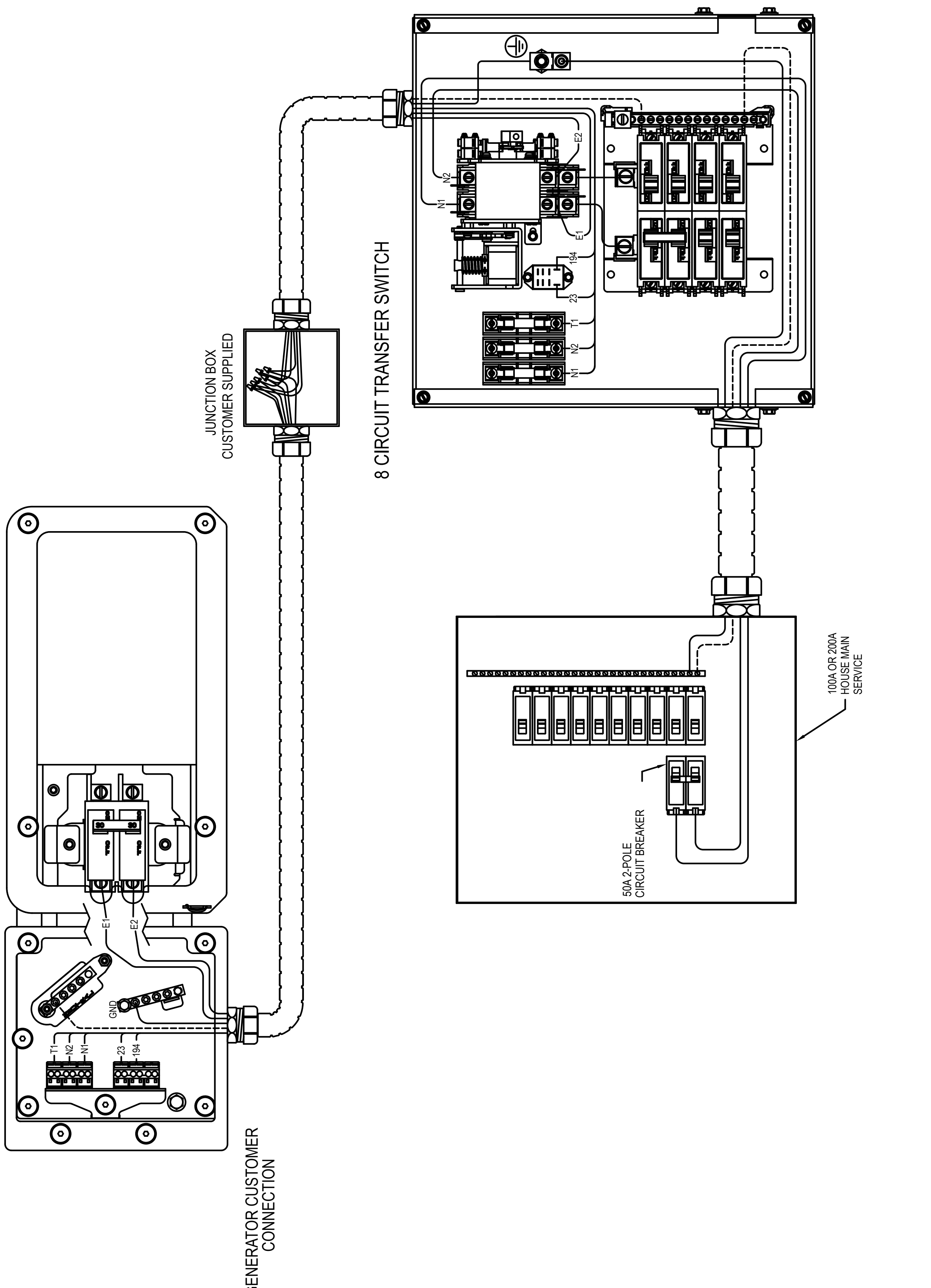


INTERCONNECTIONS - COREPOWER

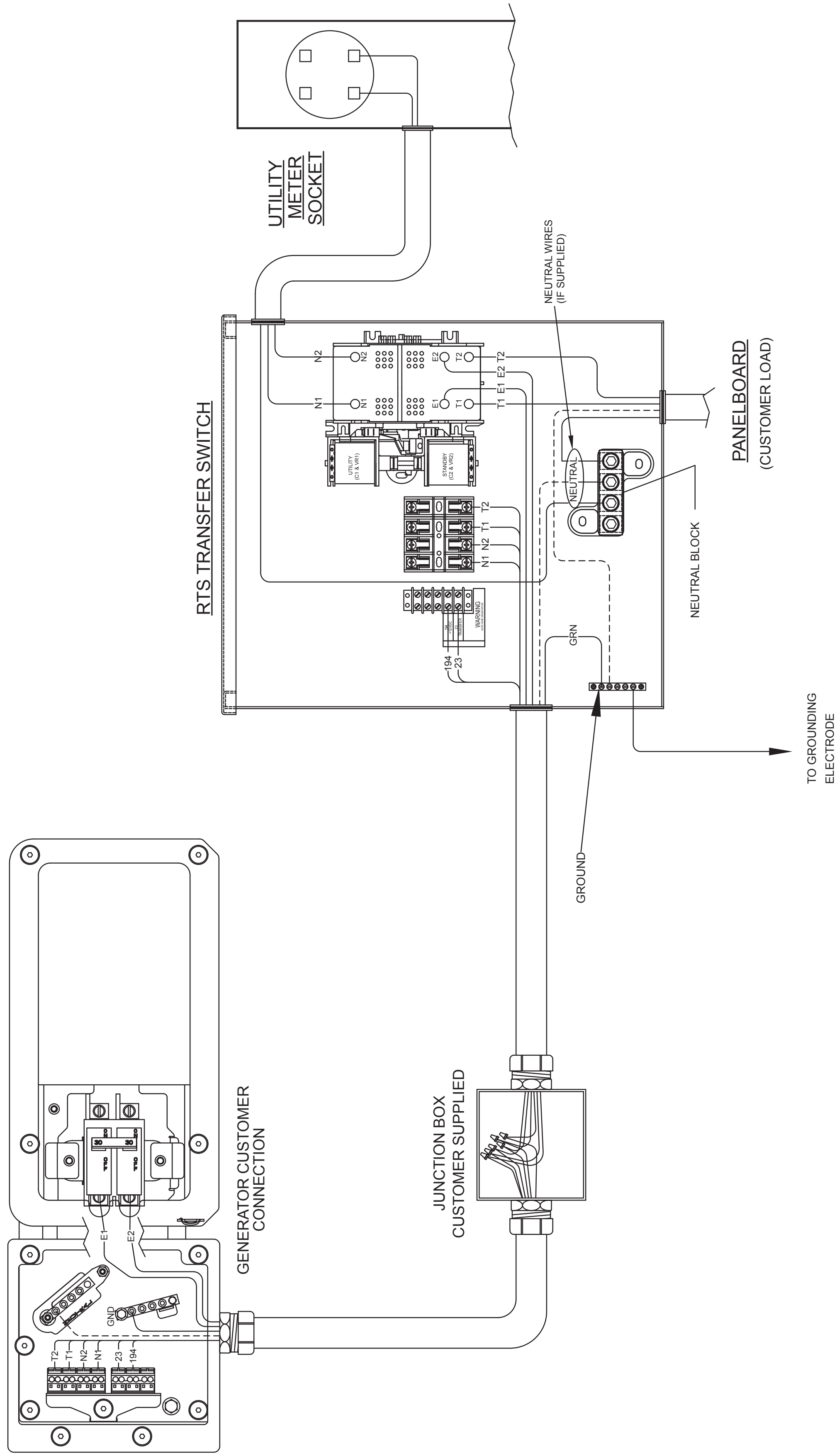


NOTE: INSTALLATION TO BE DONE BY A LICENSED ELECTRICIAN AND MUST MEET ALL NATIONAL, STATE AND LOCAL ELECTRICAL CODES.

INTERCONNECTIONS - POWERPACT (60 HZ)



INTERCONNECTIONS - POWERPACT (50 HZ)



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INTRODUCTION

This diagnostic repair manual has been prepared especially for familiarizing service personnel with the testing, troubleshooting and repair of the vertical home standby systems. Every effort has been expended to ensure that the information and instructions in the manual are both accurate and current. However, the manufacture reserves the right to change, alter or otherwise improve the product at any time without prior notification.

The manual has been divided into several PARTS. Each PART has been divided into SUBSECTIONS and each subsection consists of several sub headings.

It is not the manufacturer's intent to provide detailed disassembly and reassembly of the vertical home standby. It is the manufacturer's intent to (a) provide the service technician with an understanding of how the various assemblies and systems work, (b) assist the technician in finding the cause of malfunctions, and (c) effect the expeditious repair of the equipment.

PARTS

Part 1 – Provides the basic understanding of the generator as well as operating instructions for commons tasks.

Part 2 – Provides the basics of the AC alternator design and the AC troubleshooting portion of the manual.

Part 3 – Provides the troubleshooting and diagnostic testing procedure for the 50 amp transfer switch with the EZ Transfer Operator.

Part 4 – Provides the troubleshooting and diagnostic procedure for the engine related problems and the controller.

Part 5 – Provides detailed step-by-step instructions for the replacement of the rotor/stator and engine.

Part 6 – Illustrates all of the electrical and wiring diagrams for the generator and transfer switch.

GENERATOR IDENTIFICATION

Data Plate

The data plate that is affixed to the generator contains important information pertaining to the unit, including its model number, serial number, amperage rating, and voltage rating. The information from this data plate may be required when requesting information, ordering parts from the factory.

Item Number

Many home standby generators manufactured are to the unique specifications of the buyer. The model number identifies the specific generator set and its unique design specifications.

Serial Number

Used for warranty tracking purposes.

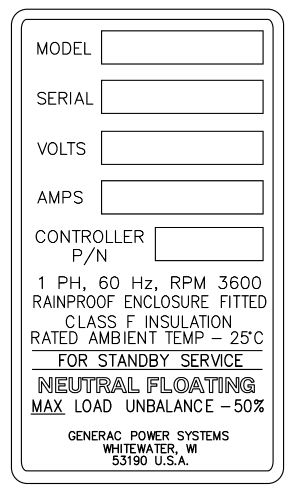


Figure 1. Typical Data Plate

METERS

Devices used to measure electrical properties are called meters. Meters are available that allow one to measure (a) AC voltage, (b) DC voltage, (c) AC frequency, and (d) resistance In ohms. The following apply:

- To measure AC voltage, use an AC voltmeter.
- To measure DC voltage, use a DC voltmeter.
- Use a frequency meter to measure AC frequency In “Hertz” or “cycles per second”.
- Use an ohmmeter to read circuit resistance, in “ohms”.

THE VOM

A meter that will permit both voltage and resistance to be read is the “Volt-Ohm-Meter” or “VOM”.

Some VOMs are of the “analog” type (not shown). These meters display the value being measured by physically deflecting a needle across a graduated scale. The scale used must be Interpreted by the user.

“Digital” VOM’s (Figure 2) are also available and are generally very accurate. Digital meters display the measured values directly by converting the values to numbers.

Note: Standard AC voltmeters react to the AVERAGE value of alternating current. When working with AC, the effective value is used. For that reason a different scale is used on an AC voltmeter. The scale is marked with the effective or “rms” value even though the meter actually reacts to the average value. That is why the AC voltmeter will give an Incorrect reading if used to measure direct current (DC).

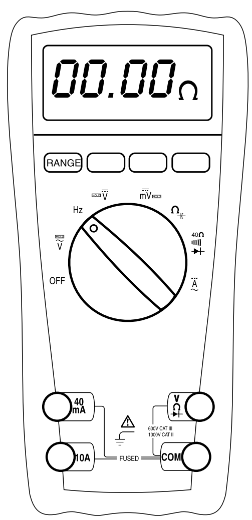


Figure 2. Digital VOM

MEASURING AC VOLTAGE

An accurate AC voltmeter or a VOM may be used to read the generator’s AC output voltage. The following guidelines apply:

1. Always read the generator’s AC output voltage at the unit’s rated operating speed and AC frequency.
2. The generator voltage regulator can be adjusted for correct output voltage only while the unit is operating at its correct rated speed and frequency.
3. Only an AC voltmeter may be used to measure AC voltage. DO NOT USE A DC VOLTMETER FOR THIS PURPOSE.

⚠ DANGER!

Generators produce high and dangerous voltages. Contact with high voltage terminals will result in dangerous and possibly lethal electrical shock.

MEASURING DC VOLTAGE

A DC voltmeter or a VOM may be used to measure DC voltages. Always observe the following rules:

1. Always observe correct DC polarity.
   a. Some VOM’s may be equipped with a polarity switch.
   b. On meters that do not have a polarity switch, DC polarity must be reversed by reversing the test leads.
2. Before reading a DC voltage, always set the meter to a higher voltage scale than the anticipated reading. If in doubt, start at the highest scale and adjust the scale downward until correct readings are obtained.
3. The design of some meters is based on the “current flow” theory while others are based on the “electron flow” theory.
   a. The “current flow” theory assumes that direct current flows from the positive (+) to the negative (-).
   b. The “electron flow” theory assumes that current flows from negative (-) to positive (+).

Note: When testing generators, the “current flow” theory is applied. That is, current is assumed to flow from positive (+) to negative (-).

MEASURING AC FREQUENCY

The generator’s AC output frequency is proportional to Rotor speed. Generators equipped with a 2-pole Rotor must operate at 3600 rpm to supply a frequency of 60 Hertz. Units with 4-pole Rotors must run at 1800 rpm to deliver a 60 Hertz output.

MEASURING CURRENT

Clamp-On

To read the current flow, in AMPERES, a clamp-on ammeter may be used. This type of meter indicates current flow through a conductor by measuring the strength of the magnetic field around that conductor. The meter consists essentially of a current transformer with a split core and a rectifier type instrument connected to the secondary. The primary of the current transformer is the conductor through which the current to be measured flows. The split core allows the Instrument to be clamped around the conductor without disconnecting it.

Current flowing through a conductor may be measured safely and easily. A line-splitter can be used to measure current in a cord without separating the conductors.

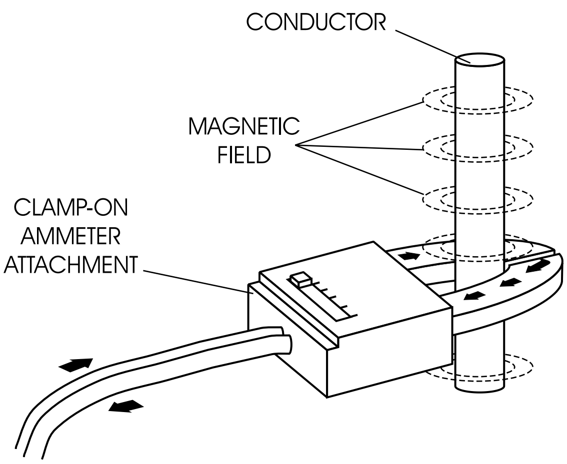


Figure 3. Clamp-On Ammeter

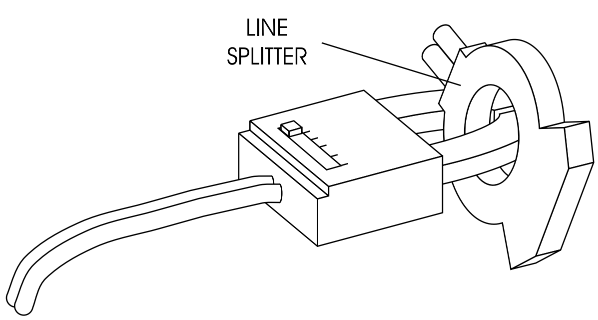


Figure 4. A Line-Splitter

Note: If the physical size of the conductor or ammeter capacity does not permit all lines to be measured simultaneously, measure current flow in each individual line. Then, add the individual readings.

In-Line

Alternatively, to read the current flow in AMPERES, an in-line ammeter may be used. Most Digital Volt-Ohm-Meters (VOM) will have the capability to measure amperes.

This usually requires the positive meter test lead to be connected to the correct amperes plug, and the meter to be set to the amperes position. Once the meter is properly set up to measure amperes the circuit being measured must be physically broken. The meter will be in-line or in series with the component being measured.

In Figure 5 the control wire to a relay has been removed. The meter is used to connect and supply voltage to the relay to energize it and measure the amperes going to it.

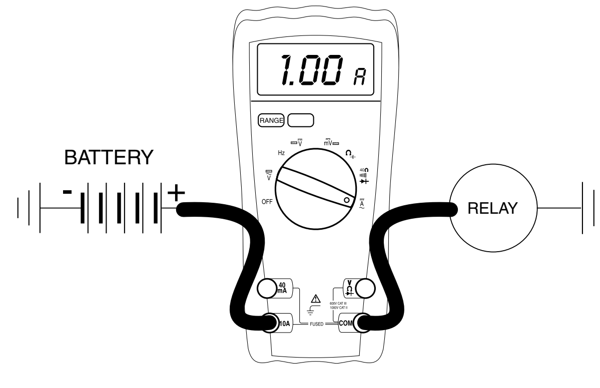


Figure 5. A VOM as an In-line Amp Meter

MEASURING RESISTANCE

The VOM may be used to measure the resistance in a circuit. Resistance values can be very valuable when testing coils or windings, such as the Stator and Rotor windings, or checking a wire for an open or grounded condition.

When testing Stator windings, keep in mind that the resistance of these windings is very low. Some meters are not capable of reading such a low resistance and will simply read CONTINUITY.

If proper procedures are used, the following conditions can be detected using a VOM:

- A “short-to-ground” condition in any Stator or Rotor winding, or a short to ground on a specific control wire.
- Shorting together of any two parallel Stator windings.
- Shorting together of any two isolated Stator windings.
- An open condition in any Stator or Rotor winding, or an open in a control wire.

Component testing may require a specific resistance value or a test for INFINITY or CONTINUITY. Infinity is an OPEN condition between two electrical points, which would read as no resistance, or OL (Open Line) on a VOM. Continuity is a closed condition between two electrical points, which would be indicated as very low resistance (000.000) or “ZERO” on a VOM.

ELECTRICAL UNITS

Ampere

The rate of electron flow in a circuit is represented by the AMPERE. The ampere is the number of electrons flowing past a given point at a given time. One AMPERE is equal to just slightly more than 6.241×10^{18} electrons per second.

With alternating current (AC), the electrons flow first in one direction, then reverse and move in the opposite direction. They will repeat this cycle at regular intervals. A wave diagram, called a “sine wave” shows that current goes from zero to maximum positive value, then reverses and goes from zero to maximum negative value. Two reversals of current flow is called a cycle. The number of cycles per second is called frequency and is usually stated in “Hertz”.

Volt

The VOLT is the unit used to measure electrical PRESSURE, or the difference in electrical potential that causes electrons to flow. Very few electrons will flow when voltage is weak. More electrons will flow as voltage becomes stronger. VOLTAGE may be considered to be a state of unbalance and current flow as an attempt to regain balance. One volt is the amount of Electromotive Force (EMF) that will cause a current of 1 ampere to flow through 1 ohm of resistance.

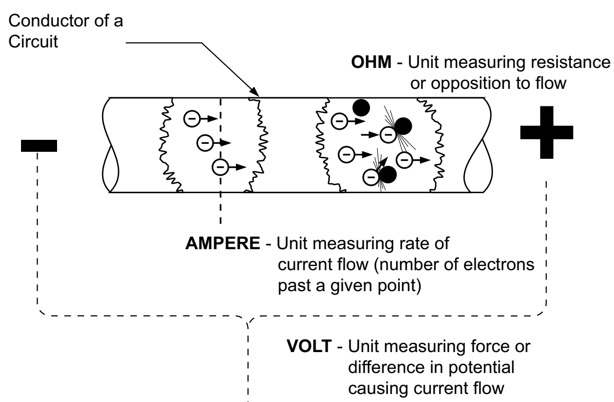


Figure 6. Electrical Units

Ohm

The OHM is the unit of RESISTANCE. In every circuit there is a natural resistance or opposition to the flow of electrons. When an EMF is applied to a complete circuit, the electrons are forced to flow in a single direction rather than their free or orbiting pattern. The resistance of a conductor depends on (a) its physical makeup, (b) its cross-sectional area, (c) its length, and (d) its temperature. As the conductor’s temperature increases, its resistance increases in direct proportion. One (1) ohm of resistance will permit one (1) ampere of current to flow when one (1) volt of EMF is applied.

OHM’S LAW

A definite and exact relationship exists between VOLTS, OHMS and AMPERES. The value of one can be calculated when the value of the other two are known. Ohm’s Law states that in any circuit the current will increase when voltage increases but resistance remains the same, and current will decrease when resistance increases and voltage remains the same.

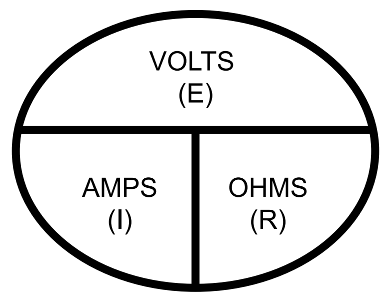


Figure 7. Ohm’s Law

If AMPERES is unknown while VOLTS and OHMS are known, use the following formula:

$$AMPERES = \frac{VOLTS}{OHMS}$$

If VOLTS is unknown while AMPERES and OHMS are known, use the following formula:

$$VOLTS = AMPERES \times OHMS$$

If OHMS is unknown but VOLTS and AMPERES are known, use the following:

$$OHMS = \frac{VOLTS}{AMPERES}$$

INTRODUCTION

It is the responsibility of the installer to ensure that the Generator installation was performed properly. A careful inspection must be performed when the installation is complete. All applicable codes, standards, and regulations pertaining to such installations must be strictly complied with. In addition, regulations established by the Occupational Safety and Health Administration (OSHA) must be complied with as well.

Prior to initial startup of the unit, the installer must ensure that the Generator has been properly prepared for use. This includes the following:

- An adequate supply of the correct fuel must be available for generator operation.
- The engine must be properly serviced with the recommended oil.
- With liquid propane (LP), use only the “vapor withdrawal” system. This type of system uses the vapors formed above the liquid fuel in the storage tank.

The engine has been fitted with a fuel carburetion system that meets the specification of the 1997 California Air Resources Board for tamper-proof dual fuel systems. The unit will run on natural gas or LP, but it has been factory set and tested to run on natural gas. When the change from natural gas to LP is needed, the fuel system needs to be re-configured.

Recommended fuels should have a British Thermal Unit (BTU) content of at least 1,000 BTU’s per cubic feet for natural gas; or at least 2,520 BTU’s per cubic feet for LP. Ask the fuel supplier for the BTU content of the fuel.

Recommended fuel pressures for natural gas and liquid propane vapor (LPV) are as follows:

Note: All pipe sizing, construction and layout must comply with NFPA 54 for natural gas applications and NFPA 58 for liquid propane applications. After installation, verify that the fuel pressure NEVER drops below five (5) inches water column for natural gas or ten (10) inches water column for LPV.

Prior to installation of the Generator, the installer should consult local fuel suppliers or the fire marshal to check codes and regulations for proper installation. Local codes will mandate correct routing of gaseous fuel line piping around gardens, shrubs and other landscaping to prevent any damage.

Special considerations should be given when installing the unit where local conditions include flooding, tornados, hurricanes, earthquakes and unstable ground for the flexibility and strength of piping and their connections.

Use an approved pipe sealant or joint compound on all threaded fittings.

FUEL CONSUMPTION

Unit	Natural Gas*		LP Vapor**	
	1/2 Load	Full Load	1/2 Load	Full Load
CorePower 6/7 kW	66/1.87	119/3.37	0.82/30/3.10	1.47/53/5.56
PowerPact 6/7 kW 60 Hz	73/2.07	117/3.31	0.73/26.2/2.75	1.3/46.8/4.9
PowerPact 5.6 kVA 50 Hz	81/2.29	120/3.42	0.67/24.4/2.54	1.14/41.5/4.32

Natural gas is in cubic feet/cubic meters per hour.

**LP is in gallons/cubic feet/liters per hour.

Values given are approximate.

Verify that gas meter is capable of providing enough fuel flow to include household appliances.

BTU Flow Requirements - Natural Gas

BTU flow required for each unit based on 1000 BTU per cubic foot.

- 119,000 BTU/Hour (Natural Gas)

RECONFIGURE THE FUEL SYSTEM

Procedure

Note: For disassembly procedures, see major disassembly section in this manual.

1. Locate the fuel throttle assembly mounted to the engine intake.
2. To change the fuel selection, remove the hose clamp and hose from the throttle assembly.
3. Remove the Natural Gas (Larger ID) fuel jet from the fuel inlet.

Note: If the nozzle is found to be inside the hose, remove it with needle nose pliers.

Figure 8. Throttle Assembly - CorePower

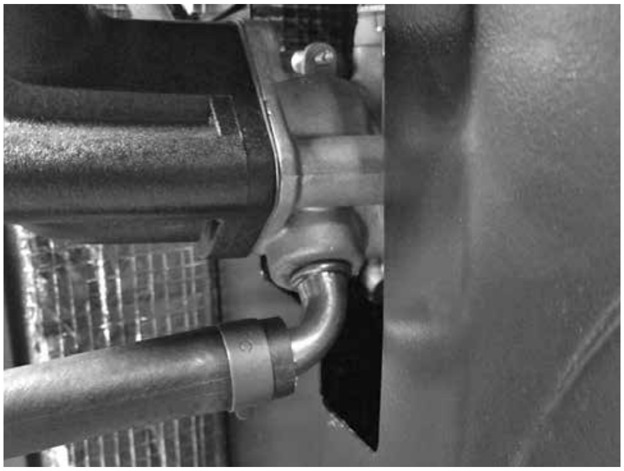


Figure 9. Throttle Assembly - PowerPact

4. Obtain the fuel jet for Propane (Smaller ID that has been supplied loose with the owners manual).
5. Verify that the O-ring, supplied loose with the owners manual is installed, into the groove of the fuel jet.
6. Insert the Propane fuel jet into the end of the fuel inlet.
7. Reinstall the hose and clamp onto the fuel inlet and secure.
8. Verify the hose has not been kinked in any way.

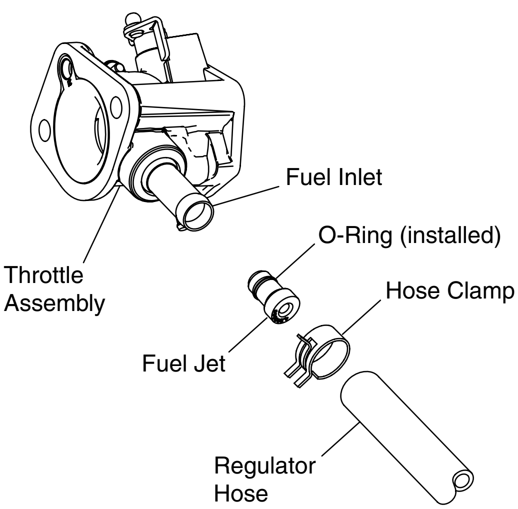


Figure 10.

9. The generator is now ready to run on LP Vapor fuel.

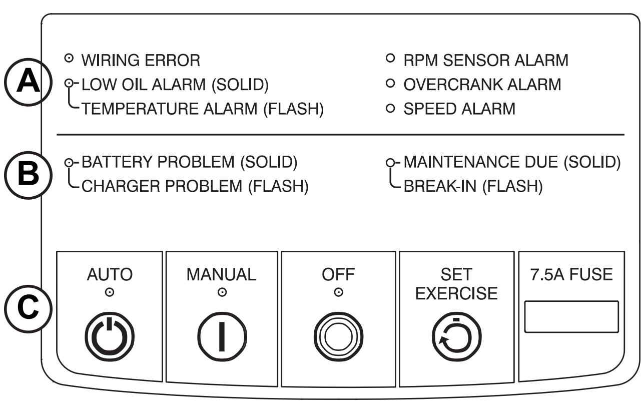
CONTROL PANEL

⚠ WARNING!

WARNING! With the controller set to AUTO, the engine may crank and start at any time without warning. Such automatic starting occurs when Utility power source voltage drops below a preset level or during the normal exercise cycle. To prevent possible injury that might be caused by such sudden starts, always set the switch to the OFF position and remove the fuse before working on or around the Generator or transfer switch. Then, place a "DO NOT OPERATE" tag on the Generator panel and on the transfer switch.

Auto/Manual/Off/Set Exercise Buttons

Button	Description of Operation
AUTO (Green)	Selecting this button activates fully automatic system operation. It also allows the unit to automatically start and exercise the engine every seven days with the setting of the exercise timer (see the "Setting the Exercise Timer" section).
OFF (Red)	This button shuts down the engine and also prevents automatic operation of the unit.
MANUAL (Blue)	This button will crank and start the generator. Transfer to standby power will not occur unless there is a utility failure.
SET EXERCISE (Grey)	Used to establish generator exercise time. Hold the button for 3 seconds at the new exercise time desired. **NOTE:** Exercise time can only be set at the time you wish exercise to actually take place. If Exercise is not set, it will default to the last time power was applied (T1 or Battery) to the control panel.



A. Alarm LEDs
B. Warning LEDs
C. Operation Mode Buttons and LEDs

Figure 11. Control Panel

Note: Damage caused by mis-wiring of the interconnect wires is not warrant-able.

Note: Loss of utility power will cause either the AUTO or OFF or MANUAL buttons to flash. Whichever mode the generator is in at the time of utility loss.

BEFORE INITIAL START-UP

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

NOTE: This unit comes filled with 30 weight organic oil from the factory. Check the oil level and add the appropriate viscosity and amount if necessary.

NOTE: Do not use or add synthetic oil until the generator has operated for a minimum of 50 hours.

GENERATOR ACTIVATION

Note: 50 Hz units do not require generator activation.

The generator needs to be activated before it will automatically run in the event of a power outage.

Activating the generator is a simple, one-time process. Once the product is activated, you will not be prompted to activate again, even if you disconnect the generator battery.

NOTE: If the AUTO button is pressed prior to activation of the generator, the AUTO, OFF and MANUAL LEDs will all flash three (3) times indicating that activation is required.

Activation Sequence

NOTE: The generator is to be run with all appropriate panels in place, including during troubleshooting by a technician.

1. Locate and record the generator's serial number. (Example: 7894562)
2. Contact Generac to obtain your activation code. Call - 1-888-9/ACTIVATE (922-8482, US & CA only) or go to www.activategen.com. For areas outside of the US & CA, please dial the international activation line 262-953-5155. The activation code, you will be given, consists of a sequence of six (6) button presses using the AUTO, OFF and SET EXERCISE buttons. See Figure 11. These MUST be entered in the exact and correct sequence in order to activate the generator.
3. Begin by holding the OFF button for 3 seconds. All the LEDs will flash twice telling you that the activation mode has begun. NOTE: You now have 20 seconds to correctly enter the press sequence or the unit will "time out" and not accept the activation code. If this occurs, you must begin the activation sequence again.
4. Enter the activation code by pressing the AUTO, OFF and SET EXERCISE buttons in the 6 press sequence you were given. (Example: AUTO / OFF / OFF/ SET EXERCISE / SET EXERCISE / SET EXERCISE). The yellow maintenance LED will blink each time a button is pressed.
5. If the sequence is INCORRECTLY entered, the AUTO / OFF / MANUAL buttons will flash 3 times together. Return to Step 3 and continue.

6. If the sequence is CORRECTLY entered, all the LEDs will scroll from bottom to top 5 times. The OFF button will light. The activation process has been performed successfully and the generator is ready to operate.

Before Starting

Complete the following:

1. Ensure that the generator is OFF.
2. Set the generator's main circuit breaker to the OFF (or OPEN) position.
3. Turn off all breakers that will be powered by the generator.
4. Check the engine crankcase oil level and, if necessary, fill to the dipstick FULL mark with the recommended oil. Do not fill above the FULL mark.
5. Check the fuel supply. Gaseous fuel lines must have been properly purged and leak tested in accordance with applicable fuel-gas codes. All fuel shutoff valves in the fuel supply lines must be open.

NOTE: During initial start up only, the generator may exceed the normal number of start attempts and experience an "overcrank" fault. This is due to accumulated air in the fuel system during installation. Reset the control board by pushing the OFF button twice, and restart up to two more times if necessary. If unit fails to start, contact a local dealer for assistance.

7.5 Amp Fuse

This fuse protects the controller as wells as the DC components against overload. If the fuse element has melted open due to an overload, engine cranking and or running will not be possible. Should a fuse replacement become necessary, use only an identical 7.5 amp replacement fuse.

USER INTERFACE

The generator is equipped with an internal exercise timer. Once set, the Generator will start and exercise every seven days, on the day of the week and the time of day specified. During this exercise period, the unit runs for approximately 12 minutes and then shuts down. Transfer of loads to the Generator output does not occur during the exercise cycle unless Utility is lost. Refer to "Setting the exercise time" in Section 1.4.

Note: The exercise function will only work with the controller in the AUTO mode.

AUTOMATIC OPERATION

⚠ CAUTION!

⚠ **CAUTION! The Generators Voltage and Frequency must be verified with the Generator Main Line Circuit Breaker (MLCB) OFF or OPEN Prior to selecting Automatic or Manual operation!**

To select automatic operation

The following procedure applies only to those installations which utilize an air-cooled generator in conjunction with a transfer switch. Residential transfer switches do not have intelligent circuits of their own. Printed circuit board logic in the controller controls the automatic operation of the transfer switch and the generator.

To select automatic operation when a transfer switch is installed along with a home standby generator, the procedure is as follows.

1. Ensure that the transfer mechanism in the transfer switch is in the "Utility" position. If needed, turn OFF or OPEN the Utility source Main Line Circuit Breaker and manually transfer the breaker to the "Utility" position.
2. CLOSE or turn ON the Utility source Main Line Circuit Breaker and ensure Utility voltage is available to the UTILITY terminals N1 and N2.
3. Actuate the generator main line circuit breaker (MLCB) to the "Closed" position.
4. Set the generator controller to the AUTO mode.

Following the procedure of Steps 1 through 4, a dropout of Utility voltage below a preset level will result in automatic Generator cranking and start-up. Following startup, the transfer switch will actuate to the "Standby" position.

MANUAL OPERATION

Transfer to "Standby" and Manual Startup

To transfer electrical loads to the Generator and to start the generator manually, the procedure is as follows:

1. On the generator, set the controller switch to the OFF mode.
2. On the generator, set the main line circuit breaker (MLCB) to the "Open" position.
3. Locate a means of Utility disconnect and set it to the OFF position.
4. Manually actuate the breaker to the "Standby" position in the transfer switch.
5. On the generator, set the controller switch to the MANUAL mode.

⚠ WARNING!

⚠ **WARNING! Engine will crank and start!**

6. Let the engine warm up and stabilize for a minute or two at no-load. Set the generators MLCB to the "Closed" position. Generator voltage should now be available to the transferred electrical loads.

Retransfer Back to "Utility" and Manual Shutdown

To shutdown the generator and retransfer electrical loads back to the "Utility" position, the procedure is as follows:

1. Set the generator MLCB to the OPEN position.
2. Allow the generator to run at no-load for several minutes to cool down.
3. Set the generator controller to the OFF mode.
4. Locate a means of Utility disconnect and set it to the OFF position.
5. Manually actuate the breaker in the transfer switch to the "Utility" position.
6. Restore Utility voltage to the transfer switch, by the means that was utilized in Step 4.
7. Set the generator controller to the AUTO mode.

With the generator in AUTO, a dropout in Utility voltage below a preset level will result in automatic generator cranking and start-up. Following startup, the transfer switch will actuate to the "Standby" position.

SHUTTING GENERATOR DOWN WHILE UNDER LOAD

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

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

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

NOTE: If turning the unit off for longer than 24 hours, remove the F1 fuse from the generator controller.

To turn the generator back ON:

1. Reinstall F1 fuse if necessary.
2. Put the generator back into AUTO and allow to start and warm-up for a few minutes.
3. Set the MLCB on the generator to ON.

The system will now be operating in automatic mode.

The main utility disconnect can be turned ON (CLOSED).

NOTE: To shut the unit off, this complete process must be repeated

INTRODUCTION

When the generator is installed in conjunction with a transfer switch, either manual or automatic operation is possible.

UTILITY FAILURE

Initial Conditions

The generator is in AUTO, ready to run, and the transfer switch is in the Utility position. When Utility fails, a line interrupt delay timer is started. If the Utility is still not present when the timer expires, the engine will crank and start. Once started an engine warm-up timer will start.

When the warm-up timer expires the controller will transfer load to the generator. If Utility voltage is restored at any time between the initiation of the engine start and when the generator is ready to accept load, (warm-up time has not elapsed), the controller will complete the start cycle and run the generator through its normal cool down cycle; however the switch will remain in the "Utility" position.

	CorePower	PowerPact
Utility Failure (falls below percentage of nominal)	65%	65%
Utility Restored (returns above percentage of nominal)	75%	80%
Line Interrupt Delay Time	10 seconds	5 seconds 60 Hz) 30 seconds (50 Hz)

CRANKING

CorePower

The controller will cyclic crank the engine 5 times as follows:

16 second crank, 7 second rest, 16 second crank, 7 second rest, followed by 3 additional cycles of 7 second crank followed by 7 second rests.

PowerPact

The controller will cyclic crank the engine 5 times as follows:

16 second crank, 7 second pause, 16 second crank, 7 second pause, followed by 3 additional cycles of 7 second cranks and 3 second rests.

Failure To Start

Failure to start is defined as any of the following occurrences during cranking.

1. Not reaching starter dropout within the specified crank cycle.

Note: Starter dropout is defined as 4 cycles at 1,000 RPM

2. Reaching starter dropout, but not reaching 2200 rpm within 15 seconds. After which the controller will go into a rest cycle of 7 seconds, then continue the rest of the crank cycle.
3. If the unit does not start during the crank sequence, the control panel Overcrank Alarm LED will illuminate.

Note: During a rest cycle the start and fuel outputs are de-energized and the magneto output is shorted to ground.

CRANKING CONDITIONS

The following notes apply during the crank cycle

1. Starter motor will not engage within 5 seconds of the engine shutting down.
2. The fuel output will not be energized with the starter
3. The starter and magneto outputs will be energized together.
4. Once the starter energizes, the controller will begin looking for engine rotation. If it does not see an RPM signal within 3 seconds it will shut down and latch out on "RPM Sensor loss"
5. Once the controller sees an RPM signal it will energize the fuel solenoid and continue the crank sequence. The fuel solenoid does not activate earlier because if the engine does not crank, this would potentially fill the engine/exhaust up with unspent fuel. It takes at least 3 seconds to detect cranking on the engine with a magneto RPM measurement. This would result in 3 seconds of fuel being delivered, increasing the chances of a backfire.
6. The starter motor will disengage when speed reaches starter dropout.
7. If the unit does not start during the initial crank sequence, or if the generator does not reach 2200 rpm within 15 seconds, a re-crank cycle will occur, which may result in up to 6 crank attempts total.
8. If the engine stops turning between starter dropout and 2200 RPM the controller will go into a rest cycle of 7 seconds and re-crank (if additional crank cycles exist.)
9. Once started the generator will wait for a hold off period before starting to monitor oil temperature and either oil pressure (CorePower) or oil level (PowerPact). Refer to Section 4.2 "Engine Protective Devices"
10. During a MANUAL crank attempt, if the controller is switched from MANUAL to OFF, the crank attempt will abort.
11. During automatic crank attempt, if the Utility returns, the crank cycle does NOT abort, but continues until complete. Once the engine starts, it will run for one minute then shutdown.

LOAD TRANSFER PARAMETERS

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

Manual

- No transfer to Standby when Utility is present
- Transfer to Standby will occur if Utility fails for a preset interval of time.
  - 10 consecutive seconds on CorePower
  - 6 consecutive seconds on 60 Hz PowerPact.
  - 30 consecutive seconds on 50 Hz PowerPact.
- Transfer back to Utility when Utility returns for 15 consecutive seconds. The engine will continue to run until removed from the Manual mode.

Auto

- Transfer to Standby will occur if Utility fails for 10 consecutive seconds on CorePower, or 5 consecutive seconds on PowerPact.
- An engine warm-up timer will initialize
  - 5 seconds on CorePower
  - 6 seconds on 60 Hz PowerPact.
  - 30 seconds on 50 Hz PowerPact.
- Transfer back to the “Utility” position if Utility subsequently returns
- Transfer to the “Standby” position if Utility is still not present.
- Transfer back to Utility once Utility returns (above 75% of nominal) for 15 seconds.
- Transfer back to Utility, if present, if the generator is shutdown for any reason (such as the switch turned to the OFF position or a shutdown alarm.

	CorePower	PowerPact
Utility Failure (falls below percentage of nominal)	65%	65%
Utility Restored (returns above percentage of nominal)	75%	80%

Exercise

- Exercise will not function if the generator is already running in either AUTO or MANUAL mode.
- During exercise, the controller will only transfer if Utility fails during exercise for 10 seconds, and will follow the steps outline above for AUTO operation.

Utility Restored

The generator is running, switch is in the “Standby” position, running in Utility failure. When the Utility returns, a 15 second return to Utility timer will start. At the completion of this timer, if the Utility supply is still present and acceptable, the controller will transfer the load back to the Utility and run the engine through a one minute cool down period and then shutdown. If Utility fails for three seconds during this cool down period, the controller will transfer load back to the generator and continue to run while monitoring for Utility to return.

COLD SMART START

Later model PowerPact units are equipped with a Cold Smart Start feature. The Cold Smart Start feature enables the generator to monitor ambient temperature. The warm-up delay will be adjusted based on prevailing conditions.

On a startup in AUTO mode, if the ambient temperature is below a fixed temperature (based on model) the generator will warm up for 30 seconds. This allows the engine to warm before a load is applied. If the ambient temperature is at or above the fixed temperature, the generator will start up with the normal warm-up delay of 6 seconds.

Refer to the unit Owner's Manual to determine if a unit is equipped with Cold Smart Start.

INTRODUCTION

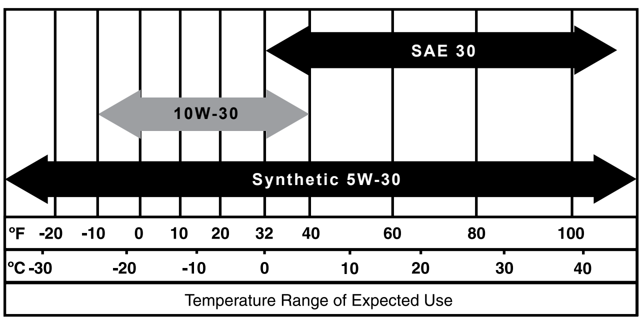
Performing proper maintenance on a Generator will ensure proper function during a Utility failure. Once a Generator has failed, it is already too late. Ensuring the proper oil changes and inspections have been completed at the specified times will help keep the Generator reliable.

ENGINE OIL

Modern oils play vital functions in protecting the engine. Lubricating oil acts to reduce friction and wear, cool engine parts, seal combustion chambers, clean engine components, and inhibit corrosion. See "Service Schedule" for specific inspection items and interval

ENGINE OIL RECOMMENDATIONS

All oil should meet minimum American Petroleum Institute (API) Service Class SJ, SL or better. Do not use special additives. Select the oil's viscosity grade according to the expected operating temperature.



- SAE 30 above 32 ºF (0 ºC)
- SAE 10W-30 between 40 º and -10 ºF (4 º and -23 ºC)
- Synthetic SAE 5W-30 for all temperature ranges

AIR FILTER

Air is necessary for successful combustion in the engine. Clean air (almost 100% pure) is critical to engine survival and vital to its performance. There are operational signs when an air filter has become completely plugged. The engine begins to lose power, and fuel consumption increases. Black smoke may blow from the exhaust. Continued operation with a plugged air filter may cause severe damage to the engine.

SPARK PLUGS

Good spark is essential to properly maintaining the engine. Although replacement may not be required, inspection of the plugs during routine maintenance is critical. Always verify that spark plugs are gapped according to the specifications. Improperly gaped spark plugs will effect the operation of the engine.

See Test 65 for diagnosing spark plug related problems.

See "Specifications" for specific spark plug gaps.

VISUAL INSPECTION

During all service intervals, a proper visual inspection must be conducted to ensure proper function, airflow, and to prevent fire hazards.

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

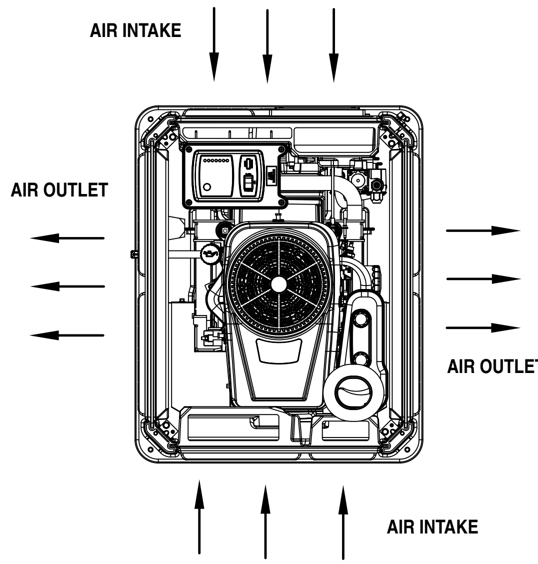


Figure 12. CorePower Cooling Vent Locations

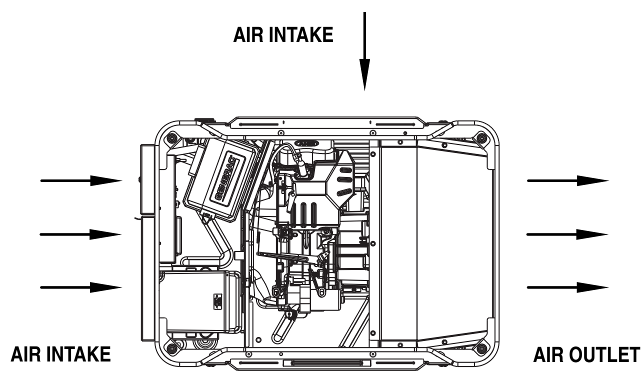


Figure 13. PowerPact Cooling Vent Locations

CORROSION PROTECTION

Spray engine linkages with a light oil such as WD-40.

⚠ CAUTION!

CAUTION! Do not spray flammable oils on a hot or running engine.

VALVE CLEARANCE

Proper valve clearance is vital to ensuring longevity of the engine. After the first 6 months of operation, check the engine valve clearance and adjust as necessary. Checking of the engine valve clearance thereafter periodically will increase reliability of the Generator. Refer to Test 70 for Specification and adjustment procedure.

Some symptoms of an engine with valves in need of adjustment are:

- Hard starting
- Loud tapping noise
- Rough running
- Insufficient power to carry load

BATTERY

Performing proper battery maintenance at the required intervals will allow for proper starting of the Generator during a power outage. Some common things to look for and check during maintenance are:

- Inspect the battery posts and cables for tightness and corrosion. Tighten and clean as necessary.
- Check the battery fluid level of unsealed batteries and, if necessary, fill with Distilled Water only. Do not use tap water in batteries.
- Have the state of charge and conditions checked. This should be done with an automotive-type battery hydrometer.

Note: See Test 56 for further testing the state of a battery.

SERVICE SCHEDULE - COREPOWER

SYSTEM/COMPONENT	PROCEDURE			FREQUENCY
X = Action R = Replace as Necessary * = Notify Dealer if Repair is Needed.	Inspect	Change	Clean	W = Weekly M = Monthly Y = Yearly
FUEL				
Fuel lines and connections*	X			M
LUBRICATION				
Oil level	X			M or 24 hours of continuous operation.
Oil		X		1Y or 100 hours of operation.**
Oil filter		X		1Y or 100 hours of operation.**
COOLING				
Enclosure louvers	X		X	W
BATTERY				
Remove corrosion, ensure dryness	X		X	M
Clean and tighten battery terminals	X		X	M
Check charge state	X	R		EVERY 6 M
Electrolyte level	X	R		EVERY 6 M
ENGINE AND MOUNTING				
Air cleaner	X	R		1Y or 200 hours
Spark plug	X	R		1Y or 200 hours
GENERAL CONDITION				
Vibration, Noise, Leakage, Temperature*	X			M
COMPLETE TUNE-UP*	TO BE COMPLETED BY A DEALER			1Y or 200 hours

* Contact the nearest dealer for assistance if necessary.

** Change oil and filter after first eight (8) hours of operation and then every 100 hours thereafter, or 1 year, whichever occurs first. Change sooner when operating under a heavy load or in a dusty or dirty environment or in high ambient temperatures.

SERVICE SCHEDULE - POWERPACT

SYSTEM/COMPONENT	PROCEDURE			FREQUENCY
X = Action R = Replace as Necessary * = Notify Dealer if Repair is Needed.	Inspect	Change	Clean	W = Weekly M = Monthly Y = Yearly
FUEL				
Fuel lines and connections*	X			M
LUBRICATION				
Oil level	X			M or 24 hours of continuous operation.
Oil		X		6 M or 100 hours of operation**
COOLING				
Enclosure louvers	X		X	W
BATTERY				
Remove corrosion, ensure dryness	X		X	Y
Clean and tighten battery terminals	X		X	Y
Check charge state	X	X		Y
Electrolyte level (unsealed batteries only)*	X	X		Every 6 M
ENGINE AND MOUNTING				
Air cleaner	X	X	X	3 M / 50 hours - clean / 1 Y / 300 hours - replace
Spark plug	X	X		6 M or 100 hours - inspect / 1 Y or 300 hours - change
Valve Clearance				1 Y or 300 hours***
GENERAL CONDITION				
Vibration, Noise, Leakage*	X			M

* Contact the nearest Dealer for assistance if necessary.

** Change oil after the first 20 hours of operation or 1 month. Continue to check at intervals of 100 hours or 6 months, whichever occurs first. Severe duty oil drain intervals: In cold weather conditions (ambient below 40 ºF/4.4 ºC) change engine oil every 6 months or 50 hours of operation to prevent accumulation of water in the oil. If the unit will be operated continuously in hot ambient conditions (ambient above 85 ºF/29.4 ºC) or operation in an extremely dusty or dirty environment change the engine oil every 3 months or 50 hours of operation to prevent oil breakdown.

*** Check valve clearance after the first 20 hours of operation. Continue to check at intervals of 300 hours.

INTRODUCTION

This section familiarizes the service technician with the manufacturer recommended procedures for the testing and evaluation of various problems that can occur on the standby generators. It is highly recommended that you read these introductory tips before you attempt to troubleshoot any of the three main generator components: AC Generator, Engine, or the Transfer Switch. The Troubleshooting Flow Charts provide the simplest, quickest, systematic means to troubleshoot the typical problems that might occur during the lifetime of the unit. If you use the flow charts and perform the indicated tests, you will be able to identify the faulty component, which can then be repaired or replaced as necessary.

The test procedures in each section do require a basic knowledge of electricity and electrical safety, hand tool skills, and use of Volt-Ohm-Meters.

RECOMMENDED TOOLS

In addition to the normal hand tools required, some test procedures may require the use of specialized test equipment. At a minimum you must have a meter that measures AC voltage and frequency, and DC voltage and current (digital multi meters (DMM) are recommended); standard meter test leads, a set of piercing probe leads , and a set of pin probe leads for the connector pins. The manufacturer carries a set of acceptable piercing probes (PN 0G7172), or other suppliers piercing probes may be used. Fluke provides a high quality piercing probe, PN AC89, which is highly recommended. The manufacturer also carries a set of flexible pin leads for use with the connector plugs (PN 0J09460SRV).

Figure 14. Test Probes

For engine troubleshooting you will need a good manometer which measures low pressure in Inches of Water Column (IN WC or IN H20). An ignition spark tester is also a handy tool to have when working with air-cooled engines.

Testing and troubleshooting methods covered in each section are not exhaustive. No attempt has been made to discuss, evaluate and advise the home standby service trade of all conceivable ways in which service and trouble diagnosis must be performed. Accordingly, anyone who uses a test method not recommended herein must first satisfy himself that the procedure or method he has selected will jeopardize neither his nor the product's safety, and will not cause damage to any connectors or components.

Recommended Tools Check List

- ❒ General Mechanics Tool Box
- ❒ A Meter Capable of Measuring Frequency (Hz), AC & DC volts, DC amps, and Ohms
- ❒ A Clamp-on Ammeter
- ❒ A 1/4" & 3/8" Metric & SAE Socket Set
- ❒ Allen Wrenches (Metric & SAE)
- ❒ Manometer
- ❒ Spark Tester
- ❒ Compression Gauge
- ❒ Oil Pressure Gauge
- ❒ Leak Down Tester

TROUBLESHOOTING REMINDERS AND TIPS

The most important step in troubleshooting is identifying the actual problem.

The next step is to determine the applicable flow chart to use to help diagnose the problem. Use the flow chart index for the part of the generator you are working with. If it is problem with voltage, use Part 2 – AC Generators; for engine problems use Part 4 – Engine/DC Control; for a problem with the transfer switch, use Part 3 – Transfer Switch. The index for each will help you clarify the problem and the flow chart to use. In each flow chart start at the top and use the test indicated to verify whether a component or control item is working properly or not. At the end of each test follow the "good" or "bad" arrows and perform the next test.

It is always good practice to continue to ask questions during the troubleshooting process. When evaluating a problem, these questions may help identify the problem quicker.

- What is it doing? (low voltage; not cranking; not transferring; etc)
- What should it do? (run and start; transfer; shutdown; etc)
- Does the same thing happen each time?
- When is it happening?
- What could or would cause this?
- What type of test will either prove or disprove the cause of the fault?

CONNECTORS

A number of the tests require the use of a volt-meter and a set of wire piercing probes. When using the piercing probes make sure you use some liquid tape or silicon to coat the insulation where you pierced it; this will keep moisture out and prevent long term corrosion.

It is very easy to damage the female pins in the connectors on the control panel and the C1 connector (Molex connector) which goes to the alternator can.

DO NOT ATTEMPT TO PUSH PROBE TIPS INTO THE FEMALE PINS OF THE MOLEX CONNECTORS; doing so will damage the female pin which will create another problem. Use the piercing probes on the correct wire to check for the appropriate voltages ; or use the flexible pin leads, available from the manufacturer (PN 0J09460SRV) to work with the connector plugs.

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INTRODUCTION

The alternator contained within the generator is a revolving field (rotor) type with a stationary armature (stator), and excitation to the field provided through brushes and slip rings (direct excitation). The generator may be used to supply electrical power for the operation of the 120 and/or 240 VAC, 1-phase, 60 Hz, AC loads.

ENGINE-GENERATOR DRIVE SYSTEM

The air-cooled engine is directly coupled to the rotor internally. Both the engine and the rotor operate at 3600 rpm to provide a 60 HZ AC output.

ALTERNATOR ASSEMBLY

The standard alternator consists of three basic components; a rotor, stator, and brush assembly. The rotor assembly provides the magnetic field which will induce a voltage into the stator assembly. The brush assembly provides the electrical connection to the rotor, which allows for excitation voltage and current to create the needed magnetic field.

Rotor

Operating the 2-pole rotor at 3600 rpm will supply 60 HZ AC. The term “2-pole” means the rotor has a single north and a single south magnetic pole. Held in place with a single through bolt, the tapered rotor shaft mounts to the tapered crankshaft of the engine. As the rotor rotates its lines of magnetic flux cut across the stator windings and induce a voltage into the stator windings. The rotor shaft has a positive and negative slip ring, with the positive slip ring nearest the lower bearing carrier. The bearing is pressed onto the end of the rotor shaft.

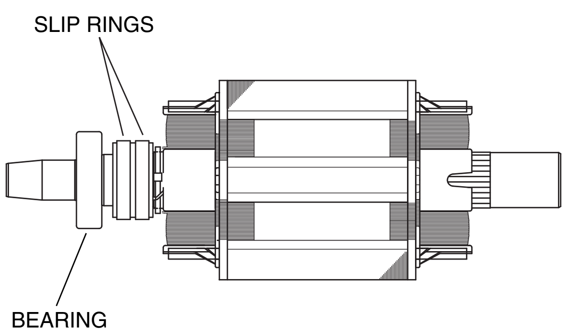


Figure 15. Rotor

Stator

The stator houses a dual power winding and an excitation winding. Coming from the stator there are eight stator leads as shown in Figures 16 and 17.

An adapter molded into the engine block and a rear-bearing carrier support the stator can. Four stator bolts connect the rear bearing carrier and the stator can to the engine.

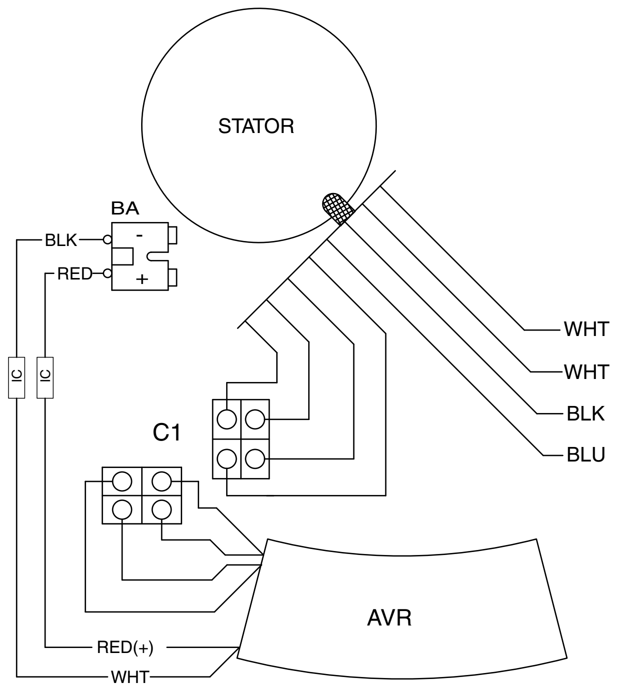


Figure 16. Stator Leads - CorePower

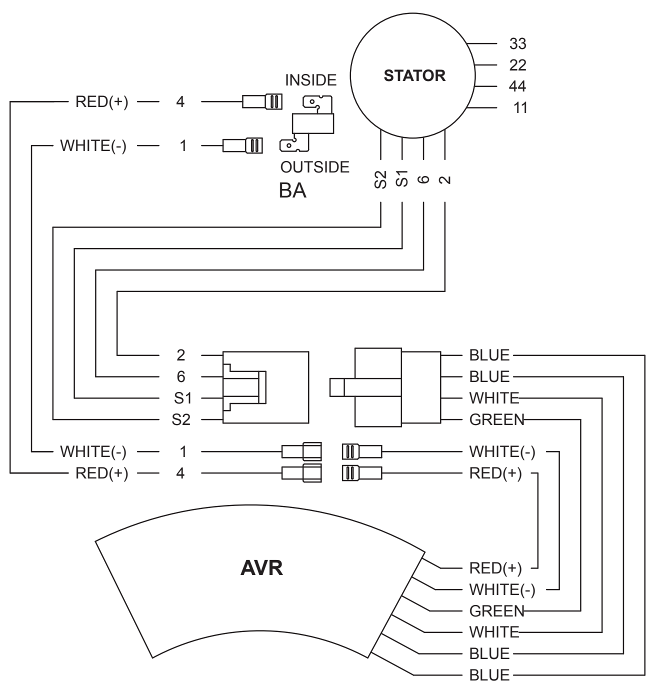


Figure 17. Stator Leads - PowerPact

BRUSH HOLDER AND BRUSHES

Attached to the lower bearing carrier, the brush holder and brushes allow for electrical connection to the rotor. Positive and negative brushes are retained in the brush holder, with the positive brush riding on the slip ring nearest the rotor bearing.

The Red wire connects to the positive brush and the Black Wire to the negative brush. The rotor windings receive rectified and regulated field excitation voltage (DC) through the Red and Black Wires. The current flow creates a magnetic field around the rotor having a flux concentration that is proportional to the amount of current flow on the Red and Black Wires.

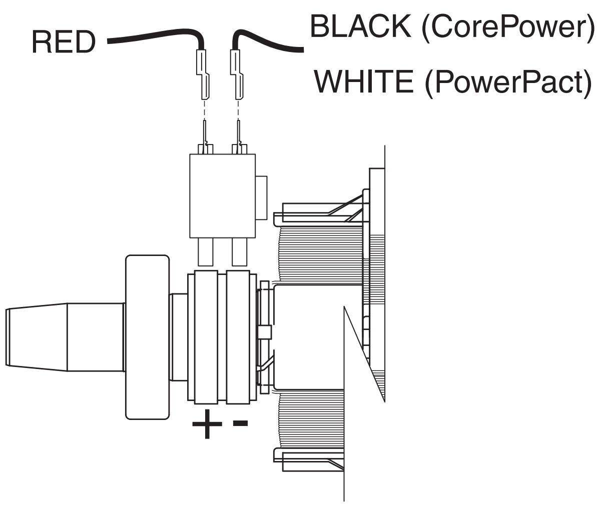


Figure 18. Brush Holder and Brushes

OTHER AC GENERATOR COMPONENTS

Located within the generator control panel enclosure are the voltage regulator and the main line circuit breaker.

Voltage Regulator

Unregulated AC output from the stator excitation winding is delivered to the regulator's DPE circuit through the two Blue wires and C1-1 and C1-2. The voltage regulator rectifies that voltage and, based on stator AC power winding sensing, regulates it. The rectified and regulated field excitation current is then delivered to the rotor windings from the positive (+) and negative (-) brush wires. Stator AC power winding sensing is delivered to the regulator through the Green and White Wires.

Main Line Circuit Breaker

The main line circuit breaker protects the generator against electrical overload. Refer to "Specifications" section for the specific amperage ratings.

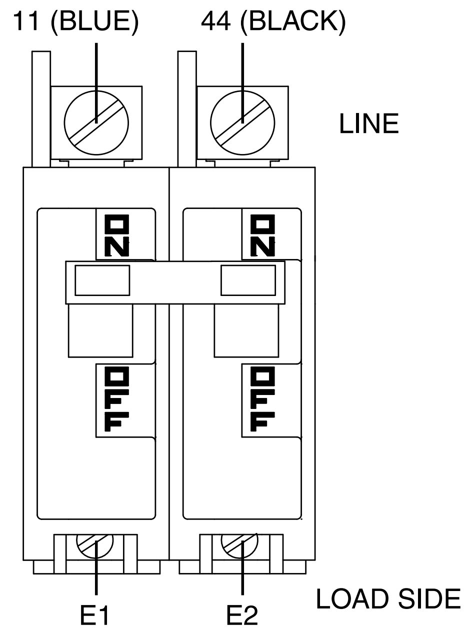


Figure 19. Main Line Circuit Breaker

Note: In Figure 19, Terminals 11 and 44 are for PowerPact units. Blue and Black are for CorePower units.

STARTUP

When the engine is started, permanent magnets embedded in the rotor induce a voltage into (a) the stator AC power windings, (b) the stator excitation or DPE windings. In an "on-speed" (engine cranking) condition, this magnetism is capable of creating approximately one to three volts AC.

ON-SPEED OPERATION

As the engine accelerates, the voltage that is induced into the stator windings increases rapidly, due to the increasing speed at which the rotor operates.

FIELD EXCITATION

An AC voltage is induced into the stator excitation (DPE) windings. The DPE winding circuit is delivered to the voltage regulator through the two Blue Wires and C1-1 and C1-2. Unregulated alternating current flows from the winding to the regulator. The voltage regulator "senses" AC power winding output voltage and frequency through the Green and White Wires.

The regulator changes the AC from the excitation winding to DC Field Excitation. In addition, based on the AC sensing wires, it regulates the flow of direct current to the rotor. The rectified and regulated current flow from the regulator is delivered to the rotor windings through the positive (+) wire and the positive brush and slip ring. This excitation voltage flows through the rotor windings and through the negative (-) slip ring and brush on the negative (-) wire.

The greater the current flow through the rotor windings, the more concentrated the lines of flux around the rotor become. The more concentrated the lines of flux around the rotor that cut across the stationary stator windings, the greater the voltage that is induced into the stator windings.

Initially, the AC power winding voltage sensed by the regulator is low. The regulator reacts by increasing the flow of field excitation voltage to the rotor until voltage increases to a desired level. The regulator then maintains the desired voltage. For example, if voltage exceeds the desired level, the regulator will decrease the flow of field excitation voltage. Conversely, if voltage drops below the desired level, the regulator responds by increasing the flow of excitation current.

AC POWER WINDING OUTPUT

A regulated voltage is induced into the stator AC power windings. When electrical loads are connected across the AC power windings to complete the circuit, current can flow in the circuit.

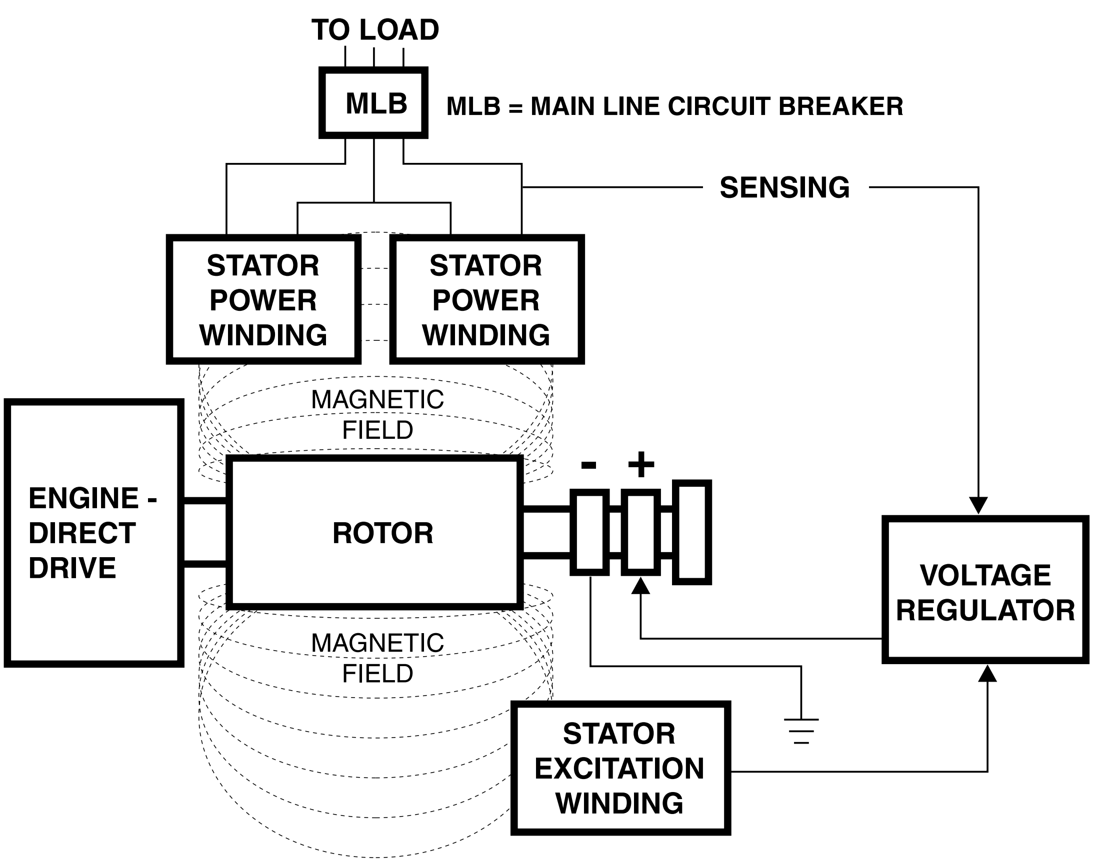
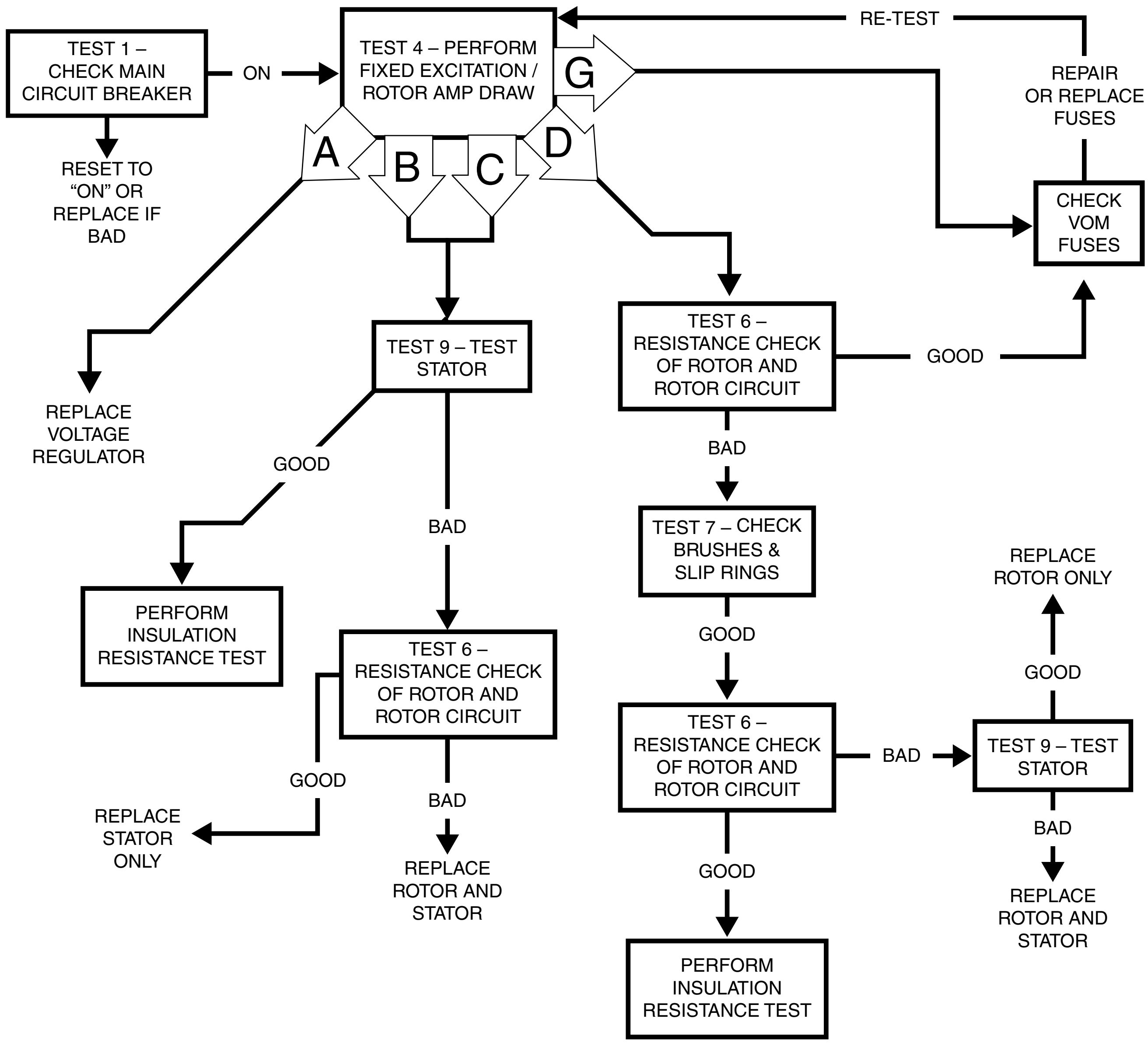


Figure 20. Operating Diagram

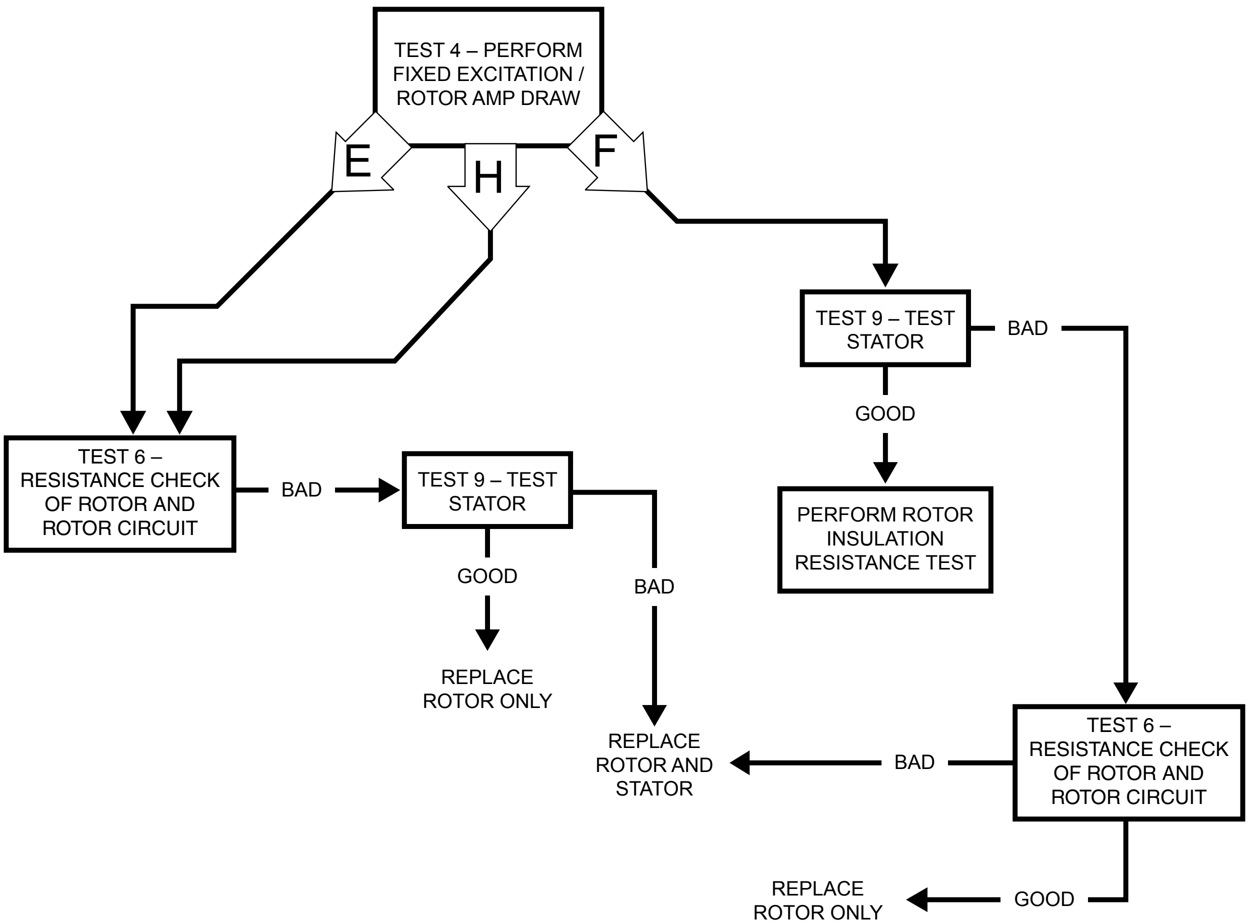
INTRODUCTION

Use the “Flow Charts” in conjunction with the detailed instructions in Section 2.4. Test numbers used in the flow charts correspond to the numbered tests in Section 2.4. The first step in using the flow charts is to identify the correct problem on the following pages. For best results, perform all tests in the exact sequence shown in the flow charts.

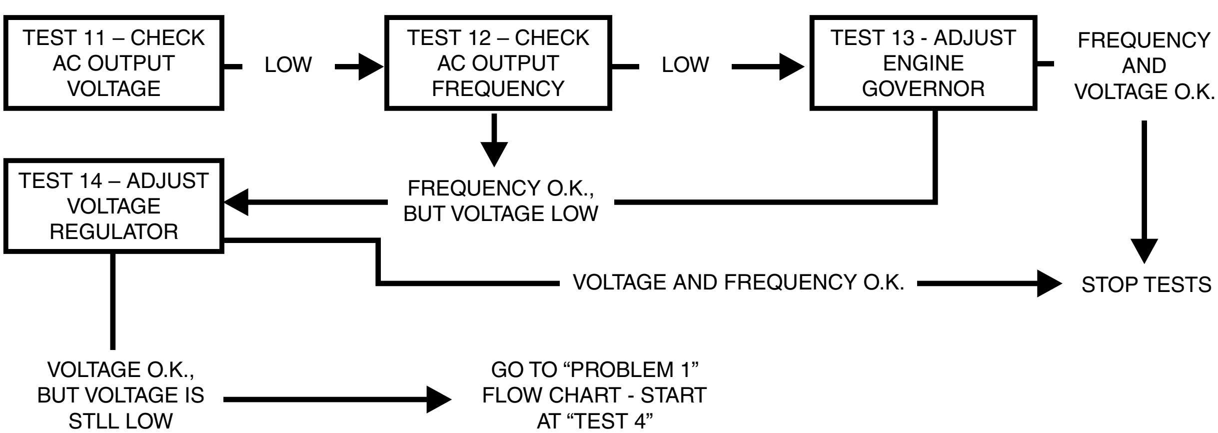
Problem 1 – Generator Produces Zero Voltage or Residual Voltage



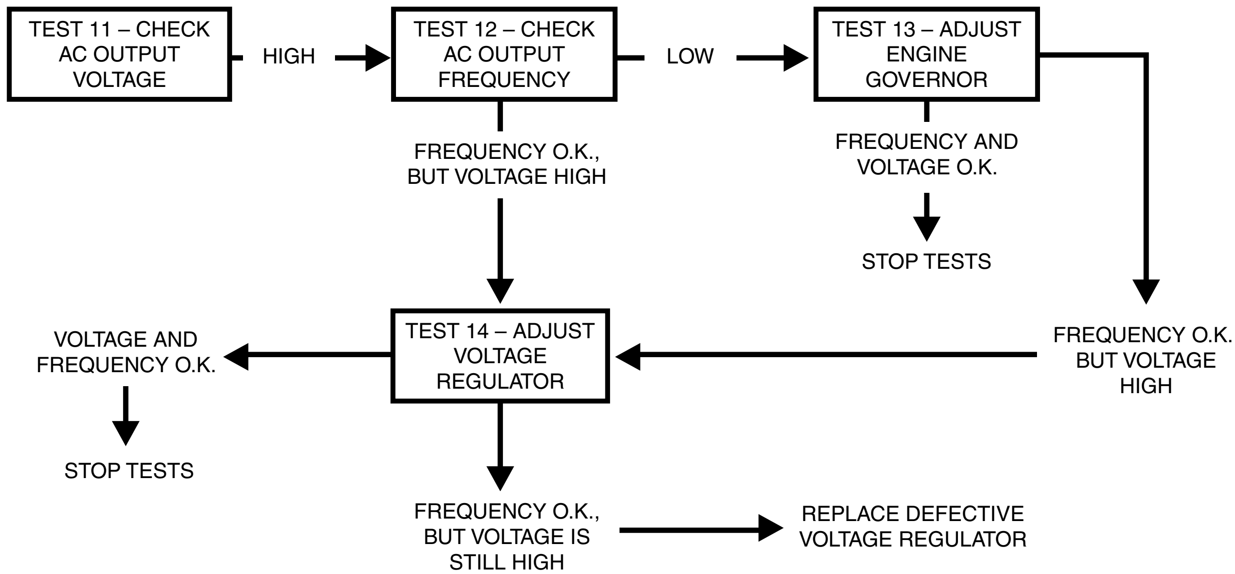
Problem 1 – Generator Produces Zero Voltage or Residual Voltage (Continued)



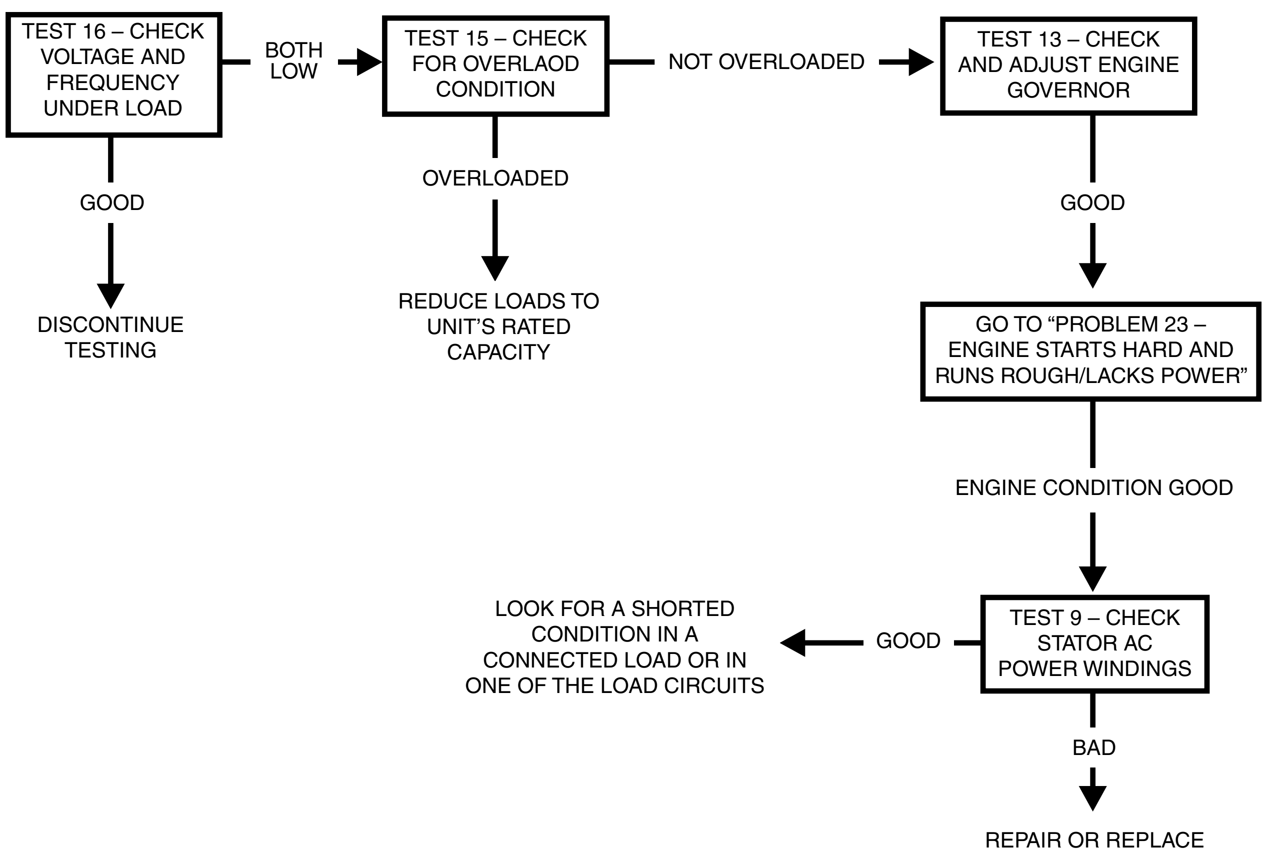
Problem 2 – Generator Produces Low Voltage at No-Load



Problem 3 – Generator Produces High Voltage at No-Load



Problem 4 – Voltage and Frequency Drop Excessively When Loads Are Applied



INTRODUCTION

This section familiarizes the service technician with acceptable procedure for the testing and evaluation of various problems that can occur on the standby generators with air-cooled engines. Use this section in conjunction with Section 2.3, "Troubleshooting Flow Charts." The numbered tests in this section correspond with those of Section 2.3.

Some test procedures in this section may require the use of specialized test equipment, meters or tools. Most tests can be performed with an inexpensive Volt-Ohm-Meter (VOM). An AC frequency meter is required where frequency readings must be taken. To measure AC loads it is acceptable to use a clamp-on ammeter.

Testing and troubleshooting methods covered in this section are not exhaustive. No attempt has been made to discuss, evaluate and advise the home standby service trade of all conceivable ways in which service and trouble diagnosis must be performed. Accordingly, anyone who uses a test method not recommended herein must first satisfy himself that the procedure or method he has selected will jeopardize neither his nor the product's safety.

SAFETY

Service personnel who work on this equipment should be aware of the dangers of such equipment. Extremely high and dangerous voltages are present that can kill or cause serious injury. Gaseous fuels are highly explosive and can ignite by the slightest spark. Engine exhaust gases contain deadly carbon monoxide gas that can cause unconsciousness or even death. Contact with moving parts can cause serious injury. The list of hazards is seemingly endless.

When working on this equipment, use common sense and remain alert at all times. Never work on this equipment while you are physically or mentally fatigued. If you do not understand a component, device or system, do not work on it.

AC TROUBLESHOOTING

It is always good practice to continue to ask questions during the troubleshooting process. When evaluating the problem asking some of these questions may help identify the problem quicker.

- What is the generator supposed to do?
- What fault (Alarm) is shutting the generator down?
- Is the fault a symptom of another problem?
- Does the generator have the same fault consistently?
- When does the fault occur?
- Why would this happen?
- How would this happen?
- What type of test will either prove or disprove the cause of the fault?

TEST 1 – CHECK MAIN CIRCUIT BREAKER

Discussion

Often the most obvious cause of a problem is overlooked. If the generator main line circuit breaker is set to OFF or "Open", no electrical power will be supplied to electrical loads. If loads are not receiving power, perhaps the main circuit breaker is open or has failed.

Procedure

The generator main circuit breaker is located in the external customer connection box. If loads are not receiving power, make sure the breaker is set to "On" or "Closed".

If you suspect the breaker may have failed, it can be tested as follows (see Figure 21):

1. Set a Volt-Ohm-Meter (VOM) to its "R x 1" scale and zero the meter.
2. With the generator shut down, disconnect all wires from the main circuit breaker terminals, to prevent interaction.
3. With the generator shut down, connect one VOM test probe to the Wire 11 (Blue) terminal of the breaker and the other test probe to the Wire E1 terminal.
4. Set the breaker to its "On" or "Closed" position. The VOM should read CONTINUITY.
5. Set the breaker to its OFF or "Open" position and the VOM should indicate INFINITY.
6. Repeat Steps 4 and 5 with the VOM test probes connected across the Wire 44 (Black) terminal and the E2 terminal.

Results

1. If the circuit breaker tests good, refer back to flow chart.
2. If the breaker tests bad, it should be replaced.

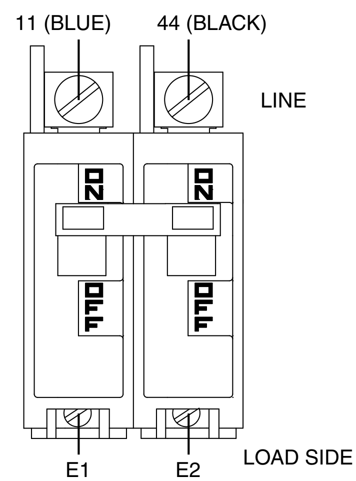


Figure 21. Generator Main Circuit Breaker Test Points

TEST 4 – FIXED EXCITATION /ROTOR AMP DRAW TEST

Discussion

Supplying a fixed DC current to the rotor will induce a magnetic field in the rotor. With the generator running, this should create a proportional voltage output from the stator windings.

NOTE: Depending on the model being serviced, starting and stopping the engine is performed differently. Refer to the following to start or stop the engine in this procedure.

PowerPact:

- To Start in MANUAL: Press the MANUAL mode button on the controller.
- To Stop: Press the OFF mode button on the controller.

CorePower:

- To Start in MANUAL: Set the AUTO-OFF-MANUAL switch to the MANUAL position.
- To Stop: Set the AUTO-OFF-MANUAL switch to the OFF position.

Procedure

1. Locate and disconnect the Red (Wire 4) and White (Wire 1) [Red and Black on CorePower] wires from the voltage regulator.
2. Set a Volt-Ohm-Meter (VOM) to measure resistance.
3. Connect one meter test lead to the Red brush wire (Wire 4) and connect the other meter test lead to the White (Black on CorePower) brush wire (Wire 1). Measure and record the resistance.
4. Set Volt-Ohm-Meter (VOM) to measure DC voltage.
5. Connect one meter test lead to the positive post of the battery and the other meter test lead to the negative post of the battery. Measure and record the voltage indicated.
6. Depending on model being serviced, perform the following;
   a. PowerPact: Disconnect the 4-wire Connector containing Wires 2, 6, S1 and S2 from the voltage regulator.
   b. CorePower: Disconnect the C1 Connector from the voltage regulator.
7. Using two jumper wires similar to Figure 22, proceed as follows:
   a. Connect a fused jumper wire to the disconnected Red Wire 4 (going to the brush assembly) and the positive post of the battery.
   b. Connect a jumper wire to the disconnected White Wire 1 (Black Wire on CorePower) (going to the brush assembly) and the negative post of the battery.
8. Set Volt-Ohm-Meter (VOM) to measure AC voltage.
9. Connect meter test leads across the two Blue banded Wires coming from the Stator. Refer to Figure 23 for CorePower or Figure 24 for PowerPact.
10. Start the engine in MANUAL mode (Refer to note above). Allow the engine to start and run.
11. Once the engine reaches rated speed, measure and record the voltage.
12. Stop the engine (Refer to note above).
13. Connect meter test leads across the Green and White banded Wires. Refer to Figure 23 for CorePower or Figure 24 for PowerPact.
14. Start the engine in MANUAL mode (Refer to note above). Allow the engine to start and run.

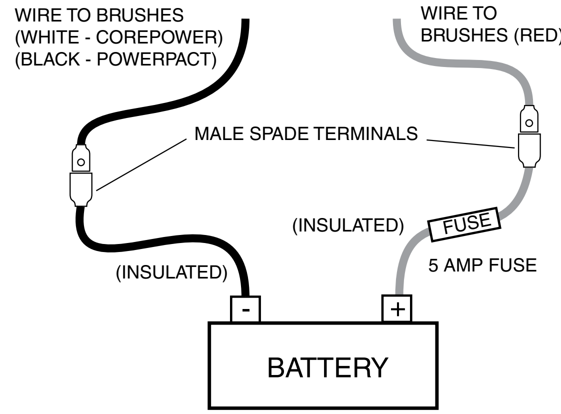


Figure 22. Jumper Wires Connected

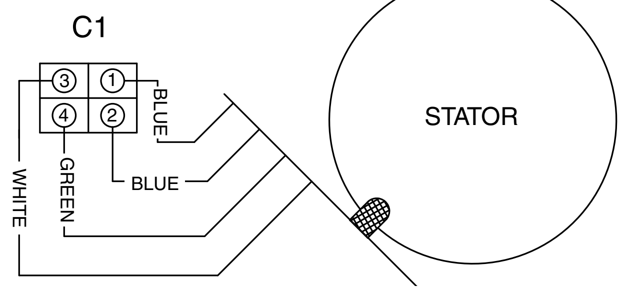


Figure 23. CorePower C1 Test Points

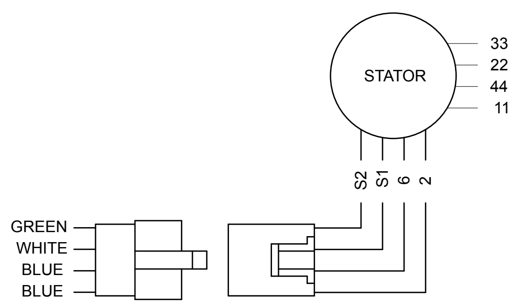


Figure 24. PowerPact Stator Test Points

15. Once the engine reaches rated speed, measure and record the voltage.
16. Stop the engine (Refer to note above).
17. Connect meter test leads across Wire 11 and Wire 44 at the MLCB. Refer to Figure 21.
18. Start the engine in MANUAL mode (Refer to note above). Allow the engine to start and run.
19. Once the engine reaches rated speed, measure and record the voltage.
20. Stop the engine (Refer to note above).
21. Remove the jumper wire that was connected in Step 5 from

the Red Wire.

22. Set the VOM to measure DC amperage. Note: be sure to re-locate the test leads per the meter manufacturer's instructions so as to avoid a blown meter fuse.
23. Connect the negative meter test lead to the Red Wire disconnected in Step 1. Connect the positive meter test lead to the positive post of the battery. Measure and record the static DC amperage.
24. Start the engine in MANUAL mode (Refer to note above). Allow the engine to start and run.
25. Measure and record the running DC amperage.
26. Stop the engine (Refer to note above).
27. Reconnect all wires to the voltage regulator.

Results

Using the values recorded in the above procedures, compare the results to Table 2 "CorePower Test 4 Results – Fixed Excitation Test" or Table 3 "PowerPact Test 4 Results – Fixed Excitation Test." Determine the appropriate lettered column to use and refer back to the flow chart. The rotor amp draws are a calculated amp draw and actual amperage readings may vary depending on the resistance of the rotor and battery voltage.

Note: To calculate rotor amp draw take the battery voltage applied, divided by the actual resistance reading of the rotor. To determine actual rotor resistance, refer to "Step 4" of this test, or use "Test 6 – Resistance Check of Rotor Circuit" in this manual.

$$\frac{12.9 \text{ VDC}}{50 \text{ Ohms} \times .258 \text{ DC Amps}}$$

Table 1. Test 4 Results Worksheet

Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White to Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Table 2. CorePower Test 4 Results – Fixed Excitation Test

Results:	A	B	C	D	E	F	G	H
Blue and Blue	Above 20 VAC	Above 20 VAC	Below 20 VAC	Zero or Residual Volts	Below 20 VAC	Below 20 VAC	Above 20 VAC	Below 20 VAC
White and Green (C1 Terminal 3 & 4)	Above 20 VAC	Below 20 VAC	Above 20 VAC	Zero or Residual Volts	Below 20 VAC	Below 20 VAC	Above 20 VAC	Below 20 VAC
Static Rotor Amp Draw	0.22 - 0.46	0.22 - 0.46	0.22 - 0.46	Zero Current Draw	Above 1 Amp	0.22 - 0.46	Zero Current Draw	0.22 - 0.46
Running Rotor Amp Draw	0.22 - 0.46	0.22 - 0.46	0.22 - 0.46	Zero Current Draw	Above 1 Amp	0.22 - 0.46	Zero Current Draw	Above 1 Amp
Note: Actual values measured may vary by as much as 0.5 amps; depending on the type and quality of meter used, the condition of the unit, and how good the connection is between the test leads and test points.								
← ***MATCH RESULTS WITH LETTER AND REFER TO FLOW CHART IN SECTION 2.3 "Problem 1"*** →								

Table 3. PowerPact Test 4 Results – Fixed Excitation Test

Results:	A	B	C	D	E	F	G	H
Blue and Blue (Banded ID)	Above 20 VAC	Above 20 VAC	Below 20 VAC	Zero or Residual Volts	Below 20 VAC	Below 20 VAC	Above 20 VAC	Below 20 VAC
White and Green (S1 and S2)	Above 5 VAC	Below 5 VAC	Above 5 VAC	Zero or Residual Volts	Below 5 VAC	Below 5 VAC	Above 5 VAC	Below 5 VAC
11 and 44 (at the MLCB)	Above 60 VAC	Below 60 VAC	Above 60 VAC	Zero or Residual Volts	Below 60 VAC	Below 60 VAC	Above 60 VAC	Below 60 VAC
Static Rotor Amp Draw	0.195 - 0.29	0.195 - 0.29	0.195 - 0.29	Zero Current Draw	Above 1 Amp	0.195 - 0.29	Zero Current Draw	0.195 - 0.29
Running Rotor Amp Draw	0.195 - 0.29	0.195 - 0.29	0.195 - 0.29	Zero Current Draw	Above 1 Amp	0.195 - 0.29	Zero Current Draw	Above 1 Amp
Note: Actual values measured may vary by as much as 0.5 amps; depending on the type and quality of meter used, the condition of the unit, and how good the connection is between the test leads and test points.								
← ***MATCH RESULTS WITH LETTER AND REFER TO FLOW CHART IN SECTION 2.3 "Problem 1"*** →								

TEST 6 – RESISTANCE CHECK OF ROTOR AND ROTOR CIRCUIT

Procedure A

1. Locate and disconnect the Red (Wire 4) and White (Wire 1) [Red and Black on CorePower] wires from the voltage regulator.
2. Set a Volt-Ohm-Meter (VOM) to measure resistance.
3. Connect meter test leads across the Red (Wire 4) and White (Wire 1) [Red and Black on CorePower] wires leading to the brush assembly disconnected in Step 1. Measure and record the resistance.

Results

1. If the VOM indicated a resistance of approximately 50 ohms ±20 ohms (40 ohms ± 20 ohms on CorePower), refer back to flow chart.
2. If the VOM did not indicate the proper resistance, go to Step 4.

Procedure B

1. Locate and remove the brush assembly. Refer to Section 5.1 "Major Disassembly."
2. Set a Volt-Ohm-Meter (VOM) to measure resistance.
3. Connect meter test leads across the two exposed slip rings. Measure and record the resistance.

Results

1. If the VOM indicated a resistance of approximately 50 ohms ±20 ohms (40 ohms ± 20 ohms on CorePower), verify rotor amp draw.
2. If the VOM did not indicate the proper resistance, refer back to flow chart.

TEST 7 – CHECK BRUSHES AND SLIP RINGS

Discussion

The brushes and slip rings function to provide an electrical connection for excitation current from the stationary components to the rotating rotor. Made of a special long lasting material, brushes seldom wear out or fail. However, slip rings can develop a tarnish or film that can inhibit or offer a resistance to the flow of current. Such a non-conducting film usually develops during non-operating periods. Broken or disconnected wiring can also cause loss of excitation current to the rotor.

Procedure

1. Disassemble the Generator until the brushes and slip rings are exposed. Refer to Section 5.1 "Major Disassembly."
2. Inspect the brush wires and verify they are secured and properly connected.
3. Inspect the brush assembly for excessive wear, or damage.
4. Inspect the rotor slip rings. If their appearance is dull or tarnished, polish with a fine grade abrasive material.

⚠ WARNING!

Do not use metallic grit to polish slip rings. This may cause irreversible damage to the rotor.

5. The Red and White (Red and Black on CorePower) wires, located on the brush terminals, provide an electrical connection to the voltage regulator. To test these wires for an OPEN condition, remove the Red and White (Red and Black on CorePower) wires from the brush assembly and disconnect the connector containing Wires 2, 6, S1 and S2 from the voltage regulator.
6. Set Volt-Ohm-Meter (VOM) to measure resistance.
7. Connect one meter test lead to the White (Wire 1) wire at the brush assembly and connect the other meter test lead to the White (Wire 1) wire disconnected at the voltage regulator. Measure and record the Resistance.
8. Connect one meter test lead to the Red (Wire 4) wire disconnected at the brushes and the other meter test lead to the Red (Wire 4) wire disconnected at the voltage regulator. Measure and record the Resistance.

Results

1. Repair or replace any damaged wires as necessary.
2. Replace damaged brush holder if necessary.
3. Clean and polish slip rings as required.
4. Reconnect all wires.

TEST 9 – TEST THE STATOR

Discussion

This test will use a Volt-Ohm-Meter (VOM) to test the stator windings for the following faults:

- An OPEN circuit condition
- A "short-to-ground" condition
- A short circuit between windings

Tables 10 and 11 are provided to record the results of the following procedure. These results may be required when requesting factory support.

Additional copies of Tables 10 and 11 can be found in Appendix A "Supplemental Worksheets" at the back of this manual.

Note: It is the recommendation of the factory to perform this test procedure using appropriate probe adapters on the wire side of the connector. Testing inside the connector itself (front-probing) can cause damage resulting in poor or loose connections.

Stator Resistances – CorePower

Power Windings	
White/Blue	0.173 Ohms
White/Black	0.173 Ohms
Blue/Black	0.346 Ohms
Sensing Winding	
Green/White	0.064 Ohms
DPE Winding	
Blue/Blue	1.158 Ohms

Stator Resistances – PowerPact

Power Windings	60 Hz	50 Hz
11/22	0.24 Ohms	0.36 Ohms
33/44	0.24 Ohms	0.36 Ohms
Sensing Winding		
White (S1)/Green (S2)	0.024 Ohms	0.024 Ohms
DPE Winding		
Blue (2)/Blue (6)	1.85 Ohms	1.85 Ohms

Procedure: Resistance Test

1. Disconnect the Blue and Black Wires from the main line circuit breaker (MLCB).
2. Disconnect all stator neutral wires.
3. Disconnect the connector (C1 on CorePower) from the voltage regulator.
4. Make sure all of the disconnected leads are isolated from each other and are not touching the frame or ground during the test.
5. Set the VOM to measure resistance.
6. Measure and record the resistance values for each set of windings between the A and B test points as shown in Table 4 (CorePower) or Table 5 (PowerPact). Record the results in Table 10 (CorePower) or Table 11 (PowerPact).

Table 4. Test Points – Resistance Tests (CorePower)

Test Point A	Test Point B
Stator Lead Blue Wire	Stator Lead Black Wire
Stator Lead Blue Wire	C1 Pin 3 (White Wire)
Stator Lead Blue Wire	C1 Pin 4 (Green Wire)

Table 5. Test Points – Resistance Tests (PowerPact)

Test Point A	Test Point B
Stator Lead Blue (Wire 2)	Stator Lead Blue (Wire 6)
Stator Lead (Wire 22)	Stator Lead (Wire 11)
Stator Lead (Wire 22)	Stator Lead (Wire S1)
Stator Lead (Wire 11)	Stator Lead (Wire S1)
Stator Lead (Wire 33)	Stator Lead (Wire 44)
Stator Lead (Wire 33)	Stator Lead (Wire S2)
Stator Lead (Wire 44)	Stator Lead (Wire S2)

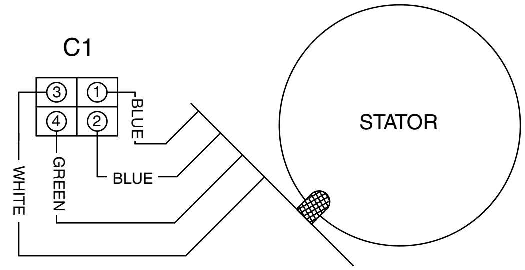


Figure 25. CorePower Stator Lead Connections

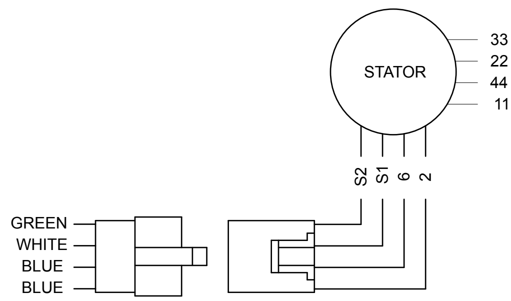


Figure 26. PowerPact Stator Lead Connections

Test Windings for a Short to Ground

7. Make sure all stator leads are isolated from each other and are not touching the frame.
8. Measure and record the resistance values for each set of windings between the A and B test points as shown in Table 6 (CorePower) or Table 7 (PowerPact). Record the results in Table 10 (CorePower) or Table 11 (PowerPact).

Table 6. Test Points – Shorts to Ground (CorePower)

Test Point A	Test Point B
Ground	Stator Lead Blue Wire
Ground	Stator Lead Black Wire
Ground	C1 Pin 1 Wire 44 (Blue Wire)
Ground	C1 Pin 4 (Green Wire)

Table 7. Test Points – Shorts to Ground (PowerPact)

Test Point A	Test Point B
Ground	Stator Lead Blue Wire
Ground	Stator Lead (Wire 11)
Ground	Stator Lead (Wire 44)
Ground	Stator Lead (Wire S1)
Ground	Stator Lead (Wire S2)

Test For A Short Circuit Between Windings

9. Measure and record the resistance values for each set of windings between the A and B test points as shown in Table 8 (CorePower) or Table 9 (PowerPact). Record the results in Table 10 (CorePower) or Table 11 (PowerPact).

Table 8. Test Points – Shorted Condition (CorePower)

Test Point A	Test Point B
C1 Pin 1 (Blue Wire)	Stator Lead Blue Wire
C1 Pin 1 (Blue Wire)	Stator Lead Black Wire

Table 9. Test Points – Shorted Condition (PowerPact)

Test Point A	Test Point B
Stator Lead (Wire 22)	Stator Lead (Wire 44)
Stator Lead Blue (Wire 2)	Stator Lead (Wire 33)
Stator Lead Blue (Wire 6)	Stator Lead (Wire 22)

Table 10. Stator Test Results - CorePower

Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue Wire	Stator Lead Black Wire	
Stator Lead Blue Wire	C1 Pin 3 (White Wire)	
Stator Lead Blue Wire	C1 Pin 4 (Green Wire)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead Black Wire	
Ground	C1 Pin 1 Wire 44 (Blue Wire)	
Ground	C1 Pin 4 (Green Wire)	
Shorted Condition		
C1 Pin 1 (Blue Wire)	Stator Lead Blue Wire	

Table 11. Stator Test Results - PowerPact

Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue (Wire 2)	Stator Lead Blue (Wire 6)	
Stator Lead (Wire 22)	Stator Lead (Wire 11)	
Stator Lead (Wire 22)	Stator Lead (Wire S1)	
Stator Lead (Wire 11)	Stator Lead (Wire S1)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire 44)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire S2)	
Stator Lead (Wire 44)	Stator Lead Blue (Wire S2)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead (Wire 11)	
Ground	Stator Lead (Wire 44)	
Ground	Stator Lead (Wire S1)	
Ground	Stator Lead (Wire S2)	
Shorted Condition		
Stator Lead (Wire 22)	Stator Lead (Wire 44)	
Stator Lead Blue (Wire 6)	Stator Lead (Wire 33)	

Note: These results may be needed when requesting factory support.

Note: Stator winding resistance values are very low and some VOM's will not read such a low resistance, and will simply indicate CONTINUITY. The manufacturer recommends a high quality digital type meter capable of reading a very low resistance.

Results

1. Resistance Test: If the VOM indicated a very high resistance or INFINITY, the windings are open or partially open.
2. Grounded Condition: Any resistance value other than INFINITY indicates a grounded winding.
3. Shorted Condition: Any resistance value other than INFINITY indicates a shorted winding.

Note: If the winding tests good, perform an insulation resistance test. If the winding fails the insulation resistance test (using a meg-ohm-meter), clean and dry the stator. Then, repeat the insulation resistance test. If the winding fails the second resistance test (after cleaning and drying), replace the stator assembly.

TEST 11 – CHECK AC OUTPUT VOLTAGE

Discussion

A Volt-Ohm-Meter (VOM) may be used to check the generator output voltage. Output voltage may be checked at the unit's main circuit breaker terminals. Refer to the unit's DATA PLATE for rated line-to-line and line-to-neutral voltages.

⚠ DANGER!

DANGER! Use extreme caution during this test. The generator will be running. High and dangerous voltages will be present at the test terminals. Connect meter test clamps to the high voltage terminals while the generator is shut down. Stay clear of power terminals during the test. Make sure meter clamps are securely attached and will not shake loose.

Procedure

1. With the engine shut down, connect the AC voltmeter test leads across the 11 (Blue) and 44 (Black) wire terminals of the generator main circuit breaker. These connections will permit line-to-line voltages to be read.
2. Set the generator main circuit breaker to its OFF or "Open" position. This test will be conducted with the generator running at no-load.
3. Start the generator, let it stabilize and warm up for a minute or two.
4. Take the meter reading. On unit's having a rated line-to-line voltage of 240 volts, the no-load voltage should be about 242-252 volts AC.
5. Shut the engine down and remove the meter test leads.

Results

1. If zero volts or residual voltage is indicated, proceed to Test 4.

2. If the voltage reading is higher than residual, but is lower than the stated limits, go to Test 12.
3. If a high voltage is indicated, go on to Test 12.

NOTE: "Residual" voltage may be defined as the voltage that is produced by rotor residual magnetism alone. The amount of voltage induced into the stator AC power windings by residual voltage alone will be approximately 2 to 16 volts AC. If a unit is supplying residual voltage only, either DC field excitation voltage is not reaching the rotor or the rotor windings are open and the excitation voltage cannot pass.

TEST 12 – CHECK AC OUTPUT FREQUENCY

Discussion

The generator AC frequency is proportional to the operating speed of the rotor. The 2-pole rotor will supply a 60 Hertz AC frequency at 3600 RPM and 50 Hertz AC frequency at 3000 RPM. The unit's AC output voltage is proportional to the AC frequency. For example, a unit rated 240 volts (line-to-line) will supply that rated voltage (plus or minus 2 percent) at a frequency of 60 Hertz. If, for any reason, the frequency should drop to 30 Hertz, the line-to-line voltage will drop to a matching voltage of 120 volts AC. Thus, if the AC voltage output is high or low and the AC frequency is correspondingly high or low, the engine speed governor may require adjustment.

Procedure

1. Connect an accurate AC frequency meter across the Blue and Black Wire terminals of the generator main line circuit breaker (see Figure 21).
2. Start the engine, let it stabilize and warm up at no-load.
3. When engine has stabilized, read the frequency meter. The no-load frequency should be about 61-63 Hertz or 51-53 Hertz.

Results

1. Refer back to flow chart.
2. If frequency and voltage are both good, tests may be discontinued.

TEST 13 – CHECK AND ADJUST ENGINE GOVERNOR

The generator AC frequency output is directly proportional to the speed of the rotor. A two-pole rotor (having a single north and a single south magnetic pole) will produce an AC frequency of 60 Hertz at 3600 RPM and 50 Hertz at 3000 RPM.

The AC output voltage is generally proportional to AC frequency. A low or high governor speed will result in a correspondingly low or high AC frequency and voltage output. The governed speed must be adjusted before any attempt to adjust the voltage regulator is made.

⚠ WARNING!

The engine must be OFF to perform steps 1 and 4.

PROCEDURE - CorePower

1. Ensure throttle rod and anti-lash spring are moving freely by cycling to full open and full closed throttle positions.
2. Loosen the governor clamp bolt (13 mm). See Figure 27.
3. Hold the governor lever at its wide open throttle position (clockwise), and rotate the governor shaft clockwise as far as it will go.
4. Tighten the governor lever clamp bolt to 70 **in-lbs** (8 Nm).
5. Connect a frequency meter across the AC output leads (MLCB).
6. Start the generator and let it warm up and stabilize at no-load.
7. Turn the adjust nut to obtain a frequency reading of 62.5 Hz.

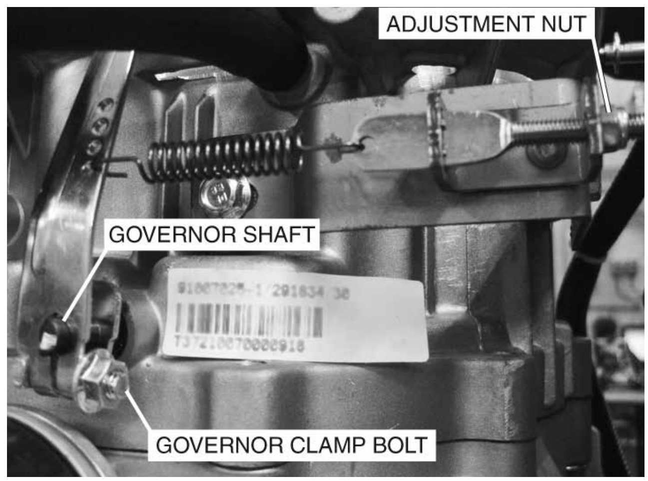


Figure 27. CorePower Engine Governor Adjustment Points

PROCEDURE - PowerPact

1. Ensure throttle rod and anti-lash spring are moving freely by cycling to full open and full closed throttle positions. (See Figure 28)

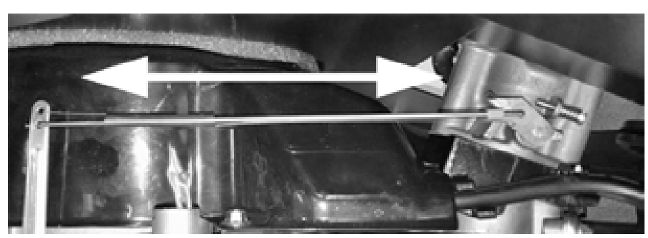


Figure 28.

2. Be sure Governor Spring is attached as shown. Governor Arm should be fully seated against cotter pin on Governor Shaft (See Figure 29, pin not shown).

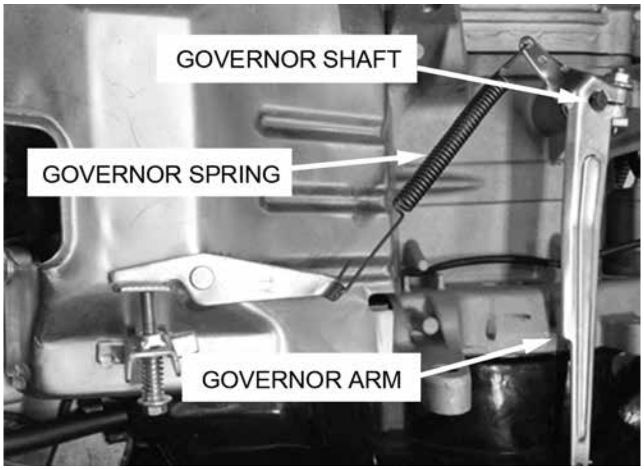


Figure 29.

3. Set Governor Arm and Shaft by rotating the arm in the direction shown to the wide open throttle position. Rotate the Shaft counter-clockwise until it stops. (See Figure 30)

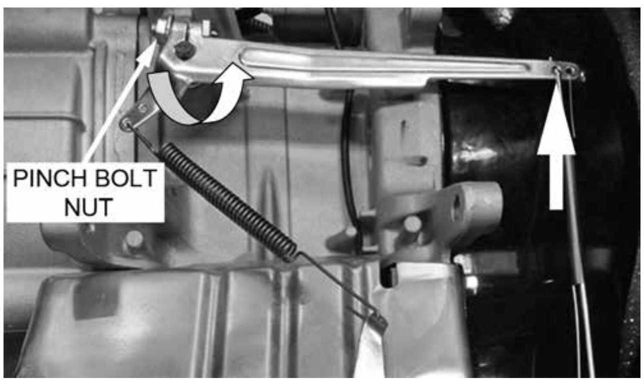


Figure 30.

4. Tighten Pinch Bolt Nut to 62 **in-lbs** (7 Nm).
5. Set the Governor Adjustment Screw to be perpendicular to Governor Pivot Arm. This will set the initial speed close to the operating speed. (See Figure 31)
6. Connect a frequency meter across the AC output leads (MLCB).
7. Start the generator; let it stabilize and warm up at no-load.
8. Adjust speed by turning the Governor Adjustment Screw. If the speed is too high, rotate the screw counterclockwise. If the speed is too low, rotate the screw clockwise. (See Figure 31)

Note: The no-load speed for 60 Hz is 3750 RPM (62.5 Hz); 50 Hz is 3120 RPM (52 Hz).

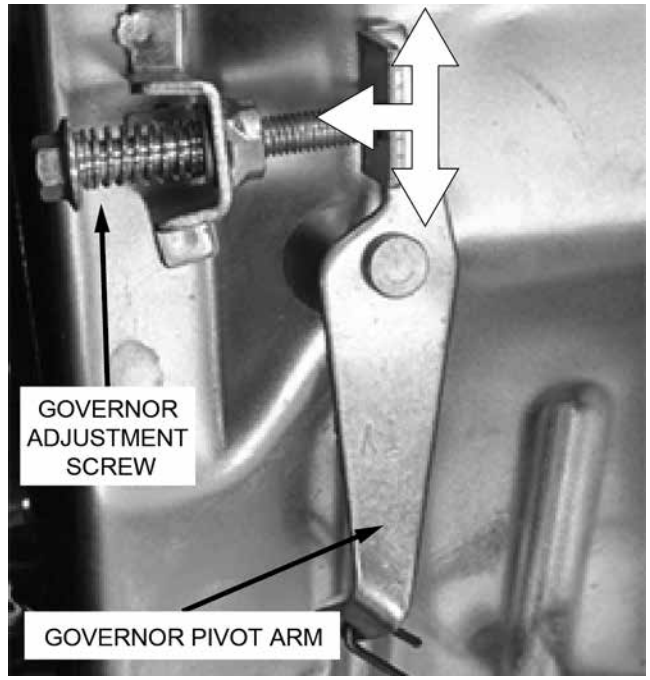


Figure 31.

TEST 14 – ADJUST VOLTAGE REGULATOR

Procedure

1. On **CorePower** units, remove two screws holding down the voltage regulator (AVR). PowerPact and CorePower proceed to Step 2.
2. Leave the C1 connector and the brush connections connected.
3. Set VOM (Volt-Ohm-Meter) to measure AC voltage.
4. Connect meter test leads across the main breaker.

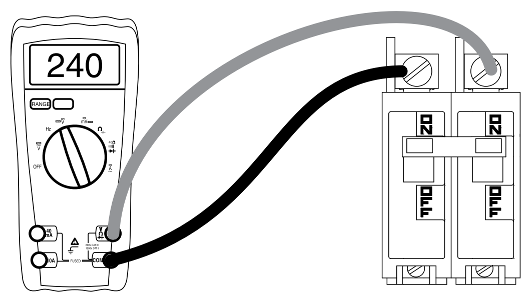


Figure 32. VOM Test Leads Connected to the main breaker.

6. Ensure all material is clear of the alternator before proceeding.
7. Set the controller to the MANUAL mode.
8. Refer to Figure 33 for location of adjustment screw.

9. Adjusting screw clockwise will increase voltage, adjusting counterclockwise will lower the voltage.

Results

1. If no change in voltage while adjusting refer back to flow chart.
2. If voltage is correct, stop testing.

Figure 33. Voltage Regulator Adjustment Screw

TEST 15 – CHECK FOR OVERLOAD CONDITION

Discussion

An "overload" condition is one in which the generator rated wattage/amperage capacity has been exceeded. To test for an overload condition on an installed unit, the best method is to use an ammeter. See "Measuring Current" in Section 1.2.

Procedure

Use a clamp-on ammeter to measure load current draw, with the generator running and all normal electrical loads turned on.

Results

1. If the unit is overloaded, reduce loads to the unit's rated capacity.
2. If unit is not overloaded, but rpm and frequency drop excessively when loads are applied, go to Test 16.

TEST 16 – CHECK VOLTAGE AND FREQUENCY UNDER LOAD

Discussion

It is possible for the generator AC output frequency and voltage to be good at no-load, but they may drop excessively when electrical loads are applied. This condition, in which voltage and frequency drop excessively when loads are applied, can be caused by (a) overloading the generator, (b) loss of engine power, or (c) a shorted condition in the stator windings or in one or more connected loads.

Procedure

1. Connect an accurate AC frequency meter and an AC voltmeter across the stator AC power winding leads.
2. Start the engine, let it stabilize and warm-up.
3. Apply electrical loads to the generator equal to the rated capacity of the unit.
4. Check the AC frequency and voltage. Frequency should not drop below approximately 58-59 Hertz. Voltage should not drop below about 230 volts (plus or minus 2 percent).

Results

1. If frequency and voltage drop excessively under load, go to Test 15.
2. If frequency and voltage under load are good, discontinue tests.

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GENERAL

The 50 amp transfer switch is designed to operate in conjunction with all product which utilizes the Wire 194/15B and Wire 23 control systems. Utility voltage and the control panel on the generator controls sequence delays. The controller must be in the AUTO mode for automatic operation of the transfer switch.

ENCLOSURE

The standard switch enclosure is a National Electrical Manufacturer's Association (NEMA) UL Type 1.

EZ TRANSFER OPERATOR (GENREADY SWITCH ONLY)

The EZ Transfer Operator is a rotary device that actuates the arms that push two standard 2-pole breakers, transferring the load from Utility to Generator. The operator returns to a "Neutral" position so the arms move freely and allow the manual operation of the breakers.

The operator is suited for single-phase applications only, when the single-phase NEUTRAL line is to be connected to a Neutral Lug and is not to be switched.

Internal Components

Three components make up the operator: the servomotor, Limit Switch 1 (LS1), and Limit Switch 2 (LS2). The servomotor is responsible for changing the position of the breakers inside the switch. Both limit switches are responsible for interrupting current flow to the servomotor once the transfer cycle is complete.

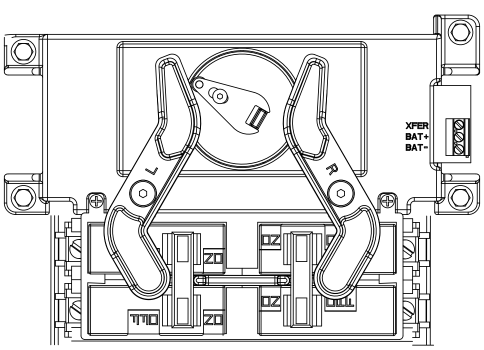


Figure 34. EZ Transfer Operator

FUSE HOLDER

Utility N1 and N2

N1 and N2 provide the Utility voltage-sensing signal to the controller. The controller utilizes the sensing circuit as follows:

- If Utility source voltage should drop below 65% of nominal for ten seconds, the controller's logic will initiate automatic cranking and startup. The controller will transfer the switch to the Standby position after a five second engine warm-up timer.

Load T1

Wire T1, connected to the Load side of the switch, provides 120 VAC for the battery charging. The charger maintains battery voltage anytime the load terminals have voltage available.

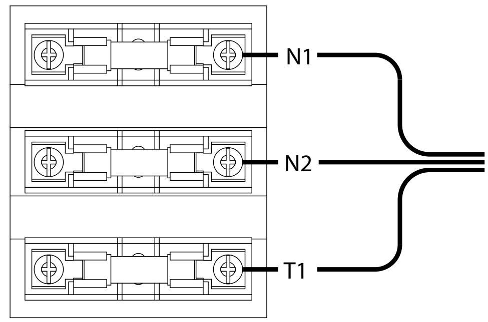


Figure 35. Fuse Holder

Figure 36. Fuse

LOAD MANAGEMENT OPTIONS

Loads can be managed using a smart power management system. The system can accommodate up to eight individual Smart Management Modules (SMM).*

NOTE: The SMM modules are self-contained and have individual built-in controllers.

SMART MANAGEMENT MODULE (SMM)

Description

The Smart Power Management System is designed to optimize the performance of a standby generator. The system can consist of up to 8 individual Smart Management Modules (SMM). Unlike other load management systems that depend on another control device, the SMM modules are actually self-aware and operate autonomously.

Frequency is the true measure of generator engine performance and does not need to factor in increased ambient temperatures, elevation changes or generator fuel type. The modules monitor the frequency (Hz) of the power being produced by a standby generator and if it falls below a certain threshold, the module will automatically follow a power management algorithm to ensure that the generator is not overloaded.

The modules can be set to a load priority between 1 and 8 or be set in a lock out only mode for loads that do not need to run during a power outage, which reduces the necessary size of the generator for a more cost effective solution.

UNDERSTANDING THE SMART MANAGEMENT MODULE

Priority Dial (A) – Sets module priority.

NOTE: PRIORITY MUST BE DIFFERENT for each module in an installation. Priority sets the order in which loads recover from a load shed event. Recovery time from a load shed event is five minutes for Priority 1. Each priority after Priority 1 waits an additional 15 seconds after the initial recovery time. See Table 12.

Lockout Switch (B) – Prevents load from operating when system is operating under generator power. See Table 13.

NOTE: Recovery time is based on priority dial settings. See Table 12.

Test Button (C) – Disables contactor output for a specified time.

LED (D) – Provides module status. See Table 14.

Contactor (E) – Controlled by a smart controller in module. Contactor remains CLOSED until generator power is required. Upon generator activation, controller moves to OPEN to handle overload conditions.

NOTE: When the system is on generator power, the contactor is also opened during lockout switch ACTIVE state.

Mounting Holes (F) – Internal enclosure mounting holes provide clean and sturdy mounting.

Priority Decal (G) – Provided for recording priority of each module in installation. This decal should be installed on the electrical panel.

Table 12. Priority Dial Settings

Priority	Recovery Time
1	5 minutes
2	5 minutes 15 seconds
3	5 minutes 30 seconds
4	5 minutes 45 seconds
5	6 minutes
6	6 minutes 15 seconds
7	6 minutes 30 seconds
8	6 minutes 45 seconds
9	Not Used
0	Not Used

Table 13. Lockout Switch Settings

Lockout Switch Position	Mode	Function
ON	GENERATOR	Power is NOT available on module output (contactor output). Contactor is OPEN.
ON	UTILITY	Power is available on module output (contactor output). Contactor is CLOSED.
OFF	GENERATOR	Module operates with standard load shed logic. Contactor is OPEN or CLOSED per logic.
OFF	UTILITY	Power is available on module output (contactor output). Contactor is CLOSED.

Table 14. LED States

State	Led State	Mode	Note
Shed	1 second flash (1 On – 1 Off)	Generator	Module detected an overload and shed its load. This state only occurs in generator mode, or during a first time utility power up for five minutes of initial operation.
Lockout (30 minutes)	3 second flash (3 On – 3 Off)	Generator	Module detected an overload while trying to recover from a shed situation. It identified the offending load and disabled operation for 30 minutes to allow other loads to operate. This state only occurs in generator mode.
Lockout Switch Active	6 second flash (6 On – 6 Off)	Generator	Module output is disabled and there is no power to the appliance while in generator mode. Lockout switch must be ON. See Table 13.
Lockout Switch Active	ON	Utility	Lockout Switch operates in generator mode only. It has no function in utility mode. LED is solid, indicating contactor is CLOSED and load is connected. Lockout switch must be ON. See Table 13.
Normal	ON	Generator or Utility	Indicates contactor is CLOSED and appliance has power. This is the default in utility mode. It is the normal operating state in generator mode when an overload is not detected.
Test	1 second flash	Generator or Utility	Test button triggers a typical shed condition and overrides all other states except generator lockout switch ACTIVE state.

Table 15. Electrical Specifications	
Input Voltage	240 VAC
Current Rating	50A resistive, 40A inductive
Locked Rotor Amp Rating	240A
Motor Rating	3HP
Contactor Coil Voltage	240 VAC

Table 16. Enclosure Specifications n	
Input Voltage	240 VAC
Current Rating	50A resistive, 40A inductive

SETTING PRIORITIES

High priority 240 VAC loads should be set to the highest priorities so those loads recover first, in the event of generator overload.

NOTE: The highest priority and first load to activate is Priority 1. The last load to activate is Priority 8.

Setting priority determines timing for 3 scenarios:

- Order in which loads recover
- Delay time until power returns during an outage
- Delay time for post load shed recovery

An example configuration is shown below. Configurations will vary depending on customer prioritization of loads:

Priority 1 - Baseboard heat

Priority 2 - Air conditioner

Priority 3 - Range

Priority 4 - Dryer

Priority 5 - Non-essential circuits

Priority 6 - Pool pump or hot tub

Priority 7 - Other circuits

Priority 8 - Other circuits

1. Set the priority of each SMM module as desired (using the example configuration for reference).
2. Apply priority decal in a suitable location on electrical panel to record chosen priority designations.
3. Record priorities on decal.

Most installations will require the lockout switch will be DISABLED. When performing a whole house backup with a generator not sized to manage all household loads, SMM's can be used to disable appliances or circuits during an outage. For non-essential loads that will not be used on generator power, set lockout switch to ENABLED.

TESTS

Utility Test

1. Turn utility power ON and enable all module feeding circuits.
2. Verify LED begins to flash at one second intervals.
3. All contactors will close after five minutes. LED will illuminate, and stay ON.
4. Wait 30 seconds after contactor closes, then press TEST button and verify module load shed. LED will flash at one second intervals.
5. Wait five minutes, plus predefined priority set time for module to recover.
6. Contactor will CLOSE and LED will illuminate, and stay ON.

Generator Test

1. Simulate a utility loss by turning main line circuit breaker (MLCB - service disconnect) to OFF while generator is in AUTO.
2. All modules will lose power and LEDs will disable.
3. Generator will power on after preset delay.
4. All LEDs will flash when generator transfers.
5. Allow each module to enable output per its priority setting.
6. After predefined priority time elapses, each contactor will CLOSE and LED will illuminate and stay ON.
7. Once LED stays ON, press TEST button and verify load shed occurs.
8. Once load shed occurs, LED will flash at one second intervals.
9. Allow time for each module to enable contactor output per priority setting.
10. After predefined priority set time, each contactor will CLOSE and LED will illuminate and stay ON.

NOTE: Depending on load size, the SMM module may immediately go into load shed mode or lockout during test. In this event, remove one or more higher priority loads to allow testing of each module.

Generator Test with Lockout Switch Enabled (perform if Lockout Switch Enabled on any loads)

1. Simulate a utility loss by turning MLCB (service disconnect) to OFF while generator is in AUTO.
2. All modules will lose power and LEDs will disable.
3. Generator should power on after preset delay.

NOTE: For modules with lockout switch enabled, LEDs will flash at six second intervals and load will remain disabled while in generator power.

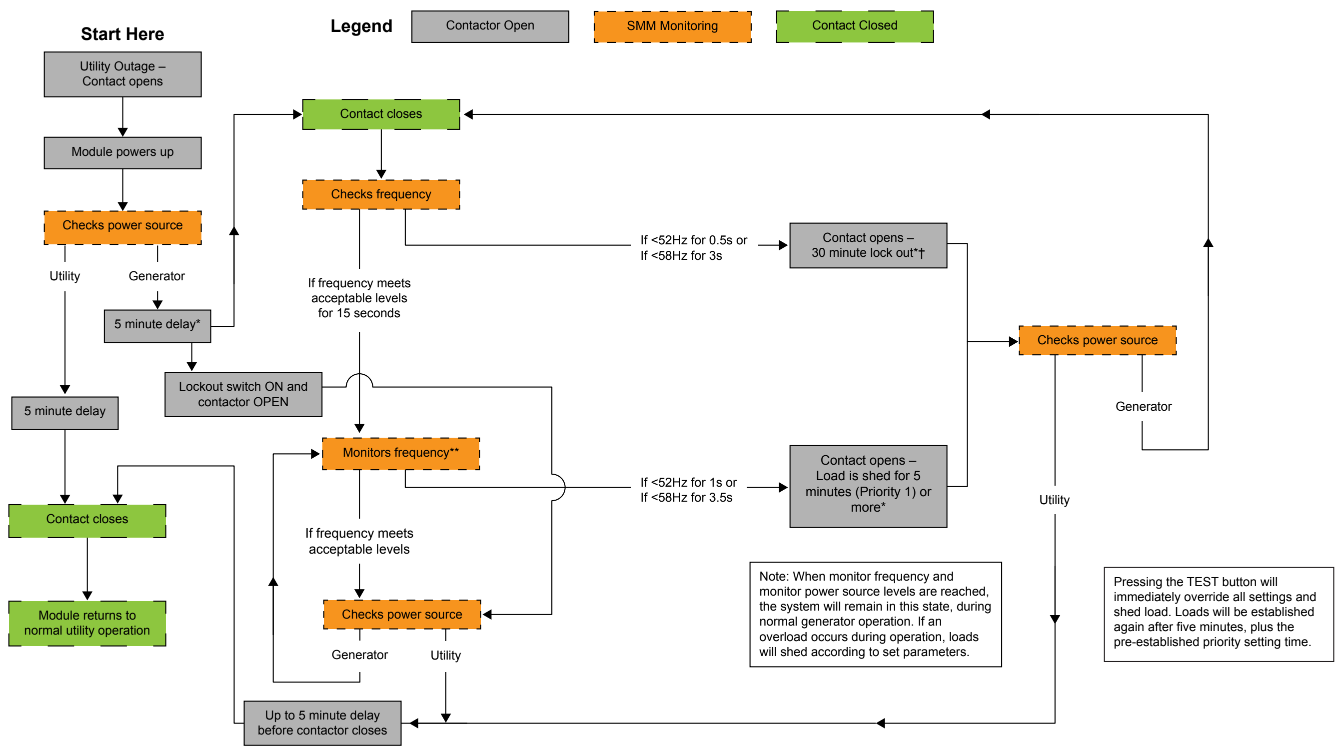
Return to Utility Test

1. Return utility power by setting the MLCB (service disconnect) to ON.
   a. All modules should begin flashing at one second intervals.
   b. All modules will recover in five minutes (including units with lockout switch enabled).

TROUBLESHOOTING

See troubleshooting flowcharts.

SMM Functionality Flow Chart



* Each priority setting above Priority 1 will increase delay time in 15 second increments, starting with 15 seconds at Priority 2.
** If the frequency drops below acceptable levels for the pre-determined durations, all modules will shed.
† During lock out, the module will continuously monitor power source. If utility returns before the 30 minute lock out is satisfied, the module will allow five minutes to elapse from utility return time, and then close the contact.

Note 1: If the frequency is under 58 Hz when a module attempts to close the contactor after a shed, the module will wait another 5minutes plus Priority delay before attempting to enable.
Note 2: The "Checks power source" block monitors frequency and will change state, Generator or Utility, after it detects 1 minute of stable operation in the new state.

000105b

UTILITY VOLTAGE PRESENT

When Utility voltage is present, the circuit may be briefly described as:

- Battery voltage is available to B+ (194 or 15B) and B- (Wire 0) from the generator.
- The internal K1 relay is de-energized.
- K1 contacts 11 and 13 are in their normally closed state.
- K1 contacts 8 and 7 are in their normally open state.

TRANSFER TO STANDBY

With the Generator running during a Utility failure, the circuit may be described as:

- Battery voltage is available to B+ and B- from the generator.
- A ground has been applied to Terminal XFER (Wire 23) via the generator controller.
- The K1 relay is energized, contacts 11 and 13 open, and 8 and 7 close completing a path for current to flow to the servo motor.
- The servo motor will operate till LS2 is mechanically opened, interrupting the current flow to the servo motor.

TRANSFER TO UTILITY

With the Generator running and Utility restored, the circuit may be described as:

- Battery voltage is available to B+ and B- from the generator.
- The return to utility timer has expired and the ground has been removed from the XFER terminal (Wire 23).
- The K1 relay will de-energize, contacts 11 and 13 will close, and 8 and 7 will open completing a path for current to flow to the servo motor.
- The servo motor will operate till LS1 is mechanically opened and LS2 will mechanically close.

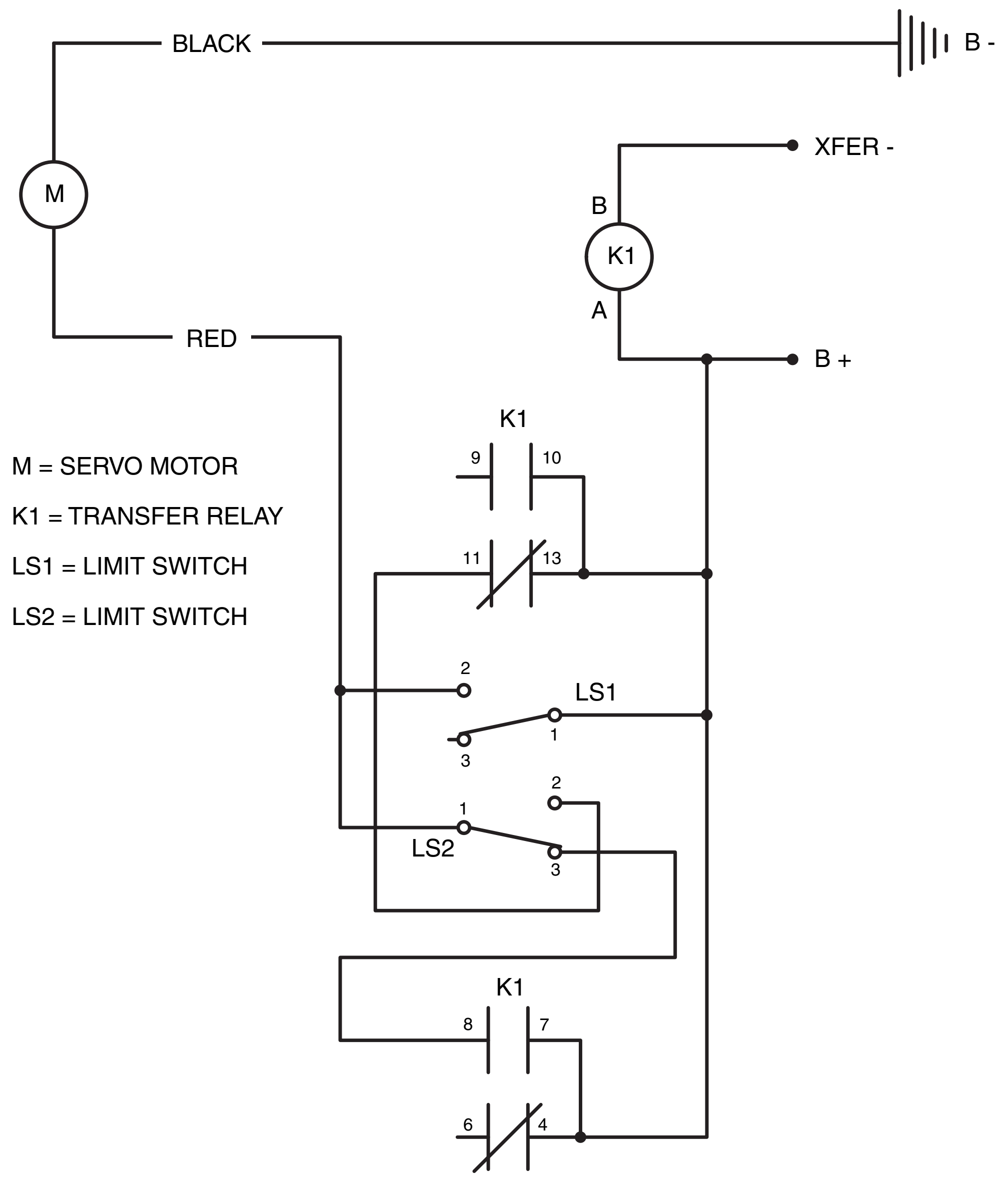


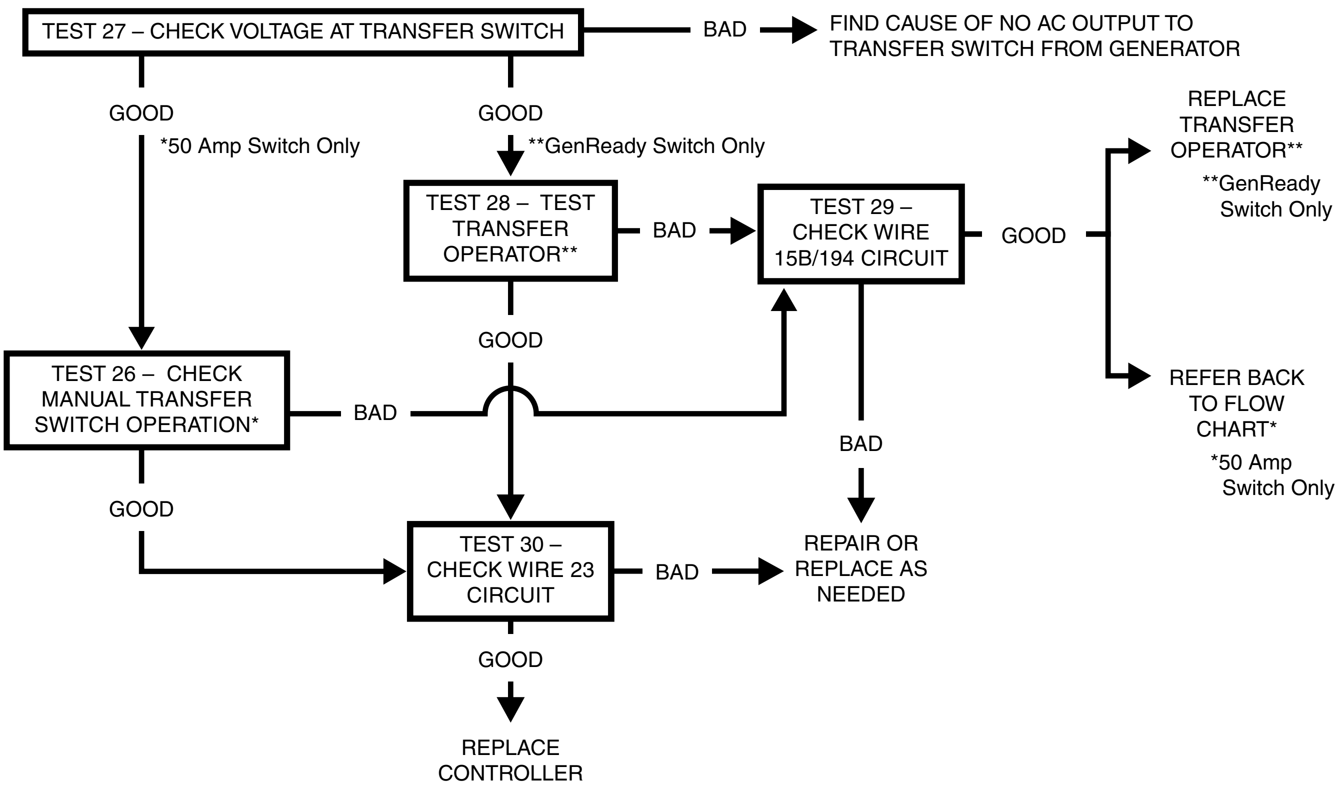
Figure 37. EZ Operator Electrical Schematic (CorePower)

INTRODUCTION

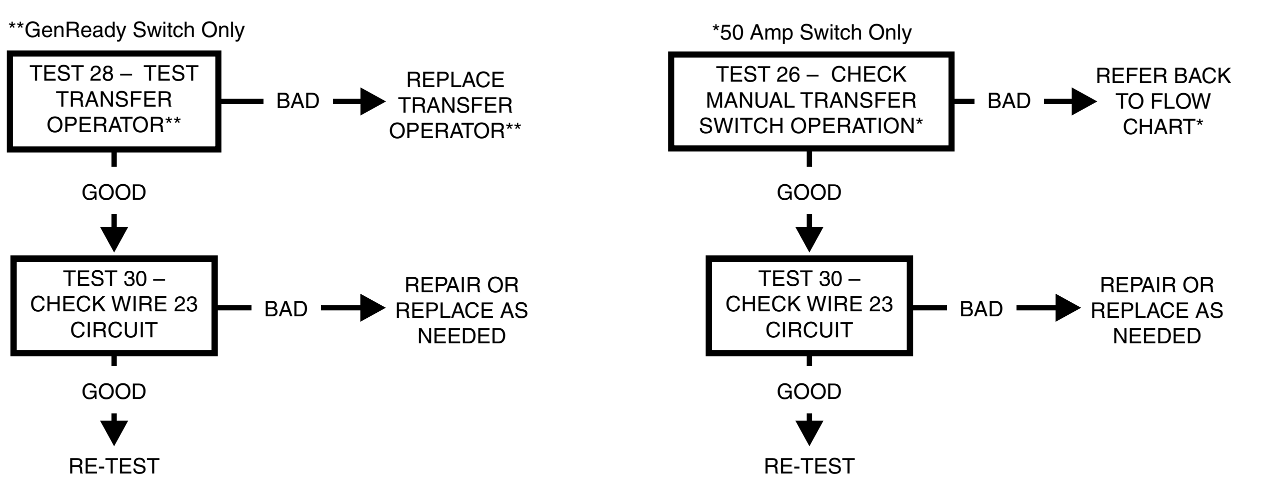
Use the "Flow Charts" in conjunction with the detailed instructions in Section 3.4 for the GenReady switch with CorePower and the 50A Switch with PowerPact. Test numbers used in the flow charts correspond to the numbered tests in Section 3.4. The first step in using the flow charts is to identify the correct problem on the following pages. For best results, perform all tests in the exact sequence shown in the flow charts.

Note: Diagnostics not included in this section for the 50A Switch (i.e. Testing TR1 Relay) can be found in the Air-Cooled Product with Evolution or Nexus Control Diagnostic Repair Manual (0H9172).

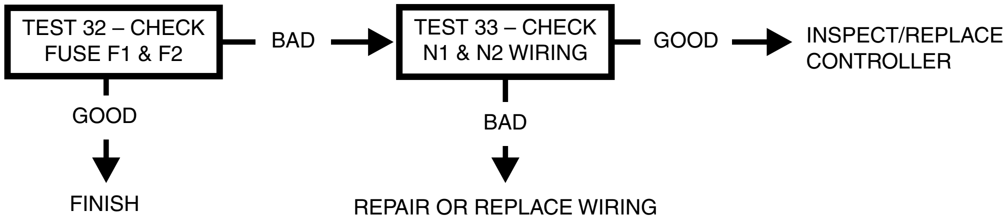
Problem 10 – In Automatic Mode, No Transfer To Standby



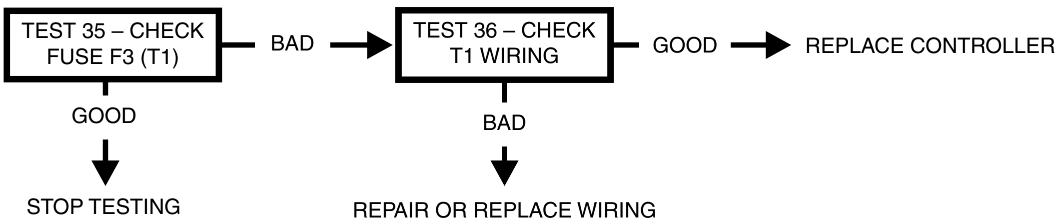
Problem 11– In Automatic Mode, Generator Starts When Loss of Utility Occurs, Generator Shuts Down When Utility Returns But There is No Retransfer to Utility Power Or Generator Transfers to Standby During Exercise or in Manual Mode



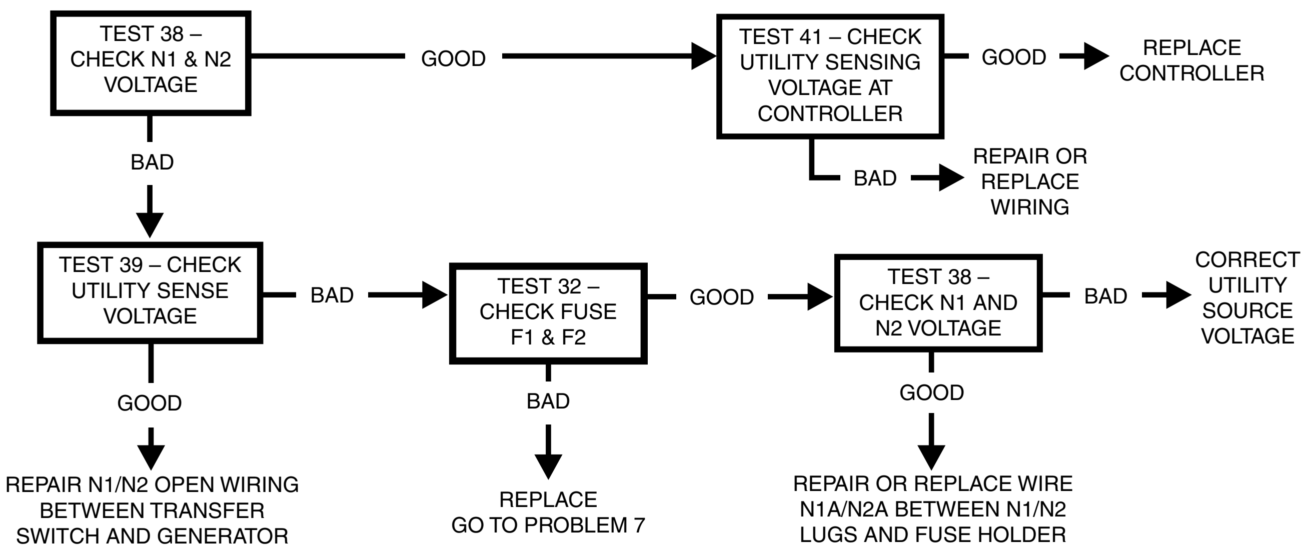
Problem 12 – Blown F1 or F2 Fuse



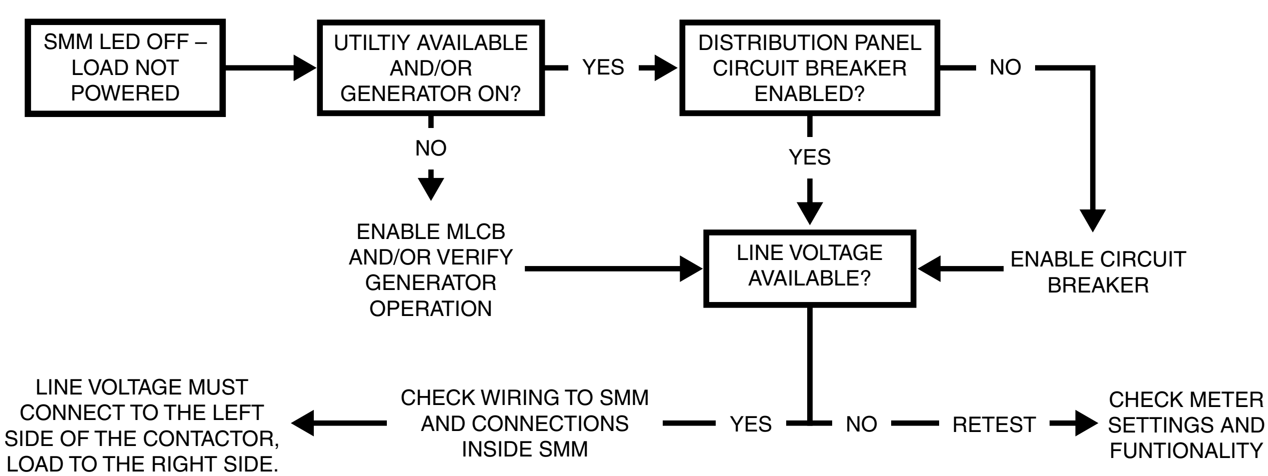
Problem 13 – Blown T1 Fuse



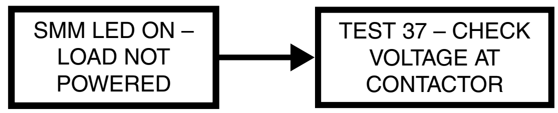
Problem 14 – Unit Starts and Transfer Occurs When Utility Power Is On



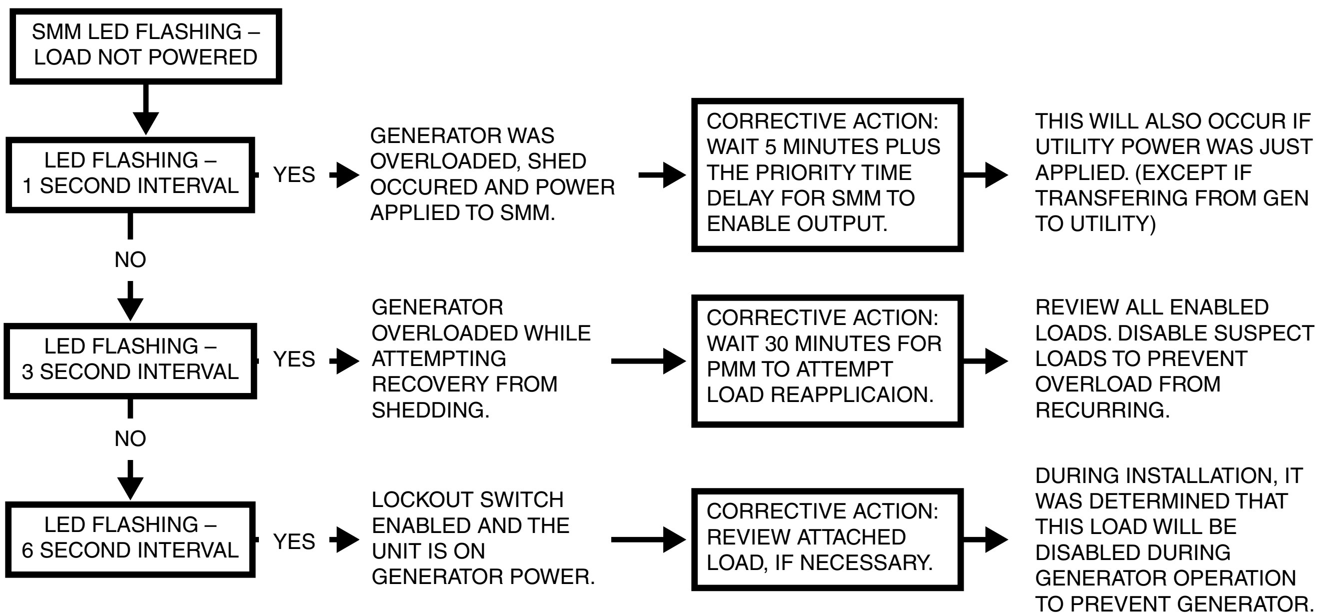
SMM Problem 1 – Load Management Module (SMM) LED is OFF, Load Not Powered



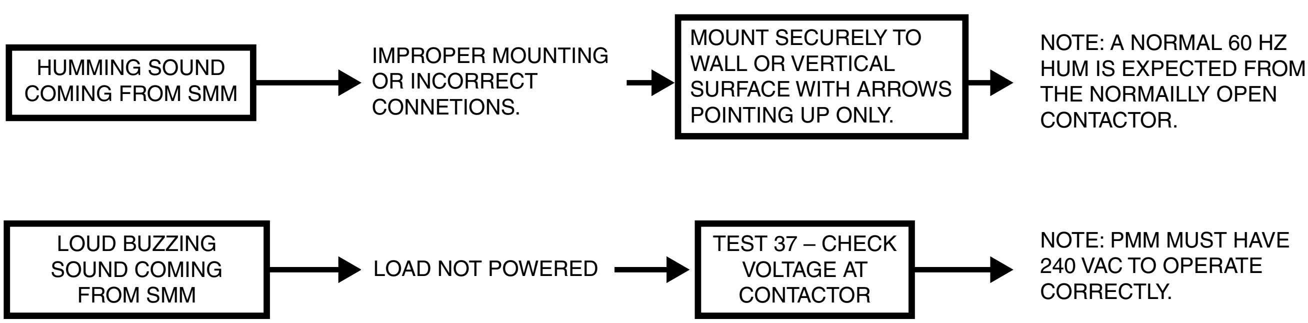
SMM Problem 2 – Load Management Module (SMM) LED is ON, Load Not Powered



SMM Problem 3 – Load Management Module (SMM) LED is Flashing, Load Not Powered



SMM Problem 4 – Load Management Module (SMM) is Humming or Buzzing



INTRODUCTION

This section familiarizes the service technician with acceptable procedure for the testing and evaluation of various problems that can occur on pre-packaged transfer switches. Use this section in conjunction with Section 3.3, "Troubleshooting Flow Charts." The numbered tests in this section correspond with those of Section 3.3.

Some test procedures in this section may require the use of specialized test equipment, meters or tools. Most tests can be performed with an inexpensive volt-ohm-meter (VOM). An AC frequency meter is required, where frequency readings must be taken. To measure AC loads it is acceptable to use a clamp-on ammeter.

Testing and troubleshooting methods covered in this section are not exhaustive. No attempt has been made to discuss, evaluate and advise the home standby service trade of all conceivable ways in which service and trouble diagnosis must be performed. Accordingly, anyone who uses a test method not recommended herein must first satisfy himself that the procedure or method he has selected will jeopardize neither his nor the product's safety.

SAFETY

Service personnel who work on this equipment should be aware of the dangers of such equipment. Extremely high and dangerous voltages are present that can kill or cause serious injury. Gaseous fuels are highly explosive and can ignite by the slightest spark. Engine exhaust gases contain deadly carbon monoxide gas that can cause unconsciousness or even death. Contact with moving parts can cause serious injury. The list of hazards is seemingly endless.

When working on this equipment, use common sense and remain alert at all times. Never work on this equipment while you are physically or mentally fatigued. If you do not understand a component, device or system, do not work on it.

TRANSFER SWITCH TROUBLESHOOTING

It is always good practice to continue to ask questions during the troubleshooting process. When evaluating the problem asking some of these questions may help identify the problem quicker.

- What is the transfer switch doing?
- What was the transfer switch supposed to do?
- Does the transfer switch have the same fault consistently, and when does it occur?
- Who is controlling it?
- Exactly what is occurring?
- When is it happening?
- Why would this happen?
- How would this happen?
- What type of test will either prove or disprove the cause of the fault?

TEST 26 – CHECK MANUAL TRANSFER SWITCH OPERATION

Discussion

In automatic operating mode, when utility source voltage drops below a preset level, the engine should crank and start. On engine startup, an "engine warm-up timer" on the generator should start timing. After the timer has expired (about 15 seconds), the transfer relay (TR1) energizes to deliver generator source voltage to the standby closing coil terminals. If generator voltage is available to the standby closing coil terminals, but transfer to standby does not occur, the cause of the failure may be (a) a failed standby closing coil and/or bridge rectifier, or (b) a seized or sticking actuating coil or load contact. This test will help you evaluate whether any sticking or binding is present in the contactor.

Procedure

1. Set the generator main line circuit breaker (MLCB) to the "Open" position.
2. Set the controller to the OFF mode.
3. Disconnect Utility from the transfer switch.

⚠ DANGER!

Do not attempt manual transfer switch operation until all voltage to the switch have been disconnected. Failure to turn off all power voltage supplies may result in extremely hazardous and possibly lethal electrical shock.

4. Locate the manual transfer handle inside the switch enclosure.
5. Insert the un-insulated end of the handle over the transfer switch-operating lever. Refer to Figure 38.
   a. Manually actuate the contactor lever to the "Utility" position.
   b. Actuate the operating lever down to the "Standby" position.

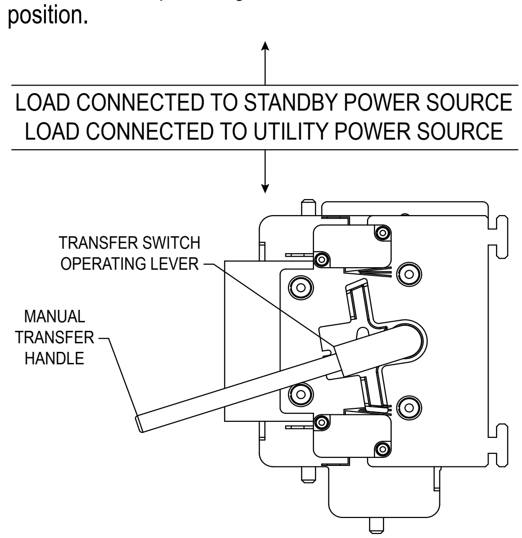


Figure 38. Terminal Block Test Points

6. Repeat Step 5 several times. When the contactor lever is moved, slight force should be needed until the lever reaches its center position. As the lever moves past its "over center" position, an over-center spring should snap the movable load contacts against the stationary standby or utility contacts.
7. Actuate the contactor to the "Utility" position.

Results

1. If there is no evidence of binding, sticking, or excessive force required the test is GOOD; refer back to the flow chart.
2. If evidence of sticking, binding, excessive force is required to move the CONTACTOR, find cause of binding or sticking and repair or replace damaged components.

TEST 27 – CHECK GENERATOR VOLTAGE AT TRANSFER SWITCH

Procedure

1. Set Volt-Ohm-Meter (VOM) to measure AC voltage
2. With the generator running check generator voltage at the generator's circuit breaker in the transfer switch. Measure and record the voltage.

Results

1. If the VOM indicated approximately 240 VAC, refer back to flow chart.
2. If the VOM did not indicate the correct AC voltage, investigate the cause of the no AC output.

TEST 28 – TEST TRANSFER OPERATOR (GENREADY SWITCH ONLY)

Procedure

1. Using a jumper wire connected to a common ground; connect a ground to the XFER terminal on the operator. Observe the rotation of the operator.
2. Disconnect ground from XFER terminal and observe the rotation of the operator.

Results

1. If the operator transferred to "Standby" when XFER was grounded and re-transferred back to "Utility" when XFER was ungrounded, the operator is functioning correctly.
2. If the operator failed to transfer to either "Standby" or "Utility" positions, refer back to flow chart.

TEST 29 – CHECK 15B/194 CIRCUIT

Procedure

1. Refer to Wiring Diagrams and Schematic Diagrams in Section 6 of this manual for proper wire numbers and location. Set a Volt-Ohm-Meter (VOM) to measure DC voltage.
2. On CorePower with GenReady Switch ONLY (PowerPact with 50A switch, skip to Step 3), connect one meter test lead to BAT + and connect the other meter test lead to BAT - on the operator. Measure and record the voltage.
   a. If the VOM indicated battery voltage, replace transfer operator.
   b. If the VOM did not indicate battery voltage, proceed to Step 3.
3. Connect one meter test lead to Wire 15B or 194 and the other meter test lead to Wire 0 located on the customer connection block or junction box. Measure and record the voltage.
   a. If the VOM indicated battery voltage, repair or replace the wiring between the transfer switch and the generator.
   b. If the VOM did not indicate battery voltage, proceed to Step 4.
4. Connect one meter test lead to Wire 15B or 194 and the other meter test lead to a clean frame ground. Measure and record the voltage.
   a. If the VOM indicated battery voltage, repair or replace Wire 0 in the generator.
   b. If the VOM did not indicate battery voltage, repair or replace Wire 15B in the generator.

Results

Refer back to flow chart.

TEST 30 – CHECK WIRE 23 CIRCUIT

Procedure

1. Set a Volt-Ohm-Meter (VOM) to measure DC voltage

Note: Generator should not be running for this part of the procedure.

2. Connect one meter test lead to the XFER terminal on the operator and the other meter test lead to the BAT + terminal. Measure and record the voltage.
   a. If the VOM indicated battery voltage and the transfer operator transferred the load to the Generator, Wire 23 circuit is shorted to ground, proceed to Step 3.
   b. If the VOM did not indicate battery voltage, proceed to Step 8
3. Disconnect the customer supplied Wire 23 from the customer connection block in the generator.

4. Connect one meter test lead to Wire 23 on the customer connection block and the other meter test lead to Wire 15B.
   a. If the VOM indicated battery voltage, proceed to Step 5.
   b. If the VOM did not indicate battery voltage, repair or replace the shorted Wire 23 between the switch and the generator.
5. Locate and disconnect the J2 connector from the controller.
6. Set the VOM to measure resistance.
7. Connect one meter test lead to a clean frame ground and the other meter test lead Wire 23 and the customer connection block. Measure and record the resistance.
   a. If the VOM indicated any resistance to ground, repair or replace the wire between the J2 connector and the customer connection block.
   b. If the VOM indicate INFINITY, replace controller.
8. Set VOM to measure DC voltage.
9. Set the controller to the AUTO mode and simulate a Utility Failure.
10. Once the generator has started and warmed up, connect one meter test lead to the XFER terminal and the other meter test lead to the BAT + terminal in the transfer switch. Measure and record the voltage.
    a. If the VOM indicated battery voltage, stop testing.
    b. If the VOM did not indicate battery voltage, proceed to Step 11.
11. Connect one meter test lead to Wire 23 and the other meter test lead to Wire 15B in the customer connection block. Measure and record the voltage.
    a. If the VOM indicated battery voltage, repair or replace Wire 23 between the transfer switch and the generator.
    b. If the VOM did not indicate battery voltage, proceed to Step 11.
12. Locate and disconnect the J2 connector from the controller.
13. Set VOM to measure resistance.
14. Connect one meter test lead to J2-5 (Wire 23) and the other meter test to Wire 23 connected at the customer connection terminal block.
    a. If the VOM indicated in CONTINUITY, replace controller.
    b. If the VOM indicated INFINITE, repair or replace Wire 23 between the J2 connector and the customer connection terminal block.

Results

Refer back to flow chart.

TEST 32 – CHECK FUSES F1 AND F2

Discussion

Fuses F1 and F2 are connected in series with the N1 and N2 circuits, respectively. A blown fuse will open the applicable circuit and will result in (a) generator startup and transfer to the “Standby”, or (b) failure to re-transfer back to utility source.

Procedure

1. On the generator panel, set the controller to the OFF mode.
2. Disconnect Utility from the transfer switch.
3. Remove fuse F1 and F2 from the fuse holder. (see Figures 39, 40, and 41).
4. Inspect and test fuses for an OPEN condition with a Volt-Ohm-Meter (VOM) set to measure resistance, CONTINUITY should be measured across the fuse.

Results

1. Replace blown fuse(s) as needed.

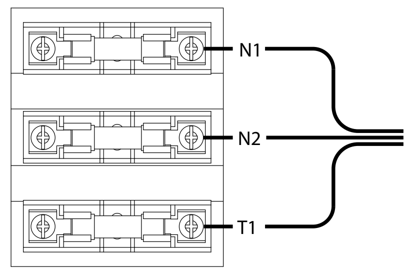


Figure 39. Transfer Switch Fuse Block - CorePower

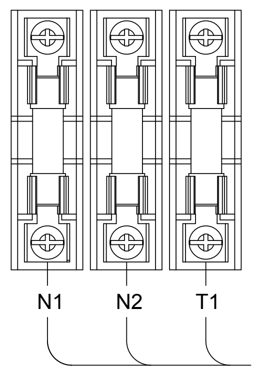


Figure 40. Transfer Switch Fuse Block - PowerPact 60 Hz

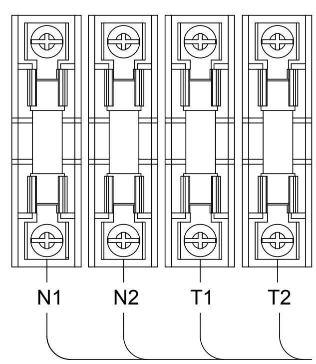


Figure 41. Transfer Switch Fuse Block - PowerPact 50 Hz

TEST 33 – CHECK N1 AND N2 WIRING

Discussion

A shorted Wire N1 or N2 to ground can cause fuse F1 or F2 to blow.

Procedure

1. On the generator panel, set the controller to the OFF mode.
2. Turn off the utility power supply to the transfer switch, using whatever means provided.
3. Remove fuses F1, F2, and F3 from the fuse holder (see Figures 39, 40, and 41).
4. Remove the generator control panel cover.
   a. On CorePower, disconnect the N1/N2 connector that supplies the printed circuit board located in the control panel (see Section 4.1).
   b. On PowerPact, disconnect N1 and N2 from the WAGO block in the customer connection area.
5. Set VOM to measure resistance.
6. Connect the positive meter test lead to Wire N1 at the terminal block in the control panel.
   a. Connect the negative meter lead to the ground lug. INFINITY should be measured.
   b. Connect the negative meter lead to Wire 23 at the terminal strip. INFINITY should be measured.
   c. Connect the negative meter lead to Wire 15B at the terminal strip. INFINITY should be measured.
   d. Connect the negative meter lead to Wire 0 at the terminal strip. INFINITY should be measured.
   e. Connect the negative meter lead to Wire N2 at the terminal block. INFINITY should be measured.
   f. Connect the negative meter lead to the neutral connection. INFINITY should be measured.
7. Connect the positive meter test lead to Wire N2 at the terminal block in the control panel.
   a. Connect the negative meter lead to the ground lug. INFINITY should be measured.
   b. Connect the negative meter lead to Wire 23 at the terminal strip. INFINITY should be measured.
   c. Connect the negative meter lead to Wire 15B at the terminal strip. INFINITY should be measured.
   d. Connect the negative meter lead to Wire 0 at the terminal strip. INFINITY should be measured.
   e. Connect the negative meter lead to the neutral connection. INFINITY should be measured.

Results

If a short is indicated in Step 6 or Step 7, repair wiring and re-test.

TEST 35 – CHECK FUSE F3

Discussion

Connected in series with Load Wire T1, F3 provides 120 VAC on 60 Hz units (F3 & F4 provides 220 VAC on 50 Hz) to the generator controller to operate the battery charger. A blown fuse (or fuses) may result in a dead battery situation.

Procedure

1. On the generator panel, set the controller to the OFF mode.
2. Disconnect Utility from the transfer switch.
3. Remove Fuse F3 from the fuse holder (F3 and F4 on 50 Hz).
4. Inspect and test fuses for an OPEN condition with a Volt-Ohm-Meter (VOM) set to measure resistance. CONTINUITY should be measured across the fuse.

Results

1. If fuse(s) is blown (open), replace as needed.

TEST 36 – CHECK T1 WIRING (60 HZ)

Discussion

If fuse F3 is open, a short may have occurred. This test will determine if either:

- The T1 wiring is shorted to ground or to other circuits.
- The controller is causing the short.

Procedure

1. Set the controller to the OFF mode and remove the 7.5 amp fuse.
2. Remove F1, F2 and F3 from the fuse holder in the transfer switch.
3. Disconnect the proper harness connector from the controller containing Wire T1.
4. Set the Volt-Ohm-Meter (VOM) to measure resistance.
5. Using the chart below, measure and record the resistance at the customer connection in the generator. (Example: Connect one meter test lead to Wire T1 and the other meter test lead to Ground.)

Table 17. Test 36 Results

	Ground	Wire 194	Wire 23	Wire N1	Wire N2
Wire T1					

Results

1. If the VOM indicated INFINITY in any connection points above, replace the controller.
2. If the VOM indicated CONTINUITY, repair or replace the wiring in the appropriate circuit.

TEST 36A – CHECK T1 AND T2 WIRING (50 HZ)

Discussion

If fuse F3, F4 or both fuses are open, a short may have occurred. This test will determine if either:

- The T1 or T2 wiring is shorted to ground or to other circuits.
- T1 and T2 are shorted together.

Procedure

1. Set the controller to the OFF mode and remove the 7.5 amp fuse.
2. Remove F1, F2, F3 and F4 from the fuse holder in the transfer switch.
3. Disconnect the proper harness connector from the controller containing Wire T1 and T2.
4. Set the Volt-Ohm-Meter (VOM) to measure resistance.
5. Using the chart below, measure and record the resistance at the customer connection in the generator. (Example: Connect one meter test lead to Wire T1 and the other meter test lead to Ground.)

Table 18. Test 36A Results

	T1	Ground	Wire 194	Wire 23	Wire N1	Wire N2
T1						
T2						

Results

1. If the VOM indicated INFINITY in any connection points above, replace the controller.
2. If the VOM indicated CONTINUITY, repair or replace the wiring in the appropriate circuit.

TEST 37 – TEST SMM CONTACTOR LINE, LOAD AND CONTROL

Discussion

The SMM Load Shed Module (integral to load shedding) requires line voltage from either the utility or the generator for it to operate. If line voltage is present, but the SMM is still not operating, this test will confirm the proper operation of the contactor.

Required Tools

- Meter test leads that are capable of measuring voltage.
- Phillips screwdriver.

Procedure

1. Remove the four (4) screws securing the cover to the SMM Load Shed Module.
2. Ensure the LED is ON, but not flashing.
   a. If the LED in OFF or flashing in any interval, return to the flowchart.
3. Set the VOM (Volt-Ohm-Meter) to measure AC volts.
4. Place the meter leads across the line (input) terminals and record the voltage.
5. Place the meter leads across the load (output) terminals and record the voltage.

Results

1. If the meter indicated less than approximately 240 VAC in Step 4, stop testing and check source voltage coming from the circuit breaker.
2. If the meter indicated approximately 240 VAC in Step 4, but not in Step 5, replace the contactor.

TEST 38 – CHECK N1 AND N2 VOLTAGE

Discussion

Loss of utility source voltage to the generator will initiate a startup and transfer by the generator. Testing at the control panel terminal block will divide the system in two, thereby reducing troubleshooting time.

Procedure

1. Set the CONTROLLER to the OFF mode.
2. Set a VOM to measure AC voltage.
3. See Figure 42. Connect one test lead to Wire N1 at the terminal block in the generator control panel. Connect the other test lead to Wire N2. Utility line-to-line voltage should be measured.

Results

Refer to Flow Chart

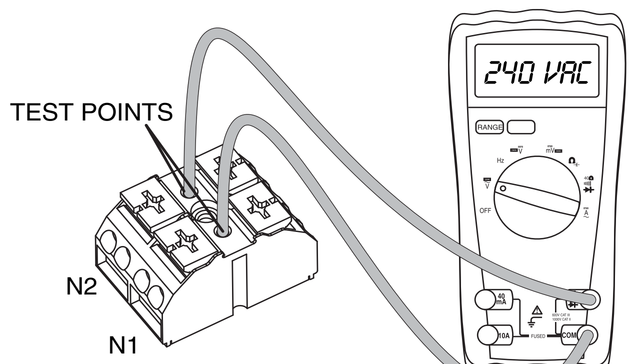


Figure 42. Terminal Block Test Points

TEST 39 – CHECK UTILITY SENSE VOLTAGE

The N1 and N2 terminals in the transfer switch deliver utility voltage "sensing" to the controller. If voltage at the terminals is zero or low, standby generator startup and transfer to the "Standby" source will occur automatically as controlled by the circuit board. A zero or low voltage at these terminals will also prevent retransfer back to the "Utility" source.

Procedure

With utility source voltage available to terminal lugs N1 and N2, use a VOM to test for utility source line-to-line voltage across terminal locations N1 and N2 terminals. Normal line-to-line utility source voltage should be indicated.

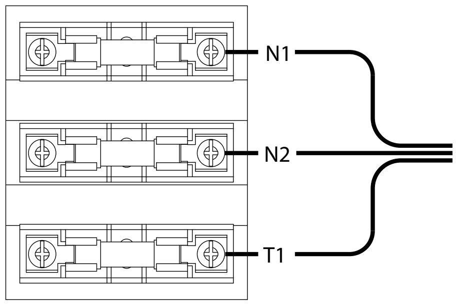


Figure 43. Transfer Switch Fuse Block - CorePower

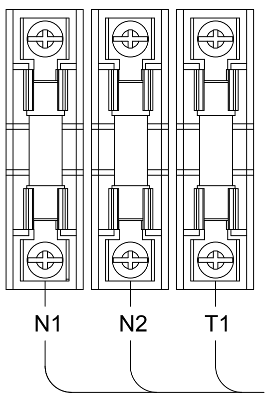


Figure 44. Transfer Switch Fuse Block - PowerPact 60 Hz

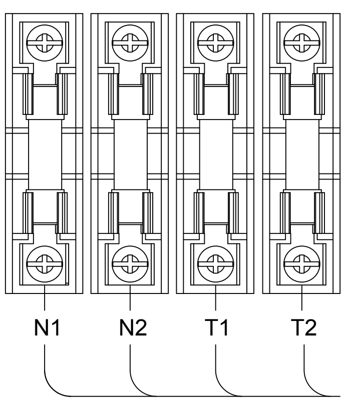


Figure 45. Transfer Switch Fuse Block - PowerPact 50 Hz

Results

1. If voltage reading across the N1 and N2 terminals is zero or low, refer to Flow Chart.
2. If voltage reading is good, refer to Flow Chart.

TEST 40 – CHECK UTILITY VOLTAGE AT TRANSFER SWITCH

Procedure

1. Set a Volt-Ohm-Meter (VOM) to measure AC voltage.
2. Connect meter test leads across the Utility Disconnect breaker in the transfer switch. Measure and record the voltage.

Results

1. If the VOM indicated approximately 240 VAC, refer back to flow chart.
2. If the VOM did not indicate 240 VAC, verify any additional breakers or wiring are correct.

TEST 41 – CHECK UTILITY SENSING VOLTAGE AT THE CONTROLLER

Discussion

If the generator starts and transfer to STANDBY occurs in the automatic mode when acceptable UTILITY source voltage is available at the terminal block, the next step is to determine if sensing voltage is reaching the controller.

Note: The System Ready LED will flash in AUTO or UTILITY LOST will display on the panel.

Procedure

1. Set the CONTROLLER to the OFF mode.
2. On CorePower only, disconnect the N1/N2 connector from the control panel (see Section 4.1).
3. Set a VOM to measure AC voltage.
4. Connect one meter test lead to Wire N1 at the incoming Utility sensing connector. Connect the other meter test lead to Wire N2. For 60 Hz units approximately 240 VAC should be measured. For 50 Hz units approximately 220 VAC should be measured.

Results

1. If voltage was measured in Step 4 and the pin connections are good, replace the circuit board.
2. If voltage was NOT measured in Step 4, repair or replace Wire N1/N2 between connector and terminal block.

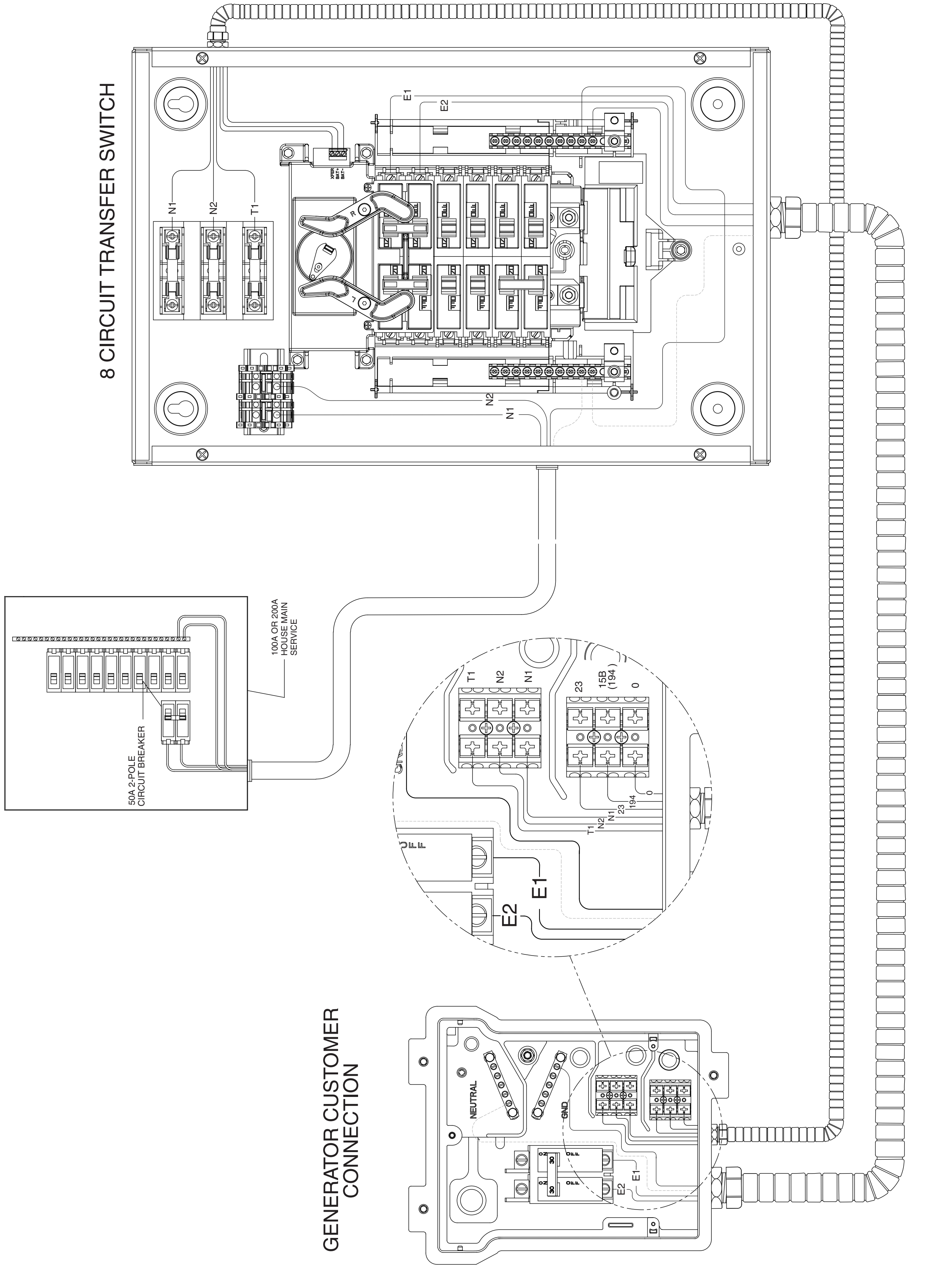


Figure 46. Interconnection Diagram - CorePower

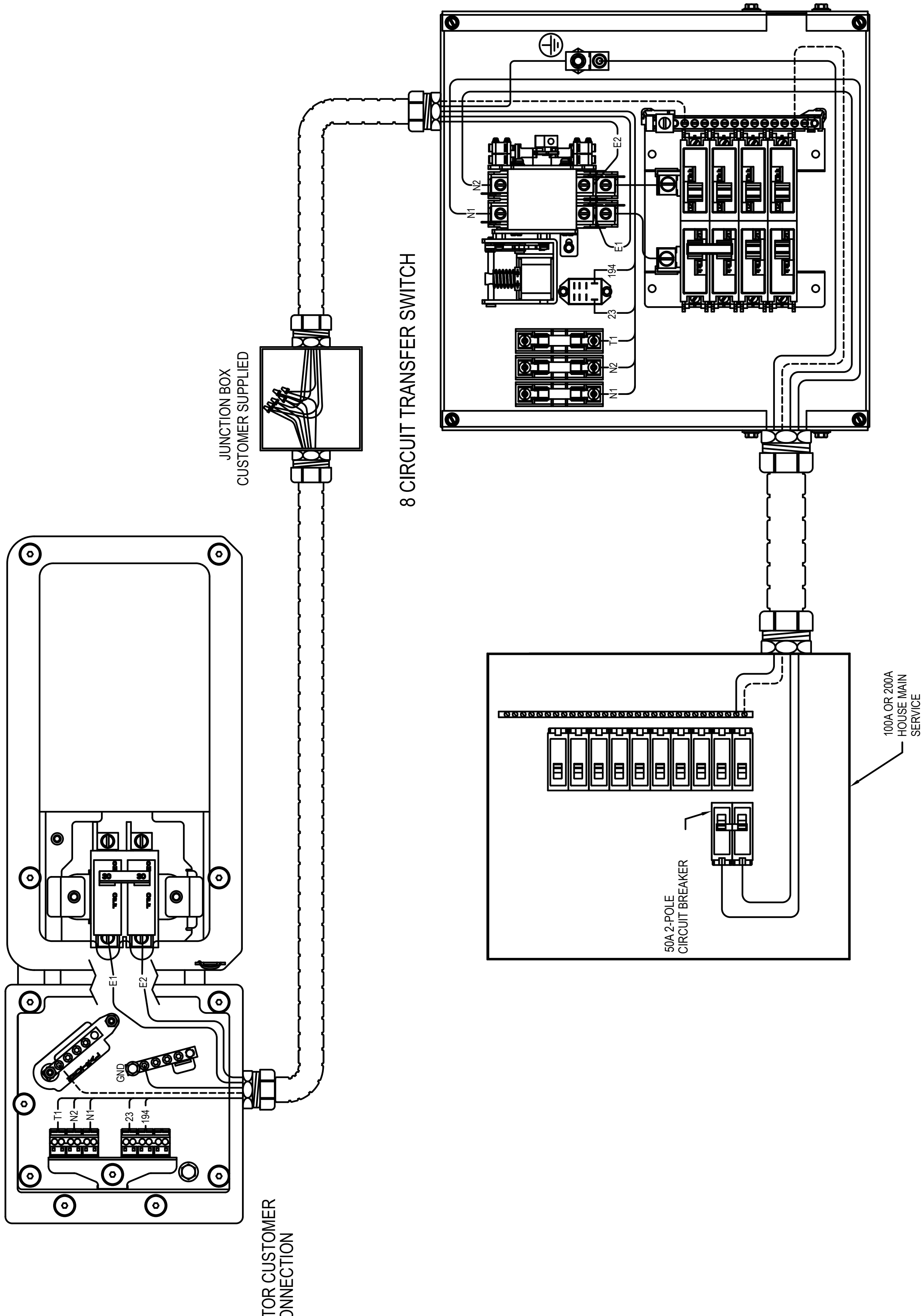


Figure 47. Interconnection Diagram - PowerPact (60 Hz)

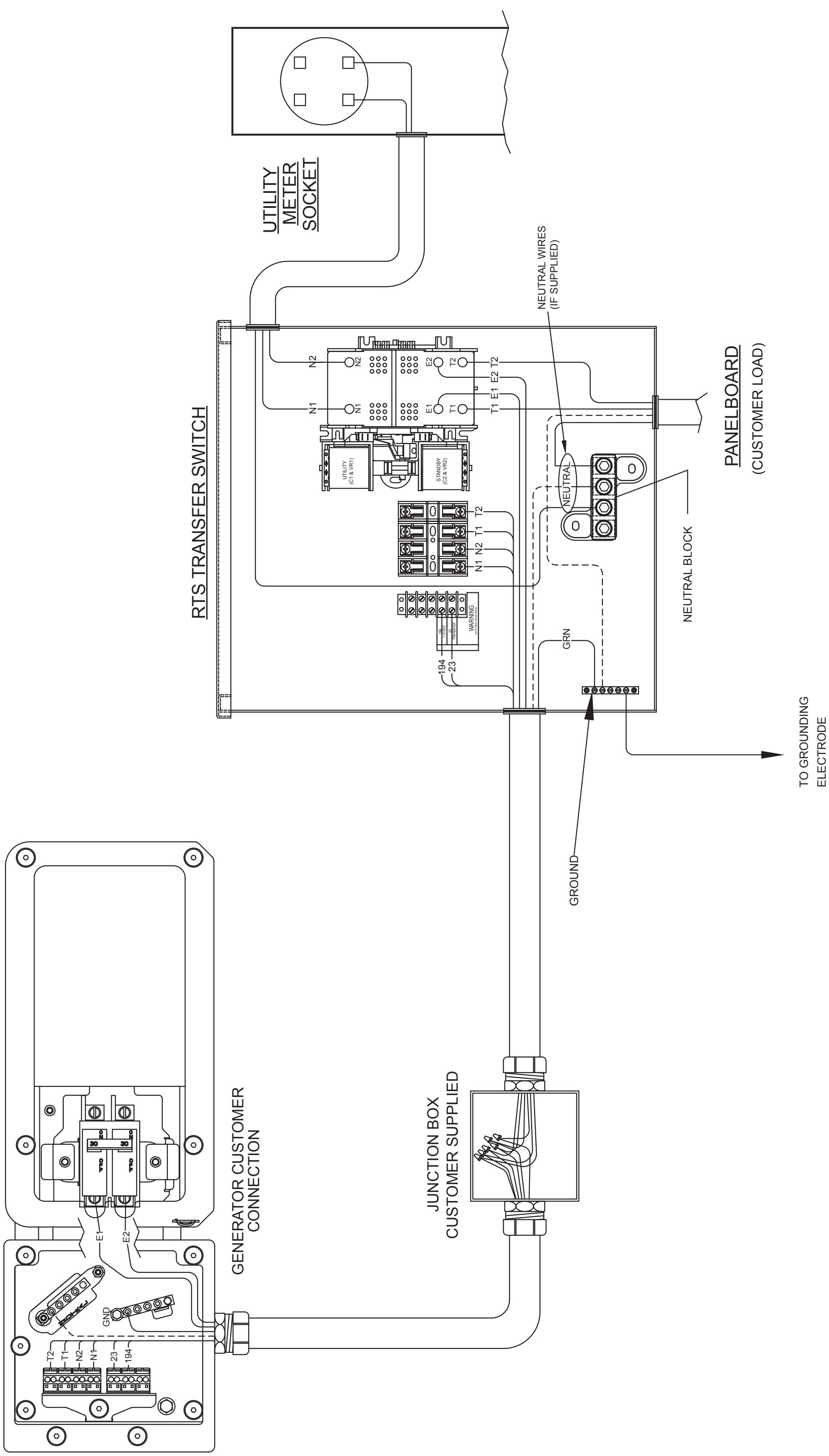


Figure 48. Interconnection Diagram - PowerPact (50 Hz)

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GENERAL

This section will familiarize the reader with the various components that make up the DC control system. Major DC control system components that will be covered include the following:

- A Terminal Strip / Interconnection Terminal
- A Controller
- An AUTO-OFF-MANUAL Switch (CorePower only)
- Touchpad with AUTO, OFF and MANUAL buttons. (PowerPact only)
- A 7.5 Amp Fuse

TERMINAL STRIP / INTERCONNECTION TERMINAL (COREPOWER ONLY)

The terminals of this terminal strip are connected to identically numbered terminals on a transfer switch terminal board. The terminal board connects the transfer switch to the controller.

The terminal board provides the following connection points:

- N1 (Utility Sensing)
- N2 (Utility Sensing)
- T1 (Battery Charger)
- Wire 194 (Transfer Relay)
- Wire 23 (Transfer Relay)

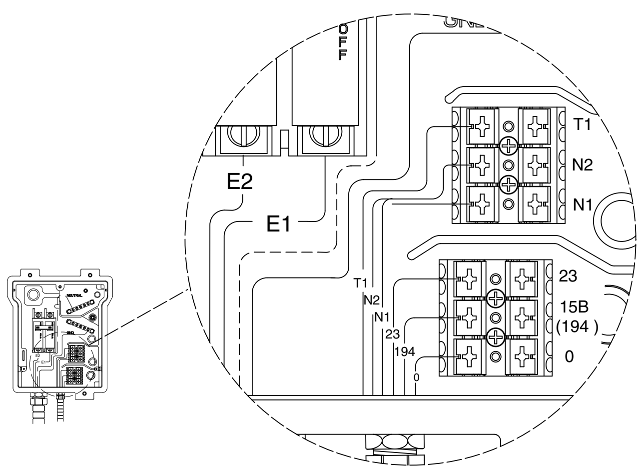


Figure 49. Customer Connections

CONTROLLER

The controller controls all standby electric system operations including (a) engine startup, (b) engine running, (c) automatic transfer, (d) automatic retransfer, and (e) engine shutdown. In addition, the controller performs the following functions:

- Starts and “exercises” the generator once every seven days.
- Provides automatic engine shutdown in the event of low oil pressure (CorePower), low oil level (PowerPact), high oil temperature, overspeed, no RPM sense, overcrank, or low battery.

An 18-pin and a 4-pin connector are used to interconnect the controller with the various circuits of the DC systems. Connector pin numbers, associated wires and circuit functions are listed in the CHART on the next page.

If the Utility sensing voltage drops below a preset value, controller action will initiate automatic generator startup and transfer to the “Standby” source side.

The crank relay and fuel solenoid valve are energized by controller action at the same time.

AUTO-OFF-MANUAL CONTROL

These three selections permit the operator to (a) select fully automatic operation, (b) start the generator manually, or (c) stop the engine and prevent automatic startup.

7.5 AMP FUSE

This fuse protects the circuit board against excessive current. If the fuse has blown, engine cranking and operation will not be possible. Should fuse replacement become necessary, use only an identical 7.5 amp replacement fuse.

BATTERY CHARGER (COREPOWER ONLY)

The battery charger is an independent part the generator. It has a 120 VAC input and a DC output of 13.4 VDC with a max amperage of 2.5 amps.

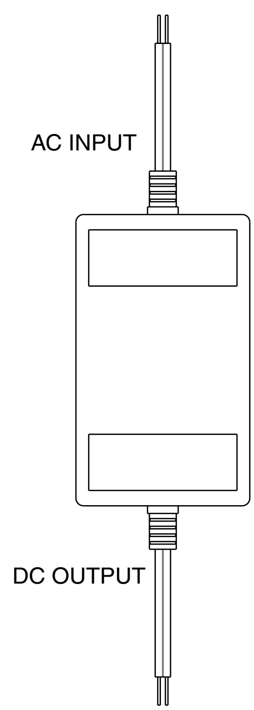


Figure 50. Battery Charger

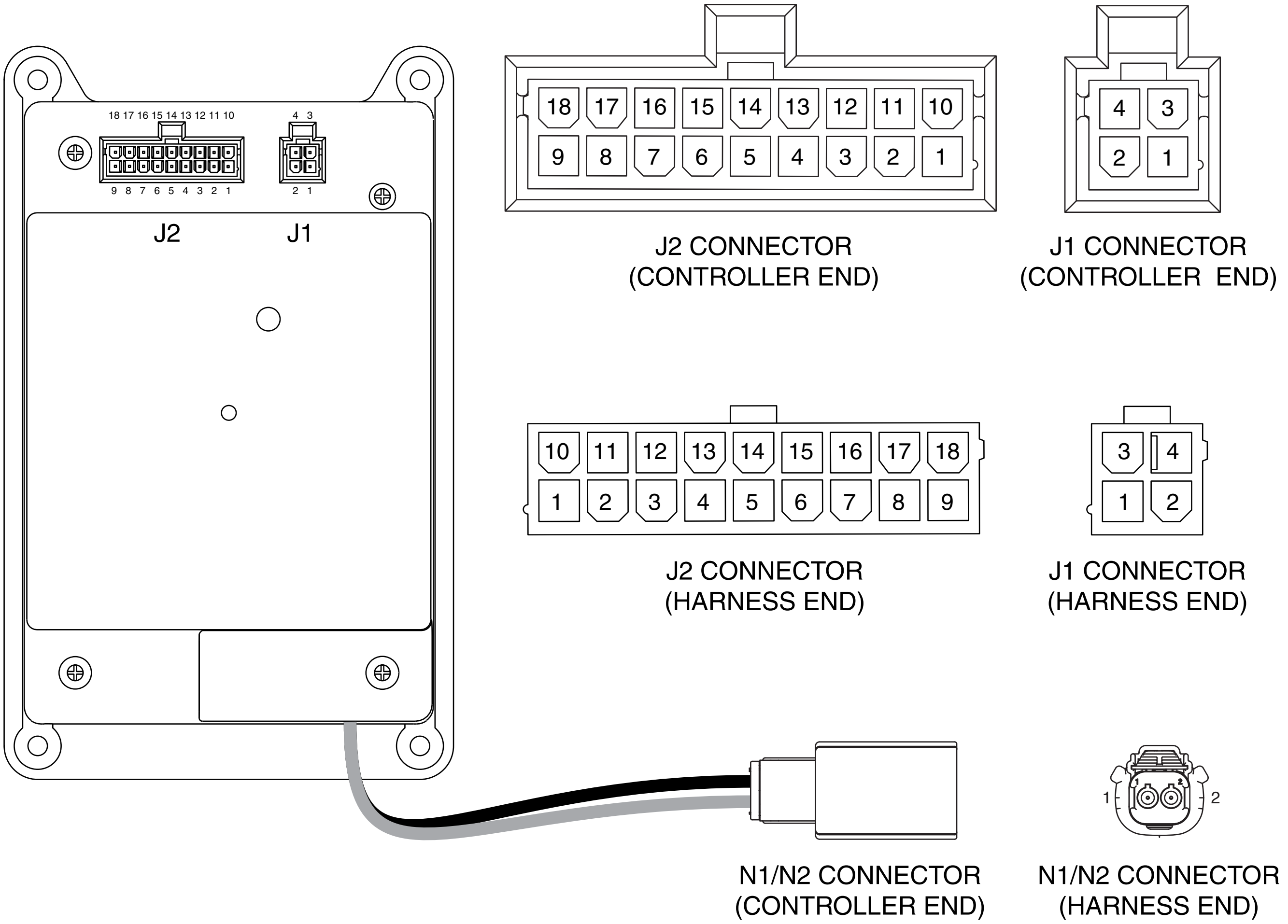


Figure 51. CorePower Controller Pin Descriptions

6/7 kW CorePower Connector Pin Descriptions

PIN	WIRE	CIRCUIT FUNCTION
J1-1	85	High temperature shutdown: Shutdown occurs when Wire 85 is grounded by contact closure in HTO
J1-2	86	Low oil pressure shutdown: Shutdown occurs when Wire 86 is grounded by loss of oil pressure to the LOP
J1-3	13	12 VDC source voltage for the controller
J1-4	18	Ignition Shutdown: Circuit board action grounds Wire 18 for ignition shutdown.
J2-1	0	Not Used
J2-2	0	Not Used
J2-3	14	12 VDC output for engine run condi-tion. Used for fuel solenoid.
J2-5	23	Switched to ground for transfer relay operation
J2-6		NOT USED
J2-7		NOT USED
J2-8	15B	Provides an electrical connection for charge current to reach the battery from the battery charger. Provides 12 VDC to the Transfer Relay
J2-9		NOT USED
J2-10	0	Common Ground
J2-11	56	12 VDC output to starter contactor and the choke solenoid.
J2-15	90	Used to operate the choke solenoid and is active during cranking only.
J2-16		NOT USED
J2-17		NOT USED
J2-18		NOT USED
Wired Plug 1	N1	240 VAC sensing for controller.
Wired Plug 2	N2	240 VAC sensing for controller.

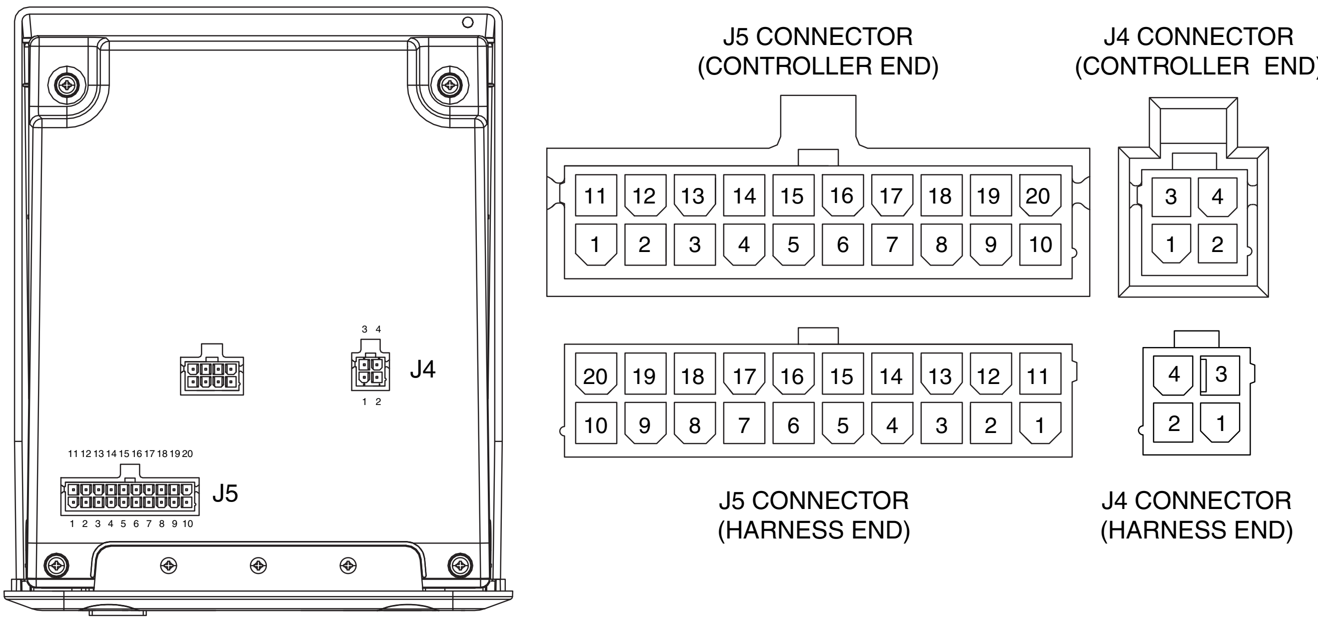


Figure 52. PowerPact Controller Pin Descriptions

6/7 kW PowerPact Connector Pin Descriptions

PIN	WIRE	CIRCUIT FUNCTION
J4-1	T1	120VAC Power for the Battery Charger
J4-2	-	Not Used
J4-3	0	Neutral Connection for T1 (battery charger)
J4-4	-	Not Used
J5-1	N1	240 VAC Utility sensing voltage
J5-2	-	Not Used
J5-3	-	Not Used
J5-4	15A	B+ input to the choke solenoid
J5-5	R1	Model ID Resistor
J5-6	90	Switched to ground for choke solenoid operation
J5-7	-	Not Used
J5-8	R3	Model ID Resistor
J5-9	13	12 VDC un-fused for the controller
J5-10	13	12 VDC un-fused for the controller
J5-11	N2	240 VAC Utility sensing voltage
J5-12	-	Not Used

PIN	WIRE	CIRCUIT FUNCTION
J5-13	14	12 VDC output for engine run condition. Fuel solenoid supply voltage.
J5-14	56	12 VDC output to starter contactor relay/ solenoid
J5-15	86	Low oil level shutdown: Shutdown occurs when Wire 86 is grounded by low oil level at the LOL switch
J5-16	85	High temperature shutdown: Shutdown occurs when Wire 85 is grounded by contact closure in the oil temperature switch
J5-17	23	Switched to ground (internally) to energize the Transfer Relay
J5-18	194	Provides 12 VDC to the transfer relay (TR1)
J5-19	18	Ignition Shutdown: The controller grounds Wire 18 for ignition shutdown and receives a reference signal for speed control while cranking and running
J5-20	0	Common Ground (DC)

ALARMS

Low Oil Pressure (Shutdown Alarm) - CorePower

A five (5) second delay on start-up and eight (8) second delay once the engine is running. This switch has normally closed contacts that are held open by engine oil pressure during operation. Should the oil pressure drop below the five (5) PSI range, switch contacts close and the engine shuts down. The unit should not be restarted until oil level is verified.

Low Oil Level (Shutdown Alarm) - PowerPact

When the oil level switch contacts are in the closed position (Low Oil Level), the engine will crank and start. However, shutdown will then occur within about five (5) seconds. If the engine cranks and starts, then shuts down almost immediately with an LOL fault light, the cause may be low engine oil level or a defective oil level switch. The unit should not be restarted until oil level is verified.

High Oil Temperature (Shutdown Alarm – Auto Reset)

A 10 second delay on start-up and one (1) second delay before shutdown. Auto reset when the condition clears and restart the engine if a valid start signal is still present.

If the temperature exceeds approximately 124° C (255° F), the high oil temperature switch will initiate an engine shutdown.

CorePower: normally open contacts will close.

PowerPact: normally closed contacts will open.

Once the oil temperature drops to a safe level the switch's contacts open again.

Over Crank (Shutdown Alarm)

This occurs if the engine has not started within the specified crank cycle. (See Section 1.5 "Automatic Operation")

Over Speed (Shutdown Alarm) - 60 Hz

4320 RPM for three (3) seconds or 4500 RPM immediately. This feature protects the generator from damage by shutting it down if it happens to run faster than the preset limit. This protection also prevents the generator from supplying an output that could potentially damage appliances connected to the generator circuit.

Over Speed (Shutdown Alarm) - 50 Hz

3600 RPM for three (3) seconds or 3750 RPM immediately. This feature protects the generator from damage by shutting it down if it happens to run faster than the preset limit. This protection also prevents the generator from supplying an output that could potentially damage appliances connected to the generator circuit.

RPM Sensor Loss (Shutdown Alarm)

During cranking, if the controller does not see a valid RPM signal within three (3) seconds, it will shut down and lock out on RPM sensor loss. While engine is running, if RPM signal is lost for two (2) seconds the controller will shut the engine down, wait 15 seconds, then re-crank the engine. If no RPM signal is detected within the first three (3) seconds of cranking, the controller will shut the engine down and latch out on RPM sensor loss. If the RPM signal is detected, the engine will start and run normally. If the RPM signal is subsequently lost again, the controller will try one more re-crank attempt before latching out and displaying the RPM sensor failure message.

CLEAR ALARMS

NOTE: Depending on the model, clearing the alarm is performed differently.

CorePower

To clear the alarm: Set the AUTO-OFF-MANUAL switch to the OFF position.

PowerPact

To clear the alarm: Press the OFF mode button on the controller two (2) times.

WARNINGS

Second Priority (Non-latching) Displayed on the CorePower control panel.

Warnings automatically clear when the monitored condition goes away. Warnings cannot cause shutdowns.

Low Battery

The controller monitors battery voltage and illuminates an LED warning if the battery voltage falls below 11.9 volts for one (1) minute. Warning is automatically cleared if the battery voltage rises above 12.4 volts. Battery voltage is not monitored during the crank cycle.

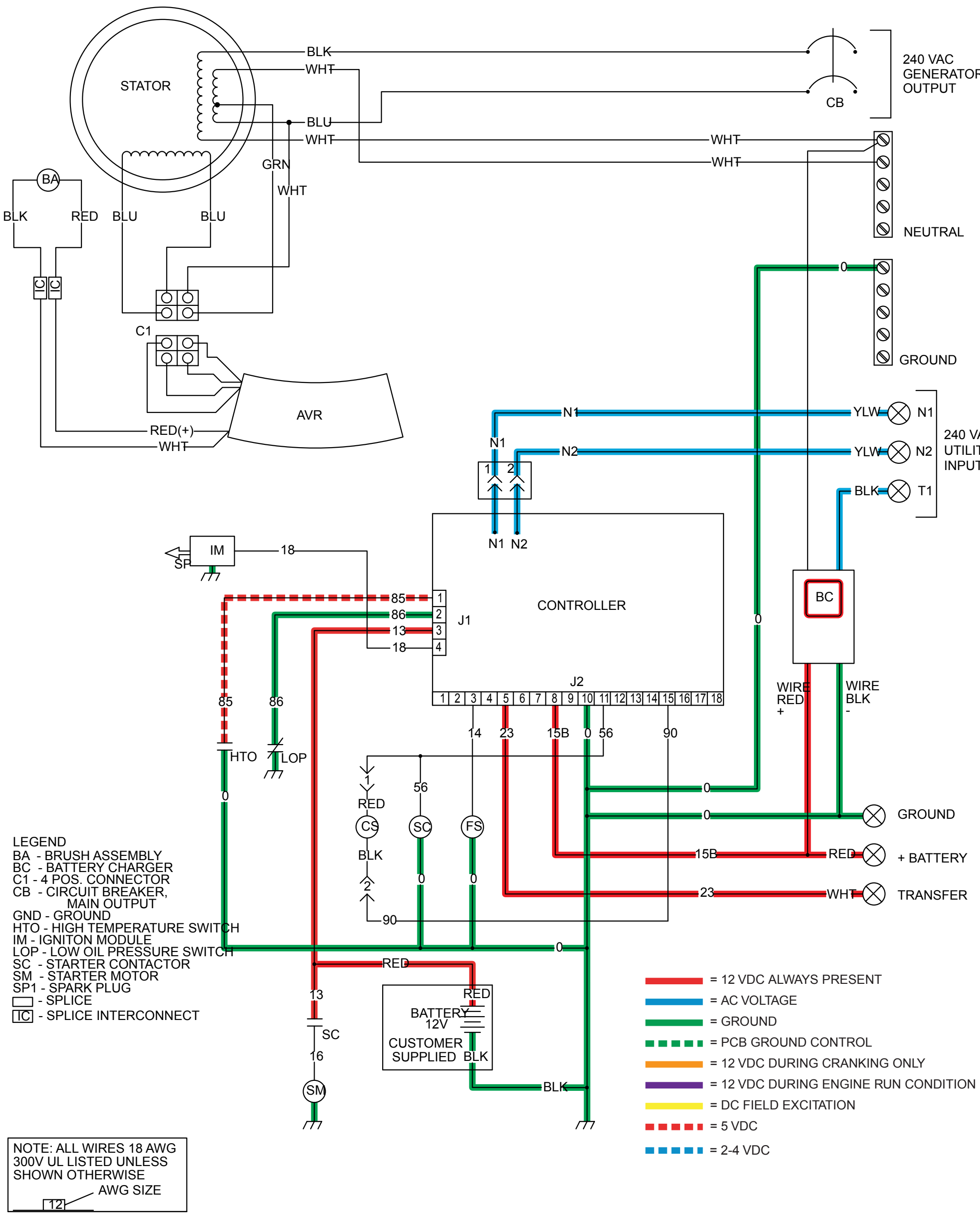
UTILITY SOURCE AVAILABLE - COREPOWER

Utility voltage is available to the transfer switch terminals N1/N2 and the transfer switch in the normal utility position.

Utility sensing voltage is delivered to the controller via Wires N1/N2 from a transfer switch. This voltage is 240 VAC sensing voltage only for the controller. T1 is 120 VAC supply for power to the battery charger.

Battery output voltage is delivered to the controller via Wire 13 when the battery is installed.

UTILITY FAILURE AND ENGINE CRANKING - COREPOWER



When the utility sensing voltage drops out the controller will start a 10 second timer. If the voltage does not return fully of is below 60 percent of normal the generator will start to crank.

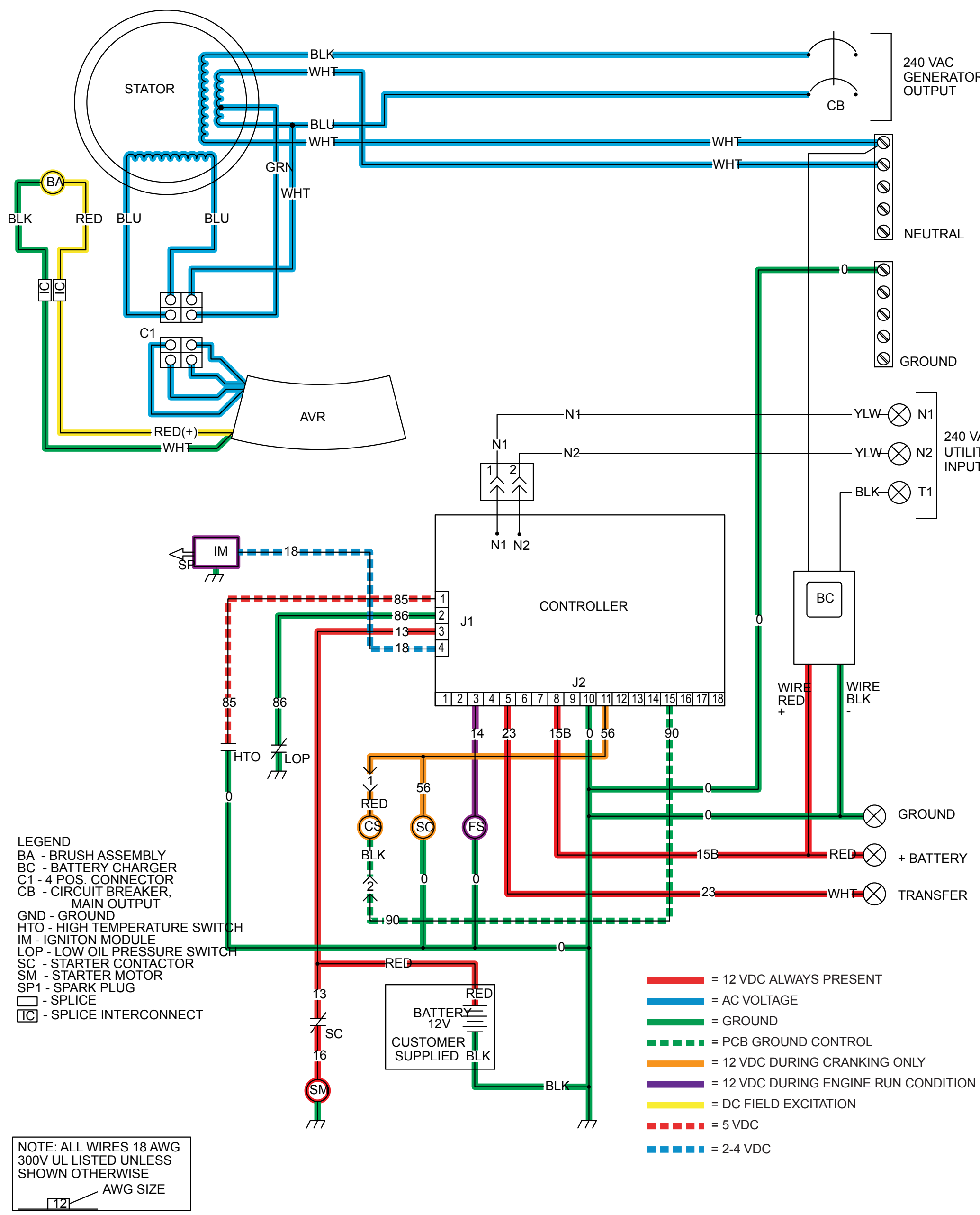
The controller action delivers 12 VDC to the starter contactor via Wire 56. When the starter contactor energizes, it delivers battery voltage to the starter motor and the engine will crank.

Wire 56 also delivers 12 VDC to the choke solenoid. The controller action grounds Wire 90 to actuate the choke solenoid cyclically during cranking. The controller action will remove wire 90 from ground during normal running operation.

The controller delivers 12 VDC to the fuel solenoid during cranking and will continue to during normal running and operation.

As the engine cranks a magnet on the flywheel induces a high voltage into the engines ignition magneto (IM). A spark is produced that jumps the spark plug gap.

During cranking residual magnetism from the rotor induces a voltage into the stator (blue) excitation wires and the (green and white) sensing wires. Voltage from the excitation wires power up the voltage regulator.



UTILITY FAILURE AND ENGINE RUNNING - COREPOWER

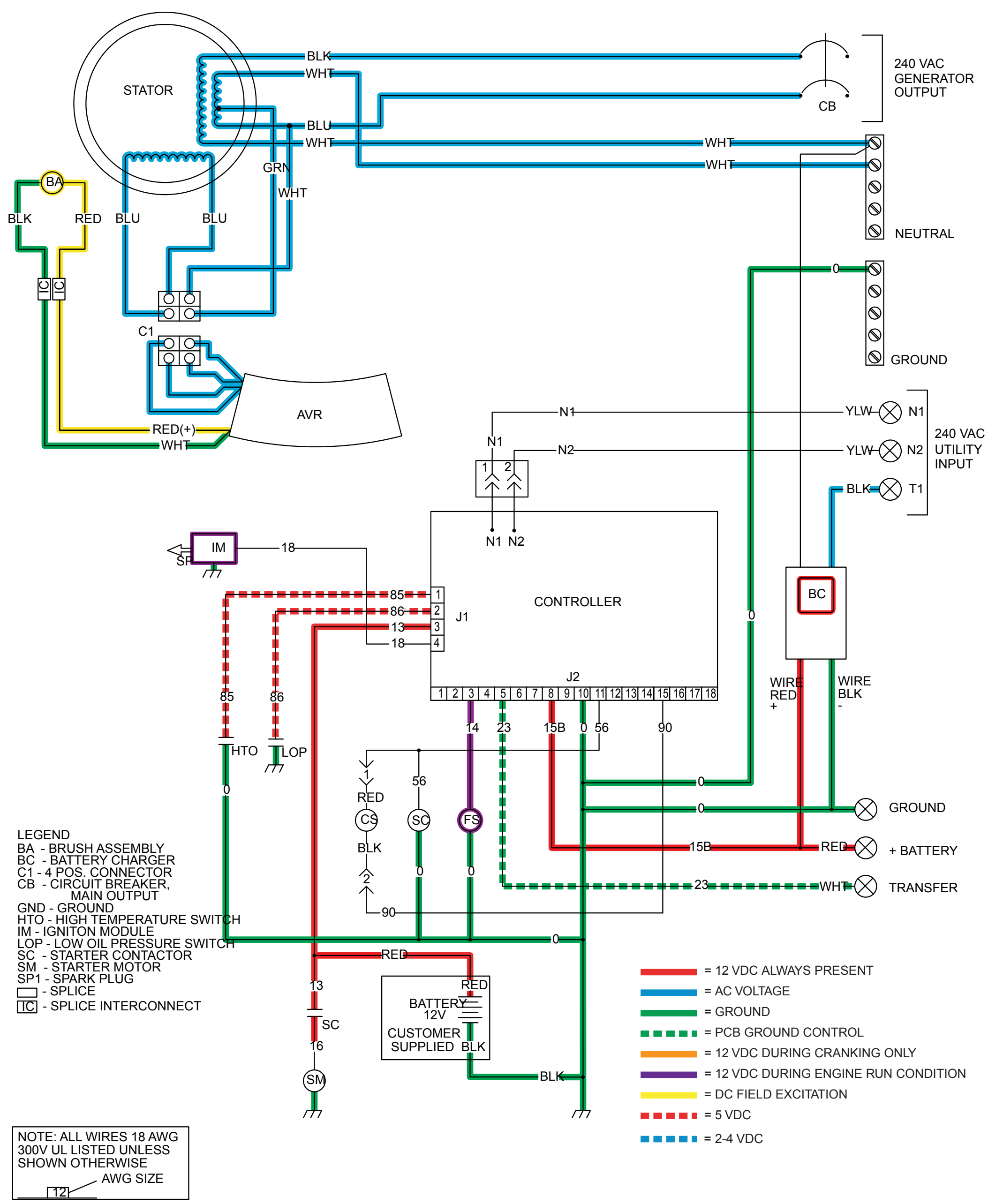
The generator is running, the controller's engine warm up timer is timing out and the generator is producing AC voltage.

12 VDC is delivered to the actuator motor (in the EZ Transfer Operator) via Wire 15B. This 12 VDC circuit is completed back to the controller via Wire 23. When the engine warm up time expires the controller will take Wire 23 to ground to actuate the actuator in the transfer switch to the generator position.

When the utility voltage returns to the controller above 75 percent of normal, the controller will energize a 15 second timer. Once the timer has expired the controller will remove wire 23 from ground, this will actuates the actuator in the transfer switch to the normal utility position.

Once back in the utility the controller will run the generator for one (1) minute for its "cool down" cycle then shut down.

With utility available and the generator in the AUTO position the SYSTEM READY light will be solid.



UTILITY SOURCE AVAILABLE - POWERPACT

Utility voltage is available to the transfer switch terminals N1/N2 and the transfer switch in the normal utility position.

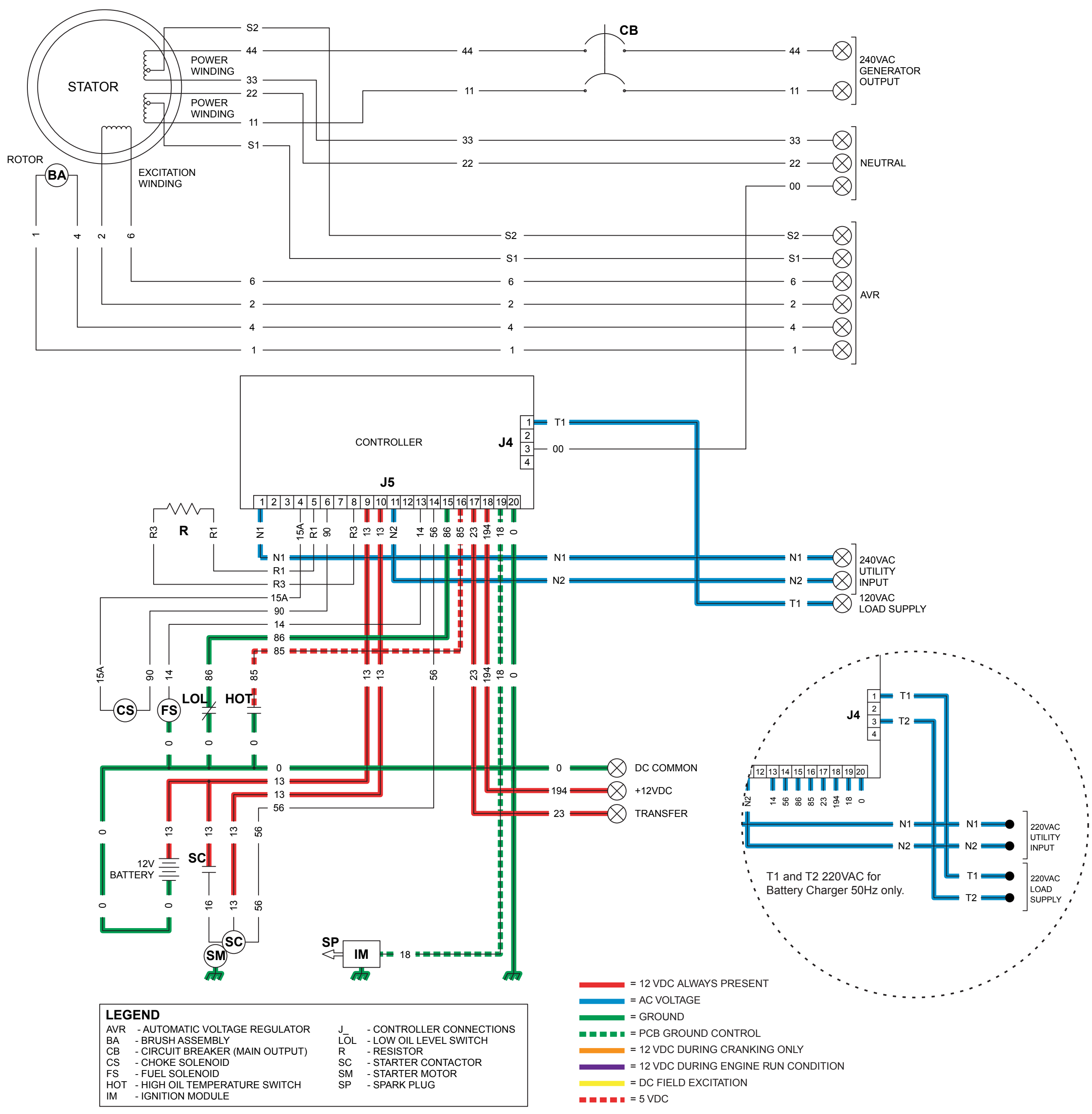
Utility sensing voltage is delivered to the controller via Wires N1/N2 from a transfer switch. Sensing voltage only for the controller is:

- 240 VAC (60 Hz)
- 220 VAC (50 Hz)

Power supply to the battery charger is:

- 120 VAC on T1 (60 Hz)
- 220 VAC on T1 and T2 (50 Hz)

Battery output voltage is delivered to the controller via Wire 13 when the battery is installed.



UTILITY FAILURE AND ENGINE CRANKING - POWERPACT

When the utility sensing voltage drops out, the controller will start a 5 second timer. If utility voltage does not return or is below 60 percent of nominal, the generator will start to crank.

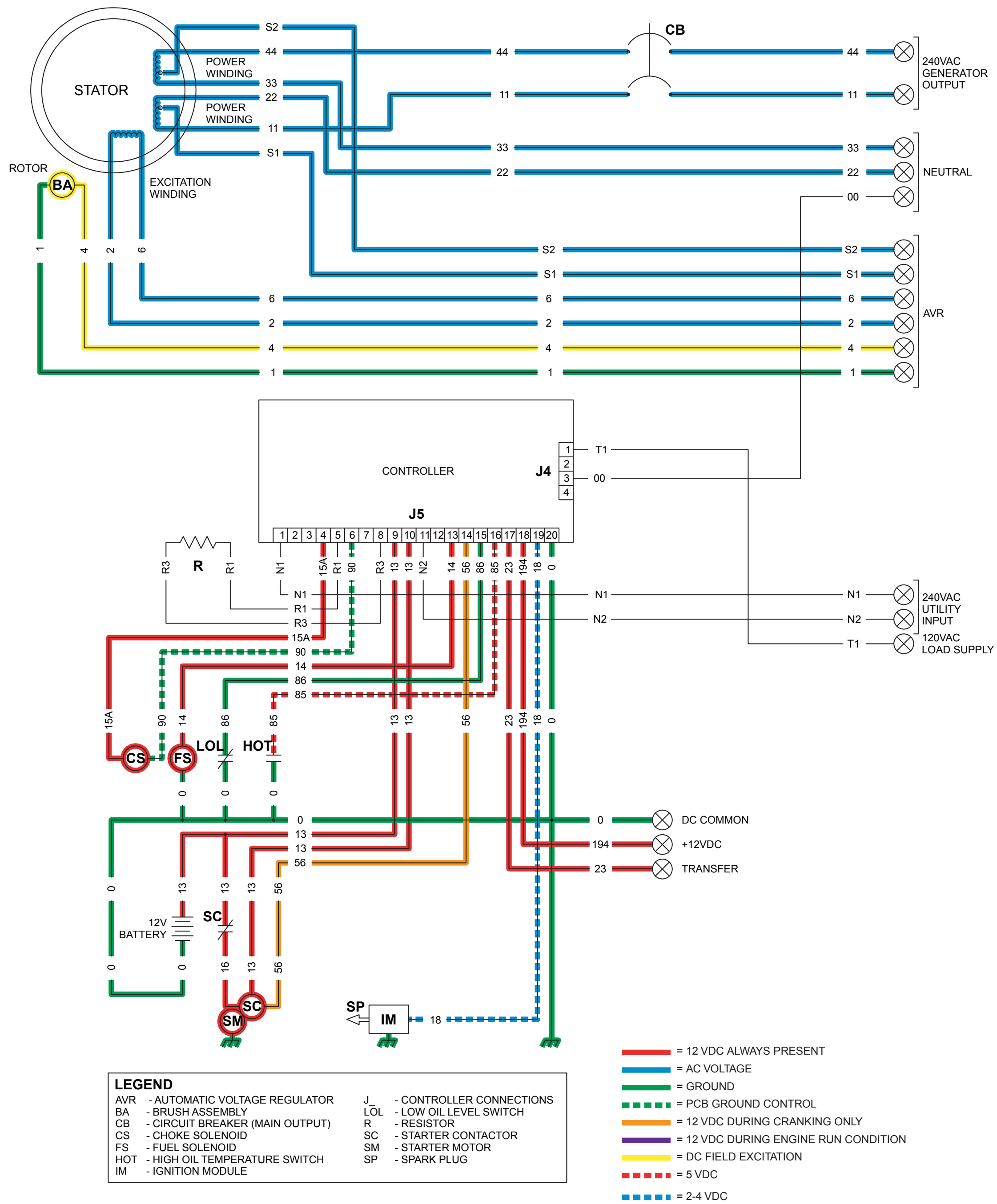
The controller action delivers 12 VDC to the starter contactor via Wire 56. When the starter contactor energizes, it delivers battery voltage to the starter motor and the engine will crank.

Wire 15A delivers 12 VDC to the choke solenoid. The controller action grounds Wire 90 to actuate the choke solenoid cyclically during cranking. The controller action will remove ground from Wire 90 during normal running operation.

The controller delivers 12 VDC to the fuel solenoid during cranking and normal running operation.

As the engine cranks, a magnet on the flywheel induces a high voltage into the engines ignition magneto (IM). A spark is produced and is delivered to the spark plug, igniting the fuel/air mixture in the cylinder.

During cranking residual magnetism from the rotor induces a voltage into the stator (blue) excitation wires and the (green and white) sensing wires. Voltage from the excitation wires power up the voltage regulator.



UTILITY FAILURE AND ENGINE RUNNING - POWERPACT

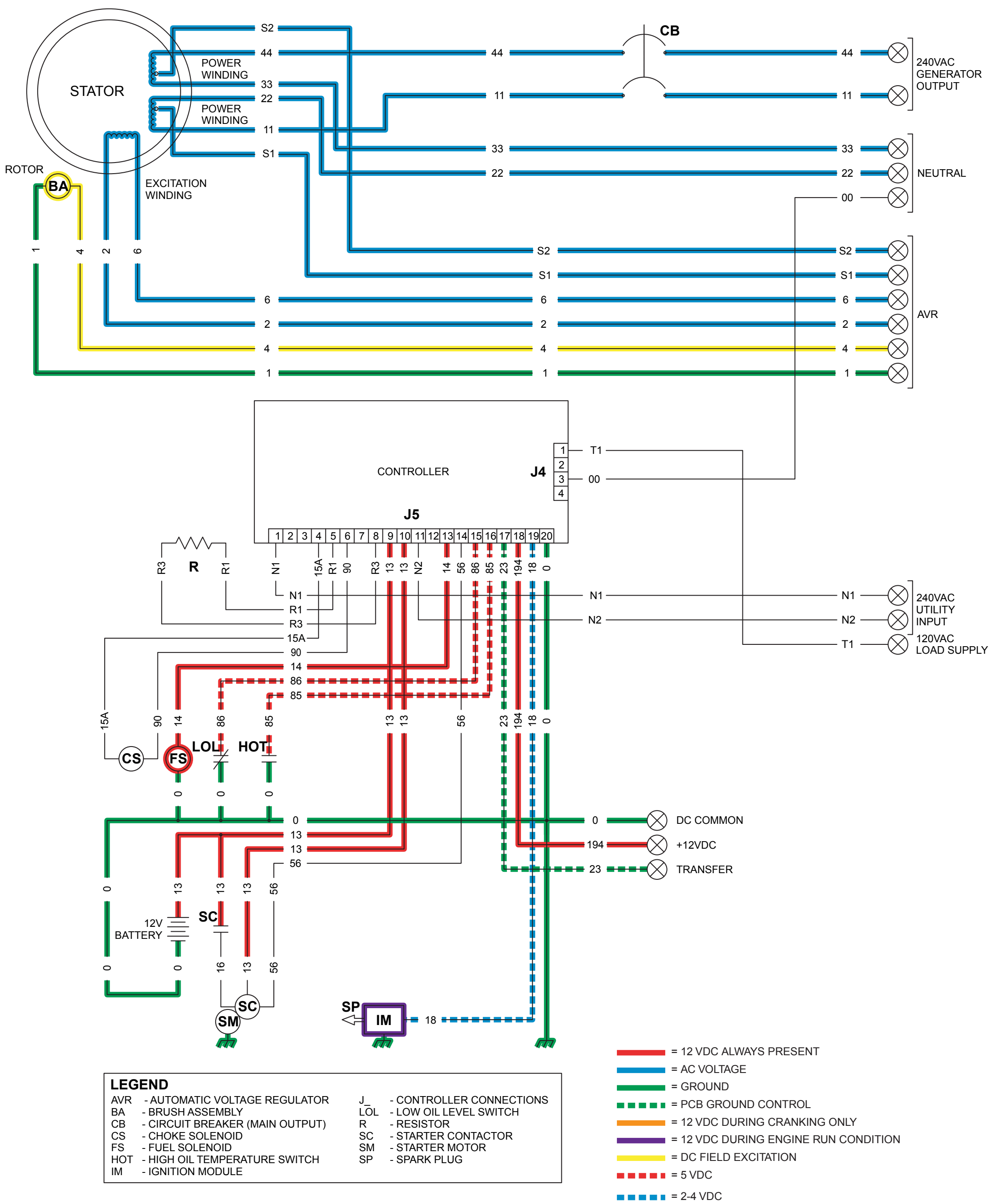
The generator is running, the controller's engine warm up timer is timing out and the generator is producing AC voltage.

12 VDC is delivered to the Transfer Relay (TR1) via Wire 194. This 12 VDC circuit is completed back to the controller via Wire 23. When the engine warm up timer expires, the controller will take Wire 23 to ground to energize the transfer relay. The contacts in the transfer switch move to the generator position.

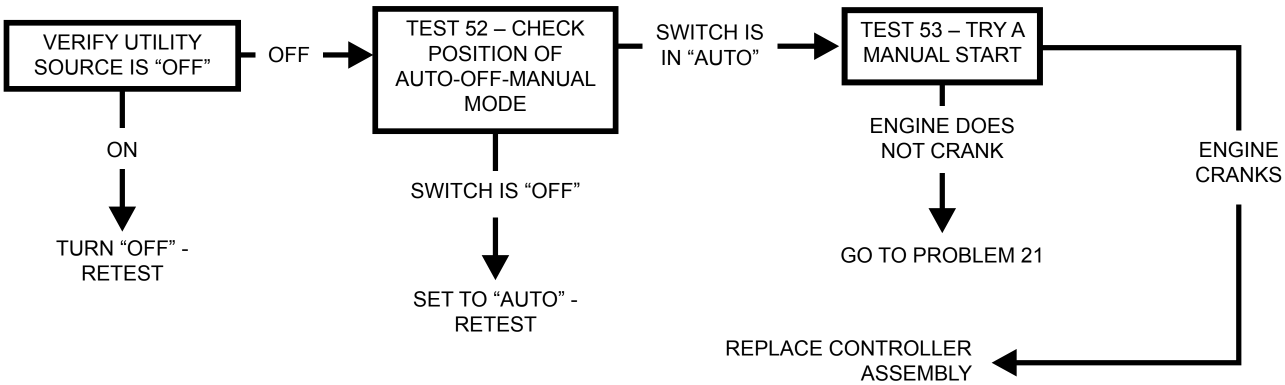
When the utility voltage returns (above 80 percent of nominal), the controller will initiate a 15 second timer. Once the timer has expired, the controller will remove Wire 23 from ground. This will de-energize the transfer relay. The contacts in the transfer switch move to the normal utility position.

With the generator utility mode, the controller will run the generator for one (1) minute for its "cool down" cycle, and then shut down.

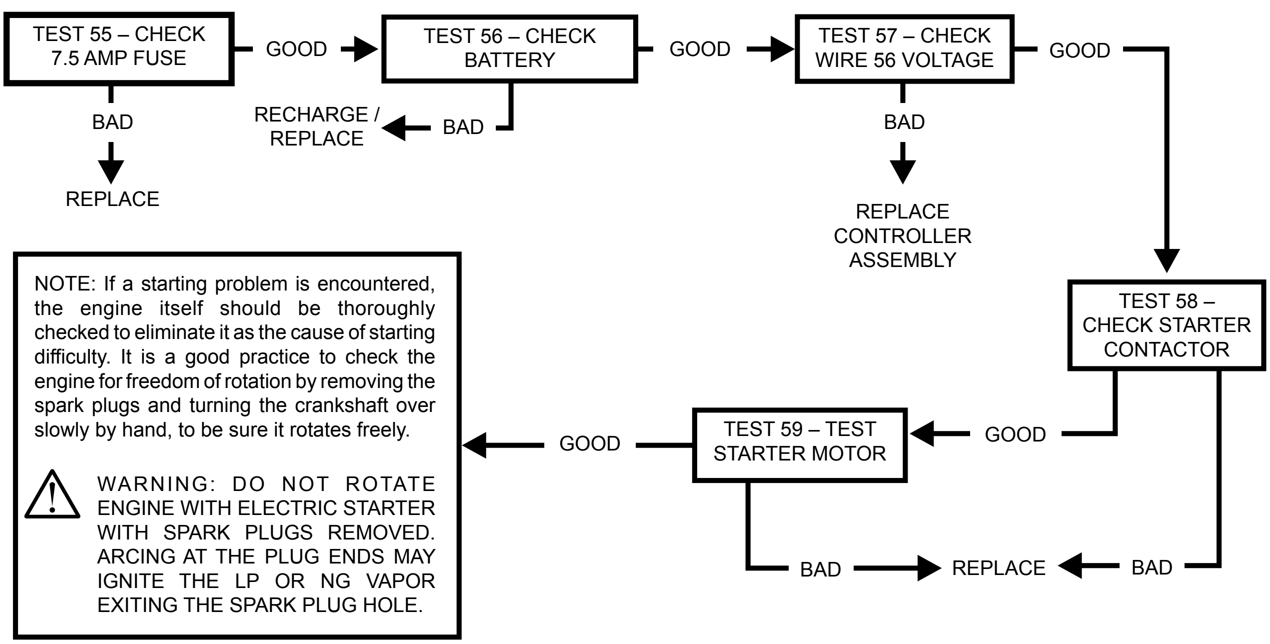
With utility available and the generator in the AUTO position the AUTO (GREEN) light will display.



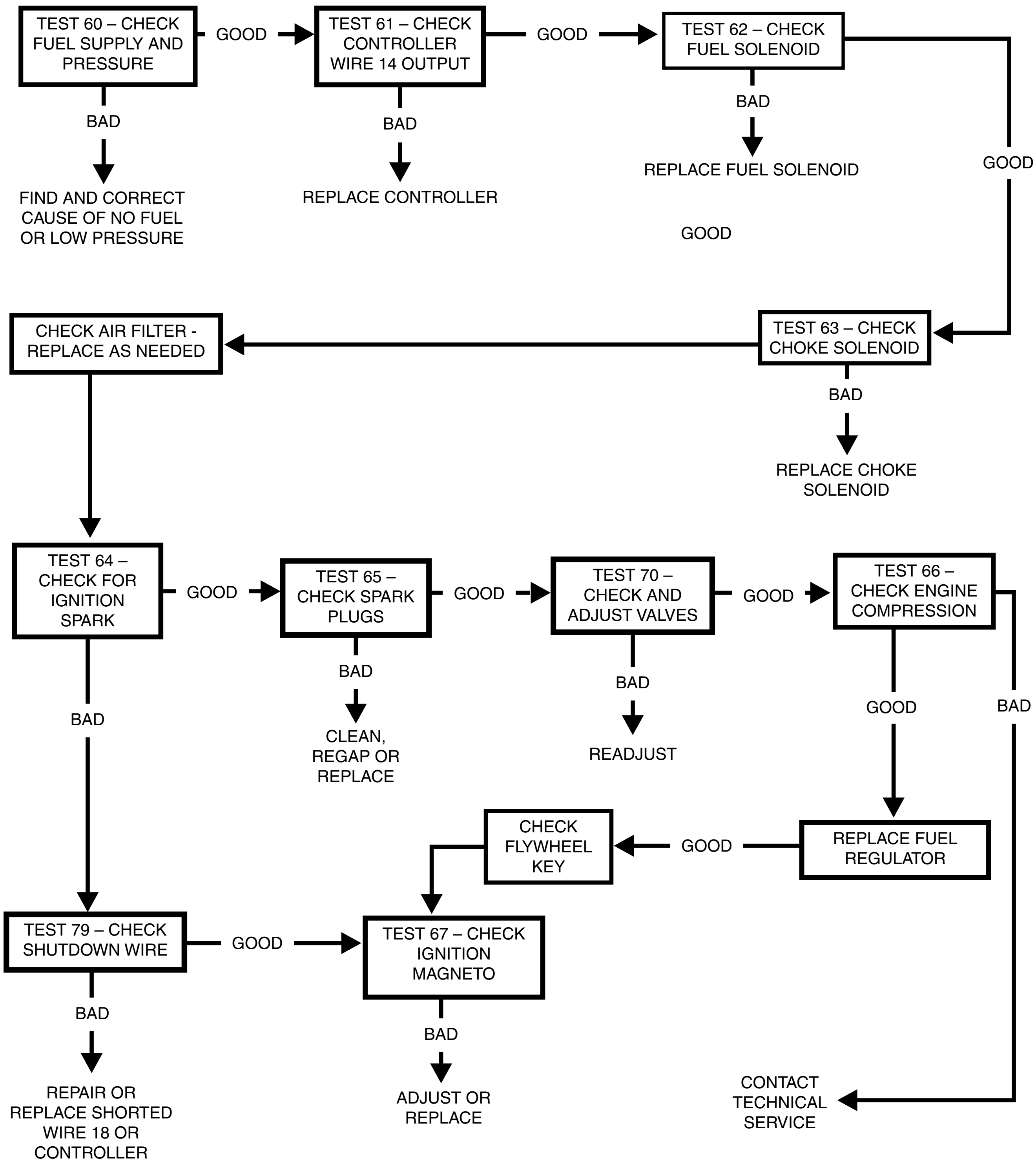
Problem 20 – Engine Will Not Crank When Utility Power Source Fails



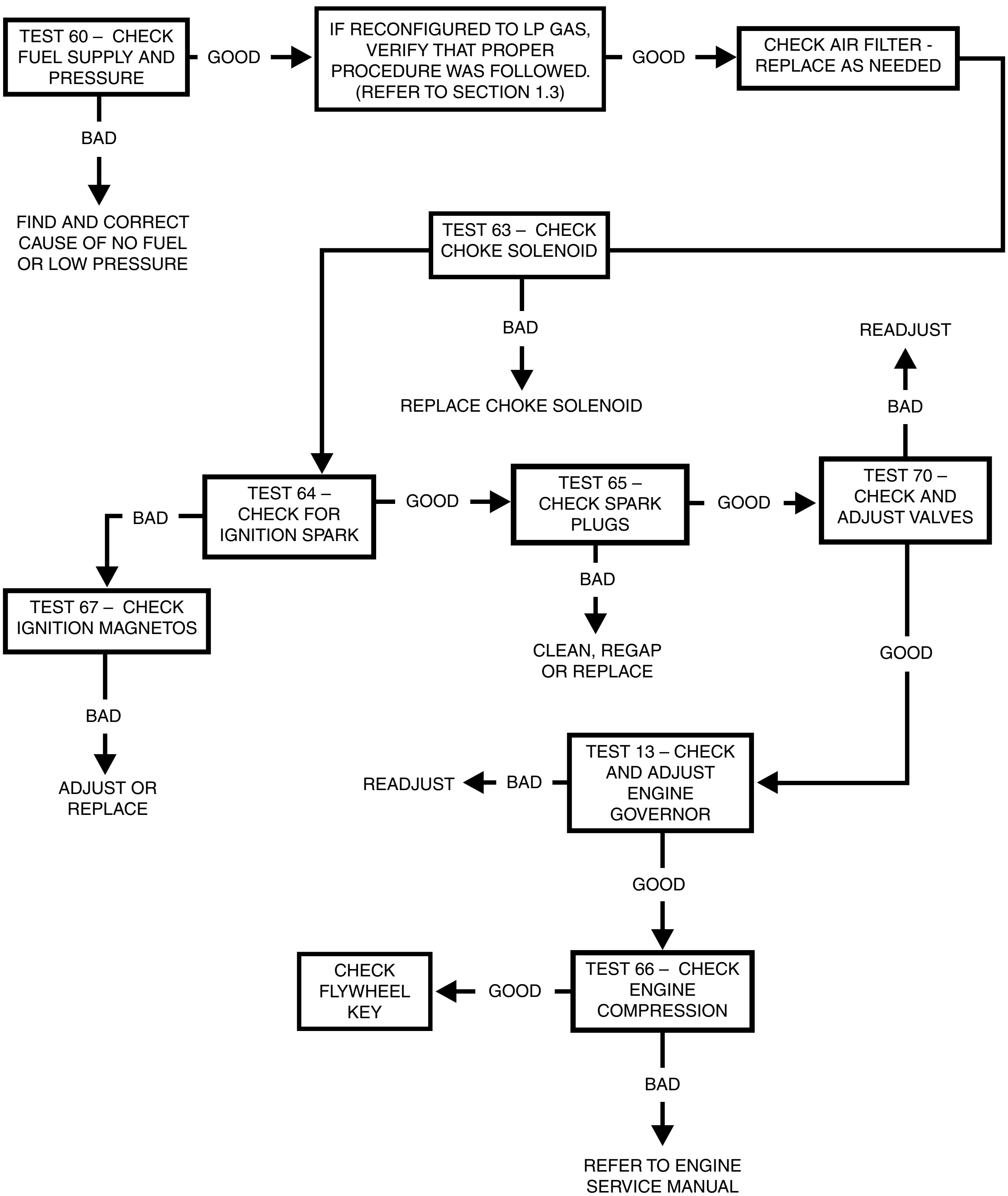
Problem 21 – Engine Will Not Crank When Controller is Set to "MANUAL" Mode



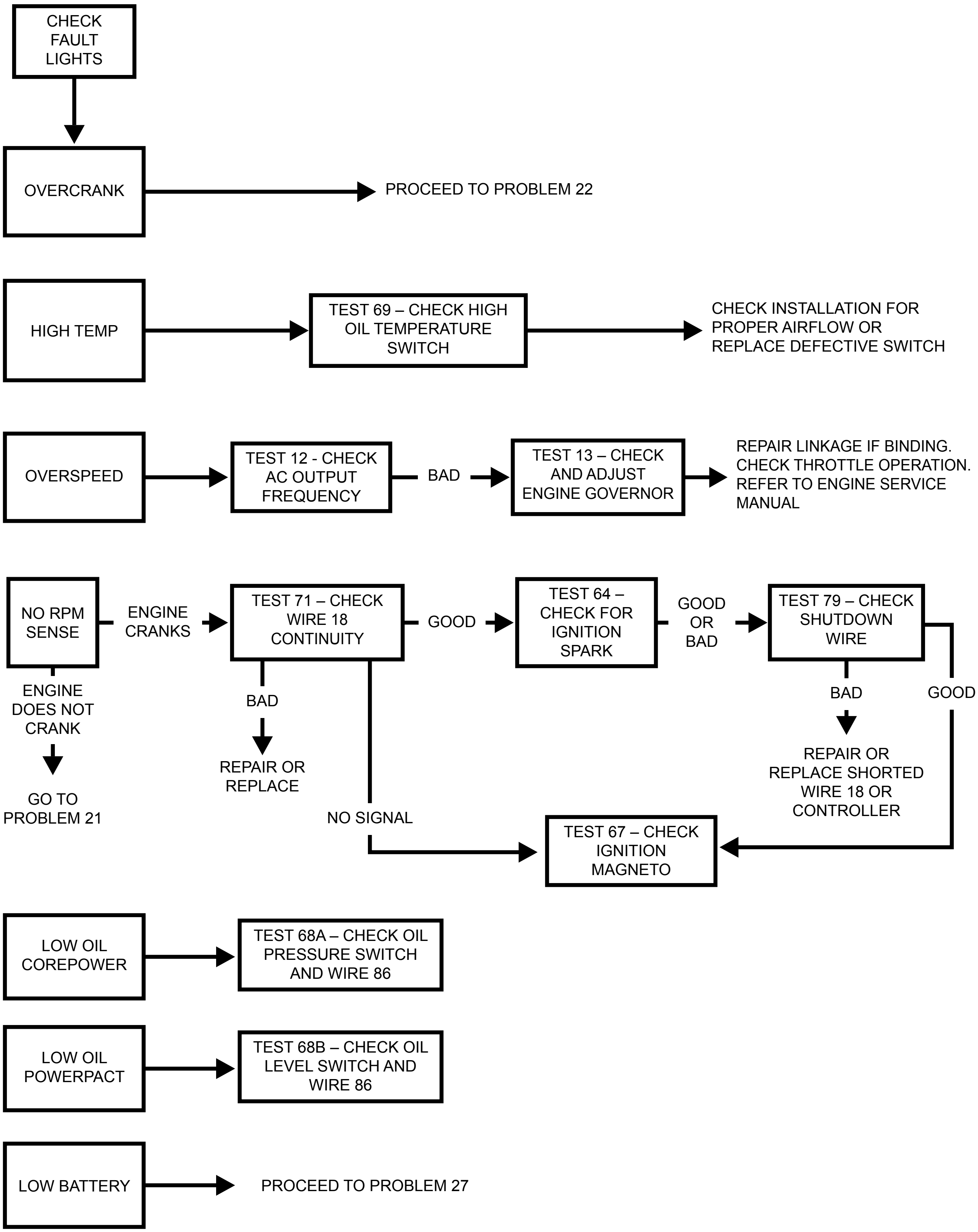
Problem 22 – Engine Cranks but Won't Start



Problem 23 – Engine Starts Hard and Runs Rough / Lacks Power / Backfires

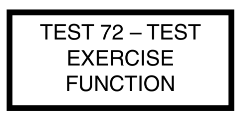


Problem 24 – Shutdown Alarm/Fault Occurred

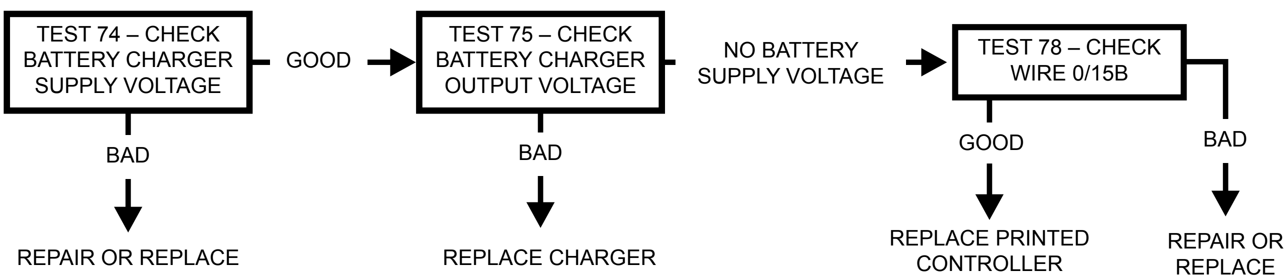


Problem 25 – 7.5 Amp Fuse (F1) Blown

Problem 26 – Generator Will Not Exercise



Problem 27 – No Battery Charge



INTRODUCTION

This section familiarizes the service technician with acceptable procedures for the testing and evaluation of various problems that can occur on the standby generators with air-cooled engines. Use this section in conjunction with Section 4.4, “Troubleshooting Flow Charts.” The numbered tests in this section correspond with those of Section 4.4.

Some test procedures in this section may require the use of specialized test equipment, meters or tools. Most tests can be performed with an inexpensive volt-ohm-meter (VOM). An AC frequency meter is required where frequency readings must be taken.

Testing and troubleshooting methods covered in this section are not exhaustive. No attempt has been made to discuss, evaluate and advise the home standby service trade of all conceivable ways in which service and trouble diagnosis must be performed. Accordingly, anyone who uses a test method not recommended herein must first satisfy himself that the procedure or method he has selected will jeopardize neither his nor the product’s safety.

Figure 53 shows the Volt-Ohm-Meter (VOM) in two different states. The left VOM indicates an OPEN circuit or INFINITY. The right VOM indicates a dead short or CONTINUITY. Throughout the troubleshooting, refer back to Figure 53 as needed to understand what the meter is indicating about the particular circuit that was tested.

Note: CONTINUITY is equal to .01 ohms of resistance or a dead short.

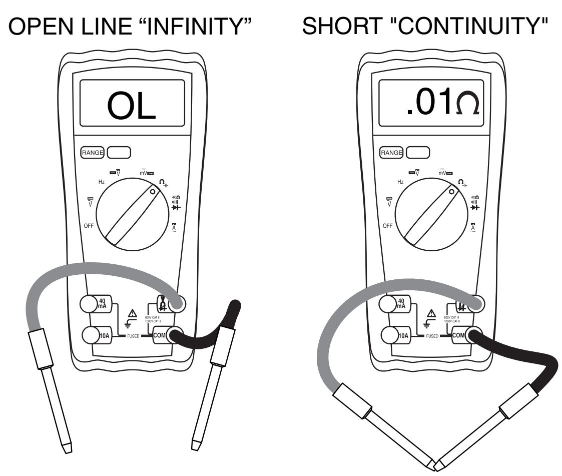


Figure 53. Open Line vs. Continuity

SAFETY

Service personnel who work on this equipment should be aware of the dangers of such equipment. Extremely high and dangerous voltages are present that can kill or cause serious injury. Gaseous fuels are highly explosive and can ignite by the slightest spark. Engine exhaust gases contain deadly carbon monoxide gas that can cause unconsciousness or even death. Contact with moving parts can cause serious injury. The list of hazards is seemingly endless.

When working on this equipment, use common sense and remain alert at all times. Never work on this equipment while you are physically or mentally fatigued. If you do not understand a component, device or system, do not work on it.

ENGINE/DC TROUBLESHOOTING

It is always good practice to continue to ask questions during the troubleshooting process. When evaluating the problem asking some of these questions may help identify the problem quicker.

- What is the generator doing?
- What is the fault that the generator is shutting down for?
- Is the fault causing the shutdown a symptom of another problem?
- Does the generator have the same fault consistently, and when does it occur?
- What was the generator supposed to do?
- Who is controlling it?
- Exactly what is occurring?
- When is it happening?
- Why would this happen?
- How would this happen?
- What type of test will either prove or disprove the cause of the fault?

TEST 52 – CHECK CONTROLLER SWITCH POSITION

Discussion

If the standby system is to operate automatically, the controller must be set to AUTO. That is, the generator will not crank and start on the occurrence of a “Utility” power outage unless it is set to the AUTO mode. In addition, the generator will not exercise every seven (7) days as programmed unless it is set to the AUTO mode.

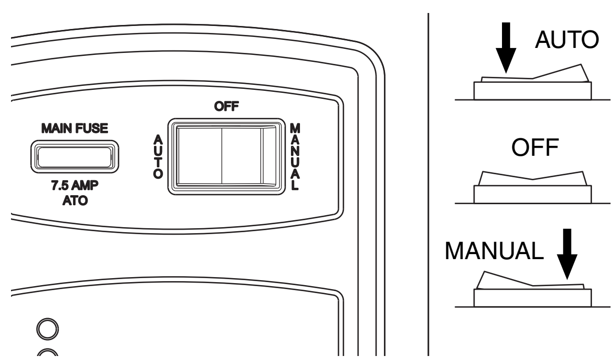


Figure 54. AUTO-OFF-MANUAL Switch Positions - CorePower

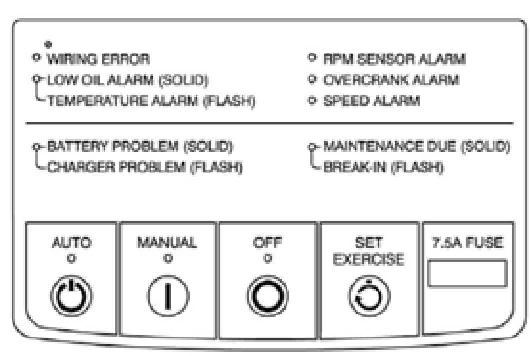


Figure 55. AUTO-OFF-MANUAL Buttons - PowerPact

Procedure

With the controller set to the AUTO mode, test automatic operation. Testing of automatic operation can be accomplished by turning off the Utility power supply to the transfer switch. When the utility power is turned off, the standby generator should crank and start after the utility loss delay time has expired. Following startup, transfer to the standby source should occur. Refer to Section 1.5 in this manual.

Following generator startup and transfer to the standby source, turn ON the utility power supply to the transfer switch. Retransfer back to the "Utility" source should occur. After an "engine cooldown timer" has timed out, generator shutdown should occur.

Results

1. If normal automatic operation is obtained, discontinue tests.
2. If engine does not crank when utility power is turned off, proceed to Problem 20 Flow Chart, Section 4.4.
3. If engine cranks but won't start, go to Problem 22 in Section 4.4.
4. If engine cranks and starts, but transfer to "Standby" does NOT occur, go to Problem 10 in Section 3.3.
5. If transfer to "Standby" occurs, but retransfer back to "Utility" does NOT occur when utility source voltage is restored, go to Problem 11 in Section 3.3.

TEST 53 – TRY A MANUAL START

Discussion

The first step in troubleshooting for an "engine won't crank" condition is to determine if the problem is peculiar to automatic operations only or if the engine won't crank manually either.

Procedure

1. On the generator panel, set the controller to the OFF mode.
2. Set the generator main line circuit breaker to its OFF (or open) position.
3. Set the generator controller to the MANUAL mode.
   a. The engine should crank cyclically through it's "crank-rest" cycles until it starts.
   b. Let the engine stabilize and warm up for a few minutes after it starts.

Results

1. If the engine cranks manually but does not crank automatically, go to Problem 20, Section 4.4.
2. If the engine does not crank manually, proceed to Problem 21 in Section 4.4.

TEST 54 – TEST AUTO OPERATIONS

Discussion

Initial Conditions: The generator is in AUTO, ready to run, and the transfer switch is running on Utility. When Utility fails, a line interrupt delay timer is started. If the Utility is still not present when the timer expires, the engine will crank and start. Once started an engine warm-up timer will start.

When the warm-up timer expires the controller will transfer load to the generator. If Utility voltage is restored at any time between the initiation of the engine start and when the generator is ready to accept load, (warm-up time has not elapsed), the controller will complete the start cycle and run the generator through its normal cool down cycle; however the switch will remain in the "Utility" position.

	CorePower	PowerPact
Utility Failure (falls below percentage of nominal)	65%	65%
Utility Restored (returns above percentage of nominal)	75%	80%
Line Interrupt Delay Time	10 seconds	5 seconds 60 Hz) 30 seconds (50 Hz)

Procedure

1. Simulate a power failure by disconnecting main breaker.
2. If the generator does not perform the sequence of events listed in the above discussion, replace the controller.

Results

Refer back to flow chart

TEST 55 – CHECK 7.5 AMP FUSE

Discussion

The 7.5 amp fuse is located on the generator control console. A blown fuse will prevent battery power from reaching the controller, with the same result as setting the controller to the OFF mode.

Procedure

Remove the 7.5 amp fuse (F1) by pushing the fuse.

Results

1. If the fuse if good, refer back to Flow Chart.
2. If the fuse is bad, it should be replaced. Use only an identical 7.5 amp replacement fuse.
3. If fuse continues to blow, proceed to Problem 25 Flow Chart.

TEST 56 – CHECK BATTERY AND CABLES

Discussion

Battery power is used to (a) crank the engine and (b) to power the circuit board. Low or no battery voltage can result in failure of the engine to crank, either manually or during automatic operation. The battery charger in the control panel is not designed to recharge a dead battery. As well, if there is a loose connection or corrosion associated with a wire (positive or negative), battery voltage may be present, but because of the high resistance, will not allow current to flow. Electrical voltage drop varies according to current flow. Unless the circuit is operated so current flows through it, voltage drop cannot be measured. So, to properly measure voltage drop, a crank attempt will need to be performed. This test will determine whether the battery, battery cables, or both are at fault.

Procedure

A. Perform Starter Circuit Voltage Drop Test:

1. Remove the T1 fuse from the Transfer Switch.
2. Set a Volt-Ohm-Meter (VOM) to measure DC voltage.
3. Connect the red meter test lead to the positive battery post and connect the black meter test lead to the negative battery post.
   a. If battery voltage is 12.1 VDC or below, proceed to Step C or Step D.
   b. If battery voltage is 12.2 VDC or above, proceed to next step. (For this test, battery voltage should be at least 12.2 VDC)

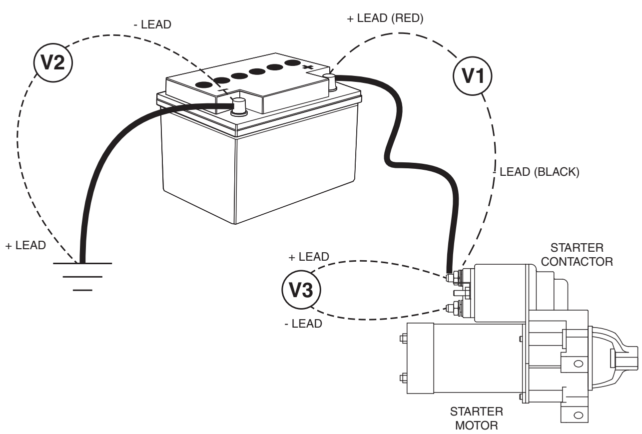


Figure 56. Starter Circuit Voltage Drop Test

4. Turn off the fuel source and remove the Wire 14 from the fuel solenoid to inhibit any possible startup.
5. Refer to Figure 56 for battery post and starter connections. Perform a voltage drop test as indicated.

Note: Single Cylinder units have a bulkhead mounted starter solenoid.

6. Set the controller to the MANUAL mode; measure and record the voltage.
7. Record readings from test points V1, V2 and V3 as depicted in Figure 56. Although resistance-free connections, wires and cables would be ideal, most of them will contain at least some voltage drop. The maximum voltage readings you should see are as follows:
   a. 0.00-0.10 VDC across a connection
   b. 0.10-0.20 VDC on a ground connection
   c. 0.20-0.30 VDC across a wire or cable (V1, V2)
   d. 0.20-0.30 VDC across a switch or starter contactor
   e. 0.40-0.50 VDC across the entire circuit
8. If voltage drop is greater than the above, based on the circuit or component, proceed to Step B. If voltage drop is within the above, based on the circuit or component, proceed to Step C or D.

B. Inspect Battery Cables, Terminals and Connections:

1. Inspect battery cables and battery posts.
2. If cable clamps or terminals are corroded, clean away all corrosion.
   a. If corrosion cannot be cleaned or eliminated, replace the component in question.
3. Make sure all cable clamps are tight. The red battery cable from the starter contactor (SC) must be securely attached to the positive (+) battery post; the black cable from the frame ground stud must be tightly attached to the negative (-) battery post.

C. Perform a load test on the Battery: (All Lead-Acid Type Batteries)

1. Remove 7.5 amp fuse from the Controller.
2. Remove the T1 fuse from the Transfer Switch.
3. Disconnect both negative and positive cables.

Note: Use of a quality Conductance Battery Tester is highly recommended.

Note: Disconnect negative cable first.

4. Using a lead acid battery load tester test the load capability of the battery.
5. Follow the load tester's manufacturer's instructions carefully.
6. Reconnect both positive and negative cables.

Note: Reconnect positive cable first.

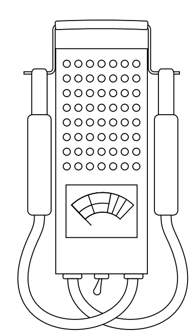


Figure 57. A Typical Battery Load Tester

Note: Use of a quality Conductance Battery Tester is also recommended.

D. Test Battery State of Charge: (Non-Maintenance Free Battery Only)

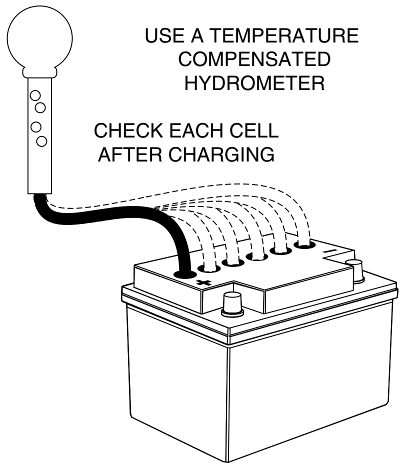
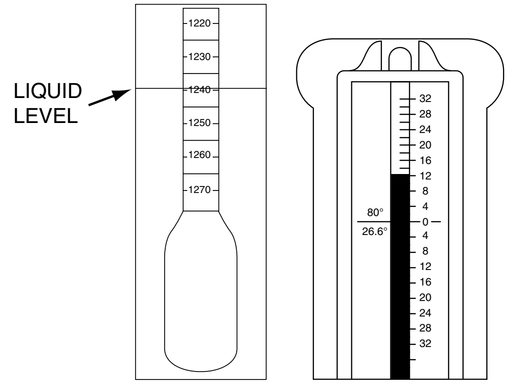


Figure 58. Using a Battery Hydrometer

1. Use an automotive type battery hydrometer to test battery state of charge.
2. Follow the hydrometer manufacturer's instructions carefully. Read the specific gravity of the electrolyte fluid in all battery cells.
3. If cells are low, distilled water can be added to refill cell compartment.
4. If the hydrometer does not have a "percentage of charge" scale, compare the reading obtained to the following:
   a. An average reading of 1.260 indicates the battery is 100% charged.
   b. An average reading of 1.230 means the battery is 75% charged.
   c. An average reading of 1.200 means the battery is 50% charged.
   d. An average reading of 1.170 indicates the battery is 25% charged.
5. Test Battery Condition:
   a. If the difference between the highest and lowest reading cells is greater than 0.050 (50 points), battery condition has deteriorated and the battery should be replaced.
   b. However, if the highest reading cell has a specific gravity of less than 1.230, the test for condition is questionable. Recharge the battery to a 100 percent state of charge, and then repeat the test for condition.

Results from Step C or Step D

1. If the VOM indicated less than 10.5 VDC in Step C, remove the battery and recharge with an automotive battery charger.
2. If battery fails tests in step C or D, replace with a new battery.
3. If battery condition is good, refer back to flow chart.



Cell #	Specific Gravity	
1	1.255	
2	1.260	HIGH READING
3	1.235	35 POINTS DIFFERENCE
4	1.250	
5	1.240	LOW READING
6	1.225	

Figure 59. Reading a Battery Hydrometer

TEST 57 – CHECK WIRE 56 VOLTAGE

Discussion

During an automatic start or when starting manually, a crank relay in the controller should energize. Each time the crank relay energizes, the controller should deliver 12 VDC to the starter contactor (SC), and the engine should crank. This test will verify (a) that the crank relay on the controller is energizing, and (b) that controller action is delivering 12 VDC to the starter contactor.

Procedure

1. Set a VOM to measure DC voltage.
2. Connect the positive (+) test probe of a DC voltmeter (or VOM) to the Wire 56 connector of the starter contactor the starter contactor (SC). Connect the common (-) test probe to frame ground.
3. Observe the meter. Then, set the controller to the MANUAL mode. The meter should indicate battery voltage. If battery voltage is measured, stop testing and refer back to flow chart.
4. Set a VOM to measure resistance.

Note: Remove 7.5 amp fuse before disconnecting J1 (J5 on PowerPact) connector.

5. Remove Wire 56 from the starter contactor. Connect one meter test lead to disconnected Wire 56 at the contactor. Remove the J2 Connector (J5 on PowerPact) from the controller. Connect the other test lead to Wire 56 at the controller end of the harness (J2-11 on CorePower and J5-14 on PowerPact). CONTINUITY should be measured.

Results

1. If battery voltage is indicated in Step 3 refer back to flow chart.
2. If CONTINUITY is not measured in Step 5, repair or replace Wire 56.

TEST 58 – TEST STARTER CONTACTOR

Discussion

The coil in the starter contactor (SC) must energize and its normally open contacts must close or the engine will not crank. This test will determine if the SC is working.

Procedure

Carefully inspect the starter motor cable that runs from the battery to the starter motor. Cable connections must be clean and tight. If connections are dirty or corroded, remove the cable and clean cable terminals and terminal studs. Replace any cable that is defective or badly corroded.

Refer to Figure 60 and 61 for Test Points.

1. Set Volt-Ohm-Meter (VOM) to measure DC voltage.
2. Connect the positive meter test lead to the positive post of the battery and connect the negative meter test lead to the negative post of the battery. The VOM should indicate battery voltage. This measure will be a reference during the testing procedure.
3. Connect the positive meter test lead to Test Point 1 and connect the negative meter test lead to a common ground. Measure and record the voltage.
4. Connect the positive meter test lead to Test Point 2 and connect the negative meter test lead to a common ground.
5. Set the controller to the MANUAL mode, measure and record the voltage at Test Point 2. The contactor should energize.

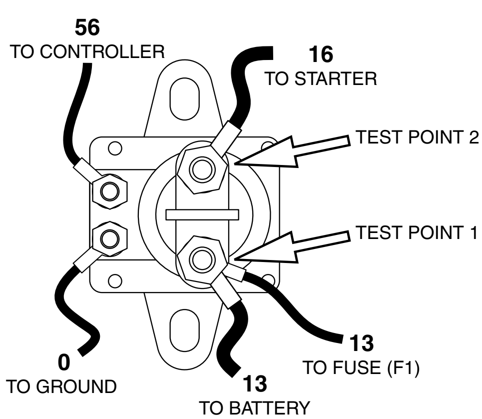


Figure 60. The Starter Contactor - CorePower

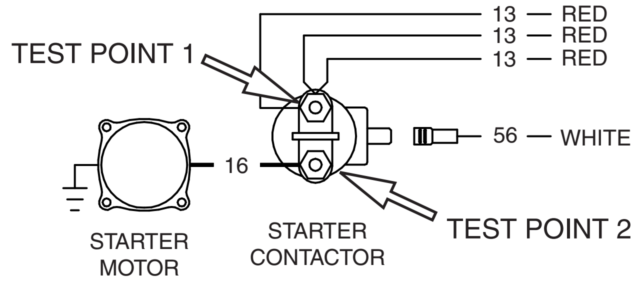


Figure 61. The Starter Contactor - PowerPact

Results for CorePower

1. If battery voltage was indicated in Steps 3 and 5, measure the resistance between Test Point 2 and starter motor. If no resistance is measured, repair or replace Wire 16. If resistance is measured, refer back to the flow chart.
2. If battery voltage was indicated in Step 3, but not in Step 5, replace the starter contactor.

Results for PowerPact

1. If the VOM indicated battery voltage in Step 3, but not in Step 5, replace the starter contactor.

TEST 59 – TEST STARTER MOTOR

Conditions Affecting Starter Motor Performance

1. A binding or seizing condition in the starter motor bearings.
2. A shorted, open or grounded armature.
   a. Shorted armature (wire insulation worn and wires touching one another). Will be indicated by low or no RPM.
   b. Open armature (wire broken) will be indicated by low or no RPM and excessive current draw.
   c. Grounded armature (wire insulation worn and wire touching armature lamination or shaft). Will be indicated by excessive current draw or no RPM.
3. A defective starter motor switch.
4. Broken, damaged or weak magnets.
5. Starter drive dirty or binding.

Discussion

Test 57 verified that the controller is delivering DC voltage to the starter contactor (SC). Test 58 verified the operation of the starter contactor (SC). Another possible cause of an “engine won’t crank” problem is a failure of the starter motor.

Procedure

The battery should have been checked prior to this test and should be fully charged.

Set a VOM to measure DC voltage (12 VDC). Connect the meter positive (+) test lead to the starter contactor stud which has the small jumper wire connected to the starter. Connect the common (-) test lead to the starter motor frame.

Set the AUTO-OFF-MANUAL Switch to its “MANUAL” position and observe the meter. Meter should indicate battery voltage, starter motor should operate and engine should crank.

Results

1. If battery voltage is indicated on the meter but motor did NOT operate, remove and test the starter motor for proper operation independent of the engine.
2. If battery voltage was indicated and the starter motor tried to engage (pinion engaged), but engine did NOT crank, check for mechanical binding of the engine or rotor.

If engine turns over slightly, go to Test 70 “Check and Adjust Valves.”

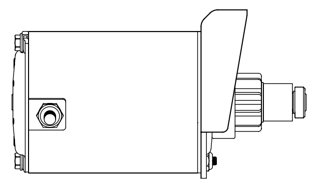


Figure 62. Starter Motor - CorePower

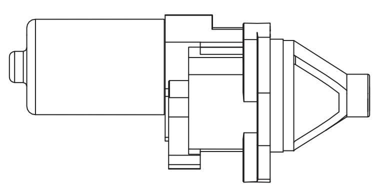


Figure 63. Starter Motor - PowerPact

Checking The Pinion - CorePower

When the starter motor is activated, the pinion gear should move and engage the flywheel ring gear. If the pinion does not move normally, inspect the pinion for binding or sticking.

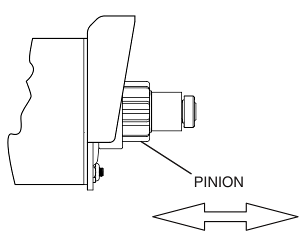


Figure 64. Check Pinion Gear Operation - CorePower

TEST 60 – CHECK FUEL SUPPLY AND PRESSURE

Discussion

The air-cooled generator was factory tested and adjusted using natural gas as a fuel. If desired, LP (propane) gas may be used. However, when converting to propane, some minor adjustments are required. The following facts apply:

- An adequate gas supply and sufficient fuel pressure must be available or the engine will not start.
- Minimum recommended gaseous fuel pressure at the generator fuel inlet connection is 5 inches water column for natural gas (NG) or 10 inches water column for LP gas.
- Maximum gaseous fuel pressure at the generator fuel inlet connection is 7 inches water column for natural gas or 12 inches water column for LP gas.
- When propane gas is used, only a “vapor withdrawal” system may be used. This type of system utilizes the gas that forms above the liquid fuel. The vapor pressure must be high enough to ensure engine operation.
- The gaseous fuel system must be properly tested for leaks following installation and periodically thereafter. No leakage is permitted. Leak test methods must comply strictly with gas codes.

⚠ **DANGER! Gaseous fuels are highly explosive. Do not use flame or heat to test the fuel system for leaks. Natural gas is lighter than air, and tends to settle in high places. LP (propane) gas is heavier than air, and tends to settle in low areas. Even the slightest spark can ignite these gases and cause an explosion.**

Procedure

A water manometer or a gauge that is calibrated in “ounces per square inch” may be used to measure the fuel pressure. Fuel pressure at the inlet side of the fuel solenoid valve should be between 5-7 inches water column for natural gas (NG) or 10-12 inches water column for LP gas.

1. See Figure 65 for the gas pressure test point on the fuel regulator. The fuel pressure can be checked at Port 1.
2. With the manometer connected properly, crank the engine. Nominal fuel pressure should be measured. If pressure is not measured while cranking refer back to flow chart.

Note: Where a primary regulator is used to establish fuel inlet pressure, adjustment of that regulator is usually the responsibility of the fuel supplier or the fuel supply system installer.

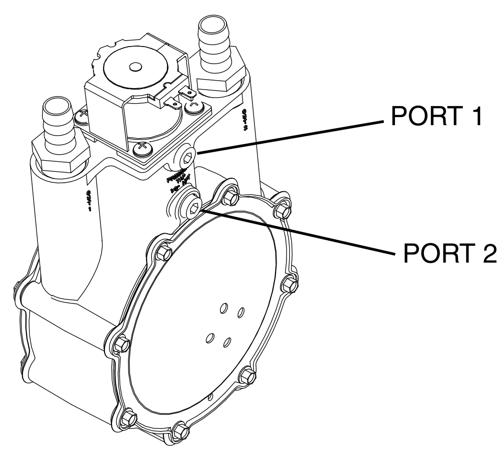


Figure 65. Gas Pressure Test point

Results

1. If fuel supply and pressure are adequate, but engine will not start refer back to flow chart.

2. If generator starts but runs rough or lacks power, repeat the above procedure with the generator running and under load. The fuel system must be able to maintain 10-12 inches water column at all load requirements for propane, and 5-7 inches water column for natural gas. If proper fuel supply and pressure is maintained, refer to Problem 18 Flow Chart.

TEST 61 – CHECK CONTROLLER WIRE 14 OUTPUT

Discussion

During any crank cycle, the controller's crank relay and run relay both energize simultaneously. When the run relay energizes, it's contacts close and 12 VDC is delivered to Wire 14 and to a fuel solenoid. The solenoid energizes open to allow fuel flow to the engine. This test will determine if the controller is working properly.

Procedure

1. Set the controller to the OFF mode.
2. Set a VOM to measure DC voltage.
3. Disconnect Wire 14 from the fuel solenoid.
4. Connect the positive test lead to disconnected Wire 14 and the negative test lead to a clean frame ground.
5. Set the controller to the MANUAL mode.
6. Battery voltage should be measured. If battery voltage is measured, refer back to flow chart.

Note: Disconnect the 7.5 amp fuse before disconnecting the J2 (J5 on PowerPact) connector.

7. Disconnect the J2 connector from controller.
8. Set VOM to measure resistance.
9. Connect one test lead to disconnected Wire 14 and the other test lead to Wire 14 at the controller end of the harness (J2-3 on CorePower and J5-13 on PowerPact).
10. CONTINUITY should be measured. If CONTINUITY is not measured, repair or replace Wire 14 between the controller connector and the fuel solenoid.

Results

Refer to flow chart.

TEST 62 – CHECK FUEL SOLENOID

Discussion

In Test 61, if battery voltage was delivered to Wire 14, the fuel solenoid should have energized open. This test will verify whether or not the fuel solenoid is operating.

Fuel Solenoid FS1 Nominal Resistance – 14-16 ohms.

Procedure

1. Install a manometer to Port 2 on the fuel regulator. See Figure 65.
2. Set the controller to the MANUAL Mode.
3. Proper gas pressure should be measured during cranking. If gas pressure is measured, the fuel solenoid is operating. If gas pressure is not measured, repair or replace the fuel solenoid.

Results

Refer to flow chart.

TEST 63 – CHECK CHOKE SOLENOID

Discussion

The automatic choke cycles open and closed during cranking and remains de-energized in the open position during running.

PowerPact units with Cold Smart Start have the following choke cycles:

Cold Sequence - below 40°F				
Crank 1	Crank 2	Crank 3	Crank 4	Crank 5
5.0s OFF	1.0s OFF	1.0s OFF	1.0s ON	1.0s ON
5.0s ON	1.0s ON	2.0s ON	3.0s OFF	
5.0s OFF	2.0s OFF	5.0s OFF	2.0s ON	
1.0s ON	2.0s ON	1.0s ON		
	2.0s OFF	1.0s OFF		
	3.0s ON	2.0s ON		
	2.0s OFF			
	3.0s ON			

Warm Sequence - above 40°F				
Crank 1	Crank 2	Crank 3	Crank 4	Crank 5
4.0s OFF	2.5s OFF	1.0s OFF	3.0s OFF	1.0s OFF
0.25.s ON	0.25.s ON	2.0s ON	4.0s ON	3.0s ON
4.0s OFF	2.0s OFF	1.0s OFF	3.0s OFF	
0.25.s ON	0.25.s ON	2.0s ON	2.0s ON	
	5.0s OFF	5.0s OFF	1.0s OFF	
	0.25.s ON	5.0s ON	3.0s ON	

PowerPact units without Cold Smart Start have the following choke cycles:

Choke Sequence				
Crank 1	Crank 2	Crank 3	Crank 4	Crank 5
1.0s OFF	3.0s OFF	1.0s OFF	2.0s OFF	1.0s ON
2.0s ON	4.0s ON	3.0s ON	2.0s ON	OFF
5.0s OFF	3.0s OFF	OFF	OFF	
3.0s ON	2.0s ON			
OFF	OFF			

Procedure

1. Turn off the fuel supply to the generator.
2. Set the AUTO-OFF-MANUAL Switch to the MANUAL position.
3. While cranking the choke solenoid should energize and pull the choke plate closed and release back to the open position as the solenoid cycles during cranking. If the choke solenoid

does not cycle, verify that the choke can be manually closed. There should be no binding or interference.

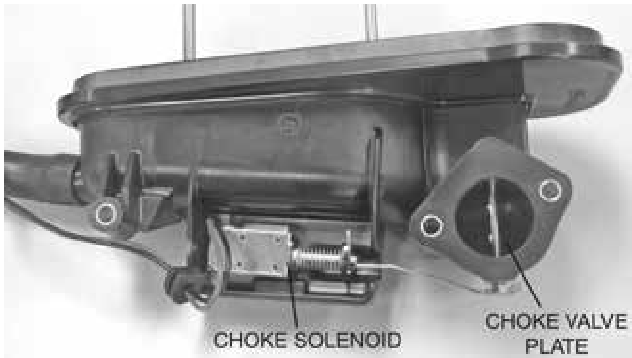


Figure 66. Choke Solenoid and Choke Valve Plate - CorePower

4. Disconnect the Choke Solenoid Connector.
5. Set a VOM to measure DC voltage.
6. Connect the positive (+) test lead to Wire 56 (Pin 1) of the connector going to the controller (Female Side) Connect the negative (-) test lead to Wire 90 (Pin 2).
7. Set the AUTO-OFF-MANUAL Switch to MANUAL. While cranking, battery voltage should be measured . If battery voltage was not measured, verify continuity of Wire 90 between the Choke Solenoid Connector and J2-15 (Wire 90) at the controller. Verify continuity of Wire 56 between the Choke Solenoid Connector Wire 56 and J2-11 (Wire 56). Repair or replace any wiring as needed.
8. Set a VOM to measure resistance.
9. Connect the positive (+) test lead to Wire 56 (Pin 1) of Choke Solenoid Connector going to the choke solenoid (Male Side). Connect the negative (-) test lead to Wire 90 (Pin 2). Approximately 3.7 ohms should be measured.

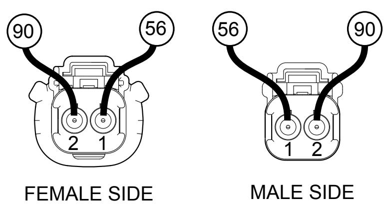


Figure 67. Choke Solenoid Connector - CorePower

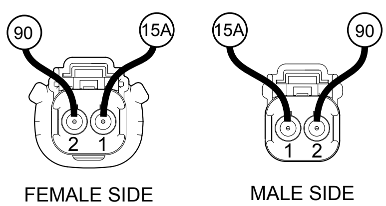


Figure 68. Choke Solenoid Connector - PowerPact

Results

1. If battery voltage was not measured in Step 7 and wire continuity is good, replace the controller.
2. If Choke Solenoid coil resistance is not measured in Step 9, replace the Choke Solenoid.
3. If battery voltage was not measured in Step 4, replace the controller.

TEST 64 – CHECK FOR IGNITION SPARK

Discussion

If the engine cranks but will not start, perhaps an ignition system failure has occurred. A special “spark tester” is required to check for ignition spark.

Procedure

1. Remove spark plug lead from the spark plug.
2. Attach the clamp of the spark tester to the engine cylinder head.
3. Attach the spark plug lead to the spark tester terminal.
4. Crank the engine while observing the spark tester. If spark jumps the tester gap, you may assume the engine ignition system is operating satisfactorily.

NOTE: The engine flywheel must rotate at 350 rpm (or higher) to obtain a good test of the solid state ignition system.

Figure 69. Spark Tester

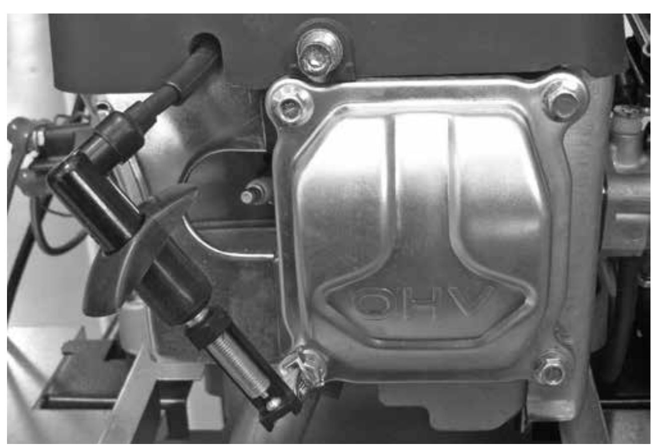


Figure 70. Checking Ignition Spark - CorePower

Figure 71. Checking Engine Misfire - CorePower

To determine if an engine misfire is ignition related, connect the spark tester in series with the spark plug wire and the spark plug (Figure 71). Then, crank and start the engine. A spark misfire will be readily apparent. If spark jumps the spark tester gap regularly but the engine misfire continues, the problem is in the spark plug or in the fuel system.

NOTE: A sheared flywheel key may change ignition timing but sparking will still occur across the spark tester gap.

Results

1. If no spark or very weak spark occurs, go to Test 79.
2. If sparking occurs but engine still won't start, go to Test 65.
3. When checking for engine misfire, if sparking occurs at regular intervals but engine misfire continues, go to Test 57.
4. When checking for engine misfire, if a spark misfire is readily apparent, go to Test 67.

TEST 65 – CHECK SPARK PLUGS

Discussion

If the engine will not start and Test 64 indicated good ignition spark, a possible cause could be a fouled or damaged electrode. An engine misfire may also be caused by defective spark plug(s).

Procedure

1. Remove spark plug and inspect for any visible damage, refer to Figure 73 for types of engine related spark plug problems.
2. Replace any spark plug having fouled, burned electrodes or cracked porcelain.
3. Refer to Figure 72. Using a wire feeler gauge, set the gap to 0.030".

Results

1. Clean and re-gap, or replace plugs as necessary, then re-test.
2. If spark plugs are good or have been replaced, refer back to flow chart.

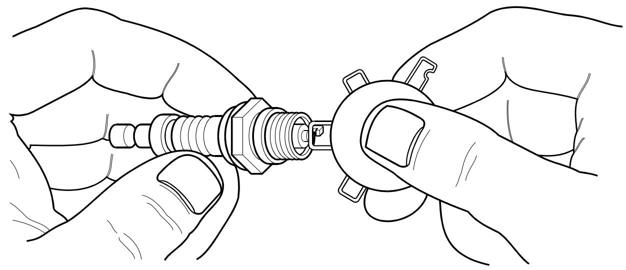


Figure 72. Checking Spark Plug Gap

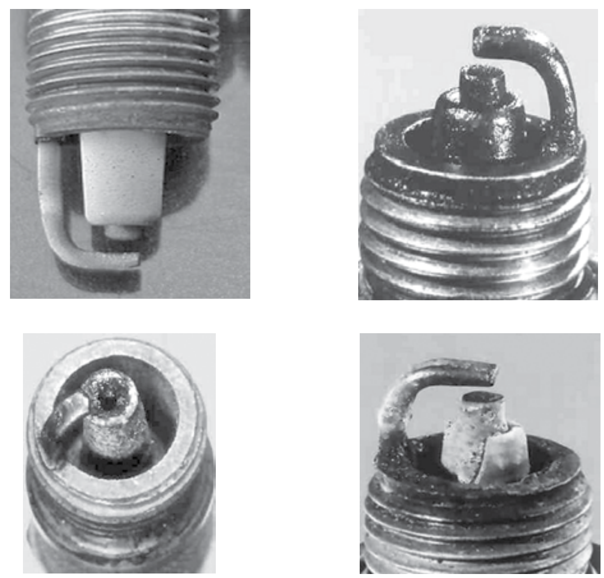


Figure 73. Spark Plug Conditions

TEST 66 – CHECK ENGINE / CYLINDER LEAK DOWN TEST / COMPRESSION TEST

Introduction

Performing the following test procedures will accurately diagnose some of the most common problems:

- Will not start
- Lack of power
- Runs Rough
- Vibration
- Overheating
- High Oil Consumption

CYLINDER LEAK DOWN TEST

Discussion

The Cylinder Leak Down Tester checks the sealing (compression) ability of the engine by measuring air leakage from the combustion chamber. Compression loss can present many different symptoms. This test is designed to detect the section of the engine where the fault lies before disassembling the engine. Figure 74 represents a standard Tester available on the market.

Note: Refer to Manufacturer's instructions for variations of this procedure.

Procedure

1. Remove the spark plug from the cylinder.
2. Gain access to the flywheel. Remove the valve cover.
3. Rotate the engine crankshaft until the piston reaches top dead center (TDC). In this position, both the intake and exhaust valves will be closed. If the engine is not properly position at TDC the results of the test may be inaccurate at diagnosing a problem.

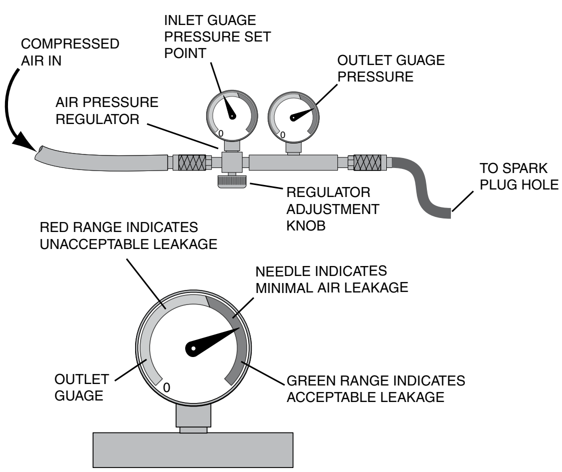


Figure 74. Cylinder Leakdown Tester

4. Lock the flywheel at top dead center.
5. Attach cylinder leak down tester adapter to spark plug hole.
6. Connect an air source of 90 PSI to the cylinder leak down tester.
7. Adjust the regulated pressure on the gauge to 80 PSI.
8. Read the right hand gauge on the tester for cylinder pressure. A leakage of 20 percent is normally acceptable. Use good judgment, and listen for air escaping at the carburetor (air intake), the exhaust, and the crankcase breather. This will determine where the fault lies.

Results

- Air escapes at the carburetor (air intake)– check intake valve
- Air escapes through the exhaust – check exhaust valve
- Air escapes through the breather – check piston rings
- Air escapes from the cylinder head – the head gasket should be replaced.

CHECK COMPRESSION

Discussion

Lost or reduced engine compression can result in a failure of the engine to start, or a rough operation. One or more of the following will usually cause loss of compression:

- Blown or leaking cylinder head gasket
- Improperly seated or sticking-valves
- Worn piston rings or cylinder. (This will also result in a high oil consumption)

The minimum allowable compression pressure for a cold engine is 60 PSI. Compression values are difficult to obtain accurately without special equipment. For this reason, compression values are not published for the larger engines. However, testing has proven that an accurate indication of compression in the cylinder can be obtained by using the following procedure.

Note: Refer to Manufacturer's instructions for variations of this procedure.

Procedure

1. Remove the spark plug.
2. Insert a compression gauge into the cylinder.
3. Crank the engine until there is no further increase in pressure.
4. Record the highest reading obtained.

Results

The minimum allowable compression pressure for a cold engine is 60 PSI. If compression is poor, look for one or more of the following causes:

- Loose cylinder head bolts
- Failed cylinder head gasket
- Burned valves or valve seats
- Insufficient valve clearance
- Warped cylinder head
- Warped valve stem
- Worn or broken piston ring(s)
- Worn or damaged cylinder bore
- Broken connecting rod
- Worn valve seats or valves
- Worn valve guides

TEST 67 – CHECK IGNITION COIL

Discussion

The ignition system is a solid-state (breakerless) type. The system utilizes a magnet on the engine flywheel to induce a relatively low voltage into an ignition coil assembly. Ignition coil internal components increase the voltage and deliver the resulting high voltage across the spark plug gap.

The ignition coil houses a solid-state circuit that controls ignition timing. Timing is fixed, air gap is non-adjustable and spark advance is automatic.

Major components of the ignition system include (a) the ignition coil assembly, (b) the spark plug, and (c) the engine flywheel.

Solid-state components encapsulated in the ignition coil are not accessible and cannot be serviced. If the coil is defective, the entire assembly must be replaced. The air gap between the coil and the flywheel magnet is fixed and non-adjustable.

The ignition coil assembly (Figure 75) consists of (a) ignition coil, (b) spark plug high tension lead and (c) spark plug boot.

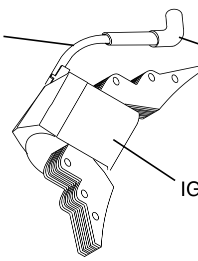


Figure 75. Ignition Coil

Procedure

1. Disconnect Wire 18 at the bullet connector.
2. Set the controller to MANUAL mode and crank the engine.

Results

1. If unit was able to produce spark after disconnecting Wire 18 then a short to ground is supplying Wire 18 with a ground that is inhibiting the engine from producing spark.
2. If the Ignition Coil failed to produce spark with Wire 18 disconnected, verify integrity of Wire 18 under cover, then replace ignition coil.

Note: Before replacing the Ignition Coil, check the flywheel key.

Flywheel Key

In all cases, the flywheel's taper is locked on the crankshaft taper by the torque of the flywheel nut. A keyway is provided for alignment only and theoretically carries no load.

If the flywheel key becomes sheared or even partially sheared, ignition timing can change. Incorrect timing can result in hard starting or failure to start.

TEST 68A – CHECK OIL PRESSURE SWITCH AND WIRE 86 (COREPOWER ONLY)

Discussion

If the oil pressure switch contacts have failed in their closed position, the engine will probably crank and start. However, shutdown will then occur within about 5 (five) seconds. If the engine cranks and starts, then shuts down almost immediately with a LOP fault light, the cause may be one or more of the following:

- Low engine oil level.
- Low oil pressure.
- A defective oil pressure switch.

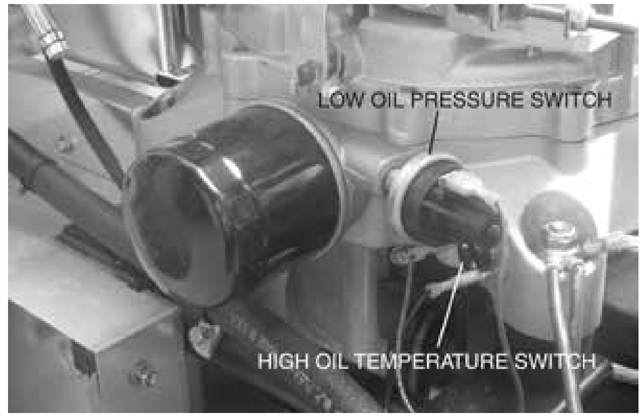


Figure 76. Oil Pressure Switch - CorePower

Procedure

1. Check engine crankcase oil level.
   a. Check engine oil level.
   b. If necessary, add the recommended oil to the dipstick FULL mark. DO NOT OVERFILL ABOVE THE FULL MARK.
2. With oil level correct, try starting the engine.
   a. If engine still cranks and starts, but then shuts down, go to the next step.
   b. If engine cranks and starts normally, discontinue tests.
3. Perform the following:
   a. Disconnect Wire 86 and Wire 0 from the oil pressure switch terminals. Remove the switch and install an oil pressure gauge in its place.
   b. Start the engine while observing the oil pressure reading on gauge.
   c. Note the oil pressure.
      (1) Normal oil pressure is approximately 35-40 psi with engine running. If normal oil pressure is indicated, go to Step 4 of this test.
      (2) If oil pressure is below about 4.5 psi, shut engine down immediately. A problem exists in the engine lubrication system.

Note: The oil pressure switch is rated at 10 psi for single cylinder engines.

4. Remove the oil pressure gauge and reinstall the oil pressure switch. Do NOT connect Wire 86 or Wire 0 to the switch terminals.
   a. Set a VOM to measure resistance.
   b. Connect the VOM test leads across the switch terminals. With engine shut down, the meter should read CONTINUITY. If INFINITY is measured with the engine shutdown, replace the LOP switch.
   c. Crank and start the engine. The meter should read INFINITY.
5. Set a VOM to measure resistance.
   a. Disconnect the J1 Connector from the controller.

b. Connect one test lead to Wire 86 (disconnected from LOP). Connect the other test lead to Pin Location 4 (Wire 86) of the J1 Connector at the controller. CONTINUITY should be measured. If CONTINUITY is not measured, repair or replace Wire 86 between the LOP switch and the J1 Connector.

c. Connect one test lead to Wire 0 (disconnected from LOP). Connect the other test lead to a clean frame ground. CONTINUITY should be measured. If CONTINUITY is NOT measured repair or replace Wire 0 between the LOP and the ground terminal connection on the engine mount.

6. If the LOP switch tests good in Step 5 and oil pressure is good in Step 4 but the unit still shuts down with a LOP fault, check Wire 86 for a short to ground. Set a VOM to measure resistance. Disconnect the J1 Connector from the controller. Remove Wire 86 from the LOP switch. Connect one test lead to Wire 86. Connect the other test lead to a clean frame ground. INFINITY should be measured. If CONTINUITY is measured, repair or replace Wire 86 between the LOP switch and the J1 Connector.

Results

1. Replace switch if it fails the test.

TEST 68B – CHECK OIL LEVEL SWITCH AND WIRE 86 (POWERPACT ONLY)

Discussion

If the oil level switch contacts have failed in their closed position, the engine will probably crank and start. However, shutdown will then occur within about five (5) seconds. If the engine cranks and starts, then shuts down almost immediately with an LOL fault light, the cause may be one or more of the following:

- Low engine oil level.
- A defective oil level switch.

Procedure

1. Check engine crankcase oil level.
   a. Check engine oil level.
   b. If necessary, add the recommended oil to the dipstick FULL mark.

NOTE: DO NOT OVERFILL ABOVE THE FULL MARK.

2. With oil level correct, try starting the engine.
   a. If engine still cranks and starts, but shuts down, go to the next step.
   b. If engine cranks, starts and continues running normally, discontinue tests.
3. Perform the following:
   a. Disconnect Wire 86 from the oil level switch wire (yellow).
   b. Set a VOM to measure continuity.
   c. Connect one VOM test lead to the oil level switch wire (yellow) coming from the engine crankcase and the other test lead to engine ground. With engine oil level FULL, the meter should read INFINITY.
   d. Disconnect the J5 Connector from the controller.
   e. Connect one test lead to harness Wire 86 (disconnected from the LOL). Connect the other test lead to J5-15 (Wire 86) of the controller connector. CONTINUITY should be measured.
   f. Connect one test lead to harness Wire 86. Connect the other test lead to a clean frame ground. INFINITY should be measured.

Figure 77. Oil Pressure Switch - CorePower

Results

1. If CONTINUITY is measured in Step 3c, replace the LOL (Low Oil Level) switch.
2. If CONTINUITY is not measured in Step 3e, repair or replace Wire 86 between the LOL switch and the J5 Connector.
3. If CONTINUITY is measured in Step 3f, repair or replace Wire 86 between the LOL switch wire and the J5 Connector.

TEST 69 – CHECK HIGH OIL TEMPERATURE SWITCH

Discussion

If the temperature switch contacts have failed in a CLOSED position on CorePower or OPEN position on PowerPact, the engine will fault out on “OVERTEMP.” If the unit is in an overheated condition, the switch contacts will close at 293 °F. This will normally occur due to inadequate airflow through the generator.

Procedure

1. Verify that the engine has cooled down (engine block is cool to the touch). This will allow the contacts in the High Oil Temperature Switch to close on CorePower and open on PowerPact.
2. Check the installation and area surrounding the generator. There should be at least three feet of clear area around the entire unit. Make sure that there are no obstructions preventing incoming and outgoing air.
3. Disconnect Wire 85 and Wire 0 from the High Oil Temperature Switch.
4. Set a VOM to measure resistance. Connect the test leads across the switch terminals. The meter should read INFINITY on Core Power and CONTINUITY on PowerPact.

5. If the switch tested good in Step 4, and a true over temperature condition has not occurred, check Wire 85 for a short to ground on Core Power or an open on PowerPact. Remove J1 (J5 on PowerPact) Connector from the controller. Set the VOM to measure resistance. Connect one test lead to Wire 85 (disconnected from High Oil Temperature Switch). Connect the other test lead to a clean frame ground. INFINITY should be measured on Core Power and PowerPact.

Testing High Oil Temperature Switch

6. Remove the High Oil Temperature Switch.
7. Immerse the sensing tip of the switch in oil as shown in Figure 78, along with a suitable thermometer.
8. Set a VOM to measure resistance. Then, connect the VOM test leads across the switch terminal and the switch body. The meter should read INFINITY on CorePower and CONTINUITY on PowerPact.
9. Heat the oil in the container. When the thermometer reads approximately 283-305 °F. (139-151 °C.), the VOM should indicate CONTINUITY on CorePower and INFINITY on PowerPact.

Results: CorePower and PowerPact

1. If the switch fails Step 4, or Steps 8-9, replace the switch.
2. If INFINITY was NOT measured in Step 5, repair or replace Wire 85 between the controller and the High Oil Temperature Switch.

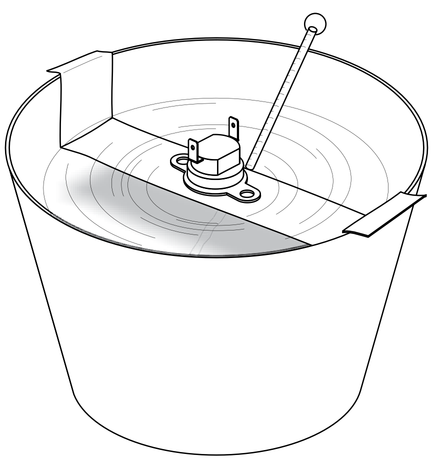


Figure 78. Testing the Oil Temperature Switch

TEST 70 – CHECK AND ADJUST VALVES

Discussion

Improperly adjusted valves can cause various engine related problems including, but not limited to, hard starting, rough running and lack of power.

Procedure

1. The engine should be cool before checking.
2. Remove spark plug wire and position wire away from plug.
3. Remove spark plug.
4. Make sure the piston is at Top Dead Center (TDC) of its compression stroke (both valves closed). To get the piston at TDC, remove the intake screen at the top of the engine to gain access to the flywheel nut. Use a large socket and socket wrench to rotate the nut and hence the engine in a clockwise direction. While watching the piston through the spark plug hole. The piston should move up and down. The piston is at TDC when it is at its highest point of travel.
5. Remove the four screws attaching the valve cover.
6. Loosen the rocker jam nut. Use a wrench to turn the pivot ball stud while checking clearance between the rocker arm and the valve stem with a feeler gauge. Correct clearance is:

Model	Intake	Exhaust
CorePower	0.005-0.007 in (0.13-0.17 mm)	0.007-0.009 in (0.18-0.22 mm)
PowerPact	0.002-0.004 in (0.05-0.1 mm)	0.002-0.004 in (0.05-0.1 mm)

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

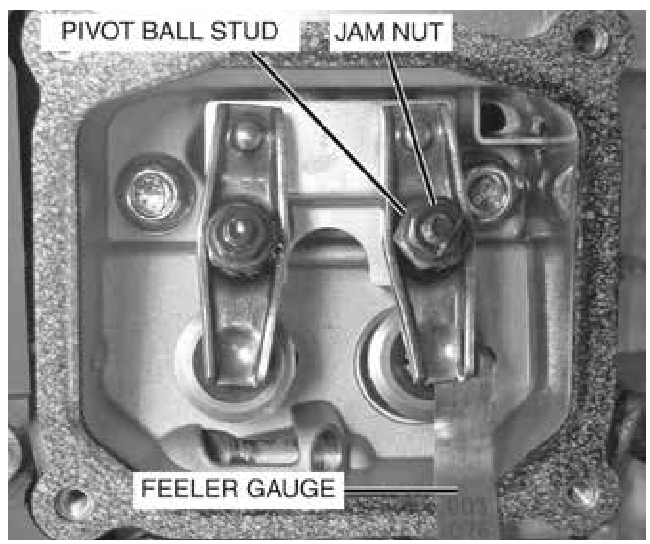


Figure 79. Valve Train - CorePower

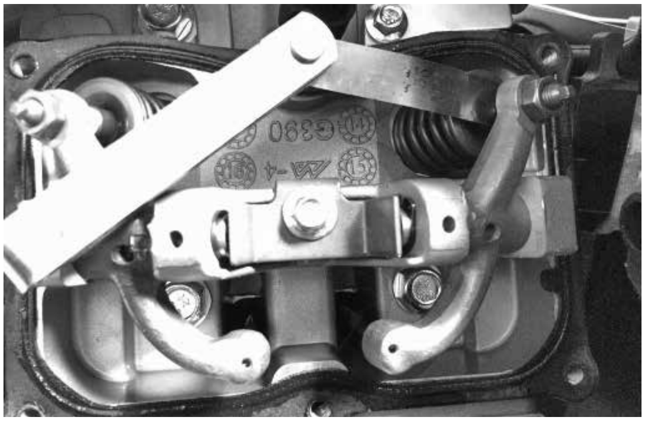


Figure 80. Valve Train - PowerPact

7. When valve clearance is correct, tighten the rocker arm jam nut. Tighten the jam nut to 70 to 106 **in-lbs**. After tightening the jam nut, recheck valve clearance to make sure it did not change.
8. Install new valve cover gasket.
9. Re-attach the valve cover.

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

10. Install spark plug.
11. Re-attach the spark plug wire to the spark plug.

Results

Adjust valve clearance as necessary, then retest.

TEST 71 – CHECK WIRE 18 CONTINUITY

Discussion

During cranking and running the controller receives a pulse from the ignition magneto via Wire 18. If this signal is not received by the controller the unit will shut down due to no RPM sensing.

Procedure

1. Set a VOM to measure resistance.
2. Remove Wire 18 from the in-line bullet connector. Disconnect the J1 (J5 on PowerPact) Connector from the controller.
3. Verify the continuity of Wire 18. Connect one meter test lead to Wire 18 removed from the bullet connector. Connect the other meter test lead to Pin Location J1-4 (J5-19 on PowerPact). CONTINUITY should be measured. If CONTINUITY is not measured, repair or replace Wire 18 as needed.

Results

Refer to flow chart.

TEST 72 – TEST EXERCISE FUNCTION

Discussion

The following parameters must be met in order for the weekly exercise to occur:

- Controller set to AUTO Mode.
- Utility Voltage Available

Procedure

1. Set the controller to MANUAL Mode. The generator should start. Set the controller back to the AUTO mode. Verify that the controller has been in AUTO for weekly exercise to function.
2. Hold the Set Exercise button for approximately 10 seconds (3 seconds on PowerPact). When the generator starts, release the button. The generator will start, run an exercise cycle, and confirm the setting. The exercise time must be established at the time you wish the exercise to take place. The exercise time is now established. The generator will exercise each week at this time.

Results

1. In all models, if the unit starts in MANUAL, but fails to exercise without any ALARMS present, replace the controller.

TEST 73 – TEST CRANKING AND RUNNING CIRCUITS

Discussion

This test will check all of the circuits that are "Hot" with battery voltage and which could cause the Main Fuse to blow. Refer to Table 19 throughout the procedure for the known resistance values of components.

Figure 81 shows the Volt-Ohm-Meter (VOM) in two different states. The left VOM indicates an OPEN circuit or INFINITY. The right VOM indicates a dead short or CONTINUITY. Throughout the troubleshooting, refer back to Figure 81 as needed to understand what the meter is indicating about the particular circuit that was tested.

Note: CONTINUITY is equal to .01 ohms of resistance or a dead short.

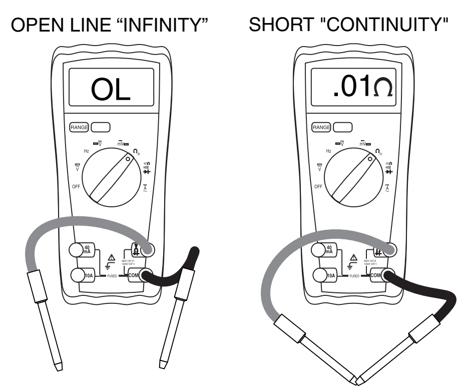


Figure 81. Open Line vs. Continuity

Table 19. Components Resistance Values

Starter Contactor	8Ω
Main Fuel Solenoid	16Ω
Transfer Relay	115Ω
Choke Solenoid	4Ω

Procedure

1. Set a Volt-Ohm-Meter (VOM) to measure resistance.
2. Disconnect the J1 (J5 on CorePower) connector from the controller.
3. Connect one meter lead to a clean frame ground and connect the other meter test lead to each of the following tests points in Table 20, measure and record the resistance.

Table 21 has been provided to record the results of this test. Additional copies of this table can be found in Appendix A "Supplemental Worksheets" at the back of this manual.

Table 20. Resistance Measurements

Test Point	CorePower Pin Location	PowerPact Pin Location	Circuit	Value
1	J2 Pin 4	J5 Pin 13	Wire 14	16Ω
2	J2 Pin 11	J5 Pin 14	Wire 56	4Ω
3	J2 Pin 8	J5 Pin 18	Wire 15B/194	OPEN

Results

1. Compare the results of Step 3 with Table 20.
   a. If the VOM indicated CONTINUITY at Test Point 1 proceed to Test 61
   b. If the VOM indicated CONTINUITY at Test Point 2 proceed to Test 57
   c. If the VOM indicated CONTINUITY at Test Point 3 proceed to Test 29
   d. If the VOM indicated CONTINUITY at Test Point 4, proceed to Test 63
   e. If the VOM indicated proper resistance values at all test points, replace the controller

Table 21. Test 73 Results

Test Point	CorePower Pin Location	PowerPact Pin Location	Circuit	Result
1	J2 Pin 4	J5 Pin 13	Wire 14	
2	J2 Pin 11	J5 Pin 14	Wire 56	
3	J2 Pin 8	J5 Pin 18	Wire 15B/194	

TEST 74 – CHECK BATTERY CHARGER SUPPLY VOLTAGE

Discussion

The battery charger is supplied with 120 VAC. The output of the battery charger is 13.4 VDC (2.5A) on CorePower.

Procedure

Refer to Figure 83 for CorePower. Refer to the PowerPact SD/WD for PowerPact.

1. Set VOM to measure AC voltage.
2. On CorePower, measure across points A and B. On PowerPact, measure across J4-1 and J4-3 at the controller connector. 120 VAC should be measured.
   a. If 120 VAC is not measured;
      CorePower: Verify that the load source voltage is available, and that the duplex circuit breaker is on.
      PowerPact: Verify that voltage is coming from the T1 in the Transfer Switch.
   b. If 120 VAC is measured, proceed to Step 3.
3. Measure across points C and D on both CorePower and PowerPact. 120 VAC should be measured.
   a. If 120 VAC is not measured;
      CorePower: Repair or replace Wire BC LINE or BC 00 between the load center and the generator.
      PowerPact: Repair or replace T1 Wire coming from the Load Side of the Transfer Switch Contactor.
   b. If 120 VAC is measured, refer to Flow Chart.

TEST 75 – CHECK BATTERY CHARGER OUTPUT VOLTAGE (COREPOWER ONLY)

Discussion

The CorePower battery charger is supplied with 120 VAC. The output of the battery charger is 13.4 VDC (2.5A).

Procedure

Refer to Figure 83.

1. Set VOM to measure DC voltage.
2. Remove and isolate battery charger black and red leads from generator terminal strip points E and F.
3. Measure across points E and F. Battery supply voltage (12 VDC) should be measured.
   a. If battery voltage is not measured, wait 5 minutes and repeat Step 3. If battery supply voltage is still not available, refer to Flow Chart.
   b. If battery voltage is measured, proceed to Step 4.
4. Reconnect battery charger black and red lead wires previously removed in Step 2.
5. Measure across points E and F. 13.4 VDC should be measured.

a. If 13.4 VDC is not measured, replace the battery charger.
b. If 13.4 VDC is measured, the charger is working.

NOTE: Battery charger voltage will be higher than battery supply voltage.

TEST 76 – CHECK BATTERY CHARGER OUT VOLTAGE (POWERPACT ONLY)

Discussion

The battery voltage of the unit can be measured on the J5 connector at the controller. This test procedure will verify battery charger voltage to the battery from the controller.

Procedure

1. Set VOM to measure DC Voltage.
2. Measure battery voltage at the battery terminals.
   a. If battery voltage measured greater than 12.6 VDC, go to Step 3
   b. If battery voltage measured less than 12.6 VDC, go to Step 4
3. Set the controller to MANUAL mode and allow the engine to crank for 2 to 3 seconds, and then set the controller to the OFF mode.
4. Connect one meter test lead to Wire 13 (Pin J5-9 and or Pin J5-10) on the controller and the other meter test lead to Wire 0 (J5-20).
5. Measure and observe the voltage indicated.

Results

1. If the meter indicated battery voltage greater than 12 VDC and incrementally increased during Step 5, the battery charger is charging the battery. Refer back to flow chart.
2. If the meter indicated battery voltage greater than 12 VDC, and held steady or incrementally decreased during Step 5, the battery charger is not operating. Refer back to flow chart.
3. If the meter indicated battery voltage between 1 VDC to 11 VDC, check wire connections from the J5 connector to the battery.

TEST 78 – CHECK WIRE 0/15B (COREPOWER ONLY)

Discussion

In order for the battery charger to function, battery supply voltage must be available to the battery charger.

Procedure

Refer to Figure 83.

1. Set VOM to measure DC voltage.
2. Remove and isolate battery charger black and red leads from generator terminal strip points E and F.
3. Measure across points G and H on the terminal strip. 12 VDC should be measured.
   a. If 12 VDC is measured, the charger should be functioning.
   b. If 12 VDC is not measured, proceed to Step 4.
4. Remove Wire 0 and Wire 15B from generator terminal strip locations E and F.
5. Wait five (5) minutes after removing wires.
6. Measure across points E and F on the terminal strip. 12 VDC should be measured.
   a. If 12 VDC is measured, proceed to Step 8.
   b. If 12 VDC is not measured, proceed to Step 7.
7. Measure across point H and ground lug. 12 VDC should be measured.
   a. If 12 VDC is measured, repair or replace Wire 0 between the generator terminal strip and the ground lug.
   b. If 12 VDC is not measured, proceed to Step 8.
8. Set VOM to measure resistance.
9. Connect the meter test leads across the disconnected Wire 0 and Wire 15B. Approximately 200 Ohms should be measured.
   a. If 200 Ohms is measured, proceed to Step 11.
   b. If zero resistance or CONTINUITY is measured, connect the meter test leads across BAT- and XFER on the load center motor.
   c. If zero resistance is measured, a short exists. Replace the load center motor.
   d. If 200 Ohms to INFINITY is measured, repair or replace Wire 15B between the generator and the load center.
10. Disconnect the J2 connector from the controller.
11. Measure across point F and pin location J2-8 of the connector just removed. CONTINUITY should be measured.
    a. If CONTINUITY is not measured, repair or replace Wire 15B between the J2 connector and the terminal strip.
    b. If CONTINUITY is measured and the pin connection looks good, the internal fuse on the controller has failed. Replace the controller.

TEST 79 – CHECK SHUTDOWN WIRE

Discussion

Circuit board action during shutdown will ground Wire 18. Wire 18 is connected to the Ignition Magneto(s). The grounded magneto will not be able to produce spark.

Figure 82. Wire 18 Connection - CorePower

Procedure

1. Disconnect Wire 18 at the bullet connector. See Figure 82.
2. Connect a fused jumper wire from the stud to which Wire 56 is connected on the Starter Contactor (SC) and Wire 13, also at the Starter Contactor. The generator will start cranking. As it is cranking, repeat Test 64.
3. If spark occurs with Wire 18 removed, check for a short to ground. Remove the J1 (J5 on PowerPact) Connector from the circuit board.
4. Set a VOM to measure resistance. Connect one test lead to Wire 18 (disconnected in Step 1). Connect the other test lead to a clean frame ground. INFINITY should be measured.
5. Reconnect the J1 Connector to the controller.

Results

1. If INFINITY was not measured in Step 4, repair or replace shorted ground Wire 18 between the J1 (J5 on PowerPact) Connector from the controller to the bullet connector.
2. If INFINITY was measured in Step 4, replace the controller and retest for spark.
3. If ignition spark still has not occurred, proceed to Test 67.

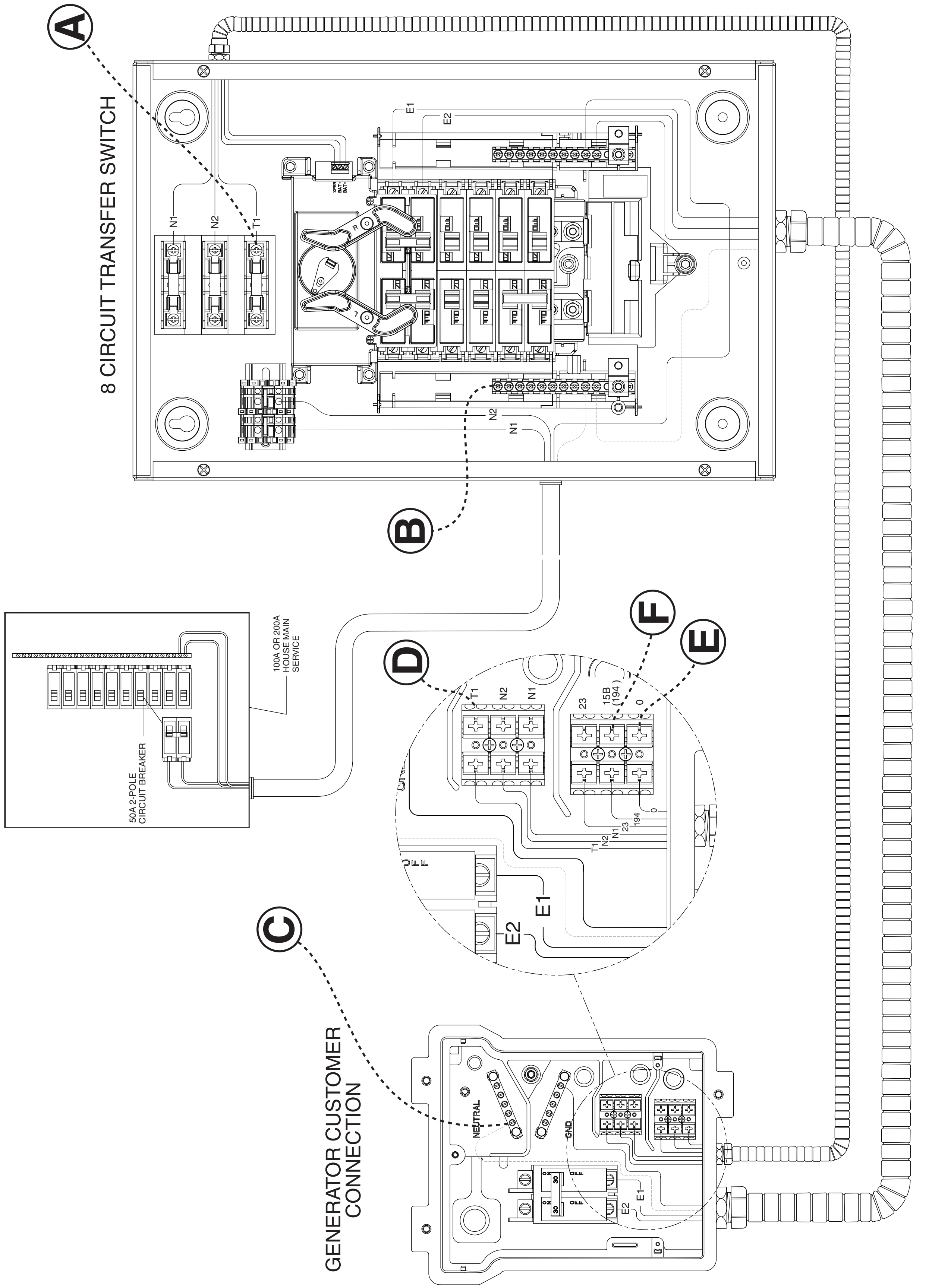


Figure 83. Test 76, 77, and 78 Test Points - CorePower

PART 5 - DISASSEMBLY

Section 5.1 – Major Disassembly - Corepower........................ 94
Section 5.2 – Major Disassembly - Powerpact 100
Section 5.3 – Exploded Views 106

DISASSEMBLY - COREPOWER

Tools Required:

- 7 mm Socket
- 8 mm Socket
- 10 mm Socket
- 13 mm Socket
- Harmonic Balancer or Steering Wheel Puller
- Replacement Rotor Bolt (Part No. 0H6930)
- Replacement Exhaust Gasket (Part No. 0H8191)

Torque Values

Stator Bolts	6 ft-lbs
Rotor Bolt	30 ft-lbs

Disassembly

1. Remove lid from the top of the enclosure.

Figure 84.

2. Remove the three removable sides of the enclosure. Refer to Figure 85 for the side that will remain during the disassembly.

Figure 85.

3. Disconnect and remove the battery.
4. Using a 10 mm socket remove the front two enclosures braces.

Figure 86.

5. Using an 8 mm socket and a 10 mm socket remove the three bolts holding the heat shield. Refer to Figures 87 and 88.

Figure 87.

Figure 88.

6. Using a 10 mm socket remove the three (3) bolts holding the exhaust housing from the engine support and base. Refer to Figure 89 and 90.

Figure 89.

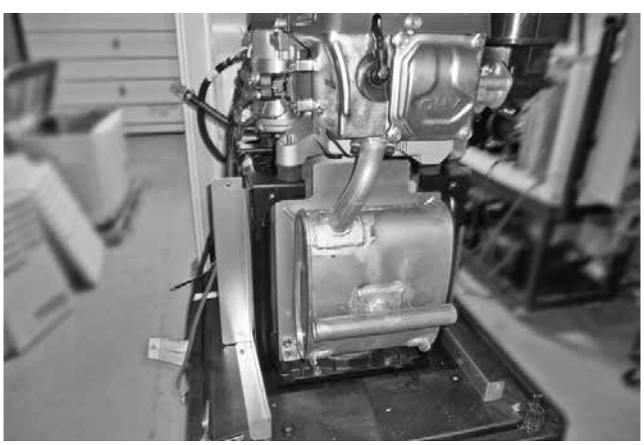


Figure 90.

7. Using a 10 mm socket remove the remaining exhaust enclosure pieces on each side.

Figure 91.

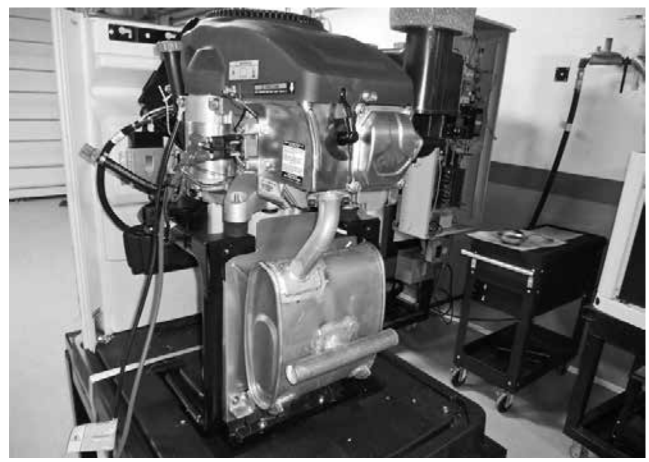


Figure 92.

8. Disconnect the red and black brush wires.

Figure 93.

9. Disconnect the voltage regulator.

Figure 94.

10. Disconnect the ground and neutral connections.

Figure 95.

11. Using an 8 mm socket remove the two bolts supporting the muffler.

Figure 96.

Figure 97.

12. Disconnect the fuel supply hose from the air box assembly.

Figure 98.

13. Disconnect the choke solenoid.

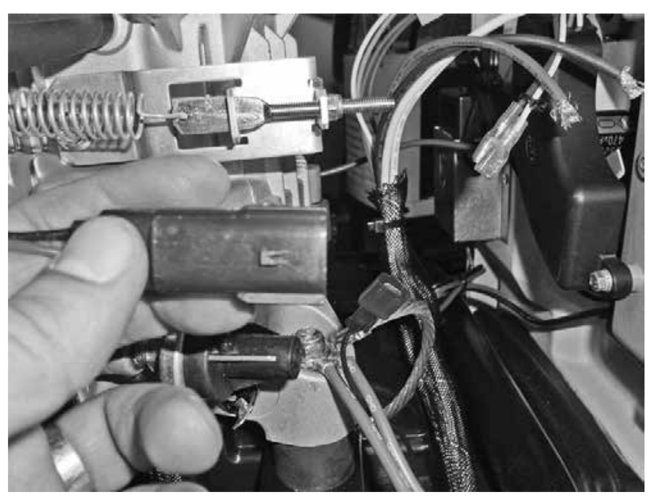


Figure 99.

14. Using an 8 mm socket remove the remaining bolt.

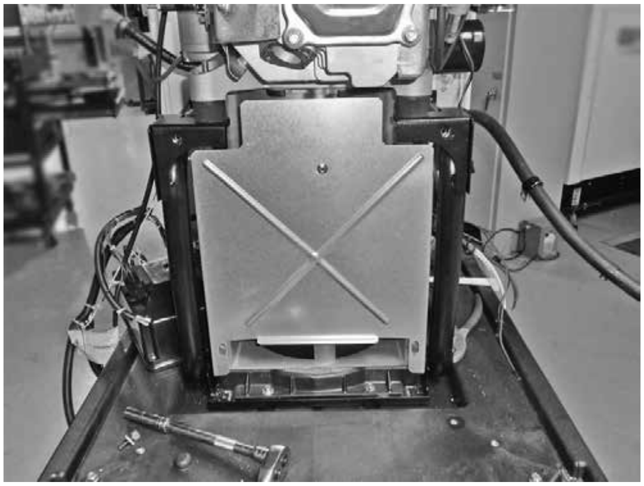


Figure 100.

15. Using a 10 mm socket remove the two bolts connecting support to the base.

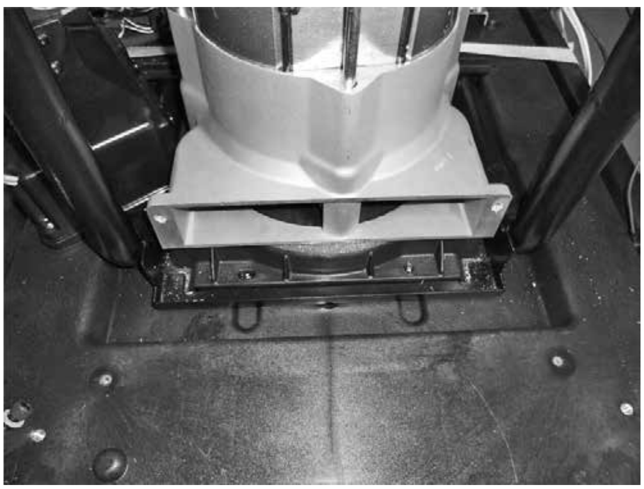


Figure 101.

16. Carefully slide out the support structure from the base and position assembly horizontally.

Figure 102.

17. Using a 13 mm wrench remove the rotor bolt from the alternator.

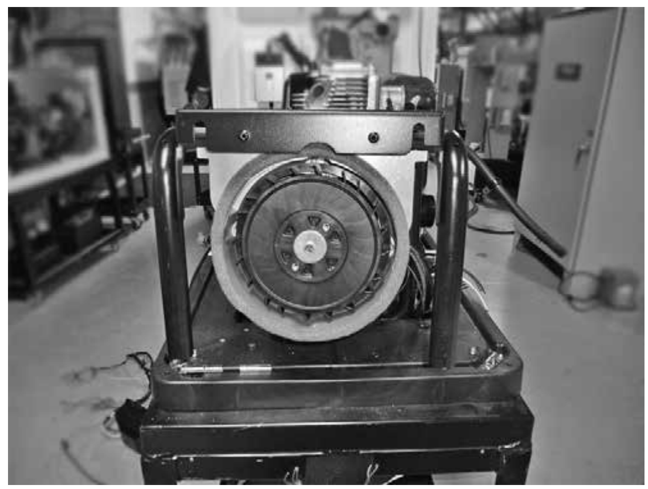


Figure 103.

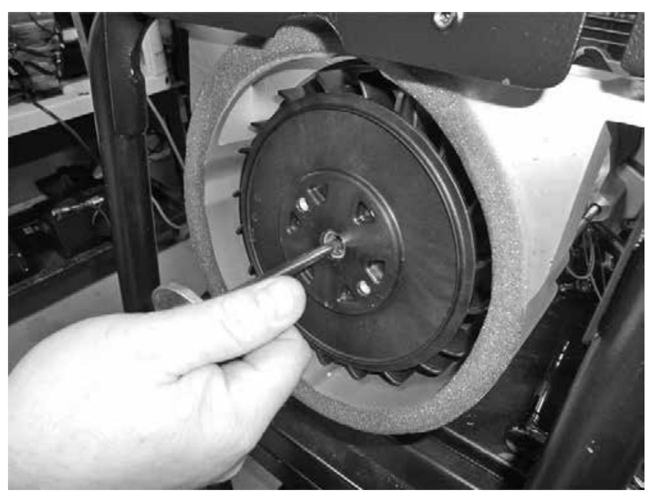


Figure 104.

18. Install a harmonic balancer or steering wheel puller onto the fan assembly.

Figure 105.

Figure 106.

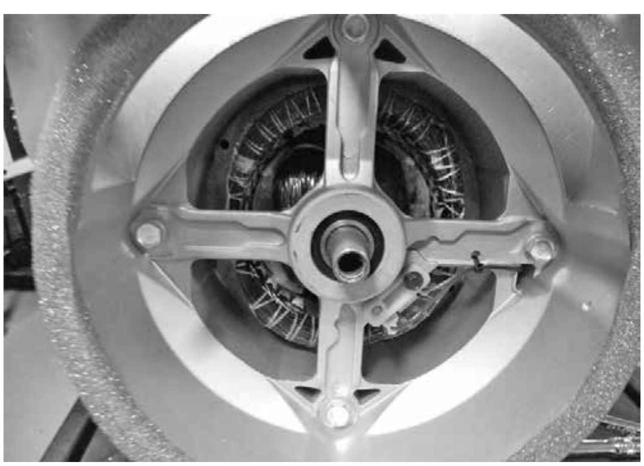


Figure 107.

19. Using a 13 mm socket remove the four stator bolts.

Figure 108.

Note: Make a note of the orientation of the brush wire exit passage on the stator. During re-assembly, if the stator is not bolted together with the exit passage in the same location, the brush wires will not be long enough to reconnect to the wire harness.

20. Remove brush assembly using a 7 mm socket.

Figure 109.

21. Slide the stator assembly off the rotor.

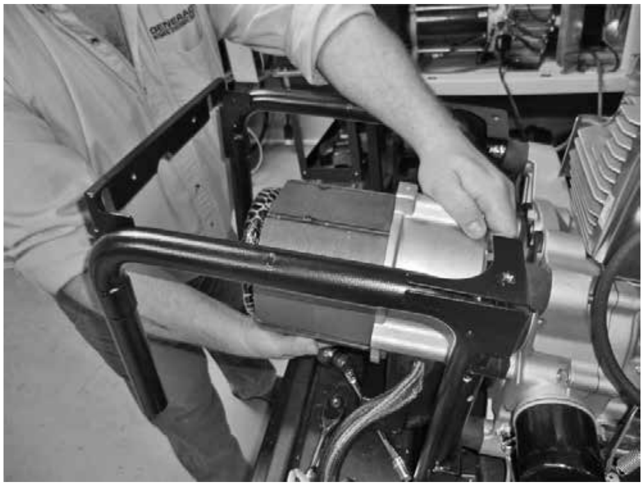


Figure 110.

⚠ WARNING!

Warning! Do not cut the rotor bolt unless you have a replacement rotor bolt.

22. Rotor Removal: Cut 2.5 inches from the rotor bolt. Slot the end of the bolt to suit a flat blade screwdriver. Slide the rotor bolt back through the rotor and use a screwdriver to screw it into the crankshaft. Use an M12 x 1.75 bolt to screw into rotor. Apply torque to the M12 x 1.75 bolt until taper breaks free.

Figure 111.

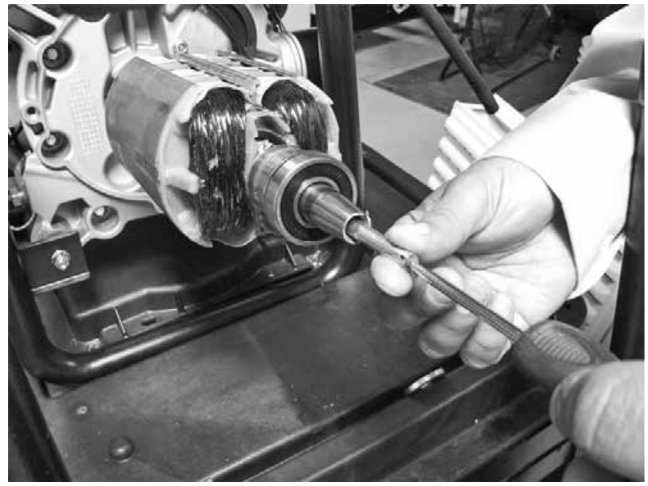


Figure 112.

Figure 113.

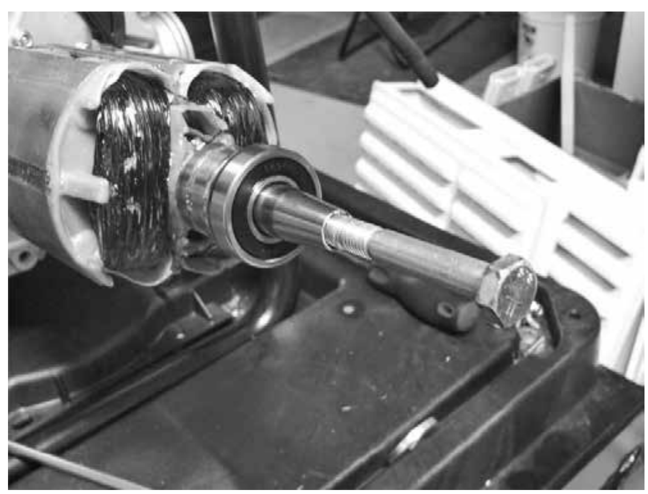


Figure 114.

23. For engine replacement remove the four bolts connecting the engine cradle to the engine casting.

DISASSEMBLY - POWERPACT

Tools Required

- 4 mm, 6 mm and 1/8" Allen Wrench
- 7 mm, 8 mm, 10 mm, 13 mm and 16 mm Sockets
- Metric wrench set
- Harmonic balancer puller or steering wheel puller (if necessary)

Parts Required

- Replacement Rotor Bolt (Part No. 0K7336)

Torque Values

- Stator Bolts 72 **in-lbs** (6 ft-lbs)
- Rotor Bolt 30 ft-lbs

Disassembly (50 Hz and 60 Hz)

1. **Enclosure Preparation:**
   a. Loosen four (4) screws and remove lid from the top of the enclosure. Refer to Figure 115.

Figure 115.

   b. Lift front access panel and remove.
   c. Remove rear access panel from the enclosure and remove air intake bellows. Refer to Figure 116.

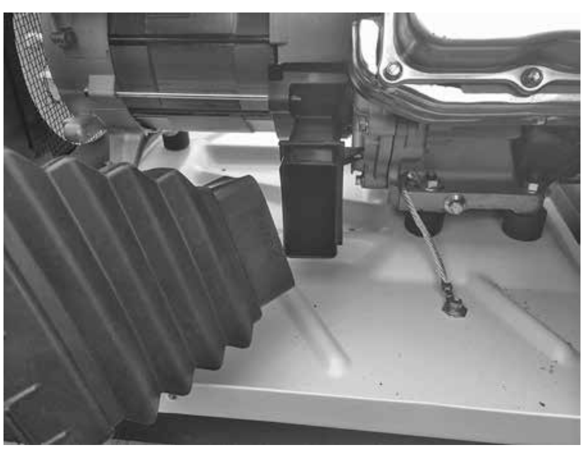


Figure 116.

   d. Remove rubber weather strip seal. Refer to Figure 117.

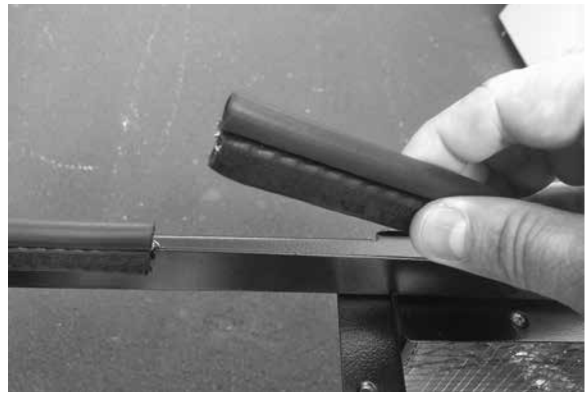


Figure 117.

   e. Remove battery access panel, disconnect and isolate the negative battery cable. Refer to Figure 118.

Figure 118.

2. **Rotor/Stator Access:**
   a. Remove the right (alternator) side end panel.
   b. Place a 2x4 wood block under the muffler as shown in Figure 119.

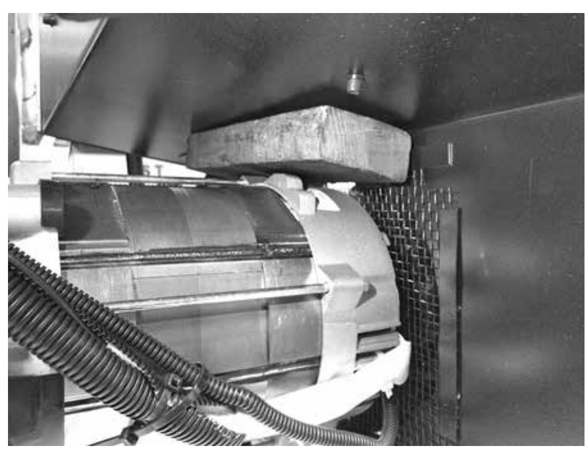


Figure 119.

c. Place a second 2x4 wood block as shown in Figure 120 and 120.

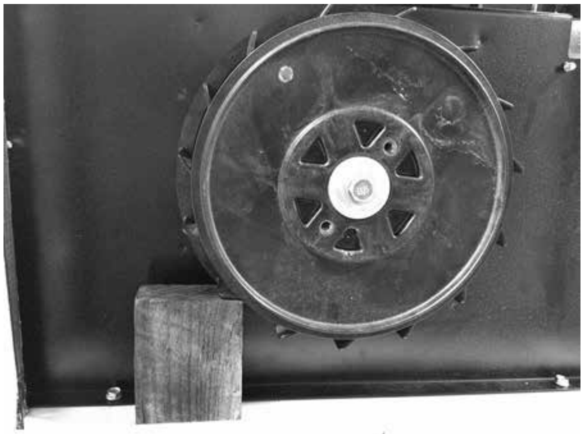


Figure 120.

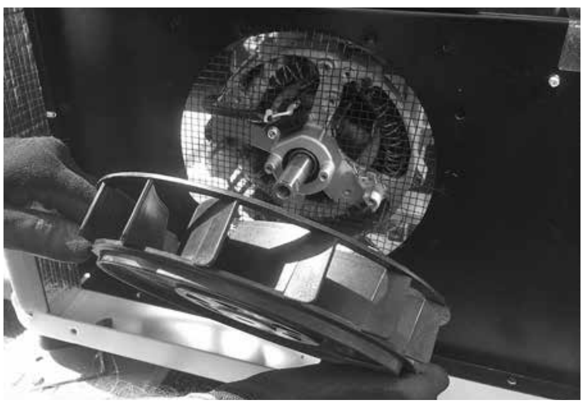


Figure 121.

d. Loosen and remove Rotor Bolt and washers, then remove fan.

Note: a puller may be needed if fan removal is difficult.

e. Reinstall rotor bolt and tighten slightly.
f. Loosen flex pipe clamp from exhaust manifold pipe. Refer to Figure 122.

Figure 122.

g. Remove divider panel fasteners and carefully remove divider panel with muffler attached. Refer to Figure 123.

Figure 123.

3. **Stator Removal – 60 Hz (for 50 Hz Stator removal, go to Step 4):**

a. Remove the brush assembly.
b. Remove the bearing carrier vibration isolator nuts. Refer to Figure 124.

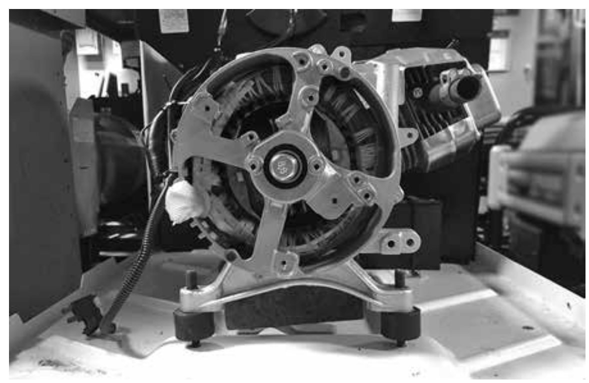


Figure 124.

c. Lift rotor/stator assembly enough to place a 2x4 wood block under the alternator air intake duct. Refer to Figure 125.

Figure 125.

d. Unscrew the bearing carrier vibration isolators from the base, leaving them loose in the bearing carrier. Refer to Figure 126.

Figure 126.

Note: these will be removed as the stator is slid off over rotor.

e. Disconnect all power, neutral and AVR wires.

f. Remove the four (4) stator holding bolts from the bearing carrier. Refer to Figure 127.

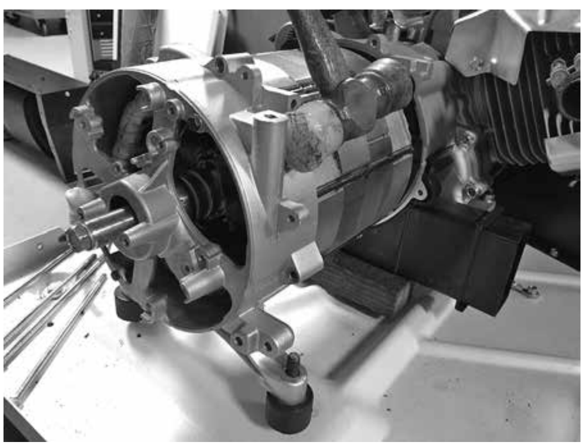


Figure 127.

g. Carefully slide the stator off over the rotor and set aside in a clean dry area.

4. Stator Removal – 50 Hz (for 60 Hz Stator removal, go back to Step 3)
   a. Remove the brush assembly.
   b. Remove the bearing carrier mounting bolts. Refer to Figure 128, 129 & 130.
   c. Lift rotor/stator assembly enough to place a 2x4 wood block under the alternator air intake duct. Refer to Figure 131.
   d. Disconnect all power, neutral and AVR wires.
   e. Remove the four (4) stator holding bolts from the bearing carrier. Refer to Figure 132.

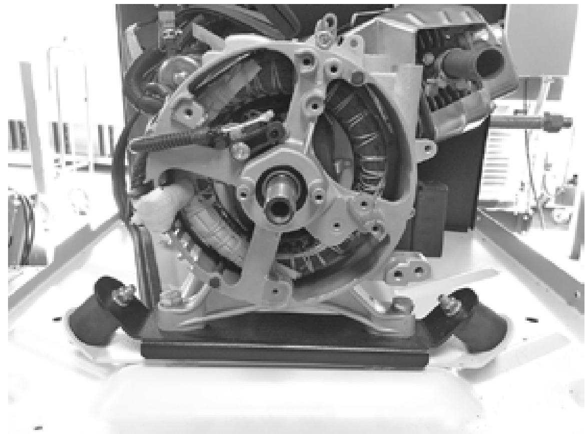


Figure 128.

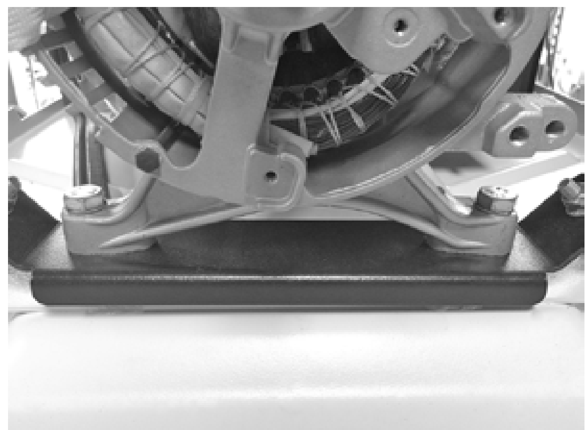


Figure 129.

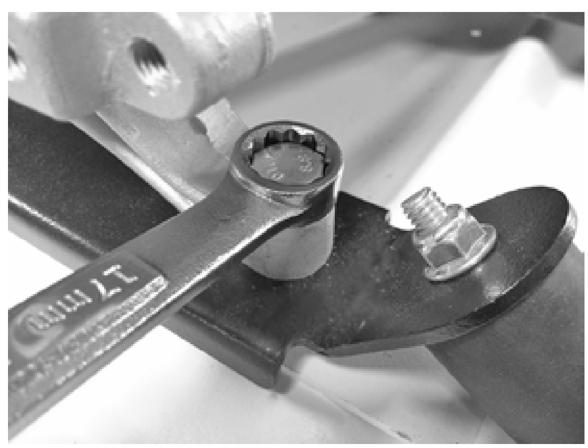


Figure 130.

f. Carefully slide the stator off over the rotor and set aside in a clean dry area.

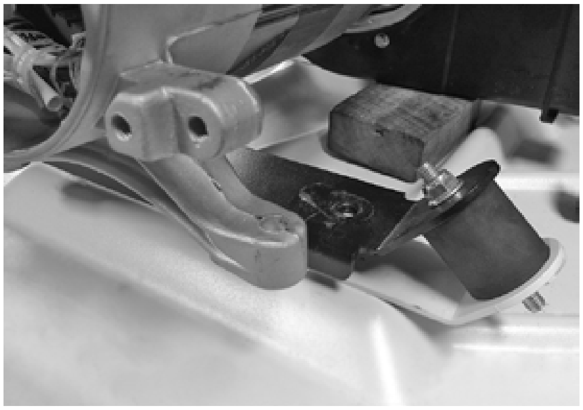


Figure 131.

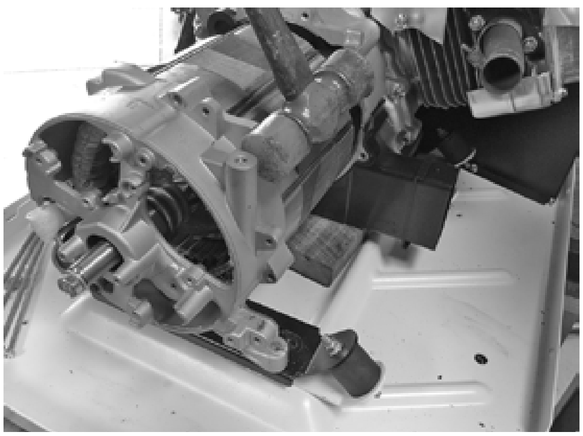


Figure 132.

5. **Rotor Removal (50 Hz and 60 Hz):**
   a. Remove rotor bolt (Part No. 0K7336) and cut approximately 3/4 of an inch from the rotor bolt.
   b. Slot the end of the bolt to suit a flat blade screwdriver. Refer to Figure 133.

Figure 133.

   c. Slide the cut rotor bolt back through the rotor and use a screwdriver to screw it into the crankshaft.
   d. Use an M12x1.75 bolt to screw into rotor. Refer to Figure 134.

Figure 134.

   e. Apply torque to the M12x1.75 bolt until taper breaks free.
   f. Remove rotor and cut-bolt.

Assembly

1. **Rotor Install:**
   a. Install rotor onto crankshaft and install new rotor bolt (Part No. 0K7336).
   b. Tighten rotor bolt slightly so as to hold the rotor in place while completing the reassembly process.
2. **Stator Install:**
   a. Position rotor poles up and down. Refer to Figure 135.

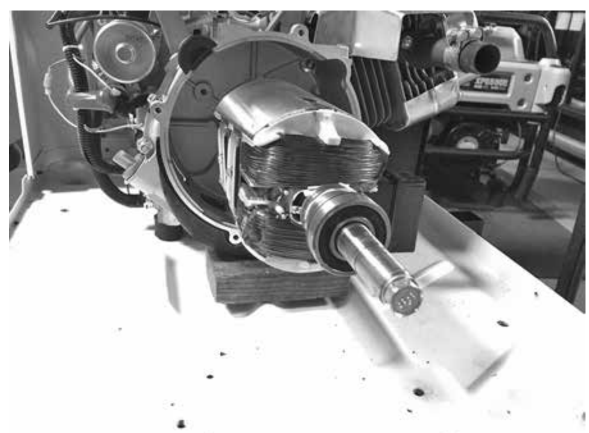


Figure 135.

   b. Install the bearing carrier vibration isolators (60 Hz only) and carefully slide the stator over the rotor. Install the 4 stator holding bolts, but do not tighten at this time.
   c. Attach vibration isolators to the base.
   d. Reconnect all power, neutral and AVR wires.
   e. Tighten the stator holding bolts in the proper sequence to the proper torque. Refer to Figure 136.

Note: DO NOT USE AN IMPACT WRENCH!

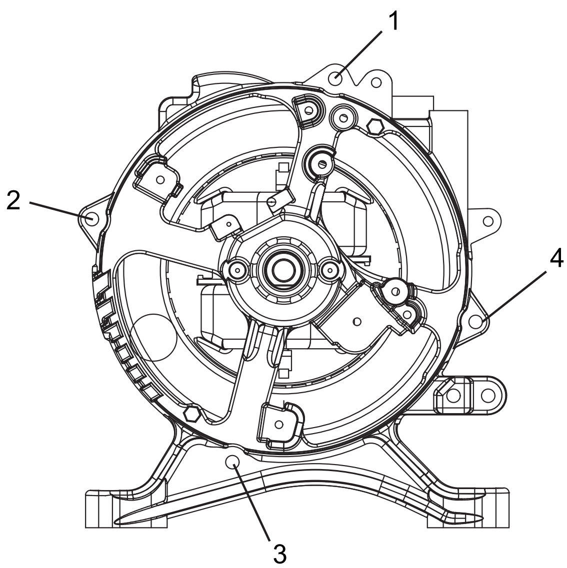


Figure 136.

f. Remove 2x4 wood block from under the alternator air duct and tighten vibration isolator nuts.

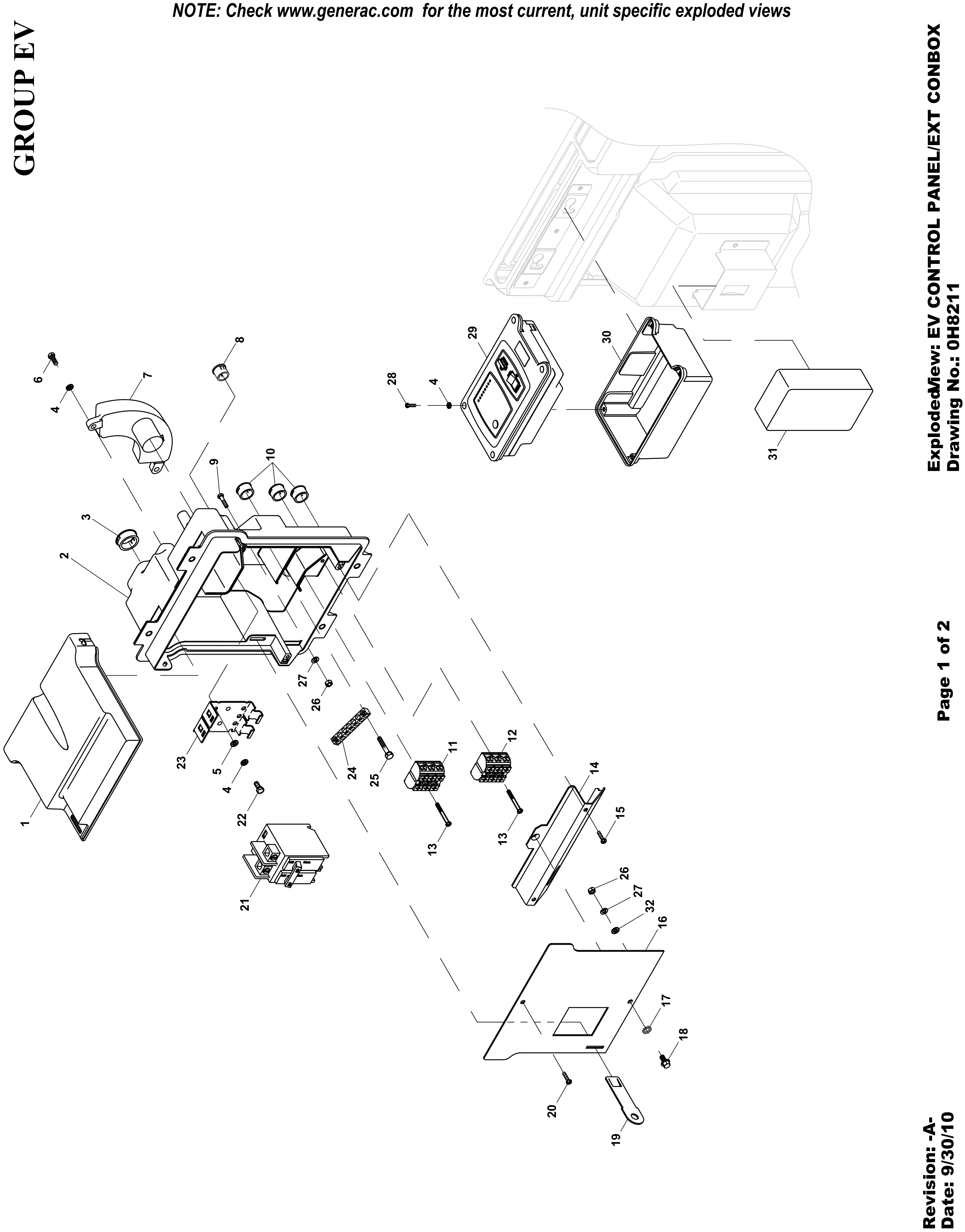
3. **Continue Reassembly:**
   a. Install the divider panel (with muffler attached) and tighten screws.
   b. Tighten exhaust flex pipe clamp.
   c. Install the right side (alternator end) enclosure.
   d. Install battery and battery access panel.
   e. Install rear and front access panels.
   f. Install roof.
4. Perform operational tests.

Torque Values

Stator Bolt	6-7 ft-lbs
Rotor Bolt	27-33 ft-lbs
M5 x 0.8 Screw On Band Clamp	7.5-9 ft-lbs
M6 x 1.0 Screw On Band Clamp	14-15 ft-lbs
M6 x 1.0 Screw Flange Nuts - Airbox to Cylinder Head	7-8 ft-lbs
M8 x 1.0 Nuts - Exhaust to Cylinder Head	20-22 ft-lbs
M8 x 1.25 Vibration Isolator to Base	20-22 ft-lbs
M10 x 1.25 Engine to Vibration Isolator	15-20 ft-lbs
3/8-16 Screw to Mounting Foot	5-8 ft-lbs
M6 x 1.0 Nyloc Nut on Dead Front Plate	40-50 **in-lbs**
M3 x 0.5 Screw into Aluminum	8-10 **in-lbs**
M3 x 0.5 Taptite Screw into Extruded Hole	8-18 **in-lbs**
M5 x 0.5 Screw into Aluminum	25-35 **in-lbs**
M5 x 0.8 Taptite Screw into Extruded Hole	25-50 **in-lbs**
M6 x 1.0 Screw into Aluminum	50-60 **in-lbs**
M6 x 1.0 Taptite Screw into Extruded Hole	50-96 **in-lbs**
M8 x 1.25 Taptite Screw into Extruded Hole	15-20 ft-lbs

Control Panel

NOTE: Check www.generac.com for the most current, unit specific exploded views



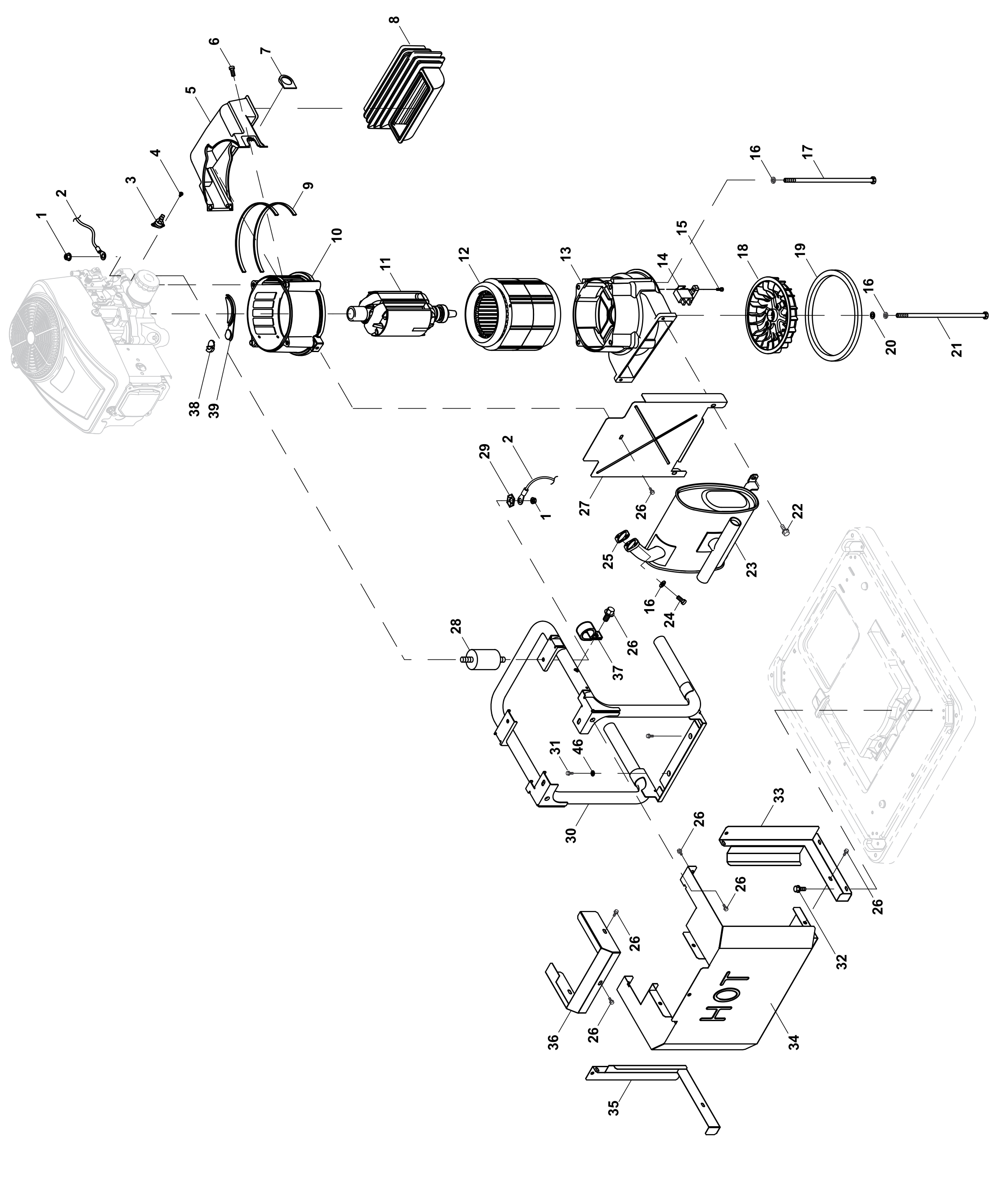
ITEM	QTY.	DESCRIPTION
1	1	COVER,.CUSTOMER CONNECT BOX
2	1	BOX CUSTOMER CONNECT
3	1	BUSHING, SNAP SB-1000-12
4	8	WASHER, LOCK M5
5	2	WASHER FLAT M5
6	2	SCREW, HHC M5-0.8 x 16 G8.8
7	1	AVR
8	1	BUSHING SNAP SB-500-6
9	1	SCREW HHC M6-1.0 X 20 C8.8
10	3	BUSHING SNAP SB-687-8
11	1	TERM BLOCK 3P UL 12-20AWG LBL
12	1	TERM BLOCK 3P UL 12-20AWG
13	4	SCREW PPHM M3-0.5 x 30
14	1	PLATE CONDUIT CUST. CONNECT
15	2	SCREW PPPH #8-16 x .66" BZC
16	1	PLATE, DEAD FRONT CUST. CONNECT
17	1	WASHER, LOCK EXT #10 STL
18	1	SCREW HHTT M5-0.8 x 10 BP

ITEM	QTY.	DESCRIPTION
19	1	EYE HASP CNTRL PNL 2008 HSB
20	1	SCREW PPPH #10 X 1/2" LG
21	1	CB 0030A 2P 240V 5 BQ2 LB
22	2	SCREW HHC M5-0.8 X 12 C8.8
23	1	BRKT CB MTG BACK
24	2	GROUND BAR (5)4-14 AWG CONN
25	4	SCREW HHC MI1.-0.7 X 25 SEMS
26	2	NUT HEX M6-1.0 G8 CLEAR ZINC
27	2	WASHER LOCK M6-1/4
28	4	SCREW PPHM M5-0.8 X 12 ZNC
29	1	ASSY CTR PNL 2010 CORE POWER
30	1	BOX CONTROL PANEL
31	1	BATTERY CHARGER 13.4VDC 2.5A CP HSB 32
32	1	WASHER FLAT 1/4-M6 ZINC
33	1	HARNESS, 7 KW (NOT SHOWN)
34	1	WIRE, DEADFNT TO GND (NOT SHOWN)
35	1	WIRE, GND TO DEADFNT (NOT SHOWN)
36	1	WIRE, BUSBAR TO GND (NOT SHOWN)

EV Powerhead, CorePower

NOTE: Check www.generac.com for the most current, unit specific exploded views

GROUP EV



Exploded View: EV POWERHEAD, COREPOWER
Drawing No.: 0H7619

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Revision: -A-
Date: 9/30/10

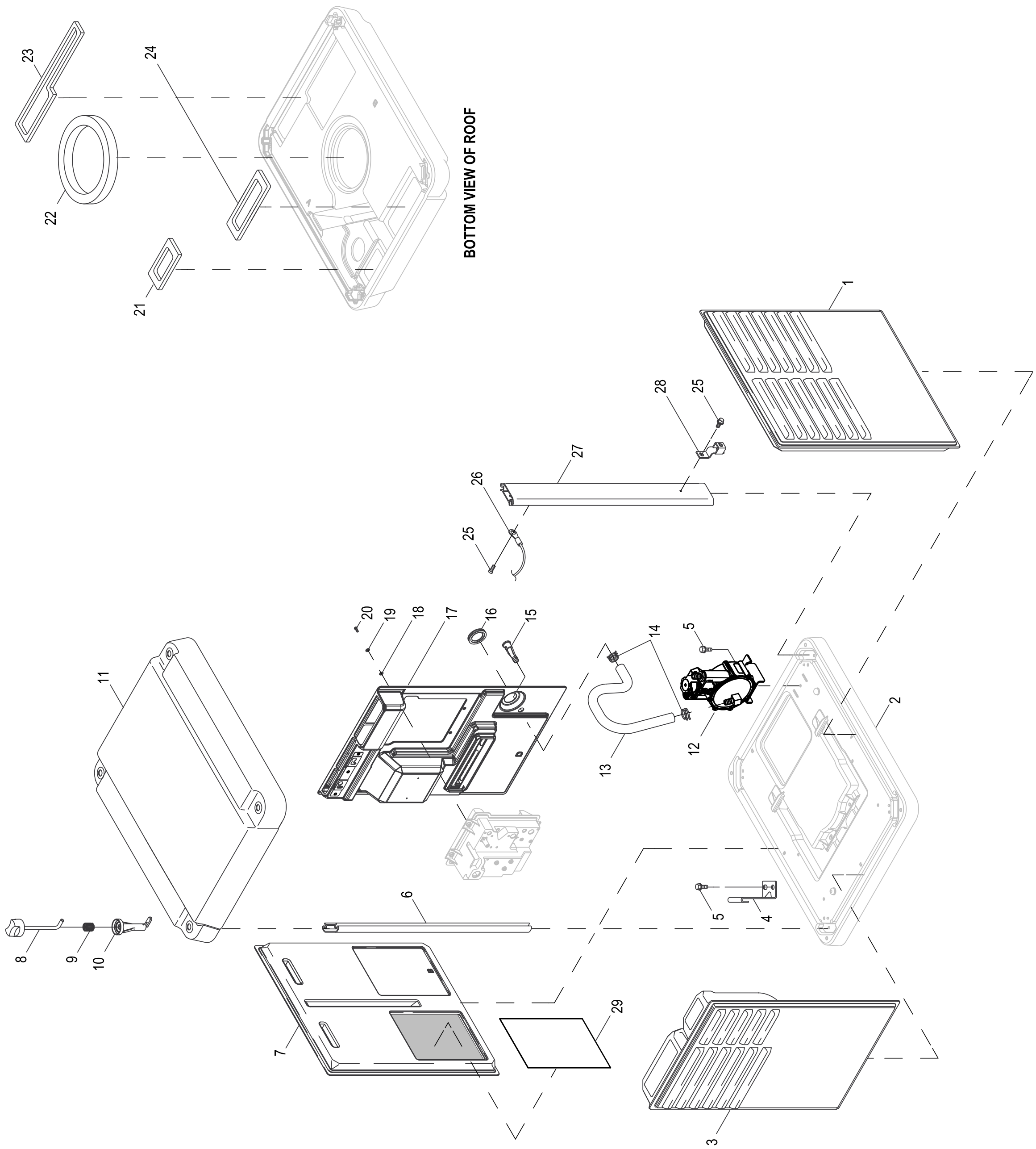
ITEM	QTY.	DESCRIPTION
1	5	NUT FLANGE 5116·18 NYLOK
2	1	EARTH STRAP 3/ax 3/8
3	1	THERMAL SWITCH 255 F
4	2	SCREW PPHM M3.o.5 X 6 SEMS
5	1	DUCT ALTERNATOR INTAKE
6	4	SCREW HHTT M5-0.8 X12 BP
7	1	GROMMET SLEEVE WIO MEMBRANE
8	1	BELLOWS, ALTAIR IN
9	1.8 FT	TAPE ELEC UL FOAM 1/8 X112
10	1	ASSY SPACER RING WI DOWEL PINS
11	1	RTR ASSY 7KW ECON VERT
12	1	STR ASSY 7KW ECON VERT
13	1	BEARING CARRIER ECON
14	1	BRUSH HOLDER
15	1	SCREW HHTT M5-0.8 X16
16	7	WASHER LOCK M8·5116
17	4	SCREW IHHC M8·1.25 X315 C8.8
18	1	FAN • CURVED BLADE, 203.5 OD
19	1	GASKET, ALT AIR OUT
20	1	WASHER FLAT .406ID X1.620D
21	1	SCREW IHHC 5116·24 X 12 G8 ZP
22	2	SCREW HHTT M8-1.2 X16 YC
23	1	MUFFLER, ECONOMY HSB
24	2	SCREW SHC 5118-18 X3/4
25	1	EXHAUST GASKET

ITEM	QTY.	DESCRIPTION
26	13	SCREW HHTT M6-1.0 X10 VEL CHR
27	1	EXHAUST SHIELD ALTERNATOR
28	4	VIB MNT 1.3axl.0X5116-18 MXM
29	1	WASHER LOCK SPECIAL 5116
30	1	FRAME WELDMENT
31	2	SCREW HHTT M6-1.0 X20 ZINC
32	4	SCREW HHFC M6-1.0X 12 G8.8
33	1	EXHAUST SHIELD, RIGHT SIDE
34	1	EXHAUST SHIELD MUFFLER COVER
35	1	EXHAUST SHIELD, LEFT SIDE
36	1	EXHAUST SHIELD, ENG WRAPPER
37	1	CLAMP STLNNL .75 X.281 Z
38	1	OIL SUMP PLUG SMALL
39	1	OIL SUMP PLUG LARGE
40	1	WIRE, BRUSH POS #4 (NOT SHOWN)
41	1	WIRE, BRUSH NEG #0 (NOT SHOWN)
42	1	CABLE, SC TO SM (NOT SHOWN)
43	2	WIRE, ENG TO GND (NOT SHOWN)
44	1	BATT POS. CABLE COREPOWER (NOT SHOWN)
45	1	BATT NEG. CABLE COREPOWER (NOT SHOWN)
46	1	WASHER FLAT 1/4-M6 ZINC

Enclosure

GROUP EV

NOTE: Check www.generac.com for the most current, unit specific exploded views



Exploded View : EV ENCLOSURE, COREPOWER
Drawing No. : 0H7620

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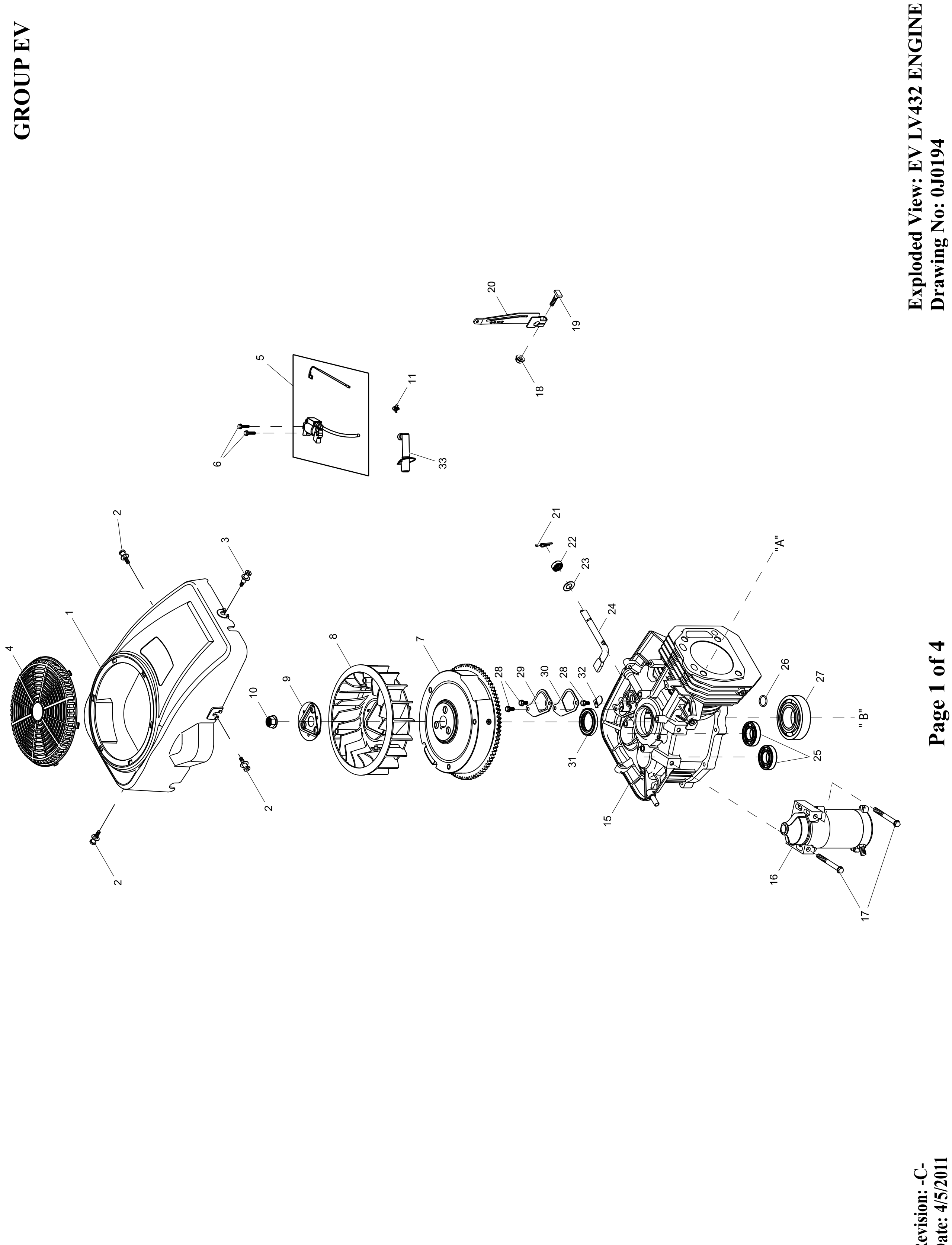
Revision -A-:
Date : 9/30/10

ITEM	QTY.	DESCRIPTION
1	1	ASSY EXHAUST PANEL AIRBOX SIDE
2	1	BASE
3	1	ASSY FRONT PANEL BISQUE
	1	ASSY FRONT PANEL GREY
4	4	BRACKET, CORNER POST
5	5	SCREW HHFC M6-1.0X 12
6	3	EXTRUSION, ENCLOSURE CORNER
7	1	ASSY. EXHAUST PANEL CONTROL PANEL SIDE
8	4	ROOF FASTENER
9	4	SPRING CORE POWER ROOF
10	4	SUPPORT, ROOF LATCH
11	1	ROOF WITH INT DUCT
12	1	ASSY REGULATOR 7KWVERT HSB
13	1	HOSE, REGULATOR VENT
14	2	CLAMP HOSE BAND .66

ITEM	QTY.	DESCRIPTION
15	1	ASSY., SNAP BARB W/SCREEN
16	1	GROMMET,38.1 CROSS SLIT W/HOLE
17	1	ASSY., BACK PANEL
18	4	WASHER, FLAT1/4-M6
19	4	WASHER, LOCK M6-1I4
20	4	SCREW, BHSC M6-1.0X16ZP
21	1	GASKET, AIRBOX PANELIROOF
22	1	GASKET, BLOWER HOUSING
23	1	GASKET, ENGINE AIR IN BACK
24	1	GASKET, ENGINE AIR IN FRONT
25	2	SCREW, HHTI M6-1.0X12 ZINC
26	1	WIRE, ENG TO CNRPST
27	1	CRNR SUPPORT W/GND HOLE
28	2	LUG SLDLSS #2-#8X17I64 CU
29	2	MAT, EXHAUST ENCLOSURE, INSIDE

Engine

NOTE: Check www.generac.com for the most current, unit specific exploded views

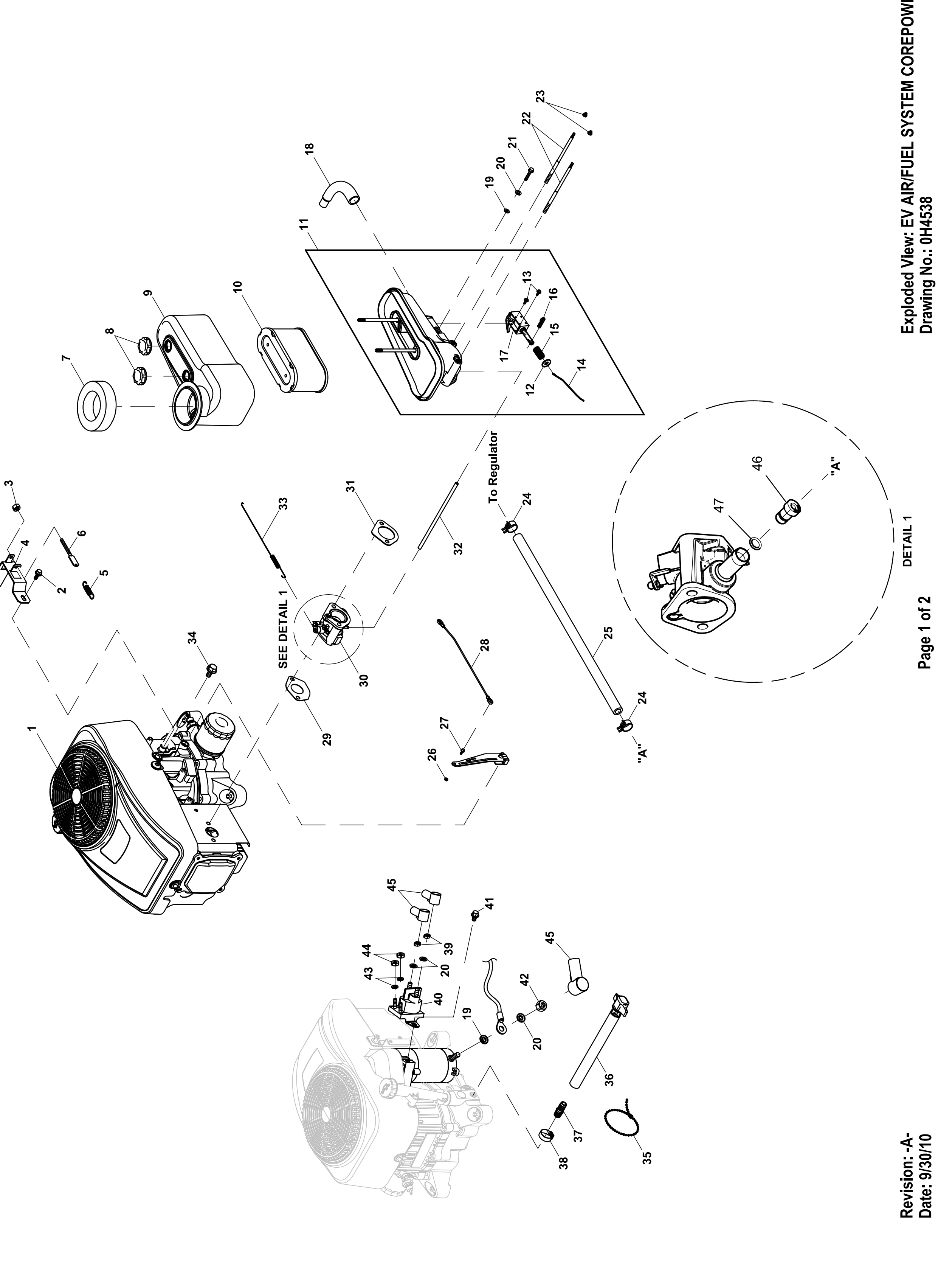


ITEM	QTY.	DESCRIPTION
1	1	SHROUD COVER, FAN
2	3	STUD, LIFTING
3	1	STUD, LIFTING
4	1	SCREEN, FAN
5	1	COIL ASSY., IGNITION
6	2	BOLT, FLANGE 6X25
7	1	FLYWHEEL, COMPLETE
8	1	FAN, COOLING
9	1	PLATE, FAN
10	1	NUT, SPECIAL M16
11	1	CLIP, WIRE HARNESS
15	1	CRANKCASE, UPPER
16	1	STARTER
17	2	BOLT, FLANGE, M8X80
18	1	NUT, FLANGE M6
19	1	BOLT, GOVERNOR ARM
20	1	ARM,GOVERNOR
21	1	PIN, LOCK
22	1	SEAL,OIL
23	1	WASHER
24	1	SHAFT, GOVERNOR ARM
25	2	BEARING, EDDP GROOVE, BALL
26	1	O-RING, 12X2.5
27	1	BEARING, EDDP GROOVE, BALL
28	3	BOLT, FLANGE 6X12
29	1	CAP, BREATHER CHAMBER
30	1	GASKET, BREATHER CHAMBER
31	1	OIL SEAL
32	1	VALVE, REED
33	1	CAP ASSY, NOISE SUPRESS

Air/Fuel System

GROUP EV

NOTE: Check www.generac.com for the most current, unit specific exploded views



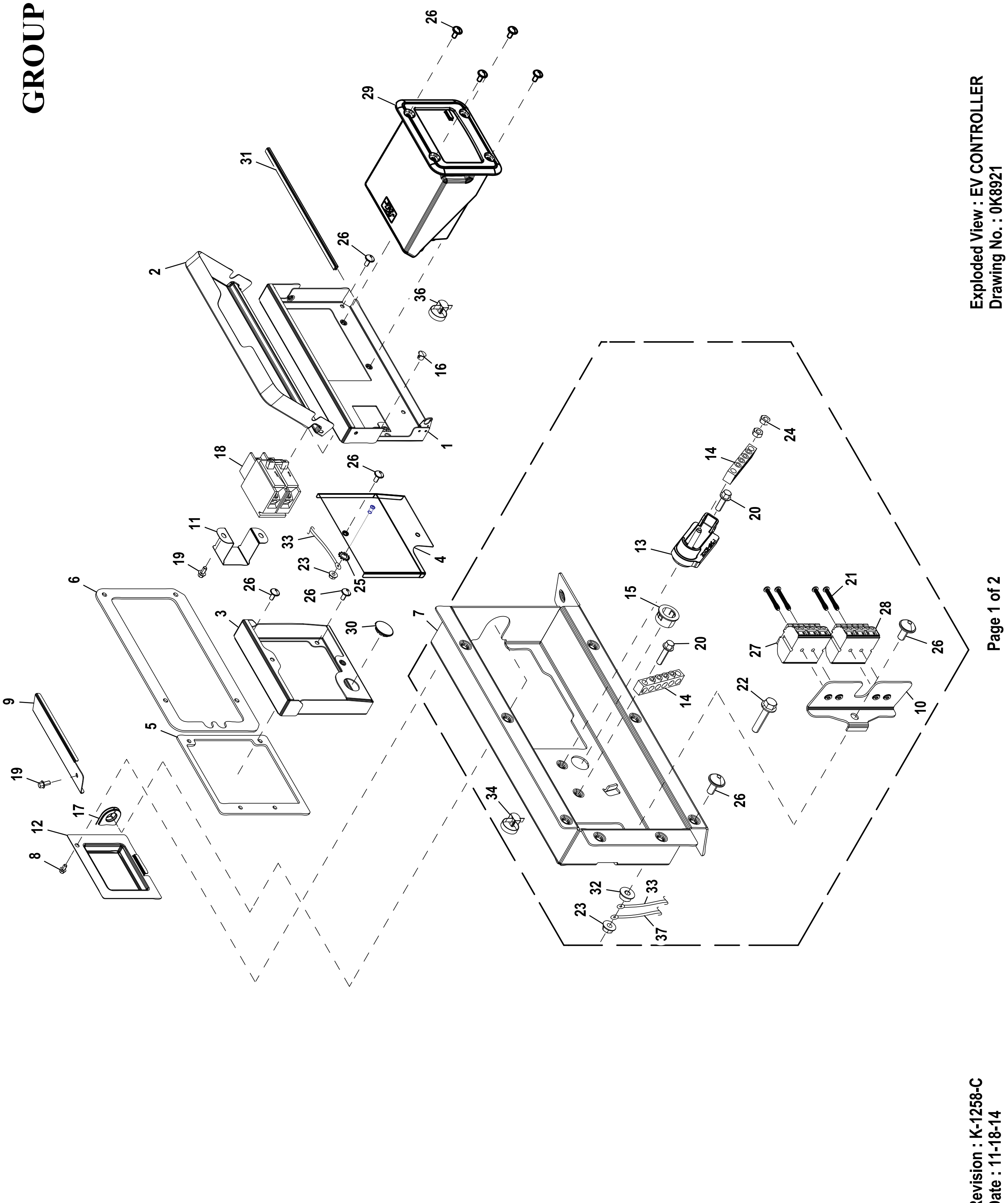
ITEM	QTY.	DESCRIPTION
1	1	ENGINE 432CC GASEOUS
2	2	SCREW, HHFCS M6·1 X16 G8.8
3	1	NUT HEX LOCK M5-0.8 NYINS ZINC
4	1	BRACKET, 432CC GOVERNOR ADJUST
5	1	SPRING, GOV MAIN LV432 EHSB
6	1	BOLT, GOV ADJUST M5
7	1	GASKET, AIRBOX
8	2	ASSEMBLY, KNOB, M6 ORANGE
9	1	AIRBOX COVER, 432CC OHV
10	1	ELEMENT, AIR FILTER
11	1	ASSY AIRBOX W/CHOKE 432CC OHV
12	1	WASHER NYLON .257
13	2	SCREW PPHM #40-4O X3/8 SEMS
14	1	CHOKE ROD 432CC EHSB
15	1	SPRING, CHOKE RETURN
16	1	COTTER PIN 1/4" SHAFT .091 WI
17	1	SOLENOID, 6VDC MOLEX
18	1	BREATHER HOSE 432CC OHV
19	2	WASHER FLAT 1/4-M6 ZINC
20	4	WASHER LOCK M6-1/4
21	1	SCREW HHC M6-1.0 X35 C8.8 BLK
22	2	INTAKE MOUNTING ROD 432CC
23	2	NUT FLANGE M6-1.0 NYLOK
24	2	CLAMP HOSE BAND .75"

ITEM	QTY.	DESCRIPTION
25	1.8FT	LPG HOSE ASSEMBLY
26	1	NUT HEX LOCK M3-0.5 NY INS
27	1	BALL STUD,10 MM
28	1	ASSY THROTTLE ROD
29	1	GASKET INTAKE 432CC OHV
30	1	ASSY THROTTLE BODY 432CC OHV
31	1	GASKET INTAKE 432CC OHV
32	1	HOSE 3.18ID SAE J30R7 METRIC
33	1	SPRING, GOV, ANTI-LASH
34	1	SCREW HHFC M6-1.0 X12 G8.8
35	1	TIE WRAP, BEADED RELEASABLE
36	1	ASSY HOSE OIL DRAIN 6.0" LG ORG
37	1	BARBED STR 3/8NPT X3/8 VS
38	1	CLAMP, HOSE OETIKER STPLSS 18.5
39	2	NUT HEX 1/4-20 STEEL
40	1	CONTACTER, STARTER SOLENOID
41	2	SCREW, HHTT M6X1.0 X10
42	1	NUT HEX M6-1.0 G8 CLEAR ZINC
43	2	WASHER LOCK #8-M4
44	2	NUT HEX #8.32 STEEL
45	3	BOOT, VINYL STARTER·SOLENOID
46	1	JET REGULATOR 4.38 (LP)
	1	JET REGULATOR 5.00 (NG)
47	1	O-RING 5 X 1.5 NITRILE 70

Control Panel

GROUP EV

NOTE: Check www.generac.com for the most current, unit specific exploded views



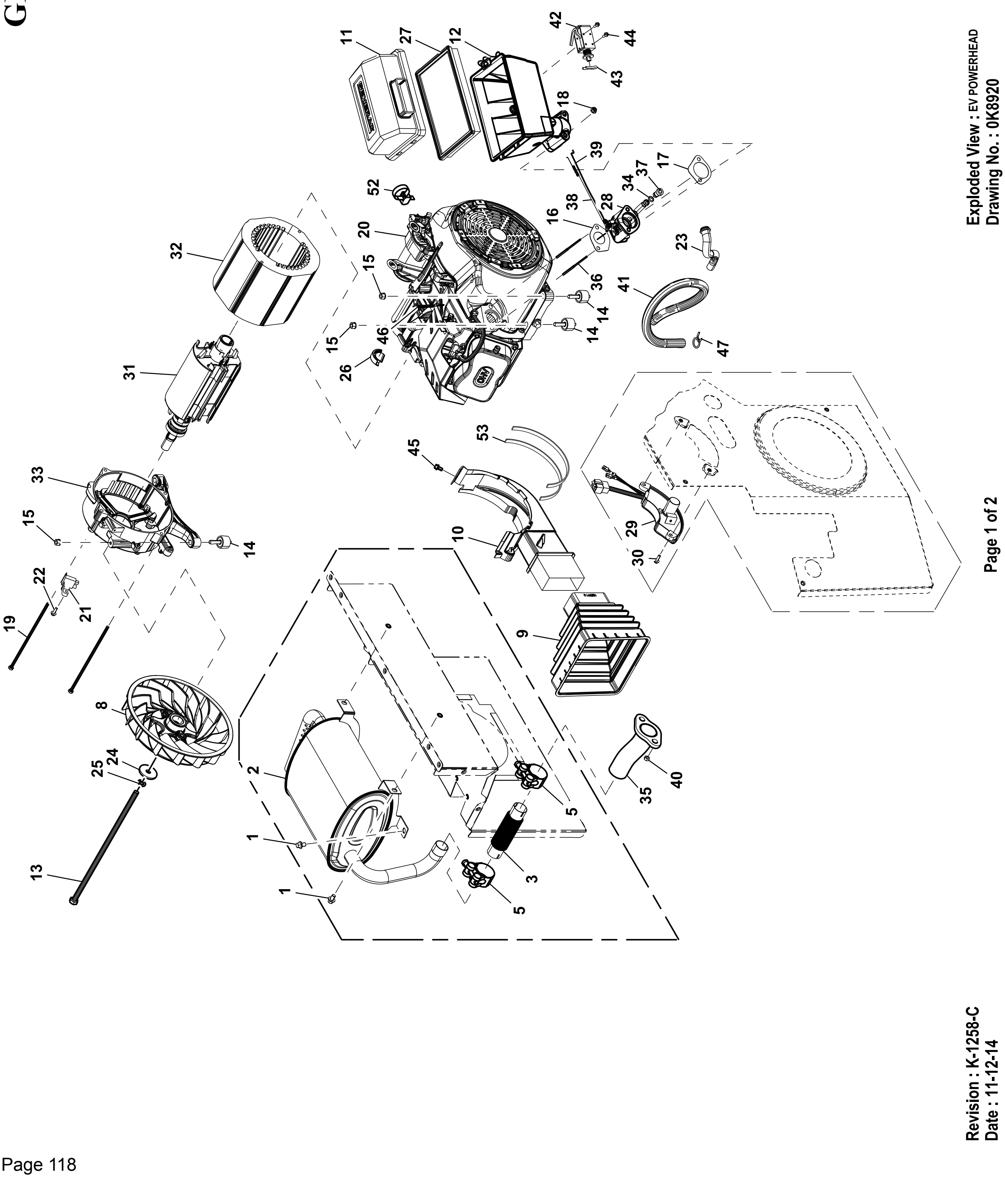
ITEM	QTY.	DESCRIPTION
1	1	CONTROLLER FRAME
2	1	CONTROLLER LID
3	1	FRAME, CONDUIT
4	1	WELDMENT, DEAD FRONT COVER
5	1	GASKET, FIELD CONNECTION COVER
6	1	GASKET, CONTROLLER FASCIA
7	1	CIRCUIT BREAKER BOX
8	1	SCREW HHTT M6-1.0 X 12 ZINC
9	1	RAIN DEFLECTOR, CONTROLLER
10	1	SHELF, WAGO BLOCK CONNECTION
11	1	BRACKET, CIRCUIT BREAKER 2P
12	1	BACKPLATE, CIRCUIT BREAKER
13	1	SPACER, NEUTRAL BAR
14	2	GROUND BAR (4) 4-14 AWG CONNECTION
15	1	BUSHING, SNAP SB-687-8
16	2	PLUG, PLASTIC DOME 7/16”
17	1	GROMMET WIRE SLEEVE
18	1	CIRCUIT BREAKER 30A 2P 240V S BQ2 LB
19	3	SCREW HHTT M6-1.0 X 12 ZINC

ITEM	QTY.	DESCRIPTION
20	2	SCREW HHTT M5-0.8X16
21	4	SCREW PHTT M3-0.5 X 25 ZINC
22	1	SCREW HHFC M6-1.0 X 30 FTH
23	2	NUT FLANGE M6-1.0 NYLOK
24	2	NUT HEX M5-0.8 G8 CLEAR ZINC
25	1	WASHER LOCK EXT ¼” STL
26	13	SCREW SWT M6-1.0 X 16 ZINKLAD
27	1	TERMINAL BLOCK 3P UL 12-20 AWG
28	1	TERMINAL BLOCK 3P UL 12-20 AWG
29	1	CONTROL PANEL
30	1	PLUG, STEEL 1.0625
31	.94 FT	TRIM
32	1	NUT HEX FL WHIZ M6-1.0
33	2	GROUND WIRE – GND BAR
34	1	TIE WRAP
35	1	WIRE HARNESS 7KW AC (NOT SHOWN)
36	1	TIE WRAP
37	1	GND WIRE, ENG TO CONN BOX

GROUP EV

Powerhead

NOTE: Check www.generac.com for the most current, unit specific exploded views



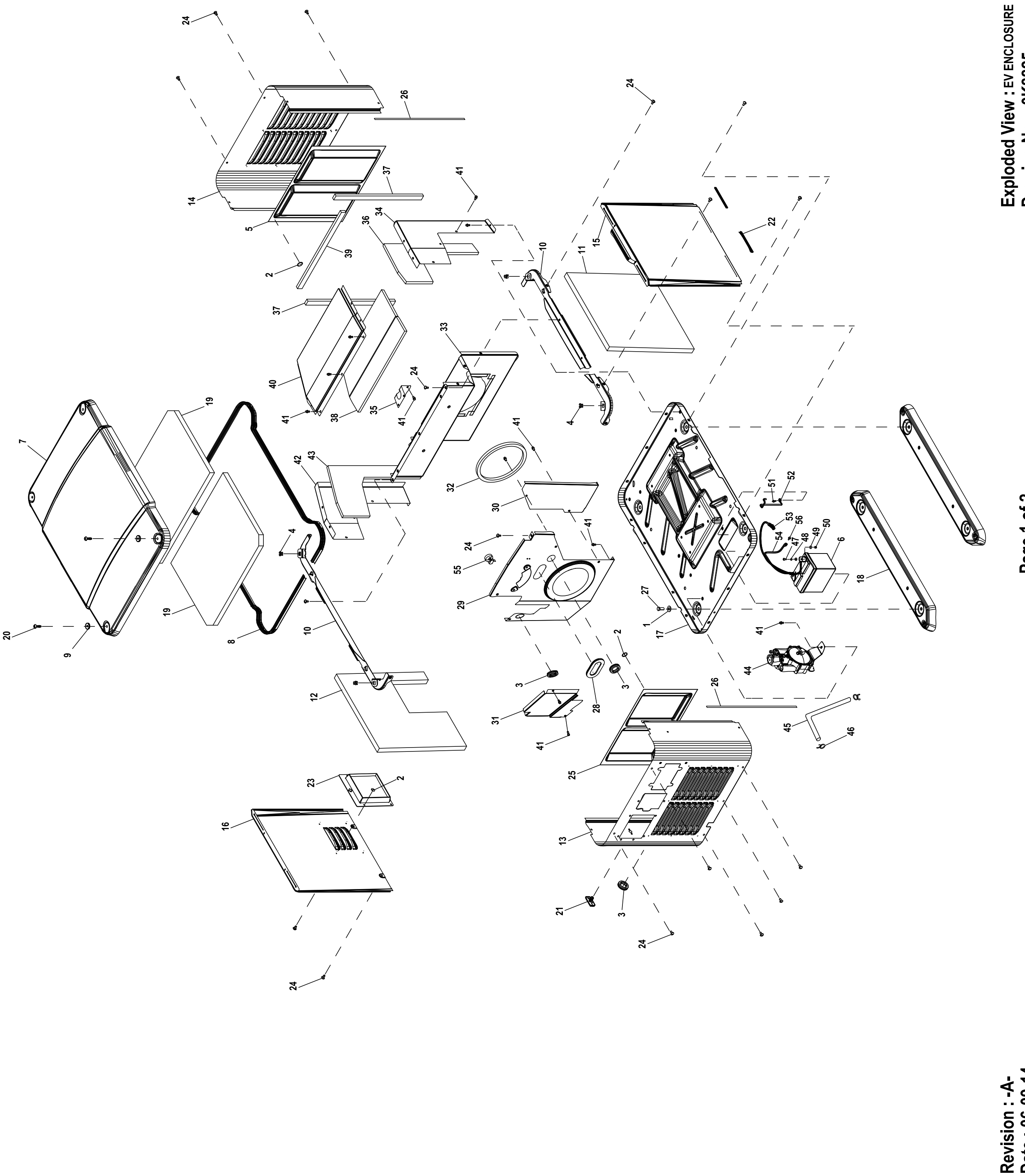
ITEM	QTY.	DESCRIPTION
1	4	SCREW HHTT M8-1.2 X 12 BP
2	1	MUFFLER
3	1	FLEX PIPE EXH MANI 420CC
4		
5	2	CLAMP BAND DIA 31-33mm
6		
7		
8	1	EXHAUST FAN 7KW D-DRIVE
9	1	BELLOWS, ALTERNATOR AIR IN
10	1	ALTERNATOR DUCT
11	1	AIRBOX COVER
12	1	BASE AIRBOX INTAKE 420cc
13	1	ROTOR BOLT HHC M10 – 1.25 X 335
14	6	VIBRATION ISOLATORS
15	6	NUT HEX FL WHIZ M10-1.25
16	1	GASKET INTAKE 432CC OHV
17	1	GASKET INTAKE 432CC OHV
18	2	NUT FLANGE M6-1.0 NYLOK
19	4	SCREW HHC M6-1.0 X 193 C8.8
20	1	ENGINE 420CC GASEOUS
21	1	BRUSH ASSEMBLY
22	1	SCREW HHFC M5-0.8 X 16
23	1	HOSE, BREATHER, 420CC
24	1	WASHER FLAT .406 ID X 1.62 OD
25	1	WASHER LOCK M10
26	1	COVER ENGINE BELL
27	1	FILTER AIR GTV530
28	1	ASSEMBLY THROTTLE BODY 420cc

ITEM	QTY.	DESCRIPTION
29	1	AVR
30	2	SCREW HHTT M5-0.8 X 16
31	1	ROTOR
32	1	STATOR
33	1	BEARING CARRIER
34	1	O-RING 50 X 1.5 NITRILE
35	1	MANIFOLD
36	2	STUD, INTAKE
37	1	JET REGULATOR (LP)
	1	JET REGULATOR (NG)
38	1	ANTI-LASH SPRING
39	1	LINKAGE
40	2	NUT, HEX M8 – 1.25 G8
41	1	HOSE 1/2" ID
42	1	SOLENOID
43	1	COTTER PIN
44	2	SCREW PPHM #4-40 X 3/8
45	3	SCREW HHFC M5 – 0.8 X 10
46	1	GOVERNOR SPRING
47	2	HOSE CLAMP
48		
49		
50		
51	1	HARNESS AVR (NOT SHOWN)
52	3	TIE WRAP
53	2.7FT	TAPE, FOAM 1/16” X 1/2”
54		

GROUP

Enclosure

NOTE: Check www.generac.com for the most current, unit specific exploded views



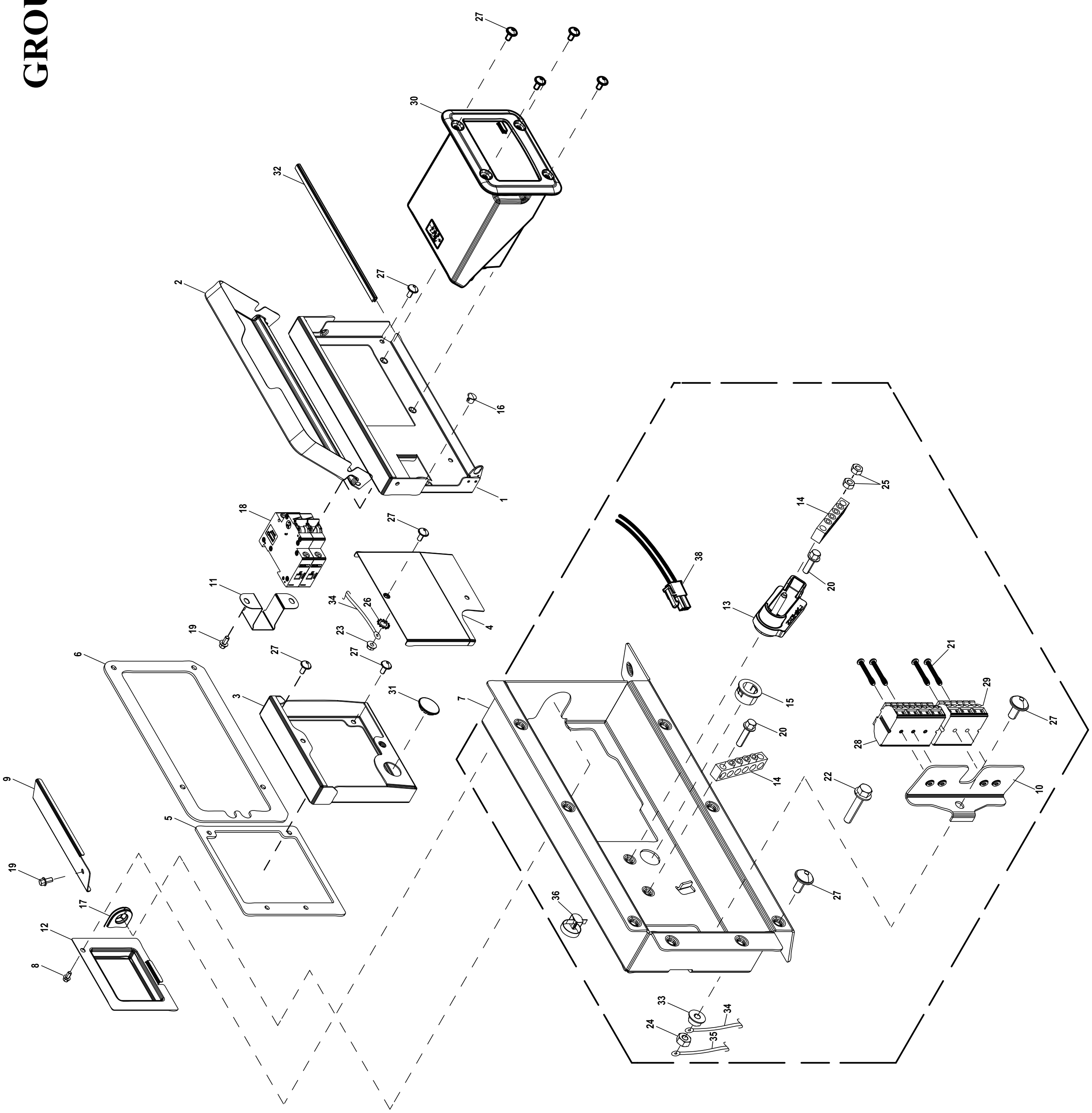
ITEM	QTY.	DESCRIPTION
1	4	WASHER FLAT M10 HEAVY DUTY
2	20	WASHER SELF LOCKING 1"DIA 12GA
3	3	GROMMET,38.1 CROSS SLIT W HOLE
4	4	PANEL CLIP, M6-1.00 EXPANSION
5	1	SCREEN - HSB LOUVERS
6	1	BATTERY
7	1	ROOF
8	9.85 FT	EDGE TRIM, 1/2" HOLLOW CYLINDER
9	4	GROMMET, ROOF
10	2	CROSS SUPPORT
11	1	FOAM,FRONT DOOR PANEL
12	1	FOAM,BACK DOOR PANEL
13	1	END PANEL ENGINE SIDE
14	1	END PANEL, EXHST SIDE
15	1	ACCESS PANEL, BISQUE
16	1	BACK PANEL
17	1	BASE
18	2	MOUNTING FOOT W/STEEL INSERT
19	2	FOAM ROOF
20	4	SCREW M6-1.0 X 30 ROOF
21	1	REGULATOR VENT
22	1.66 FT	TRIM FRONT PANEL
23	1	BELLOW COLLAR W/SCREEN
24	24	SCREW SWT M6-1.0 X 16 ZK
25	1	LOUVER SCREEN
26	6.50 FT	TAPE ELEC UL FOAM 1/8 X 1/2
27	4	SCREW HHC 3/8-16 X 1 G8
28	1	OVAL GROMMET

ITEM	QTY.	DESCRIPTION
29	1	ENGINE DIVIDER PNEL
30	1	BATTERY ACCESS PANEL
31	1	MIXER ACCESS PANEL
32	1	FOAM, ENGINE
33	1	EXHAUST DIVIDER PANEL
34	1	SIDE SHIELD, FRONT
35	1	GASKET, EXHAUST
36	1	FOAM, FRONT EXHAUST SHIELD
37	2	FOAM, BACK SHIELD
38	1	FOAM, TOP
39	1	FOAM, FRONT SHIELD
40	1	EXHAUST COVER
41	27	SCREW HHTT M6-1.0 X 12 ZINC
42	1	SIDE SHIELD, BACK
43	1	FOAM, BACK EXHAUST SHIELD
44	1	FUEL REGULATOR
45	1 FT	1/2 HOSE
46	2	HOSE CLAMP
47	2	SCREW HHC 1/4 - 20 X 3/4
48	2	WASHER LOCK M6 – 1/4
49	4	WASHER FLAT 1/4 - M6 ZINC
50	2	NUT HEX 1/4 - 20 STEEL
51	1	SCREW HHTT M6 – 1.0 X 16
52	1	HOLD DOWN BRACKET, BATTERY
53	1	CABLE BATTERY RED
54	1	CABLE BATTERY BLACK
55	1	TIE WRAP
56	1	SCREW HHFC M6-1.0 X 12 G8.8

Control Panel

NOTE: Check www.generac.com for the most current, unit specific exploded views

GROUP



Exploded View : EV CONTROLLER 50HZ
Drawing No. : 0K9279

Page 1 of 2

Revision : -A-
Date : 07-23-14

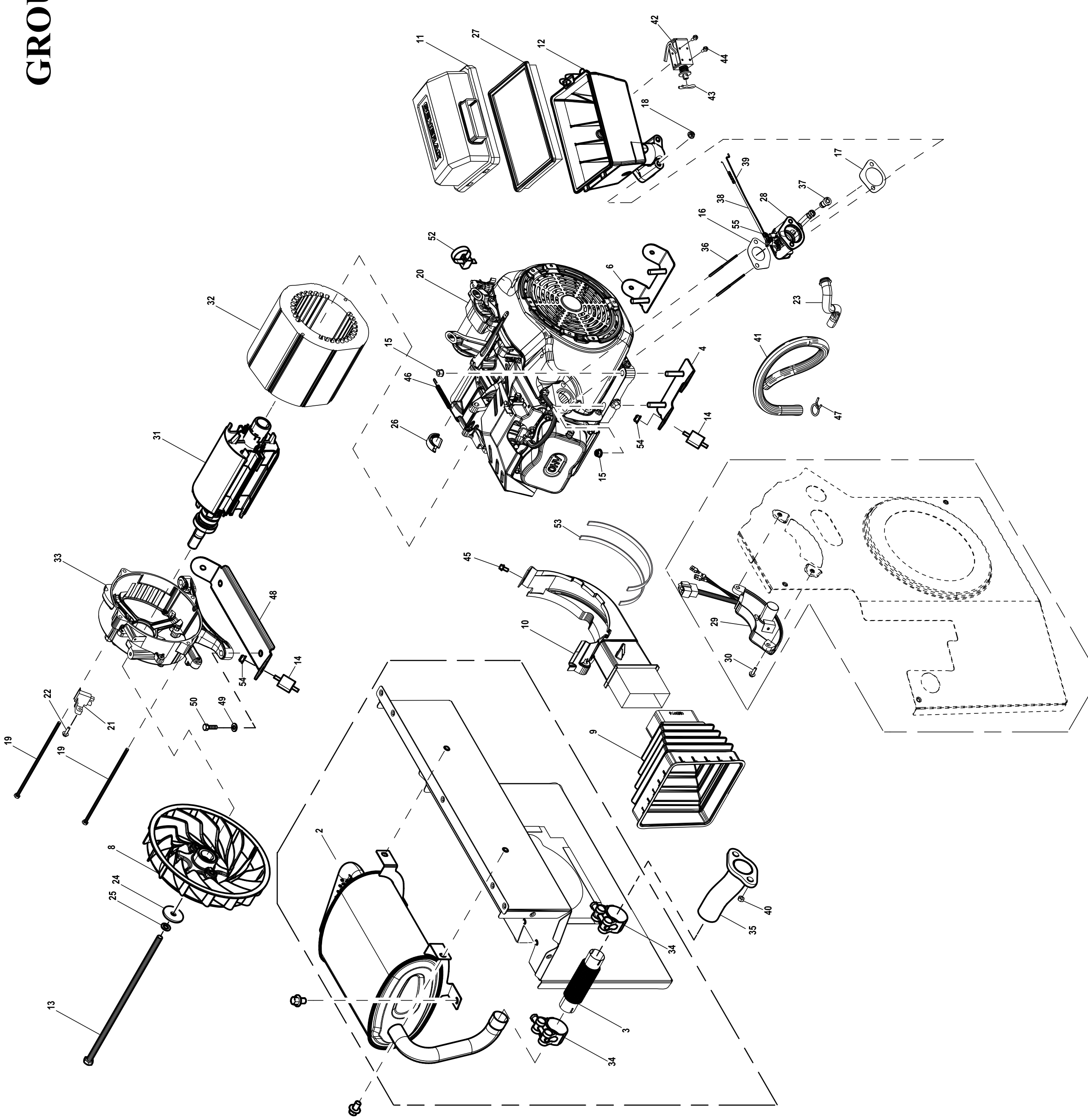
ITEM	QTY.	DESCRIPTION
1	1	CONTROLLER FRAME 50HZ
2	1	CONTROLLER LID
3	1	FRAME, CONDUIT
4	1	WELDMENT, DEAD FRONT COVER
5	1	GASKET, FIELD CONNECTION COVER
6	1	GASKET, CONTROLLER FASCIA
7	1	CIRCUIT BREAKER BOX
8	1	SCREW HHTT M5-0.8 X 10 BP
9	1	RAIN DEFLECTOR, CONTROLLER
10	1	SHELF, WAGO BLOCK CONNECTION
11	1	BRACKET, CIRCUIT BREAKER 2P
12	1	BACKPLATE, CIRCUIT BREAKER
13	1	SPACER, NEUTRAL BAR
14	2	GROUND BAR (4) 4-14 AWG CONNECTION
15	1	BUSHING, SNAP SB-687-8
16	2	PLUG, PLASTIC DOME 7/16”
17	1	GROMMET WIRE SLEEVE
18	1	CIRCUIT BREAKER 32A 2P-PLSM-C32/2
19	3	SCREW HHTT M6-1.0 X 12 ZINC
20	2	SCREW HHTT M5-0.8X16
21	4	SCREW PHTT M3-0.5 X 25 ZINC

ITEM	QTY.	DESCRIPTION
22	1	SCREW HHFC M6-1.0 X 30 FTH
23	1	NUT TOP LOCK FL M6-1.0
24	2	NUT FLANGE M6-1.0 NYLOK
25	2	NUT HEX M5-0.8 G8 CLEAR ZINC
26	1	WASHER LOCK EXT ¼” STL
27	13	SCREW SWT M6-1.0 X 16 ZINKLAD
28	1	TERMINAL BLOCK 4P UL 12-20 AWG
29	1	TERMINAL BLOCK 3P UL 12-20 AWG
30	1	CONTROL PANEL
31	1	PLUG, STEEL 1.0625
32	.96 FT	TRIM
33	1	NUT HEX FL WHIZ M6-1.0
34	2	GROUND WIRE – GND BAR
35	1	GROUND WIRE – CONNECTION BOX TO BASE
36	1	TIE WRAP
37	1	WIRE HARNESS 5.6KVA AC
38	1	HARN AUX 50HZ PPACT
39	1	FERRULE, 8AWG

Powerhead

NOTE: Check www.generac.com for the most current, unit specific exploded views

GROUP



Exploded View : EV POWERHEAD 50HZ
Drawing No. : 0K9278

Page 1 of 2

Revision : K-2409-B
Date : 04-07-15

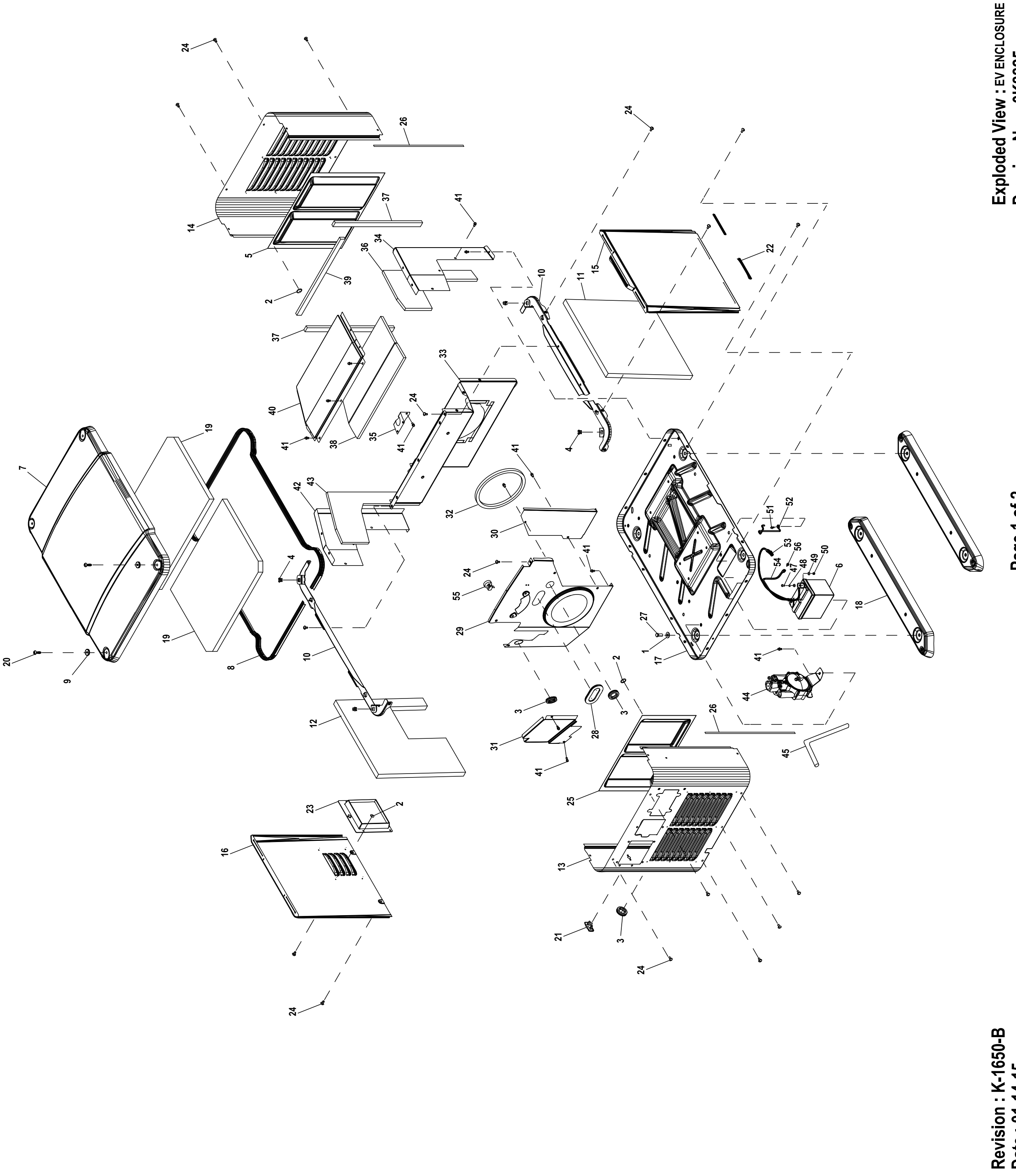
ITEM	QTY.	DESCRIPTION
1	4	SCREW HHTT M8-1.2 X 12 BP
2	1	SM DISP MFLR FULL TUBE INLETS
3	1	FLEX PIPE EXH MANI 420CC
4	1	ENGINE MOUNTING BRKT WLDMNT
5	1	CLAMP BAND DIA 31-33mm
6	1	ENGINE MOUNTING BRKT WLDMNT
7	1	TAILPIPE WITH BEND AND CAP
8	1	EXHAUST FAN 7KW D-DRIVE
9	1	BELLOWS, ALTERNATOR AIR IN
10	1	ALTERNATOR DUCT
11	1	AIRBOX COVER
12	1	BASE AIRBOX INTAKE 420cc
13	1	ROTOR BOLT HHC M10 – 1.25 X 335
14	6	VIB MNT 1.5 X 1.38 X 5/16-18
15	4	NUT HEX FL WHIZ M10-1.25
16	1	GASKET INTAKE 432CC OHV
17	1	GASKET INTAKE 432CC OHV
18	2	NUT FLANGE M6-1.0 NYLOK
19	4	SCREW HHC M6-1.0 X 193 C8.8
20	1	ENGINE 420CC GASEOUS
21	1	BRUSH ASSEMBLY
22	1	SCREW HHFC M5-0.8 X 16
23	1	HOSE, BREATHER, 420CC
24	1	WASHER FLAT .406 ID X 1.62 OD
25	1	WASHER LOCK M10
26	1	COVER ENGINE BELL
27	1	FILTER AIR GTV530
28	1	ASSEMBLY THROTTLE BODY 420cc

ITEM	QTY.	DESCRIPTION
29	1	AVR
30	2	SCREW HHTT M5-0.8 X 16
31	1	ROTOR
32	1	STATOR
33	1	BEARING CARRIER
34	1	CLAMP BAND 29-31mm
35	1	MANIFOLD
36	2	STUD, INTAKE
37	1	JET REGULATOR (LP)
37	1	JET REGULATOR (NG)
38	1	ANTI-LASH SPRING
39	1	LINKAGE
40	2	NUT, HEX M8 – 1.25 G8
41	1	HOSE 1/2" ID
42	1	SOLENOID
43	1	COTTER PIN
44	2	SCREW PPHM #4-40 X 3/8
45	3	SCREW HHFC M5 – 0.8 X 10
46	1	GOVERNOR SPRING
47	2	HOSE CLAMP
48	1	ALT MOUNTING BRKT WLDMNT
49	2	WASHER FLAT M10
50	2	SCREW HHC M10-1.5 X 30 C8.8
51	1	HARNESS AVR (NOT SHOWN)
52	3	TIE WRAP
53	2.7FT	TAPE, FOAM 1/16” X 1/2”
54	6	NUT FLANGE 5/16-18 NYLOK
55	1	GOVERNOR ROD BUSHING

GROUP

Enclosure

NOTE: Check www.generac.com for the most current, unit specific exploded views



ITEM	QTY.	DESCRIPTION
1	4	WASHER FLAT M10 HEAVY DUTY
2	20	WASHER SELF LOCKING 1"DIA 12GA
3	3	GROMMET,38.1 CROSS SLIT W HOLE
4	4	PANEL CLIP, M6-1.00 EXPANSION
5	1	SCREEN - HSB LOUVERS
6	1	BATTERY
7	1	ROOF
8	9.85 FT	EDGE TRIM, 1/2" HOLLOW CYLINDER
9	4	GROMMET, ROOF
10	2	CROSS SUPPORT
11	1	FOAM,FRONT DOOR PANEL
12	1	FOAM,BACK DOOR PANEL
13	1	END PANEL ENGINE SIDE
14	1	END PANEL, EXHST SIDE
15	1	ACCESS PANEL, BISQUE
16	1	BACK PANEL
17	1	BASE
18	2	MOUNTING FOOT W/STEEL INSERT
19	2	FOAM ROOF
20	4	SCREW M6-1.0 X 30 ROOF
21	1	REGULATOR VENT
22	1.66 FT	TRIM FRONT PANEL
23	1	BELLOW COLLAR W/SCREEN
24	24	SCREW SWT M6-1.0 X 16 ZK
25	1	LOUVER SCREEN
26	6.50 FT	TAPE ELEC UL FOAM 1/8 X 1/2
27	4	SCREW HHC 3/8-16 X 1 G8
28	1	OVAL GROMMET
29	1	ENGINE DIVIDER PNEL

ITEM	QTY.	DESCRIPTION
30	1	BATTERY ACCESS PANEL
31	1	MIXER ACCESS PANEL
32	1	FOAM, ENGINE
33	1	EXHAUST DIVIDER PANEL
34	1	SIDE SHIELD, FRONT
35	1	GASKET, EXHAUST
36	1	FOAM, FRONT EXHAUST SHIELD
37	2	FOAM, BACK SHIELD
38	1	FOAM, TOP
39	1	FOAM, FRONT SHIELD
40	1	EXHAUST COVER
41	27	SCREW HHTT M6-1.0 X 12 ZINC
42	1	SIDE SHIELD, BACK
43	1	FOAM, BACK EXHAUST SHIELD
44	1	FUEL REGULATOR
45	1 FT	HOSE VENT ½”
46		
47	2	SCREW HHC 1/4 - 20 X 3/4
48	2	WASHER LOCK M6 – 1/4
49	4	WASHER FLAT 1/4 - M6 ZINC
50	2	NUT HEX 1/4 - 20 STEEL
51	1	SCREW HHTT M6 – 1.0 X 16
52	1	HOLD DOWN BRACKET, BATTERY
53	1	CABLE BATTERY RED
54	1	CABLE BATTERY BLACK
55	1	TIE WRAP
56	1	SCREW HHFC M6-1.0 X 12 G8.8

PART 6 - ELECTRICAL DATA

Wiring Diagram –
Drawing 0H7182-C (CorePower) 130

Electrical Schematic –
Drawing 0H7182-C (CorePower) 131

Wiring Diagram –
Drawing 0K7328-C (60 Hz PowerPact 1 of 4) 132

Wiring Diagram –
Drawing 0K7328-C (60 Hz PowerPact 2 of 4) 133

Electrical Schematic –
Drawing 0K7328-C (60 Hz PowerPact 3 of 4) 134

Electrical Schematic –
Drawing 0K7328-C (60 Hz PowerPact 4 of 4) 135

Wiring Diagram –
Drawing 0K7876-D (50 Hz PowerPact 1 of 4) 136

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Drawing 0K5879-B (50 Amp Transfer Switch) 140

Electrical Schematic –
Drawing 0K5881-B (50 Amp Transfer Switch) 142

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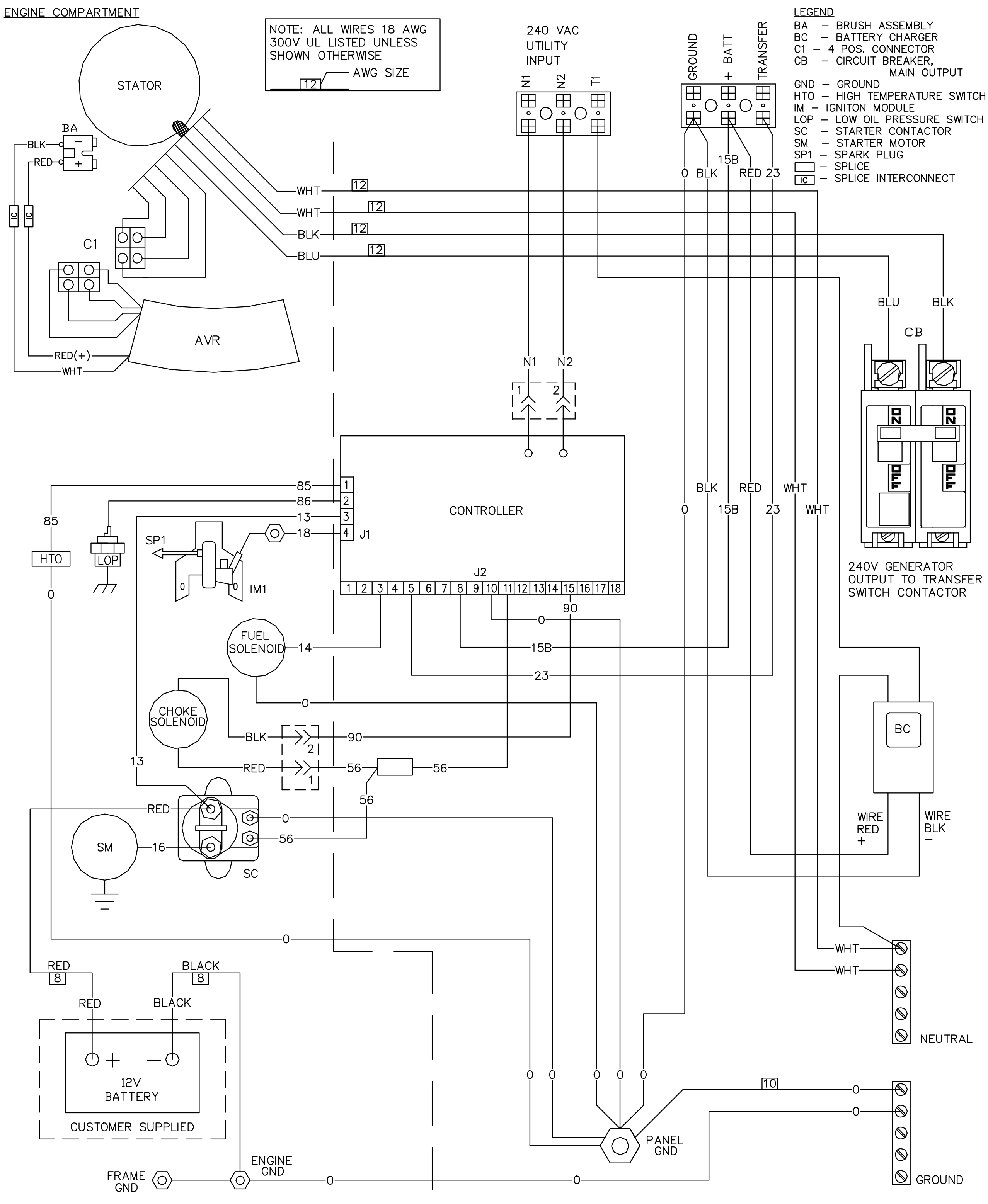
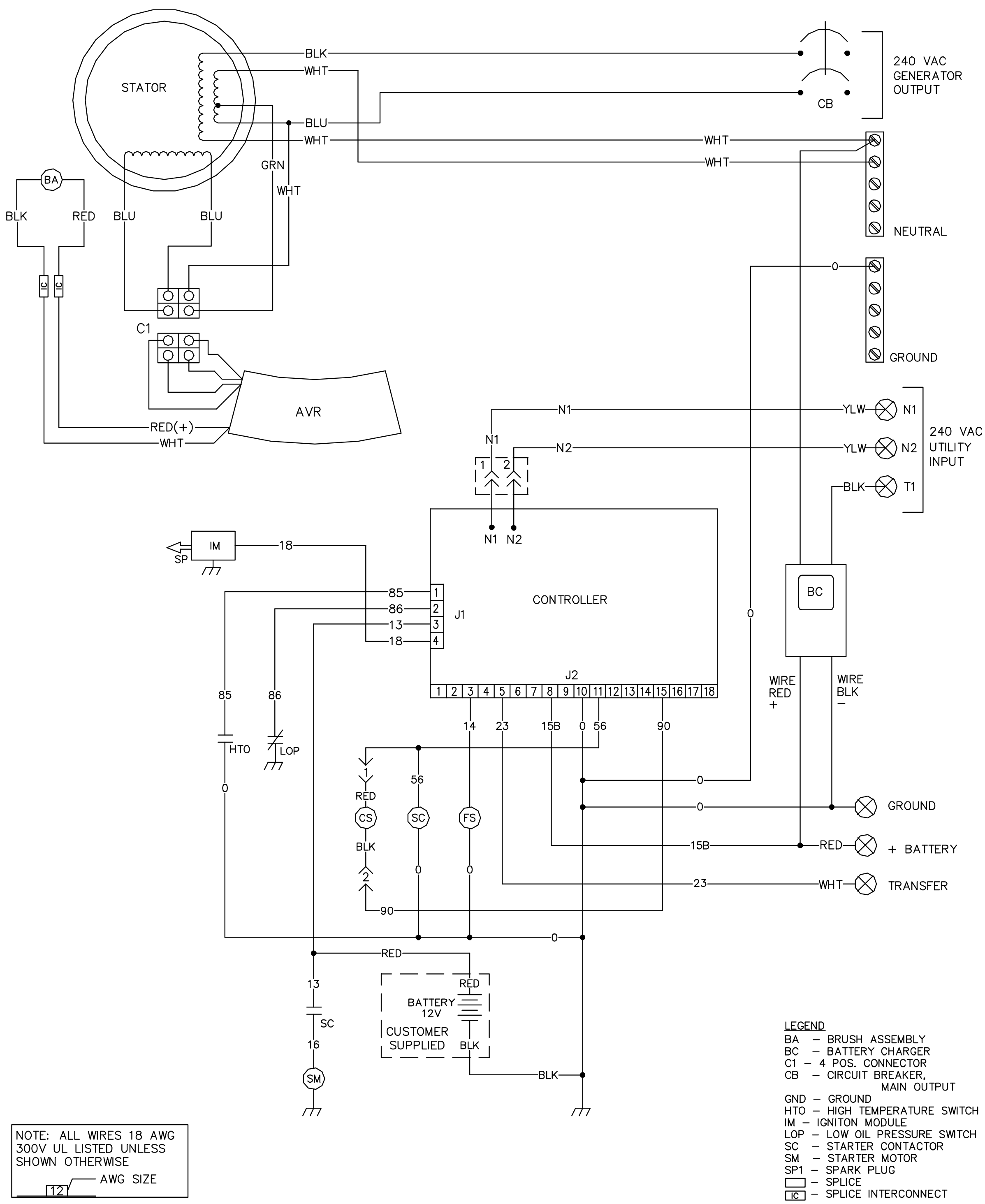
Wiring Diagram – Drawing 0H7182-C (CorePower 1 of 2)

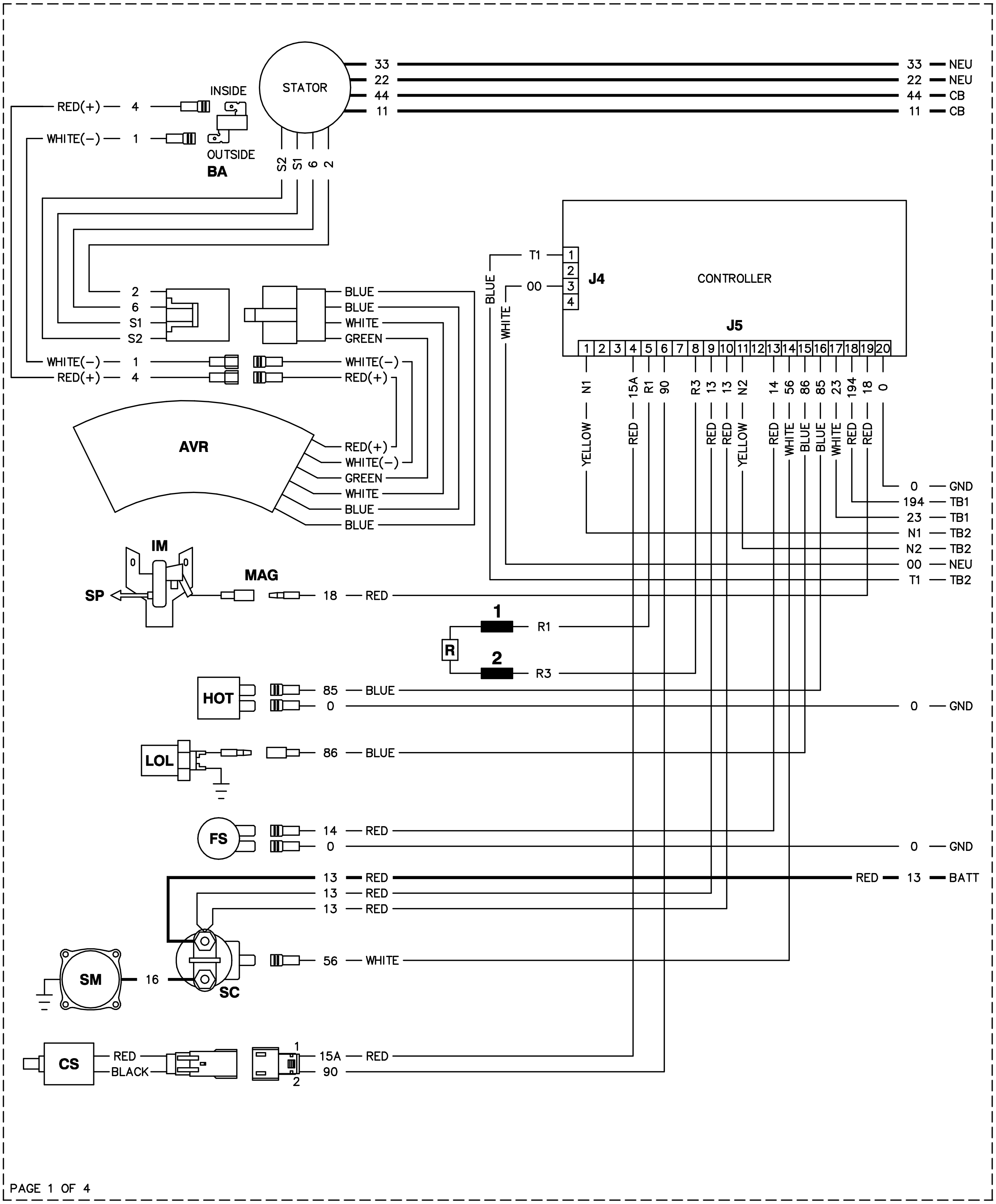


Electrical Schematic – Drawing 0H7182-C (CorePower 2 of 2)



Wiring Diagram – Drawing 0K7328-C (60 Hz PowerPact 1 of 4)

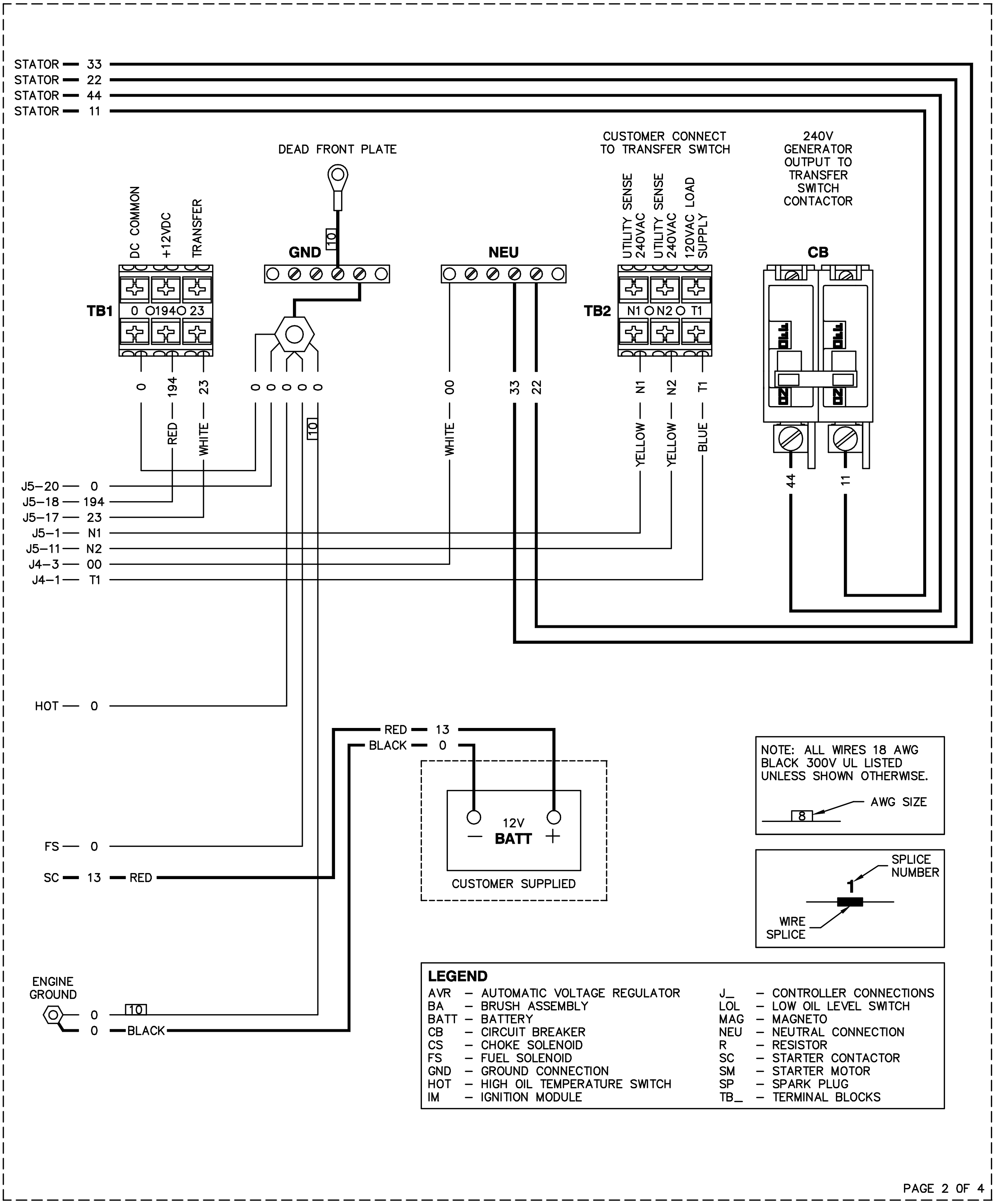
GROUP G



WIRING - DIAGRAM
REVISION: K-1258-C
7KW AC POWER PACT 60HZ
DATE: 12/5/14
PAGE 1 OF 4
DRAWING #: 0K7328

Wiring Diagram – Drawing 0K7328-C (60 Hz PowerPact 2 of 4)

GROUP G

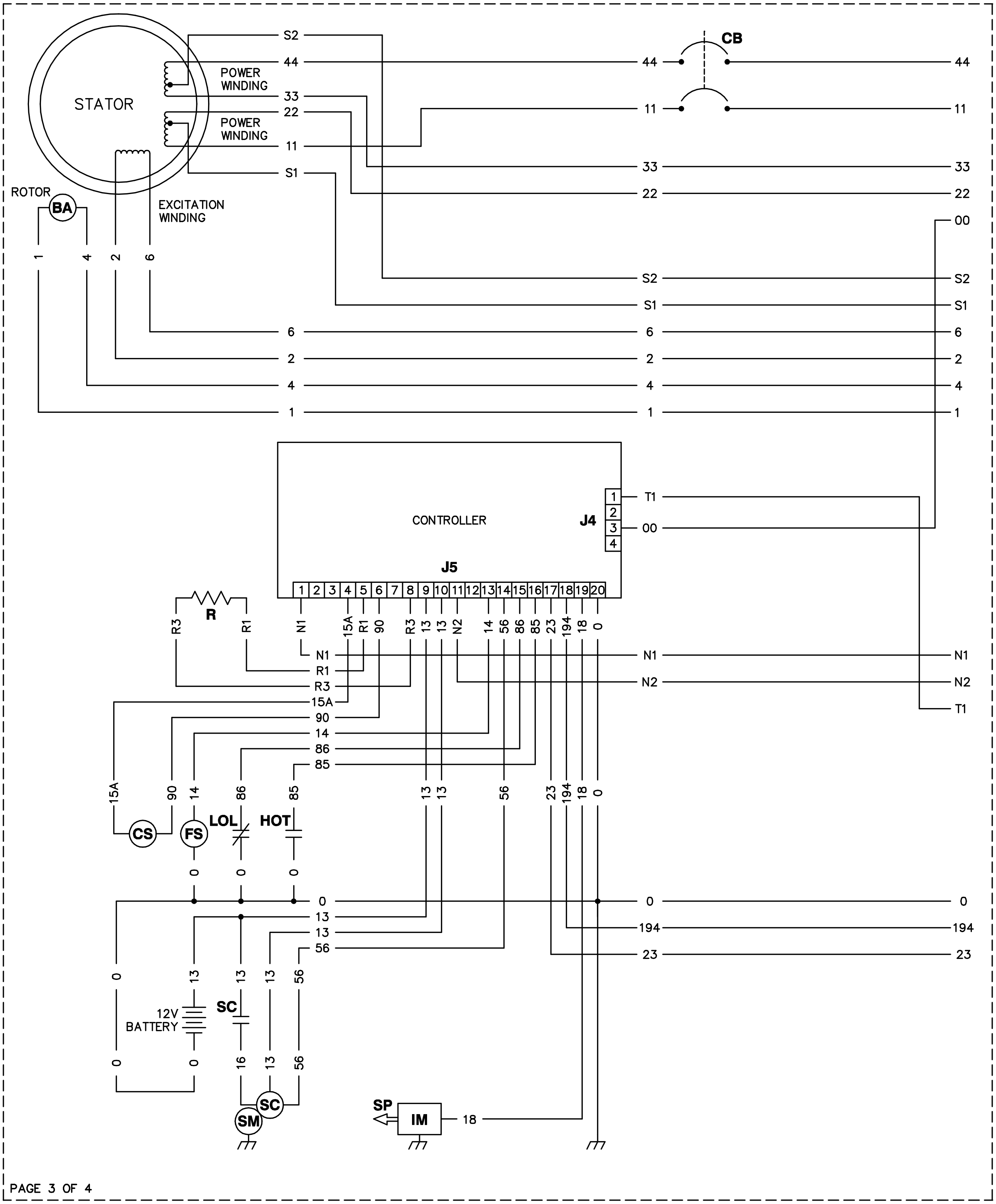


WIRING - DIAGRAM
7KW AC POWER PACT 60HZ
DRAWING #: 0K7328

REVISION: K-1258-C
DATE: 12/5/14
PAGE 2 OF 4

Electrical Schematic – Drawing 0K7328-C (60 Hz PowerPact 3 of 4)

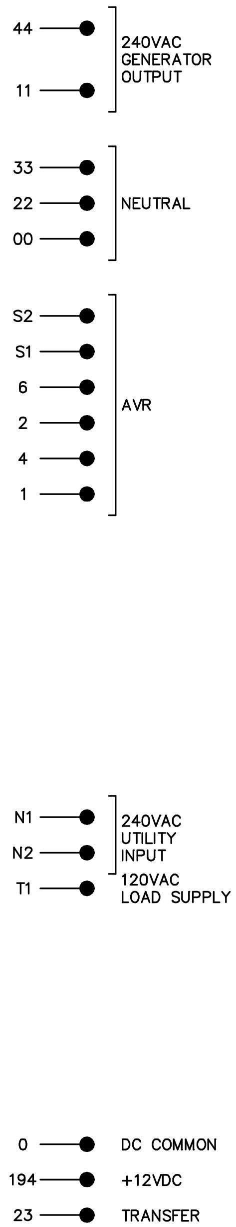
GROUP G



SCHEMATIC - DIAGRAM
7KW AC POWER PACT 60HZ
REVISION: K-1258-C
DATE: 12/5/14
PAGE 3 OF 4
DRAWING #: 0K7328

Electrical Schematic – Drawing 0K7328-C (60 Hz PowerPact 4 of 4)

GROUP G



LEGEND

AVR	– AUTOMATIC VOLTAGE REGULATOR	J_	– CONTROLLER CONNECTIONS
BA	– BRUSH ASSEMBLY	LOL	– LOW OIL LEVEL SWITCH
CB	– CIRCUIT BREAKER (MAIN OUTPUT)	R	– RESISTOR
CS	– CHOKE SOLENOID	SC	– STARTER CONTACTOR
FS	– FUEL SOLENOID	SM	– STARTER MOTOR
HOT	– HIGH OIL TEMPERATURE SWITCH	SP	– SPARK PLUG
IM	– IGNITION MODULE		

PAGE 4 OF 4

SCHEMATIC - DIAGRAM

REVISION: K-1258-C

7KW AC POWER PACT 60HZ

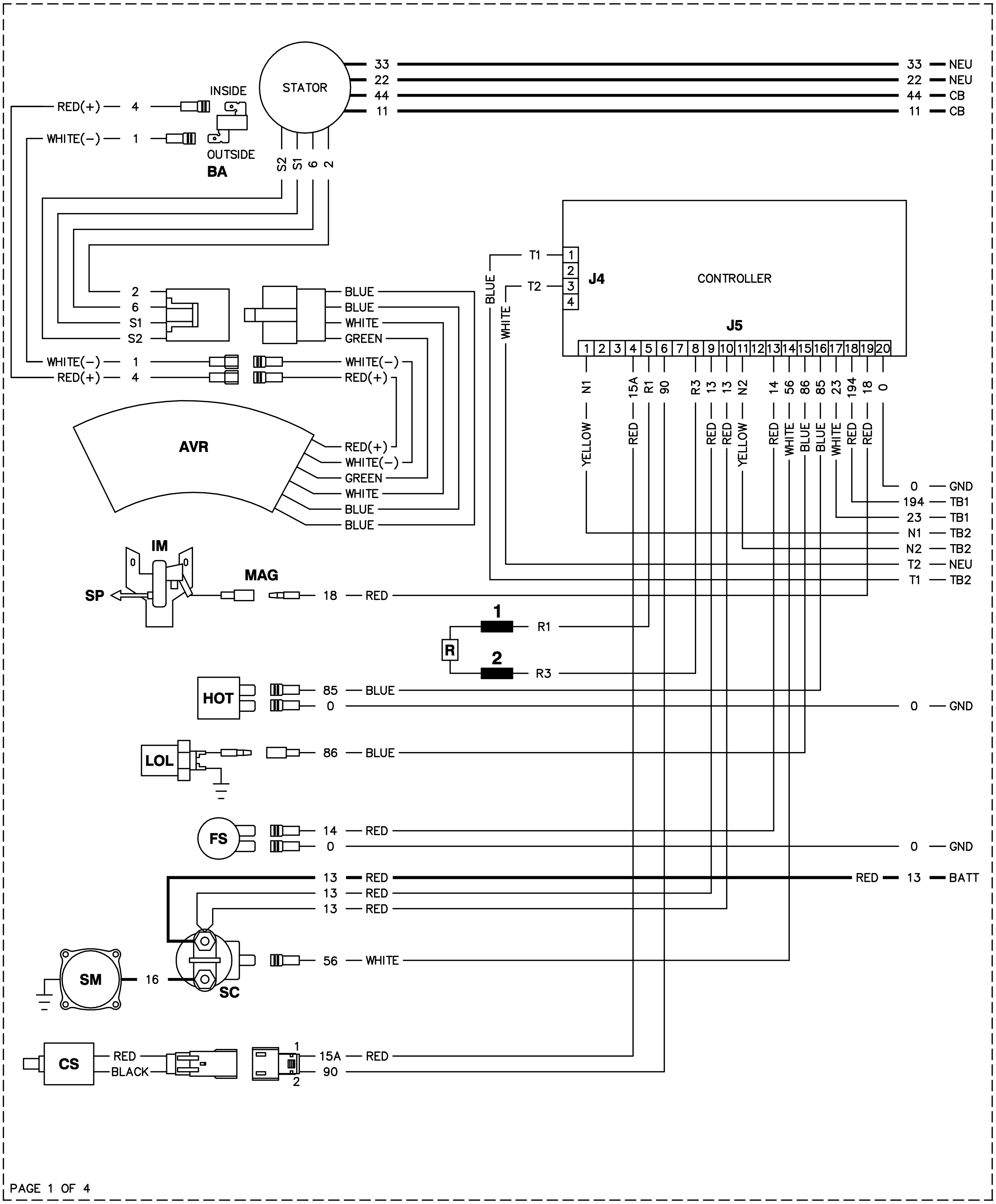
DATE: 12/5/14

PAGE 4 OF 4

DRAWING #: 0K7328

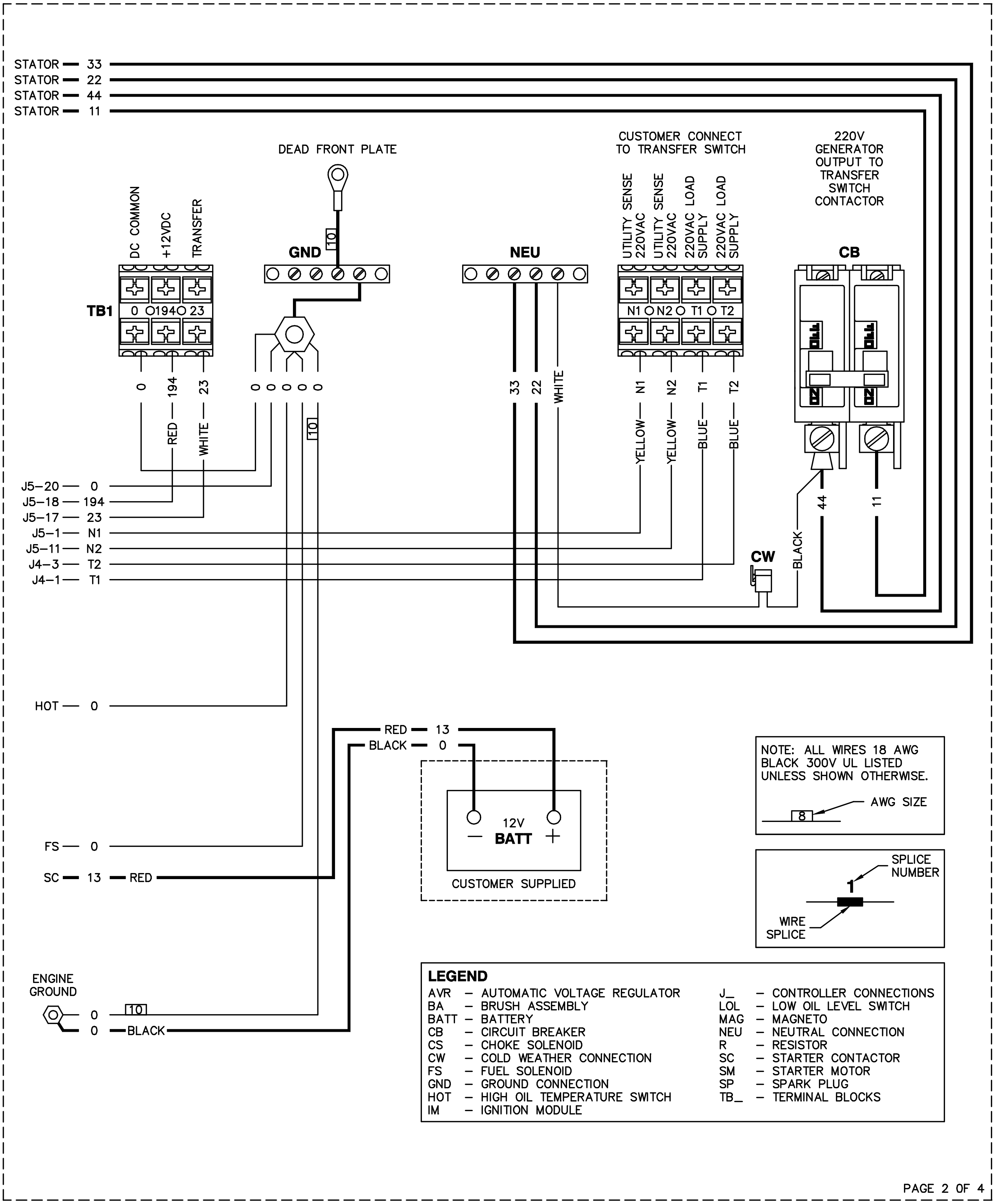
Wiring Diagram – Drawing 0K7876-D (50 Hz PowerPact 1 of 4)

GROUP G



Wiring Diagram – Drawing 0K7876-D (50 Hz PowerPact 2 of 4)

GROUP G



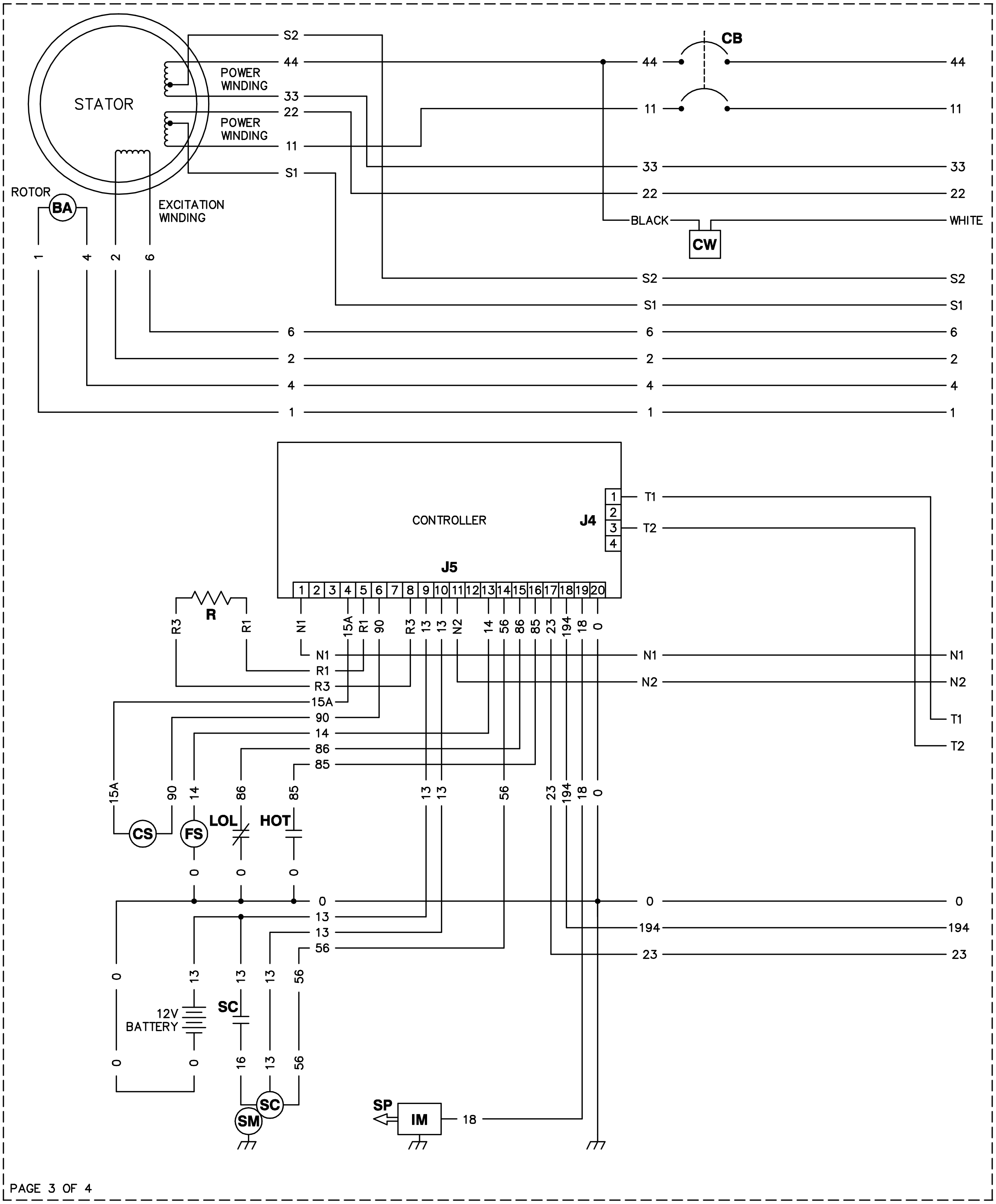
WIRING - DIAGRAM

REVISION: K-2275-D — 5.6KVA AC POWER PACT 50HZ

DATE: 3/16/15 — PAGE 2 OF 4 — DRAWING #: 0K7876

Electrical Schematic – Drawing 0K7876-D (50 Hz PowerPact 3 of 4)

GROUP G



SCHEMATIC - DIAGRAM

REVISION: K-2275-D

5.6KVA AC POWER PACT 50HZ

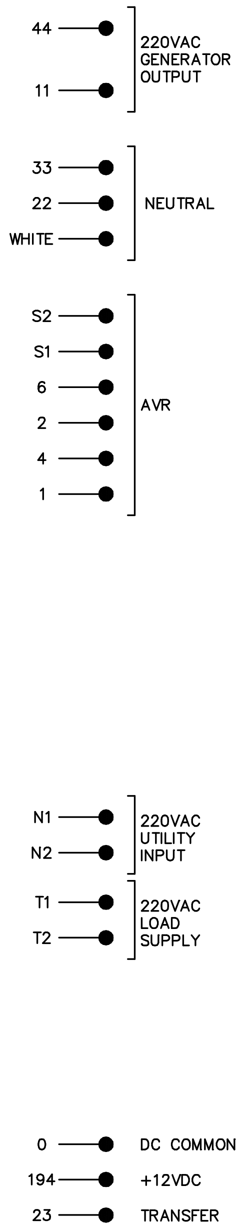
DATE: 3/16/15

PAGE 3 OF 4

DRAWING #: 0K7876

Electrical Schematic – Drawing 0K7876-D (50 Hz PowerPact 4 of 4)

GROUP G



LEGEND

AVR	– AUTOMATIC VOLTAGE REGULATOR	IM	– IGNITION MODULE
BA	– BRUSH ASSEMBLY	J_	– CONTROLLER CONNECTIONS
CB	– CIRCUIT BREAKER (MAIN OUTPUT)	LOL	– LOW OIL LEVEL SWITCH
CS	– CHOKE SOLENOID	R	– RESISTOR
CW	– COLD WEATHER CONNECTION	SC	– STARTER CONTACTOR
FS	– FUEL SOLENOID	SM	– STARTER MOTOR
HOT	– HIGH OIL TEMPERATURE SWITCH	SP	– SPARK PLUG

PAGE 4 OF 4

SCHEMATIC - DIAGRAM

REVISION: K-2275-D

5.6KVA AC POWER PACT 50HZ

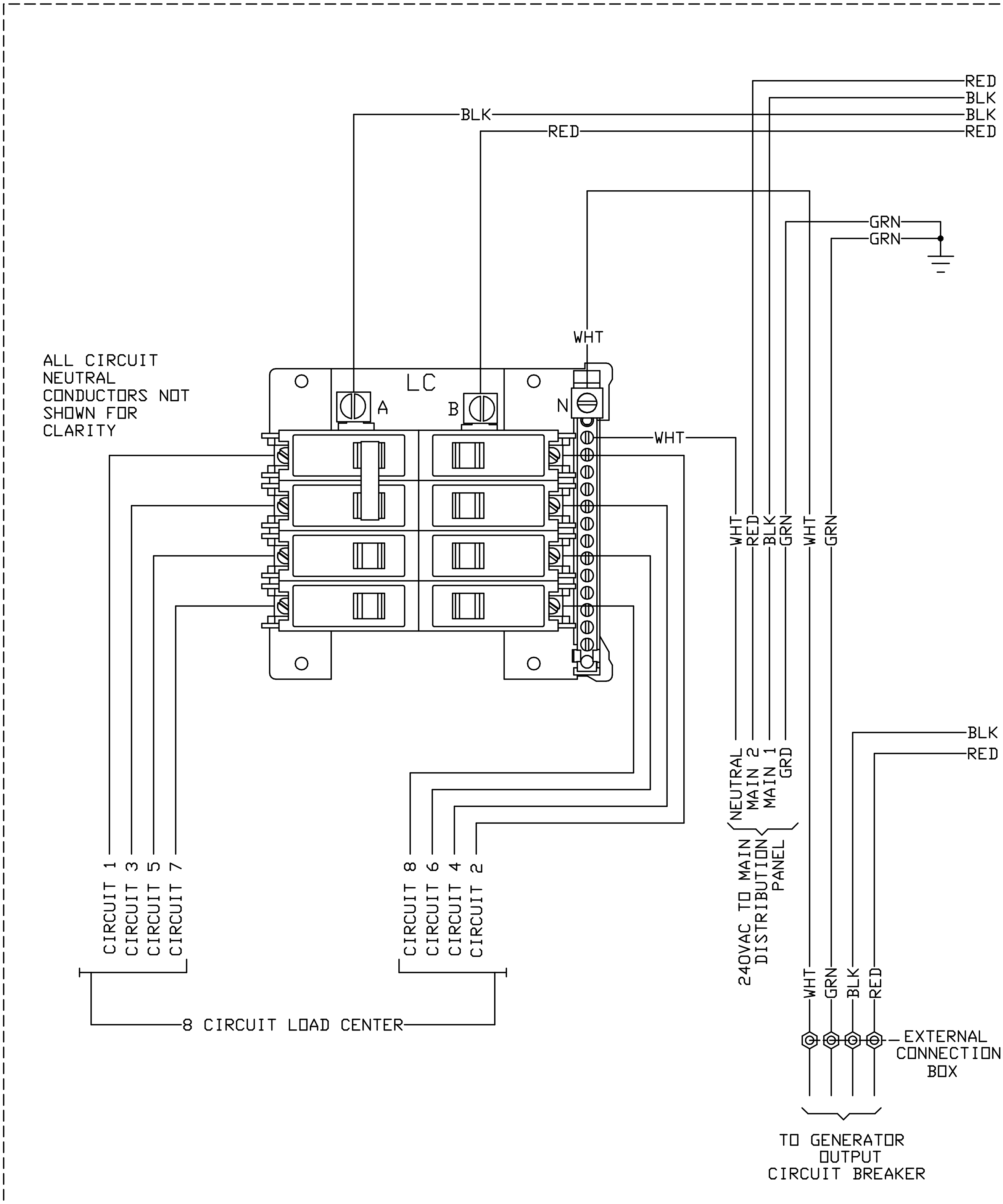
DATE: 3/16/15

PAGE 4 OF 4

DRAWING #: 0K7876

Wiring Diagram – Drawing 0K5879-B (50 Amp Transfer Switch 1 of 2)

GROUP G



WIRING - DIAGRAM

REVISION: J-8705-B

HSB TRANSFER SWITCH 50A

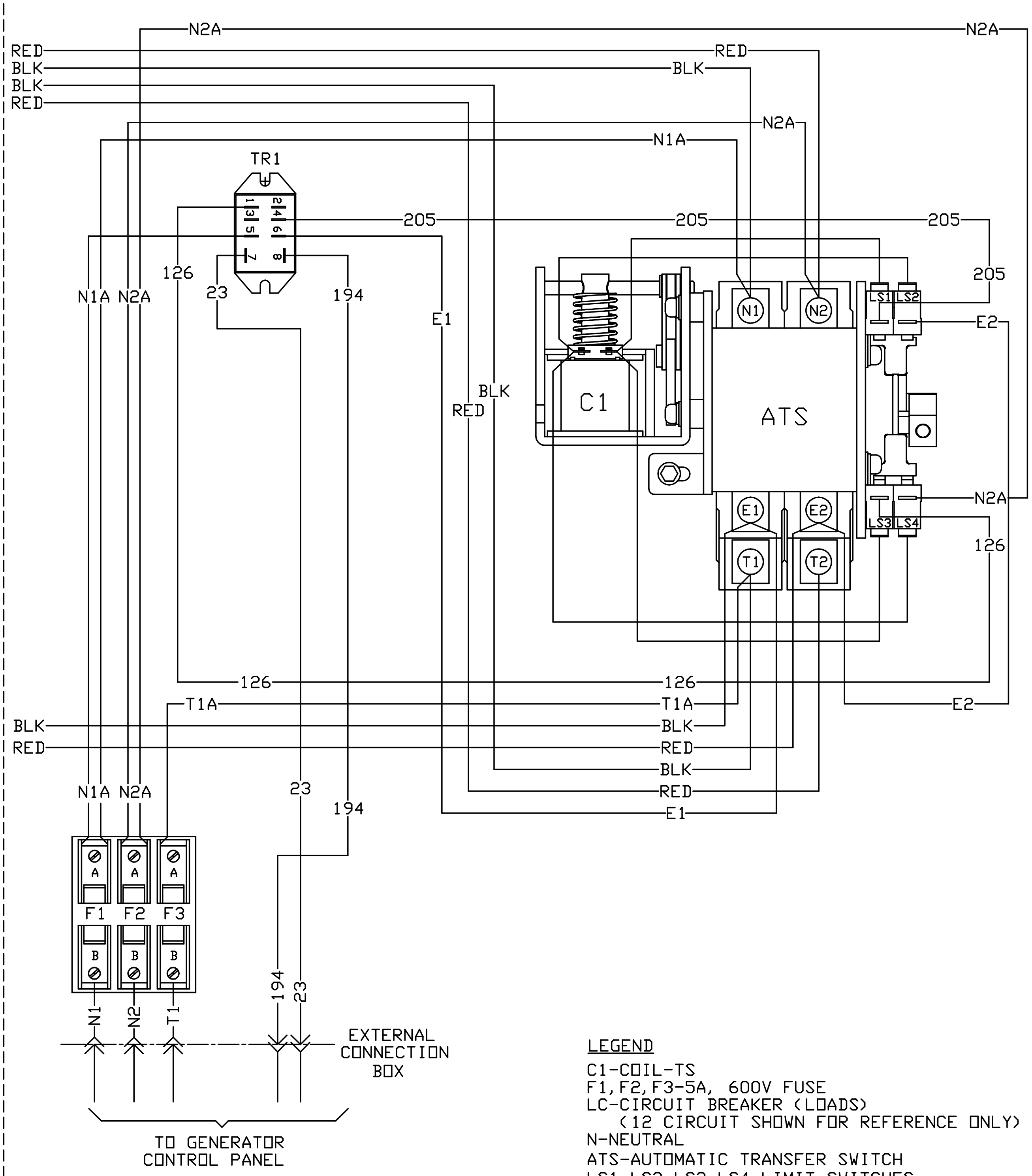
DATE: 5/12/14

PAGE 1 OF 2

DRAWING #: 0K5879

Wiring Diagram – Drawing 0K5879-B (50 Amp Transfer Switch 2 of 2)

GROUP G



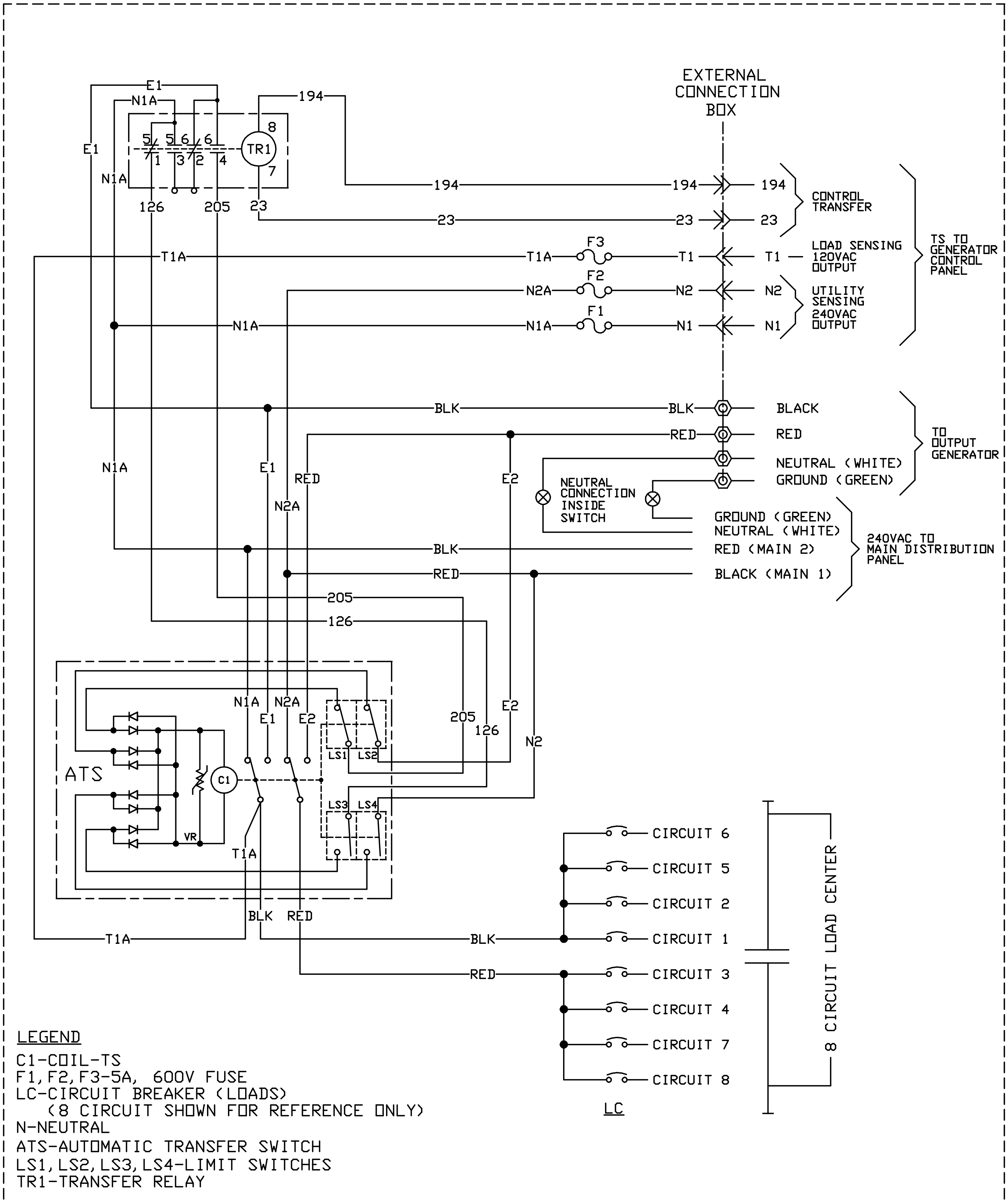
LEGEND
C1-COIL-TS
F1,F2,F3-5A, 600V FUSE
LC-CIRCUIT BREAKER (LOADS)
(12 CIRCUIT SHOWN FOR REFERENCE ONLY)
N-NEUTRAL
ATS-AUTOMATIC TRANSFER SWITCH
LS1,LS2,LS3,LS4-LIMIT SWITCHES
TR1-TRANSFER RELAY

WIRING - DIAGRAM
HSB TRANSFER SWITCH 50A
DRAWING #: 0K5879

REVISION: J-8705-B
DATE: 5/12/14
PAGE 2 OF 2

Electrical Schematic – Drawing 0K5881-B (50 Amp Transfer Switch 1 of 2)

GROUP G



SCHEMATIC - DIAGRAM

REVISION: J-8705-B

HSB TRANSFER SWITCH 50A

DATE: 5/12/14

PAGE 1 OF 2

DRAWING #: 0K5881

Electrical Schematic – Drawing 0K5881-B (50 Amp Transfer Switch 2 of 2)

GROUP G

SCHEMATIC - DIAGRAM

REVISION: J-8705-B

HSB TRANSFER SWITCH 50A

DATE: 5/12/14

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DRAWING #: 0K5881

Electrical Formulas

TO FIND	KNOWN VALUES	1-PHASE
KILOWATTS (kW)	Volts, Current, Power Factor	$\frac{E \times I}{1000}$
kVA	Volts, Current	$\frac{E \times I}{1000}$
AMPERES	kW, Volts, Power Factor	$\frac{kW \times 1000}{E}$
WATTS	Volts, Amps, Power Factor	Volts x Amps
NO. OF ROTOR POLES	Frequency, RPM	$\frac{2 \times 60 \times \text{Frequency}}{\text{RPM}}$
FREQUENCY	RPM, No. of Rotor Poles	$\frac{\text{RPM} \times \text{Poles}}{2 \times 60}$
RPM	Frequency, No. of Rotor Poles	$\frac{2 \times 60 \times \text{Frequency}}{\text{Rotor Poles}}$
kW (required for Motor)	Motor Horsepower, Efficiency	$\frac{HP \times 0.746}{\text{Efficiency}}$
RESISTANCE	Volts, Amperes	$\frac{E}{I}$
VOLTS	Ohm, Amperes	I x R
AMPERES	Ohms, Volts	$\frac{E}{R}$

E = VOLTS   I = AMPERES   R = RESISTANCE (OHMS)   PF = POWER FACTOR

APPENDIX A - SUPPLEMENTAL WORKSHEETS

Test 4 Results 146
Test 9 Results - CorePower 147
Test 9 Results - PowerPact.. 147
Test 73 Results 148

Table 1
Test 4 Results

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Test 4 Results, Serial #________________________		
Test Point	Results	
Rotor Resistance		Ohms
Battery Voltage		VDC
Blue to Blue Voltage		VAC
White and Green Voltage		VAC
Static Rotor Amp Draw		Amps
Running Rotor Amp Draw		Amps
Column Identified		

Tables 10 and 11
Test 9 Stator Results

Test 9 Results - CorePower Serial #________________________		
Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue Wire	Stator Lead Black Wire	
Stator Lead Blue Wire	C1 Pin 3 (White Wire)	
Stator Lead Blue Wire	C1 Pin 4 (Green Wire)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead Black Wire	
Ground	C1 Pin 1 Wire 44 (Blue Wire)	
Ground	C1 Pin 4 (Green Wire)	
Shorted Condition		
C1 Pin 1 (Blue Wire)	Stator Lead Blue Wire	

Test 9 Results - CorePower Serial #________________________		
Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue Wire	Stator Lead Black Wire	
Stator Lead Blue Wire	C1 Pin 3 (White Wire)	
Stator Lead Blue Wire	C1 Pin 4 (Green Wire)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead Black Wire	
Ground	C1 Pin 1 Wire 44 (Blue Wire)	
Ground	C1 Pin 4 (Green Wire)	
Shorted Condition		
C1 Pin 1 (Blue Wire)	Stator Lead Blue Wire	

Test 9 Results - PowerPact Serial #________________________		
Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue (Wire 2)	Stator Lead Blue (Wire 6)	
Stator Lead (Wire 22)	Stator Lead (Wire 11)	
Stator Lead (Wire 22)	Stator Lead (Wire S1)	
Stator Lead (Wire 11)	Stator Lead (Wire S1)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire 44)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire S2)	
Stator Lead (Wire 44)	Stator Lead Blue (Wire S2)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead (Wire 11)	
Ground	Stator Lead (Wire 44)	
Ground	Stator Lead (Wire S1)	
Ground	Stator Lead (Wire S2)	
Shorted Condition		
Stator Lead (Wire 22)	Stator Lead (Wire 44)	
Stator Lead Blue (Wire 6)	Stator Lead (Wire 33)	

Test 9 Results - PowerPact Serial #________________________		
Test Point A	Test Point B	Results
Resistance Tests		
Stator Lead Blue (Wire 2)	Stator Lead Blue (Wire 6)	
Stator Lead (Wire 22)	Stator Lead (Wire 11)	
Stator Lead (Wire 22)	Stator Lead (Wire S1)	
Stator Lead (Wire 11)	Stator Lead (Wire S1)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire 44)	
Stator Lead (Wire 33)	Stator Lead Blue (Wire S2)	
Stator Lead (Wire 44)	Stator Lead Blue (Wire S2)	
Shorts to Ground		
Ground	Stator Lead Blue Wire	
Ground	Stator Lead (Wire 11)	
Ground	Stator Lead (Wire 44)	
Ground	Stator Lead (Wire S1)	
Ground	Stator Lead (Wire S2)	
Shorted Condition		
Stator Lead (Wire 22)	Stator Lead (Wire 44)	
Stator Lead Blue (Wire 6)	Stator Lead (Wire 33)	

Table 21
Test 73 Results

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

Test 73 Results, Serial #________________________			
Test Point	Pin Location	Circuit	Result
1	J2 Pin 4	Wire 14	
2	J2 Pin 11	Wire 56	
3	J2 Pin 8	Wire 15B	

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