DIAGNOSTIC REPAIR MANUAL

50/60 Hz GC/RS/XC/XG/XP//HL/XT and XT-EFI Series Portable Generators

60 HZ MODELS:					50 HZ MODELS:
RS5500	XC6500	XG4000	XP4000	XT8000E	XG5600E
RS7000E	XC6500E	XG5600	XP6500E	XT8000EFI	XG6400E
	XC8000E	XG6400	XP8000E	GC8100	
		XG6500	XP10000E	HL6500E	
		XG7000E			
		XG10000E			

Important Note: Always use the unit specific Schematics and Wiring Diagrams for troubleshooting.

PORTABLE GENERATORS

Safety

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

⚠DANGER

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

(000001)

⚠WARNING

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

(000002)

⚠CAUTION

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

(000003)

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

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

⚠WARNING

CANCER AND REPRODUCTIVE HARM

www.P65Warnings.ca.gov.

(000393a)

Read This Manual Thoroughly

This diagnostic manual has been written and published by Generac to aid dealer 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 products 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.

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.

Rotor and Stator Resistance Tables

Series		Model	Alternator	Rotor Windings (Ohms)	Power Windings (Ohms)	Exciter Windings (Ohms)
HW	HW3250	5973	0H3578	31	0.62	1.72
		6150	0H3578	31	0.62	1.72
	HW5500	6036	0J8363	61.48	0.681	2.81
		6151		61.48	0.681	2.81
	HW5500E	6037	0J8363	61.48	0.681	2.81
	HW6500	6038	0K9546	58.95	0.657	2.68
	HW7500E	6039	0K0755, 0H9209	49.1-53.01	0.479-0.5	1.37-2.23
		6152	0K0755	53.01	0.5	2.233
XC	XC6500	6500 6823 6824	10000007873	52.23	0.346	2.232
	XC6500E	6825				
	XC8000E	6827 6826				
XT	XT8000E	6433	0K0755	53.01	0.5	2.233
	XT8000E	6434				
	XT8000EFI	7162	0L0566	52.17± 10%	0.471± 10%	1.626± 10%
HL	HL 6500E	6865	0L0608	52.3	0.48	1.37
RS	RS5500	6672	0J8363	61.48	0.681	2.81
		6674				
	RS7000E	6673	0K9547	59.3	0.66	2.23
		6675				
XG	XG6500	5796	0G8995	63.3	0.53	1.9
	XG7000E	5798	0G8990	68.06	0.49	1.93
	XG8000E	5747	0K0071 (Brushed)	52.23	0.35	2.23
		5847				
		5846				
	XG10000E	5802	0H5064C, 0G5065C	6.3-7.3	0.18-0.21	1.07-1.24
XG INT*	XG5600E	6220	0J8658	48.55	0.83	3.2
	XG6400E	6221	0J8659	48	0.48	2.43
XP	XP6500E	5930 5934	0H8886 (Brushed)	72.91	0.518	2.16
	XP8000E	5931	0H8887, 0K0071 (Brushed)	74.12 (52.23)	0.342 (0.350)	2.610 (2.230)
		5935				
	XP10000E	5932	0H5064C, 0H5065C	6.3-7.3	0.18-0.21	1.07-1.24
XP INT* 50 Hz	XP5600E	6428	0K1944	49.59	0.68	3.2
	XP6400E	6429	0K1945	49.94	0.39	1.97

INT* = International Product

Wattage Reference Guide				
Device	**Running Watts**		**Device**	**Running Watts**
*Air Conditioner (12,000 Btu)	1700		Hand Drill	250 to 1100
*Air Conditioner (24,000 Btu)	3800		Hedge Trimmer	450
*Air Conditioner (40,000 Btu)	6000		Impact Wrench	500
Battery Charger (20 Amp)	500		Iron	1200
Belt Sander (3")	1000		*Jet Pump	800
Chain Saw	1200		Lawn Mower	1200
Circular Saw (6-1/2”)	800 to 1000		Light Bulb	100
*Clothes Dryer (Electric)	5750		Microwave Oven	700 to 1000
*Clothes Dryer (Gas)	700		*Milk Cooler	1100
*Clothes Washer	1150		Oil Burner on Furnace	300
Coffee Maker	1750		Oil Fired Space Heater (140,000 Btu)	400
*Compressor (1 HP)	2000		Oil Fired Space Heater (85,000 Btu)	225
*Compressor (3/4 HP)	1800		Oil Fired Space Heater (30,000 Btu)	150
*Compressor (1/2 HP)	1400		*Paint Sprayer, Airless (1/3 HP)	600
Curling Iron	700		Paint Sprayer, Airless (hand held)	150
*Dehumidifier	650		Radio	50 to 200
Disc Sander (9")	1200		*Refrigerator	700
Edge Trimmer	500		Slow Cooker	200
Electric Blanket	400		*Submersible Pump (1-1/2 HP)	2800
Electric Nail Gun	1200		*Submersible Pump (1 HP)	2000
Electric Range (per element)	1500		*Submersible Pump (1/2 HP)	1500
Electric Skillet	1250		*Sump Pump	800 to 1050
*Freezer	700		*Table Saw (10")	1750 to 2000
*Furnace Fan (3/5 HP)	875		Television	200 to 500
*Garage Door Opener	500 to 750		Toaster	1000 to 1650
Hair Dryer	1200		Weed Trimmer	500
* Allow 3 times the listed watts for starting these devices.				

Section 1 Brushless Capacitor Excitation

Introduction

See ***Figure 1-1***. A typical brushless type portable generator needs 4 major components to function: a prime mover, stator, rotor, and capacitor.

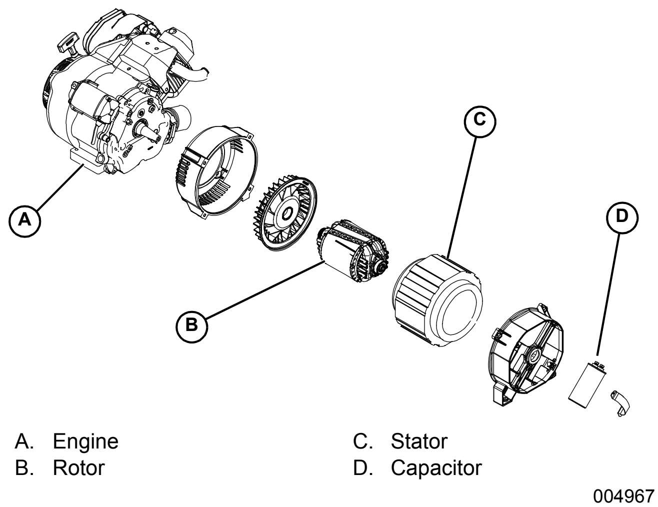


Figure 1-1. AC Generator Exploded View

As the engine begins to rotate, residual/permanent magnetism from the rotor creates magnetic lines of flux. The lines begin to cut the excitation winding and induce a small voltage into the winding. The voltage causes the capacitor to charge.

The capacitor on the excitation winding takes the place of a voltage regulator. It will charge until AC peaks, then as AC starts to fade it will discharge causing a voltage to be induced into the rotor.

In one rotation of the rotor, the capacitor will charge and discharge twice. Because it's being charged by the North and South poles, it will induce AC voltage discharges into the rotor.

Two diodes in the rotor convert AC voltage to DC. There is a diode in one pole that is orientated in one direction, and a diode in the opposite pole orientated in the opposite direction. This produces a North and South poled rotor.

A capacitor discharge generator will produce a lower voltage until load is applied. Once load is applied, the output voltage will rise due to induction into the DPE Winding/Capacitor.

As load is applied, current in the main AC windings increases. This increase in EMF is also induced into the excitation winding (much like a transformer functions). The increased EMF into the excitation winding causes voltage to increase which also increases the charge/discharge value of the capacitor. This creates a stronger magnetic field in the rotor and higher AC output.

NOTE: This will only increase from no load to full load and will stop increasing at that point.

NOTE: The voltage of a brushless capacitive discharge generator will start low and increase as load is applied.

Stator Assembly

The stator has three windings wound separately inside the can. Two are power windings located on Wire 44 (Hot) and Wire 33 (Neutral), the other winding is on Wire 11 (Hot) and Wire 22 (Neutral). The third winding is the Displaced Phase Excitation (DPE) winding and is on Wire 2 and Wire 6. Some generators have color coded wires. Always use the appropriate schematic and wiring diagram for unit.

Rotor Assembly

See ***Figure 1-2***. The 2-pole rotor must be operated at 3600 rpm to supply a 60 Hertz AC frequency. The term "2-pole" means the rotor has a single north magnetic pole and a single south magnetic pole. It spins freely inside the stator can and is excited by the charging and discharging of the capacitor. It has two diodes (A and B) that rectify voltage induced from the Excitation winding to DC voltage. Each winding/pole will have a diode orientated to create current flow in one direction, and the other winding/pole will have a diode orientated to create current flow in the opposite direction. This creates a North and South pole. The rotor bearing is pressed onto the end of the rotor shaft. The tapered rotor shaft is mounted to a tapered crankshaft and is held in place with a single through bolt.

NOTE: Some Rotors have a magnet placed inside the laminations to help excite the rotor after it's been left idle for a long period of time.

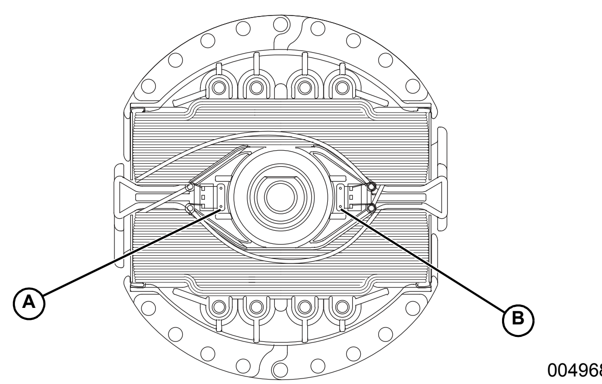


Figure 1-2. Rotor and Diodes

Operation

Startup

When the engine is started, residual/permanent magnetism from the rotor induces a voltage into (a) the stator AC power windings, and (b) the stator excitation or DPE windings. In an “On-speed” (engine cranking) condition, residual/permanent 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 completed to the capacitor where the capacitor is charged until the AC voltage peaks and then discharges as the AC voltage starts to decay. The charging and discharging causes a voltage to be induced back into the rotor which will produce voltage. 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 is low, but as the capacitor is charged and discharged this relationship between the rotor and the capacitor is what will regulate voltage at a desired level.

AC Power Winding Output

A maintained 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.

NOTE: The voltage of a brushless capacitive discharge generator will start low and increase as load is applied.

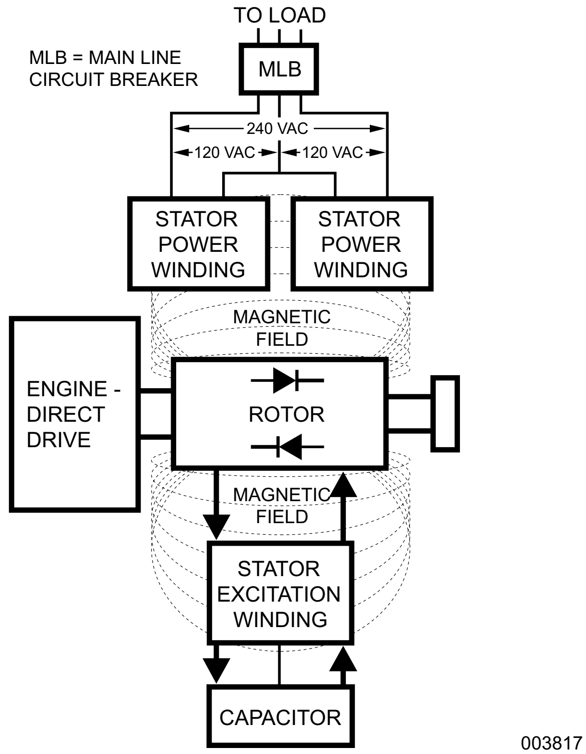


Figure 1-3. Generator Operating Diagram

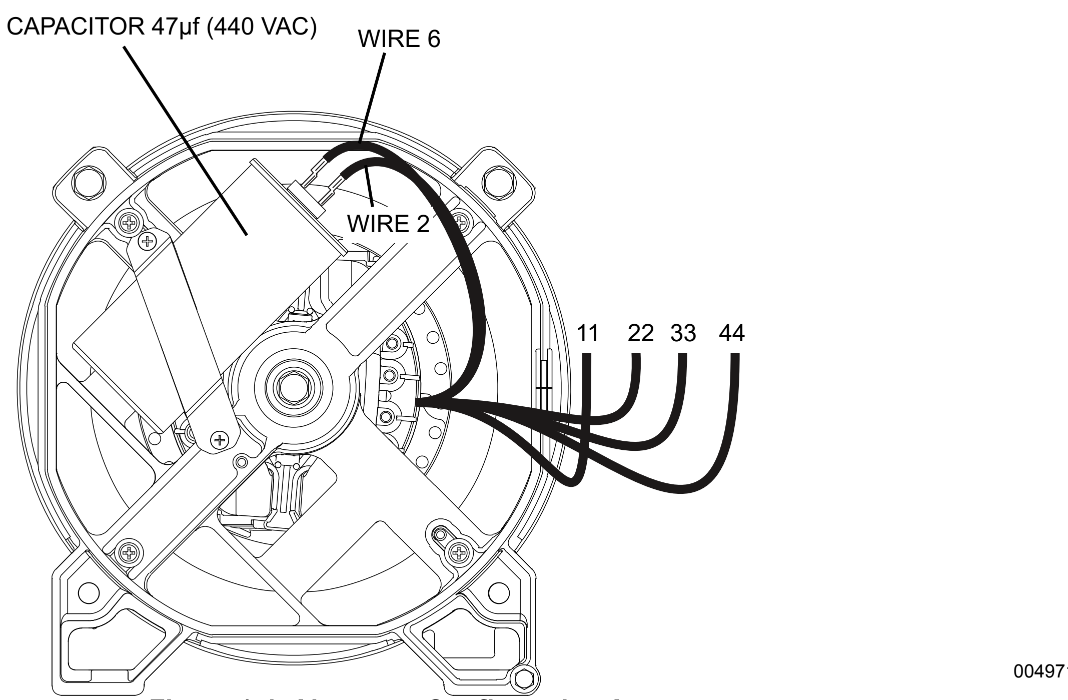


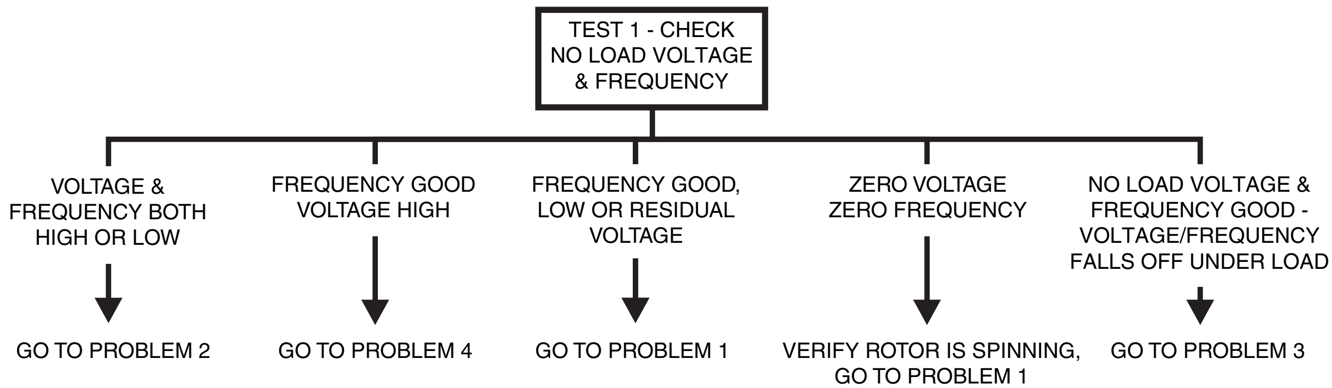
Figure 1-4. Alternator Configuration A

Troubleshooting Flowcharts

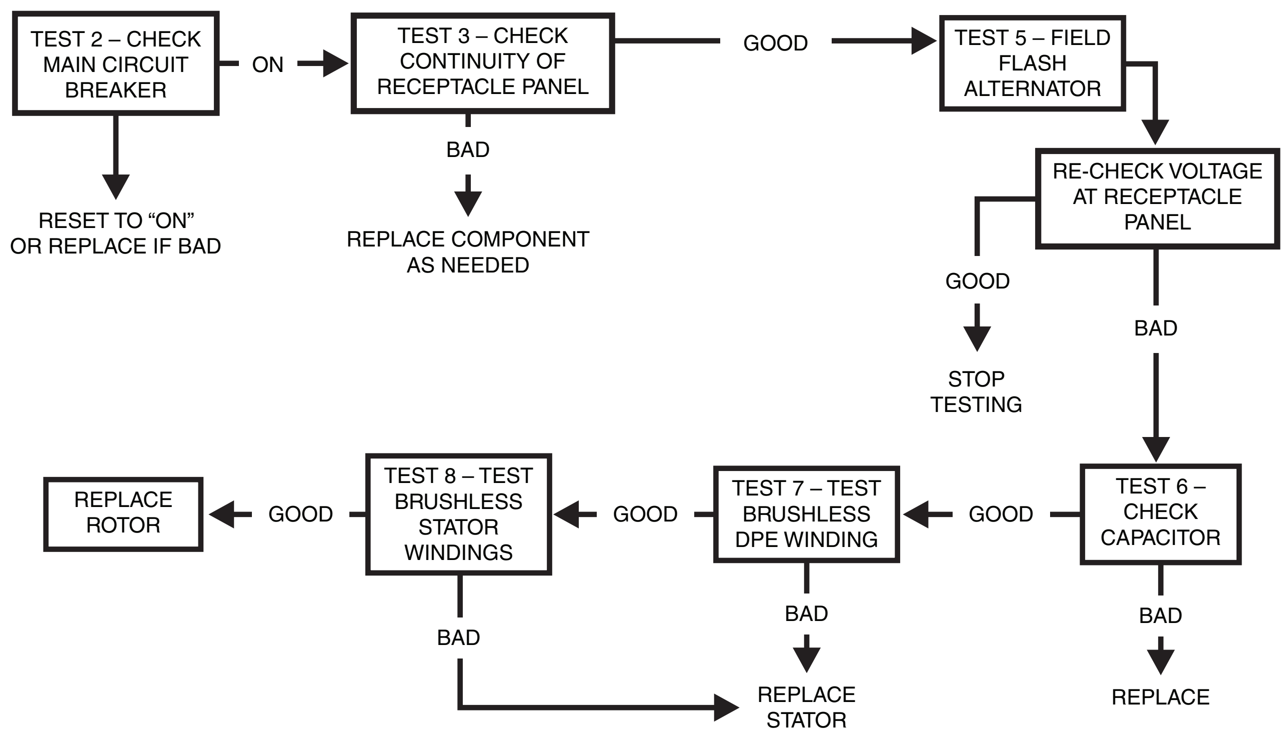
Introduction

Use the Flow Charts in conjunction with the ***AC Diagnostic Tests*** . Test numbers used in the flow charts correspond to the numbered tests in the ***AC Diagnostic Tests*** . 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.

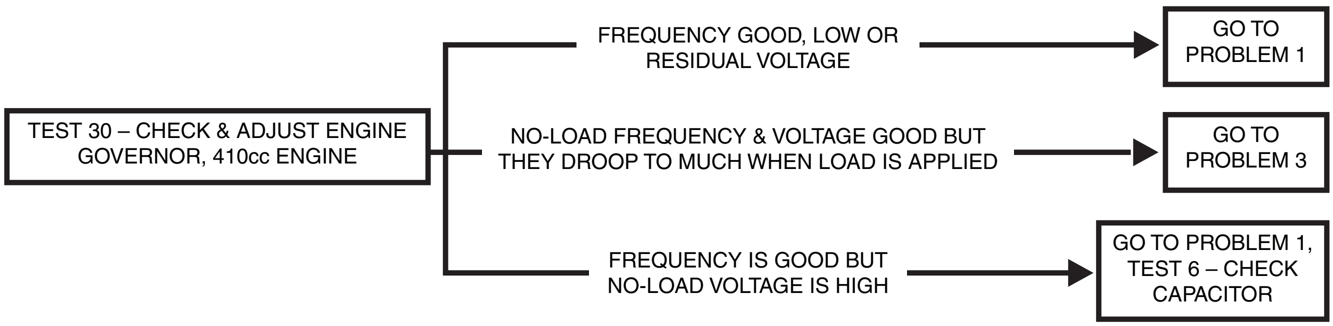
If Problem Involves AC Output



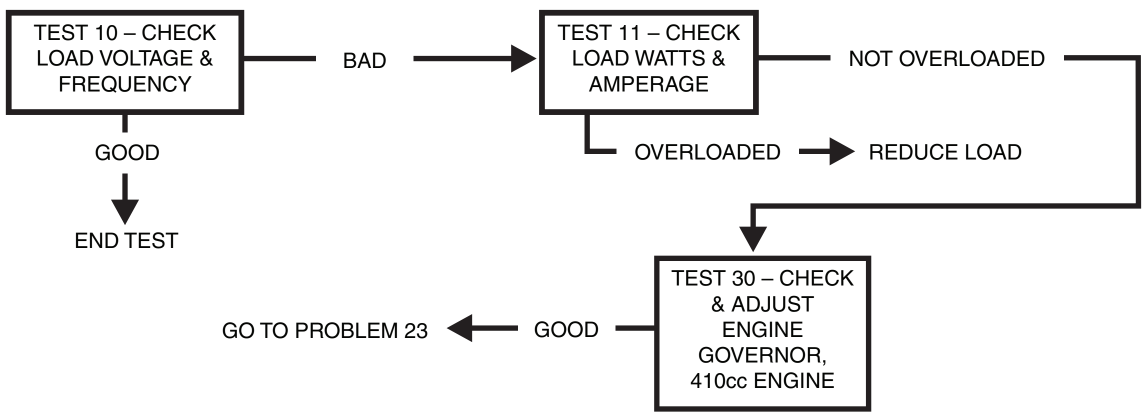
Problem 1 – Generator Produces Zero Voltage or Residual Voltage



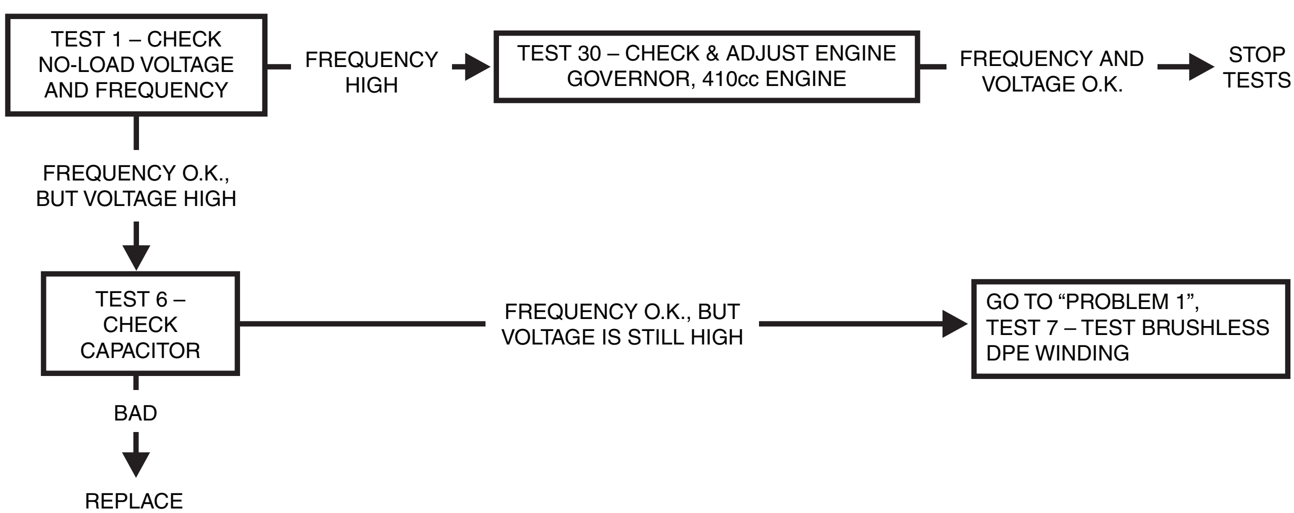
Problem 2 – Voltage & Frequency Are Both High or Low



Problem 3 – Excessive Voltage/Frequency Droop When Load is Applied



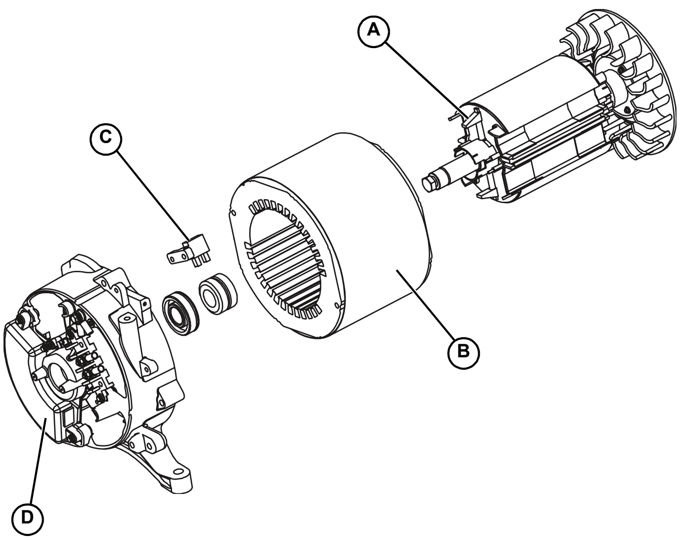
Problem 4 – Generator Produces High Voltage at No-Load



Introduction

See *Figure 2-1*. A typical brush type portable generator needs 4 major components to function: prime mover, rotor, stator, and voltage regulator.

As the engine begins to rotate, residual magnetism from the rotor creates magnetic lines of flux. The lines begin to cut across the excitation winding and induce a small voltage into the voltage regulator. The excitation voltage will power the voltage regulator and the voltage regulator will start to sense AC voltage from Wires S15 and S16. The lower voltage from the sensing wires will cause DC excitation to the rotor to be driven up until AC output is at desired level of 240 VAC. Once the generator has reached 240 VAC it will maintain the DC voltage, regulating the alternator when loads are applied and removed.



A. Rotor
B. Stator
C. Brushes
D. Voltage Regulator

Figure 2-1. AC Generator Exploded View

Stator Assembly

The stator has three windings wound separately inside the can. Two are the power windings and are located on Wire 44 (Hot) and Wire 33 (Neutral); the other winding is located on Wire 11 (Hot) and Wire 22 (neutral). The third winding is called DPE winding or Displaced Phase Excitation winding and is located on Wire 2 and Wire 6.

Some generators have color coded wires. Always use the appropriate schematic and wiring diagram for unit.

Brush Holder and Brushes

The brush holder has a positive (+) and a negative (-) brush, and is retained to the rear bearing carrier by means of two Taptite screws. Wire 4 connects to the positive (+) brush and Wire 0 to the negative (-) brush. Rectified and regulated excitation current is delivered to the rotor windings via Wire 4, and the positive (+) brush and slip ring. The excitation current passes through the windings to the negative (-) slip ring and brush on Wire 0. This current flow creates a magnetic field around the rotor having a flux concentration that is proportional to the amount of current flow.

Voltage Regulator

See *Figure 2-1*. Unregulated AC output from the stator excitation winding is delivered to the regulator's DPE terminals, via Wire 2 and Wire 6. The voltage regulator rectifies that current and, based on stator AC power winding sensing, regulates it. The rectified and regulated excitation current is then delivered to the rotor windings from the positive (+) and negative (-) regulator terminals, via Wire 4 and Wire 0. Stator AC power winding "sensing" is delivered to the regulator via Wires S15 and S16.

Operation

Startup

When the engine is started, residual magnetism from the rotor induces a voltage into (a) the stator AC power windings, (b) the stator excitation or DPE windings. In an "on-speed" (engine cranking) condition, residual 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 completed to the voltage regulator, via Wire 2 and Wire 6. Unregulated alternating current can flow from the winding to the regulator. The voltage regulator senses AC power winding output voltage and frequency via stator Wires S15 and S16.

The regulator changes the AC from the excitation winding to DC. In addition, based on the Wire S15 and Wire S16 sensing signals, 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, via Wire 4, and the positive brush and slip ring. This excitation current flows through the rotor windings and through the negative (-) slip ring and brush on Wire 0.

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.

Some generators have color coded wires. Always use the appropriate schematic and wiring diagram for unit.

Initially, the AC power winding voltage sensed by the regulator is low. The regulator reacts by increasing the flow of excitation current 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 excitation current. 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.

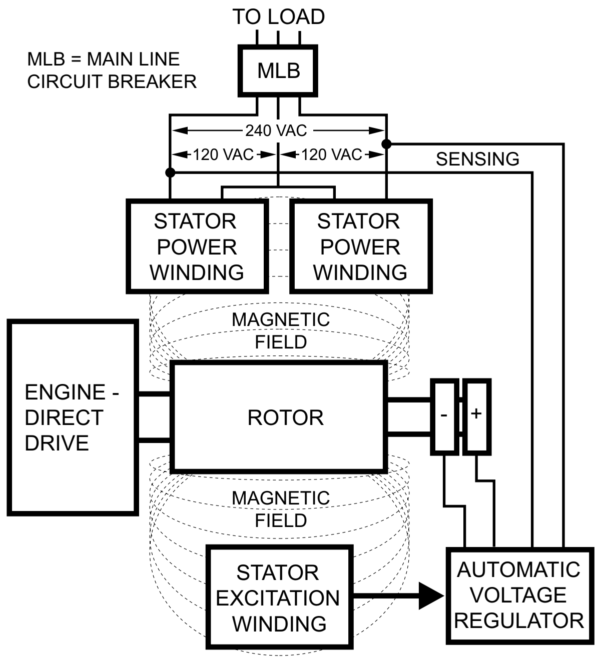


Figure 2-2. Generator Operating Diagram

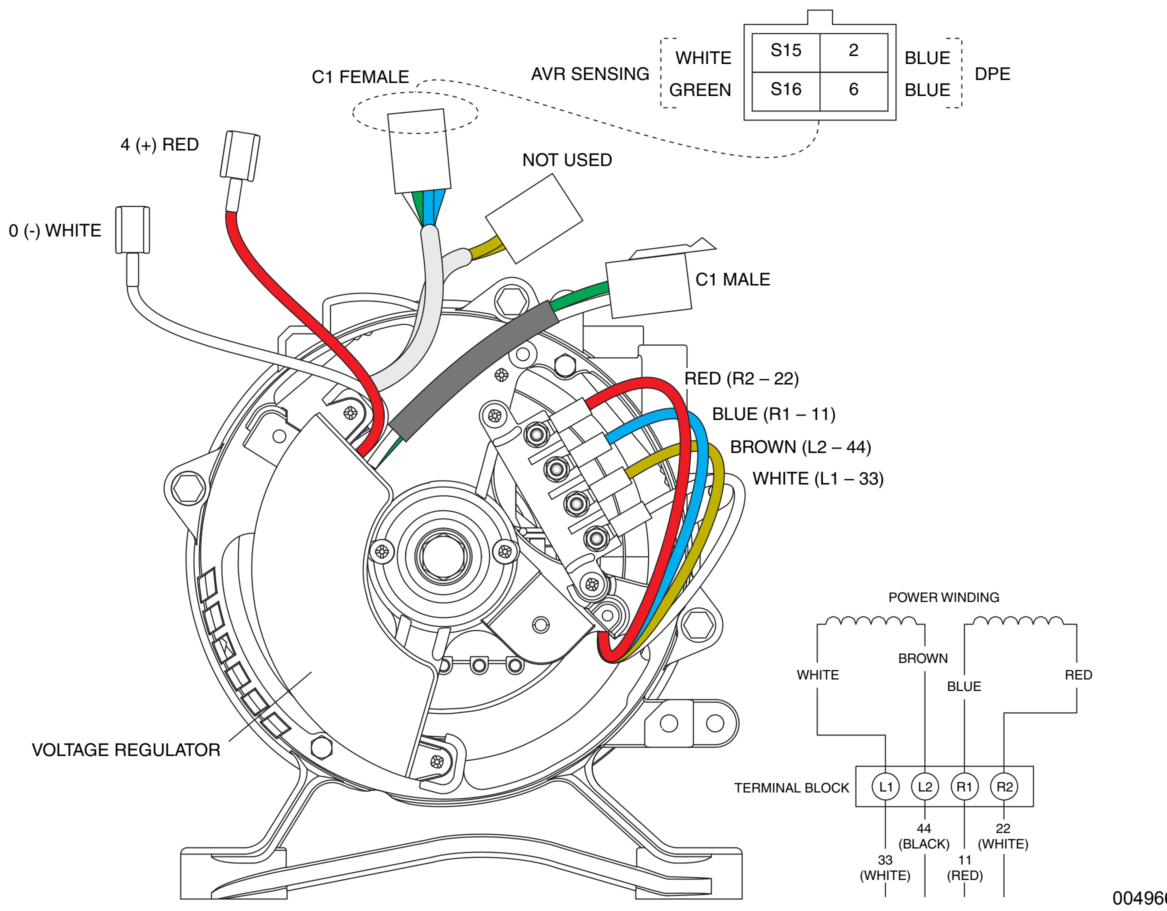


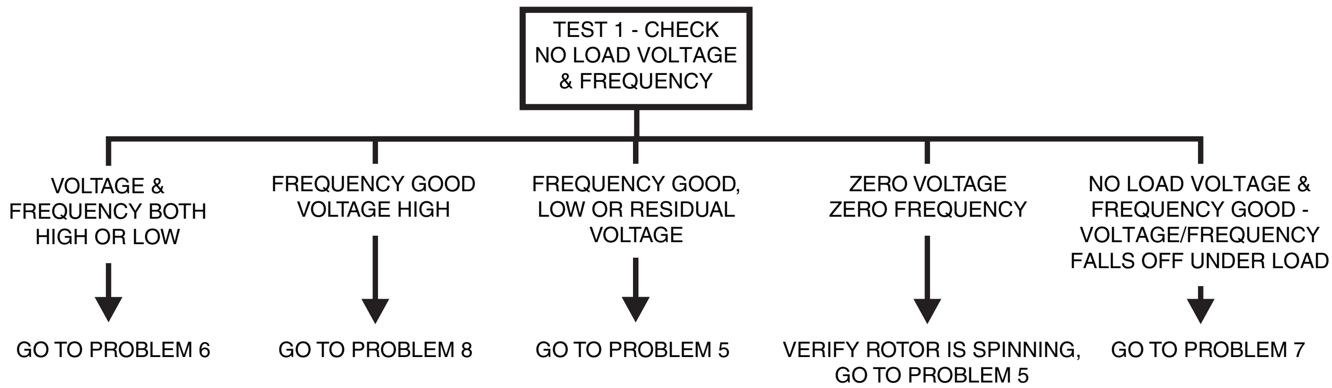
Figure 2-3. Alternator Configuration B

Troubleshooting Flowcharts

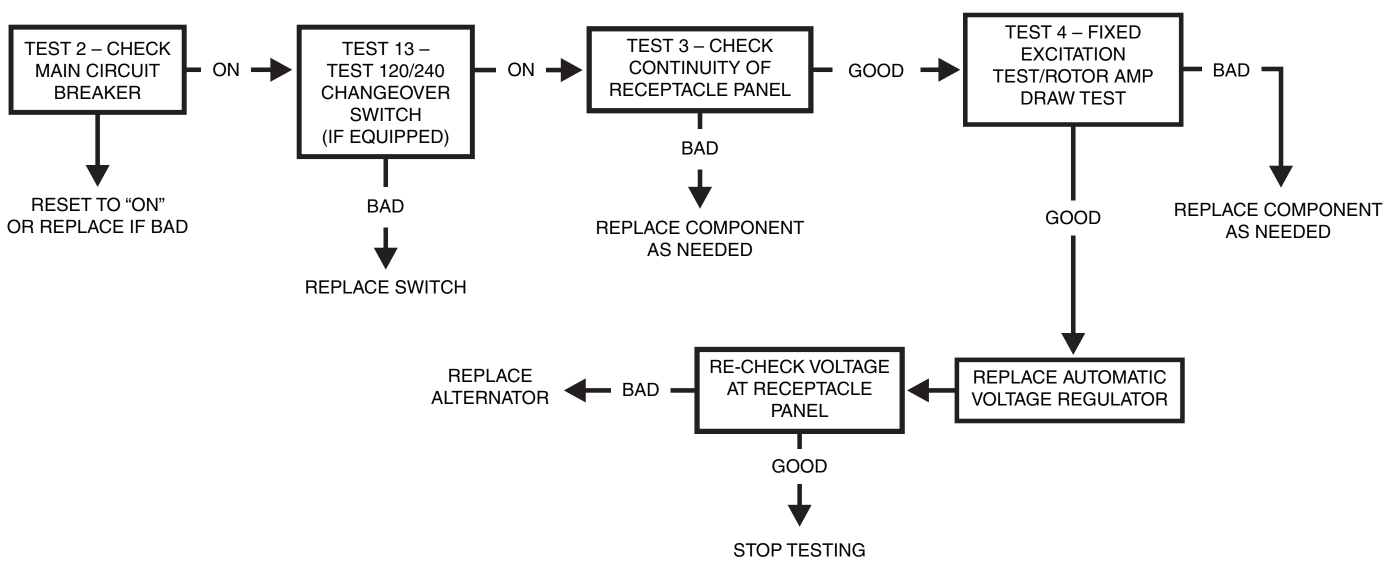
Introduction

Use the Flow Charts in conjunction with the ***AC Diagnostic Tests*** . Test numbers used in the flow charts correspond to the numbered tests in the ***AC Diagnostic Tests*** . 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.

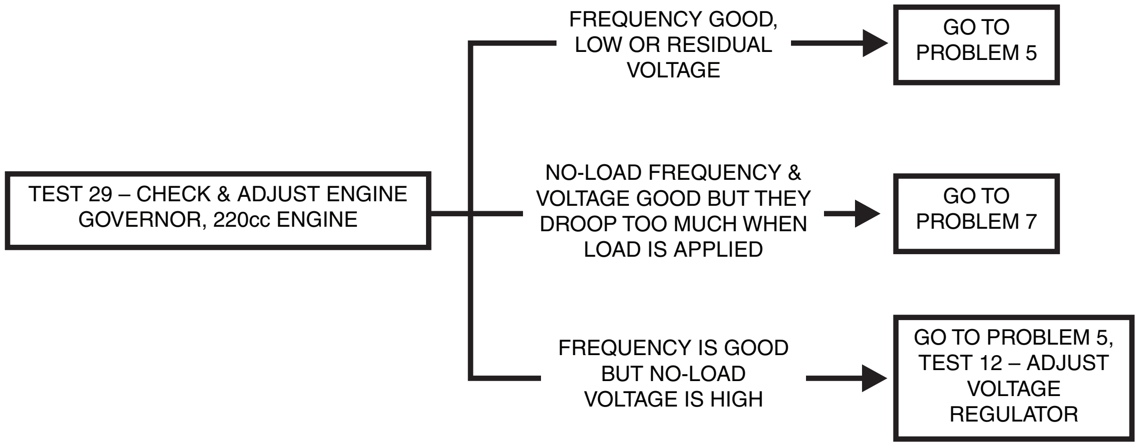
If Problem Involves AC Output (Brush Type)



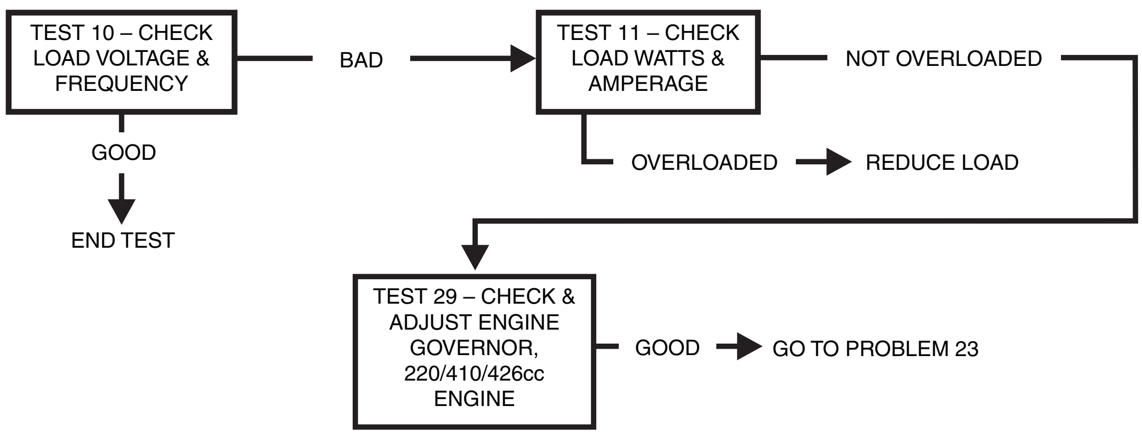
Problem 5 – Generator Produces Zero Voltage or Residual Voltage



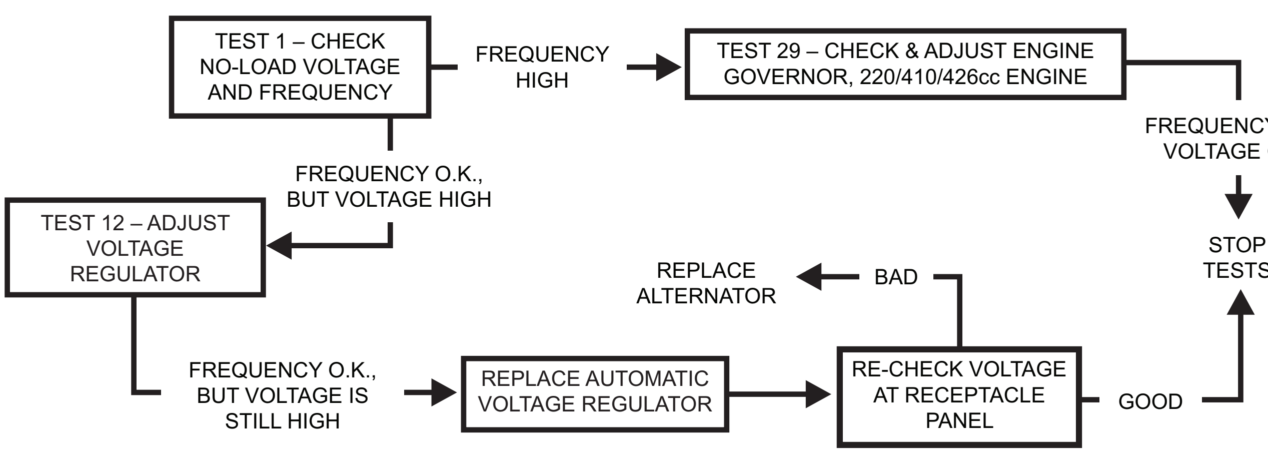
Problem 6 – Voltage & Frequency Are Both High or Low



Problem 7 – Excessive Voltage/Frequency Droop When Load is Applied



Problem 8 – Generator Produces High Voltage at No-Load



Introduction

Perform the Diagnostic Tests in this section in conjunction with the Brushless ***Troubleshooting Flowcharts*** or the Brush Type ***Troubleshooting Flowcharts***. Test numbers in this section correspond to numbered tests in the flow charts.

NOTE: Test procedures in this manual are not necessarily the only methods for diagnosing the condition of components and circuits. All possible methods that might be used for system diagnosis have not been evaluated. If any diagnostic method is used other than the method presented in this manual, the technician must be sure that neither personal safety nor product safety, will be endangered by the procedure or method selected.

NOTE: For graphics of different configurations of stators and the wire numbers associated with different components, see appropriate wiring diagrams and schematics for the generator.

Test 1 – Check No-Load Voltage and Frequency

Procedure

1. Disconnect or turn OFF all electrical loads connected to the generator.
2. Set digital multimeter (DMM) to measure AC voltage.
3. Reset all circuit breakers to ON.
4. Start engine and let stabilize and warm up.
5. See ***Figure 3-1***. Place meter test leads into an outlet.

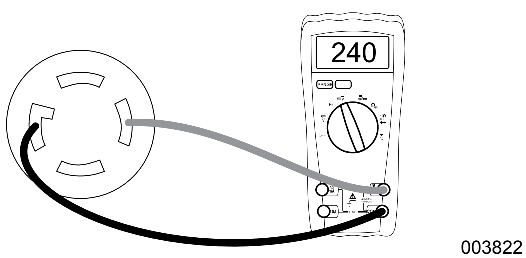


Figure 3-1. DMM Test Leads Connected to a 240 VAC Receptacle

6. Read AC voltage.
7. Connect an AC frequency meter as described in Step 5.
8. Read AC frequency.

Results

No Load Voltage	No Load Frequency
223.2 – 256.8 VAC	62.5 – 62.0 Hz

Refer to flow chart.

Test 2 – Check Main Circuit Breaker

Procedure

The generator has circuit breakers located on the control panel. If outlets are not receiving power, make sure breakers are set to ON or “Closed”.

If a breaker is suspected to have failed, test as follows:

1. Set DMM to measure resistance.
2. With generator shut down, disconnect all wires from suspected circuit breaker terminals to prevent interaction.
3. See ***Figure 3-2***. With the generator shut down, connect one meter test lead to one terminal of the breaker and the other meter test lead to the other terminal.
4. Set breaker to ON or “Closed”. The meter should read CONTINUITY.
5. Set breaker to OFF or “Open”. The meter should indicate INFINITY.

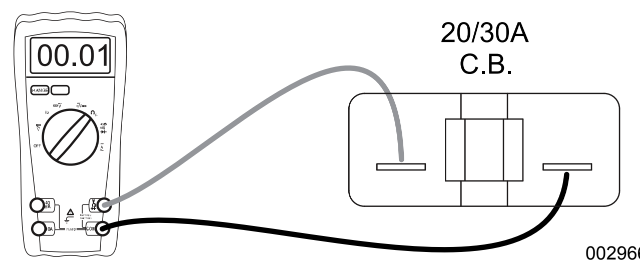


Figure 3-2. 20/30 Amp Breaker Test Points

Results

1. If circuit breaker tests good, refer to flow chart.
2. If breaker tests bad, replace.

Test 3 – Check Continuity of Receptacle Panel

General Theory

Continuity of the receptacle panel is important as it recognizes the receptacle has continuity through the wiring and is physically connected to the stator. Most stator winding values are between 0.01 and 0.02 Ohms of resistance. If a higher than normal value is shown, a poor connection could be the problem preventing that receptacle from receiving power.

Procedure

1. Set DMM to measure Resistance.
2. See ***Figure 3-3***. Connect DMM to each receptacle on unit.

NOTE: Only one outlet on each receptacle needs to be tested.

Results

1. If any other reading than CONTINUITY was measured, further troubleshooting needs to be done to determine if it is the receptacle or the wiring.
2. If receptacles test good, refer to flow chart.

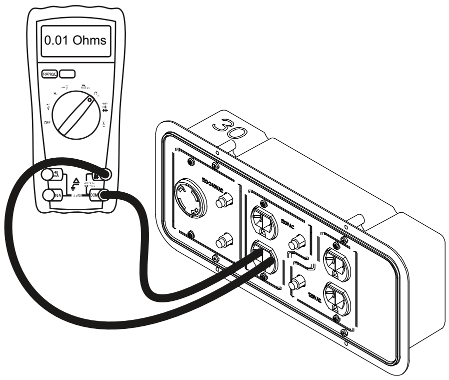


Figure 3-3. Checking Continuity of Receptacles

Test 4 – Fixed Excitation Test/Rotor Amp Draw Test

General Theory

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: A standard 12 Volt battery is needed for this procedure.

NOTE: Always use the unit specific schematics and wiring diagrams for brush orientation.

Procedure

1. Remove positive and negative wires connected to the brush assembly.
2. Connect one jumper wire to where the positive brush wire was connected on the brush assembly.
3. Connect another jumper wire to where the negative brush wire was connected on the brush assembly.

NOTE: For safety, install an in-line fuse in the positive jumper wire. Maximum fuse should be 2 amps.

4. Set DMM to measure AC Voltage.
5. See *Figure 3-4*. Connect meter test leads across the 240 VAC receptacle so the leads read line-to-line voltage.
6. Set RUN-STOP switch to RUN and start unit.
7. While the unit is running connect one jumper wire to the negative terminal of the battery and connect the other jumper wire to the positive terminal.
8. Record the voltage measured on the 240 VAC receptacle panel. Approximately 130 VAC should be measured. If no voltage is measured, connect meter test leads across R1 and L2 at the stator connection terminal strip.
9. Set RUN-STOP switch to STOP.
10. Disconnect meter leads from 240 VAC receptacle.
11. See *Figure 3-5*. Connect one meter test lead to Wire 2 and the other meter test lead to Wire 6 on the C1 female connector.
12. Set RUN-STOP switch to RUN and start unit.

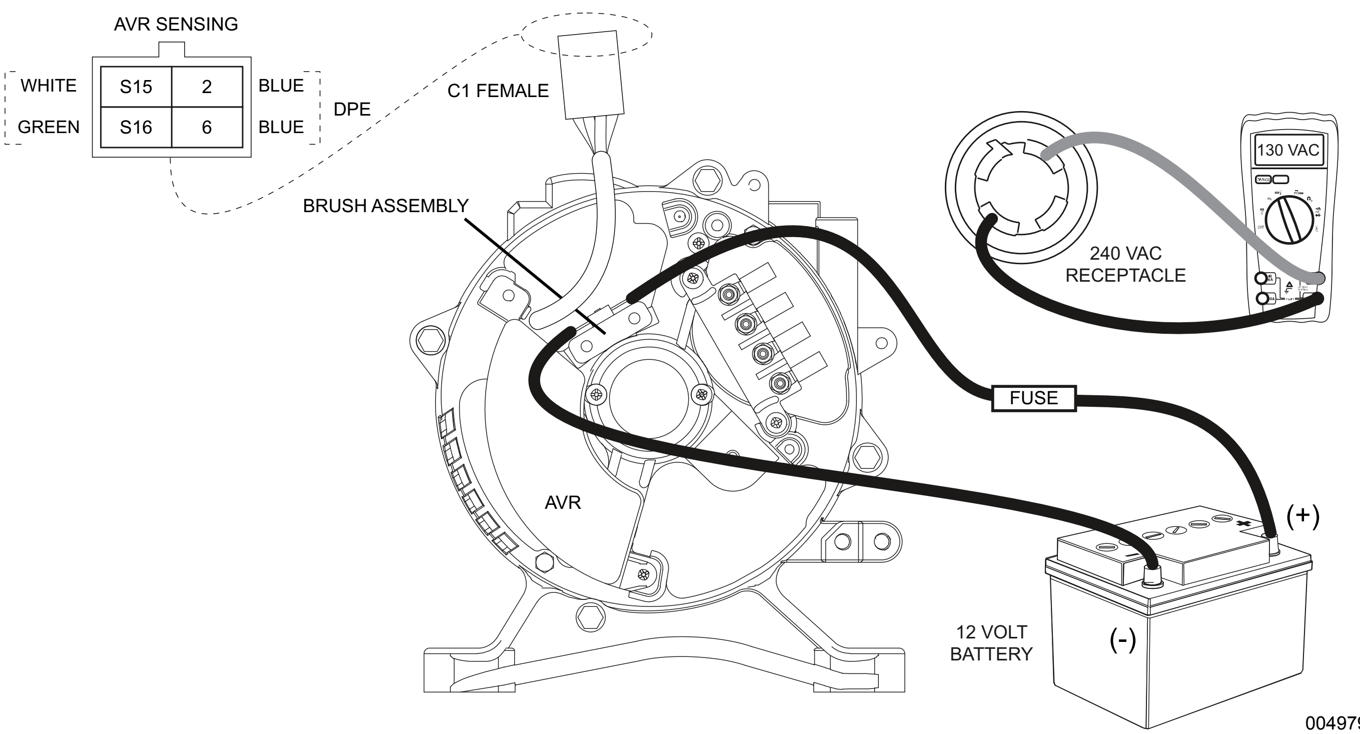


Figure 3-4. Jumper Wires Between Battery and Brush Assembly

13. While the unit is running connect one jumper wire to the negative terminal of the battery and connect the other jumper wire to the positive terminal.
14. Record voltage measured on Wires 2 and 6 on the C1 female connector. Approximately 60 VAC should be measured.
15. Set RUN-STOP switch to STOP.
16. Set DMM to measure resistance.
17. Connect the meter test lead to one jumper wire and connect the other meter test lead to the other jumper wire to measure resistance of the brushes and the rotor. See ***Rotor and Stator Resistance Tables*** for resistance values. If the correct resistance was not measured, remove brushes and measure resistance across the slip rings. If resistance is measured, inspect or replace brushes. If resistance was NOT measured across the slip rings, replace rotor.
18. Set DMM to measure DC amperage.

NOTE: Inspect the fuses in the meter to ensure test results will be correct.

19. Connect one meter test lead to the positive jumper wire.
20. Set RUN-STOP switch to RUN and start unit.
21. Connect the negative jumper wire to the negative terminal on the battery and connect the other meter test lead to the positive terminal.

NOTE: The meter should now be connected in series with the positive jumper wire.

22. Record DC amperage measured. Approximately 0.22 DC amps should be measured.

NOTE: The DC voltage of the battery divided by the resistance measured in Step 17 will give a calculated amp draw.

23. Set RUN-STOP switch to STOP.
24. Repeat Step 21 while the unit is OFF. The DC amperage measured should be the same as step 22 ± 0.10 DC amps.
25. Set DMM to measure resistance.
26. See ***Figure 2-3***. Connect one meter test lead to S15 and connect the other meter test lead to S15 on the female side of the C1 connector. Approximately 0.5 to 1.5 Ohms should be measured.

Results

1. If current was outside parameters in Steps 23 and 24, remove brushes and measure resistance.
2. If voltage was not measured in Step 8 at either the receptacle or the stator connection terminal strip, replace the alternator.
3. If voltage was not measured in Step 14, replace the alternator.
4. If the correct resistance was not measured in Step 26, replace the alternator.
5. If the correct resistance was not measured in Step 17, replace the alternator.
6. If the correct voltage was measured in Step 8 and Step 14 and the correct resistance was measured in Step 26, replace the voltage regulator.

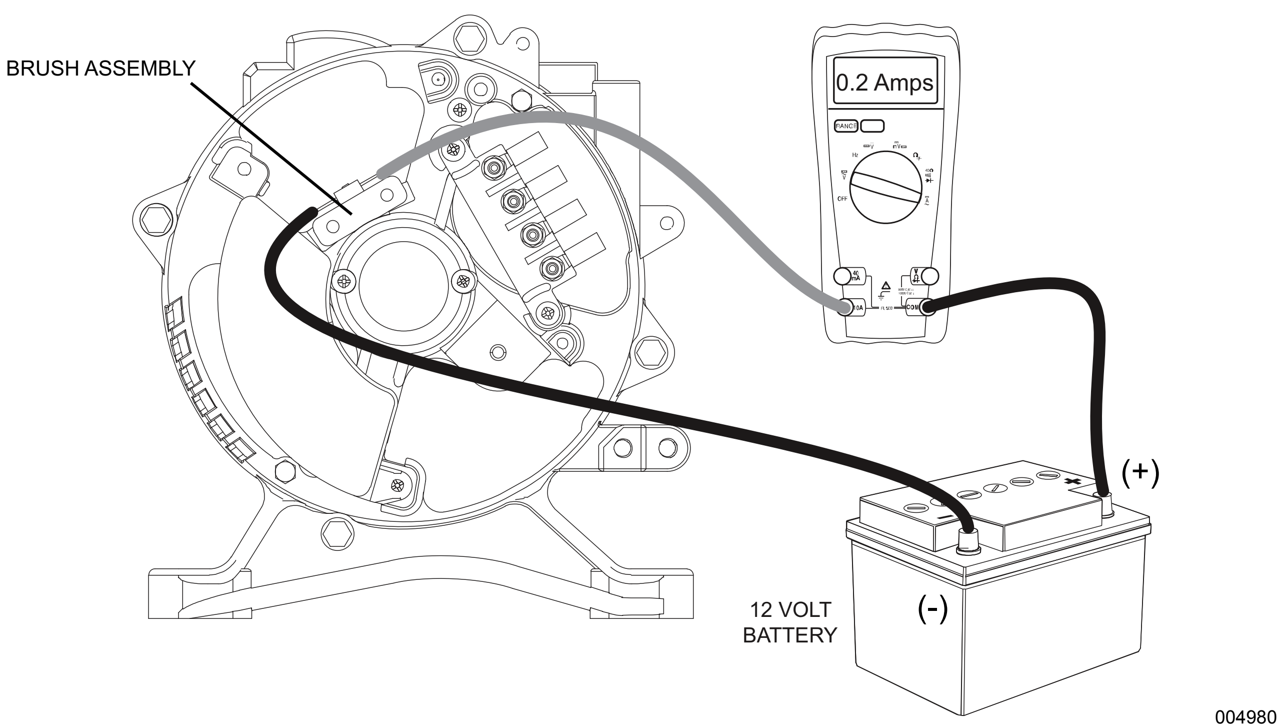


Figure 3-5. Jumper Wire and DMM Between Battery and Brush Assembly

Test 5 – Field Flash Alternator
(Configuration "A" Only)

General Theory

The alternator utilizes residual magnetism within the windings to charge the capacitor. If the generator has not been started for a long period of time, residual magnetism could be lost within the rotor. Field flashing the capacitor will restore voltage into the capacitor.

IMPORTANT NOTE: The capacitor may need to be discharged before testing. A capacitor can be discharged by crossing the terminals with a metal insulated screw driver.

IMPORTANT NOTE: Use proper protective equipment when dealing with a capacitor that has exploded.

Procedure

1. Construct an energizing cord similar to ***Figure 3-6*** and connect as shown in Figure 28.
2. Set START-RUN-STOP switch to OFF.

IMPORTANT NOTE: Do NOT energize the capacitor for more than 1 second at a time.

3. Momentarily turn on energizing cord (one second).
4. Disconnect energizing cord from capacitor.
5. Carefully re-connect the DPE winding leads to the capacitor.
6. If the field flash was successful, the generator should produce approximately 240 VAC at the main circuit breaker of the generator when the generator is started and running.

IMPORTANT NOTE: Do not field flash alternator more than two times in sequence. If the unit has not produced power after two attempts, other issues exist and need to be addressed.

Results

1. Generator produces approximately 240 VAC, stop testing.
2. Generator does not produce 240 VAC, refer to ***Troubleshooting Flowcharts***.

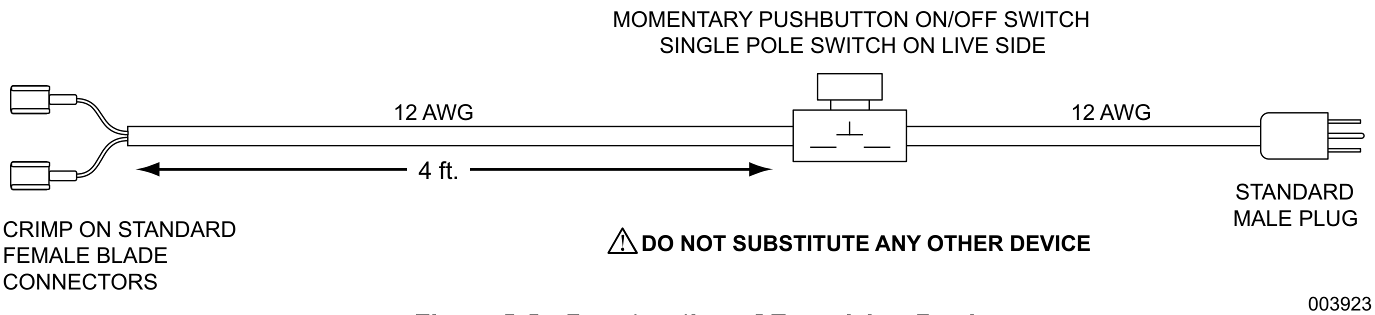


Figure 3-6. Construction of Energizing Cord

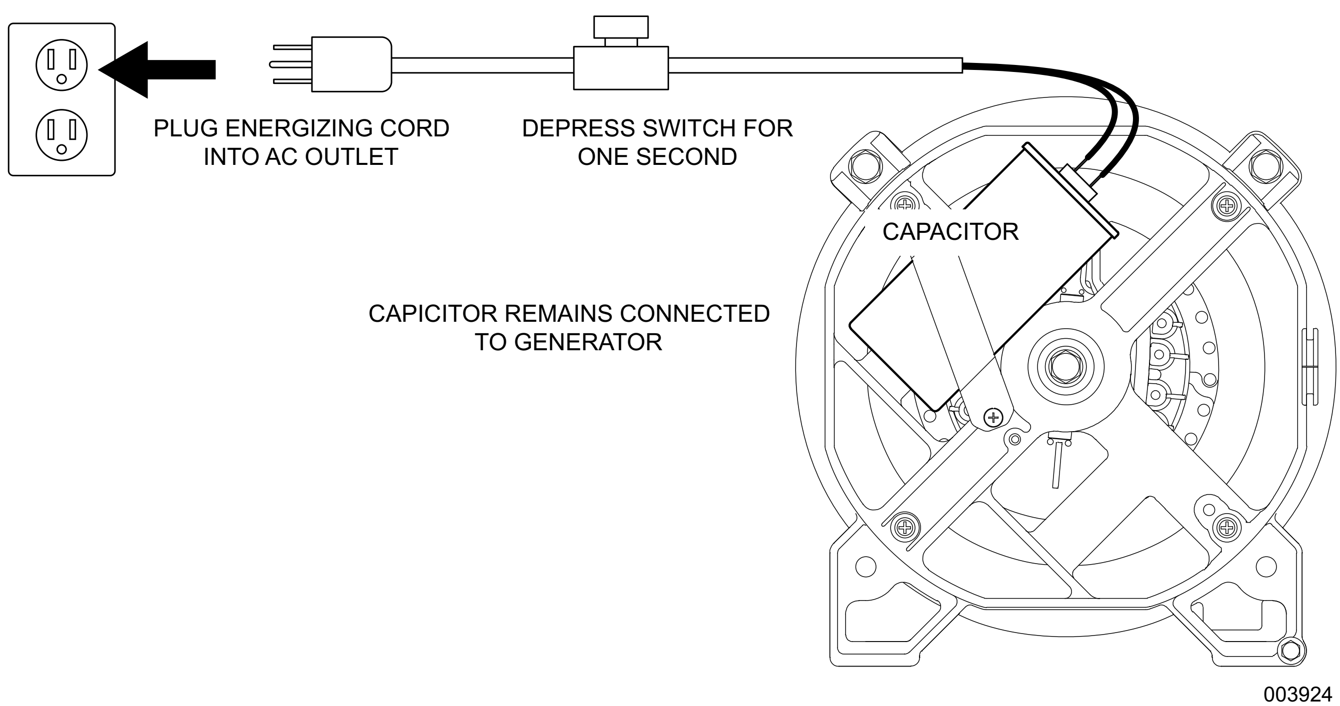


Figure 3-7. Connecting Energizing Cord

Test 6 – Check Capacitor

General Theory

The brushless rotor system relies on the charging and discharging of a capacitor to induce voltage into the rotor. The capacitor also maintains voltage once 240 VAC is achieved. If the capacitor fails, only residual magnetism of the rotor will be measured at the main breaker.

NOTE: The voltage of a brushless capacitive discharge generator will start low and increase as load is applied.

IMPORTANT NOTE: The capacitor may need to be discharged before testing. A capacitor can be discharged by crossing the terminals with a metal insulated screw driver.

IMPORTANT NOTE: Use proper protective equipment when dealing with a capacitor that has exploded.

Procedure

1. Consult the owner's manual of the meter being used for directions on measuring capacitance. ***Figure 3-8*** shows a typical meter and how to check capacitance.
2. Connect meter leads directly across the terminals of capacitor. The rated µf (micro farad) of the capacitor is marked on the side of the canister.
3. The meter should display the correct µf reading ± 5µf. If anything other than the indicated rating is displayed, replace the capacitor.

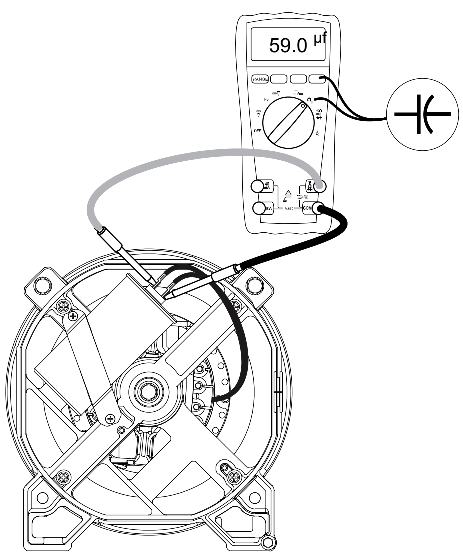


Figure 3-8. Capacitor Test Points (Alternator Configuration "A")

Results

1. Refer to ***Troubleshooting Flowcharts***.
2. Visually observe the capacitor. A capacitor is defective if:

- terminal connections are loose on the canister.
- capacitor wobbles while sitting on a flat surface.

If any of these traits are observed, replace capacitor.

IMPORTANT NOTE: A capacitor that has gone bad has a tendency to explode. Use caution when dealing with an exploded capacitor. The gel from inside a capacitor can cause skin irritation.

Test 7 – Test Brushless DPE Windings

General Theory

A Displaced Phase Excitation (DPE) winding is used to charge a capacitor. It discharges and charges, releasing a voltage that is induced into the rotor. If the DPE winding fails, only residual magnetism of the rotor will be measured at the Main Breaker.

NOTE: The resistance of stator windings is very low. Some meters will not read such a low resistance, and will simply indicate CONTINUITY. Recommended is a high quality, digital type meter capable of reading very low resistances.

IMPORTANT NOTE: The capacitor may need to be discharged before testing. A capacitor can be discharged by crossing the terminals with a metal insulated screw driver.

Procedure

1. Disconnect Wire 2 and Wire 6 from capacitor.
2. Set DMM to measure resistance.
3. Connect one meter lead to Wire 2 and connect the other meter lead to Wire 6.
   a. Reading should be approximately 0.97 and 1.13 Ohms.
4. Connect one meter lead to Wire 2 and connect the other meter lead to a clean frame ground, INFINITY should be measured.
5. Isolate the stator wire so the stator is disconnected from the receptacle panel and the capacitor.

NOTE: Isolate all main stator leads before proceeding.

6. Connect one meter lead to Wire 2 and connect the other meter lead to Wire 11. INFINITY should be measured.
7. Repeat Step 6 using Wire 2 and Wire 44. INFINITY should be measured.

Results

1. If INFINITY or a very high resistance is indicated, the winding is open or partially open.
2. Test for a "grounded" condition: Any resistance reading indicates the winding is grounded.
3. Test for a "shorted" condition: Any resistance reading indicates the winding is shorted.
4. If stator tests good and wire continuity tests good, refer to flow chart.

Test 8 – Test Brushless Stator Windings

General Theory

The brushless stator has three internal windings, two main power windings and a DPE winding. This test will ensure there are no shorts between the power windings or shorts to ground.

A DMM meter can be used to test the stator windings for the following faults:

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

NOTE: The resistance of stator windings is very low. Some meters will not read such a low resistance, and will simply indicate CONTINUITY. Recommended is a high quality, digital type meter capable of reading very low resistances.

NOTE: See ***Figure 1-4*** in Section 1, Configuration "A". Some wire numbers will not be marked on the stator.

Procedure

1. Disconnect Wires 11, 22, 33, 44 from the receptacle panel so the stator is isolated.
2. Verify all the disconnected leads are isolated from each other, and are not touching the frame during the test.
3. Set DMM to measure resistance.
4. Connect one test lead to Stator Lead 11. Connect the other test lead to Stator Lead 22. Stator resistance should be between 0.12-0.14 Ohms.
5. Connect one test lead to Stator Lead 33. Connect the other test lead to Stator Lead 44. Stator resistance should be between 0.12-0.14 Ohms.

Test windings for a short-to-ground:

1. Verify all leads are isolated from each other and are not touching the frame.
2. Connect one test lead to a clean frame ground. Connect the other test lead to Stator Lead Wire 11.
   a. The meter should read INFINITY.
   b. Any reading other than INFINITY indicates a "short-to-ground" condition.
3. Repeat Step 2 using Stator Lead 44.

Test for a short circuit between windings:

1. Connect one test lead to Stator Lead 11. Connect the other test lead to Stator Lead 33.
   a. The meter should read INFINITY.
   b. Any reading other that INFINITY indicates a short between windings.

Test 9 – Test Brushed Stator Windings

General Theory

Most brushed stators have three main windings that are needed to produce voltage. The alternator has two main power windings which supply power to the load and a DPE winding to provide excitation voltage to the rotor. These windings must remain isolated from ground or the chassis of the alternator.

Procedure

1. Isolate all stator wires from the control panel and voltage regulator.
2. Set DMM to measure resistance.
3. See ***Figure 2-3*** for proper test points to check the stator. Every connection needs to be checked coming out of the stator for a short to ground.

Results

1. If any wire has a direct short-to-ground, or to the chassis of the alternator, replace alternator assembly.
2. If all wires test good for a short-to-ground, refer to flow chart.

Test 10 – Check Load Voltage & Frequency

Procedure

Perform this test the same as Test 1 but apply a load to the generator equal to its rated capacity. Check voltage and frequency with load applied.

Frequency should not drop below about 59 Hertz.

Voltage should not drop below about 220 VAC nor rise above 265 VAC.

Results

1. If voltage and/or frequency drop excessively when load is applied, refer to flow chart.
2. If load voltage and frequency are within limits, end tests.

Test 11 – Check Load Watts & Amperage

Procedure

Add up the wattages or amperages of all loads powered by the generator at one time. If desired, a clamp-on ammeter may be used to measure current flow.

See the ***Wattage Reference Guide*** to determine generator limits.

NOTE: All figures are approximate. See data label on appliance for wattage requirements.

Results

1. If unit is overloaded, reduce load.
2. If load is within limits but frequency and voltage still drop excessively, refer to flow chart.

Overloading a generator in excess of its rated wattage capacity can result in damage to the generator and to connected electrical devices. Observe the following to prevent overloading unit:

- Add up total wattage of all electrical devices to be connected at one time. This total should NOT be greater than the generator's wattage capacity.
- The rated wattage of lights can be taken from light bulbs. The rated wattage of tools, appliances and motors can be found on a data label or decal affixed to the device.
- If the appliance, tool or motor does not give wattage, multiply volts times ampere rating to determine watts (volts x amps = watts).
- Some electric motors, such as induction types, require about three times more watts of power for starting than for running. This surge of power lasts only a few seconds when starting such motors.

Be sure to allow for high starting wattage when selecting electrical devices to connect to the generator:

1. Calculate watts needed to start the largest motor.
2. Add to that figure the running watts of all other connected loads.

Test 12 – Adjust Voltage Regulator

NOTE: Always use the unit specific schematics and wiring diagrams for brush orientation.

Procedure

1. Remove cover from end of alternator assembly.
2. Remove two screws holding down the voltage regulator (AVR); refer to ***Figure 2-3*** in Section 1 for identification.
3. Leave AVR connected to stator and brushes.
4. Set DMM to measure AC voltage.
5. See ***Figure 3-9***. Connect DMM across a 240 VAC receptacle.

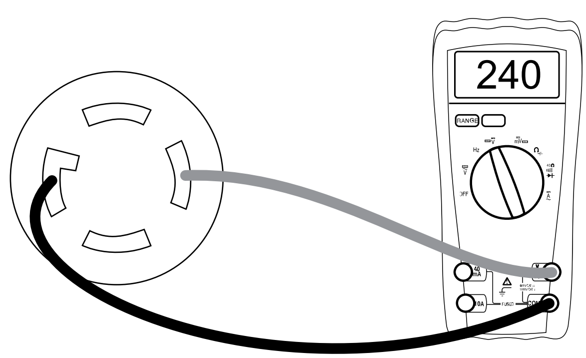


Figure 3-9. DMM Test Leads Connected to a 240 VAC Receptacle

6. Verify all material is clear of the alternator before proceeding.
7. Set START-STOP-RUN switch to START.
8. See ***Figure 3-10*** for location of adjustment screw.
9. Adjusting screw clockwise will increase voltage, adjusting counterclockwise will lower voltage.

Results

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

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Figure 3-10. Voltage Regulator Adjustment Screw

Test 13 – Voltage Changeover Switch 120/240 Position

The voltage change over switch allows the generator to produce full rated power in the 120 VAC position. The switch must never be switched while the generator is running.

1. Remove all the wiring from the voltage change over switch.
2. Set DMM to read Ohms and zero out the meter.
3. Place the switch in the 120 VAC position and use the switch schematic and number position to perform the following tests.

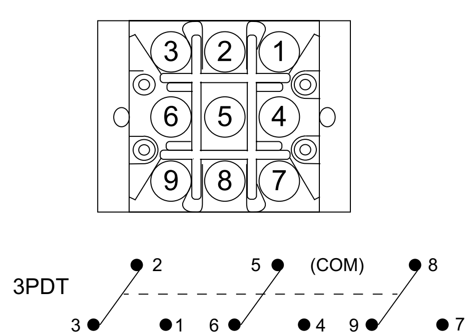

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Figure 3-11. Voltage Changeover Switch

4. Place one test meter lead on contact 2 and the other on contact 3. If CONTINUITY is not measured, rock the switch. If CONTINUITY is still not measured, replace switch.
5. Place one test meter lead on contact 5 and the other on contact 6. If CONTINUITY is not measured, rock the switch. If CONTINUITY is still not measured, replace switch.
6. Place one test meter lead on contact 8 and the other on contact 9.

The voltage change over switch allows the generator to produce full rated power in the 240 VAC position. The switch must never be switched while the generator is running.

1. Remove all wiring from the voltage change over switch.
2. Set DMM to read Ohms and zero out the meter.
3. Place the switch in the 240 VAC position and use the switch schematic and number position to perform the following tests.
4. Place one test meter lead on contact 1 and the other on contact 2. If CONTINUITY is not measured, rock the switch. If CONTINUITY is still not measured, replace switch.
5. Place one test meter lead on contact 4 and the other on contact 5. If CONTINUITY is not measured, rock the switch. If CONTINUITY is still not measured, replace switch.
6. Place one test meter lead on contact 7 and the other on contact 8. If CONTINUITY is not measured, rock the switch. If CONTINUITY is still not measured, replace switch.

Basic EFI Theory

Electronic Fuel Injection was first introduced to automobiles in the late 1960s. EFI is not new, as its roots were firmly established many years ago. However, EFI is fairly new to portable generators.

Basic Open-Loop Theory

EFI uses a solenoid valve called an injector to meter fuel delivery. The typical system uses 1 injector per cylinder. When the solenoid is energized, fuel sprays out into the intake valve port. Fuel is delivered to the injector by a high-pressure electric pump at approximately 36 psi. Fuel delivery is controlled by the injector which is cycled by the ECU. The ECU (Engine Control Unit) produces a signal to open the injector for a certain length of time depending on engine conditions transmitted by the sensors. The longer the injector is open, the more fuel is injected. As engine load increases, the injector open time is increased to match the increased airflow. This ECU output signal is called the injector pulse width. The longer the pulse width, the more fuel is injected. In a typical Open-Loop EFI system, there is no oxygen (O_2) sensor to monitor or change the fuel delivery.

Engine Requirements

The correct proportion of fuel is required to be mixed with the incoming air for efficient operation. Most generator engines utilize a ratio of approximately 14.7 parts air to 1 part fuel for the no load to full load power band. This is the chemically correct ratio which results in the lowest average emissions and best power. A rich condition is characterized by an excess of fuel and a lean condition is characterized by an excess of air or lack of fuel.

As the load is increased, up to capacity, the throttle is opened and as airflow increases fuel flow must increase to match it.

Fuel System

See ***Figure 4-1***. EFI fuel systems consist of a tank, pump, regulator, and injector. Fuel is drawn from the tank by the pump which steps up the pressure to approximately 36 psi. Fuel pressure is controlled by the fuel pressure regulator located in the fuel pump, discharging unused fuel back into the tank. When load demand increases, there is sufficient fuel available. The injector is sealed with an O-ring and has a 2-pin electrical plug to carry switching current to the solenoid windings. When energized, the solenoid core is pulled back, allowing fuel to spray out in a fine, conical pattern.

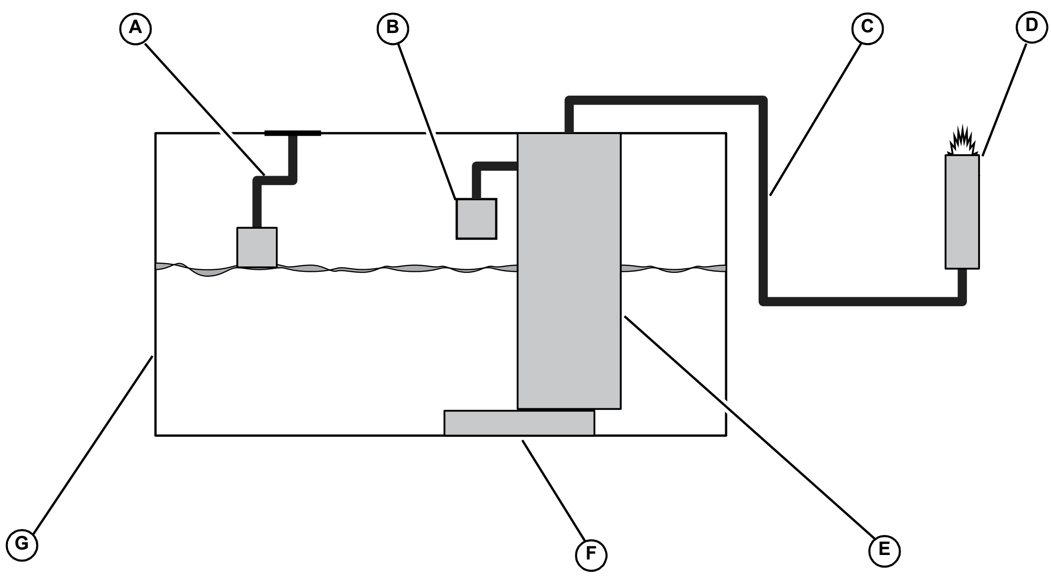

Figure 4-1. Return-less System

A. Fuel Gauge / Float
B. Pressure Regulator
C. Pressure Line
D. Fuel Injector
E. Fuel Pump
F. Fuel Filter
G. Fuel Tank

Air Metering and Measurement

The amount of air entering the engine is controlled by a conventional butterfly valve located in a throttle body assembly.

Airflow measurement is by Speed Density. The speed density system uses a solid-state pressure transducer to measure the pressure in the intake, combined with rpm and air temperature to indirectly determine airflow. A certain pressure relates to a certain voltage which is relayed to the ECU (Engine Control Unit).

Sensor Inputs

As with most EFI systems, there are 6 basic inputs that are measured by the ECU;

RPM

Most systems measure rpm using the ignition coil pulse or crank triggered magnetic/hall effect sensors. Rpm is considered a primary input signal on all EFI systems. Many systems generate an injection pulse for every tachometer pulse, so as rpm is increased, the frequency of injection pulses increases. However, since generator rpm is constant, this input is primarily for governing engine speed.

Airflow

On many systems, this input is also considered a primary input signal. However, in portable generator applications, airflow is predetermined and calculated by algorithms in the ECU.

Manifold Pressure

On speed density type systems, this input is essential when combined with the rpm signal to calculate airflow. As the throttle is opened, the manifold pressure increases which will require more fuel.

Throttle Position

This input is a secondary input on most systems. It is required mainly for load enrichment when the throttle is rapidly opened. However, a Throttle Position Sensor (TPS) is not utilized on this portable generator application.

Engine Temperature

Engine temperature is a secondary input required mainly to ensure proper starting and warm-up of the engine. When the engine is cold, the air to fuel ratio must be very rich to enable enough fuel to vaporize for proper starting. The computer increases the injector pulse width to supply extra fuel when cold and tapers this fuel off as the cylinder head temperature increases. Once the engine warms past 120 degrees or so, the computer does not need to add any extra fuel.

Where a carburetor chokes off air to enrich the mixture when cold, EFI injects extra fuel to achieve the same effect.

Air Temperature

This is a secondary input required especially on speed density systems. The sensor is usually mounted in the intake manifold or air filter area. As the air temperature drops, its density increases. Denser air requires more fuel. As the temperature of the inducted air increases, the computer reduces the pulse width to compensate for lower density.

Basic Operation

As explained in ***Basic Open-Loop Theory***, the computer processes all of the voltage signals from the various sensors to determine the engine operating conditions at the moment and delivers the appropriate pulse width to the injector. If engine airflow increases by 10%, the pulse width is also increased by about 10% to keep the air/fuel ratio constant. For example, if the load is doubled from 2000 Watts to 4000 Watts, the number of injections are also doubled to double the fuel flow.

The computer looks at the changes in sensor inputs every few milliseconds in order to be ready to modify the pulse width if any of the parameters change.

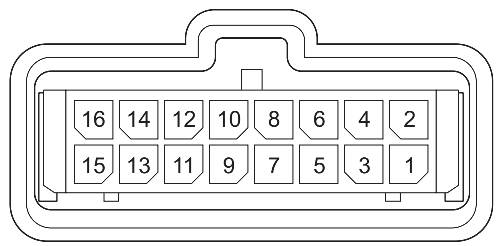

Figure 4-2. ECU/Carburetor Connector

Table 1-1. ECU/Carburetor Connector

Pin	Wire Color	Function
1	N/A	N/A
2	N/A	N/A
3	Black	Oil Pressure
4	Brown	Temperature
5	Green/White	CT (Current Txfmr)
6	Grey	Idle Switch
7	Red	Battery + (POS)
8	Green/White	CT (Current Txfmr)
9	Yellow/Green	Battery – (GND)
10	Red/White	Key Switch
11	Blue/White	Crankshaft Sensor
12	Yellow	Warning Lamp
13	White	Injector
14	Green	Communication
15	Orange	Fuel Pump
16	Red/Black	Ignition

EFI Fault Code Diagnostics

Fault Indicator Light

When the EFI system is connected to a power source (battery) and the generator is not running, the fault light will turn on. Once the generator starts the fault light will turn off. When a failure is detected, the fault light will flash in a series of codes. The severity of the fault will determine the flash code.

There are 3 failure levels:

- **Level 1** will flash and the generator will run. There may be a slight impact on performance.
- **Level 2** will flash and the generator will shut down if multiple errors are detected.
- **Level 3** will shut down the generator.

IMPORTANT NOTE: If the Fault Indicator Light is flashing 2/10 second on and 2/10 seconds off, this indicates a low or dead battery fault. This sequence stays on and takes precedent before other faults will be displayed.

Table 1-2. Fault Codes

Fault Code	Failure Description	Fault Flash (seconds)	Failure Level
2	TPS (Throttle Position Sensor) Failure	On-0.25s, Off-0.5s, On-0.25s	3
3	Cylinder Head Temperature Failure	On-0.25s, Off-0.5s Repeat 2X	2
4	Temperature failure	On-0.25s, Off-0.5s Repeat 3X	2
5	Low system voltage	On-0.25s, Off-0.5s Repeat 4X	3
6	High system voltage	On-0.25s, Off-0.5s Repeat 5X	3
7	Cylinder temperature high	On-0.25s, Off-0.5s Repeat 6X	1
8	Barometric pressure sensor failure	On-0.25s, Off-0.5s Repeat 7X	1
9	Oil pressure abnormally low	On-0.25s, Off-0.5s Repeat 8X	3
11	Fuel injector failure	On-1.2s, Off-0.5s, On-0.25s	3
13	Fuel pump failure	On-1.2s, Off-0.5s,(On-0.25s, Off-0.5s) Repeat 2X	3
15	Ignition failure	On-1.2s, Off-0.5s,(On-0.25s, Off-0.5s) Repeat 4X	3
17	ECU internal failure	On-1.2s, Off-0.5s,(On-0.25s, Off-0.5s) Repeat 6X	3
18	Crankshaft Position Sensor Failure	On-1.2s, Off-0.5s,(On-0.25s, Off-0.5s) Repeat 7X	1
19	ECU reset	On-1.2s, Off-0.5s, (On-0.25s, Off-0.5s) Repeat 8X	3
22	Engine over-speed failure	(On-1.2s, Off-0.5s) Repeat 1X, (On-0.25s, Off-0.5s) Repeat 1X	3
24	Load Stability Sensor Failure	(On-1.2s, Off-0.5s) Repeat 1X, (On-0.25s, Off-0.5s) Repeat 3X	1
27	Stepper motor binding	(On-1.2s, Off-0.5s) Repeat 1X, (On-0.25s, Off-0.5s) Repeat 6X	3
28	Engine starting failure	(On-1.2s, Off-0.5s) Repeat 1X, (On-0.25s, Off-0.5s) Repeat 7X	1
None	Low Battery	On-0.2s, Off-0.2s	0

Table 1-3. EFI Component Specifications

Battery Charge Coil	Open circuit voltage: 23V±5V Load voltage: 14V ±1V
Oil Pressure Sensor	3-9 PSI (0.02-0.06MPa)
Crank Sensor Ohm Reading	270 ±20 Ω (@25°C)
Ignition Coil	Primary: 1.5Ω ±0.1Ω (@25°C) Secondary: 5.8Ω ±0.6Ω (@25°C)
Injection Nozzle Ohm Reading	12Ω
Cylinder Head Temp Sensor	10K-3435
Stepper Motor	25Ω ±10%
Barometric Pressure Sensor	50-115kPa

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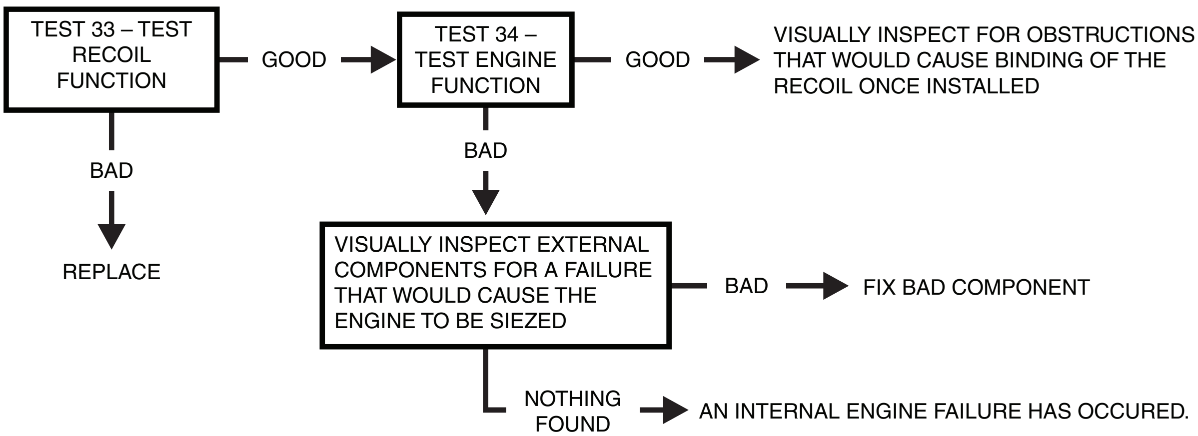
Diagnostic Flow Charts

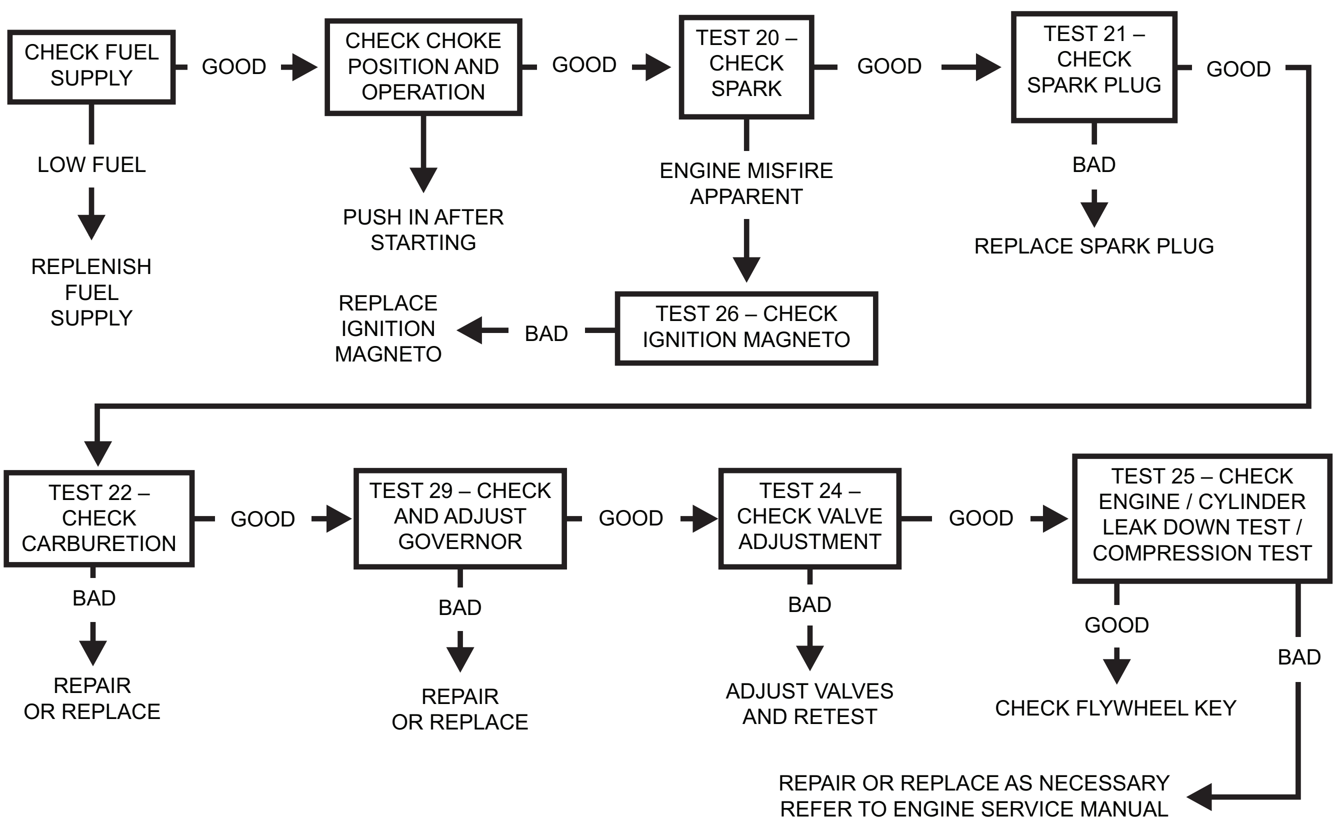
Use the Flow Charts in conjunction with the numbered tests in this section. Test numbers used in the flow charts correspond to the numbered tests. The first step in using the flow charts is to identify the correct problem on the following pages. For best results, perform all tests in the exact sequence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

NOTE: For XC6500/XC8000 426cc engine, use flow charts in conjunction with the Generac 426 Service Manual 10000016870.

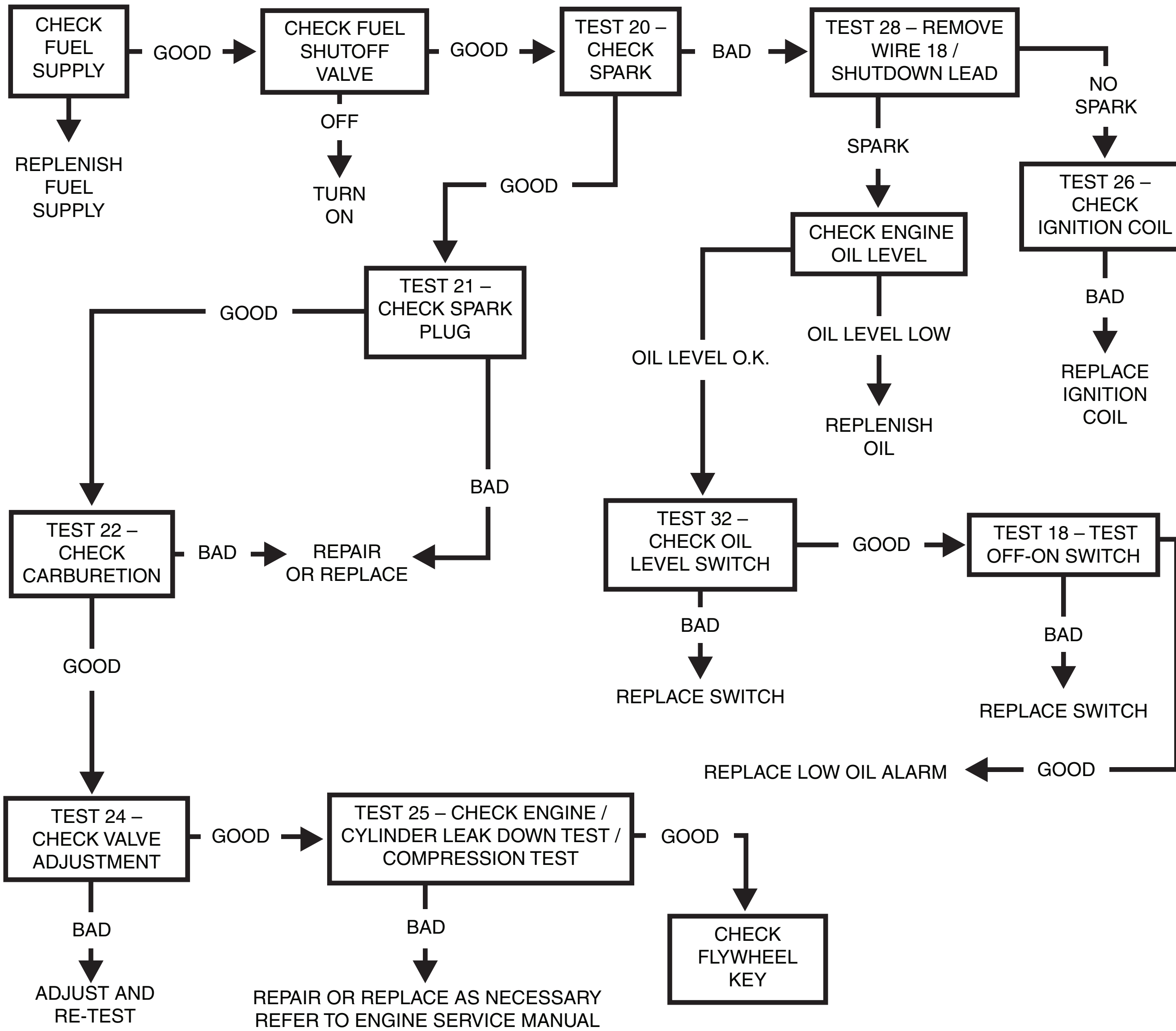
Problem 9 – Recoil Cord Will Not Pull (208/389/420/459cc Engines)



Problem 10 – Engine Starts Hard and Runs Rough (208/389/420cc Non-EFI Engines)

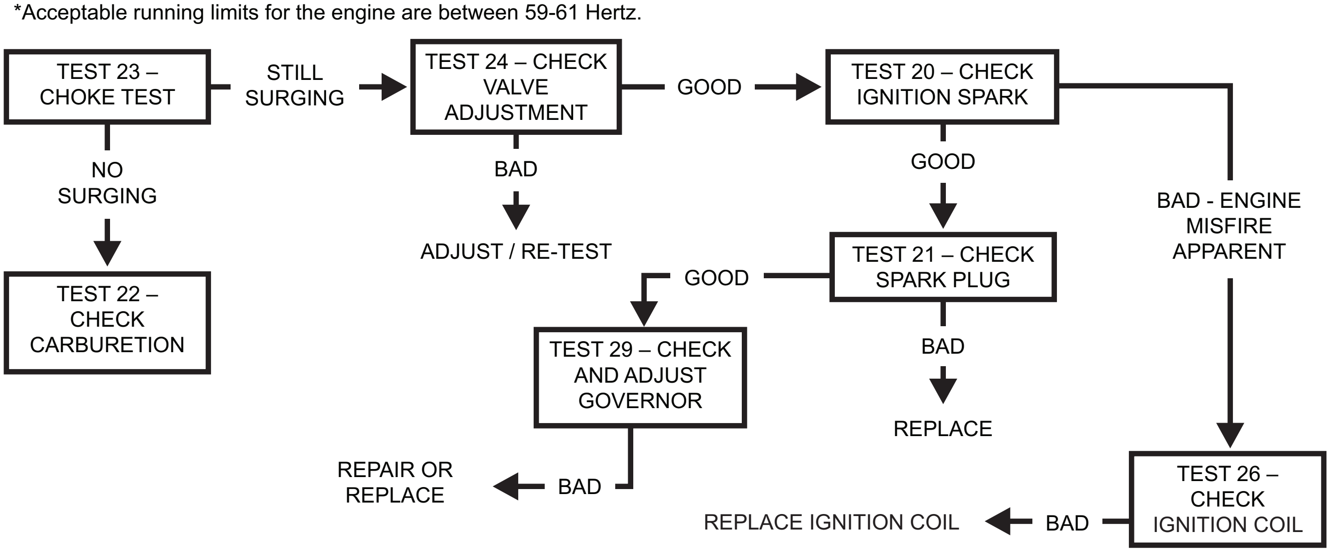


Problem 11 – Engine Turns Over But Will Not Start (208/389/420cc Non-EFI Engines)

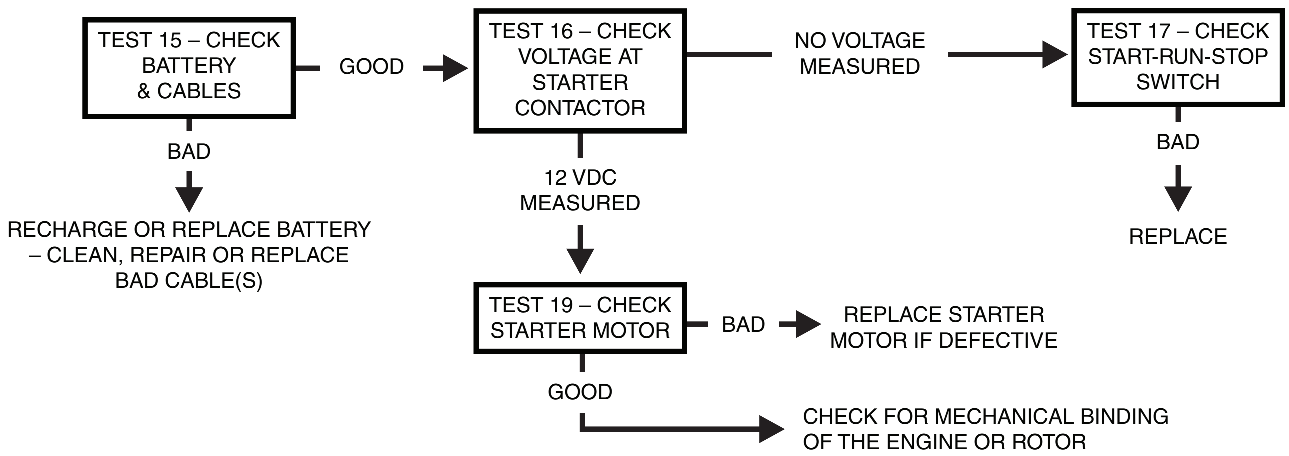


Problem 12 – Engine "Hunts" / Erratic Idle (208/389/420cc Non-EFI Engines)

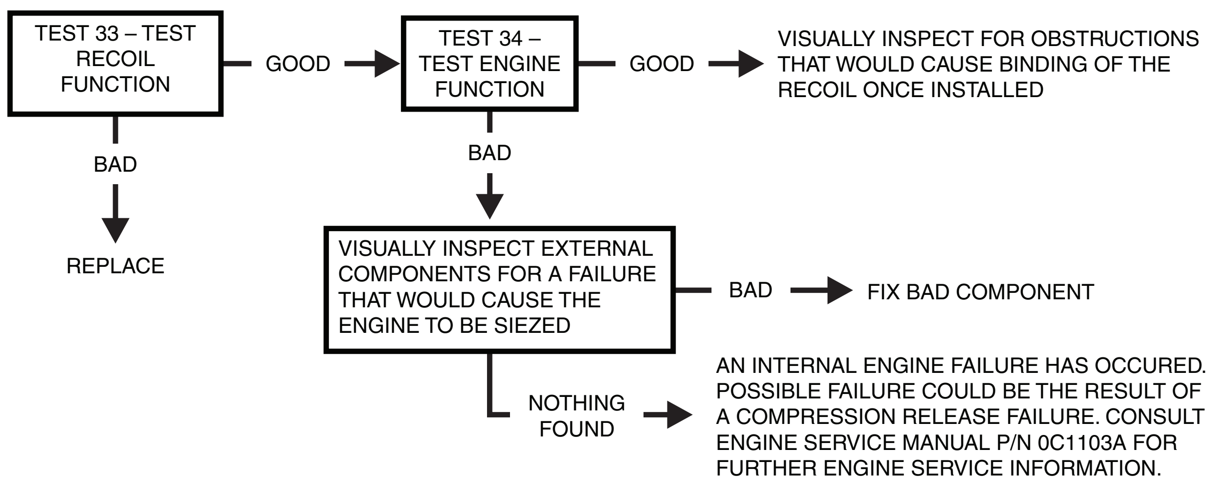
*Acceptable running limits for the engine are between 59-61 Hertz.



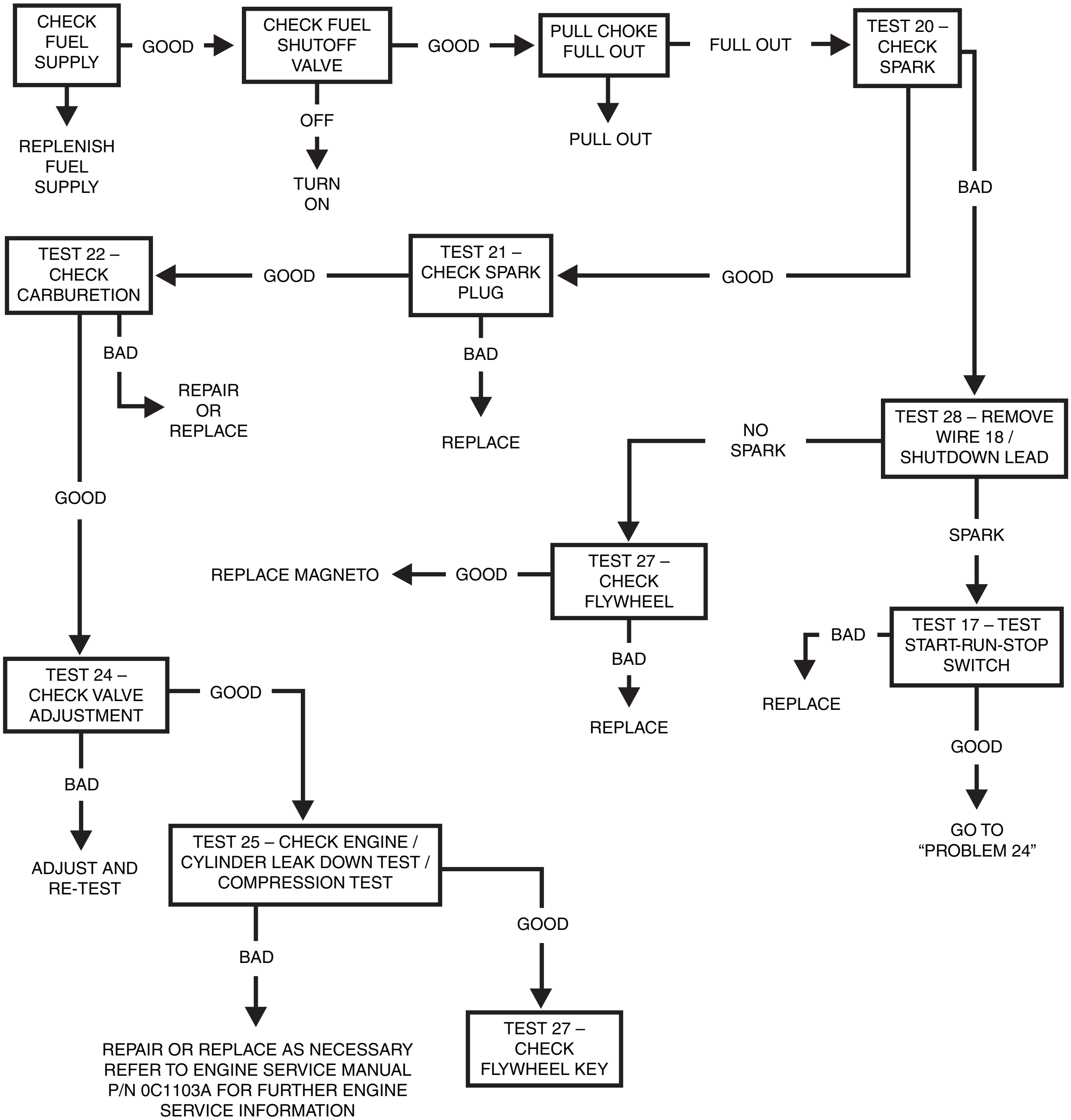
Problem 13 – Engine Will Not Crank (220/410/530cc Engines with Electric Start)



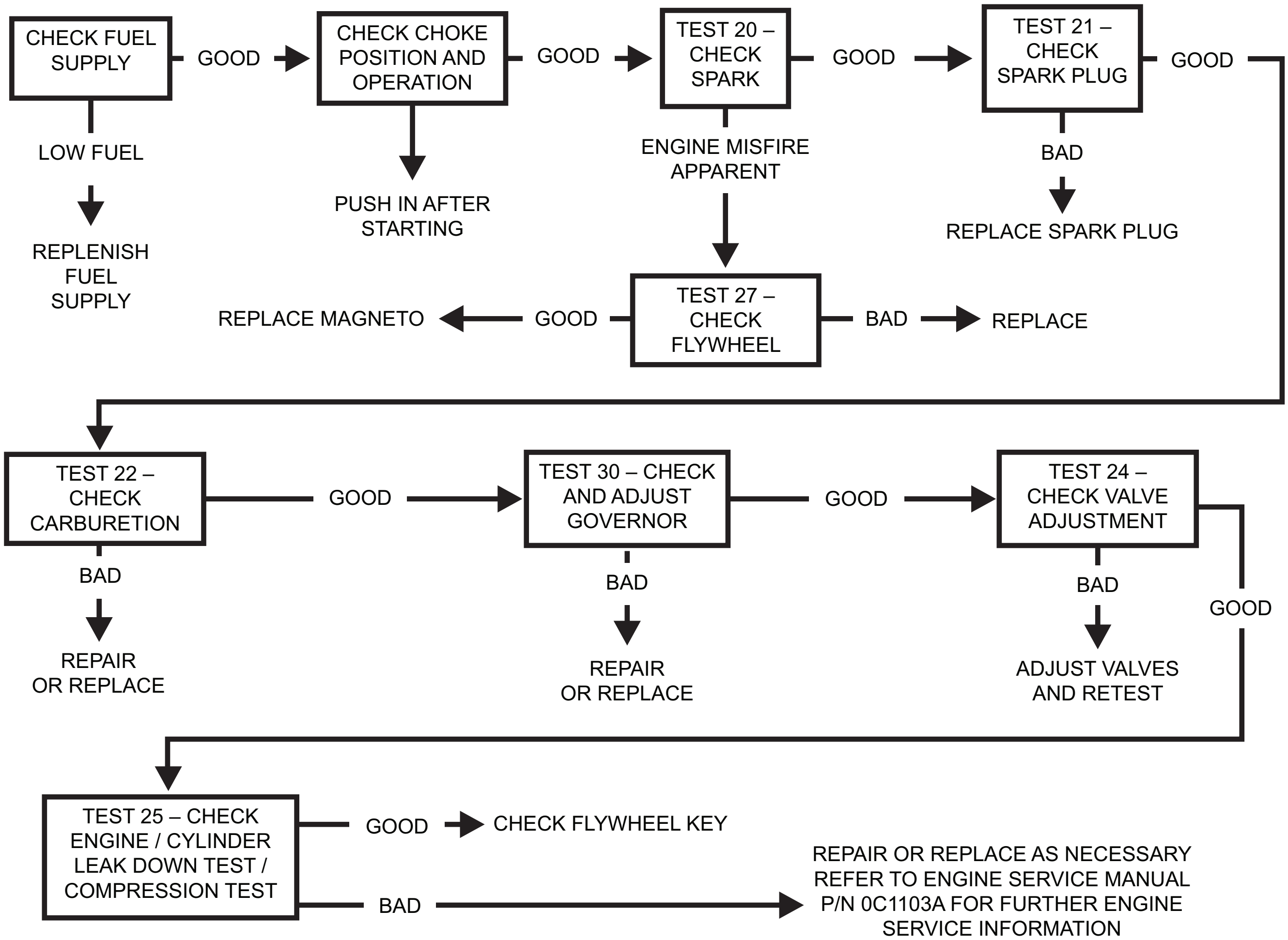
Problem 14 – Recoil Cord Will Not Pull (If So Equipped) (220/410/459/530cc Engines)



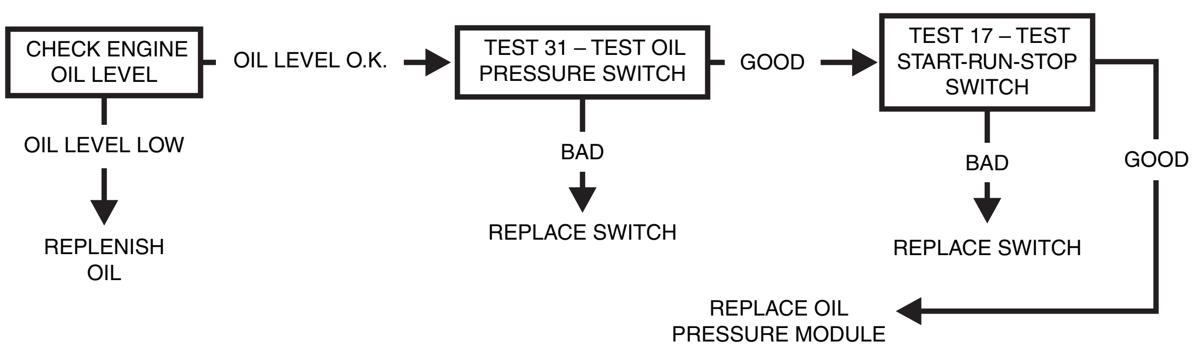
Problem 15 – Engine Cranks But Will Not Start (220/410/530cc Non-EFI Engines)



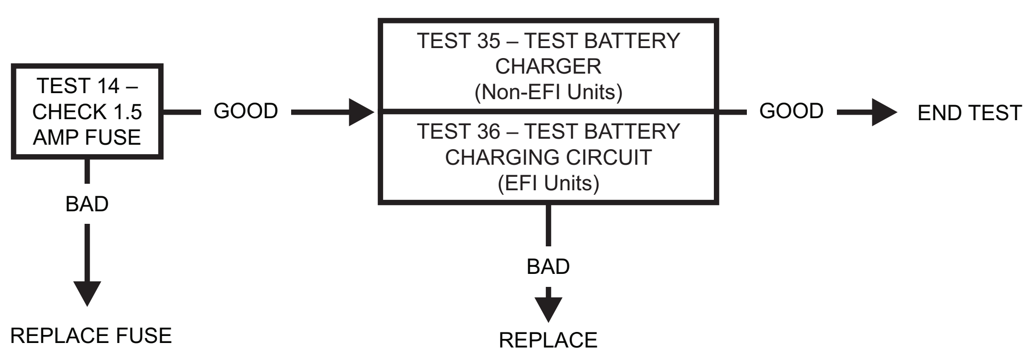
Problem 16 – Engine Starts Hard and Runs Rough (220/410/530cc Non-EFI Engines)



Problem 17 – Engine Starts Then Shuts Down (220/410/530cc Non-EFI Engines)

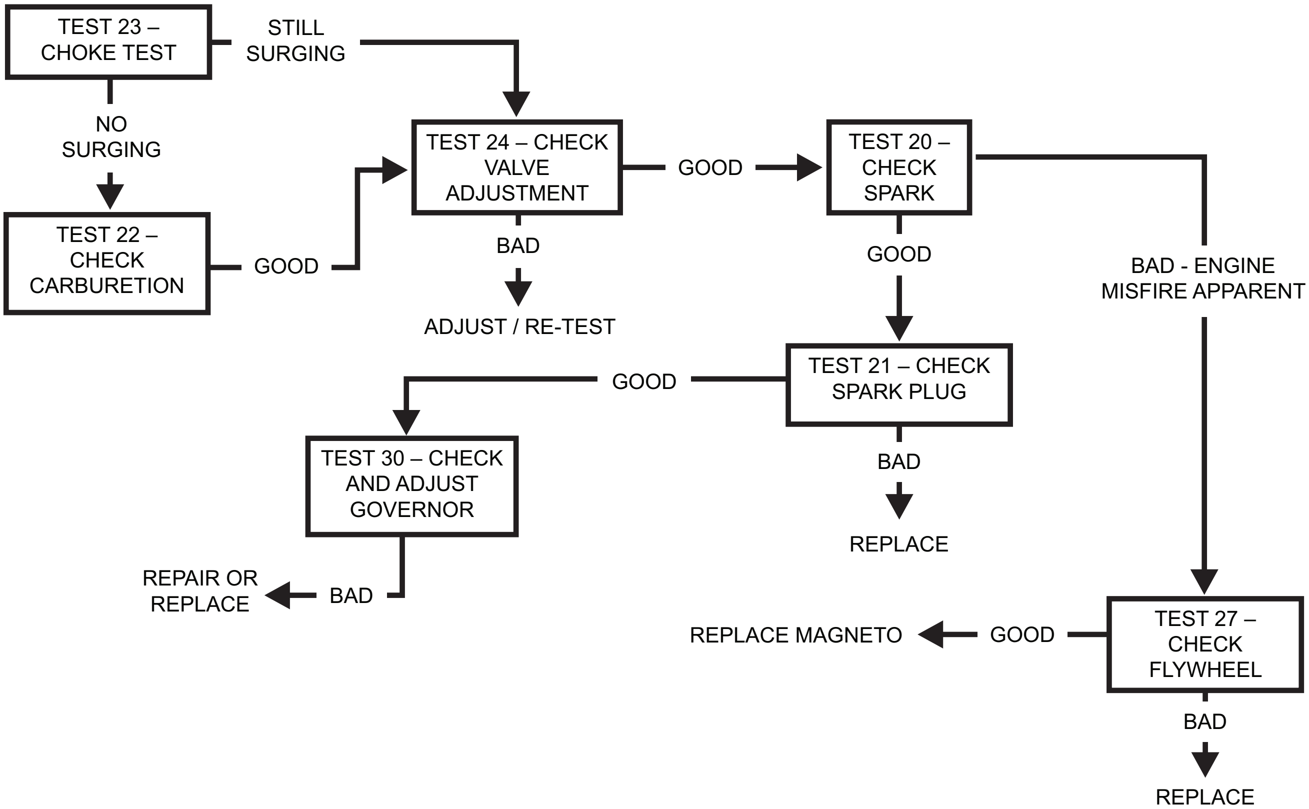


Problem 18 – Battery Will Not Charge (220/410/459/530cc Engines)



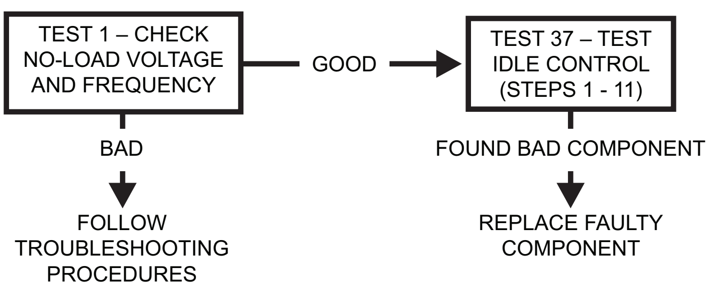
Problem 19 – Engine "Hunts" / Erratic Idle (220/410/530cc Non-EFI Engines)

*Acceptable running limits for the engine are between 59-62 Hertz.



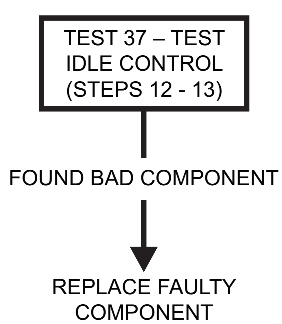
Problem 20 – Unit Will Not Idle (220/410/426/530cc Non-EFI Engines)

*Acceptable running limits for the engine are between 59-62 Hertz.



Problem 21 – Unit Will Not Come Off Idle (220/410/426/530cc Non-EFI Engines)

*Acceptable running limits for the engine are between 59-62 Hertz.



Introduction

Perform the Diagnostic Tests in this section in conjunction with the ***Diagnostic Flow Charts***. Test numbers in this chapter correspond to numbered tests in the flow charts.

NOTE: Test procedures in this manual are not necessarily the only methods for diagnosing the condition of components and circuits. All possible methods that might be used for system diagnosis have not been evaluated. If any diagnostic method is used other than the method presented in this manual, the technician must be sure that neither personal safety nor product safety, will be endangered by the procedure or method selected.

Test 14 – Check Fuse

General Theory

See ***Figure 5-1***. The fuse protects the wiring and battery charger from a short circuit.

Procedure

Push in fuse holder cap and turn counterclockwise. Remove cap with fuse. Inspect fuse.

Results

If fuse element melted open, replace fuse with an identical size fuse. If fuse is good, refer to flow chart.

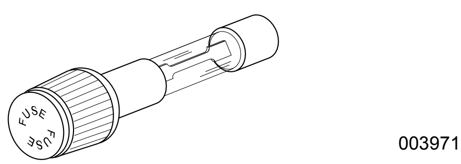


Figure 5-1. Typical Fuse

NOTE: Fuse may be an in-line wire style.

Test 15 – Check Battery and Cables

General Theory

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.

The battery charging circuit 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 due to high resistance, will not allow current to flow.

Electrical voltage drop varies according to current flow. Voltage drop cannot be measured unless the circuit is operated so current can flow through it. A crank attempt will need to be performed to properly measure voltage drop. This test will determine whether the battery, battery cables, or both are at fault.

Procedure A – Perform Starter Circuit Voltage Drop Test

1. Set a digital multimeter (DMM) to measure DC voltage.
2. 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, recharge the battery and retest.
   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)
3. To inhibit any possible startup, turn off the fuel source and ground the ignition control wire. (refer to applicable schematic)
4. Refer to battery post and starter connections in ***Figure 5-2*** and ***Figure 5-3*** then perform a voltage drop test as indicated.
5. Set the start-run-stop switch to START. Allow the engine to crank long enough to obtain a steady measurement.
6. Record voltage readings from test points V1, V2, V3 and V4. Although resistance-free connections, wires and cables would be ideal, most of them will contain at least some voltage drop. The maximum voltage readings should be as follows:
   a. 0.00-0.10 VDC across a connection or battery post (V4).
   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 (V3).
   e. 0.40-0.50 VDC across the entire circuit

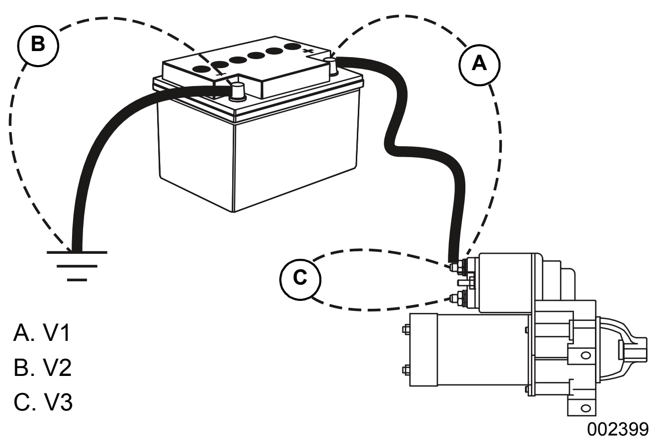


Figure 5-2. Starter Circuit Voltage Drop Test Connections

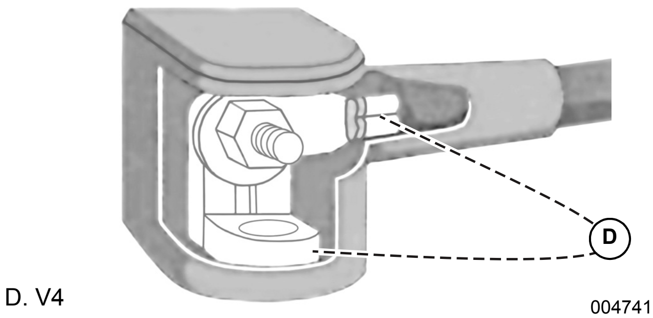


Figure 5-3. Starter Circuit Voltage Drop Test Connections

7. If voltage drop is greater than the above, based on the circuit or component, clean or replace the failed connection or component. If voltage drop test results are within the above, based on the circuit or component, refer back to the flowchart.

Test 17 – Check START-RUN-STOP Switch (410/426cc Engine)

General Theory

See ***Figure 5-4***. The START-RUN-STOP switch utilizes ground potential to start and shutdown the engine. When the switch is actuated to START, positive 12 VDC is delivered to the starter contactor, allowing the engine to crank. Once positive 12 VDC is removed, by releasing the switch to the RUN position, it disengages the starter allowing the engine to operate. When switch is actuated to STOP, ground is applied to the magneto coil(s) which inhibits spark from occurring.

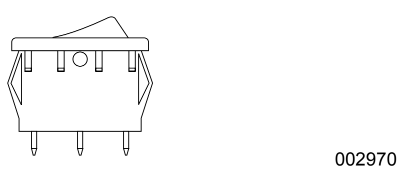


Figure 5-4. START-RUN-STOP Switch

Procedure

1. Set a digital multimeter (DMM) to measure resistance.
2. Remove all wires from START-RUN-STOP Switch (SW1).
3. Connect one meter lead to Terminal 2 and the other meter lead to Terminal 1. Actuate switch to START position. CONTINUITY should be measured.
4. Actuate switch to the STOP position. INFINITY should be measured.
5. Keep one meter lead on Terminal 2 and connect the other meter lead to Terminal 3. Actuate switch to the STOP position. CONTINUITY should be measured.
6. Actuate switch to START position. INFINITY should be measured.
7. Connect one meter test lead to disconnected Wire 0 from Terminal 2 and connect the other meter test lead to the positive post of the battery, 12 VDC should be measured. If voltage is not measured, repair or replace Wire 13A between the starter contactor and the START-RUN-STOP switch.
8. Connect all wires to the switch.

Results

1. If any other readings were measured, replace START-RUN-STOP switch.
2. Refer to flow chart.

Test 18 – Test OFF-ON Switch

General Theory

The OFF-ON switch applies a ground to the shutdown harness (Wire 18). Applying ground to the harness grounds out the magneto and inhibits spark.

Procedure

1. See ***Figure 5-5***. Disconnect Point A from switch.

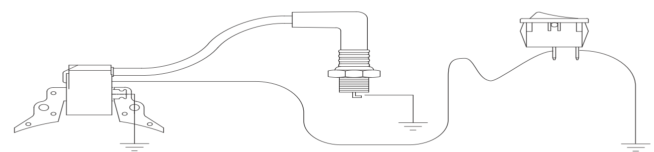


Figure 5-5. OFF-ON Switch Test Points

2. Connect one meter lead to male connector on switch and the other meter test lead to a clean frame ground.
3. Actuate switch back and forth between ON and OFF. CONTINUITY should only be measure in the OFF position.

Results

1. If switch failed Step 3, replace OFF-ON switch.
2. If OFF-ON switch is good, refer to flow chart.

Test 19 – Check Starter Motor

The following conditions affect starter motor performance:

1. Binding or seizing in starter motor bearings.
2. A shorted, open, or grounded armature.
    a. Shorted, armature (wire insulation worn and wires touching),. indicated by low or no RPM.
    b. Open armature (wire broken), indicated by low or no RPM and excessive current draw.
    c. Grounded armature (wire insulation worn and wire touching armature lamination or shaft), 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.

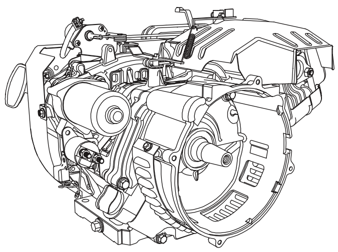


Figure 5-6. Starter Motor (SM)

Procedure

The battery should have been previously checked and fully charged.

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

Set Start-Stop Switch to START and observe meter. Meter should indicate battery voltage. Starter motor should operate and engine should crank.

Results

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

NOTE: If a starting problem is encountered, the engine itself should be thoroughly checked to eliminate it as the cause of starting difficulty. It is good practice to check engine for freedom of rotation by removing spark plugs and turning crankshaft over slowly by hand to be sure it rotates freely.

IMPORTANT NOTE: Do not rotate engine with electric starter with spark plugs removed. Arcing at the spark plug ends may ignite the gasoline vapor exiting the spark plug hole.

DANGER

Explosion and Fire. Fuel and vapors are extremely flammable and explosive. Store fuel in a well ventilated area. Keep fire and spark away. Failure to do so will result in death or serious injury.
(000143)

WARNING

Explosion. Turn fuel supply OFF before checking for spark. Failure to do so could result in death or severe injury.
(000333)

Checking The Pinion

See ***Figure 5-7***. When starter motor is activated, the pinion gear should move and engage flywheel ring gear. If pinion does not move normally, inspect pinion for binding or sticking.

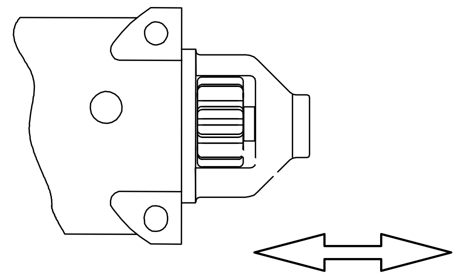


Figure 5-7. Check Pinion Gear Operation

Test 20 – Check Ignition Spark

Procedure

A commercially available spark tester may be used to test engine ignition system. One can also be purchased from Generac or local supplier.

Figure 5-8. Spark Tester

1. Disconnect spark plug lead from spark plug.
2. Attach high tension lead to spark tester terminal.
3. See ***Figure 5-9*** and ***Figure 5-10***. Ground spark tester clamp by attaching to cylinder head.
4. Crank engine rapidly. Engine must crank at 350 rpm or more. If spark jumps tester gap, assume the ignition system is working properly. Repeat on remaining cylinder spark plug.

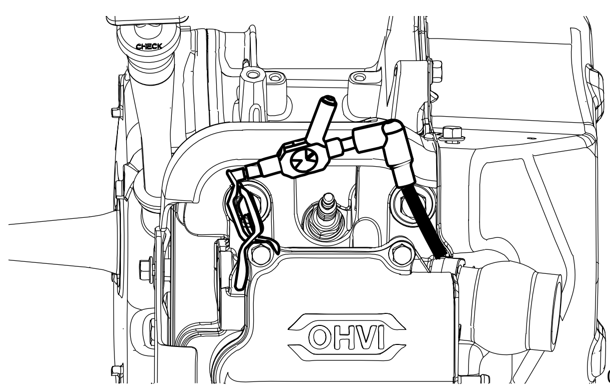


Figure 5-9. Testing Ignition System

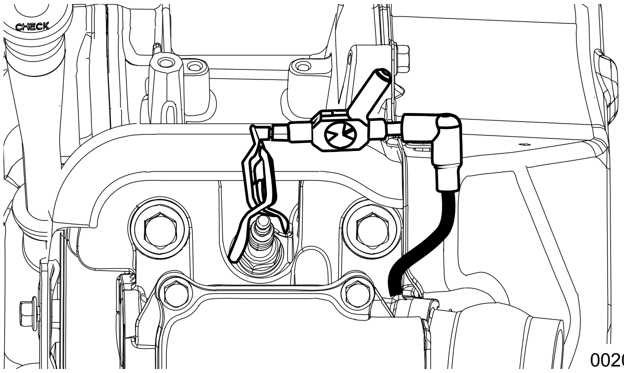


Figure 5-10. Checking Engine Misfire

5. If spark jumps tester gap intermittently, the problem may be in the ignition magneto.

Results

Refer to flow chart.

Test 21 – Check Spark Plugs

Procedure

See ***Figure 5-11*** and ***Figure 5-12***. Remove spark plugs. Clean with commercial solvent. Replace spark plugs if badly fouled, if ceramic is cracked, or if badly worn or damaged.

IMPORTANT NOTE: Do NOT blast clean spark plugs.

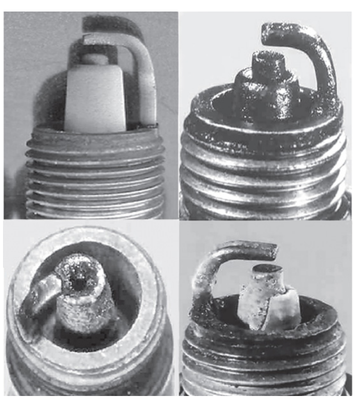


Figure 5-11. Spark Plug Conditions

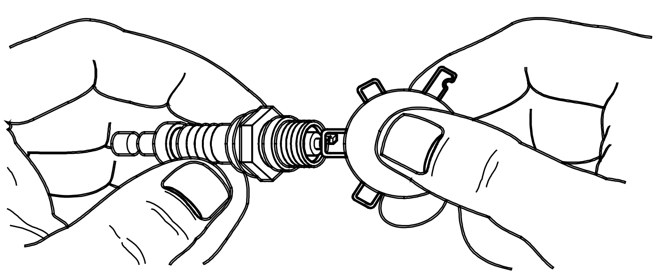


Figure 5-12. Setting Spark Plug Gap

Results

1. Clean and gap or replace sparks plug as necessary.
2. Refer to flow chart.

Test 22 – Check Carburetion

Procedure

Before making a carburetion check, be sure fuel supply tank has fresh, clean gasoline.

Check all shutoff valves are open and fuel flows freely through fuel line.

Make sure choke operates properly.

If engine will not start, remove and inspect spark plug. If spark plug is wet, look for the following:

- Overchoking
- Excessively rich fuel mixture
- Water in fuel
- Intake valve stuck open
- Needle/float stuck open

If spark plug is dry, look for the following:

- Leaking carburetor mounting gaskets
- Intake valve stuck closed
- Inoperative fuel pump
- Plugged fuel filter(s)
- Varnished carburetor

If engine starts hard or will not start, look for the following:

- Physical damage to AC generator. Check Rotor for contact with Stator.
- Starting under load. Make sure all loads are disconnected or turned off before attempting to crank and start engine.
- Be sure choke is working properly.

1. Remove fuel line at carburetor and ensure there is adequate fuel entering the carburetor.
2. Remove float bowl and check for foreign matter in bottom of carburetor bowl.
3. The float is plastic and can be removed for access to needle for cleaning.
4. With all of this removed, carburetor cleaner can be used to clean carburetor before assembly.
5. After cleaning carburetor with approved carburetor cleaner, blow dry with compressed air and assemble.

Shelf life of gasoline is 30 days. A fuel stabilizer must be used to ensure fuel is fresh at all times.

Results

If carburetor is varnished, clean or replace. Refer to flow chart.

Test 23 – Choke Test

Procedure

If generator is surging, it may be a carburetion problem. A lean condition can cause erratic RPM. Slowly pull choke out to see if surging stops. If it does stop, carburetion should be checked.

Test 24 – Check Valve Adjustment

Adjusting Valve Clearance

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

Adjust valve clearance with engine at room temperature. The piston should be at top dead center (TDC) of its compression stroke (both valves closed).

Another method is to turn engine over and position intake valve fully open (intake valve spring compressed) and adjust exhaust valve clearance. Turn engine over and position exhaust valve fully open (exhaust valve spring compressed) and adjust intake valve clearance.

1. See ***Figure 5-13***. Loosen rocker arm jam nut. Turn pivot ball stud while checking clearance between rocker arm and valve stem with a feeler gauge.

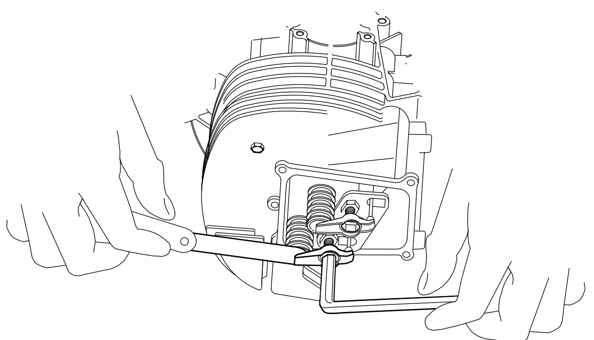


Figure 5-13. Adjusting Valve Clearance

2. See ***Figure 5-14***. When clearance is correct, hold pivot ball stud with Allen wrench and tighten rocker arm jam nut to specified torque with a crow foot wrench. After tightening jam nut, recheck valve clearance to make sure it did not change.

Table 5-1.	
Rocker Arm Jam Nut	ft-lbs
208/389/420	9 to 12
220	6
426	10
410/426/530	14.5

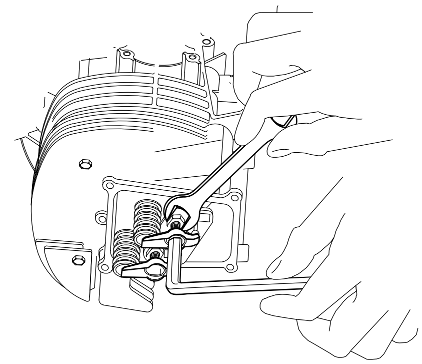


Figure 5-14. Tightening Jam Nut

Adjust Valve Clearance (426cc Engine)

See ***Figure 5-15***. Check and adjust the valve to rocker arm clearance as follows:

1. Remove the four screws attaching the valve cover and remove valve cover.
2. Discard valve cover gasket.
3. Loosen the rocker jam nut (A) using a 10 mm wrench.
4. Turn the pivot ball stud (B) using a 14 mm wrench while checking clearance between the rocker arm (C) and the valve stem (D) with a feeler gauge. Adjust clearance per ***Table 5-2***.

Table 5-2.		
Engine	Intake Valve	Exhaust Valve
208	0.004 inch	0.006 inch
220	0.001 - 0.002 inch	0.0018 - 0.003 inch
389/420	0.006 ± 0.0008 inch	0.008 ± 0.0008 inch
410/426/ 530	0.002 - 0.004 inch	0.002 - 0.004 inch

Install Rocker Arm Cover

1. Use a new rocker arm cover gasket. Install rocker arm cover and retain with four screws.

Results

Adjust valves to specification and test. If problem continues, refer to flow chart.

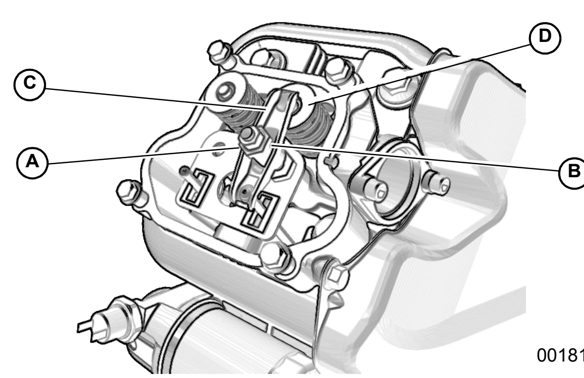


Figure 5-15. Valve Clearance Adjustment (426cc)

Test 25 – Check Engine / Cylinder Leak Down Test / Compression Test

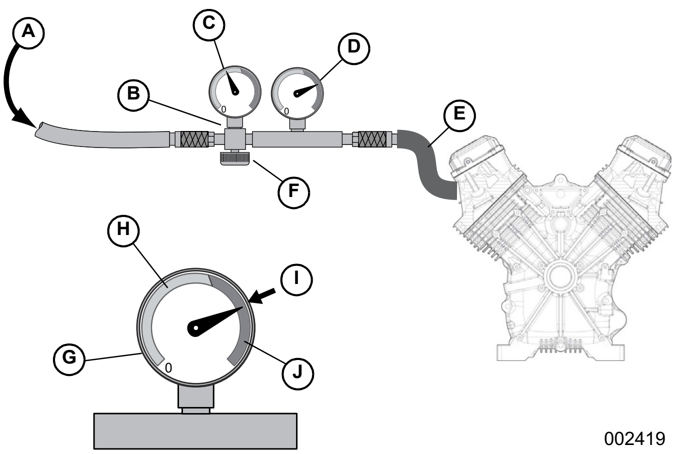
General Theory

Most engine problems may be classified as one, or a combination of the following:

- Will not start
- Starts hard
- Lack power
- Runs rough
- Vibration
- Overheating
- High oil consumption

General Theory

The Cylinder Leak Down Tester checks sealing (compression) ability of engine by measuring air leakage from combustion chamber. Compression loss can present many different symptoms. This test detects the section of the engine where the fault lies before disassembling the engine. *Figure 5-16* represents a standard tester available on the market.



A. Compressed air in
B. Air pressure regulator
C. Inlet gauge pressure set point
D. Outlet gauge pressure
E. To spark plug hole
F. Regulator adjustment knob
G. Outlet gauge
H. Red range indicates unacceptable leakage
I. Needle indicates minimal air leakage
J. Green range indicates acceptable leakage

Figure 5-16. Cylinder Leakdown Tester

Procedure

1. Shut off the fuel supply.
2. Remove spark plug.
3. Gain access to flywheel.
4. Remove valve cover.
5. Rotate engine crankshaft until the piston reaches top dead center (TDC). Both valves should be closed.
6. Lock flywheel at top dead center.
7. Attach cylinder leak down tester adapter to spark plug hole.
8. Connect an air source of at least 90 psi to the leak down tester.
9. Adjust regulated pressure on gauge to 80 psi.
10. Read right hand gauge on tester for cylinder pressure. 20 percent leakage is normally acceptable. Use good judgment, and listen for air escaping at carburetor, exhaust, and crankcase breather. This determines where the fault lies.

Results

- Air escapes at carburetor – check intake valve.
- Air escapes through exhaust – check exhaust valve.
- Air escapes through breather – check piston rings.
- Air escapes from cylinder head – replace head gasket.

Check Compression

To check engine compression, remove spark plug. Insert an automotive type compression gauge into the spark plug hole. Crank engine until there is no further in pressure. The highest reading obtained is engine compression pressure.

Minimum Allowable Compression Pressure Cold Engine – 60 psi

If compression is poor, look 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

NOTE: Refer to Engine Service Manual Part Number 0C1103A for further engine service information on the 410cc engine.

NOTE: Refer to Engine Service Manual Part Number 10000016870 for further engine service information on the 426cc engine.

Test 26 – Check Ignition Coil

General Theory

The ignition system used on these engines 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 increases voltage and delivers the high voltage across spark plug gap.

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

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

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

See ***Figure 5-17***. The ignition coil assembly consists of (a) ignition coil, (b) spark plug high tension lead, and (c) spark plug boot.

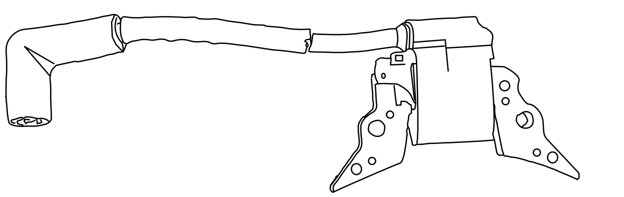


Figure 5-17. Ignition Coil

Procedure

1. Disconnect Wire 18 at bullet connector and repeat Test 20.
2. If unit produces spark, a short to ground exists on Wire 18 between the Ignition Coil and RUN-STOP switch.
3. If unit still failed to produce spark, proceed to Step 4.
4. Set a DMM to measure resistance. Connect negative (-) test lead to Wire 18, going to the coil. Connect positive (+) test lead to frame ground. Approximately 1.5 kΩ should be measured.
5. Set a DMM to measure resistance. Disconnect high tension lead from spark plug. Connect one test lead to high tension lead. Connect other test lead to frame ground. Approximately 16 kΩ should be measured.

Results

1. If unit was able to produce spark after disconnecting Wire 18, a short to ground or a faulty switch is supplying Wire 18 with a ground inhibiting the engine from producing spark.
2. If Ignition Coil fails Step 4 or Step 5 by a high margin, replace Ignition Coil.
3. If coil passes Step 4 and Step 5 but there is still no spark, replace ignition coil.

NOTE: Before replacing ignition coil, check flywheel magnet.

Checking Flywheel Magnet

The flywheel magnet rarely loses magnetism. To determine if a magnet is be defective, perform this test:

1. Place flywheel on a wooden surface.
2. Hold a screwdriver at the utmost end of handle with its point down.
3. Move tip of screwdriver to about 3/4 inch (19mm) from magnet. The screwdriver blade should be pulled in against magnet.

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

Test 27 – Check Flywheel

General Theory

See ***Figure 5-18***. In Test 20, a spark tester was used to check for engine ignition. If sparking or weak spark occurred, a possible cause might be the ignition magneto. This test checks magnetism of flywheel and will check the flywheel key.

Procedure

1. Check flywheel magnet by holding a screwdriver at extreme end of handle with its point down. When the tip of screwdriver is moved to within 3/4 inch (19mm) of magnet, the blade should be pulled in against the magnet.
2. For rough running or hard starting engines, check flywheel key. 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.

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

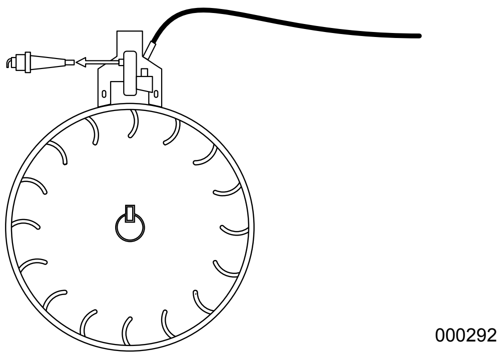


Figure 5-18. Engine Ground Harness

Test 28 – Remove Shutdown Wire

General Theory

Wire 18 on all engines is used to shut down the unit when either the switch is placed in OFF, or a low oil condition occurred. A ground is applied to the magneto in both instances which inhibits spark and shuts down unit. If a short to ground exists on this wire, the engine will be inhibited from producing spark. This test will check the integrity of the wire.

Procedure

1. Turn off fuel supply.
2. Remove flywheel cover so magneto is exposed.
3. See ***Figure 5-19***. Disconnect Wire 18 from magneto.
4. Repeat ***Test 20 – Check Ignition Spark***.

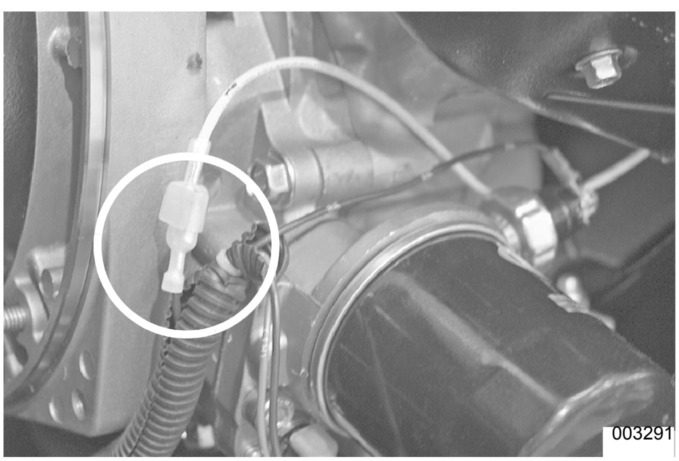


Figure 5-19. Wire 18 (410 Engine)

Results

1. If spark now occurs, Wire 18 has a short to ground. Trace Wire 18 back to START-RUN-STOP switch and Oil Pressure Module (if equipped).
2. If spark still does not occur, refer to flow chart.

Test 29 – Check / Adjust Governor (208/389/420cc Non-EFI Engine)

Rotor operating speed and AC output frequency are proportional. The generator delivers a frequency of 60 Hertz at 3600 Rotor rpm or 62 Hertz at 3720 Rotor rpm.

The Voltage Regulator should be adjusted to deliver 120 VAC (line-to-neutral) at a frequency of 60 Hertz or 124 VAC (line-to-neutral at 62 Hertz. It is apparent if governed speed is high or low, AC frequency and voltage will be correspondingly high or low. Governed speed at no-load is usually set slightly above rated speed of 60 Hertz (to 62 Hertz) to prevent excessive rpm, frequency, and voltage droop under heavy electrical loading.

Procedure

See ***Figure 5-20***.

1. Loosen governor clamp bolt (A).
2. Push Spring end of governor lever (B) clockwise to wide open throttle position.
   a. Hold governor lever at wide open throttle and, with a pair of pliers, rotate governor shaft (C) fully clockwise (CW). Use minimum amount of force against governor shaft.
   b. While holding governor shaft fully clockwise and the governor lever at wide open throttle, tighten governor clamp bolt (A) to 70 inch-pounds (8 Nm).
3. Start engine. Let stabilize and warm up at no-load.
4. Turn adjuster nut (D) to obtain frequency reading of 62 Hertz.
5. Determine if governor spring is properly located in slot of governor lever.

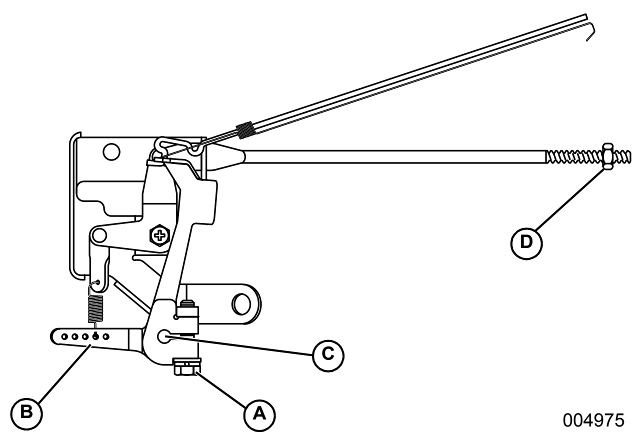


Figure 5-20. Governor Adjustment (220/410 Engine)

6. After repositioning spring on lever slot, check frequency reading and, if necessary, adjust adjuster nut to obtain 62 Hertz at no-load.
7. When frequency is correct at no-load, check AC voltage reading. If voltage is incorrect, the voltage regulator may require adjustment. See ***Test 12 – Adjust Voltage Regulator***.

Test 30 – Check / Adjust Governor (220/410/530cc Non-EFI Engine)

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.

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.

Procedure

See *Figure 5-21*.

1. Loosen governor clamp bolt (A).
2. Hold governor lever (B) at its wide open throttle position, and rotate governor shaft (C) clockwise as far as it will go. Tighten governor lever clamp bolt to 70 **in-lbs** (8 Nm).
3. Start generator and let stabilize and warm up at no-load.

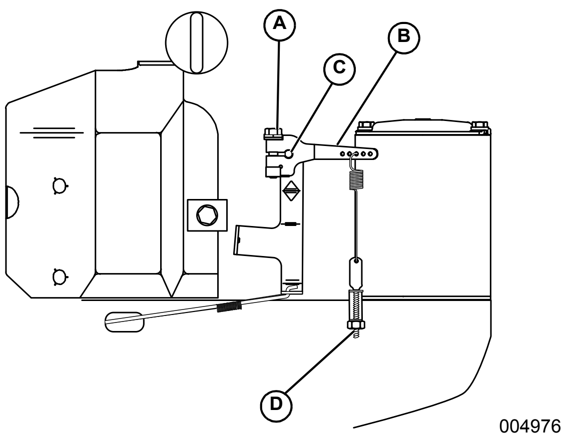


Figure 5-21. Governor Adjustment (410 Engine)

4. Connect a frequency meter across generator AC output leads.
5. Turn primary adjust screw (D) to obtain a frequency reading of 62.5 Hz.
6. When frequency is correct at no load, check AC voltage reading. If voltage is incorrect, the voltage regulator may require adjustment (if equipped).

Results

1. If after adjusting engine governor, frequency and voltage are good, discontinue tests.
2. If frequency is good but voltage is high or low, refer to flow chart.
3. If engine was overspeeding, check linkage and throttle for binding. If no governor response is indicated, refer to engine service manual.

Test 31 – Check Oil Pressure Switch

If engine cranks and starts, then shuts down almost immediately, check the following:

- Low engine oil level.
- Low oil pressure.
- Defective oil pressure switch.

Figure 5-22. Low Oil Pressure Switch

Procedure

1. Check engine crankcase oil level.
   a. Check engine oil level.
   b. If necessary, add recommended oil to dipstick FULL mark. DO NOT OVERFILL ABOVE FULL MARK.
2. Do the following:
   a. Disconnect Wire 86 and Wire 0 from oil pressure switch terminals.
   b. Remove switch and install an oil pressure gauge.
   c. Start engine while observing oil pressure reading on gauge.
   d. Note 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 10 psi, shut engine down immediately. A problem exists in engine lubrication system. Refer to Service Manual, Generac P/N 0F6923 for engine service recommendations.

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

3. Remove oil pressure gauge and install oil pressure switch. Do NOT connect Wire 86 or Wire 0 to switch terminals.
   a. Set a DMM to measure resistance.
   b. Connect meter test leads across switch terminals. With engine shut down, the meter should read CONTINUITY.
   c. Crank and start engine. The meter should read INFINITY.

   d. 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 engine mount.

4. If LOP switch tests good in Step 3 and oil pressure is good in Step 2 but unit still shuts down with a LOP fault, check all wiring connections between START-STOP-RUN switch and LOP pressure module and LOP sender for a short to ground. Any ground on this wire will cause Wire 18 to receive a ground, also inhibiting spark from occurring. If a short to ground is found, replace wire.

Results

1. If LOP switch, oil pressure, and wiring all test good, refer to flow chart.
2. If LOP switch failed, replace switch.
3. If no pressure was measured, an internal failure of oil pump may have occurred.

Test 32 – Check Oil Level Switch

General Theory

Some engines utilizes a splash type lubrication system. The switch should be open when the engine is filled with oil. The switch will close when the oil level drops too low. The switch will close and ground out the magnetos inhibiting spark until the oil level is raised.

Procedure

1. Verify the oil level is full.
2. Unplug wire from oil level switch.

Figure 5-23. Oil Level Switch

3. Set DMM to measure resistance.
4. Connect one meter test lead to disconnected wire from oil level switch. Connect the other meter test lead to frame ground. INFINITY should be measured.

Results

1. A CONTINUITY reading indicates the switch is not functioning. Replace switch.

Test 33 – Test Recoil Function

Procedure

1. Attempt to pull start engine and observe the following:
   a. Does cord pull easily and smoothly?
   b. Does cord return with no assistance?
   c. Does engine turn over as cord is pulled?

Results

If recoil did not perform correctly, possible problems could be:

- Compression release valve on 410 engine could be broken.
- Engine could be seized.
- Recoil could have become detached from flywheel.
- Recoil mechanism could be broken and not properly retracting back into engine.

Test 34 – Test Engine Function

Procedure

1. Remove recoil and front cover assembly.
2. Remove spark plug from unit.
3. Attempt to turn engine over by hand.

Results

1. If engine cannot turn over freely with spark plug removed, the engine has suffered an internal failure and seized.
2. Refer to flow chart.

Test 35 – Test Battery Charger (Non-EFI Units)

General Theory

The battery will not charge when the generator is running.

Some generators are equipped with a battery charger to charge the battery when the generator is running. There is a 120 VAC “wall” charger that comes with the generator to plug into a 120 VAC outlet to charge the battery when the generator is not running.

1. Check power to the AC charger at the outlet. If voltage is not present try another outlet. If voltage is present move to step 2.
2. Check voltage at the external battery charger connection in side of the control panel. Remove Wire 13 a from F1 fuse holder.
3. Set DMM to read DC volts and place the positive lead on Wire 13A and the negative lead to the control panel ground. The voltage should be 13.5

to 14 VDC. If voltage is not present, replace charger. If voltage is present, remove battery cables from battery.

4. Place meter leads, red to positive cable, and negative to ground cable. Approximately 13.5 to 14 VDC should be measured. If voltage is not measured, test battery charge relay. If voltage is measured, replace battery.
5. The battery charge relay is de-energized when the generator is off.
6. Remove wiring from battery charge relay. Set DMM to measure Ohms. Check continuity between Contacts 1/5 and 2/6. If the contacts read open the relay should be replaced

Battery Dies When Generator Is Running

1. Make sure generator is producing rated voltage.
2. Set DMM to read DC volts. With generator running, remove battery cables and place the red meter lead on positive cable, and negative to ground cable. 13.5 to 14 VDC should be measured. If voltage is measured, replace battery. If voltage is NOT measured, go to step 3.
3. Set DMM to measure Ohms.
4. Remove wires from battery charge relay. With the generator running and producing voltage, place one test lead to contact 3 and the other to contact 5. Continuity should be measured. If continuity is not measured, ohm out the BCR coil. The resistance should be 3.849kohms. If there is an open on the coil, replace relay.

Test 36 – Test Battery Charging Circuit (EFI Electric Start Models)

General Theory

The charging circuit has two wires coming from the charging coil to the voltage regulator. The regulator rectifies AC voltage to DC voltage for battery charging on a single wire with an in-line fuse. Voltage from the charging coil is unregulated; however, when delivered to the battery it is regulated.

The battery is constantly being charged during the operation of the generator. The charge coil is located under the flywheel and has two yellow wires that lead to a voltage regulator and then a fuse before going to the battery via a red wire.

Procedure/Results

NOTE: Check battery condition with a conductance tester prior to conducting the following test. Battery condition should be greater than 65%.

1. Start Engine and let run for about a minute. Measure voltage on battery positive and negative terminals. Shut engine off.
   a. If voltage measured above 13.2 VDC, but less than 16.0 VDC, stop testing and refer back to the flowchart. Charging circuit is good.
   b. If voltage measured above 16 volts, check electrolyte level and retest battery.
   c. If voltage measured less than 12.5 VDC, proceed to the next step.
2. Set DMM to measure continuity and check in-line fuse (on red wire) between solenoid connection and the voltage regulator.
   a. If the fuse measured open (OL), replace fuse.
   b. If the fuse measured closed (approximately 0.0), proceed to the next step.
3. Disconnect the connector containing two yellow wires. Set DMM to AC Voltage function. Measure AC voltage on the yellow wires/terminals coming from the charge coil.
   a. If voltage was low or NOT measured, replace the charge coil.
   b. If 23 volts ±5 volts was measured, the charge coil is good. Go to the next step.
4. Reconnect the yellow wire/connector to the charge coil. Set DMM to DC Voltage. Measure DC voltage on the red wire leading to the in-line fuse.
   a. If 14 volts ±1 volt was measured, the voltage regulator is good. Refer to the flowchart.
   b. If voltage was NOT measured as indicated, verify Step 2 and replace the voltage regulator.

Test 37 – Test Idle Control

Certain 4000-8000 Watt units are equipped with a low idle control system. There is a coil mounted near the engines governor. When the switch is in low idle position, generator voltage (120 VAC) is fed through the SW3 switch to system control board. The control board will rectify AC voltage to DC and sends DC voltage to the coil. The ITC is fed into the control board and when current starts to flow, the control board will remove DC voltage from coil to allow engine to run at rated speed.

PROCEDURE

1. Remove all loads from generator.
2. Test low idle switch.
3. Remove wires. Set DMM to Ohms and zero out meter.
4. With wires removed, place meter leads on the switch. Place switch to (ON) low idle. The meter should read CONTINUITY.
5. Place low idle switch to OFF. The meter should read open.

6. If CONTINUITY was measured in step 6, continue testing.
7. If CONTINUITY was not measured, replace switch and test.
8. Set DMM to read AC volts and remove wire 11B from low idle switch. Place one meter lead on wire 11B and the other lead to the ground in control panel. 120 VAC should be measured. If voltage was measured, go to step 10.
9. If 120 VAC is not measured, place multi meter to measure Ohms. Remove wire 11B from circuit breaker and low idle switch. The wire should have continuity. If wire does not have continuity, repair or replace wire.
10. Remove C1 plug between system control board the coil. Set DMM to read DC volts. From male side of plug, place the leads on pins. With low idle switch in ON position, 100VDC (12VDC for XT/DXGNR7000 series) should be measured.
11. If voltage was not measured, replace system control board.
12. If voltage was measured, set multi meter to read Ohms. Place leads on female side of plug of coil. The coil should read 1.723K Ohms (29.5 Ohms for XT/DXGNR7000 series). If coil reads open, replace.

Generator will not switch off low idle when load is applied.

13. Check idle control transformer. Remove plugs from idle control transformer.
14. Set DMM to read Ohms between the leads of the idle control transformer 53.9 Ohms. If idle control transformer reads open, replace. If transformer reads resistances, replace control board.

Section 6 Major Disassembly

Introduction

Each generator model has a unique method of disassembly. ***Figure 6-1*** is a simplified version of disassembly that does not go into step by step instructions. The figure below represents the basic disassembly and sequence of steps needed to remove the fuel tank, stator, rotor, and the engine.

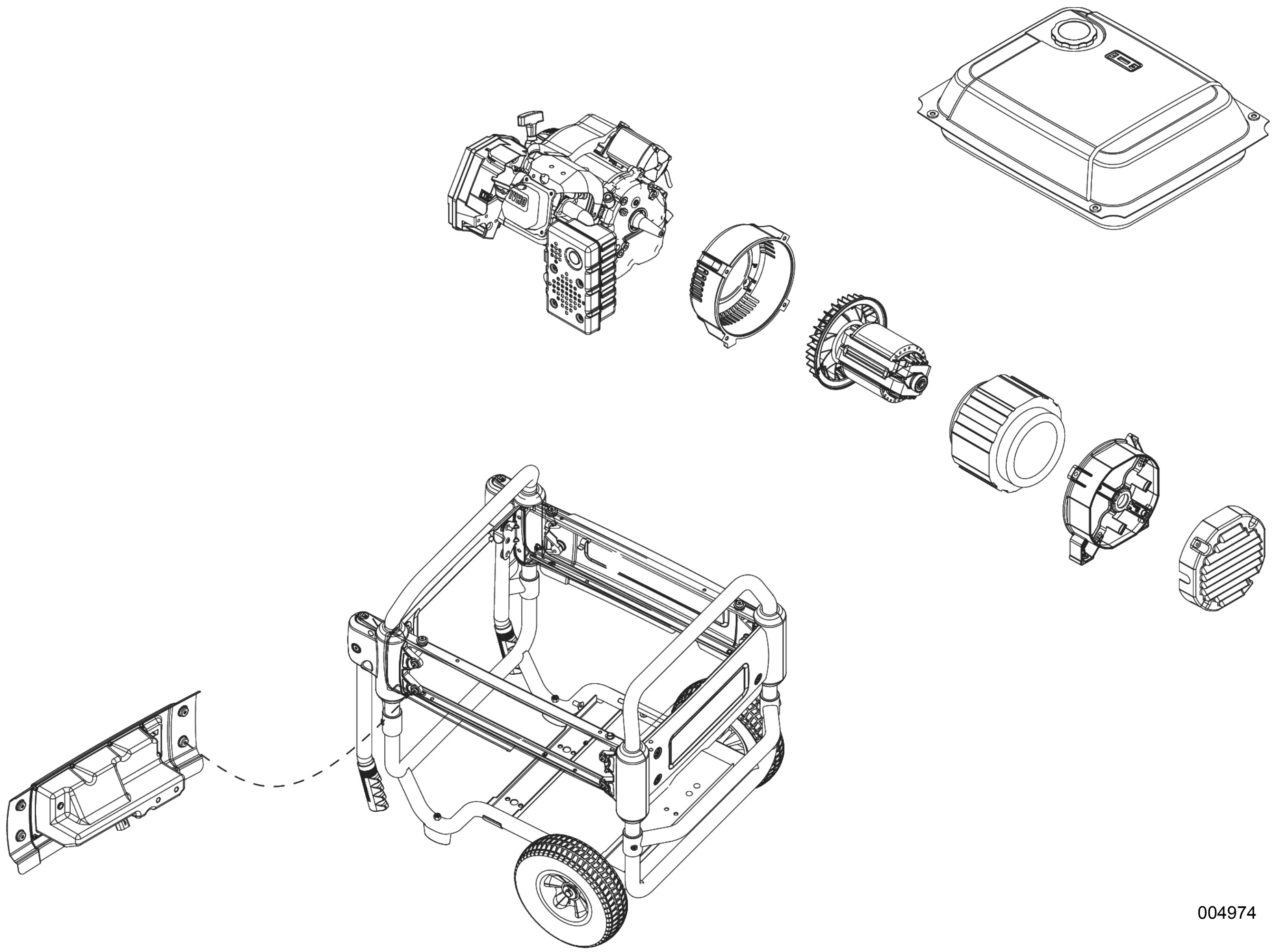
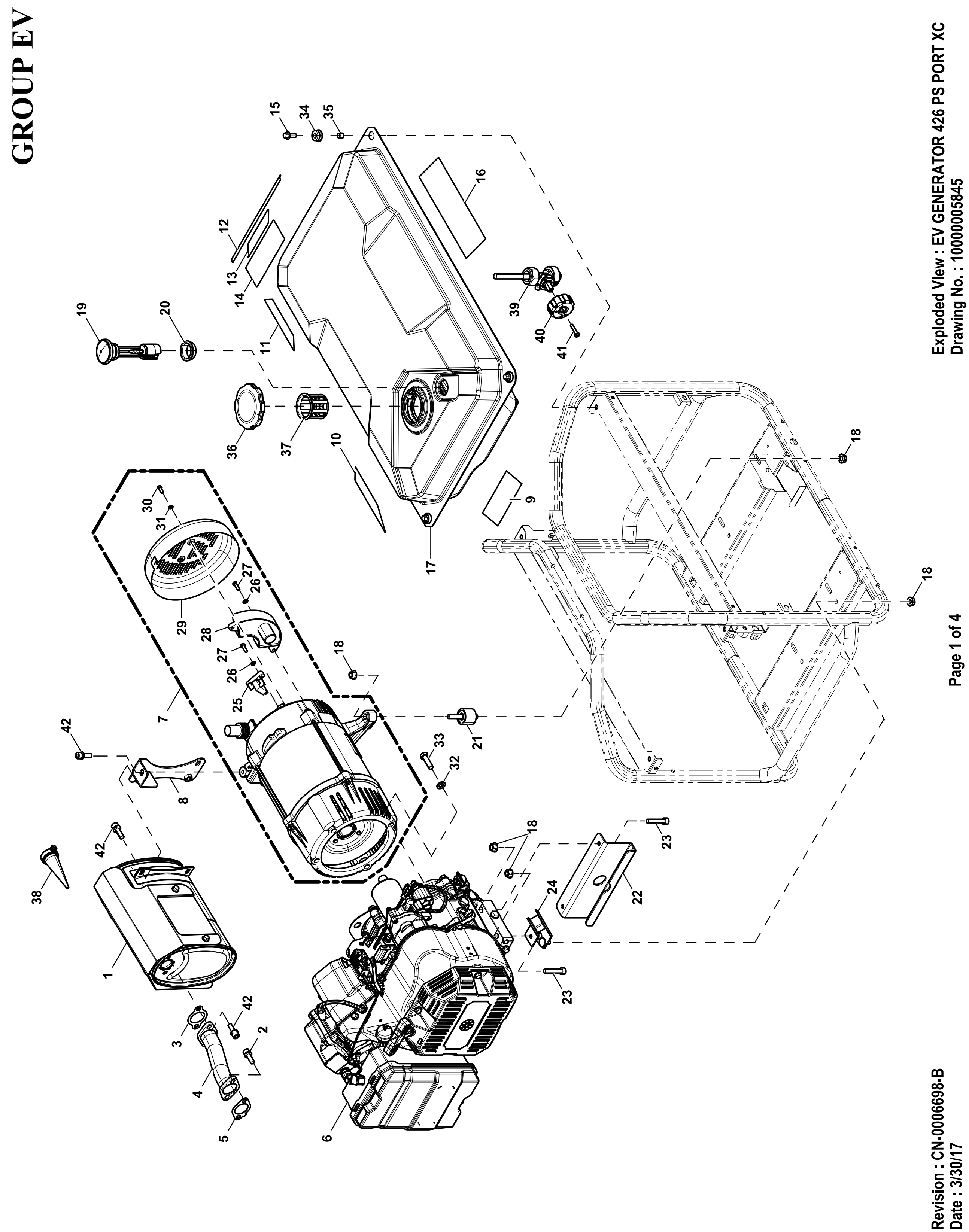
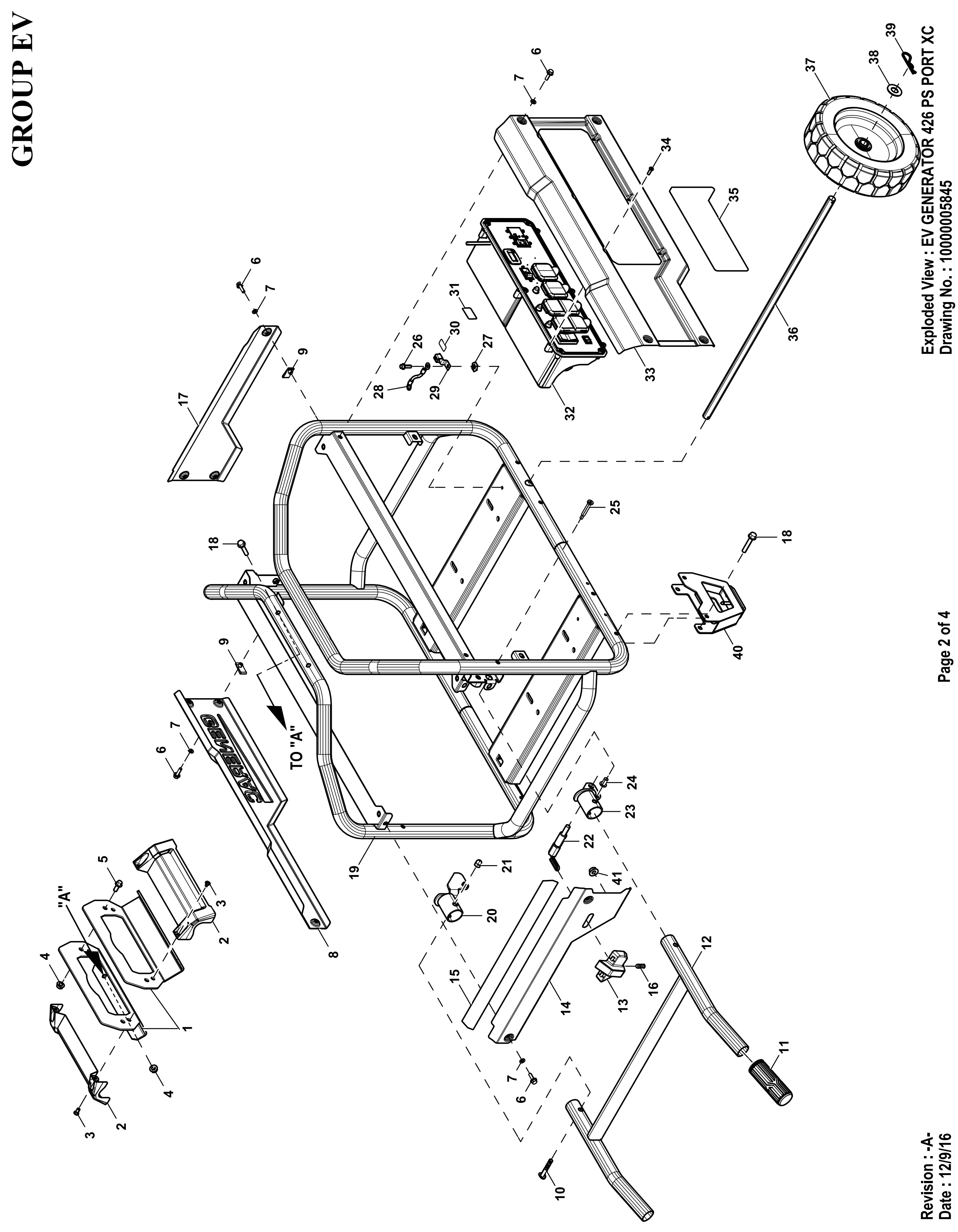


Figure 6-1. Typical Disassembly Steps

XC6500 Drawing No. 10000005845-A



XC6500 Drawing No. 10000005845-A



XC6500 Drawing No. 10000005845-A

EXPLODED VIEW: EV GENERATOR 426 PS PORT XC

DRAWING #: 10000005845

GROUP EV

PAGE 1

ITEM	QTY.	DESCRIPTION
1	1	MUFFLER GTH530 W/SA
2	8	SCREW SHC M8-1.25 X 25 G8.8 SEMS
3	1	GASKET EXHAUST PORT
4	1	MANIFOLD EXHAUST 426CC PORT
5	1	GASKET EXHAUST 426
6	1	ENGINE GH426 XP PULL 49ST
7	1	ALT 8000W COPPER BRUSH TYPE
8	1	BRACKET MUFFLER XC
9	1	DECAL FUEL OVERFLOW PRO SERIES
10	1	DECAL DATA PLATE FUEL TANK XP
11	1	DECAL BLANK PLATE FUEL TANK XP
12	1	DECAL WARN HOT EXHAUST
13	1	DECAL DANGER & SAFETY RUS
14	1	DECAL LIFT WARNING XP PORT
15	4	SCREW HHTT M8-1.25 X 20
16	1	DECAL CO WARNING 3L PRODCT HOR
17	1	FUEL TNK 9 GAL ASSY
18	13	NUT HEX FL WHIZ M8-1.25
19	1	FUEL GAUGE,ROUND 6 LONG
20	1	GROMMET FUEL GAUGE ROUND
21	2	VIB MOUNT 35 X 12 X M8-1.25
22	1	ST03 BRACKET ENGINE MOUNT XP
23	4	SCREW SHC M8-1.25 X 40 C8.8
24	2	VIBRATION MNT 45 ANGLE 65 DURO
25	1	ASSEMBLY,BRUSH VISION
26	4	WASHER FLAT M5
27	4	SCREW HHC M5-0.8 X 16 G8.8
28	1	AVR TT816-100
29	1	COVER ALTERNATOR INLET 5-7KW
30	2	SCREW HHC M5-0.8 X 12 C8.8
31	2	WASHER LOCK M5
32	4	WASHER LOCK M10
33	4	SCREW HHC 3/8-16 X 1-1/4 G5
34	4	RUBBER MOUNT 10.3 ID X 11 HGT
35	4	ANTI-CRUSH 10.8OD 9ID 10LG
36	1	ASSY GAS CAP SEALED – BLACK
37	1	FILTER FUEL
38	1	SPARK ARRESTOR
39	1	VALVE FUEL SHUTOFF PRO SERIES
40	1	KNOB FUEL VALVE TOUCH POINT PRO
41	1	SCREW BFHSC M3-0.5 X 16 BLK ZP
42	6	SCREW HHFCS M8-1.25 X 25 C8.8

PAGE 2

ITEM	QTY.	DESCRIPTION
1	2	ST15 LIFTING EYE XC
2	2	ST03 LIFT EYE COVER XC
3	2	BINDING POST ASSEMBLY #10-24 TH
4	6	NUT HEX FL WHIZ M8-1.25
5	2	SCREW HHTT M8-1.25 X 20
6	12	SCREW HHFCS M6-1.0 X 20 G8.8
7	12	WASHER FLAT M6 NYLON
8	1	ST19 SKIRT LONG SIDE XP
9	5	NUT CLIP-ON M6X1.0
10	2	CURVED HEAD M8-1.25 X 50MM LNG
11	2	HANDLE GRIP PRO SERIES
12	1	ST03 WELD HDL H-STYLE FOLD DOWN XC
13	1	LATCH HANDLE XC
14	1	ST19 SKIRT ENGINE SIDE XC
15	1	DECAL QUICK START PRO SERIES
16	1	SCREW SET M8-1.25 X 8
17	1	ST0R SKIRT ALTERNATOR SIDE XC
18	8	SCREW HHFC M8-1.25 X 45
19	1	ST03 FRAME ONE-PIECE XC6500

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XC6500 Drawing No. 10000005845-A

EXPLODED VIEW: EV GENERATOR 426 PS PORT XC

DRAWING #: 10000005845

GROUP EV

ITEM	QTY.	DESCRIPTION
20	1	ST03 BRACKET HANDLE
21	2	CAP NUT M8-1.25 BLACK ZINC
22	1	SPRING PLUNGER M16 X 2
23	1	ST03 BRACKET HANDLE
24	2	SPACER SHOULDER 5/16 ID NYLON
25	2	BOLT SHOULDER LOW PROFILE M6X1.0
26	1	SCREW HHTT M6-1.0 X 20 ZINC
27	1	WASHER LOCK SPECIAL ¼”
28	1	GRND WIRE PORT BRG CARR-FRAME
29	1	LUG SLDLSS #2-#8 X 17/64 CU
30	1	DECAL GROUND
31	1	CSA HIPOT DECAL
32	1	ASSY C-PNL XC6500
33	1	ST19 SKIRT CONTROL PANEL SIDE XC
34	6	SCREW PPPH M5-0.8 X 16 BZC
35	1	DECAL BRAND C-PNL XC6500
36	1	AXLE 15.87 DIA X 684 CLR ZINC
37	2	WHEEL 10” DIA SKID PATTERN
38	2	WASHER FLAT 5/8 ZINC
39	2	COTTER HAIRPIN 2.56 X .80
40	2	FOOT ASSEMBLY XC
41	1	NUT HEX FL WHIZ M6-1.0

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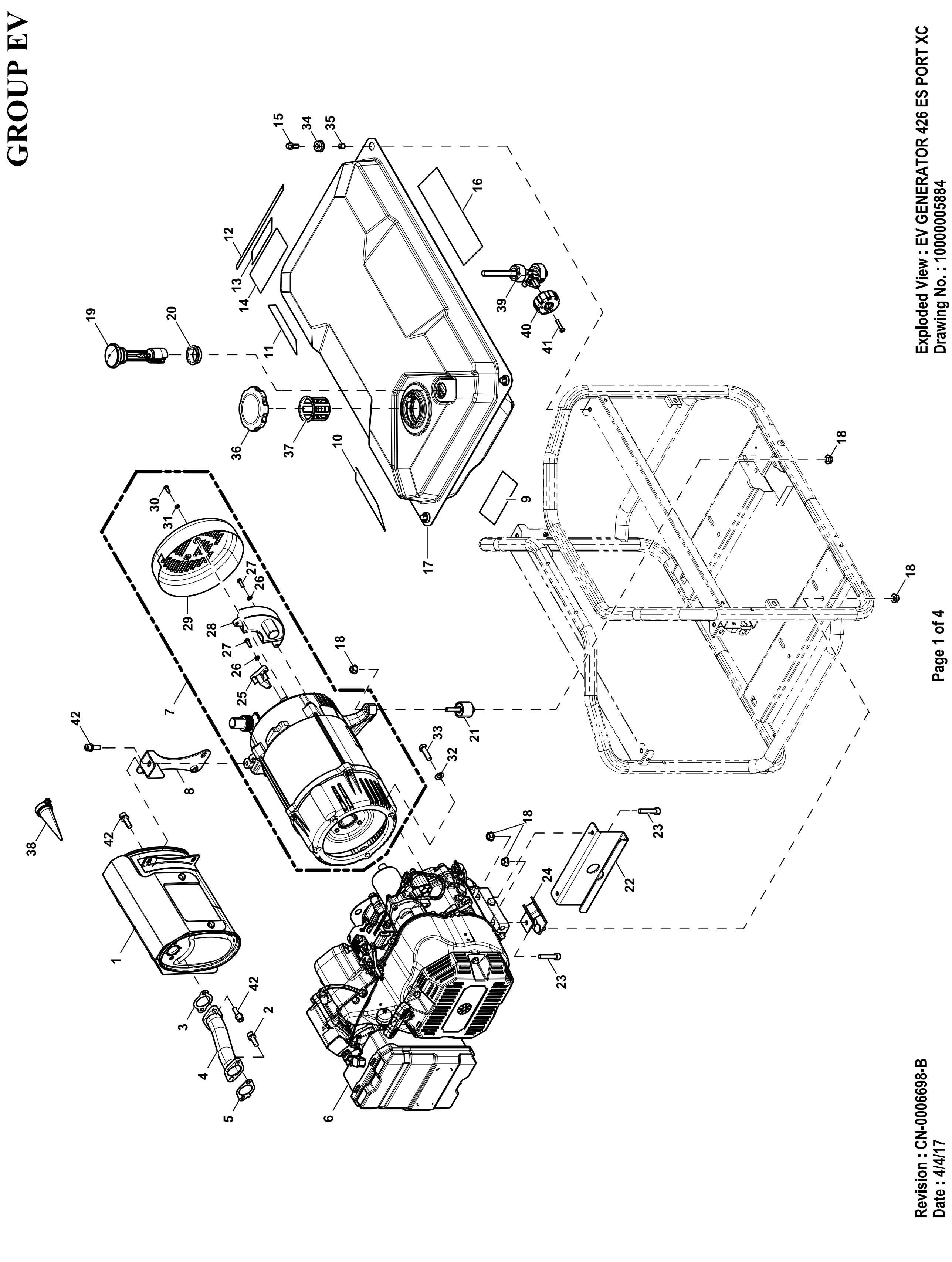
XC8000 Drawing No. 10000005884-A



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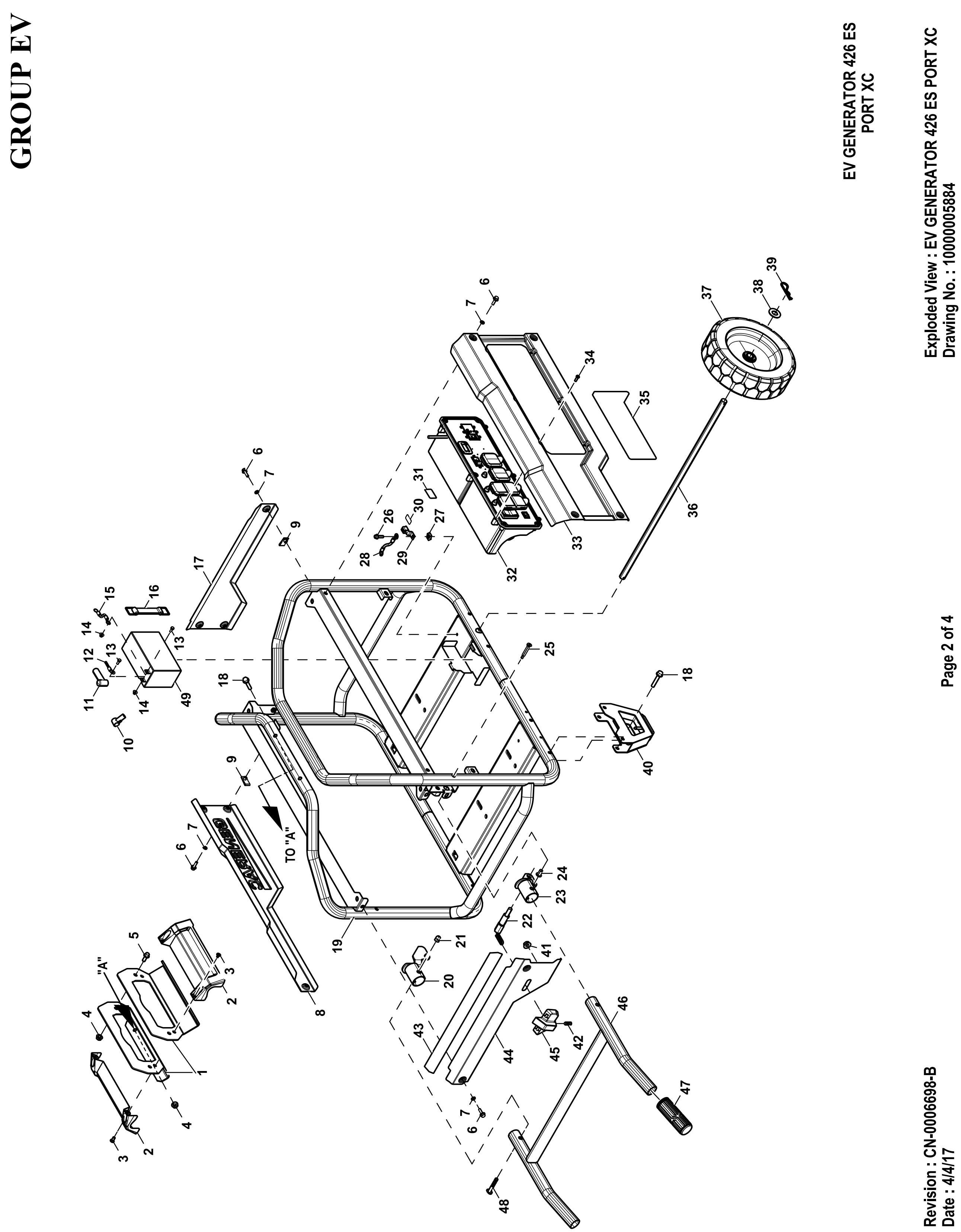

XC8000 Drawing No. 10000005884-A

EXPLODED VIEW: EV GENERATOR 426 ES PORT XC

DRAWING #: 10000005884

GROUP EV

ITEM	QTY.	DESCRIPTION
	PAGE 1	
1	1	MUFFLER GTH530 W/SA
2	2	SCREW SHC M8-1.25 X 25 G8.8 SEMS
3	1	GASKET EXHAUST PORT
4	1	MANIFOLD EXHAUST 426CC PORT
5	1	GASKET EXHAUST 426
6	1	ENGINE GH426 PORT XP 49ST
7	1	ALT 8000W COPPER BRUSH TYPE
8	1	BRACKET MUFFLER XC
9	1	DECAL FUEL OVERFLOW PRO SERIES
10	1	DECAL DATA PLATE FUEL TANK XP
11	1	DECAL BLANK PLATE FUEL TANK XP
12	1	DECAL WARN HOT EXHAUST
13	1	DECAL DANGER & SAFETY RUS
14	1	DECAL LIFT WARNING XP PORT
15	4	SCREW HHTT M8-1.25 X 20
16	1	DECAL CO WARNING 3L PRODCT HOR
17	1	FUEL TNK 9 GAL ASSY
18	13	NUT HEX FL WHIZ M8-1.25
19	1	FUEL GAUGE,ROUND 6 LONG
20	1	GROMMET FUEL GAUGE ROUND
21	2	VIB MOUNT 35 X 12 X M8-1.25
22	1	ST03 BRACKET ENGINE MOUNT XP
23	4	SCREW SHC M8-1.25 X 40 C8.8
24	2	VIBRATION MNT 45 ANGLE 65 DURO
25	1	ASSEMBLY,BRUSH VISION
26	4	WASHER FLAT M5
27	4	SCREW HHC M5-0.8 X 16 G8.8
28	1	AVR TT816-100
29	1	COVER ALTERNATOR INLET 5-7KW
30	2	SCREW HHC M5-0.8 X 12 C8.8
31	2	WASHER LOCK M5
32	4	WASHER LOCK M10
33	4	SCREW HHC 3/8-16 X 1-1/4 G5
34	4	RUBBER MOUNT 10.3 ID X 11 HGT
35	4	ANTI-CRUSH 10.8OD 9ID 10LG
36	1	ASSY GAS CAP SEALED – BLACK
37	1	FILTER FUEL
38	1	SPARK ARRESTOR
39	1	VALVE FUEL SHUTOFF PRO SERIES
40	1	KNOB FUEL VALVE TOUCH POINT PRO
41	1	SCREW BFHSC M3-0.5 X 16 BLK ZP
42	6	SCREW HHFCS M8-1.25 X 25 C8.8
	PAGE 2	
1	2	ST15 LIFTING EYE XC
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3	2	BINDING POST ASSEMBLY #10-24 TH
4	6	NUT HEX FL WHIZ M8-1.25
5	2	SCREW HHTT M8-1.25 X 20
6	12	SCREW HHFCS M6-1.0 X 20 G8.8
7	12	WASHER FLAT M6 NYLON
8	1	ST19 SKIRT LONG SIDE XP
9	5	NUT CLIP-ON M6X1.0
10	1	BOOT VINYL STARTER-SOLENOID
11	1	BOOT BATTERY CABLE
12	1	WIRE ASSY SOL TO BATT-POS
13	4	SCREW HHC M5-0.8 X 12 C8.8
14	6	NUT FLANGE M5-0.8 NYLOCK
15	1	WIRE ASSEMBLY
16	1	ASSEMBLY BATTERY STRAP
17	1	ST19 SKIRT ALTERNATOR SIDE XC
18	8	SCREW HHFC M8-1.25 X 45
19	1	ST03 FRAME ONE-PIECE XC6500E/8000E

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XC8000 Drawing No. 10000005884-A

EXPLODED VIEW: EV GENERATOR 426 ES PORT XC

DRAWING #: 10000005884

GROUP EV

ITEM	QTY.	DESCRIPTION
20	1	ST03 BRACKET HANDLE
21	2	CAP NUT M8-1.25 BLACK ZINC
22	1	SPRING PLUNGER M16 X 2
23	1	ST03 BRACKET HANDLE
24	2	SPACER SHOULDER 5/16 ID NYLON
25	2	BOLT SHOULDER LOW PROFILE M6X1.0
26	1	SCREW HHTT M6-1.0 X 20 ZINC
27	1	WASHER LOCK SPECIAL ¼"
28	1	GRND WIRE PORT BRG CARR-FRAME
29	1	LUG SLDLSS #2-#8 X 17/64 CU
30	1	DECAL GROUND
31	1	CSA HIPOT DECAL
32	1	ASSY C-PNL XC6500E (6500W UNITS)
	1	ASSY C-PNL XC8000E (8000W UNITS)
33	1	ST19 SKIRT CONTROL PANEL SIDE XC
34	6	SCREW PPPH M5-0.8 X 16 BZC
35	1	DECAL BRAND C-PNL XC6500 (6500W UNITS)
	1	DECAL BRAND C-PNL XC8000E (8000W UNITS)
36	1	AXLE 15.87 DIA X 684 CLR ZINC
37	2	WHEEL 10" DIA SKID PATTERN
38	2	WASHER FLAT 5/8 ZINC
39	2	COTTER HAIRPIN 2.56 X .80
40	2	FOOT ASSEMBLY XC
41	1	NUT HEX FL WHIZ M6-1.0
42	1	SCREW SET M8-1.25 X 8
43	1	DECAL QUICK START PRO SERIES
44	1	ST19 SKIRT ENGINE SIDE XC
45	1	LATCH HANDLE XC ORANGE
46	1	ST03 WELD HDL H-STYLE FOLD DOWN XC
47	2	HANDLE GRIP PRO SERIES
48	2	CURVED HEAD M8-1.25 X 50MM LNG
49	1	BATTERY 12V SEALED

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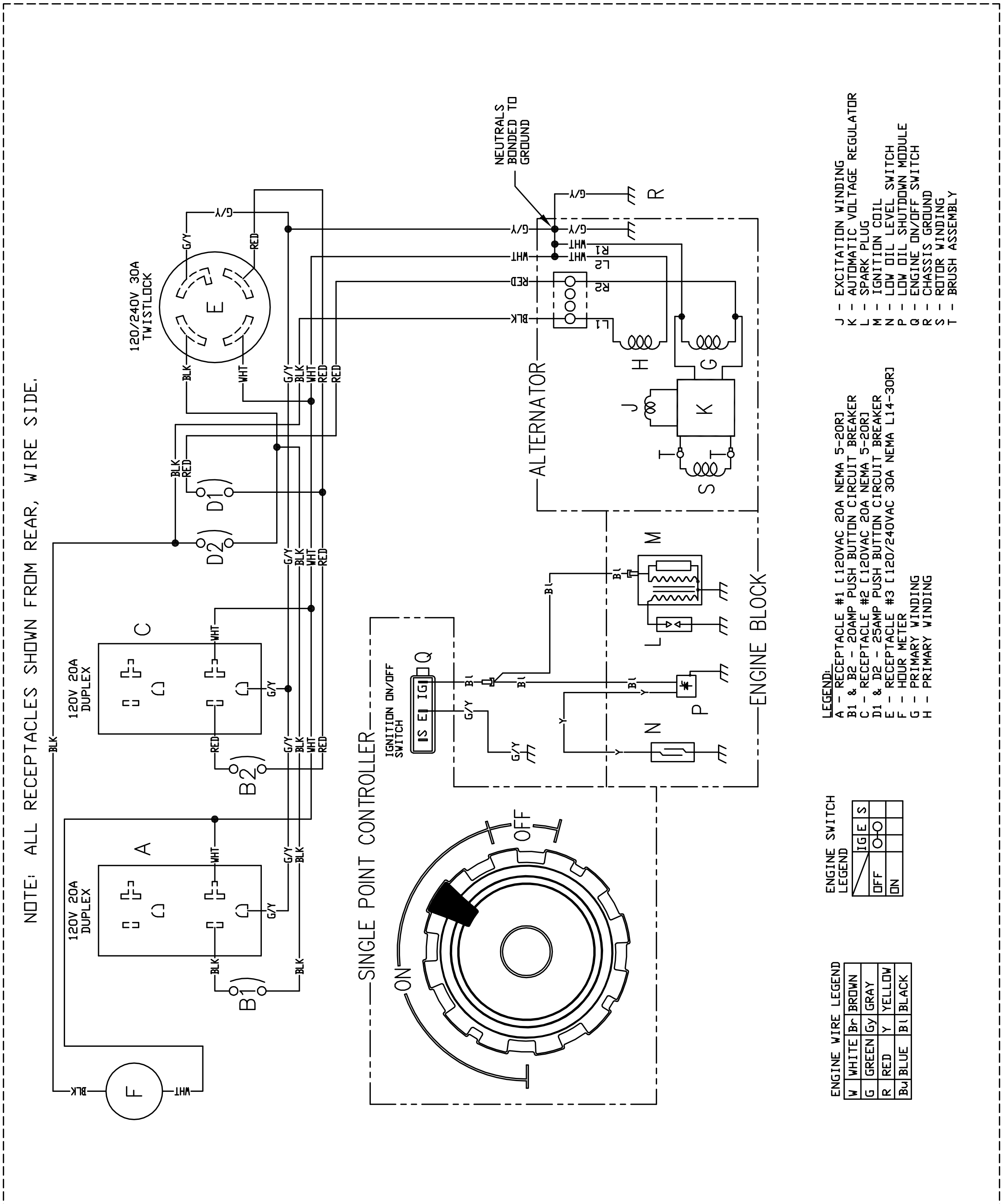
Section 7 Electrical Data

Introduction

Go to www.generac.com (http://www.generac.com/service-support/product-support-lookup) for the most current wiring diagrams and electrical schematics. Use model or serial number.

Wiring Diagram and Electrical Schematic, RS5500 Drawing No. 0K6393-A



SCHEMATIC - DIAGRAM

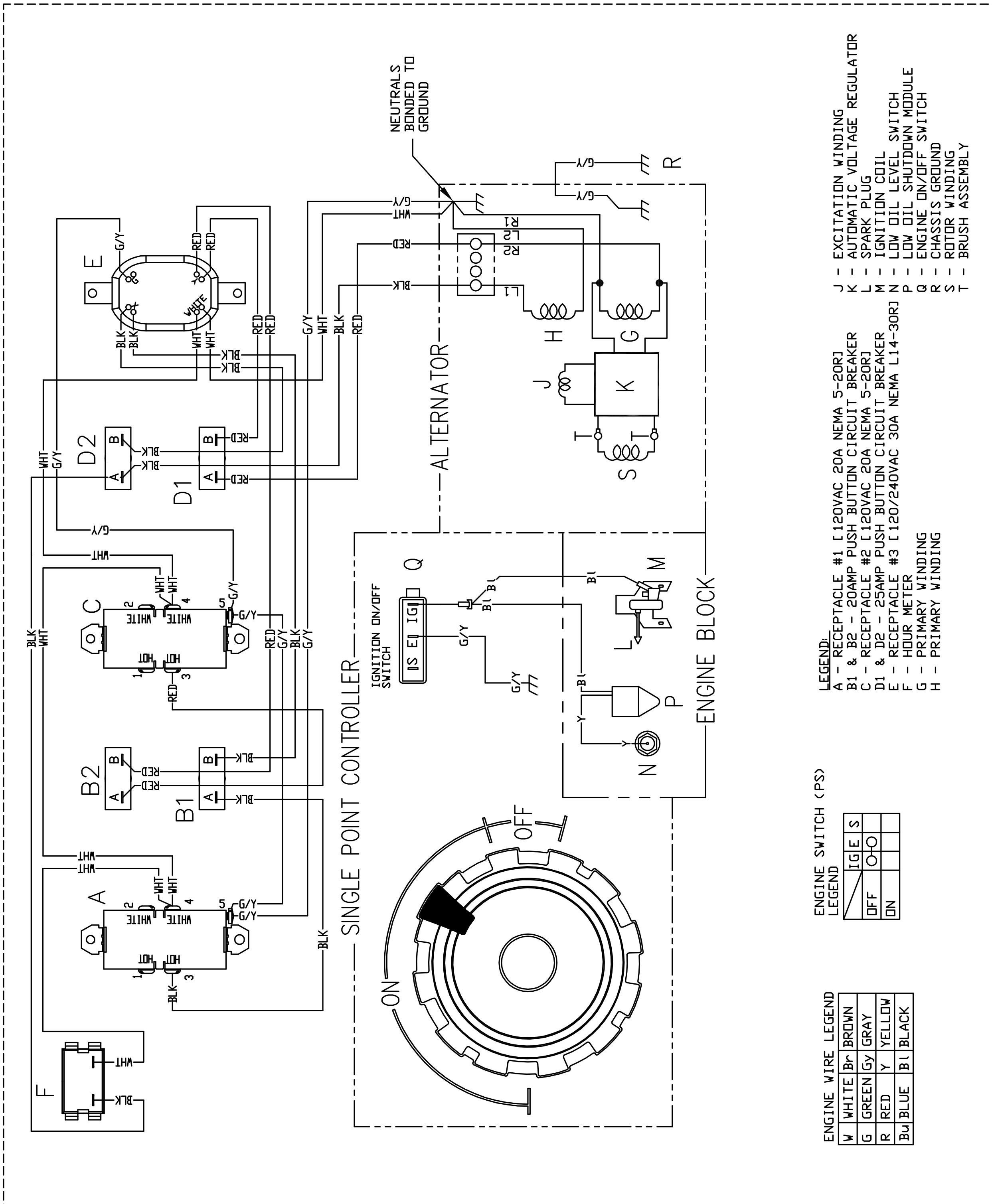
REVISION: A

RS SERIES

DATE: 02/24/2014

DRAWING #: 0K6393

Wiring Diagram and Electrical Schematic, RS5500 Drawing No. 0K6393-A



WIRING - DIAGRAM

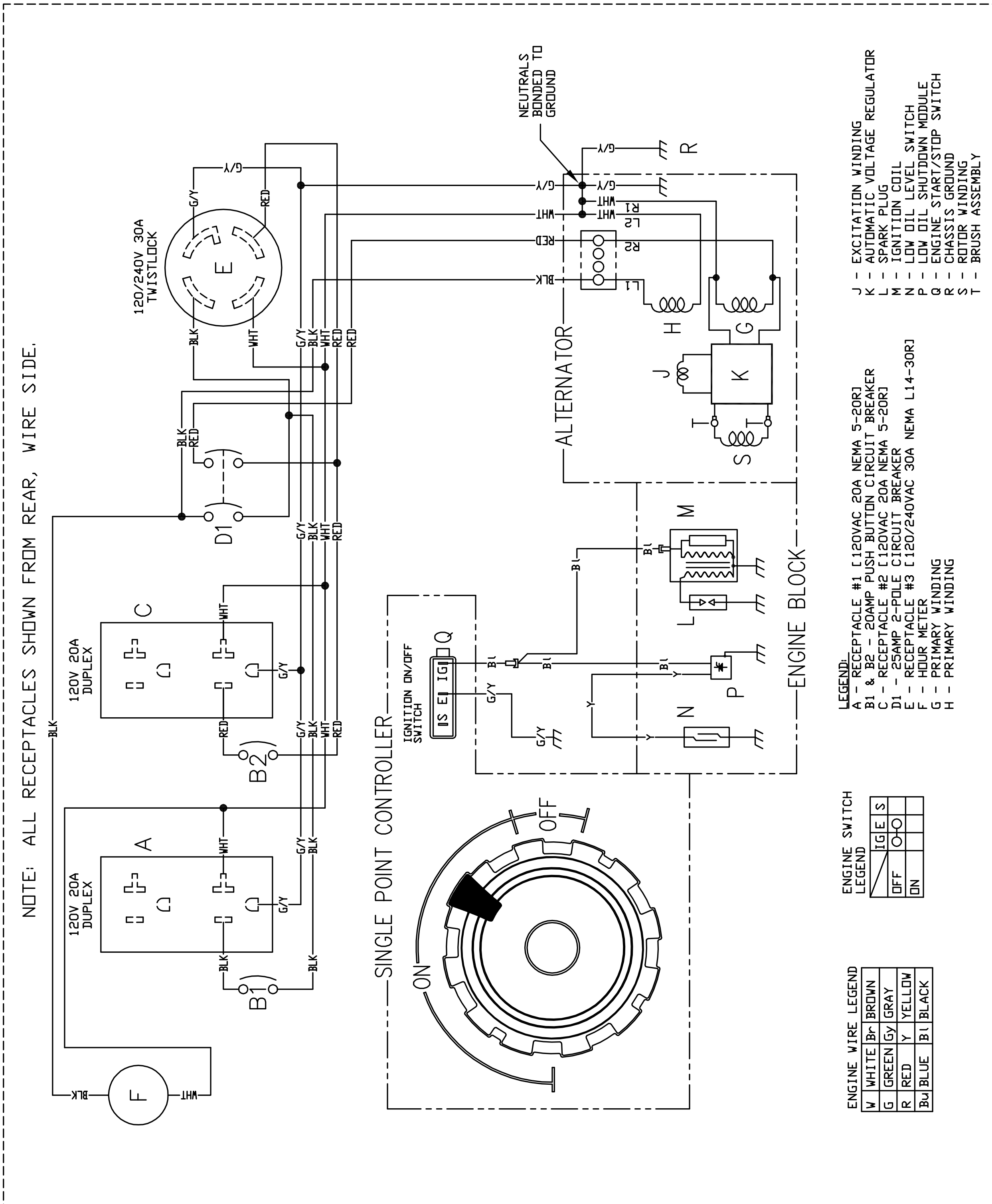
REVISION: A

RS SERIES

DATE: 02/24/2014

DRAWING #: 0K6393

Wiring Diagram and Electrical Schematic, RS5500 Drawing No. 0K6393-A



SCHEMATIC - DIAGRAM

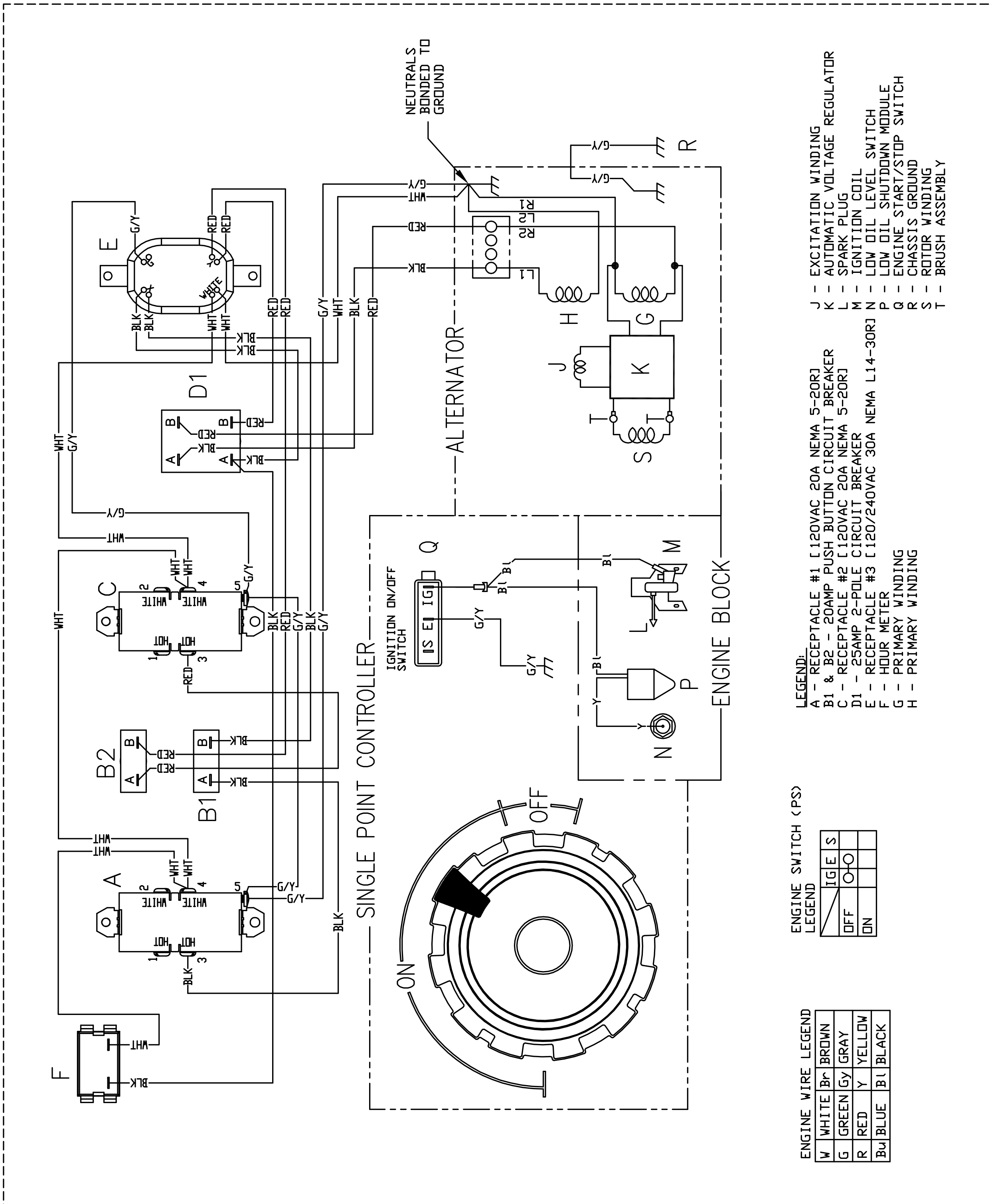
REVISION: A

RS SERIES

DATE: 02/24/2014

DRAWING #: 0K6393

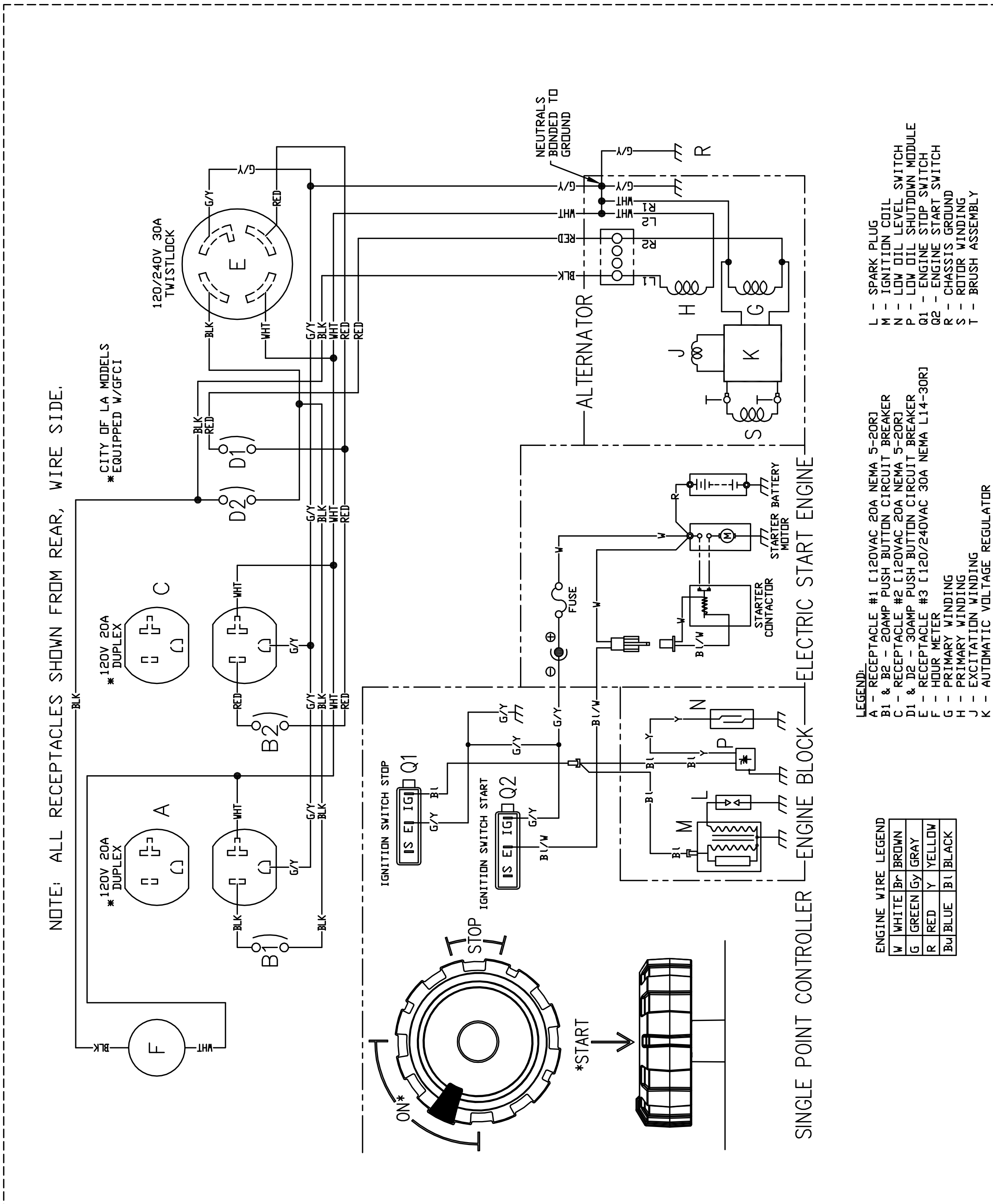
Wiring Diagram and Electrical Schematic, RS5500 Drawing No. 0K6393-A



WIRING - DIAGRAM
RS SERIES
DRAWING #: 0K6393

REVISION: A
DATE: 02/24/2014

Wiring Diagram and Electrical Schematic, RS7000E Drawing No. 0K6394-C



SCHEMATIC - DIAGRAM

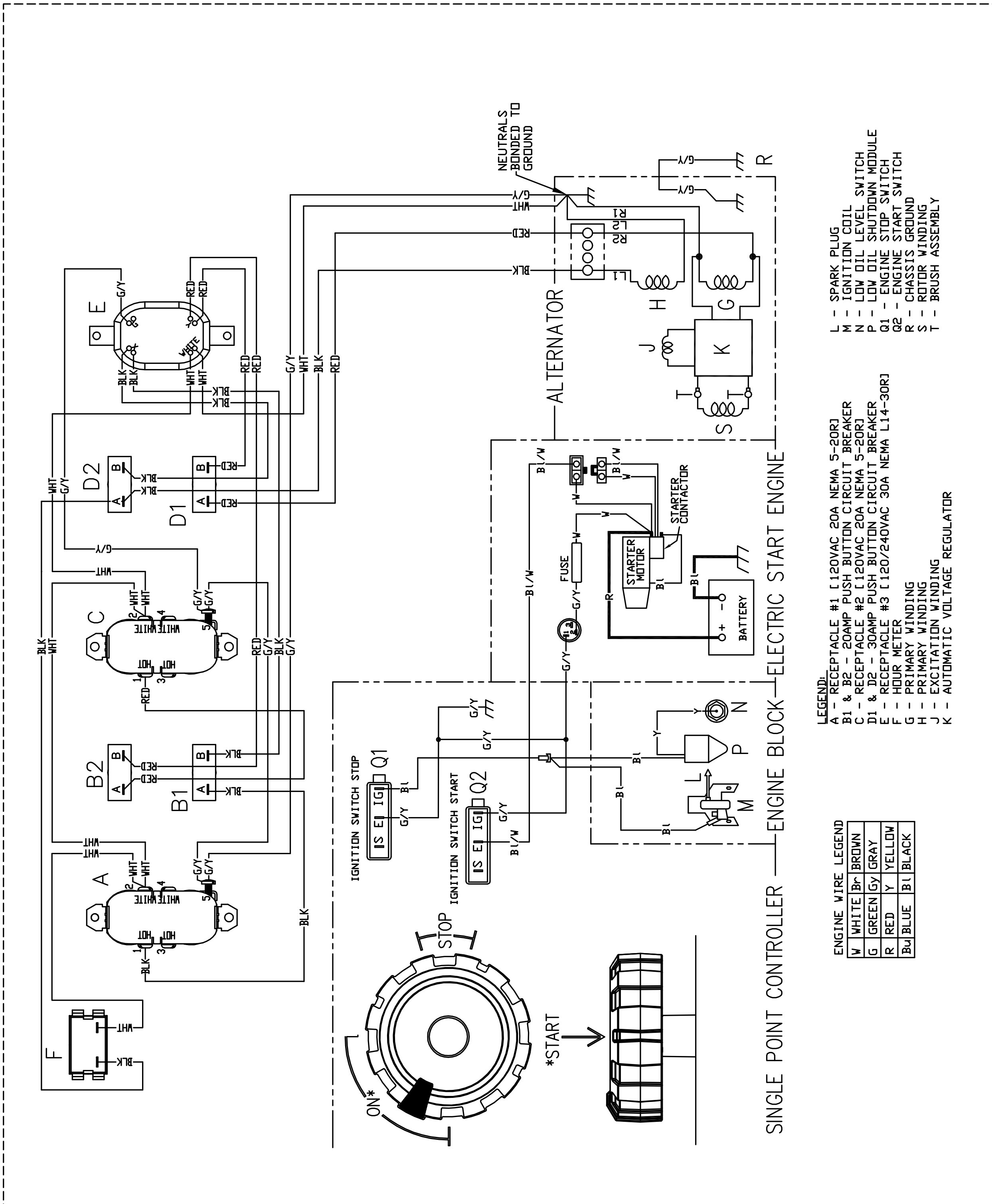
REVISION: C

GP SERIES

DATE: 03/21/13

DRAWING #: 0J8438

Wiring Diagram and Electrical Schematic, RS7000E Drawing No. 0K6394-C



WIRING - DIAGRAM

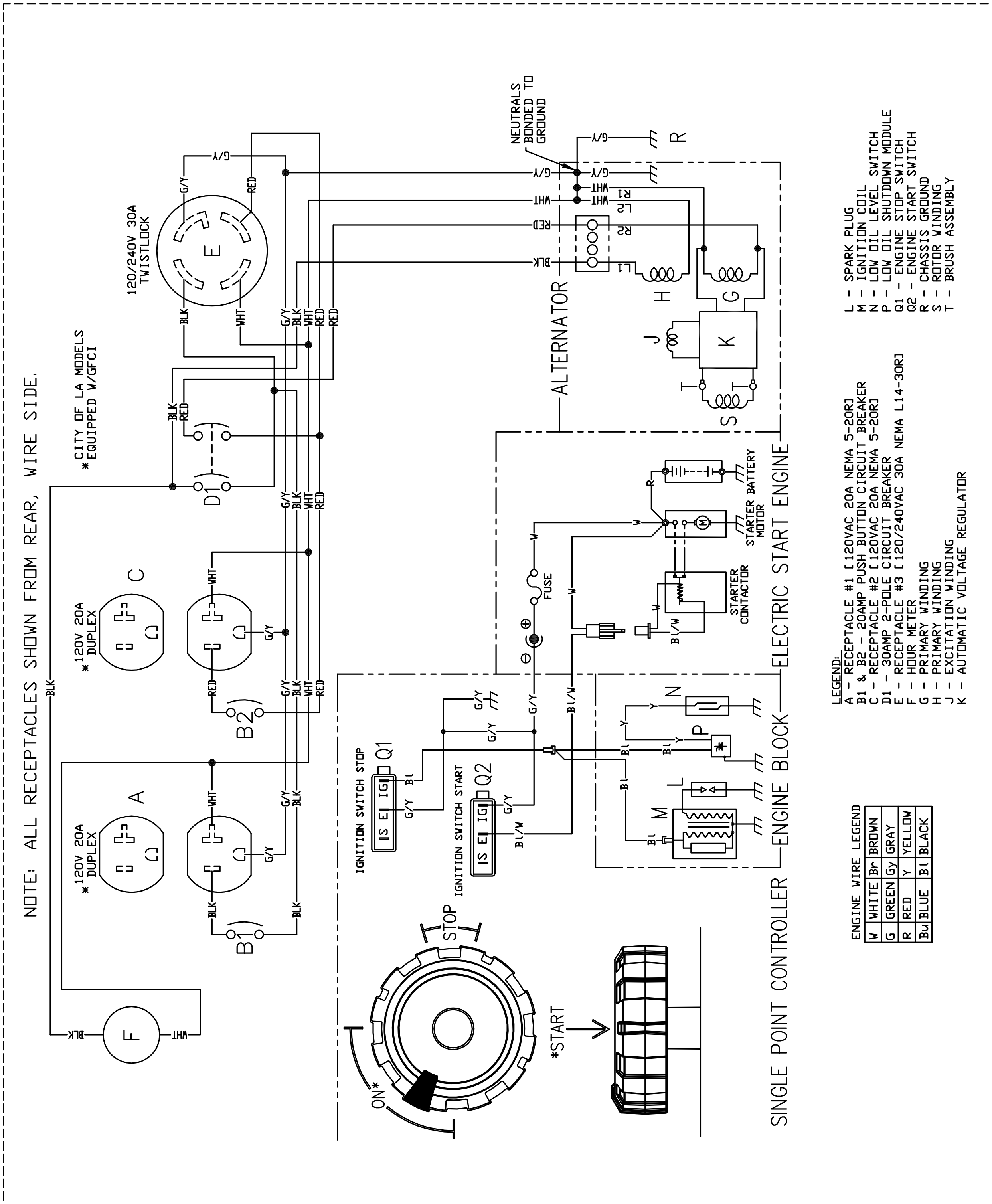
REVISION: C

GP SERIES

DATE: 03/21/13

DRAWING #: 0J8438

Wiring Diagram and Electrical Schematic, RS7000E Drawing No. 0K6394-C



SCHEMATIC - DIAGRAM

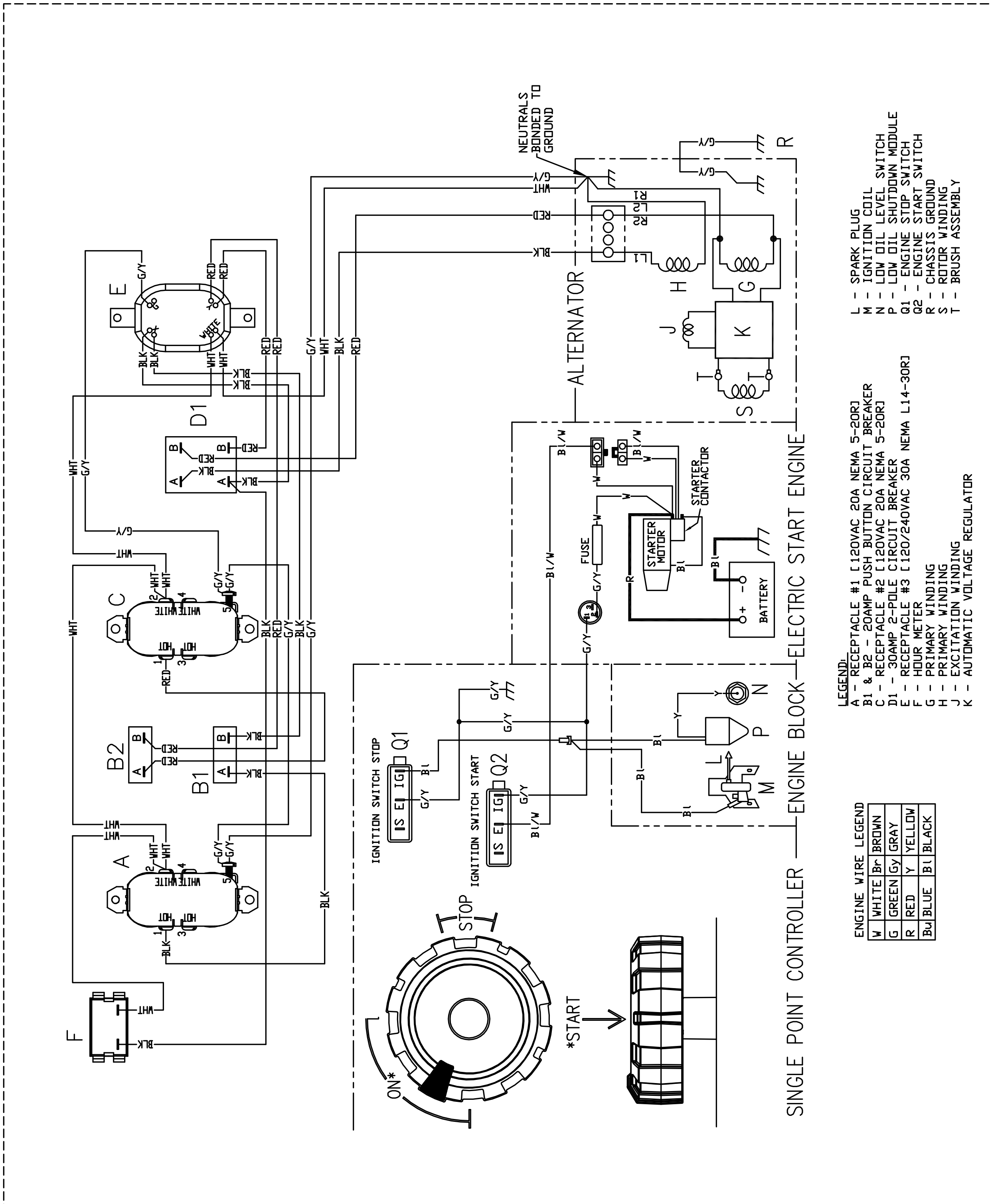
REVISION: C

GP SERIES

DATE: 03/21/13

DRAWING #: 0J8438

Wiring Diagram and Electrical Schematic, RS7000E Drawing No. 0K6394-C



WIRING - DIAGRAM

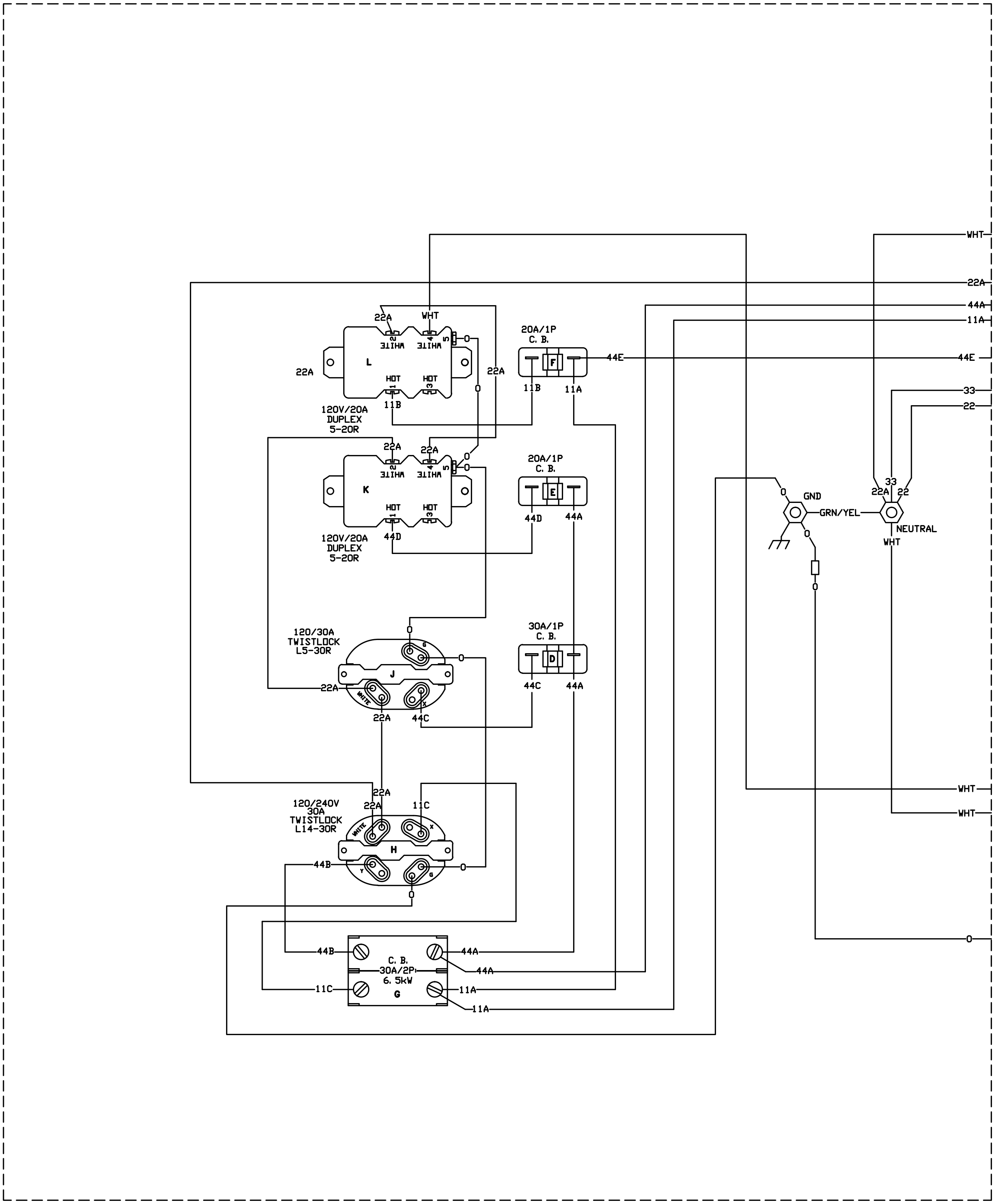
REVISION: C

GP SERIES

DATE: 03/21/13

DRAWING #: 0J8438

Wiring Diagram and Electrical Schematic, XC6500 Drawing No. 10000010344-A

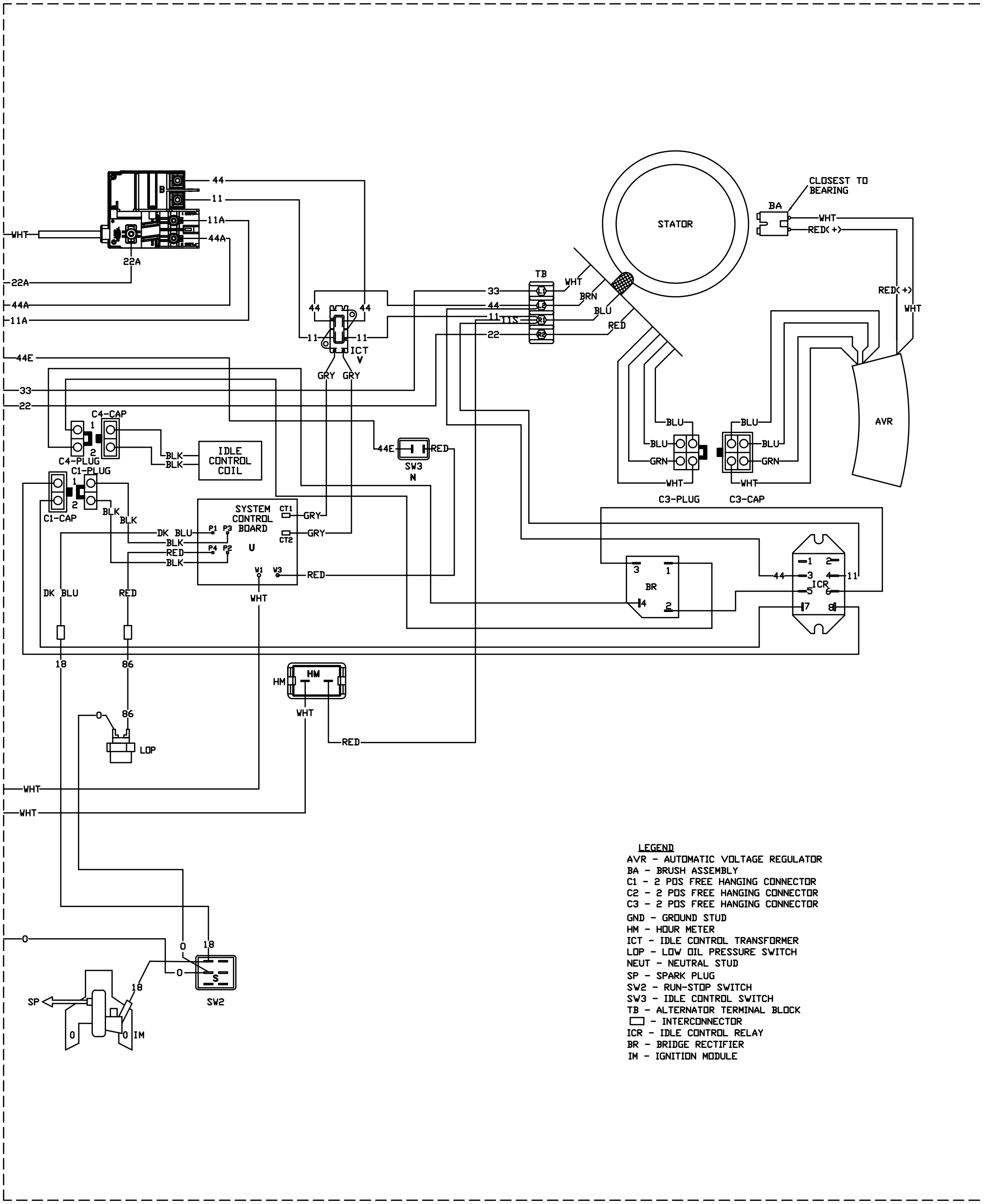


WIRING - DIAGRAM

REVISION: -A- PAGE 1 OF 4 XC6.5 PORTABLE

DATE: 06/16/2017 DRAWING #:10000010344

Wiring Diagram and Electrical Schematic, XC6500 Drawing No. 10000010344-A



REVISION:-A-

DATE: 06/16/2017

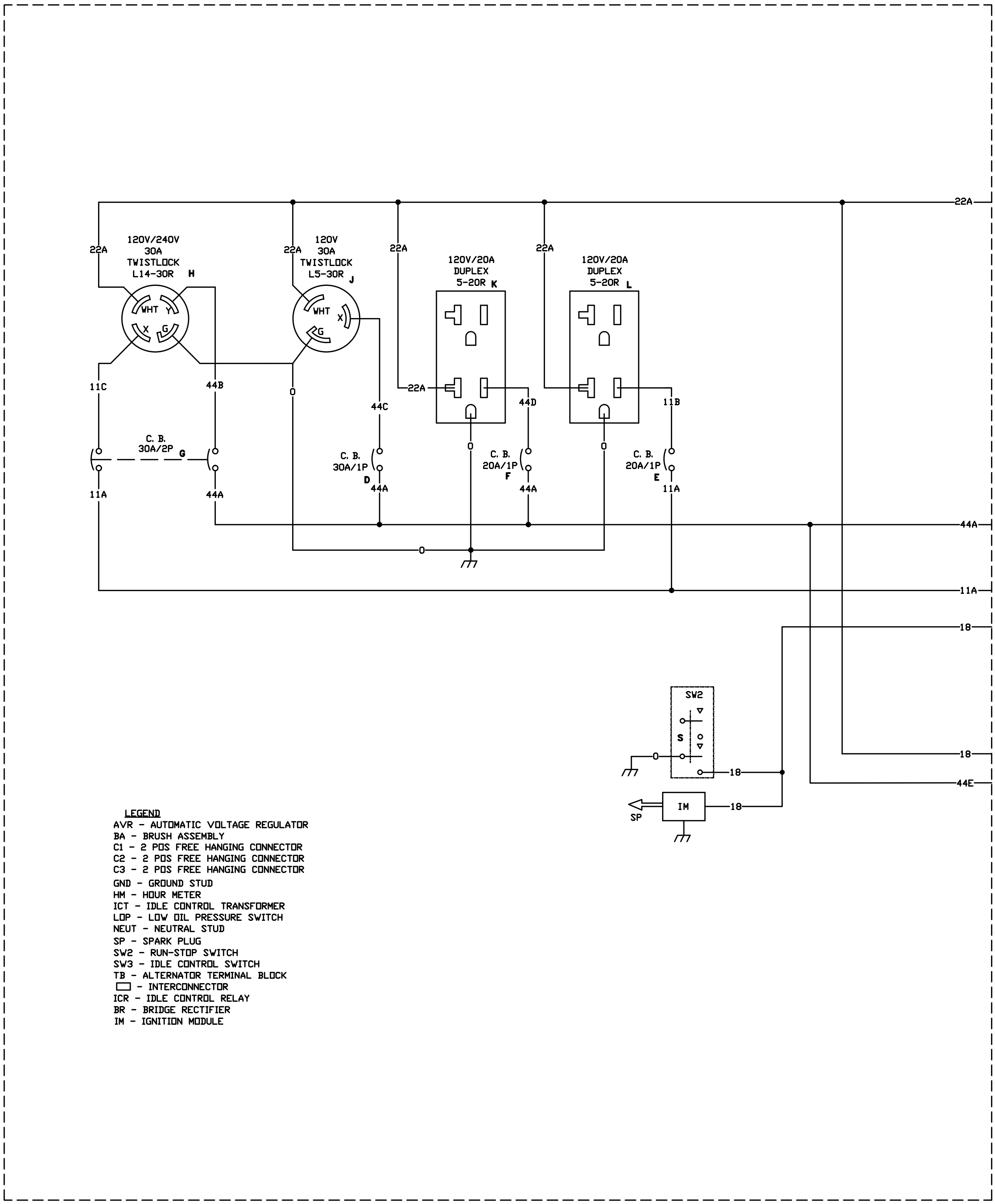
PAGE 2 OF 4

WIRING - DIAGRAM

XC6.5 PORTABLE

DRAWING #: 10000010344

Wiring Diagram and Electrical Schematic, XC6500 Drawing No. 10000010344-A

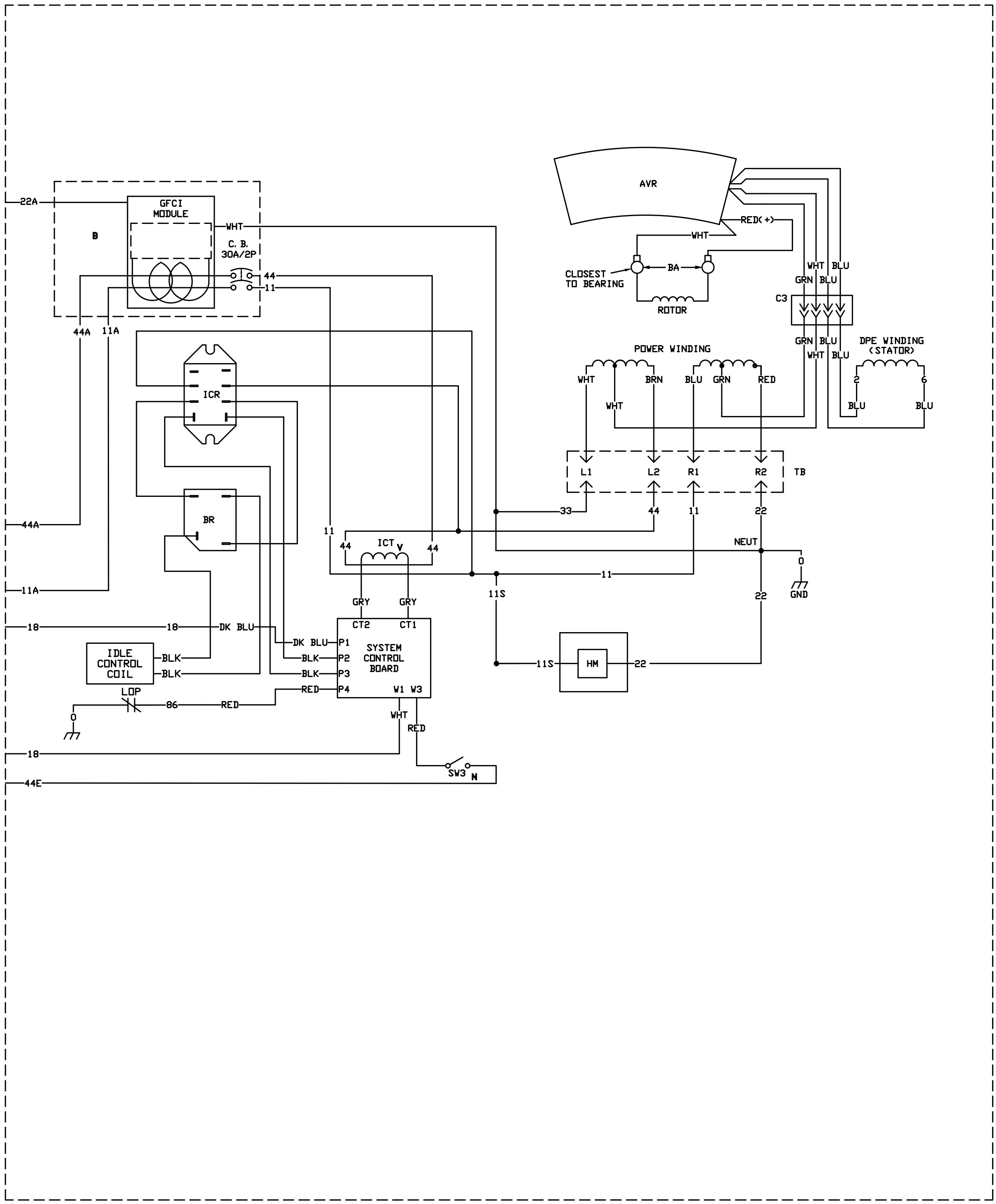


SCHEMATIC - DIAGRAM

REVISION: -A- | PAGE 3 OF 4 | XC6.5 PORTABLE

DATE: 06/16/2017 | DRAWING #: 10000010344

Wiring Diagram and Electrical Schematic, XC6500 Drawing No. 10000010344-A



REVISION: -A-

DATE: 06/16/2017

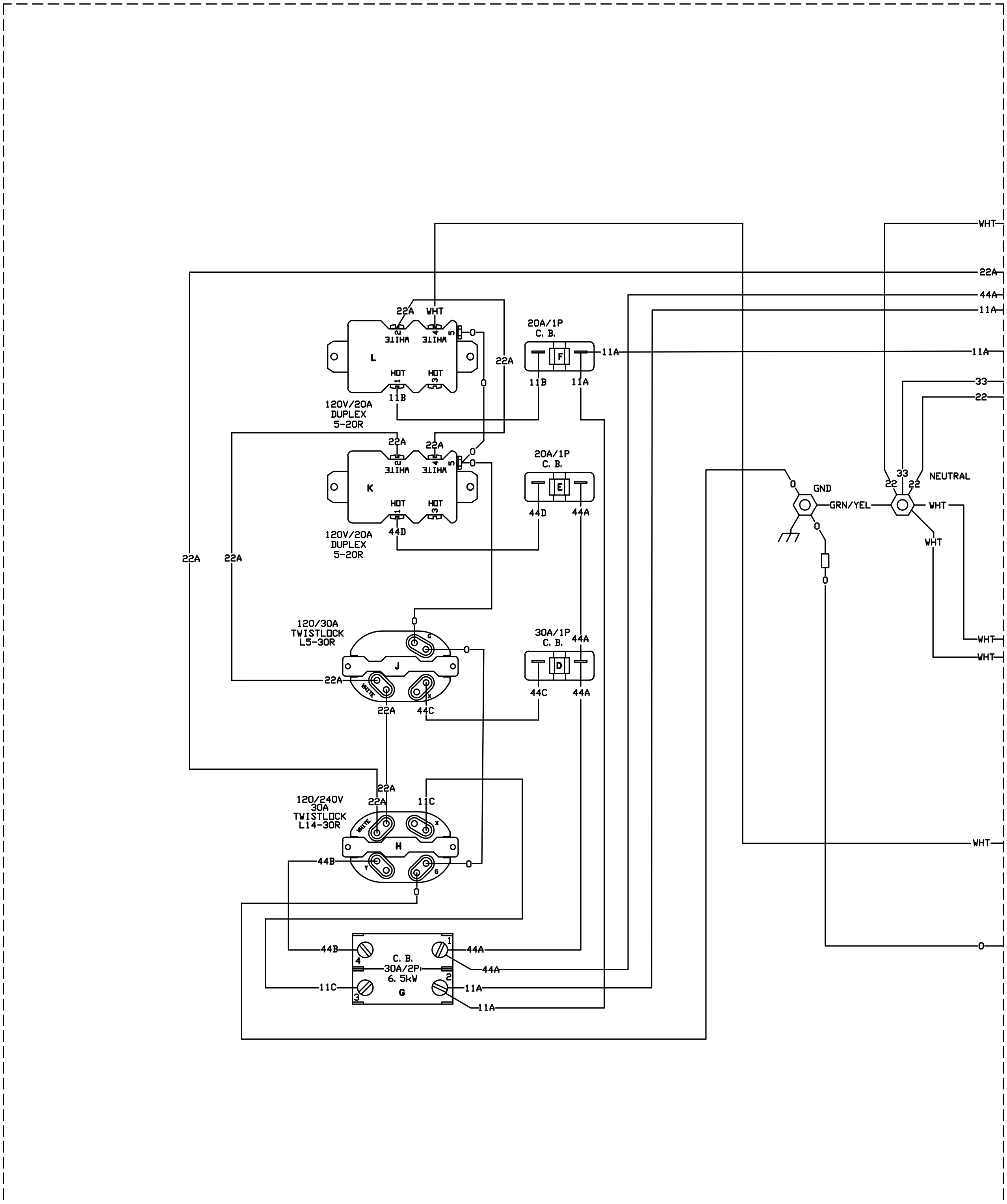
PAGE 4 OF 4

SCHEMATIC - DIAGRAM

XC6.5 PORTABLE

DRAWING #: 10000010344

Wiring Diagram and Electrical Schematic, XC6500E/XC8000E Drawing No. 10000010343-A



WIRING - DIAGRAM

REVISION: -A-

XC6.5E/XC8.0E PORTABLE

DATE: 12/13/16

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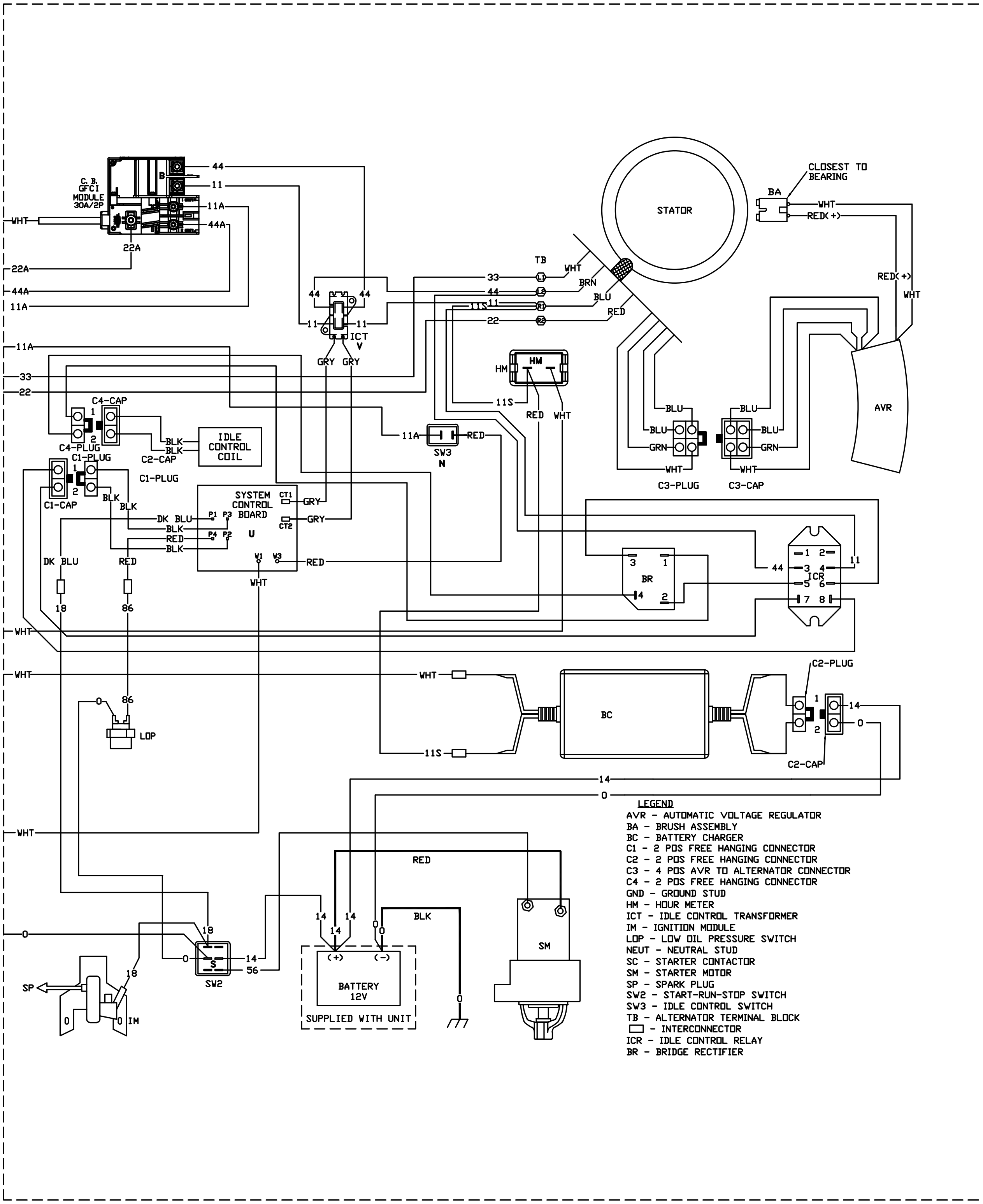

WIRING - DIAGRAM

REVISION:-A- XC6.5E/XC8.0E PORTABLE

DATE: 12/13/16 DRAWING #: 10000010343

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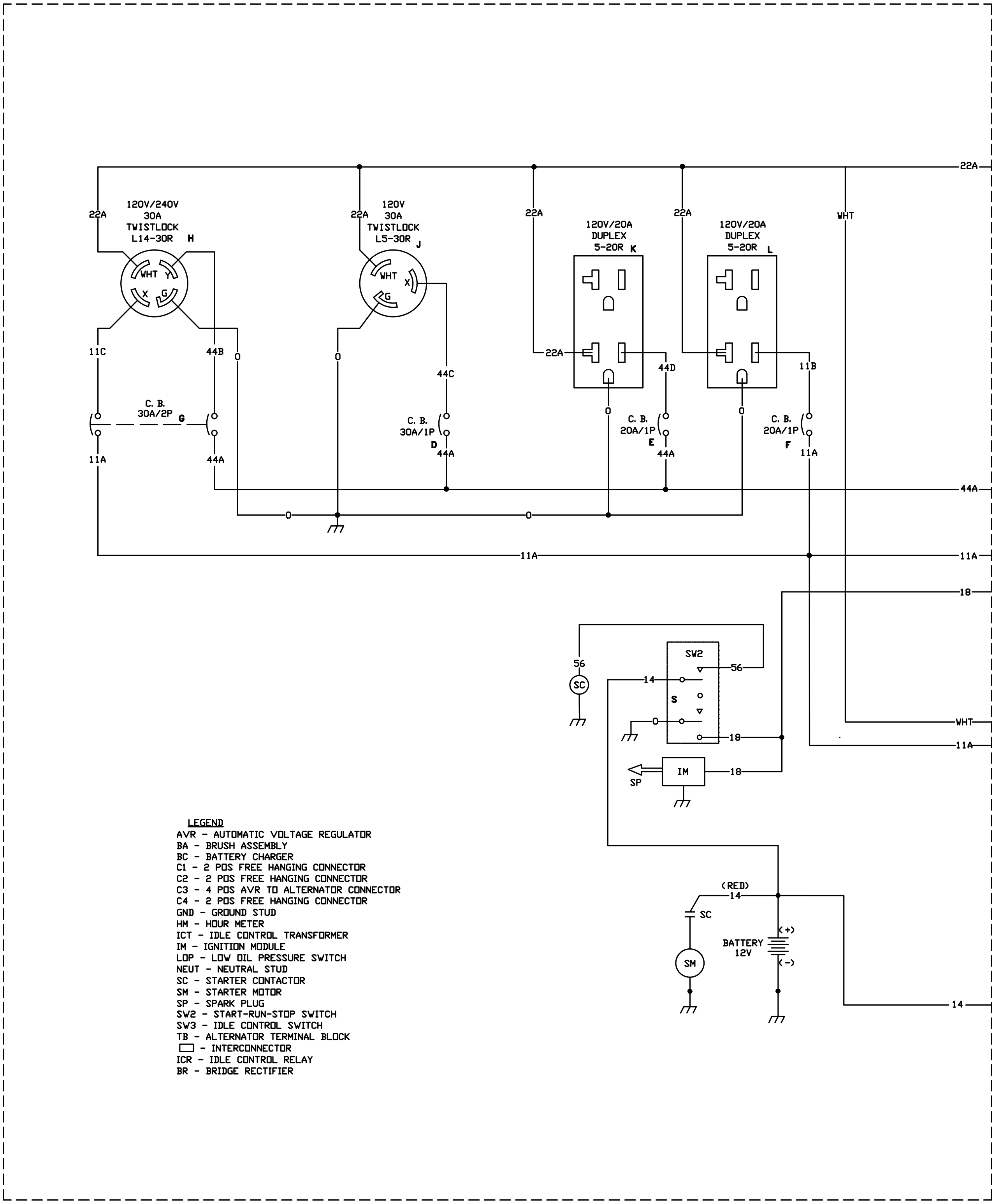

SCHEMATIC - DIAGRAM

REVISION: -A-

XC6.5E/XC8.0E PORTABLE

DATE: 12/13/16

DRAWING #: 110000010343

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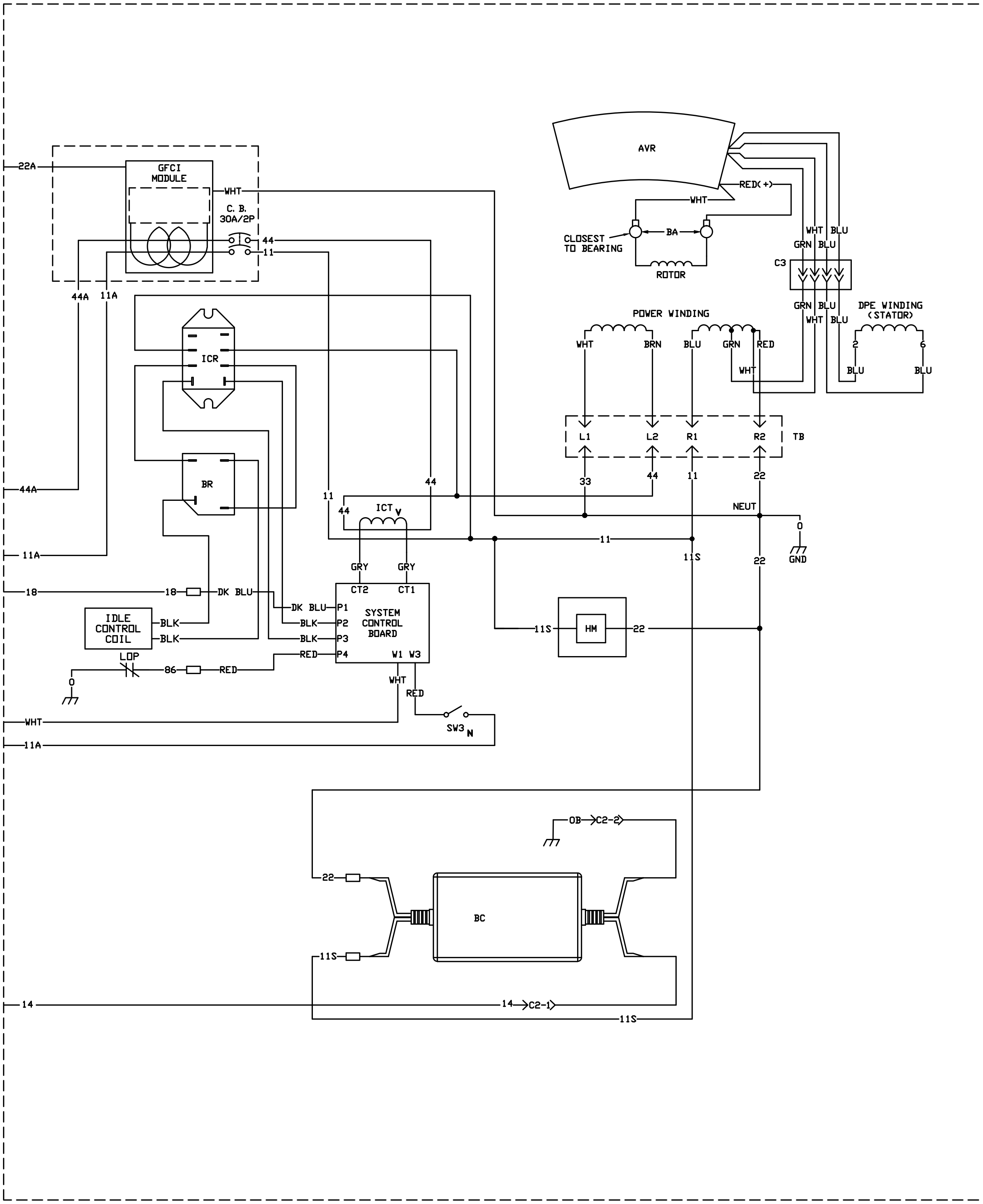


SCHEMATIC - DIAGRAM

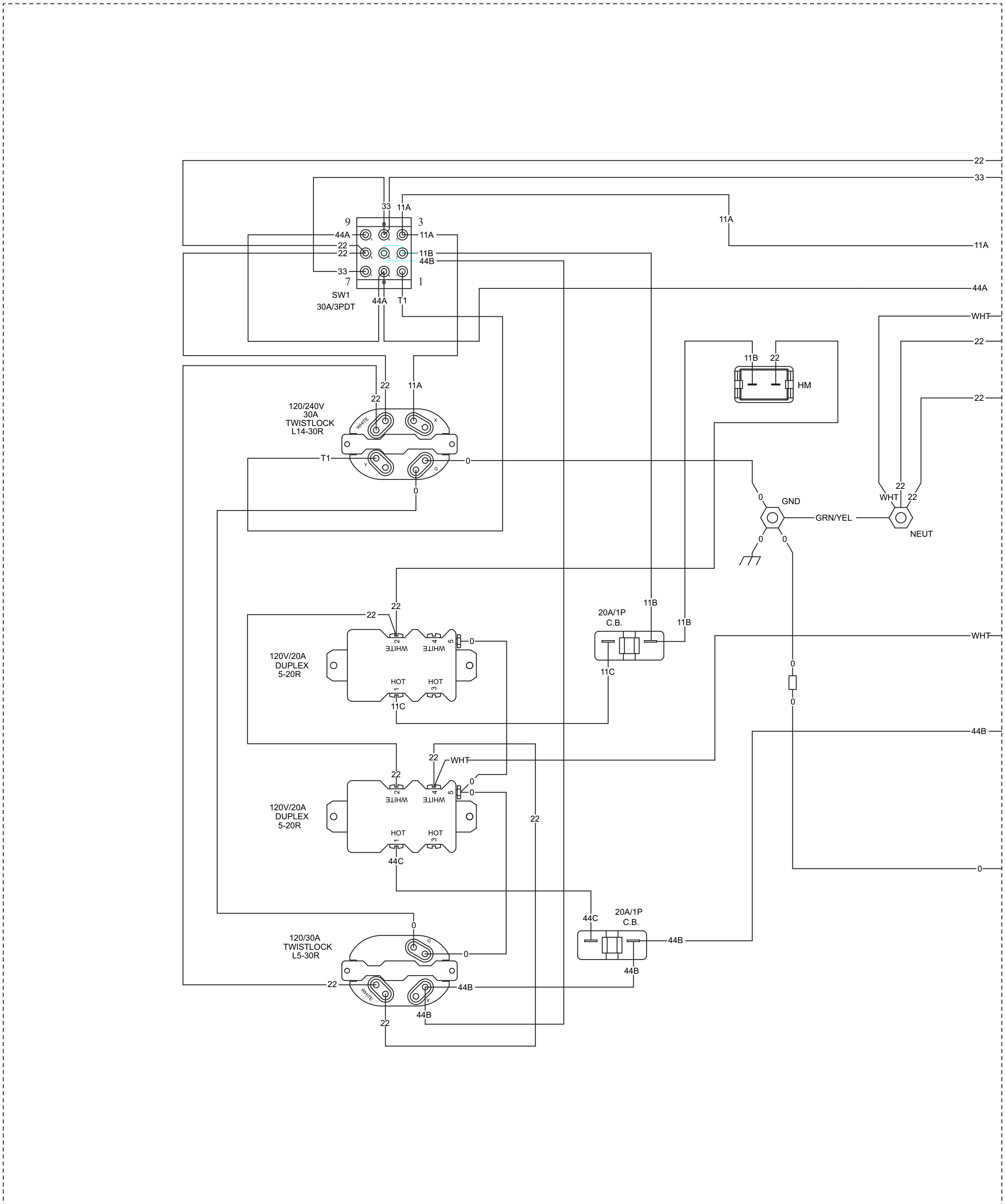
REVISION: -A-

XC6.5E/XC8.0E PORTABLE

DATE: 12/13/16

DRAWING #: 10000010343

Wiring Diagram and Electrical Schematic, XP4000 Drawing No. 0H8536-D



WIRING - DIAGRAM

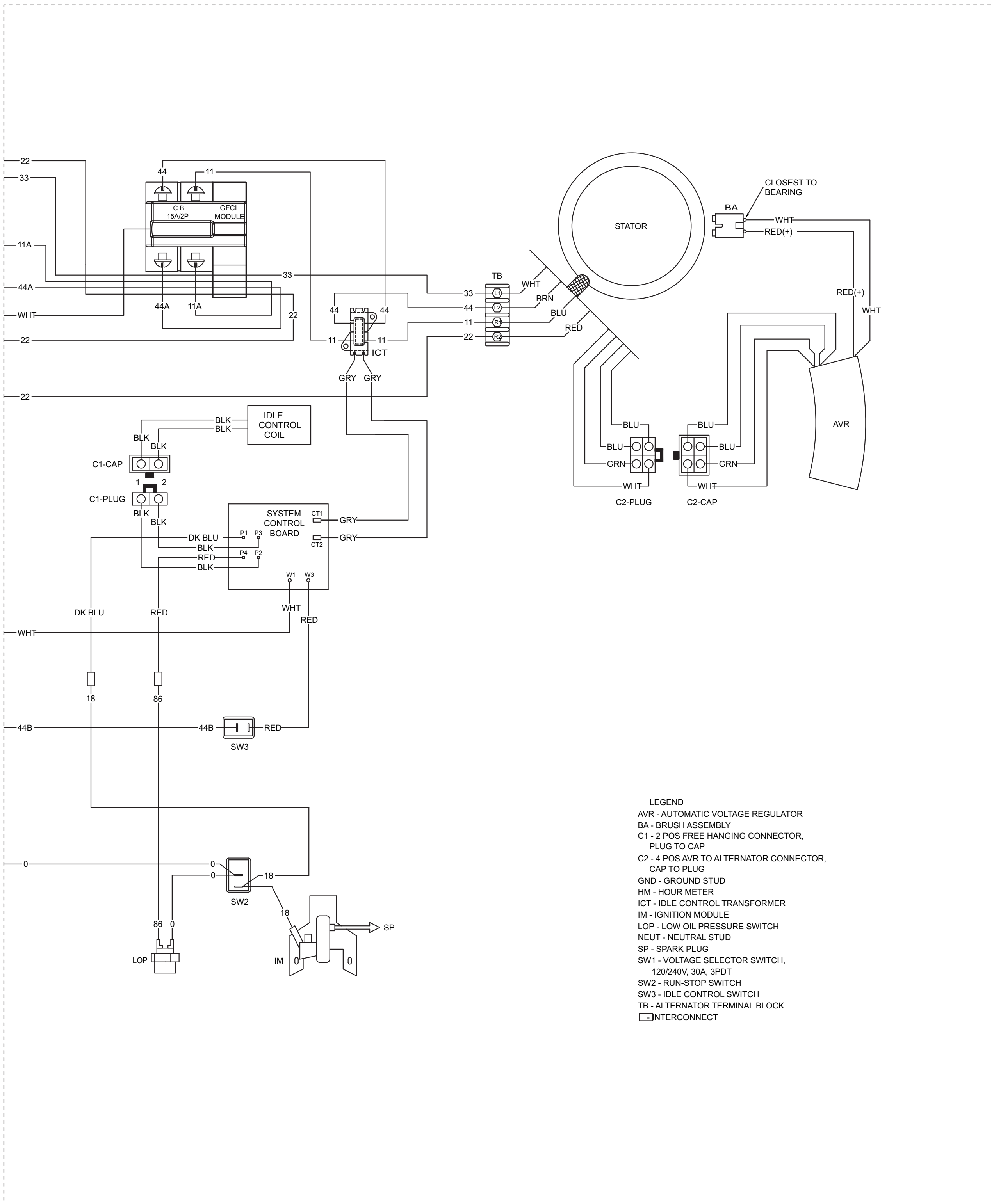
REVISION: D

XP4000 PORTABLE

DATE: 05/20/11

DRAWING #: 0H8536

Wiring Diagram and Electrical Schematic, XP4000 Drawing No. 0H8536-D



WIRING - DIAGRAM

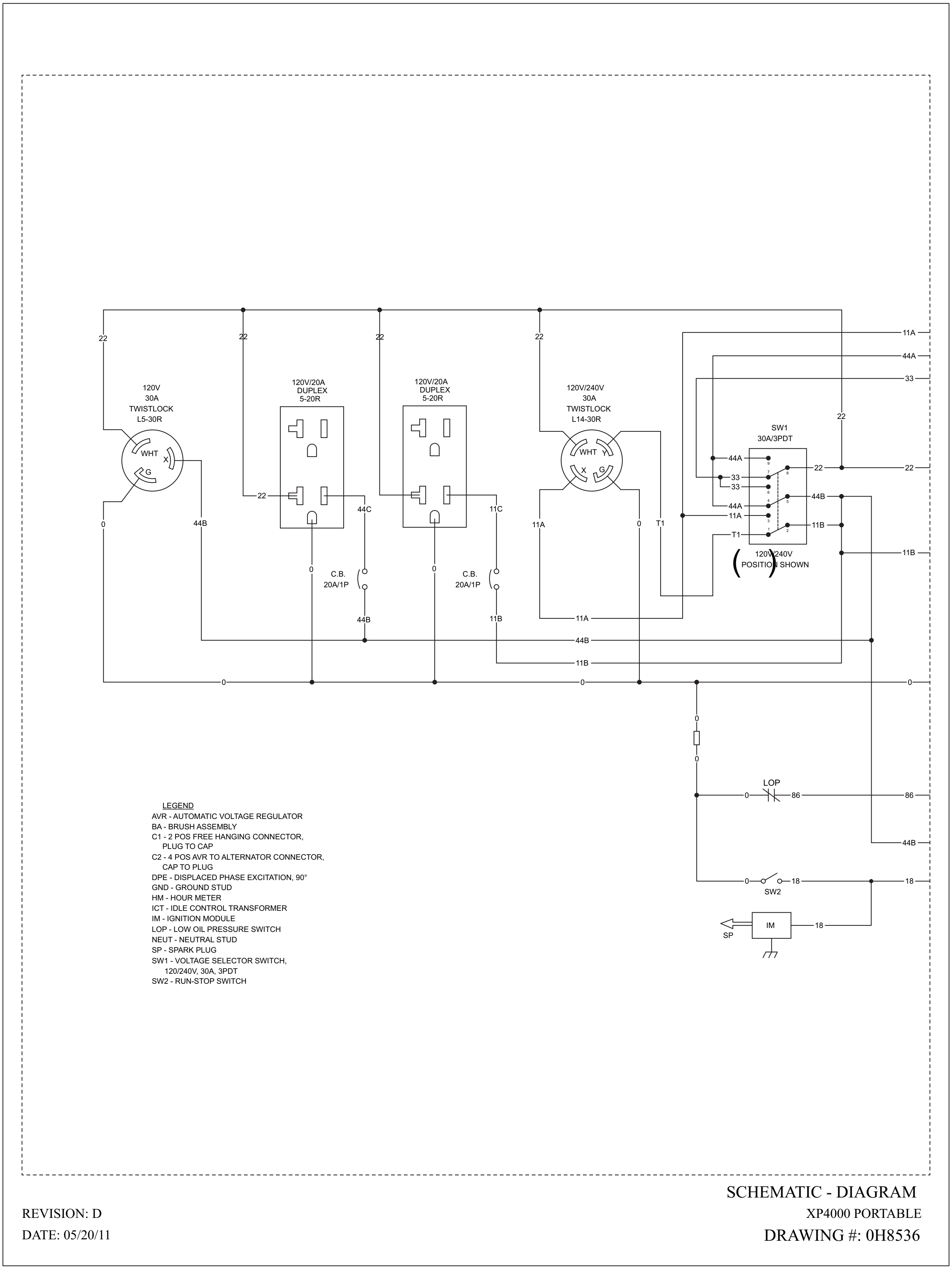
REVISION: D

XP4000 PORTABLE

DATE: 05/20/11

DRAWING #: 0H8536

Wiring Diagram and Electrical Schematic, XP4000 Drawing No. 0H8536-D



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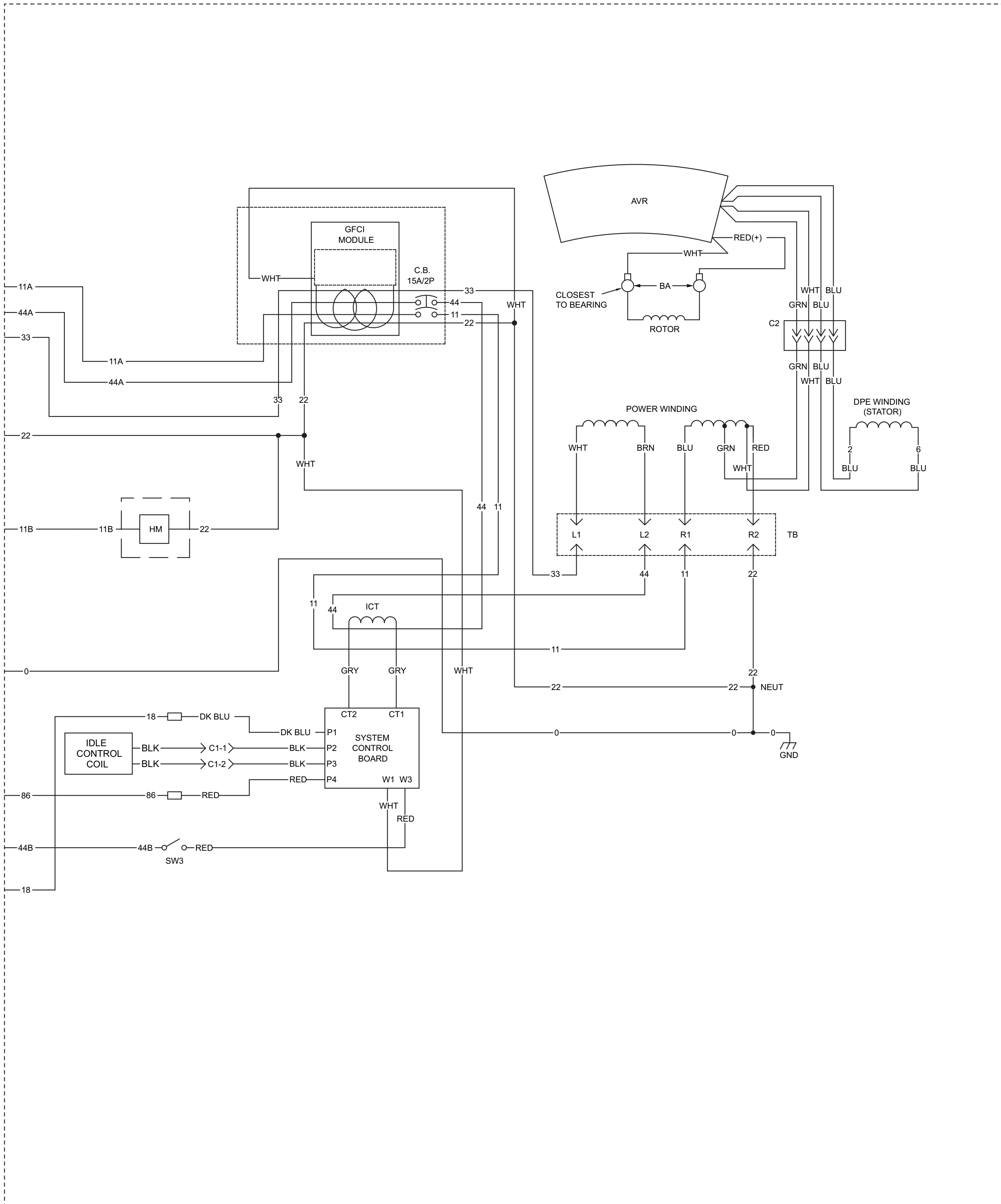


SCHEMATIC - DIAGRAM

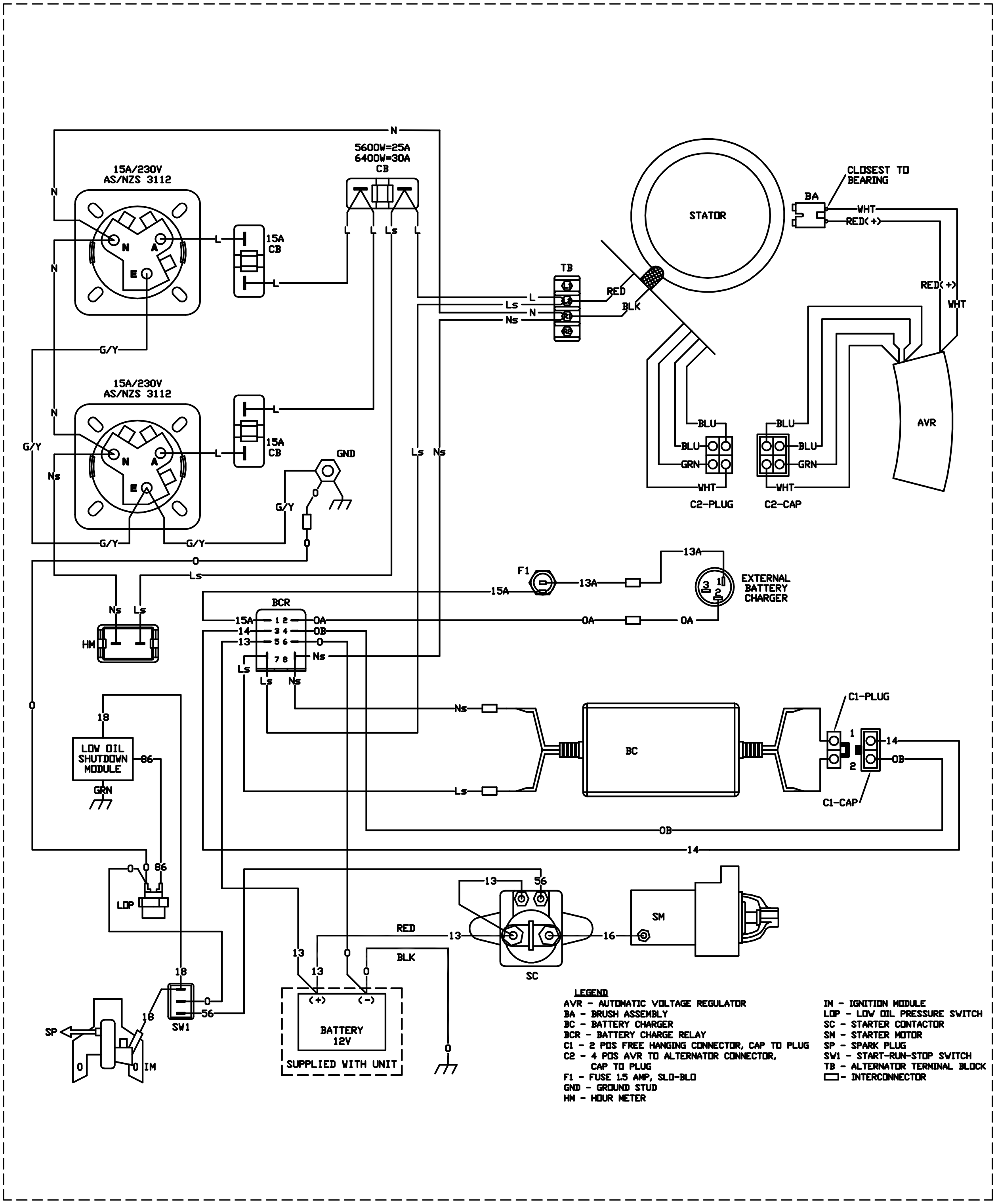
REVISION: D

XP4000 PORTABLE

DATE: 05/20/11

DRAWING #: 0H8536

Wiring Diagram and Electrical Schematic, XP5600E & XP6400E Drawing No. 0K2042-A

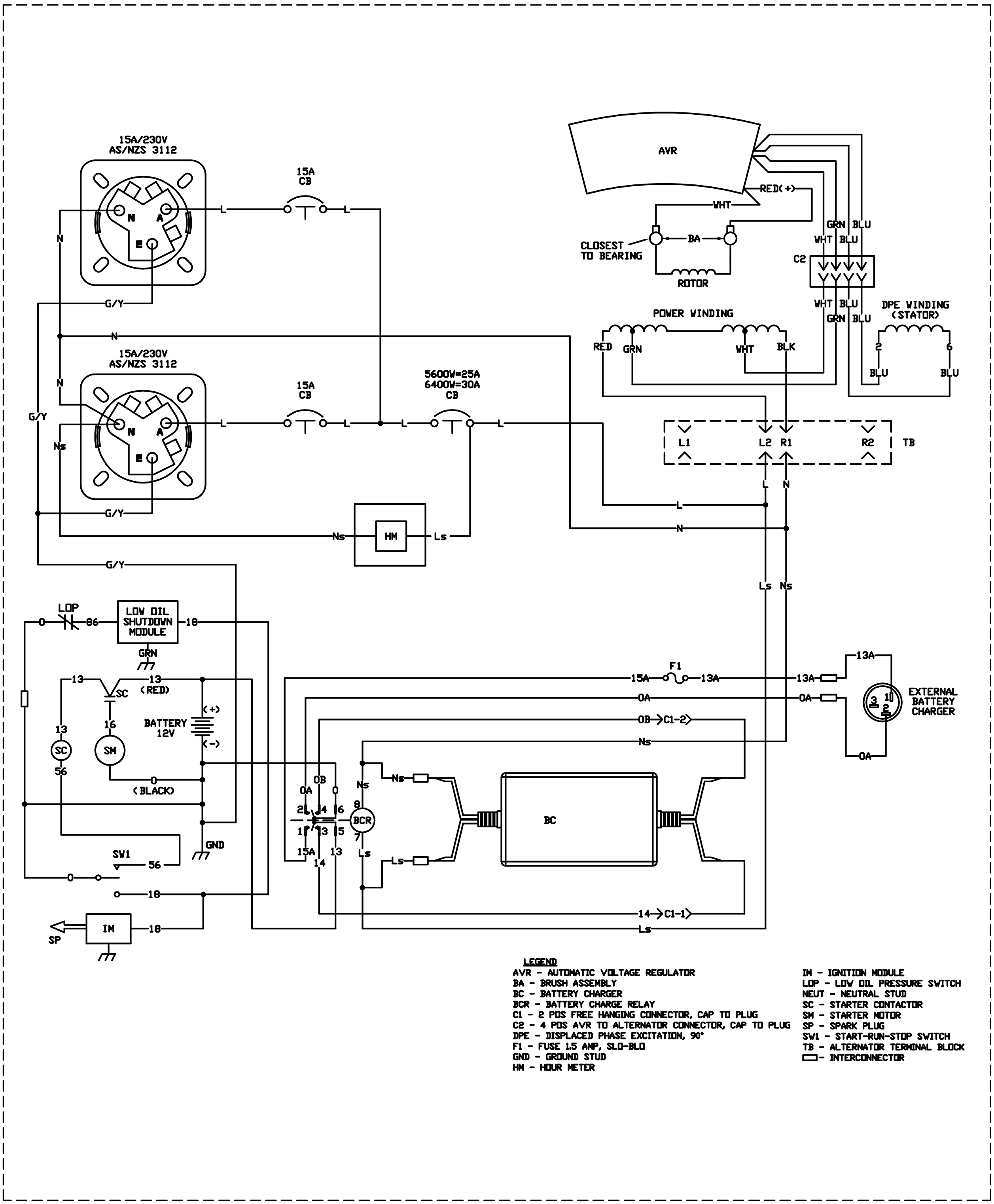


WIRING - DIAGRAM

REVISION: A
WD SD XP5600E/6400E 50HZ AUS

DATE: 10/22/12
DRAWING #: 0K2042

Wiring Diagram and Electrical Schematic, XP5600E & XP6400E Drawing No. 0K2042-A



SCHEMATIC - DIAGRAM

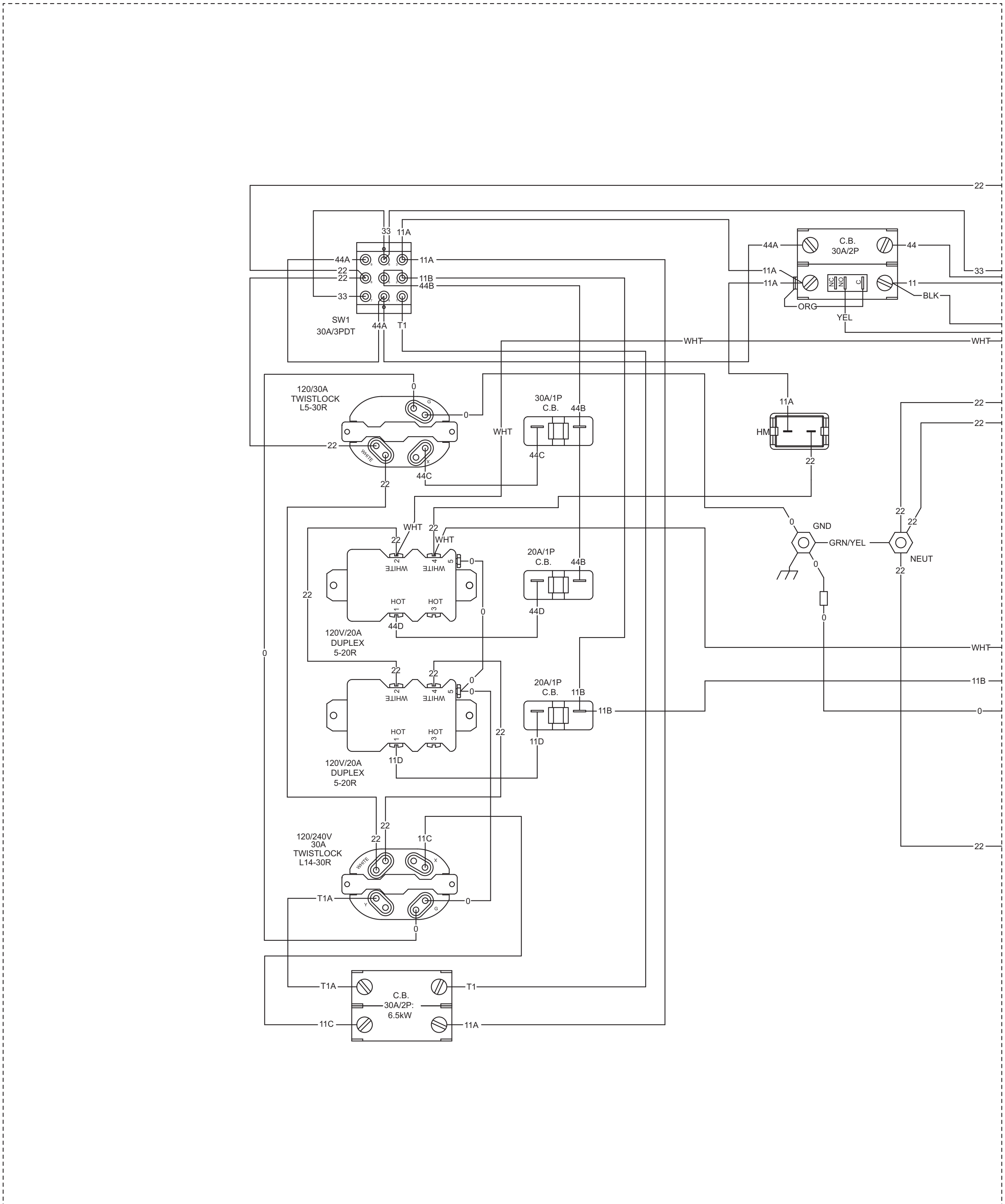
REVISION:A

WD SD XP5600E/6400E 50HZ AUS

DATE: 10/22/12

DRAWING #: 0K2042

Wiring Diagram and Electrical Schematic, XP6500E Drawing No. 0H6809-D



REVISION: D

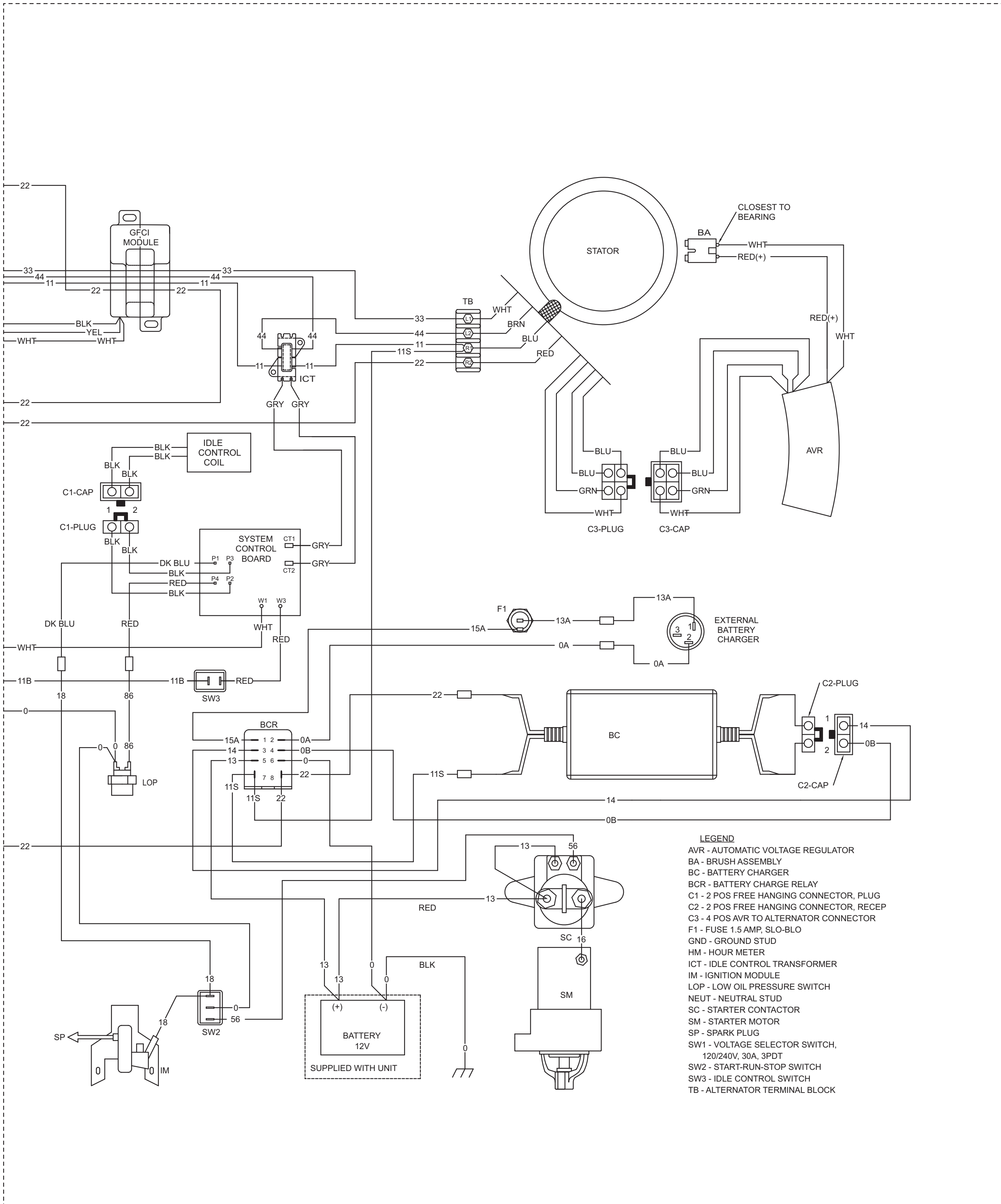
DATE: 05/20/11

WIRING - DIAGRAM

XP6.5 PORTABLE

DRAWING #: 0H6809

Wiring Diagram and Electrical Schematic, XP6500E Drawing No. 0H6809-D



WIRING - DIAGRAM

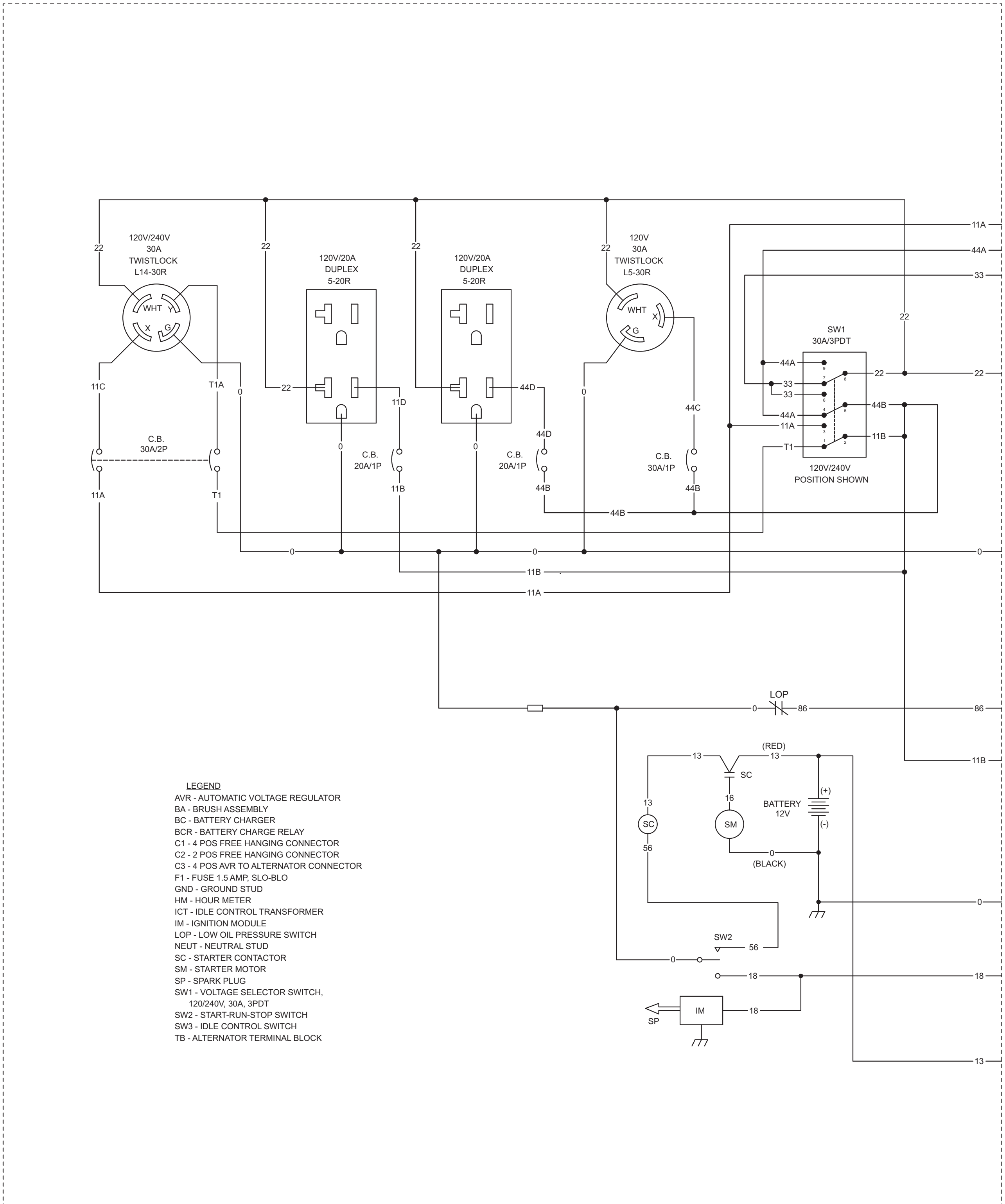
REVISION: D

XP6.5 PORTABLE

DATE: 05/20/11

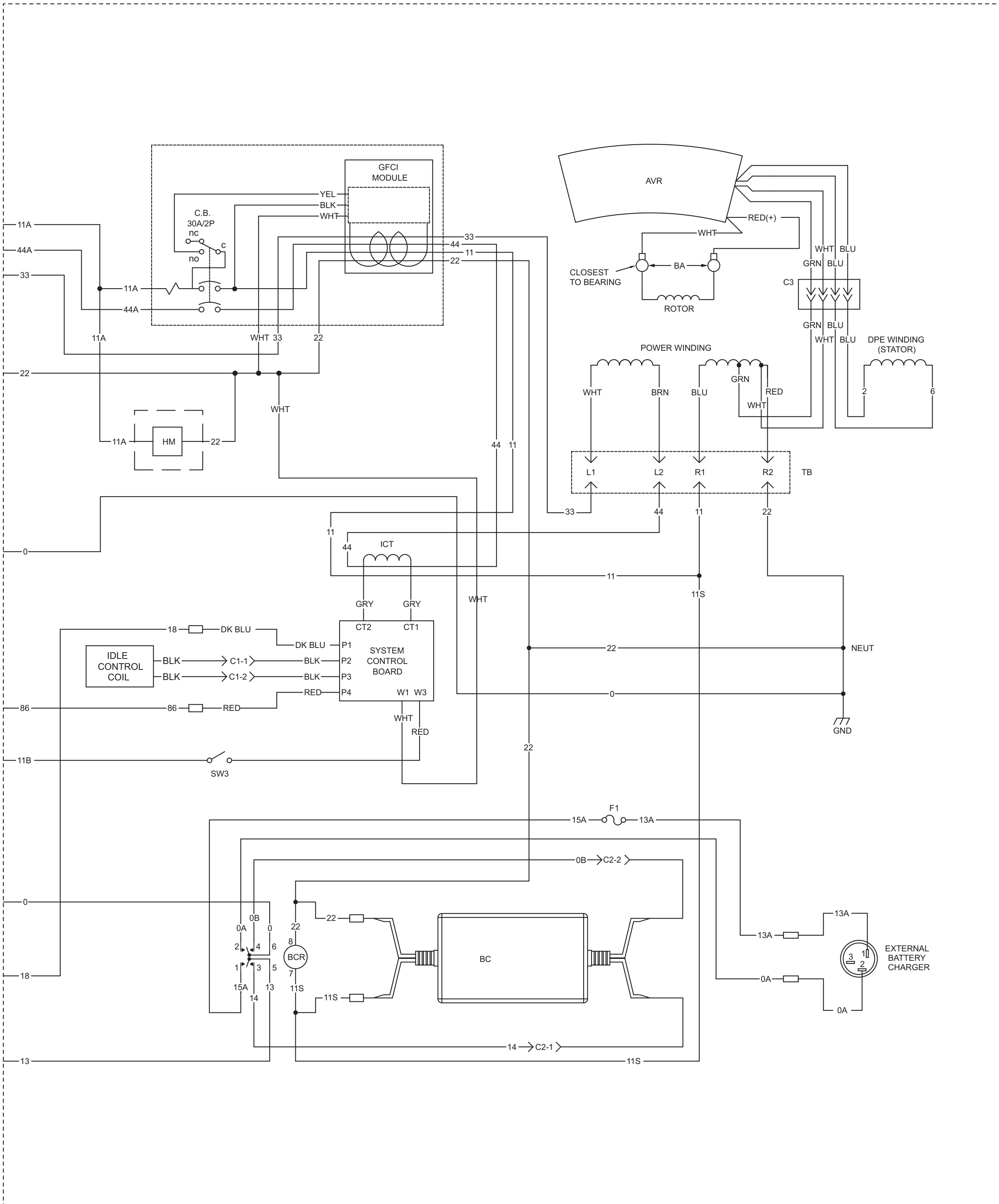
DRAWING #: 0H6809

Wiring Diagram and Electrical Schematic, XP6500E Drawing No. 0H6809-D



SCHEMATIC - DIAGRAM
REVISION: D
XP6.5 PORTABLE
DATE: 05/20/11
DRAWING #: 0H6809

Wiring Diagram and Electrical Schematic, XP6500E Drawing No. 0H6809-D



SCHEMATIC - DIAGRAM

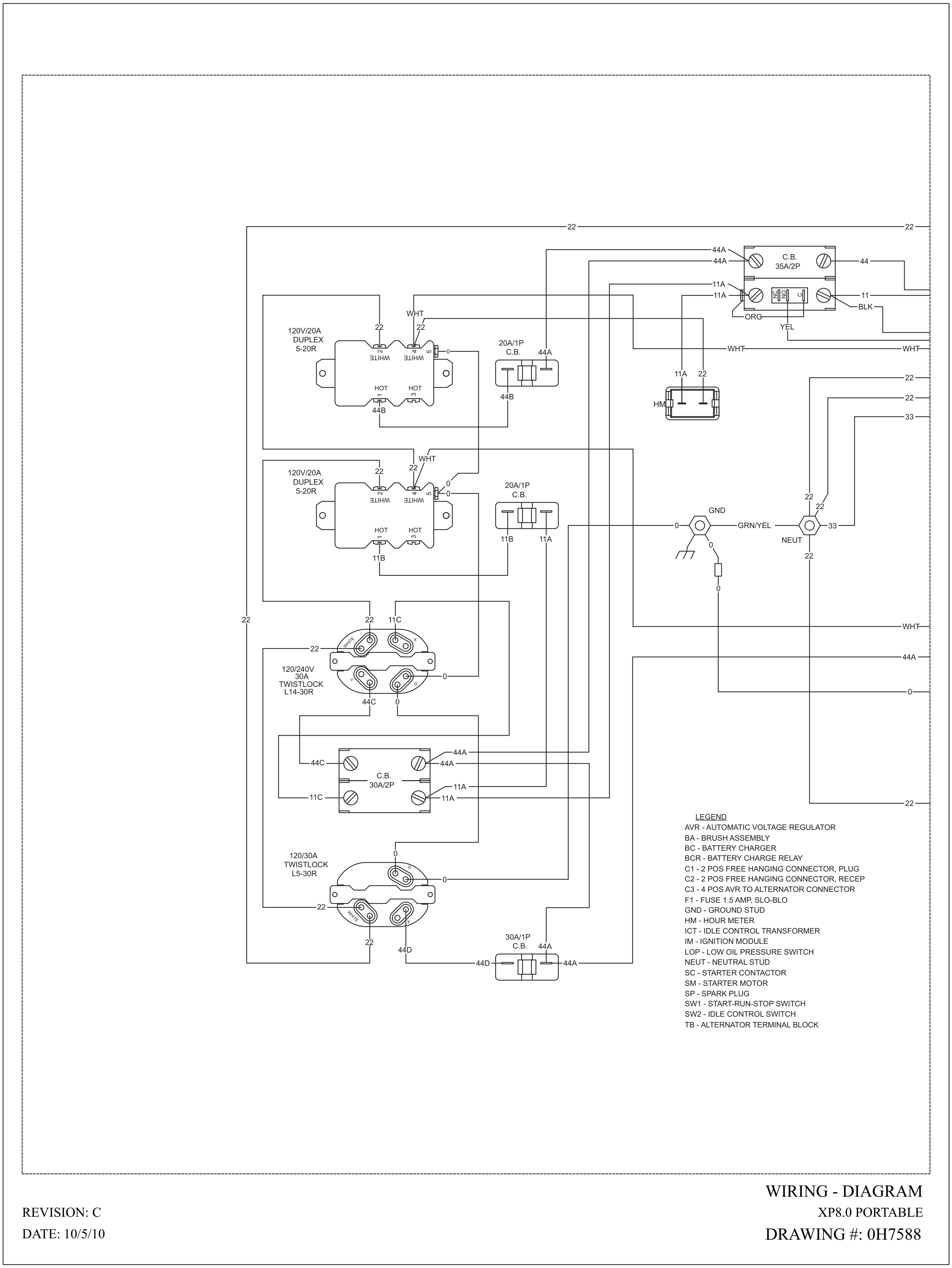
REVISION: D

XP6.5 PORTABLE

DATE: 05/20/11

DRAWING #: 0H6809

Wiring Diagram and Electrical Schematic, XP8000E Drawing No. 0H7588-C



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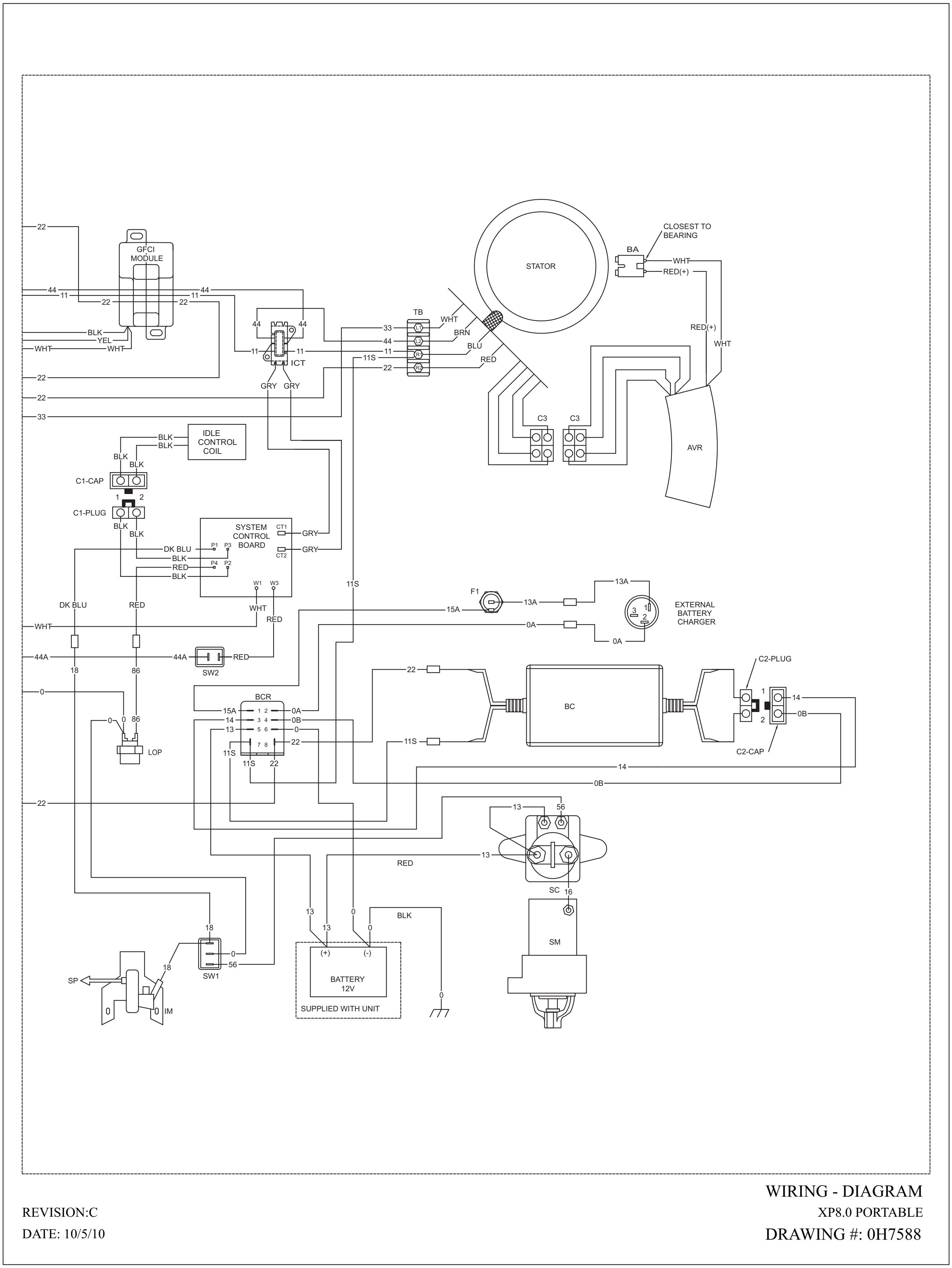

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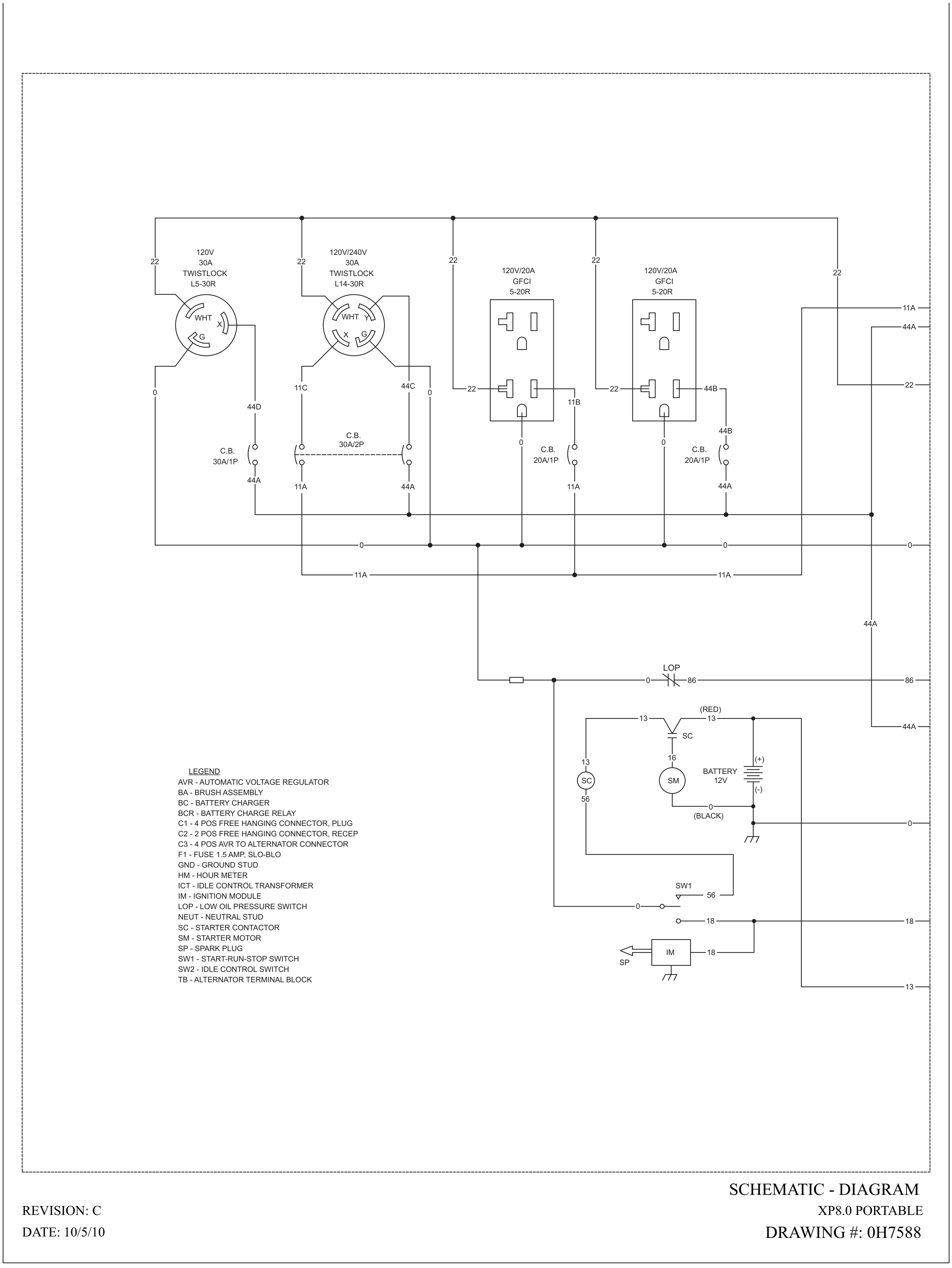

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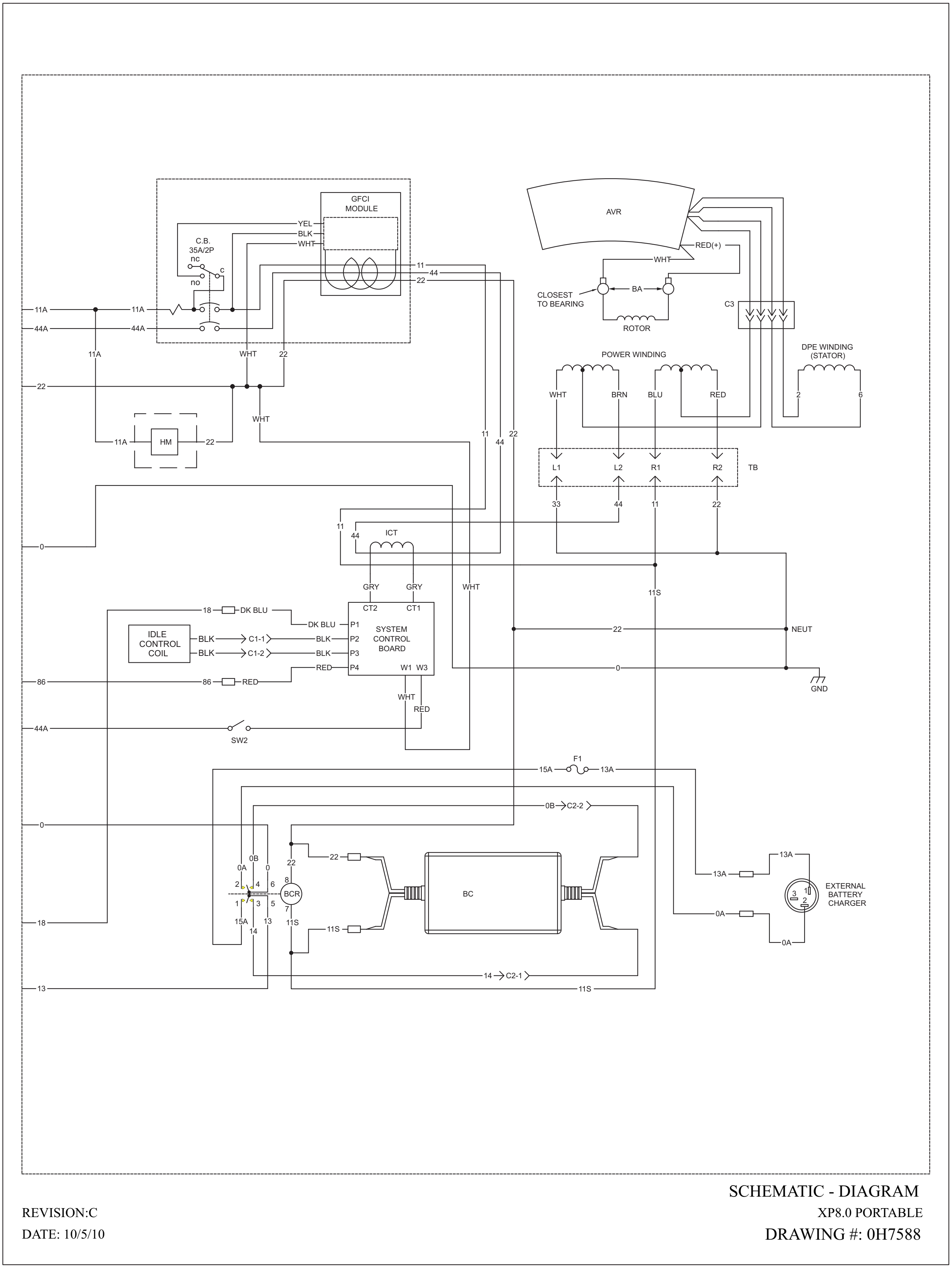
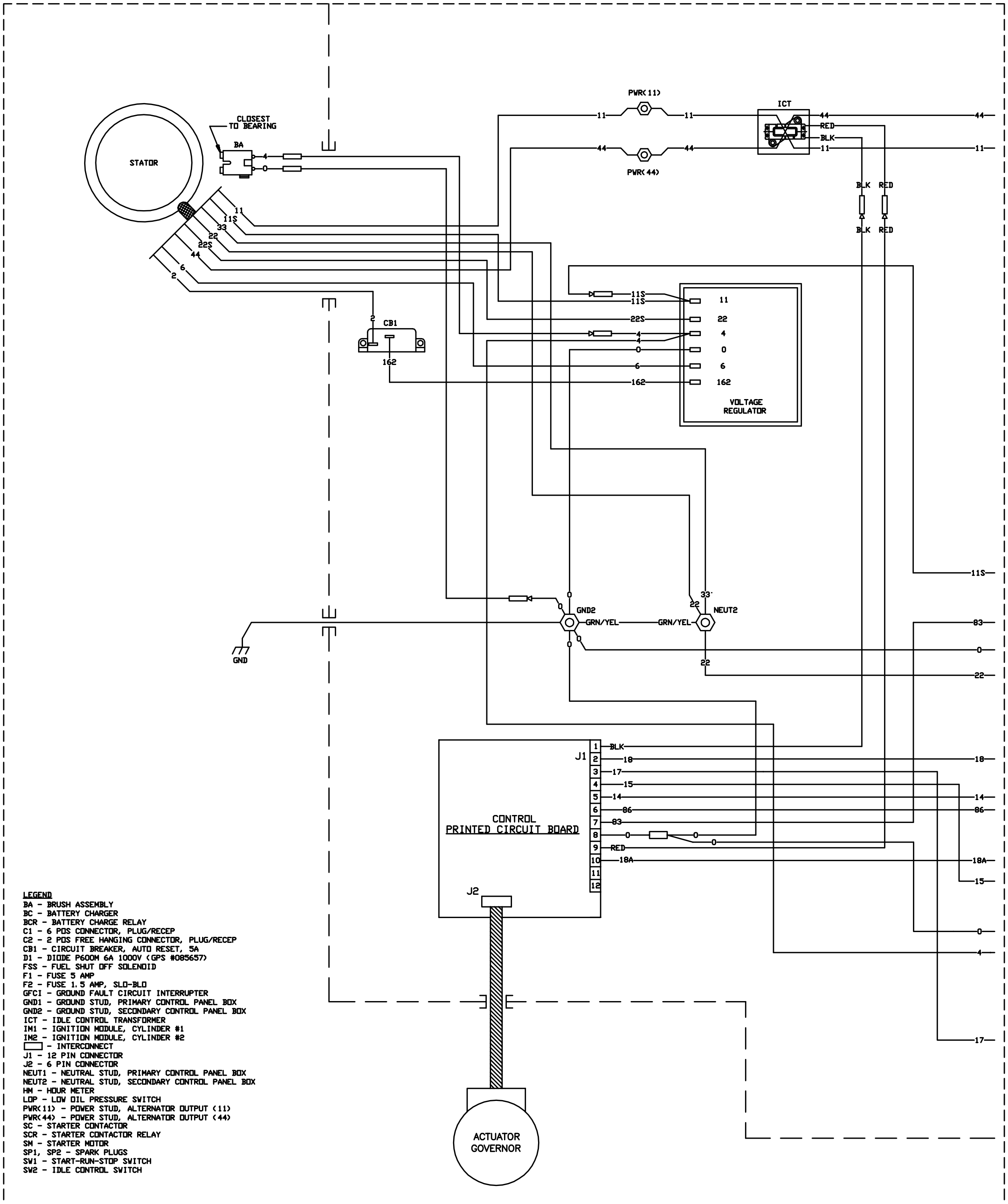


Wiring Diagram and Electrical Schematic, XP10000E Drawing No. 0H7214-D

GROUP G



SCHEMATIC - DIAGRAM

REVISION: J-7456-D

GFCI

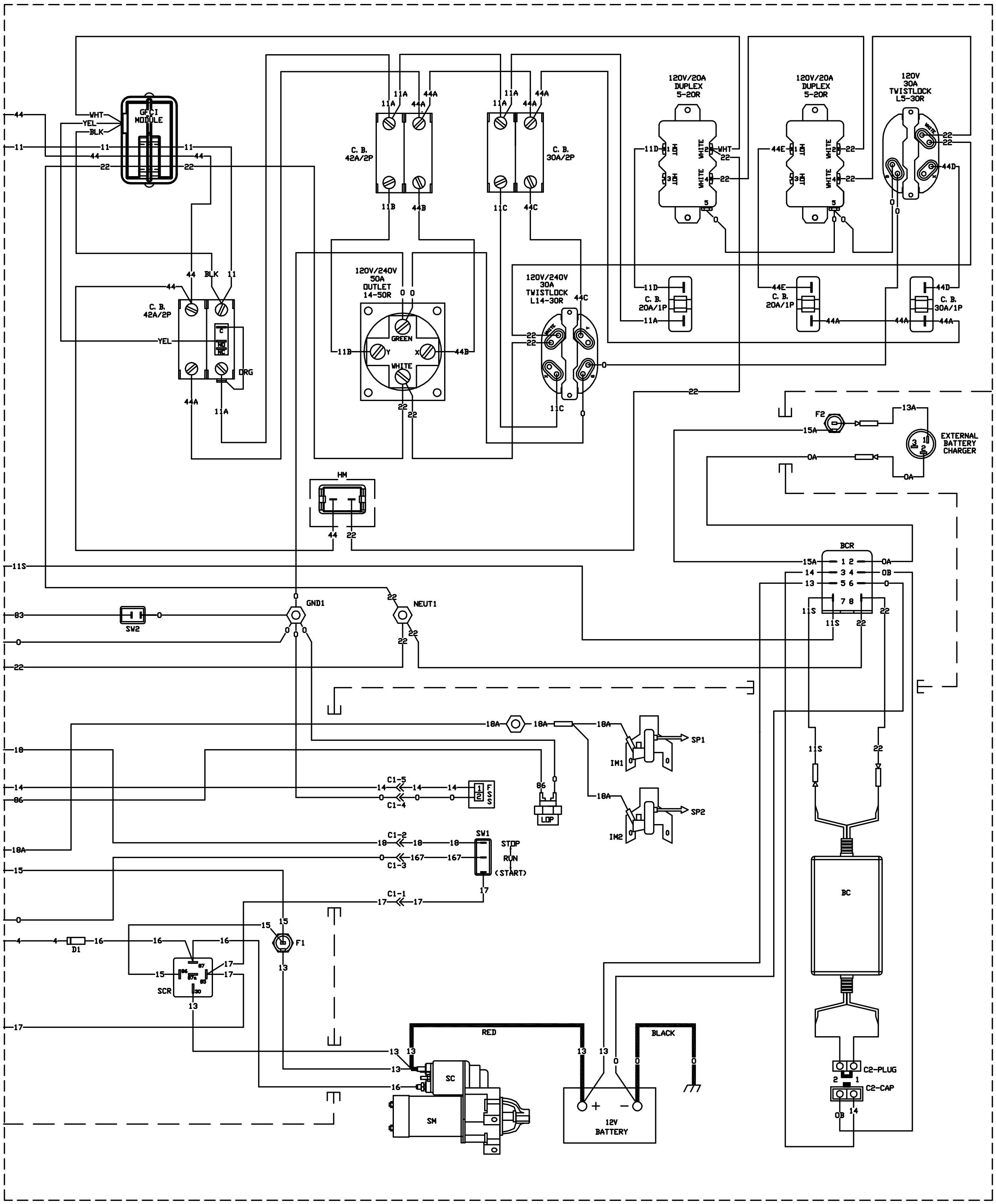
DATE: 01/07/13

PAGE 1 OF 4

DRAWING #: 0H7214

Wiring Diagram and Electrical Schematic, XP10000E Drawing No. 0H7214-D

GROUP G



SCHEMATIC - DIAGRAM

REVISION: J-7456-D

GFCI

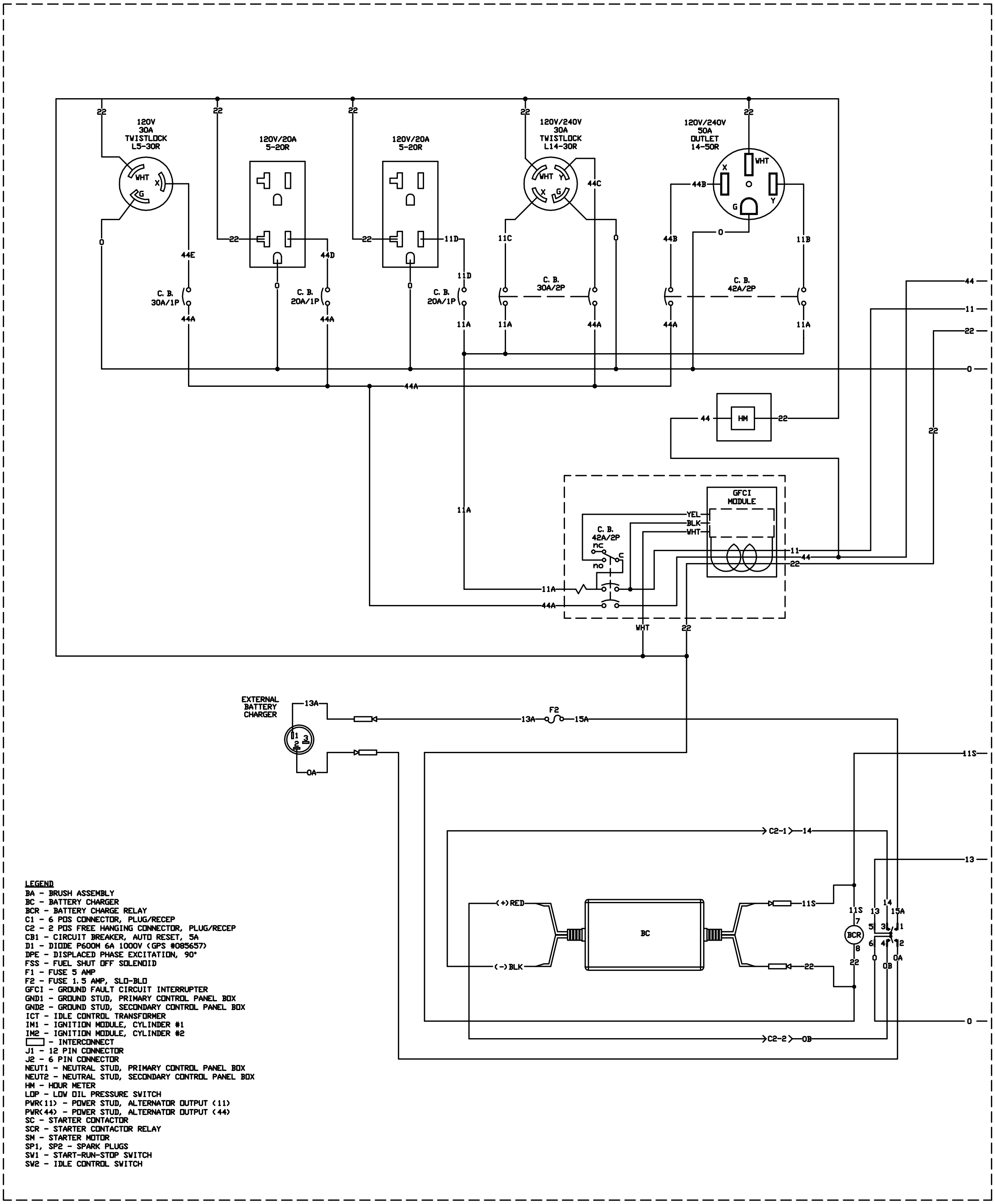
DATE: 01/07/13

PAGE 2 OF 4

DRAWING #: 0H7214

Wiring Diagram and Electrical Schematic, XP10000E Drawing No. 0H7214-D

GROUP G



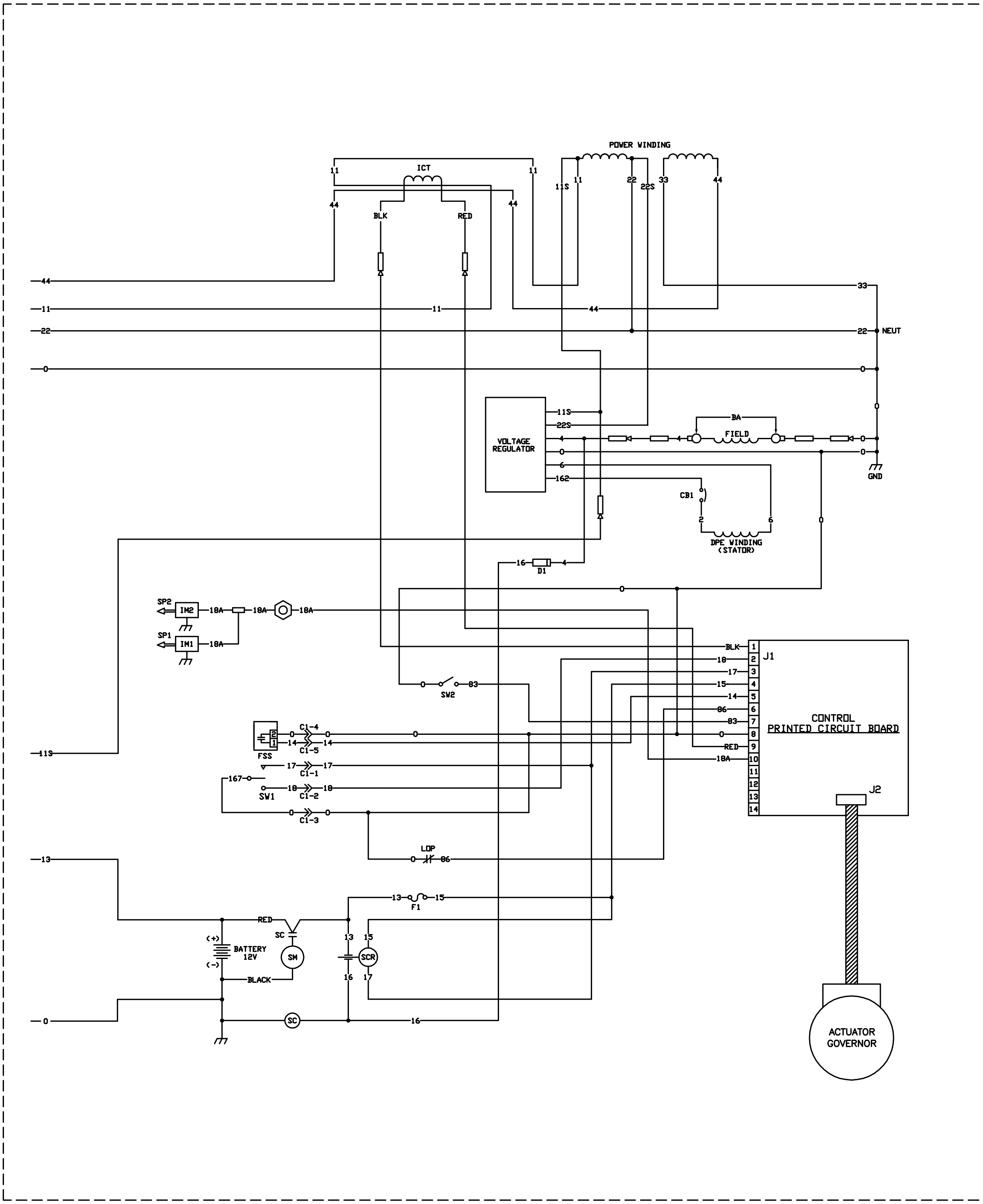
SCHEMATIC - DIAGRAM

REVISION: J-7456-D GFCI

DATE: 01/07/13 PAGE 3 OF 4 DRAWING #: 0H7214

Wiring Diagram and Electrical Schematic, XP10000E Drawing No. 0H7214-D

GROUP G



SCHEMATIC - DIAGRAM

GFCI

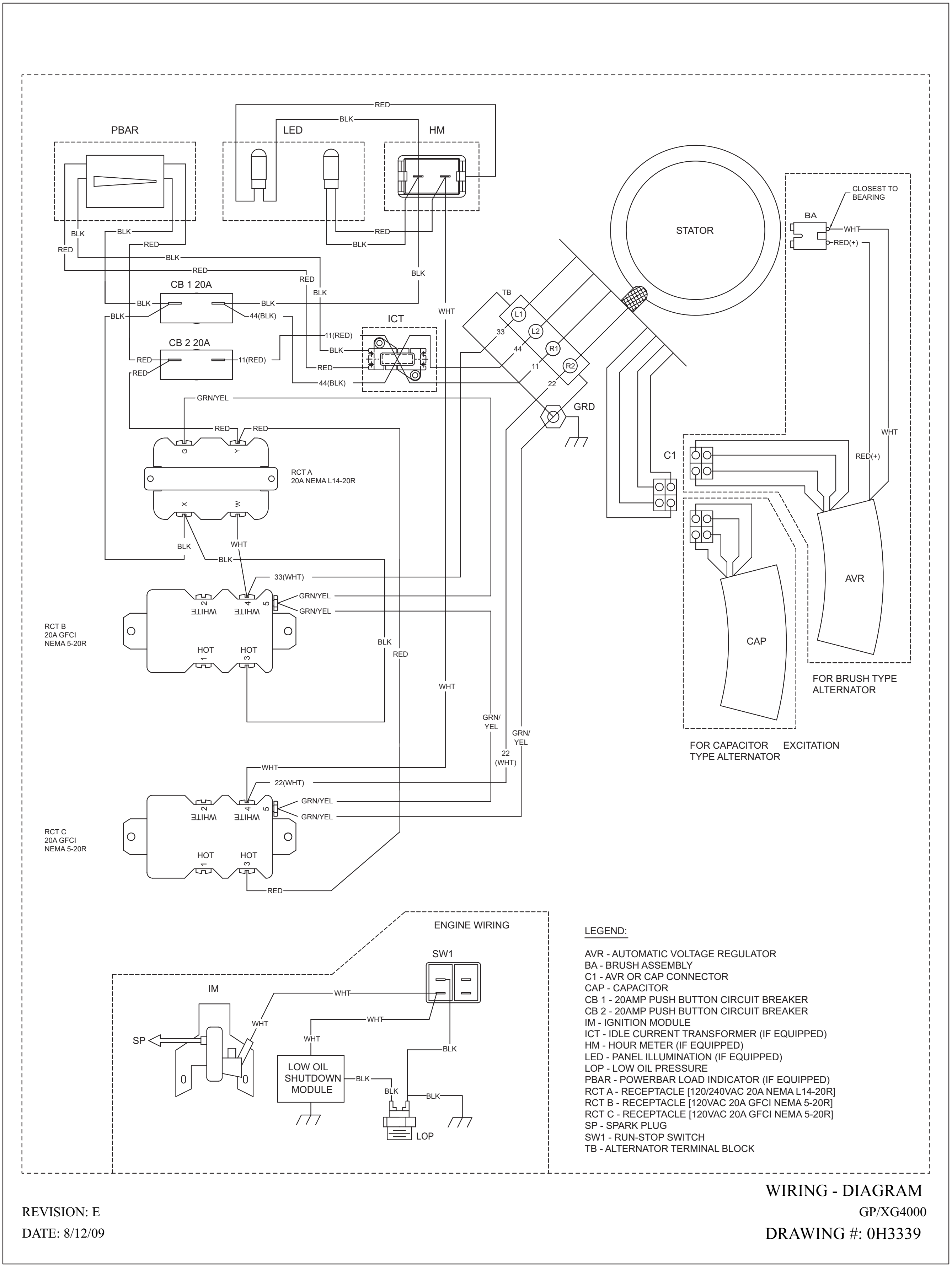
REVISION: J-7456-D

DATE: 01/07/13

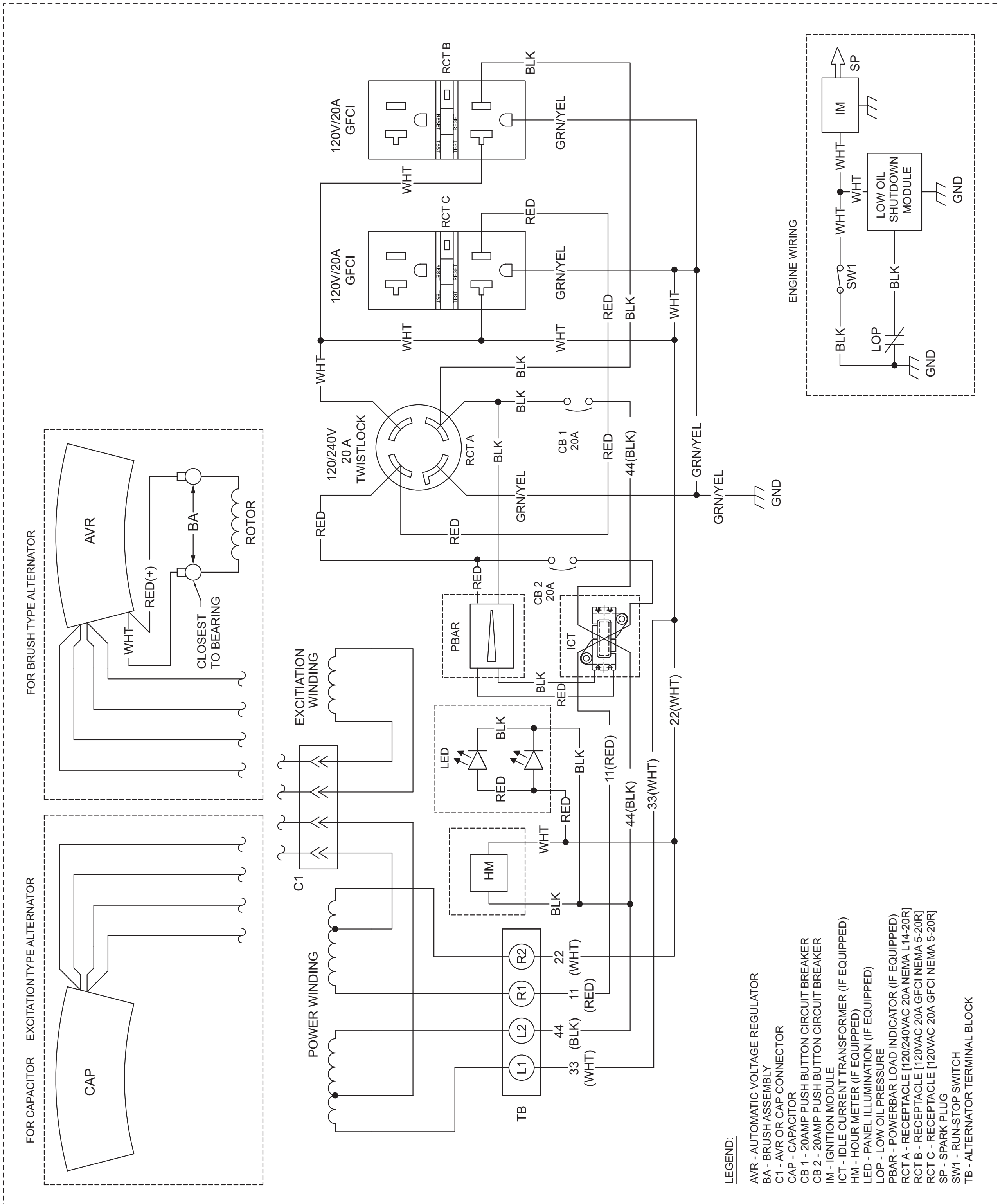
PAGE 4 OF 4

DRAWING #: 0H7214

Wiring Diagram and Electrical Schematic, XG4000 Drawing No. 0H3339-E



Wiring Diagram and Electrical Schematic, XG4000 Drawing No. 0H3339-E



SCHEMATIC - DIAGRAM

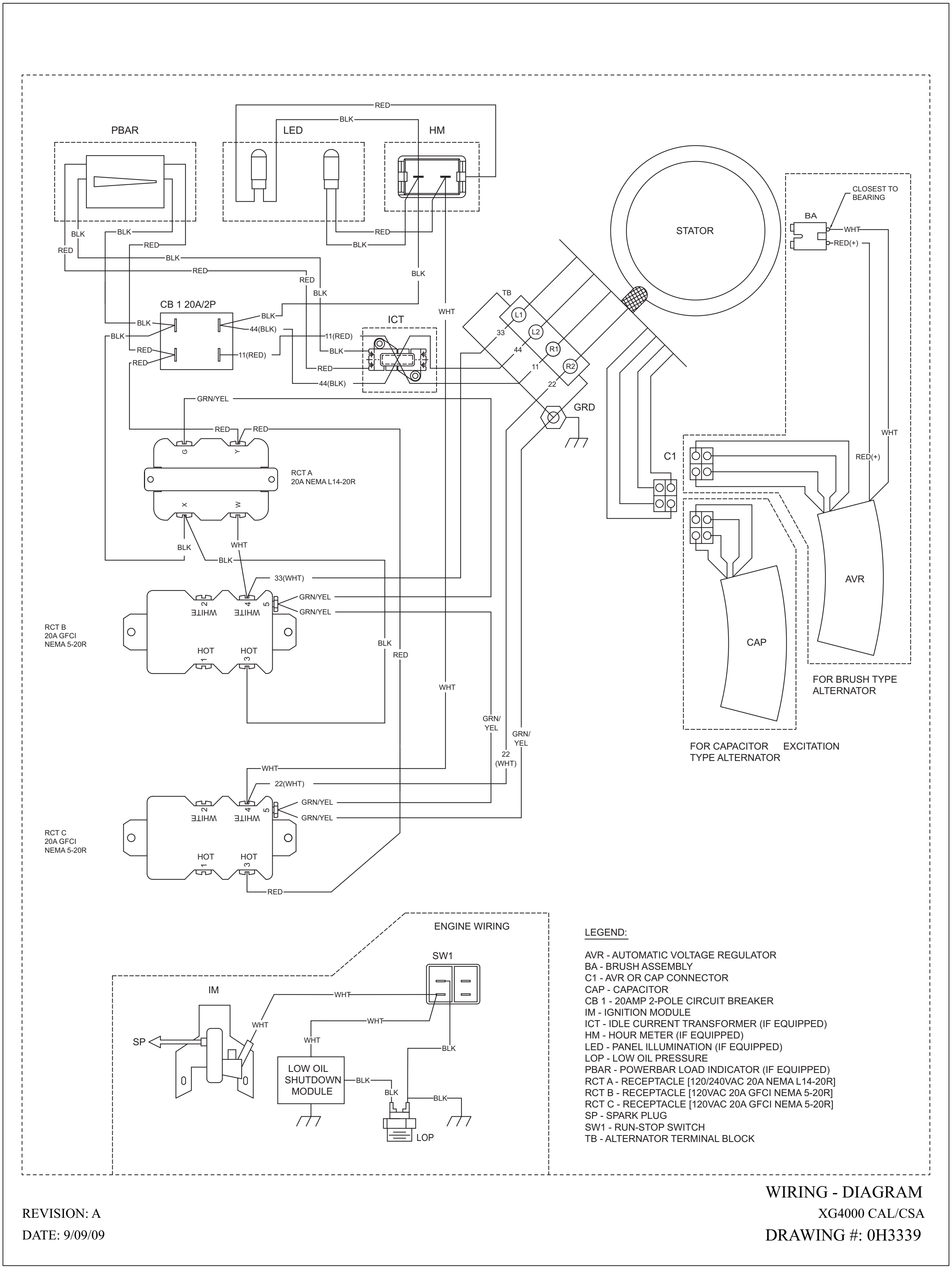
REVISION: E

GP/XG4000

DATE: 8/12/09

DRAWING #: 0H3339

Wiring Diagram and Electrical Schematic, XG4000 Drawing No. 0H5278-A



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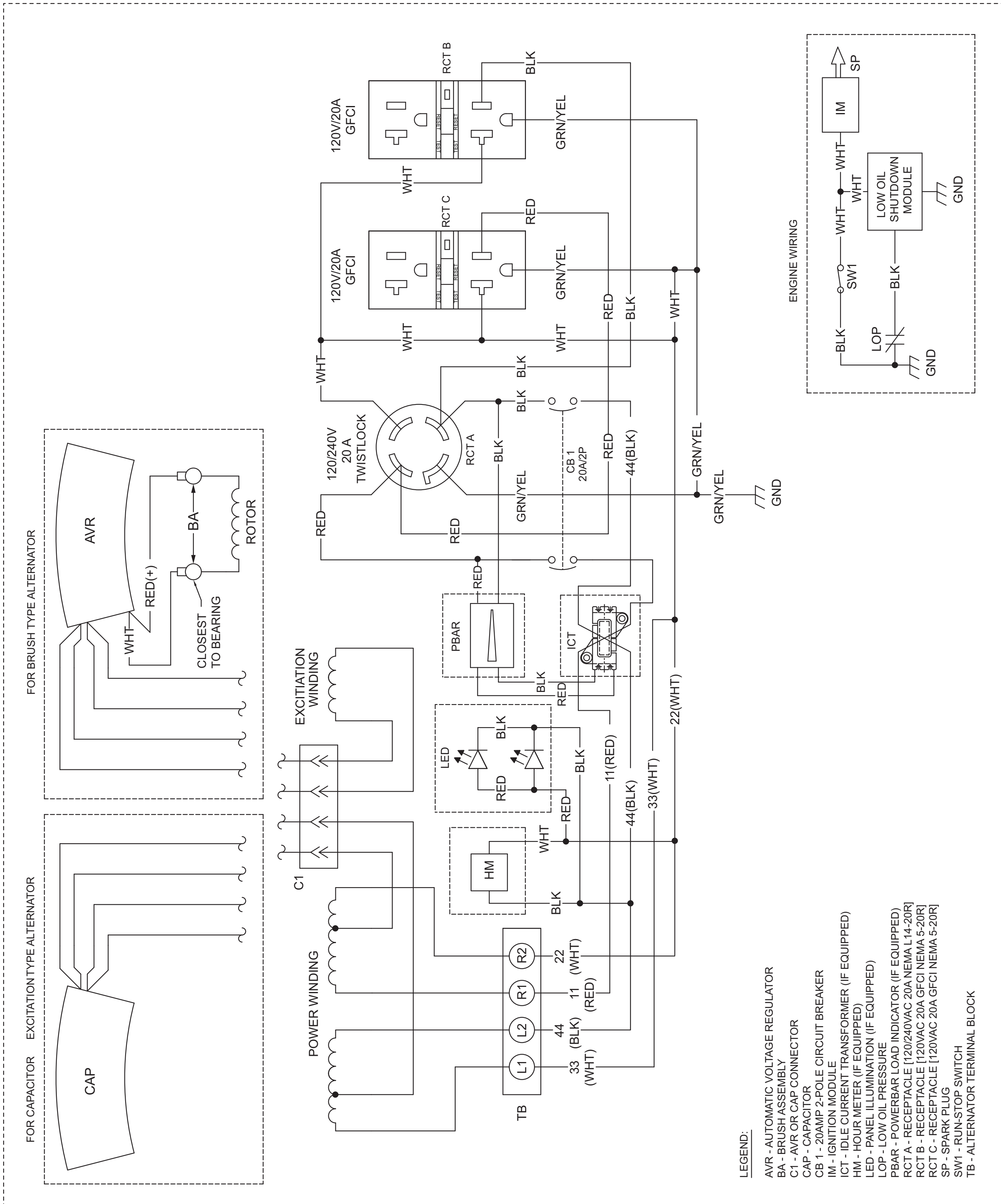


SCHEMATIC - DIAGRAM

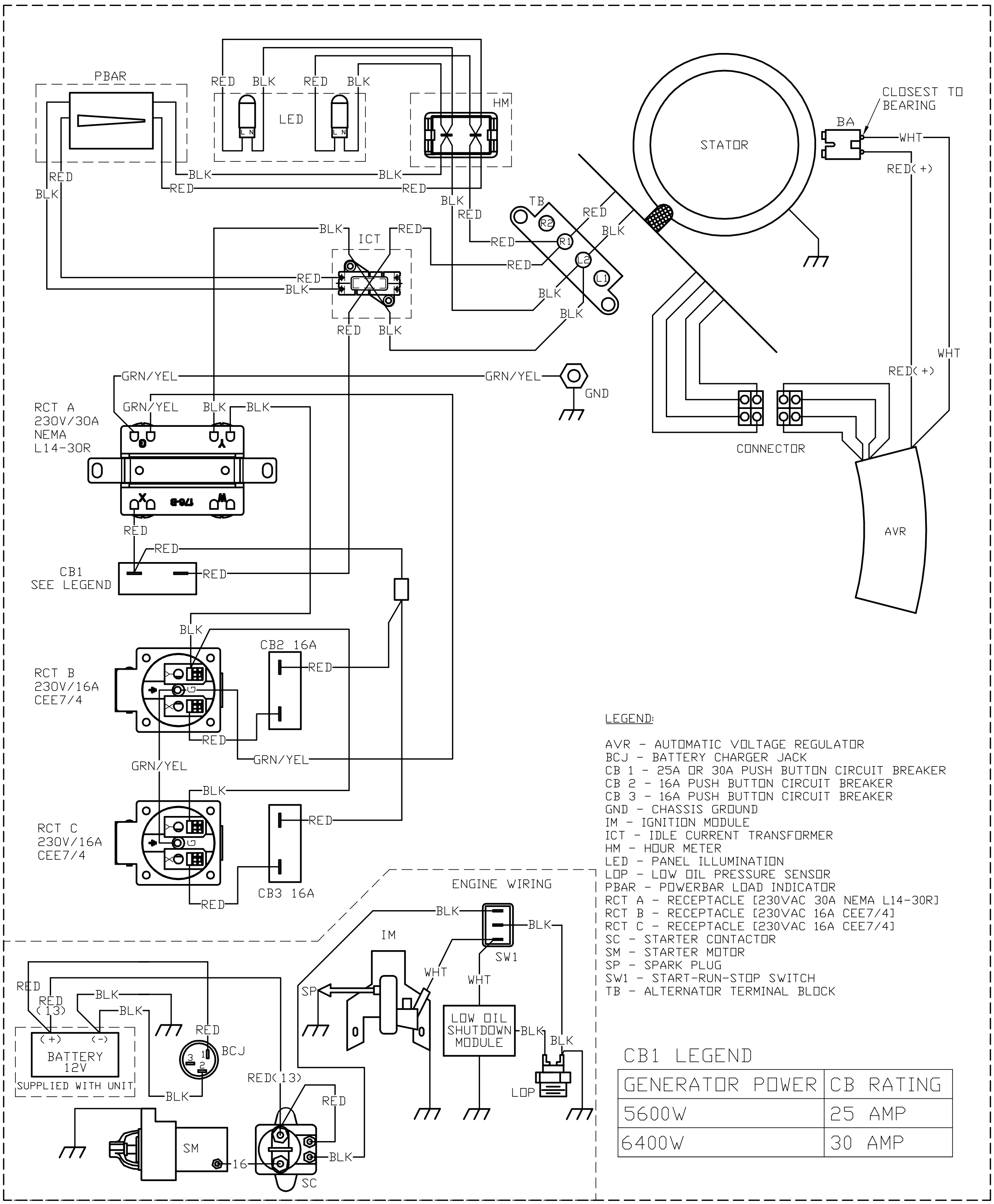
REVISION: A

XG4000 CAL/CSA

DATE: 9/09/09

DRAWING #: 0H5278

Wiring Diagram and Electrical Schematic, XG5600E/XG6400E Drawing No. 0J8223-B



WIRING - DIAGRAM

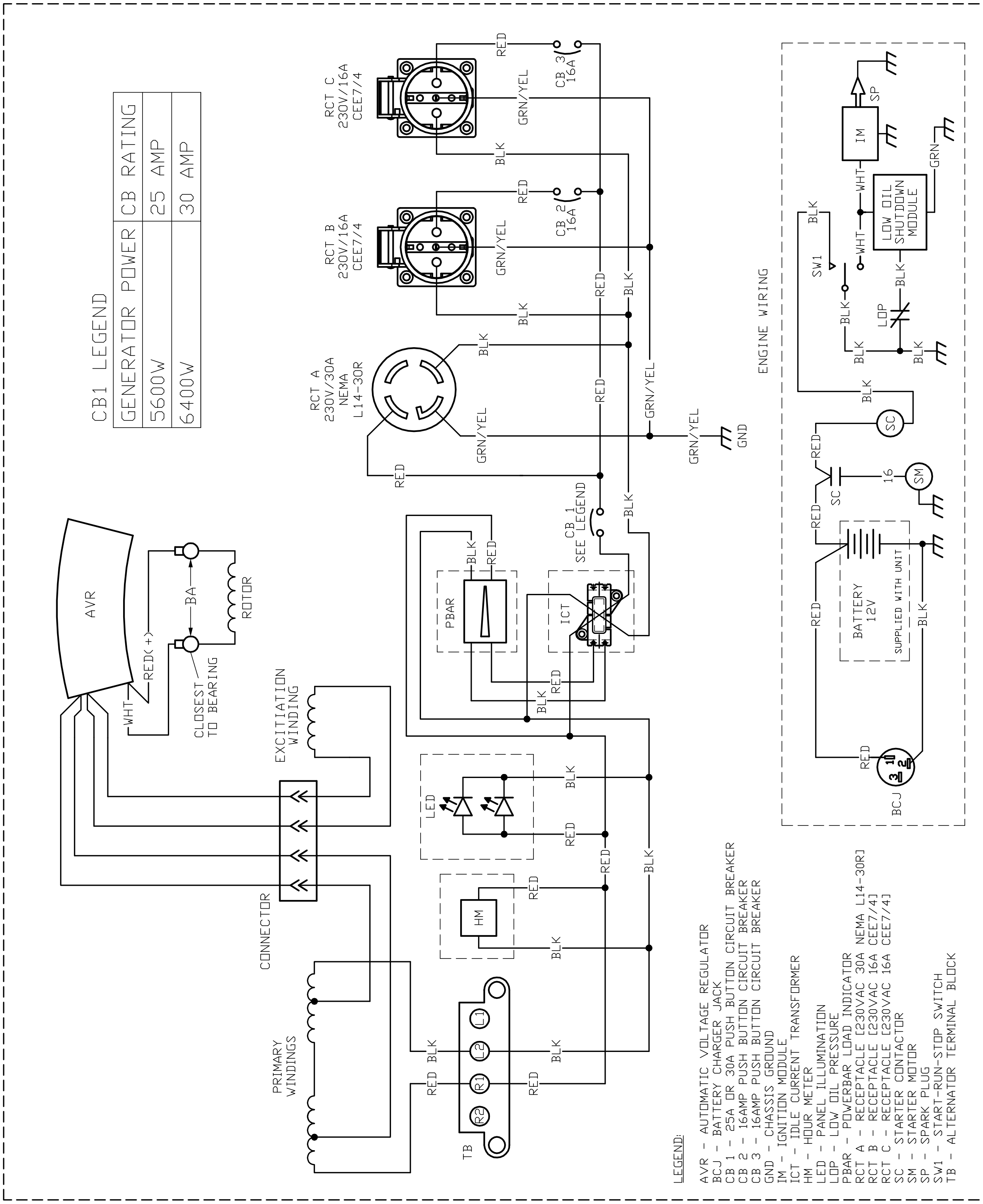
REVISION: B

XG 5600W-6400W 50Hz

DATE: 10/10/12

DRAWING #: 0J8223

Wiring Diagram and Electrical Schematic, XG5600E/XG6400E Drawing No. 0J8223-B



SCHEMATIC - DIAGRAM

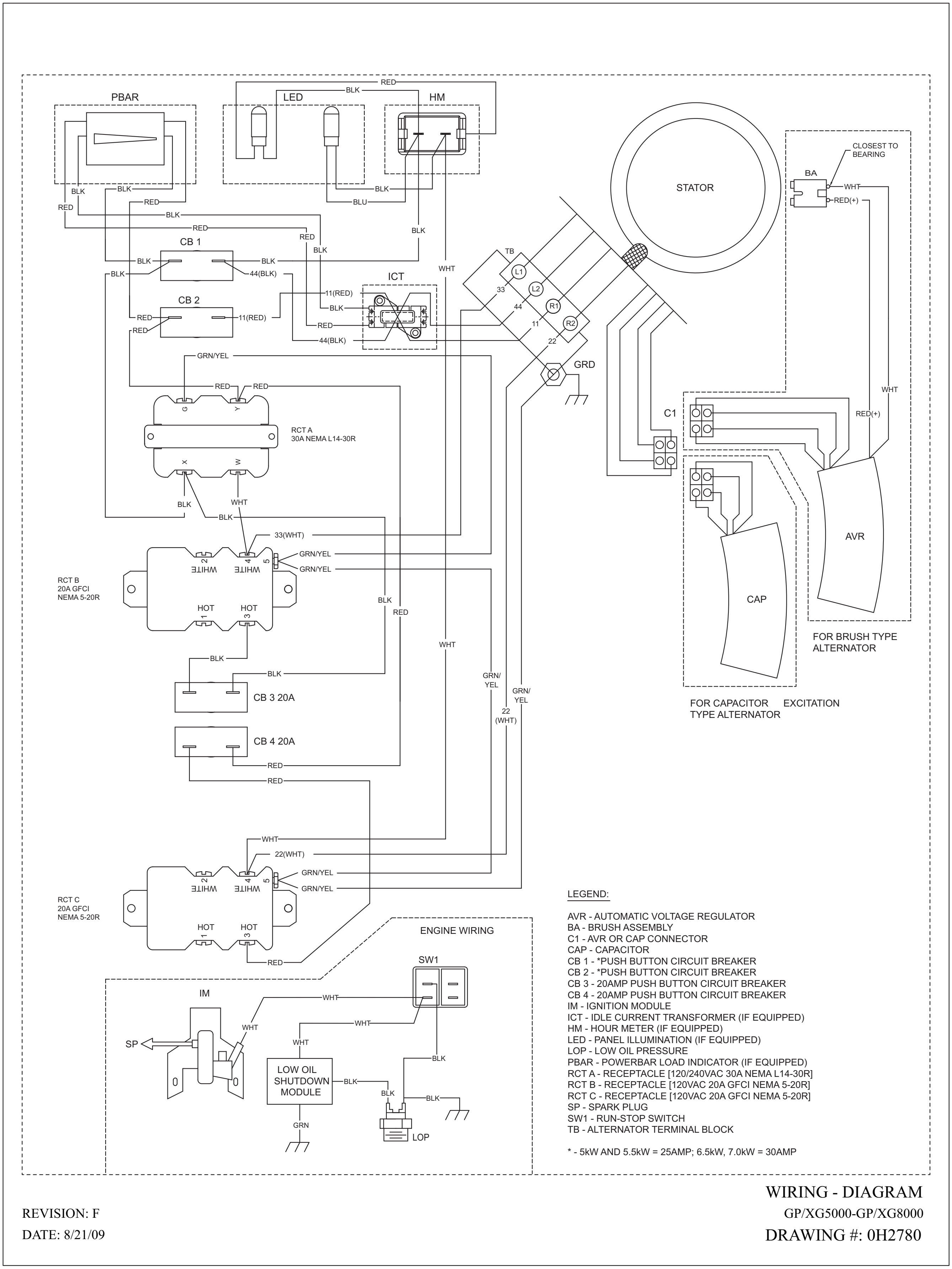
REVISION: B

XG 5600W-6400W 50Hz

DATE: 10/10/12

DRAWING #: 0J8223

Wiring Diagram and Electrical Schematic, XG6500 Drawing No. 0H2780-F



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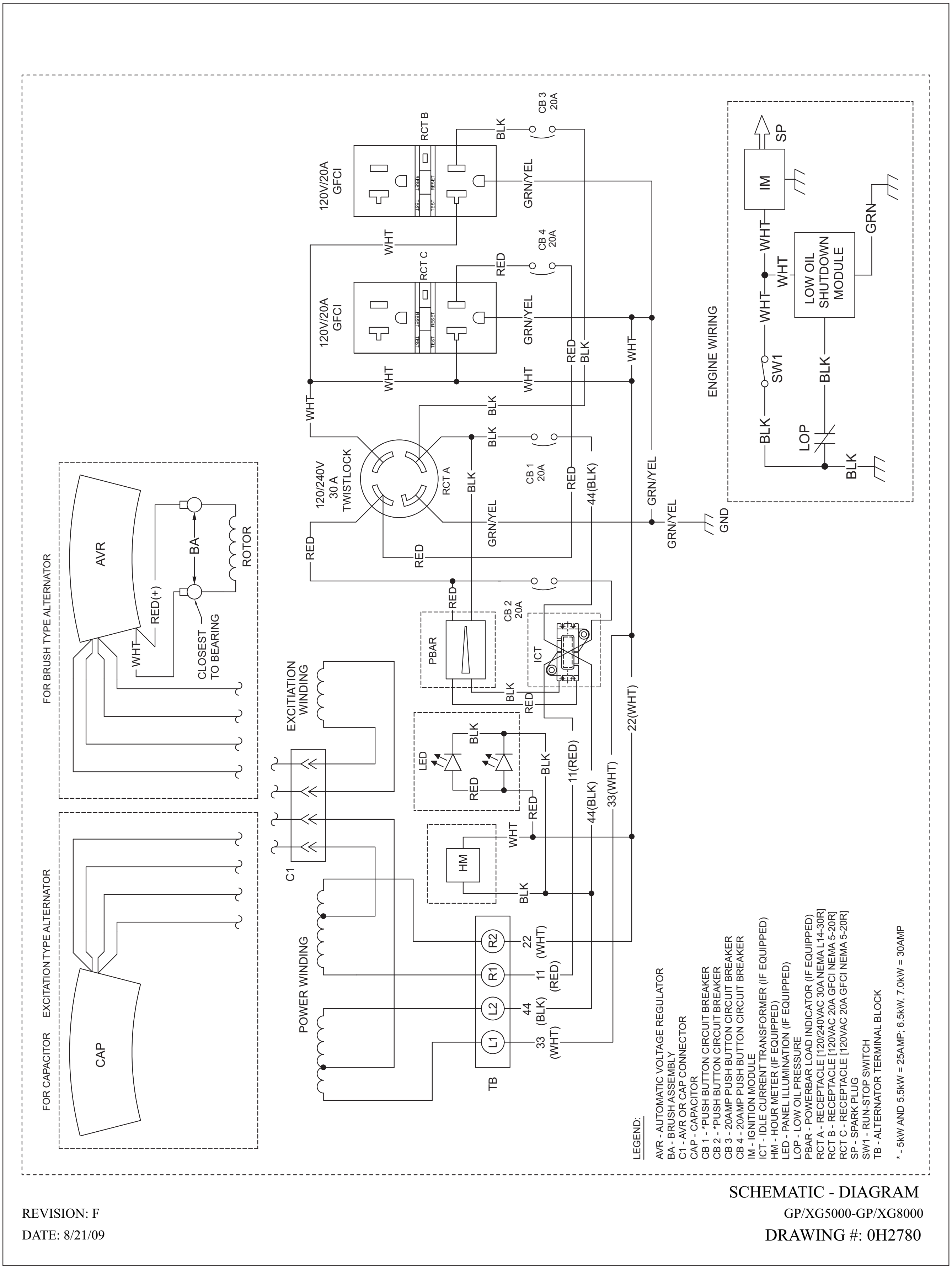

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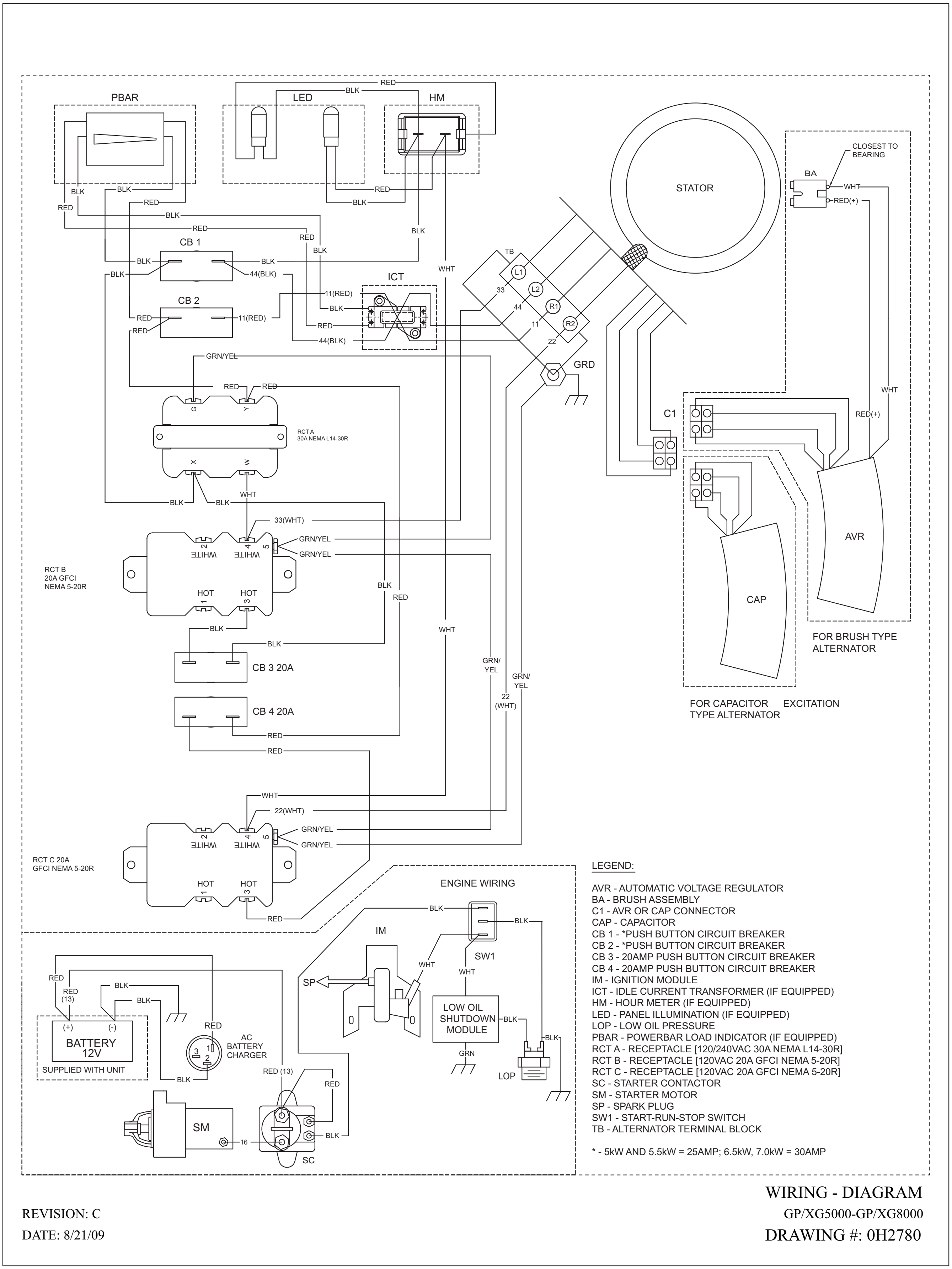

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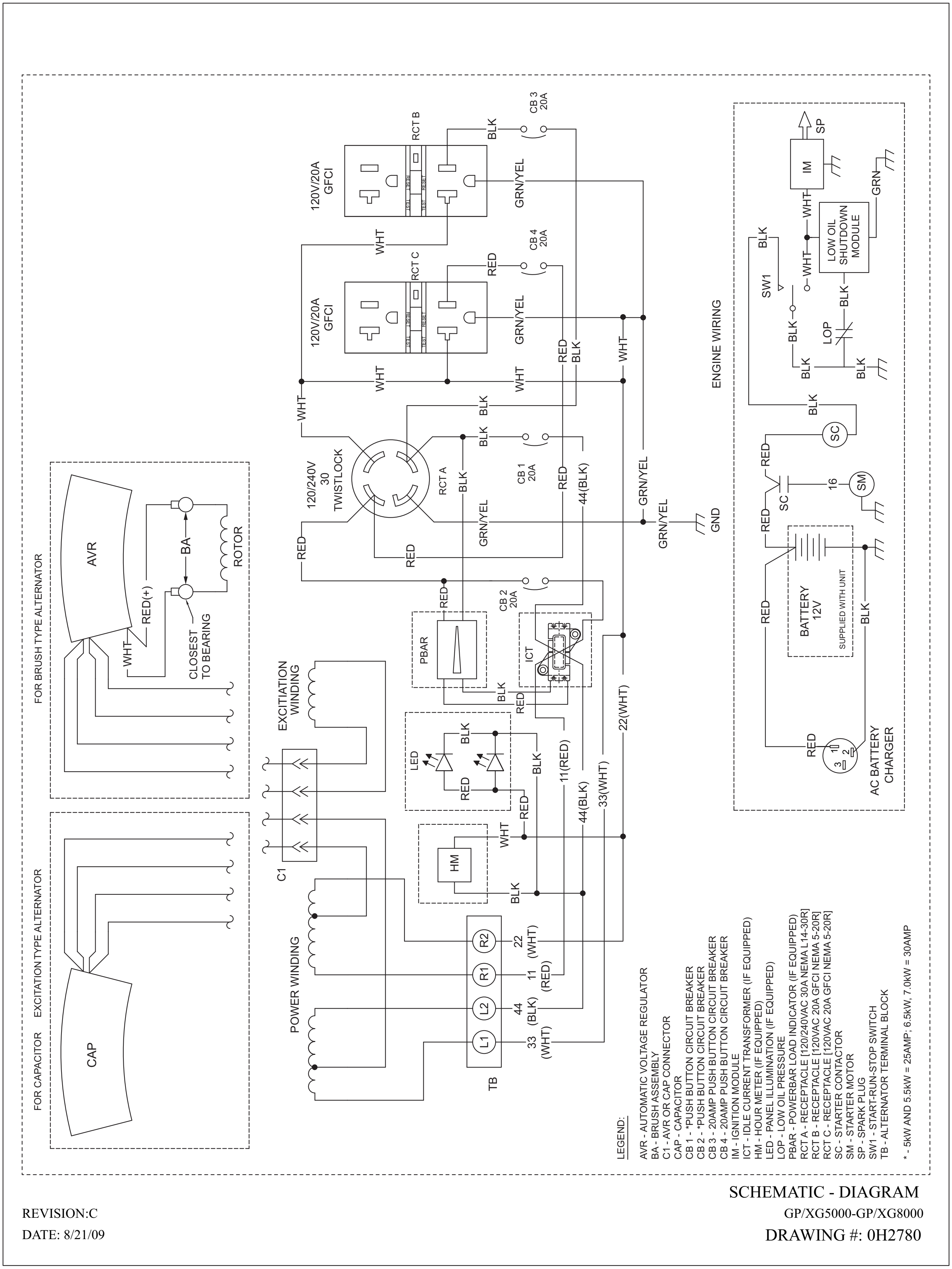

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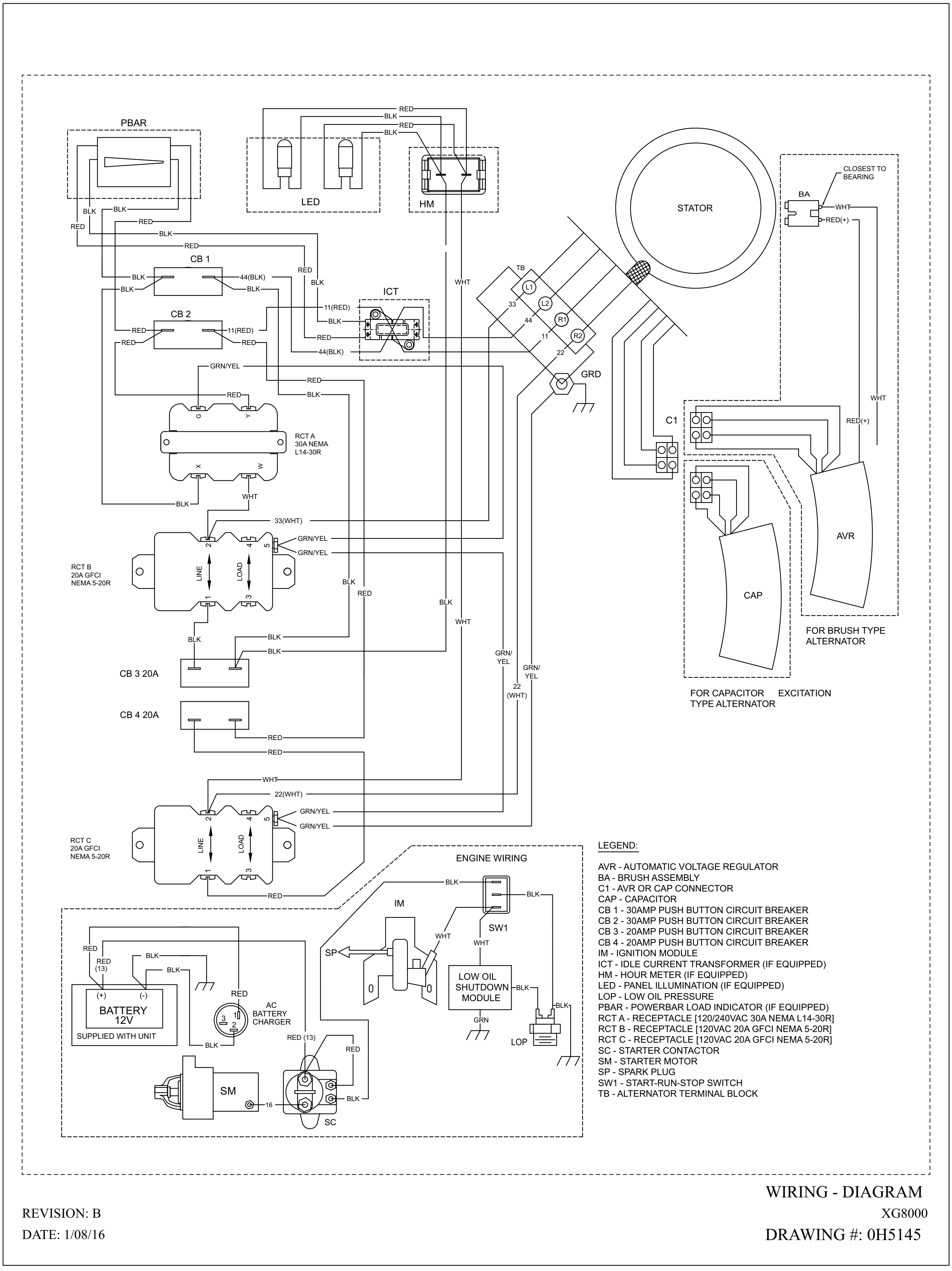

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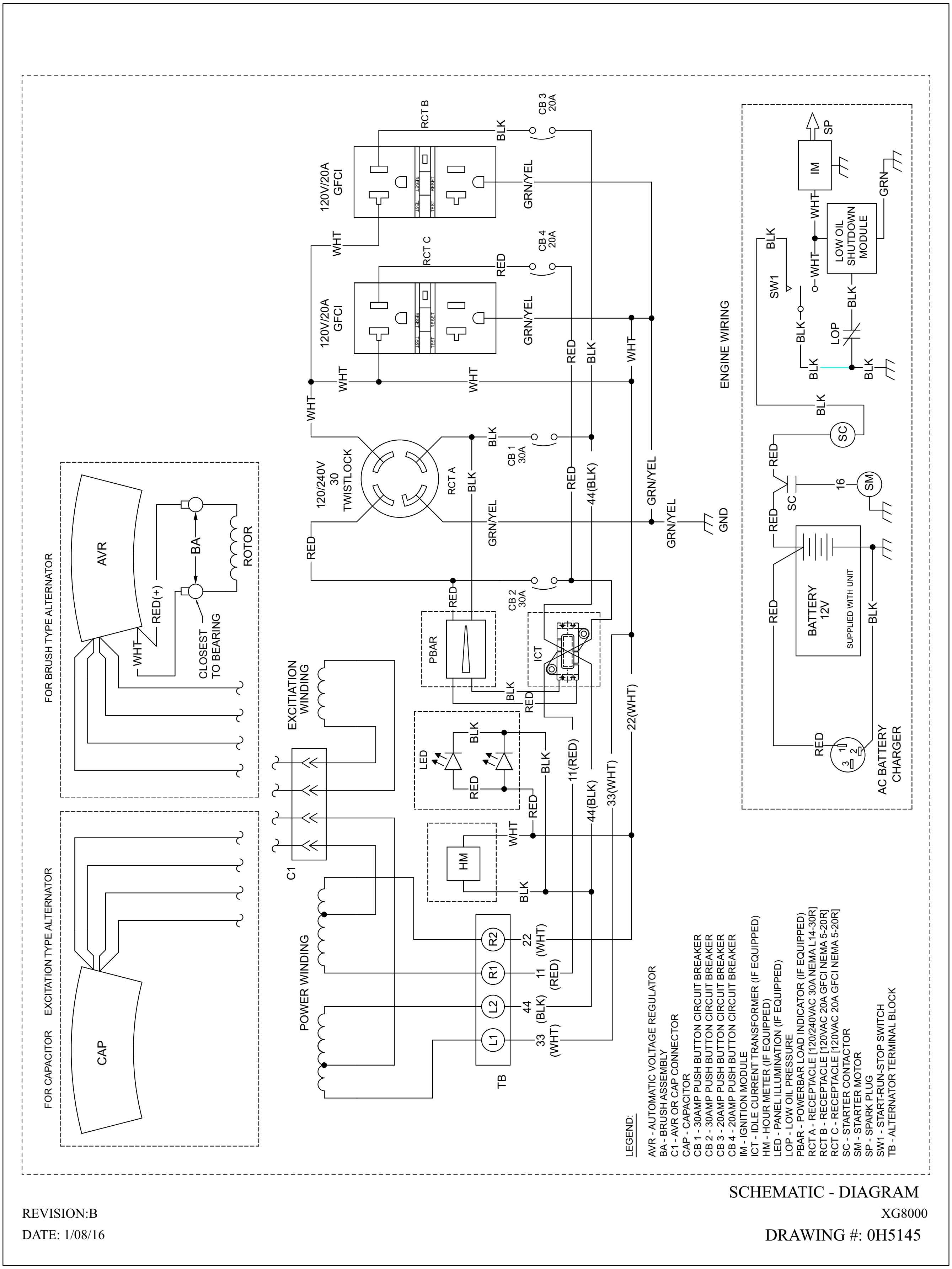
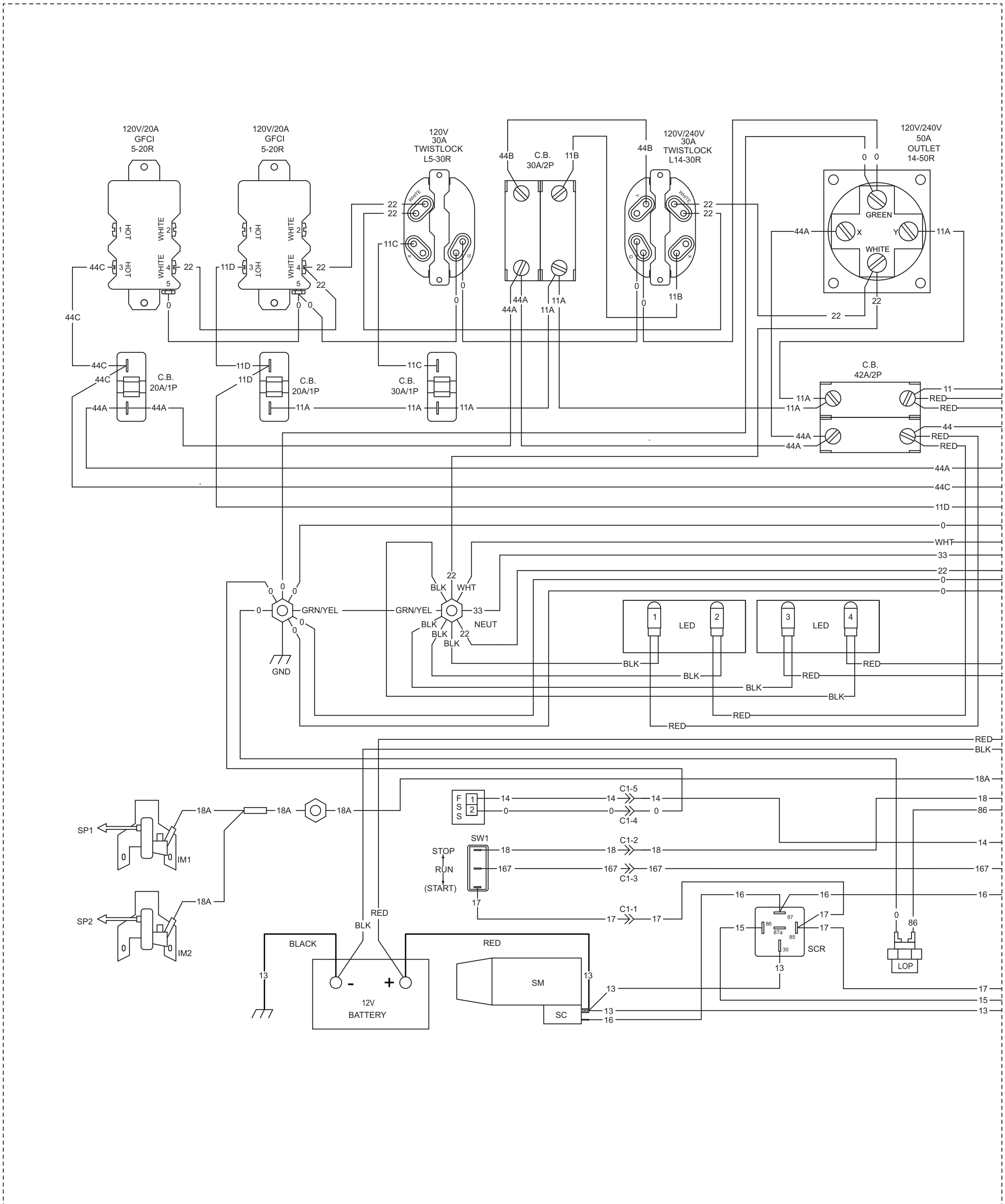


Wiring Diagram and Electrical Schematic, XG10000E Drawing No. 0H3931-B



WIRING - DIAGRAM

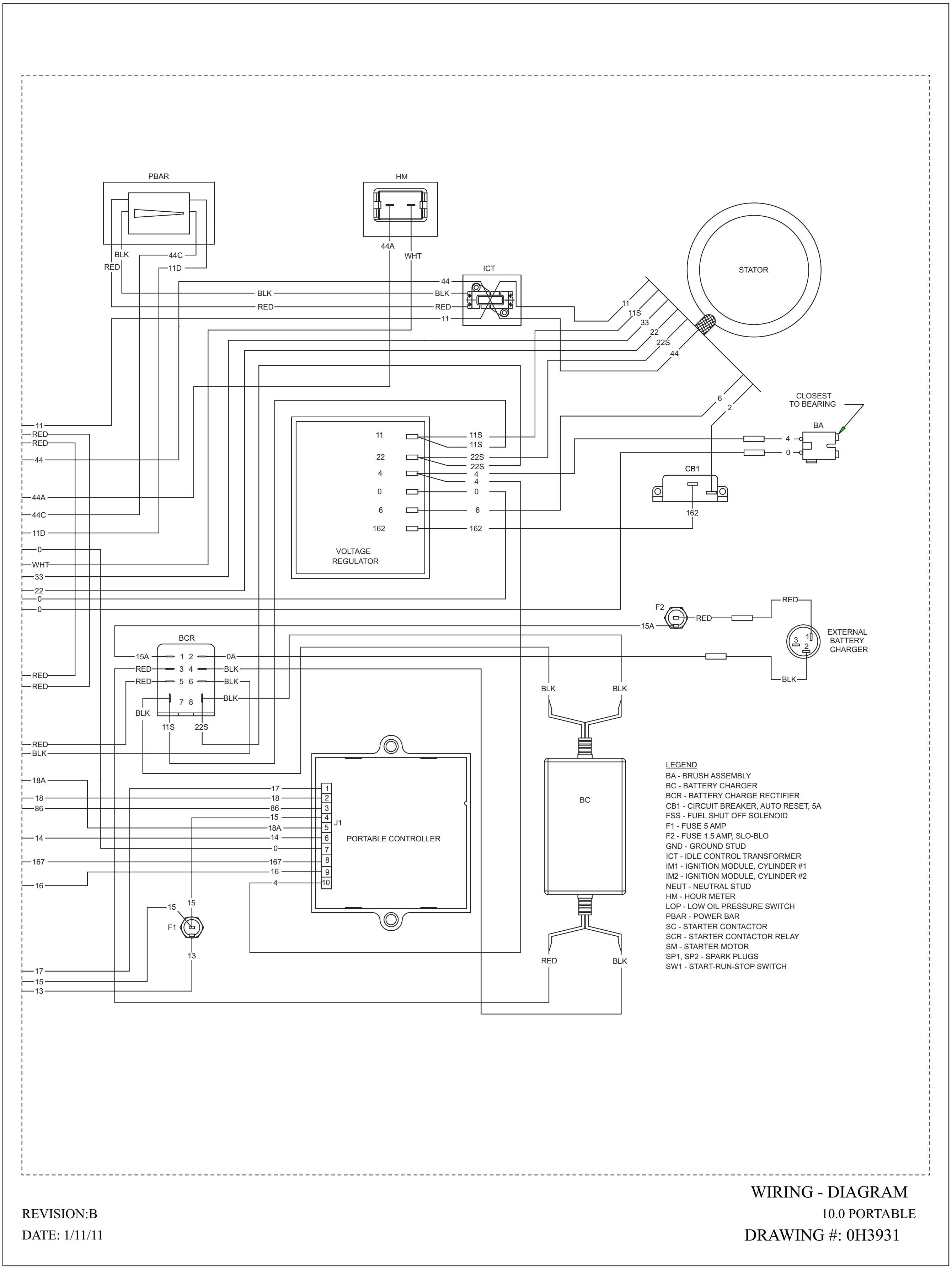
10.0 PORTABLE

REVISION: B

DATE: 1/11/11

DRAWING #: 0H3931

Wiring Diagram and Electrical Schematic, XG10000E Drawing No. 0H3931-B



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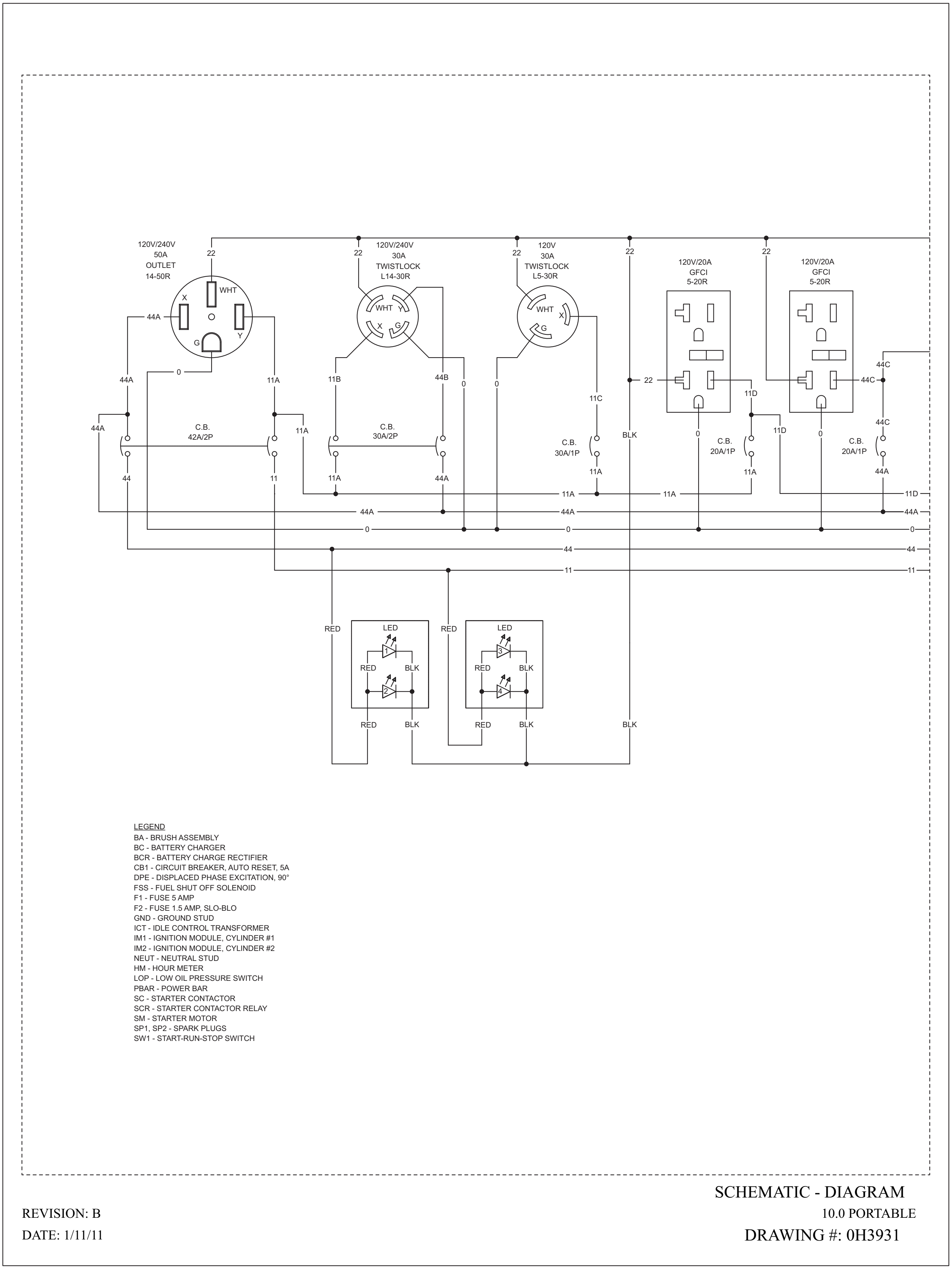
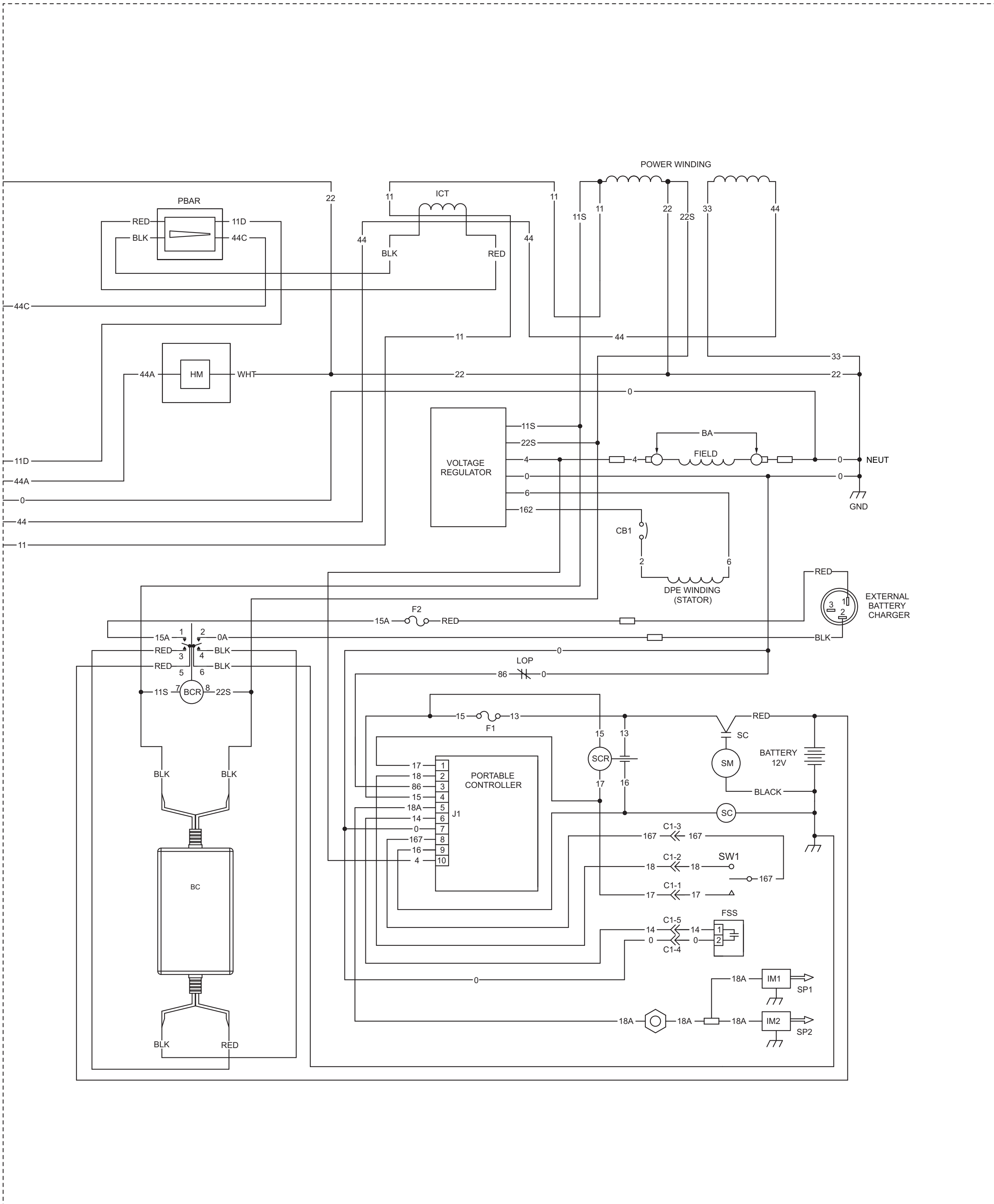


Wiring Diagram and Electrical Schematic, XG10000E Drawing No. 0H3931-B



SCHEMATIC - DIAGRAM

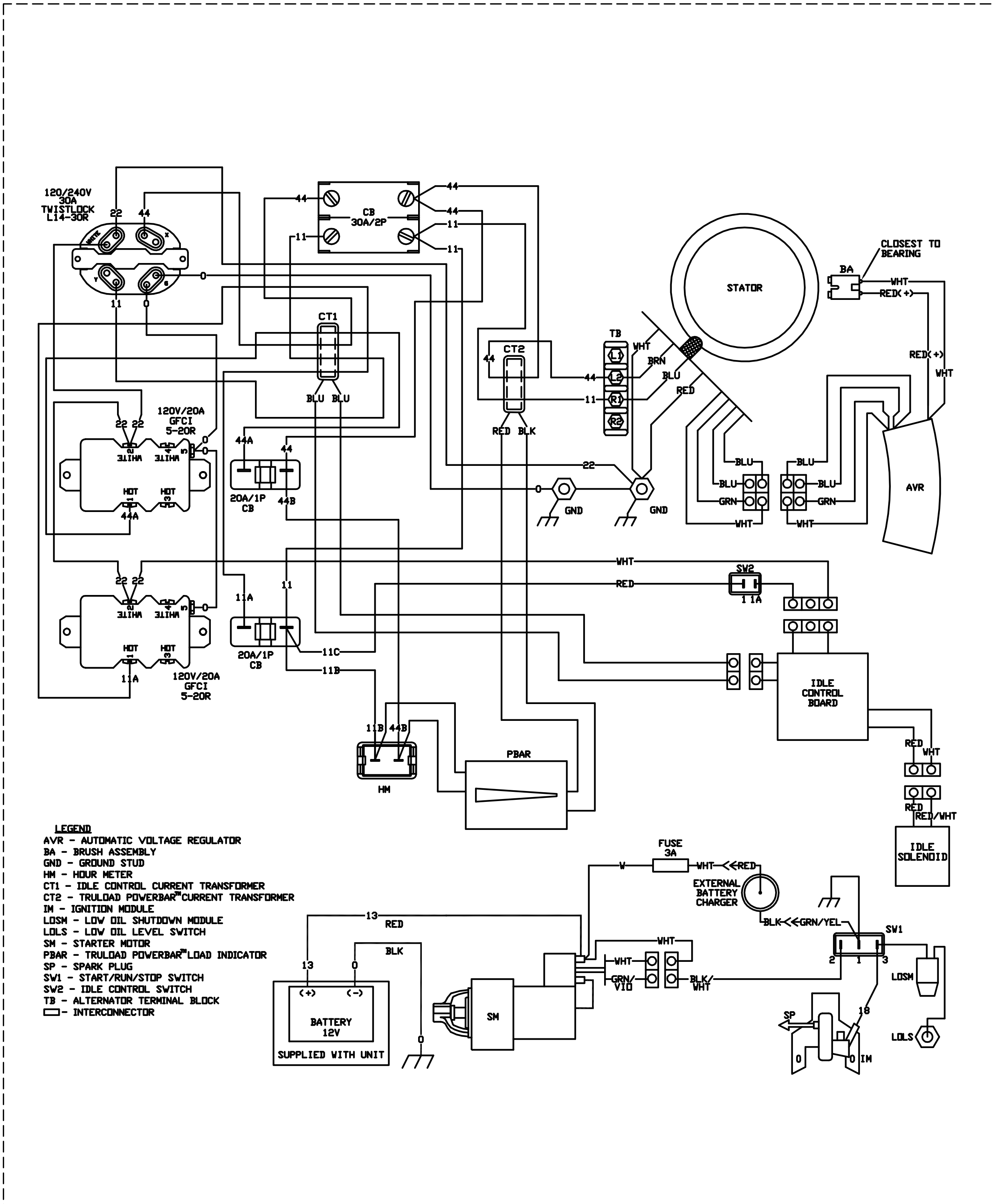
REVISION:B

10.0 PORTABLE

DATE: 1/11/11

DRAWING #: 0H3931

Wiring Diagram and Electrical Schematic, XT8000E Drawing No. 0K2800-C



WIRING - DIAGRAM

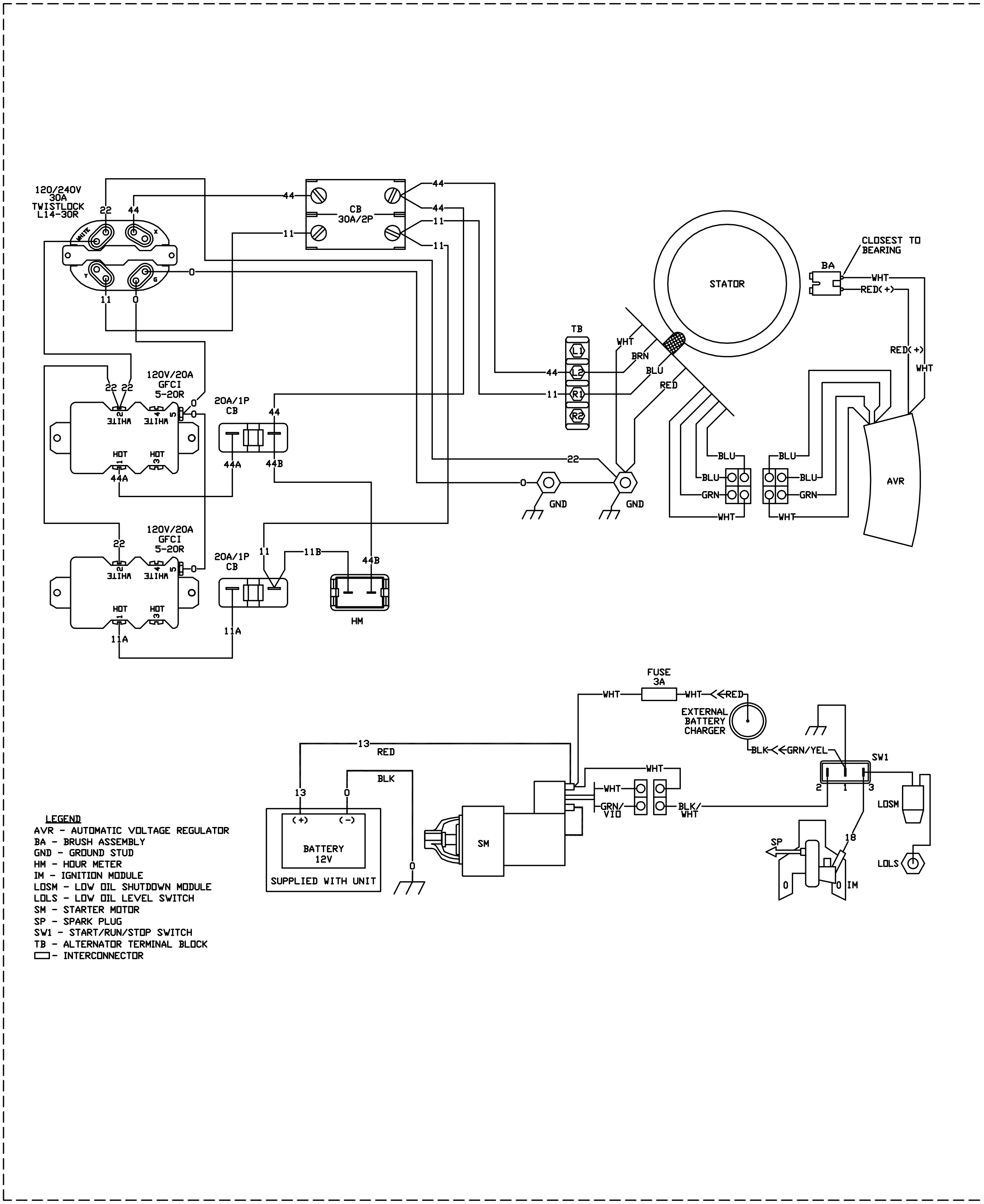
REVISION: C

XT8 PORTABLE

DATE: 04/17/13

DRAWING #: 0K2800

Wiring Diagram and Electrical Schematic, HL6500E Drawing No. 0L2474-A



WIRING - DIAGRAM

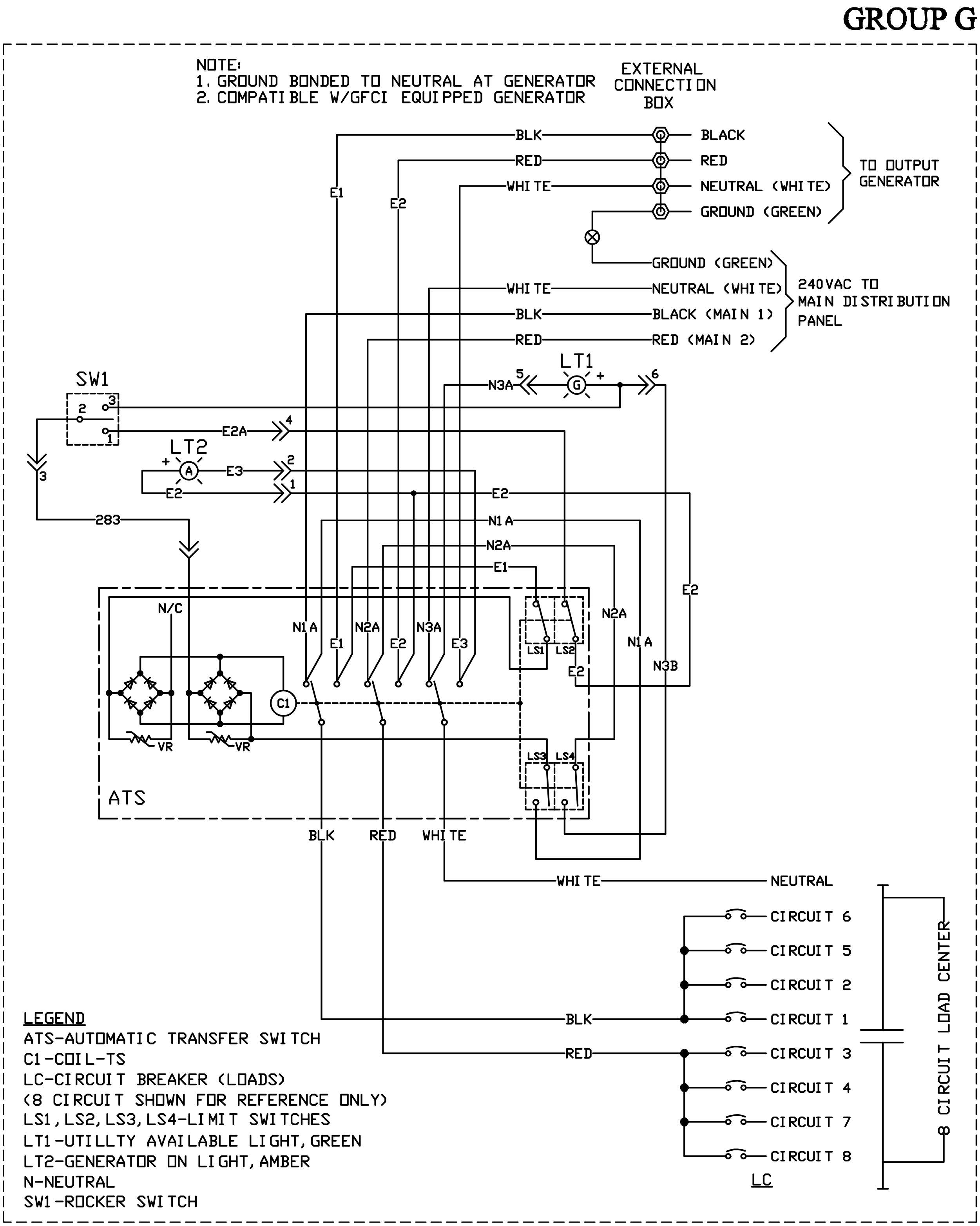
REVISION: A

HL6500 PORTABLE

DATE: 02/04/15

DRAWING #: 0L2474

Wiring Diagram and Electrical Schematic, HL6500E Drawing No. 0K9434-B



SCHEMATIC - DIAGRAM
MTS TRANSFER SWITCH 50A
DRAWING #: 0K9434

REVISION: K-1000-B
DATE: 10/13/14

Wiring Diagram and Electrical Schematic, HL6500E Drawing No. 0K9434-B

GROUP G

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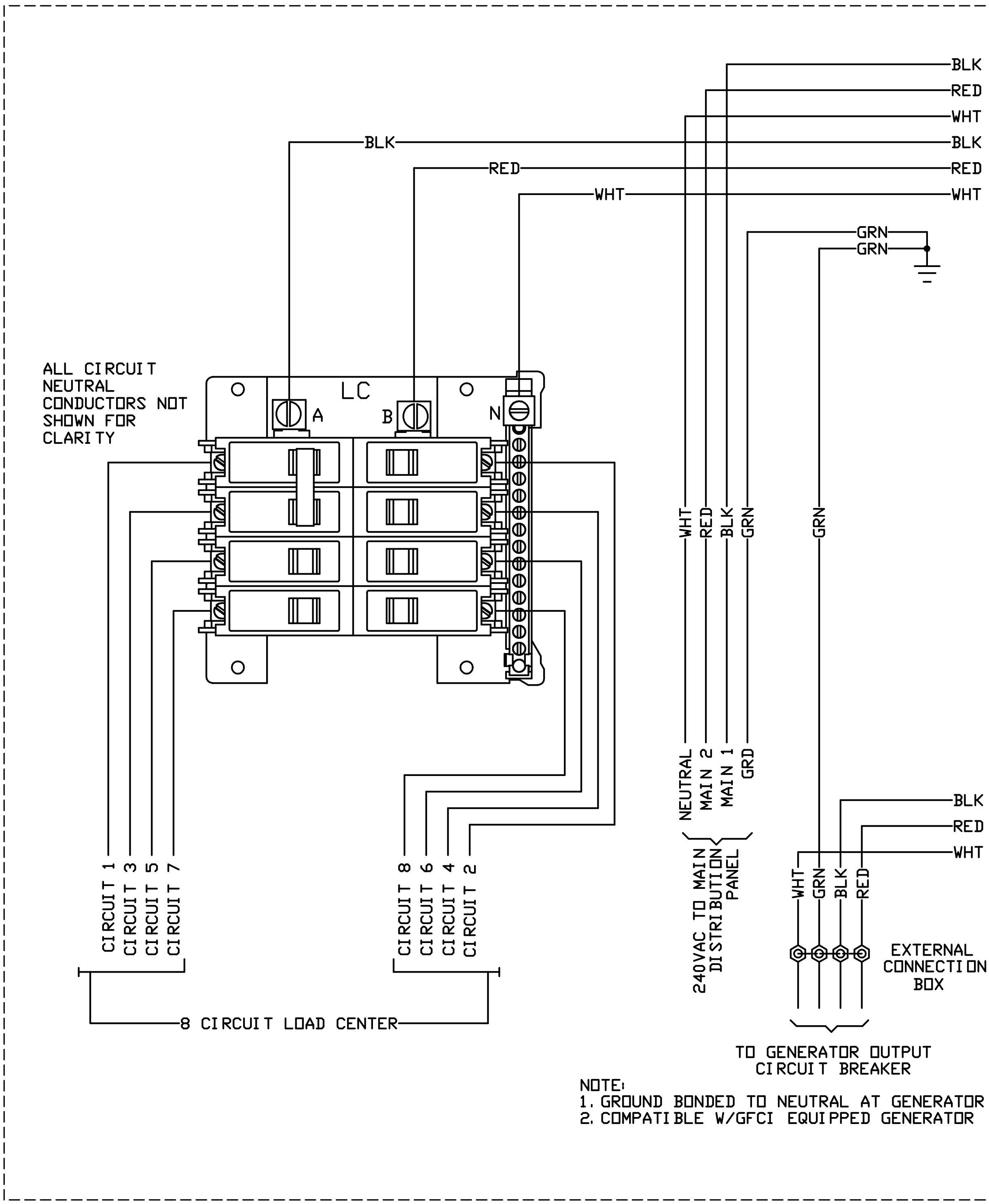
SCHEMATIC - DIAGRAM
MTS TRANSFER SWITCH 50A
DRAWING #: 0K9434

REVISION: K-1000-B
DATE: 10/13/14

Wiring Diagram and Electrical Schematic, HL6500E Drawing No. 0K9433-B

GROUP G



WIRING - DIAGRAM

HSB TRANSFER SWITCH 50A

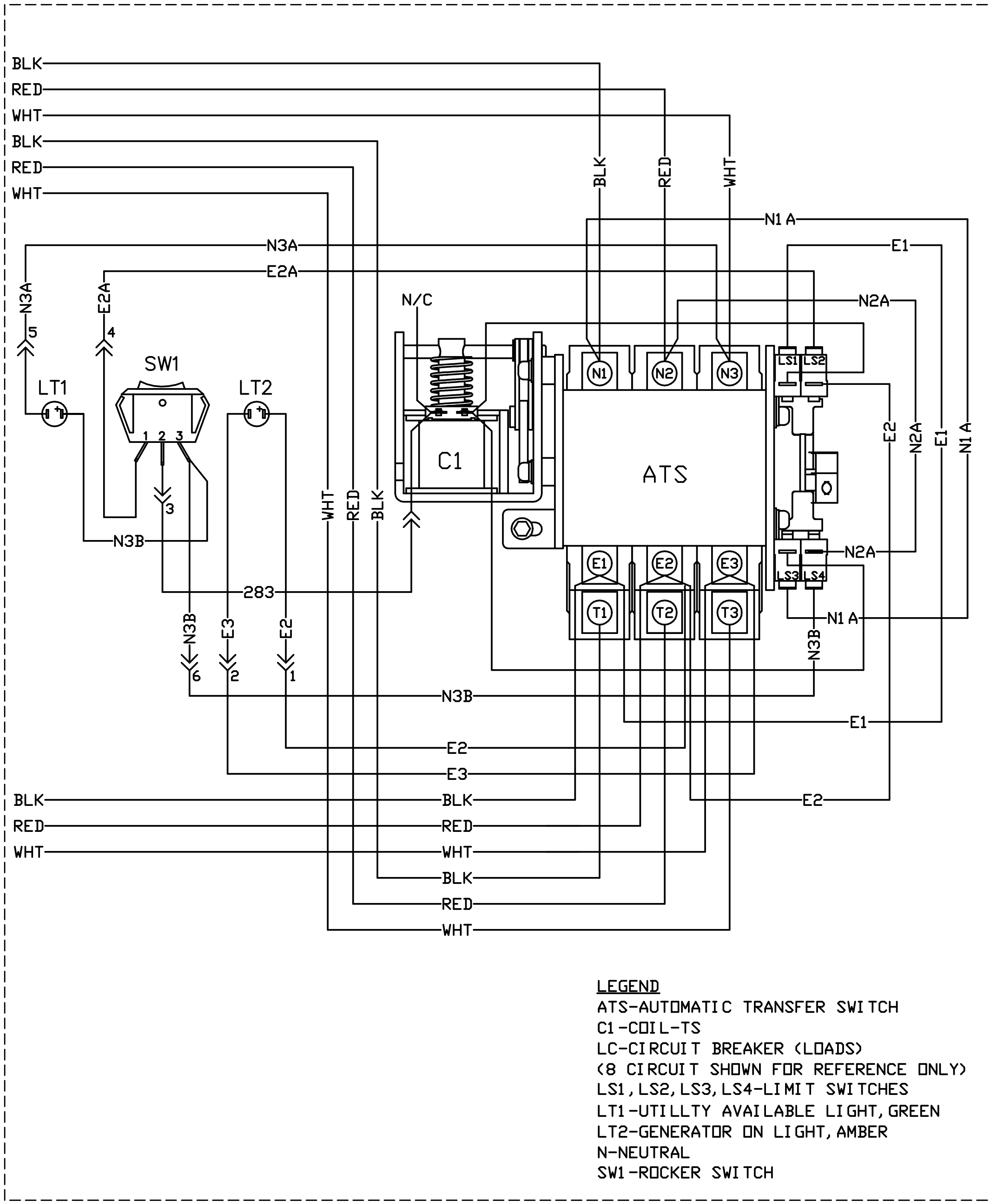
DRAWING #: 0K9433

REVISION: K-1000-B

DATE: 10/13/14

Wiring Diagram and Electrical Schematic, HL6500E Drawing No. 0K9433-B

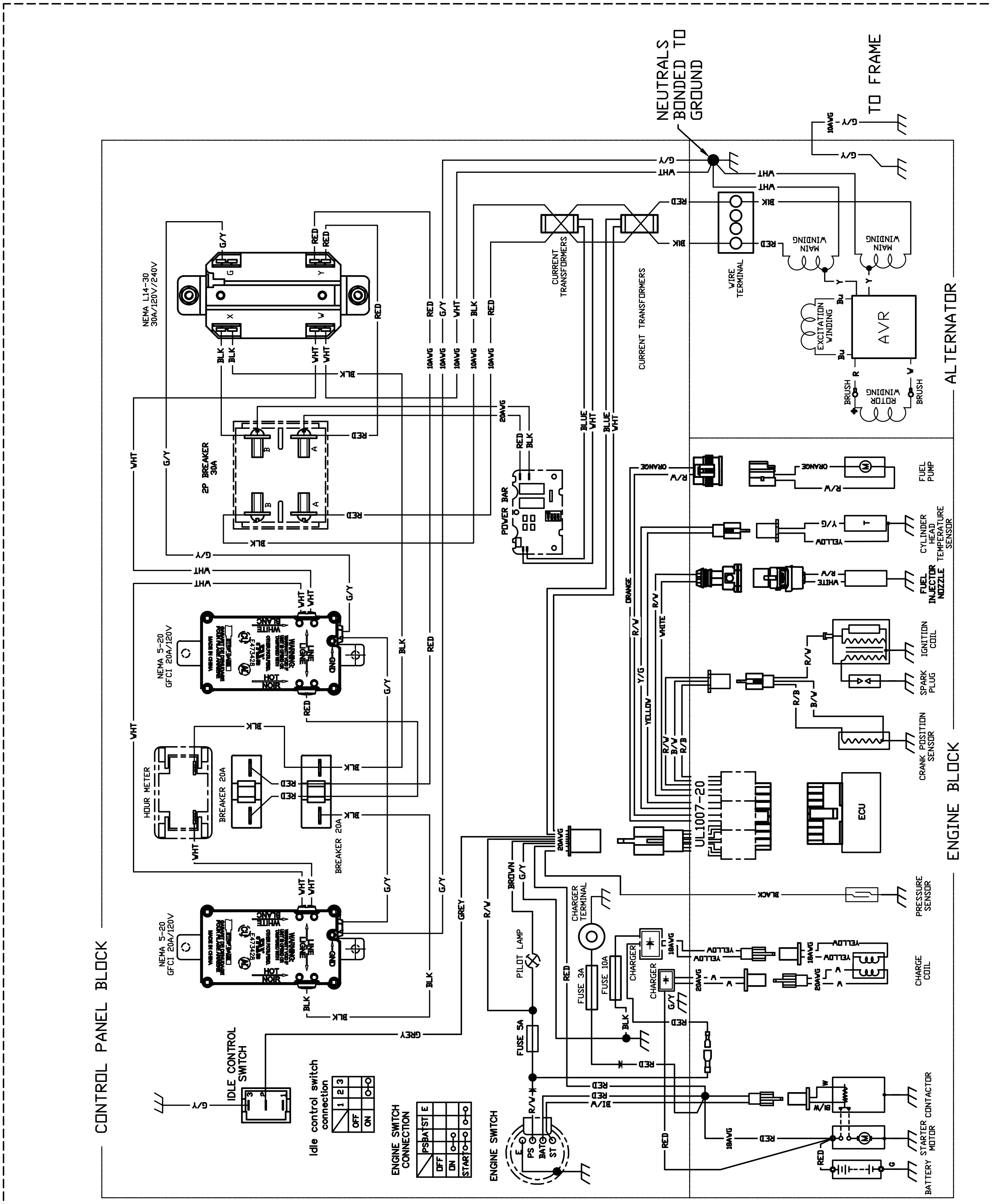
GROUP G



WIRING - DIAGRAM
HSB TRANSFER SWITCH 50A
DRAWING #: 0K9433

REVISION: K-1000-B
DATE: 10/13/14

Wiring Diagram, XT8000EFI Drawing No. 10000023894-A



WIRING - DIAGRAM

REVISION: A

8000EFI

DATE: 01/15/2018

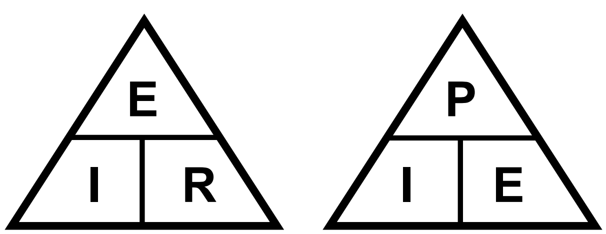
DRAWING #: 10000023894

Electrical Formulas

To Find	Known Values	1-phase	3-phase
Kilowatts (kW)	Volts, Current, Power Factor	$\frac{E \times I}{1000}$	$\frac{E \times I \times 1.73 \times PF}{1000}$
KVA	Volts, Current	$\frac{E \times I}{1000}$	$\frac{E \times I \times 1.73}{1000}$
Amperes	kW, Volts, Power Factor	$\frac{kW \times 1000}{E}$	$\frac{kW \times 1000}{E \times 1.73 \times PF}$
Watts	Volts, Amps, Power Factor	Volts x Amps	E x I x 1.73 x PF
No. of Rotor Poles	Frequency, RPM	$\frac{2 \times 60 \times Frequency}{RPM}$	$\frac{2 \times 60 \times Frequency}{RPM}$
Frequency	RPM, No. of Rotor Poles	$\frac{RPM \times Poles}{2 \times 60}$	$\frac{RPM \times Poles}{2 \times 60}$
RPM	Frequency, No. of Rotor Poles	$\frac{2 \times 60 \times Frequency}{Rotor\ Poles}$	$\frac{2 \times 60 \times Frequency}{Rotor\ Poles}$
kW (required for Motor)	Motor Horsepower, Efficiency	$\frac{HP \times 0.746}{Efficiency}$	$\frac{HP \times 0.746}{Efficiency}$
Resistance	Volts, Amperes	$\frac{E}{I}$	$\frac{E}{I}$
Volts	Ohm, Amperes	I x R	I x R
Amperes	Ohms, Volts	$\frac{E}{R}$	$\frac{E}{R}$

E = Volts   I = Amperes   R = Resistance (Ohms)   PF = Power Factor

Term	Symbol	Measurement
Current	I	Amps
Wattage	P	Watts
Voltage	E	Volts
Resistance	R	Ohms



003003

Constant	Shift		Result	
Voltage E	Resistance Increase	⇧	Current Decrease	⇩
Voltage E	Resistance Decrease	⇩	Current Increase	⇧
Resistance R	Voltage Decrease	⇩	Current Decrease	⇩
Resistance R	Voltage Increase	⇧	Current Increase	⇧
Current I	Resistance Decrease	⇩	Voltage Decrease	⇩
Current I	Resistance Increase	⇧	Voltage Increase	⇧
Power P	Voltage Increase	⇧	Power Increase	⇧
Power P	Voltage Decrease	⇩	Power Decrease	⇩
Power P	Current Increase	⇧	Power Increase	⇧
Power P	Current Decrease	⇩	Power Decrease	⇩

Part No. 0H2953 Rev. F 05/16/2018

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