DIAGNOSTIC REPAIR MANUAL

GENERAC®

GP Series Portable Generators

MODELS:

GP1800
GP3250
GP5000
GP5500
GP6500
GP7000
GP8000

PORTABLE GENERATORS

SAFETY

Throughout this publication, “DANGER!” and “CAUTION!” blocks are used to alert the mechanic to special instructions concerning a particular service or operation that might be hazardous if performed incorrectly or carelessly. PAY CLOSE ATTENTION TO THEM.

DANGER! UNDER THIS HEADING WILL BE FOUND SPECIAL INSTRUCTIONS WHICH, IF NOT COMPLIED WITH, COULD RESULT IN PERSONAL INJURY OR DEATH.

CAUTION! Under this heading will be found special instructions which, if not complied with, could result in damage to equipment and/or property.

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

NOTICE TO USERS OF THIS MANUAL

This SERVICE MANUAL has been written and published by Generac to aid our dealers' mechanics 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. 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.

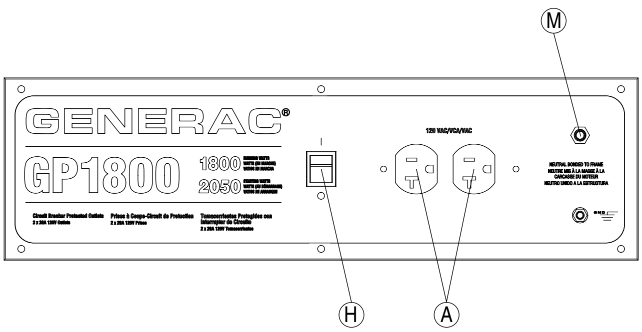
Any time the intake or exhaust openings of the engine are exposed during service, they should be covered to prevent accidental entry of foreign material. Entry of such materials will result in extensive damage when the engine Is started.

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

Components on Generac recreational vehicle generators are designed and manufactured to comply with Recreational Vehicle Industry Association (RVIA) Rules and Regulations to minimize the risk of fire or explosion. The use of replacement parts that are not in compliance with such Rules and Regulations could result in a fire or explosion hazard. 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.

SPECIFICATIONS – GP1800



Outlets

A (2) 5-20R 120V

Circuit Breakers

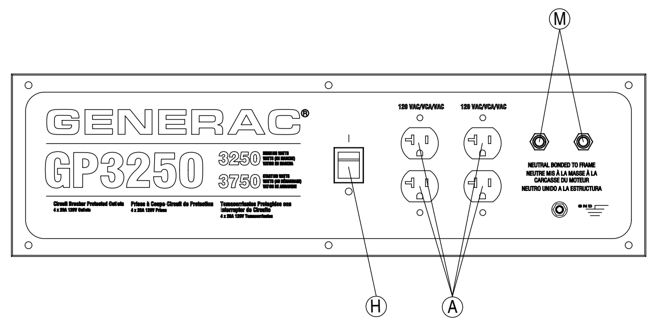
M (1) 20A

Other Features

H On/Off Switch

Product Series	GP1800
A/C Rated Output Watts:	1800
A/C Maximum Output Watts:	2050
A/C Voltage	120VAC
A/C Frequency	60 Hz
Rated 120 VAC Amperage	7.5
Max 120 VAC Amperage	8.5
Engine Displacement	163cc
Engine Type	OHV
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Splash Sump
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method	Manual
Battery	n/a
Battery Size	n/a
Low Oil Shutdown Method	Low Level
Start Switch Type	On/Off Toggle
Switch Location	Control Panel
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	4
Fuel Tank Capacity (Liters)	15.14
Run Time at 50% (Hours)	14
Cord Set	No
Handle Style	Folding
Wheel type	n/a
Length (L)	23.5
Width (W)	17
Height (H)	17.5
Extended Length (EL)	23.5
Unit Weight (lbs)	79
Spark Plug Type	NGK BPR4ES or Champion RN14YC
Spark Plug Gap	0.028"-0.031" (0.7-0.8mm)
Oil Capacity	0.634 quart (0.6 liter)

Product Series	GP3250
A/C Rated Output Watts:	3250
A/C Maximum Output Watts:	3750
A/C Voltage	120VAC
A/C Frequency	60 Hz
Rated 120 VAC Amperage	13.5
Max 120 VAC Amperage	15.6
Engine Displacement	206cc
Engine Type	OHV
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Splash Sump
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method	Manual
Battery	n/a
Battery Size	n/a
Low Oil Shutdown Method	Low Level
Start Switch Type	On/Off Toggle
Switch Location	Control Panel
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	4
Fuel Tank Capacity (Liters)	15.14
Run Time at 50% (Hours)	13.5
Cord Set	No
Handle Style	Folding
Wheel type	7.0" Solid Wheels
Length (L)	25.5
Width (W)	21
Height (H)	19
Extended Length (EL)	39.5
Unit Weight (lbs)	91
Spark Plug Type	NGK BPR4ES or Champion RN14YC
Spark Plug Gap	0.028"-0.031" (0.7-0.8mm)
Oil Capacity	0.634 quart (0.6 liter)



Outlets

A	(4) 5-20R 120V

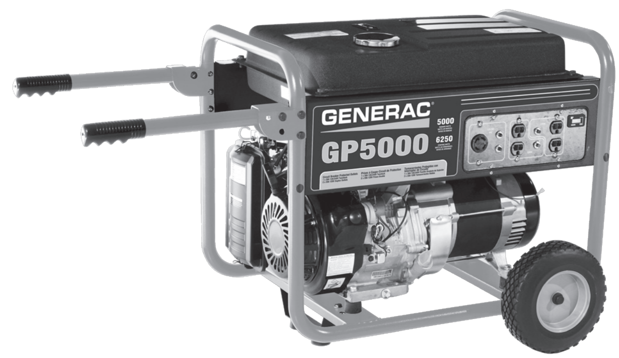
Circuit Breakers

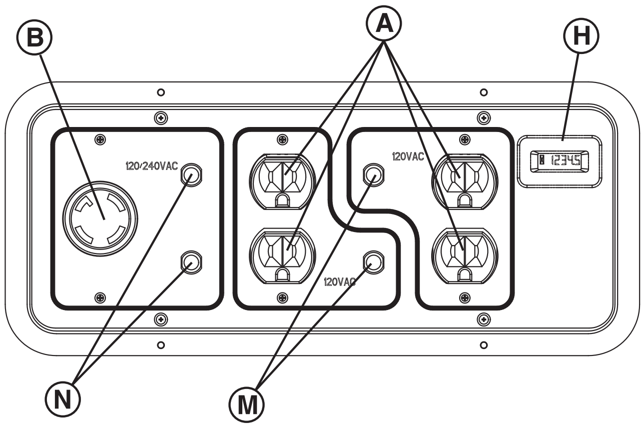
M	(2) 20A

Other Features

H	On/Off Switch

SPECIFICATIONS – GP5000





Receptacles

A	(4) 5-20R 120V
B	L14-30R Twist-Lock 120/240V

Circuit Breakers

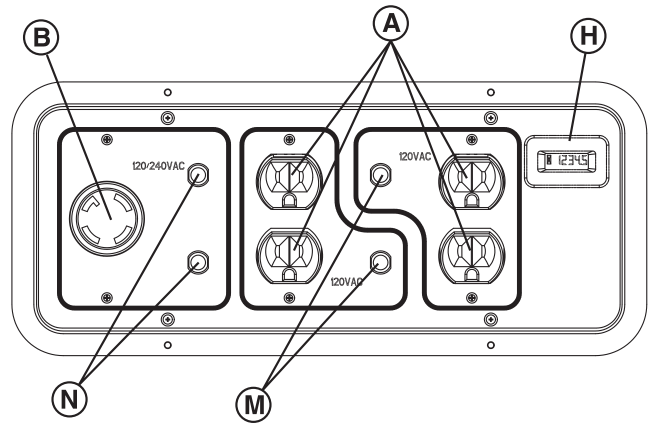
M	(2) 20A
N	(2) 25A

Other Features

H	Hour Meter with Maintenance Reset

Product Series	GP5000
A/C Rated Output Watts:	5000
A/C Maximum Output Watts:	6250
A/C Voltage	120/240VAC
A/C Frequency	60 Hz
Rated 120/240 VAC Amperage	20.8
Max 120/240 VAC Amperage	26.0
Engine Displacement	389cc
Engine Type	OHV
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Splash Sump
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method	Manual
Battery	n/a
Battery Size	n/a
Low Oil Shutdown Method	Low Level
Start Switch Type	3-Position
Switch Location	On Engine
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	6.6
Fuel Tank Capacity (Liters)	24.981
Run Time at 50% (Hours)	10
Cord Set	No
Handle Style	Folding Interlocked
Wheel type	9.5" Solid Wheels
Length (L)	33.5
Width (W)	26.5
Height (H)	27.5
Extended Length (EL)	47
Unit Weight (lbs)	167
Spark Plug Type	NHSP F7RTC or Champion RN9YC
Spark Plug Gap	0.028"-0.031" (0.7-0.8mm)
Oil Capacity	1.16 quart (1.1 liter)

Product Series	GP5500
A/C Rated Output Watts:	5000
A/C Maximum Output Watts:	6875
A/C Voltage	120/240VAC
A/C Frequency	60 Hz
Rated 120/240 VAC Amperage	22.9
Max 120/240 VAC Amperage	28.6
Engine Displacement	389cc
Engine Type	OHV
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Splash Sump
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method	Manual
Battery	n/a
Battery Size	n/a
Low Oil Shutdown Method	Low Level
Start Switch Type	3-Position
Switch Location	On Engine
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	6.6
Fuel Tank Capacity (Liters)	24.98
Run Time at 50% (Hours)	10
Cord Set	No
Handle Style	Folding Interlocked
Wheel type	9.5" Solid Wheels
Length (L)	33.5
Width (W)	26.5
Height (H)	27.5
Extended Length (EL)	47
Unit Weight (lbs)	167
Spark Plug Type	NHSP F7RTC or Champion RN9YC
Spark Plug Gap	0.028"-0.031" (0.7-0.8mm)
Oil Capacity	1.16 quart (1.1 liter)



Receptacles

A	(4) 5-20R 120V
B	L14-30R Twist-Lock 120/240V

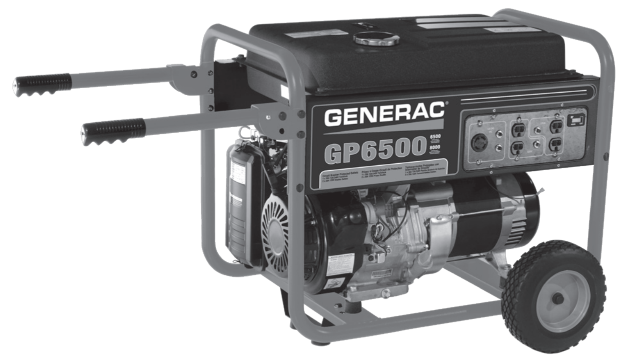
Circuit Breakers

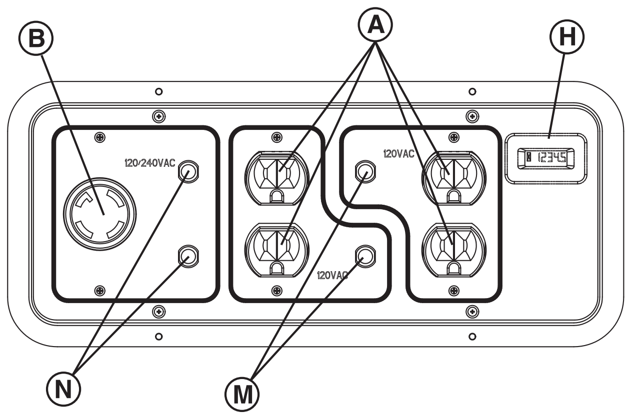
M	(2) 20A
N	(2) 25A

Other Features

H	Hour Meter with Maintenance Reset

SPECIFICATIONS – GP6500





Outlets

A	(4) 5-20R 120V
B	L14-30R Twist-Lock 120/240V

Circuit Breakers

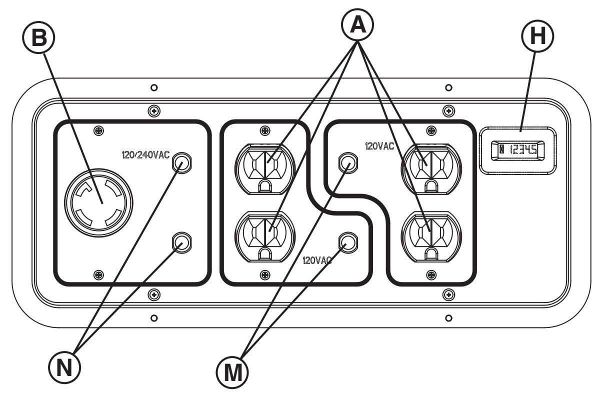
M	(2) 20A
N	(2) 30A

Other Features

H	Hour Meter with Maintenance Reset

Product Series	GP6500
A/C Rated Output Watts:	6500
A/C Maximum Output Watts:	8000
A/C Voltage	120/240VAC
A/C Frequency	60 Hz
Rated 120/240 VAC Amperage	27.1
Max 120/240 VAC Amperage	33.3
Engine Displacement	389cc
Engine Type	OHV
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Splash Sump
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method	Manual
Battery	n/a
Battery Size	n/a
Low Oil Shutdown Method	Low Level
Start Switch Type	3-Position
Switch Location	On Engine
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	6.6
Fuel Tank Capacity (Liters)	24.98
Run Time at 50% (Hours)	9
Cord Set	No
Handle Style	Folding Interlocked
Wheel type	9.5" Solid Wheels
Length (L)	33.5
Width (W)	26.5
Height (H)	27.5
Extended Length (EL)	47
Unit Weight (lbs)	172
Spark Plug Type	NHSP F7RTC or Champion RN9YC
Spark Plug Gap	0.028"-0.031" (0.7-0.8mm)
Oil Capacity	1.16 quart (1.1 liter)

Product Series	GP7000
A/C Rated Output Watts:	7000
A/C Maximum Output Watts:	8750
A/C Voltage	120/240VAC
A/C Frequency	60 Hz
Rated 120/240 VAC Amperage	29.2
Max 120/240 VAC Amperage	36.5
Engine Displacement	410cc
Engine Type	OHVI
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Full Pressure
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method GP7000	Manual
Starting Method GP7000E	Manual or Electric
Battery Size (if equipped)	12VDC 10 Ahr
Low Oil Shutdown Method	Low Pressure
Start Switch Type	3-Position
Switch Location	On Engine
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	8
Fuel Tank Capacity (Liters)	30.28
Run Time at 50% (Hours)	11
Cord Set	No
Handle Style	Folding Interlocked
Wheel type	9.5" Solid Wheels
Spark Plug Type	Champion RC14YC
Spark Plug Gap	0.030" (0.76mm)
Oil Capacity	1.5 quart w/filter



Outlets

A	(4) 5-20R 120V
B	L14-30R Twist-Lock 120/240V

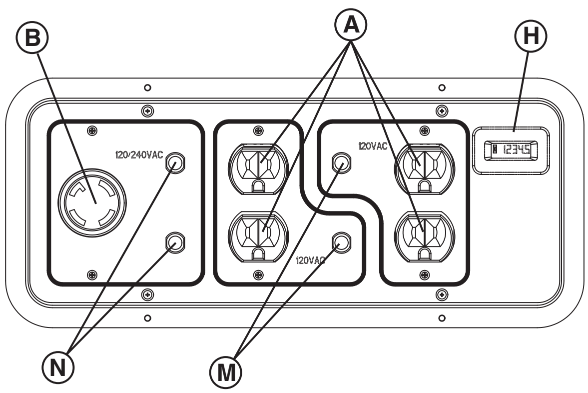
Circuit Breakers

M	(2) 20A
N	(2) 30A

Other Features

H	Hour Meter with Maintenance Reset

SPECIFICATIONS – GP8000/GP8000E



Outlets

A	(4) 5-20R 120V
B	L14-30R Twist-Lock 120/240V

Circuit Breakers

M	(2) 20A
N	(2) 30A

Other Features

H	Hour Meter with Maintenance Reset

Product Series	GP8000/GP8000E
A/C Rated Output Watts:	8000
A/C Maximum Output Watts:	10000
A/C Voltage	120/240VAC
A/C Frequency	60 Hz
Rated 120/240 VAC Amperage	33.3
Max 120/240 VAC Amperage	41.7
Engine Displacement	410cc
Engine Type	OHVI
Engine RPM	3600
Recommended Oil	5W30
Lubrication Method	Full Pressure
Choke Type	Manual Lever
Fuel Shut Off	Manual Lever
Idle Control	Full Speed
Starting Method GP8000	Manual
Starting Method GP8000E	Manual or Electric
Battery Size (if equipped)	12VDC 10 Ahr
Low Oil Shutdown Method	Low Pressure
Start Switch Type	3-Position
Switch Location	On Engine
Single-Point Lifting Eye	N/A
Fuel Gauge	Built-In
Fuel Tank Capacity (Gal)	8
Fuel Tank Capacity (Liters)	30.28
Run Time at 50% (Hours)	8
Cord Set	No
Handle Style	Folding Interlocked
Wheel type	9.5" Solid Wheels
Spark Plug Type	Champion RC14YC
Spark Plug Gap	0.030" (0.76mm)
Oil Capacity	1.5 quart w/filter

PART 1
GENERAL INFORMATION

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GP Series Portable Generators

MAGNETISM

Magnetism can be used to produce electricity and electricity can be used to produce magnetism.

Much about magnetism cannot be explained by our present knowledge. However, there are certain patterns of behavior that are known. Application of these behavior patterns has led to the development of generators, motors and numerous other devices that utilize magnetism to produce and use electrical energy.

See Figure 1. The space surrounding a magnet is permeated by magnetic lines of force called “flux”. These lines of force are concentrated at the magnet's north and south poles. They are directed away from the magnet at its north pole, travel in a loop and re-enter the magnet at its south pole. The lines of force form definite patterns which vary in intensity depending on the strength of the magnet. The lines of force never cross one another. The area surrounding a magnet in which its lines of force are effective is called a “magnetic field”.

Like poles of a magnet repel each other, while unlike poles attract each other.

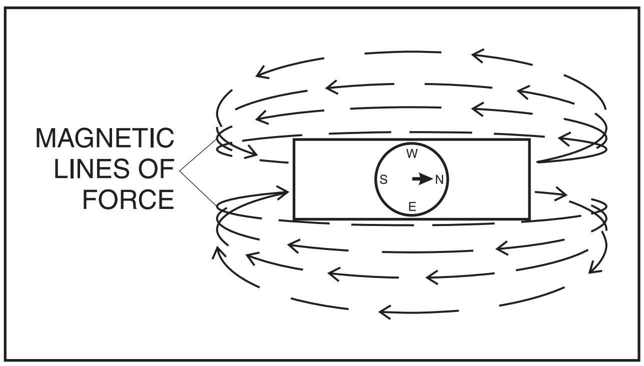


Figure 1. Magnetic Lines of Force

ELECTROMAGNETIC FIELDS

All conductors through which an electric current is flowing have a magnetic field surrounding them. This field is always at right angles to the conductor. If a compass is placed near the conductor, the compass needle will move to a right angle with the conductor. The following rules apply:

- The greater the current flow through the conductor, the stronger the magnetic field around the conductor.
- The increase in the number of lines of force is directly proportional to the increase in current flow and the field is distributed along the full length of the conductor.
- The direction of the lines of force around a conductor can be determined by what is called the “right hand rule”. To apply this rule, place your right hand around the conductor with the thumb pointing in the direction of current flow. The fingers will then be pointing in the direction of the lines of force.

NOTE: The “right hand rule” is based on the “current flow” theory which assumes that current flows from positive to negative. This is opposite the “electron” theory, which states that current flows from negative to positive.

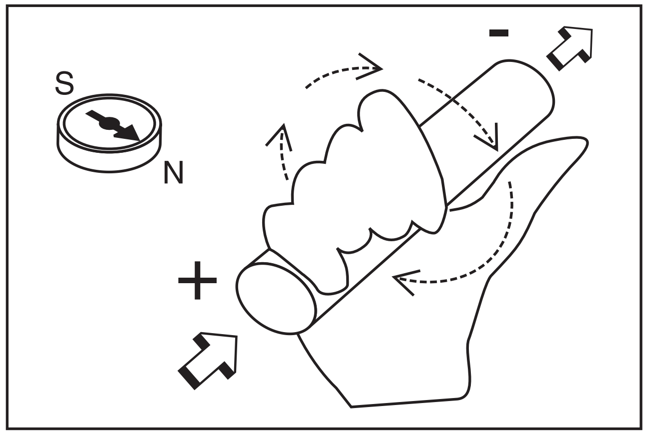


Figure 2. The Right Hand Rule

ELECTROMAGNETIC INDUCTION

An electromotive force (EMF) or voltage can be produced in a conductor by moving the conductor so that it cuts across the lines of force of a magnetic field.

Similarly, if the magnetic lines of force are moved so that they cut across a conductor, an EMF (voltage) will be produced in the conductor. This is the basic principal of the revolving field generator.

Figure 3, below, illustrates a simple revolving field generator. The permanent magnet (Rotor) is rotated so that its lines of magnetic force cut across a coil of wires called a Stator. A voltage is then induced into the Stator windings. If the Stator circuit is completed by connecting a load (such as a light bulb), current will flow in the circuit and the bulb will light.

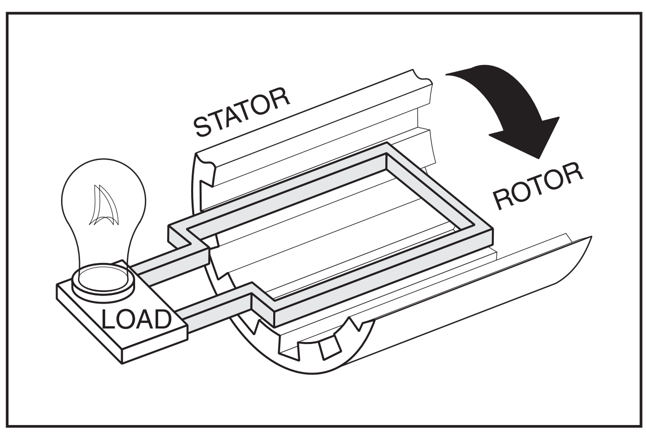


Figure 3. A Simple Revolving Field Generator

A SIMPLE AC GENERATOR

Figure 4 shows a very simple AC Generator. The generator consists of a rotating magnetic field called a ROTOR and a stationary coil of wire called a STATOR. The ROTOR is a permanent magnet which consists of a SOUTH magnetic pole and a NORTH magnetic pole.

As the MOTOR turns, its magnetic field cuts across the stationary STATOR. A voltage is induced Into the STATOR windings. When the magnet's NORTH pole passes the STATOR, current flows in one direction. Current flows in the opposite direction when the magnet's SOUTH pole passes the STATOR. This constant reversal of current flow results in an alternating current (AC) waveform that can be diagrammed as shown in Figure 5.

The ROTOR may be a 2-pole type having a single NORTH and a single SOUTH magnetic pole. Some ROTORS are 4-pole type with two SOUTH and two NORTH magnetic poles. The following apply:

1. The 2-pole ROTOR must be turned at 3600 rpm to produce an AC frequency of 60 Hertz, or at 3000 rpm to deliver an AC frequency of 50 Hertz.
2. The 4-pole ROTOR must operate at 1800 rpm to deliver a 60 Hertz AC frequency or at 1500 rpm to deliver a 50 Hertz AC frequency.

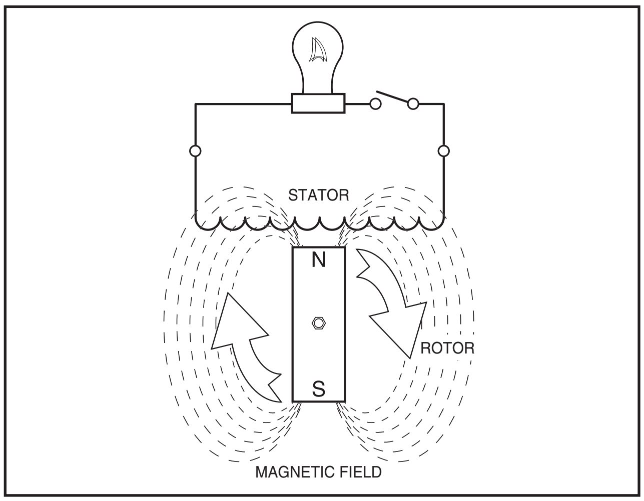


Figure 4. A Simple AC Generator

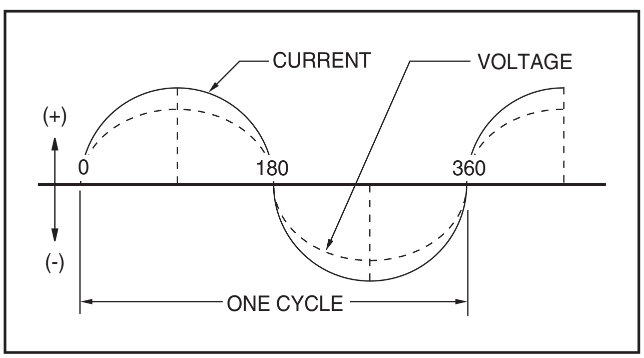


Figure 5. Alternating Current Sine Wave

A MORE SOPHISTICATED AC GENERATOR

Figure 6 and 7 show two methods of creating alternating current that are implemented on GP Series portable generator product.

Figure 6 shows a consistent voltage being induced to the rotor from a capacitor which is installed in series with the DPE winding. As a result a regulated voltage is induced into the STATOR.

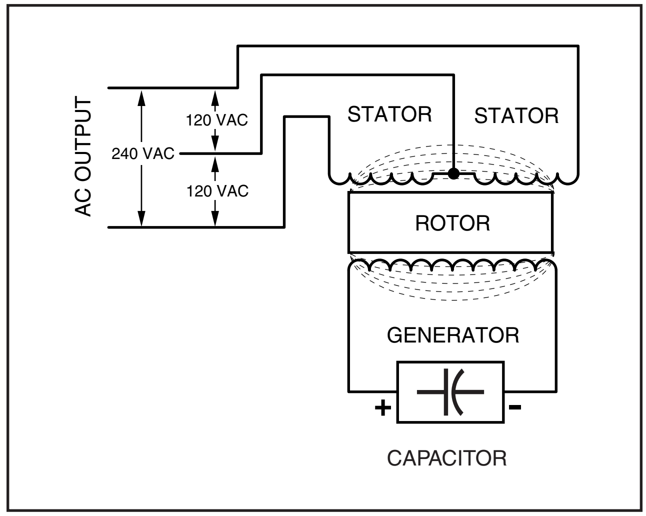


Figure 6. Capacitive Discharge

Figure 7 shows a regulated direct current being delivered into the ROTOR windings via carbon BRUSHES AND SLIP RINGS. This results in the creation of a regulated magnetic field around the ROTOR. As a result, a regulated voltage is induced into the STATOR. Regulated current delivered to the ROTOR is called "EXCITATION" current.

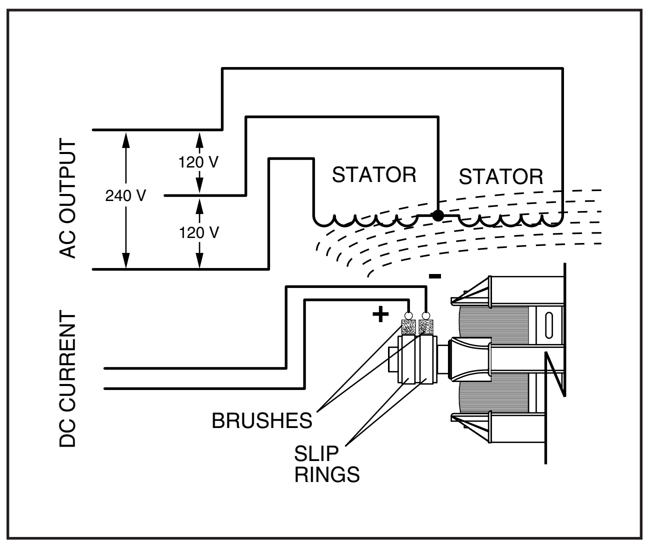


Figure 7. Direct Excitation

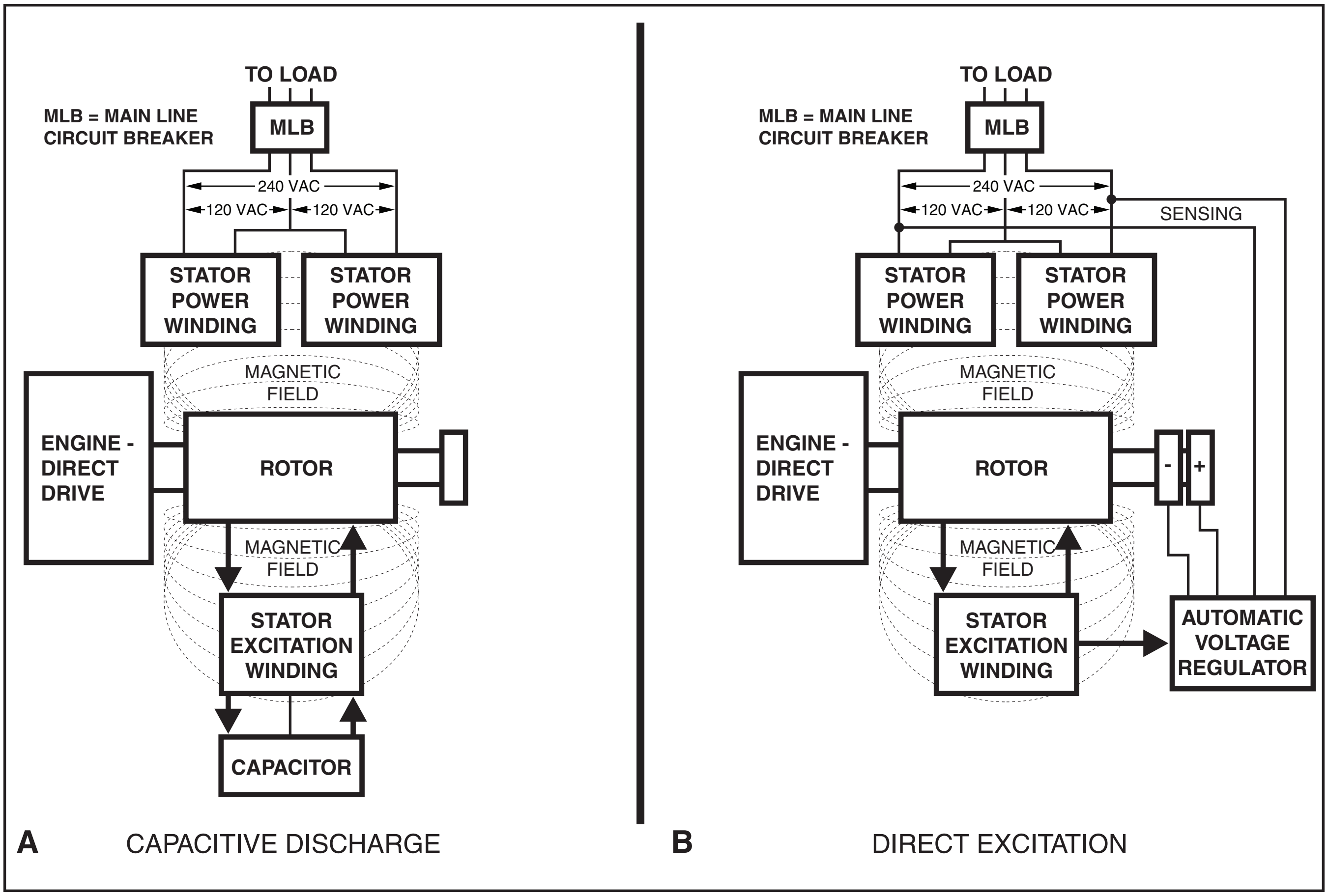


Figure 8. Generator Operating Diagram

The revolving magnetic field is driven by the engine at constant speed. This constant speed is maintained by a mechanical engine governor. Units with a 2-pole rotor require an operation speed of 3600 rpm to deliver a 60 Hertz AC output.

Generator operation may be described briefly as follows.

1. Some “residual” magnetism is normally present in the Rotor, which is sufficient to induce approximately 1 to 2 Volts AC in to the Stator’s AC Power Windings and DPE winding.
2. See Figure 8.
   A. During startup, the “residual” voltage that is induced into the DPE winding will initially charge the capacitor to a greater potential. When the capacitor is discharged the voltage is in turn induced back into the Rotor which will exponentially raise the voltage to 120/240.
   B. During startup, the “residual” voltage that is induced into the DPE winding will turn on the voltage regulator allowing DC excitation current to be delivered to the rotor and raise the voltage to 120/240.

METERS

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

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

THE VOM

A meter that will permit both voltage and resistance to be read is the “volt-ohm-milliammeter” or “VOM”.

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

“Digital” VOMs (Figure 1) are also available and are generally very accurate. Digital meters display the measured values directly by converting the values to numbers.

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

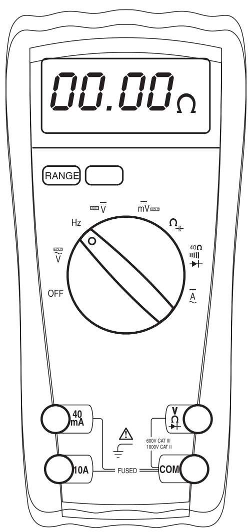


Figure 1. Digital VOM

MEASURING AC VOLTAGE

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

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

DANGER! GENERATORS PRODUCE HIGH AND DANGEROUS VOLTAGES. CONTACT WITH HIGH VOLTAGE TERMINALS WILL RESULT IN DANGEROUS AND POSSIBLY LETHAL ELECTRICAL SHOCK.

MEASURING DC VOLTAGE

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

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

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

MEASURING AC FREQUENCY

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

Correct engine and Rotor speed is maintained by an engine speed governor. For models rated 60 Hertz, the governor is generally set to maintain a no-load frequency of about 62 Hertz with a corresponding output voltage of about 124 volts AC line-to-neutral. Engine speed and frequency at no-load are set slightly high to prevent excessive rpm and frequency droop under heavy electrical loading.

MEASURING CURRENT

CLAMP-ON:

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

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

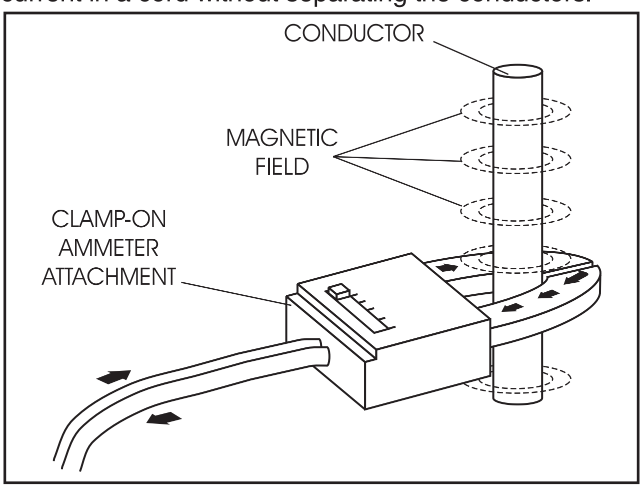


Figure 2. Clamp-On Ammeter

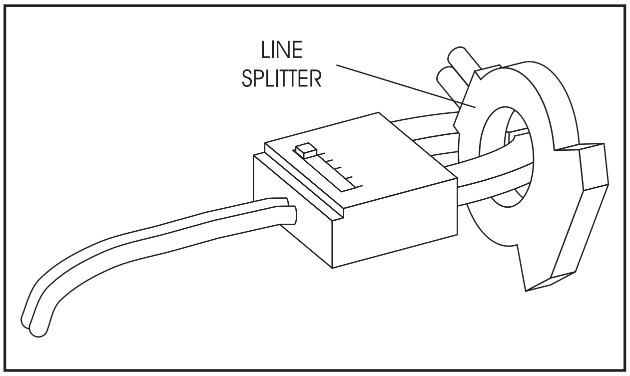


Figure 3. A Line-Splitter

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

IN-LINE:

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

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

In Figure 4 the control wire to a relay has been removed. The meter is used to connect and supply voltage to the relay to energize it and measure the amperes going to it.

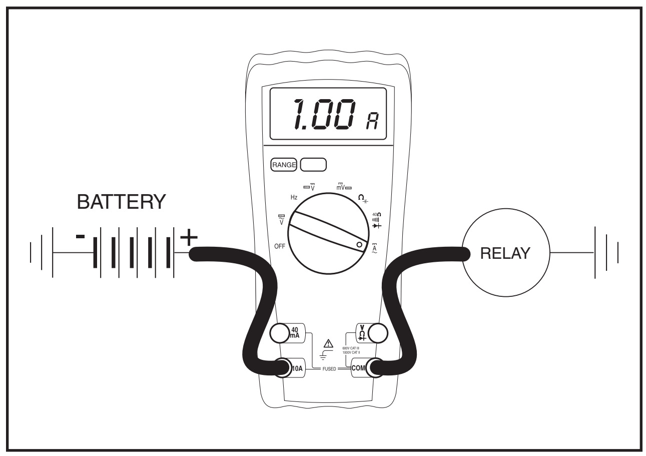


Figure 4. A VOM as an In-line meter

MEASURING RESISTANCE

The volt-ohm-milliammeter may be used to measure the resistance in a circuit. Resistance values can be very valuable when testing coils or windings, such as the Stator and Rotor windings.

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

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

- A "short-to-ground" condition in any Stator or Rotor winding.
- Shorting together of any two parallel Stator windings.
- Shorting together of any two isolated Stator windings.
- An open condition in any Stator or Rotor winding.

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

ELECTRICAL UNITS

AMPERE:

The rate of electron flow in a circuit is represented by the AMPERE. The ampere is the number of electrons flowing past a given point at a given time. One AMPERE is equal to just slightly more than six thousand million billion electrons per second (6.25×10^{18}).

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

VOLT:

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

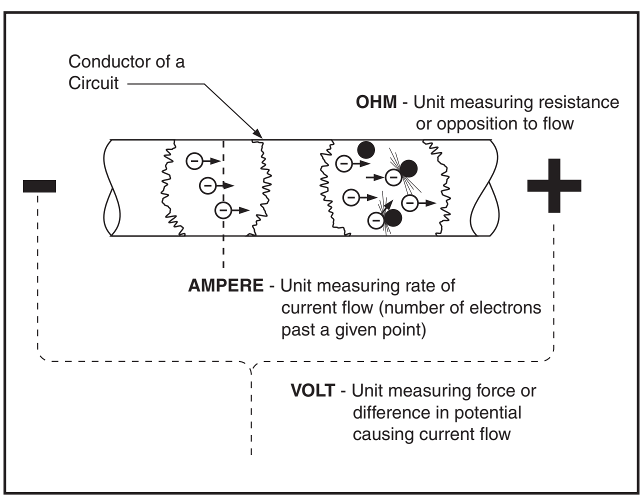


Figure 5. Electrical Units

OHM:

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

OHM'S LAW

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

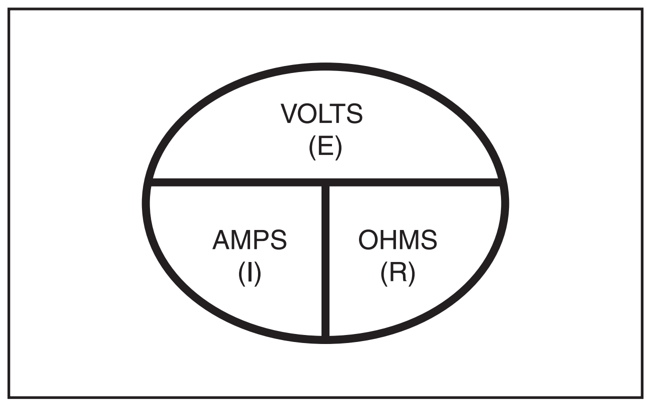


Figure 6. Ohm's Law

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

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

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

$$\text{VOLTS} = \text{AMPERES} \times \text{OHMS}$$

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

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

INTRODUCTION

A typical brushless type portable generator will need 4 major components to function—a prime mover, a stator, a rotor, and a capacitor.

As the engine starts to crank, residual 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. When the capacitor has fully charged it will discharge a voltage that will be induced back into the rotor. The AC voltage induced into the rotor is rectified using a diode. The magnetic lines of flux from the rotor will increase, causing output voltage to increase. The charge and discharge relationship that the capacitor and rotor share is the voltage regulation system that allows the generator to maintain 240 volts.

Figure 1 shows the major components of a typical GP Series brushless AC generator.

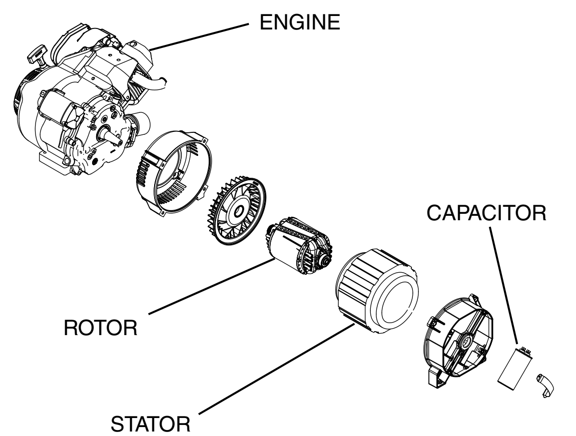


Figure 1. AC Generator Exploded View

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 the DPE winding or Displaced Phase Excitation winding and is located on Wire 2 and Wire 6.

ROTOR ASSEMBLY

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 that rectify voltage induced from the Excitation winding to DC voltage. 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 to help excite the rotor after it has been left idle for a long period of time.

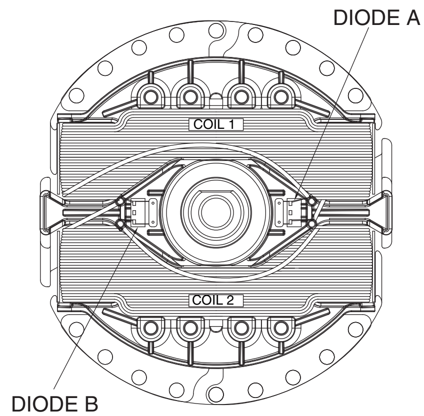


Figure 2. Rotor and Diodes

CIRCUIT BREAKERS

Each individual circuit on the generator is protected by a circuit breaker to prevent overload.

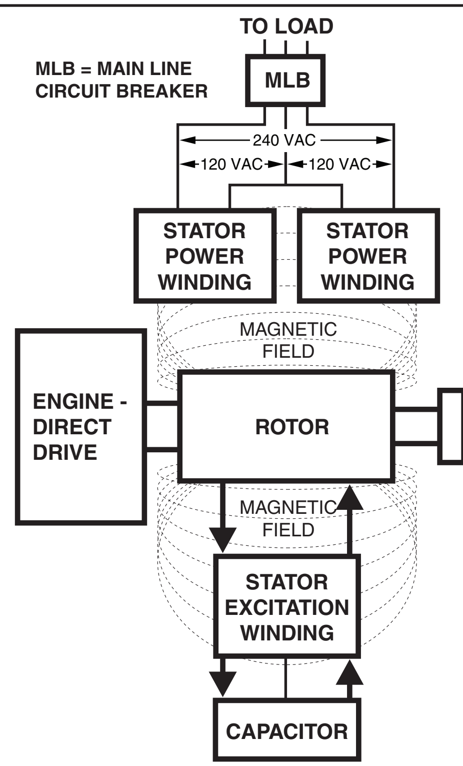


Figure 3. Generator Operating Diagram

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.

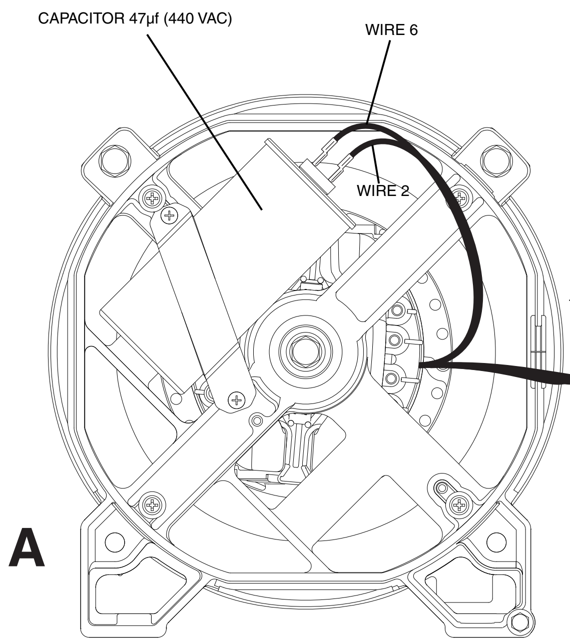


Figure 4. Alternator Configuration A

FIELD EXCITATION:

An AC voltage is induced into the stator excitation (DPE) windings. The DPE winding circuit is completed to the capacitor where the charging and discharging causes a voltage to be induced back in to the rotor which will regulate 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 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.

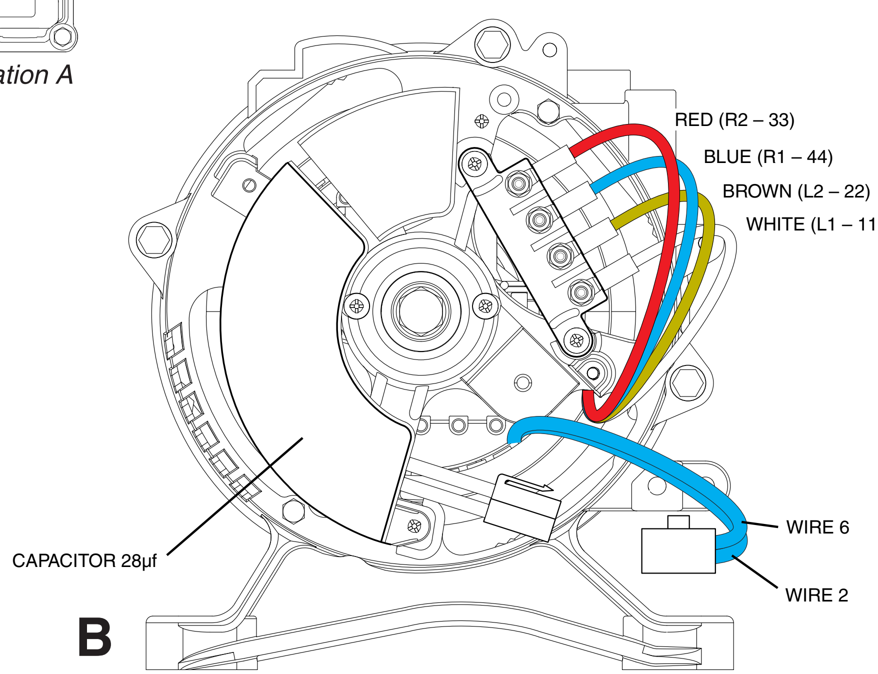


Figure 5. Alternator Configuration B

INTRODUCTION

A typical brushed type portable generator will need 4 major components to function: a prime mover, a stator, a rotor, and a voltage regulator.

As the engine starts to crank, residual magnetism from the rotor creates magnetic lines of flux. The lines begin to cut 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 240VAC. Once the generator has reached 240VAC it will maintain the DC voltage, regulating the alternator when loads are applied and removed.

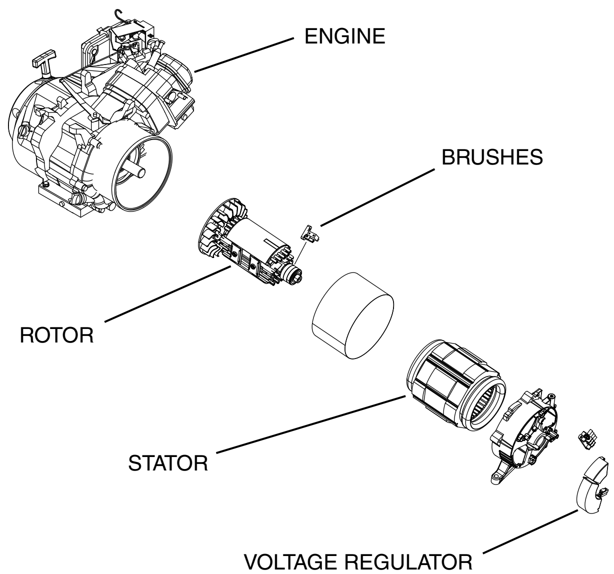


Figure 1. AC Generator Exploded View

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.

BRUSH HOLDER AND BRUSHES

The brush holder is retained to the rear bearing carrier by means of two Taptite screws. A positive (+) and a negative (-) brush are retained in the brush holder. Wire 4 connects to the positive (+) brush and Wire 0 to the negative (-) brush. Rectified and regulated excitation current are 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.

ROTOR RESIDUAL MAGNETISM

The generator revolving field (rotor) may be considered to be a permanent magnet. Some "residual" magnetism is always present in the rotor. This residual magnetism is sufficient to induce a voltage into the stator AC power windings that is approximately 2-5 volts AC.

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

VOLTAGE REGULATOR

Refer to Figure 3 for the proper identification of the voltage regulator. 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.

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.

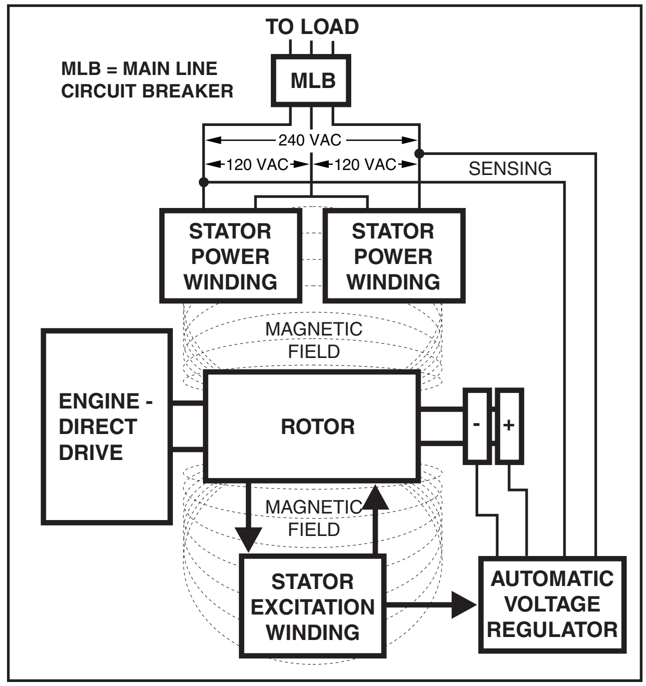


Figure 2. 240 VAC Sensing Alternator

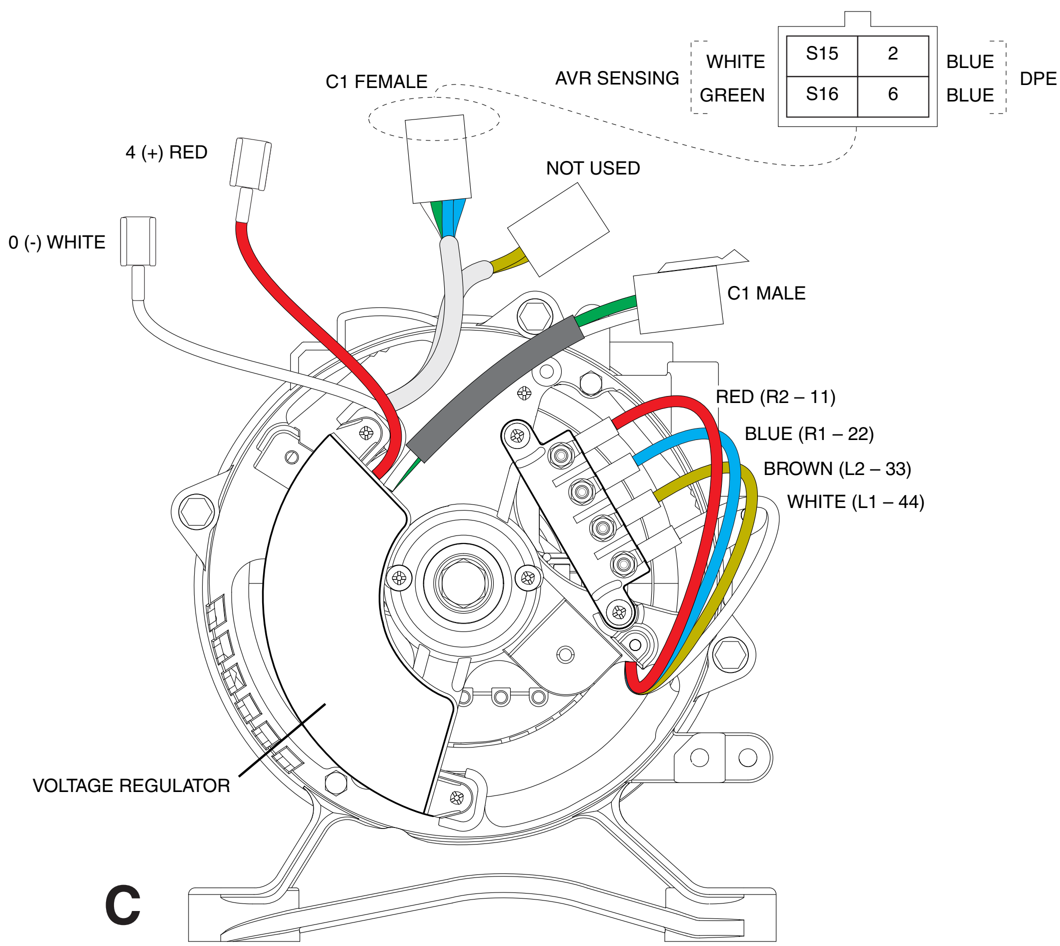


Figure 3. Alternator Configuration C

NOTES

PART 2
AC GENERATORS

GP Series Portable Generators

TABLE OF CONTENTS		
PART	TITLE	PAGE#
2.1	**Brushless Excitation Troubleshooting Flowcharts**	22
2.2	**Brushed Capacitor Troubleshooting Flowcharts**	24
2.3	**AC Diagnostic Tests**	26

SECTION 2.1
BRUSHLESS CAPACITOR TROUBLESHOOTING FLOWCHARTS

The GP series portable generators currently use three different types of alternators. Two of the alternators are brushless capacitor type with different style of capacitors (Configuration “A” and “B”). The third utilizes a voltage regulator and a brushed excitation system (Configuration “C”). To help with troubleshooting, two sets of flow charts have been created for these different styles of alternators.

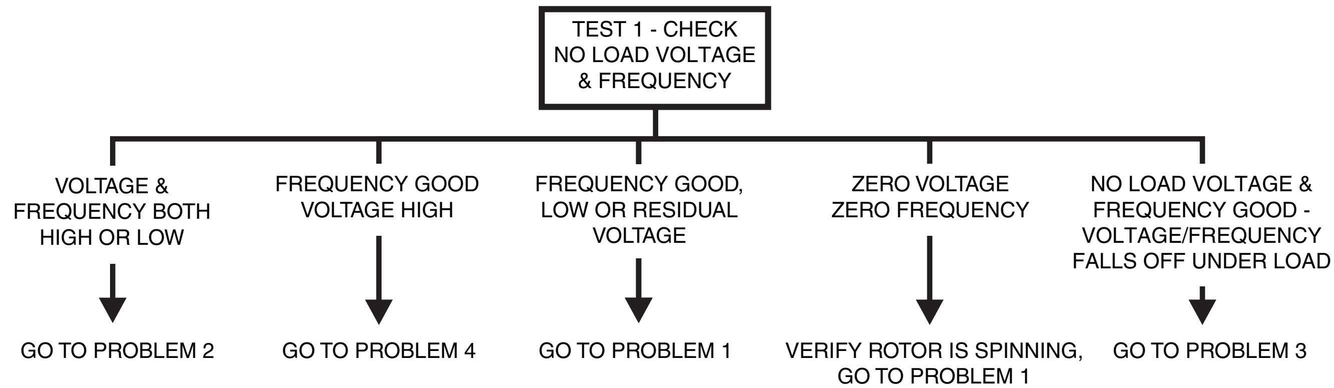
Identify the configuration of the alternator being serviced using Sections 1.3 and 1.4 of this manual and proceed to the appropriate flowchart section.

Configuration “A” – Brushless Capacitor, use Section 2.1

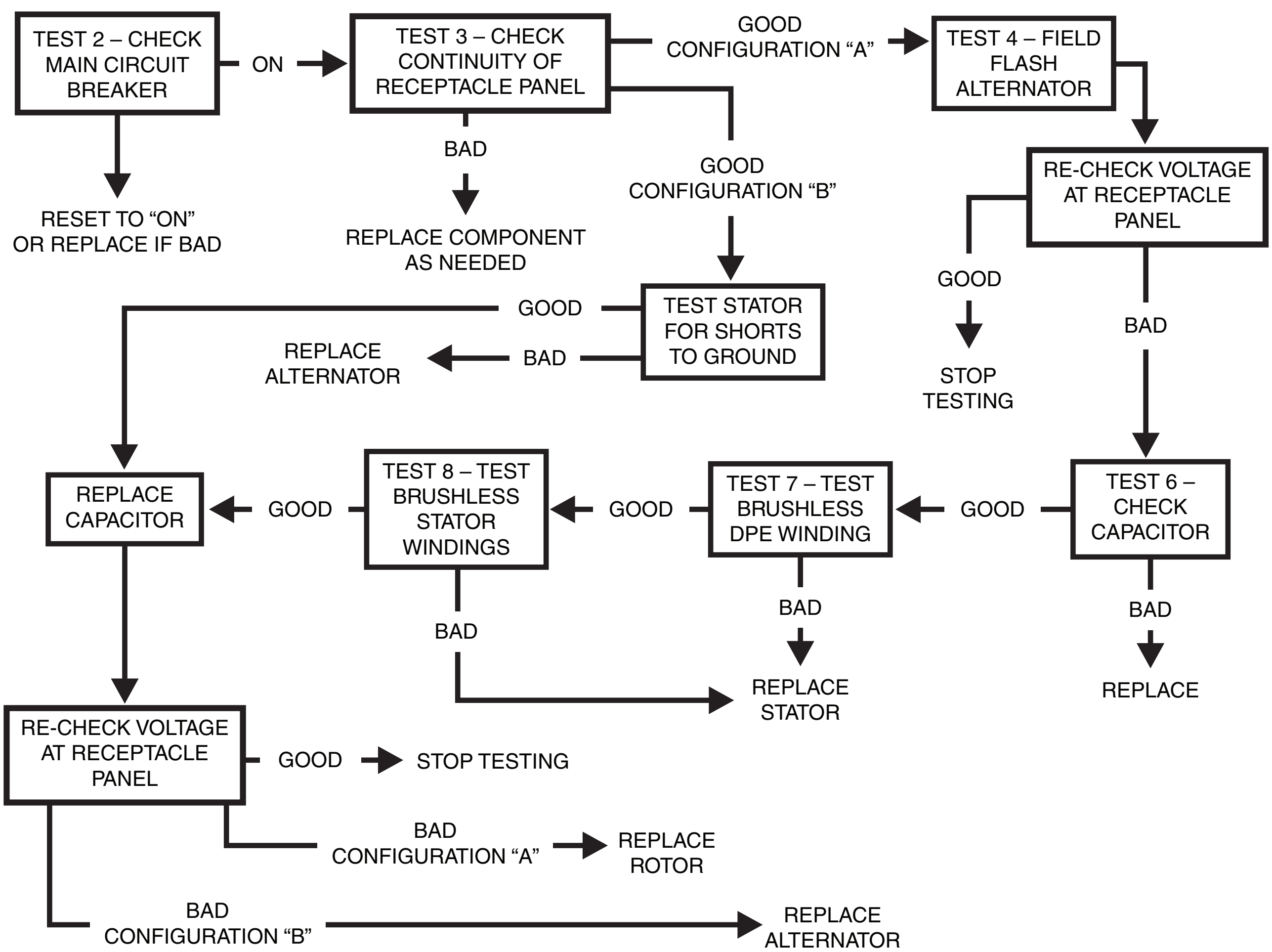
Configuration “B” – Brushless Capacitor, use Section 2.1

Configuration “C” – Brushed Excitation, use Section 2.2

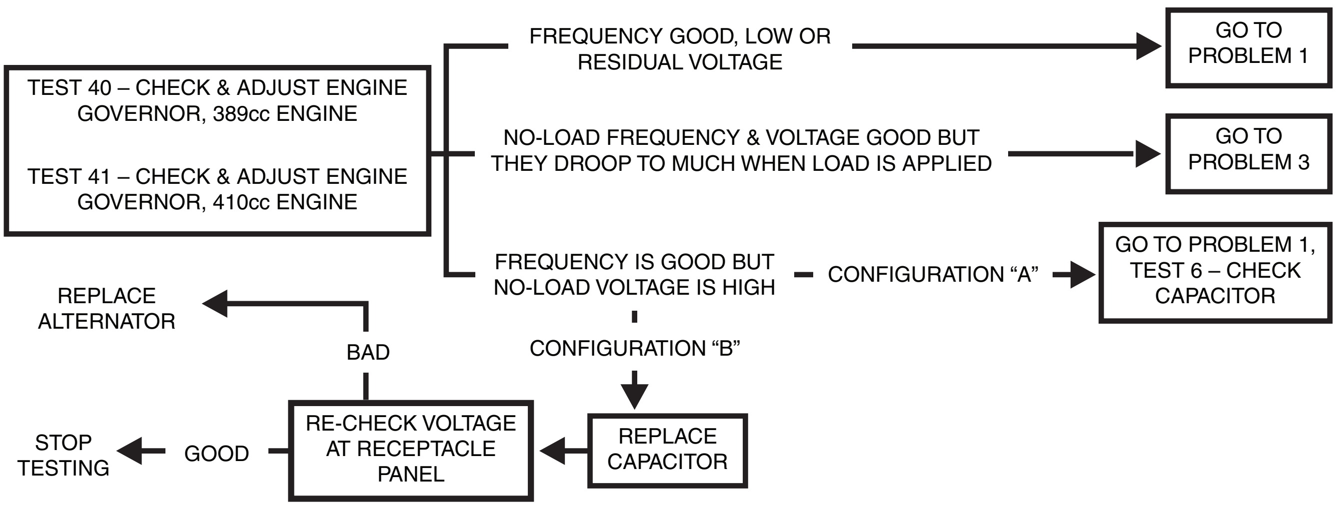
If Problem Involves AC Output



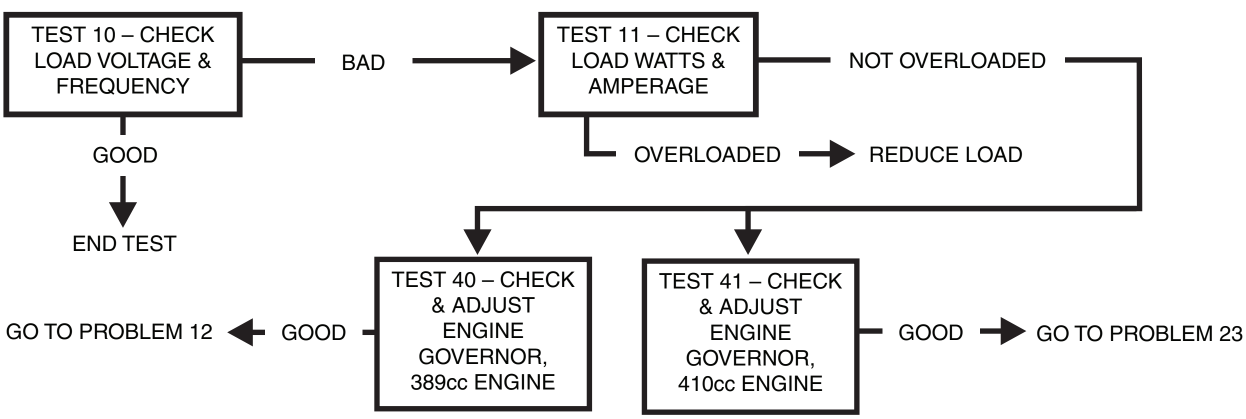
Problem 1 – Generator Produces Zero Voltage or Residual Voltage



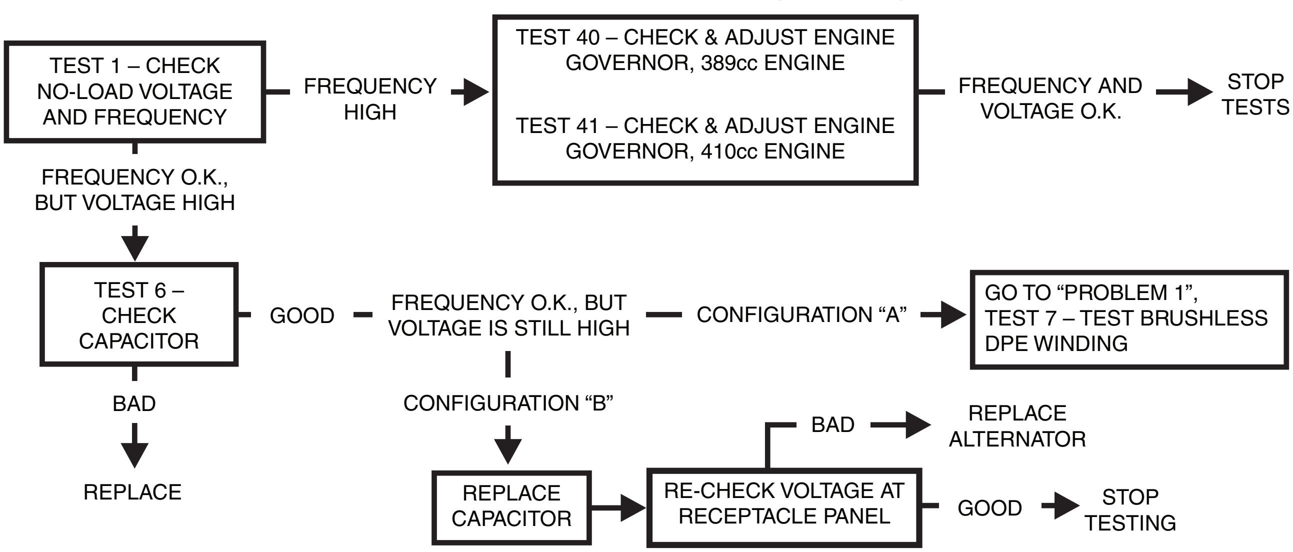
Problem 2 – Voltage & Frequency Are Both High or Low



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



Problem 4 – Generator Produces High Voltage at No-Load



The GP series portable generators currently use three different types of alternators. Two of the alternators are brushless capacitor type with different style of capacitors (Configuration "A" and "B"). The third utilizes a voltage regulator and a brushed excitation system (Configuration "C"). To help with troubleshooting, two sets of flow charts have been created for these different styles of alternators.

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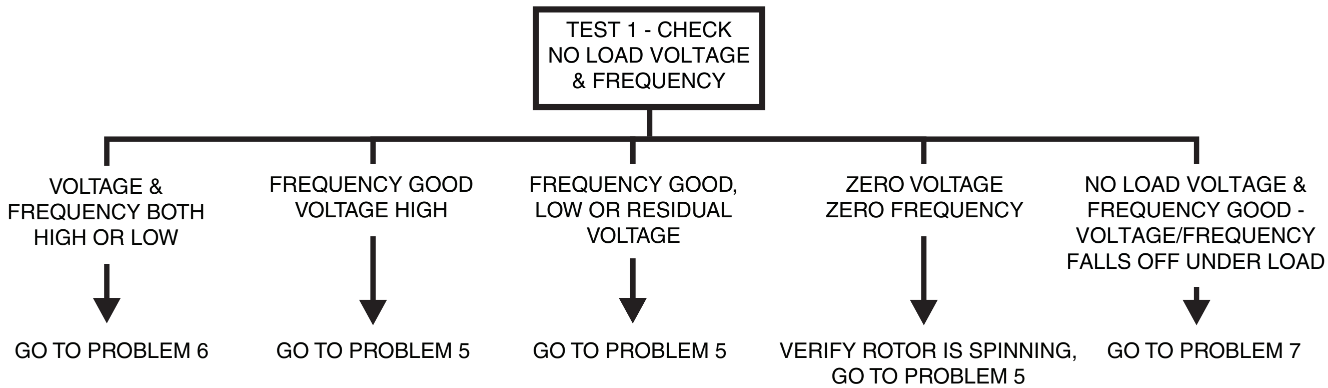
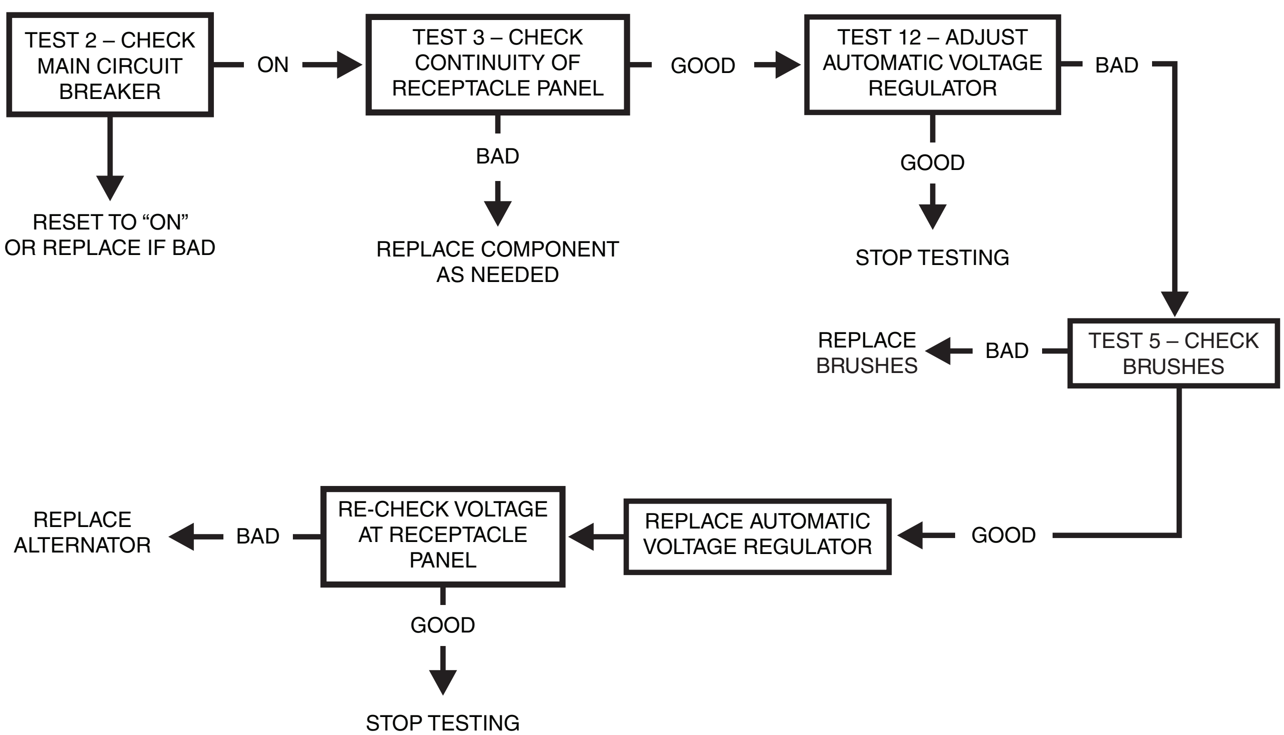
Configuration "C" – Brushed Excitation, use Section 2.2

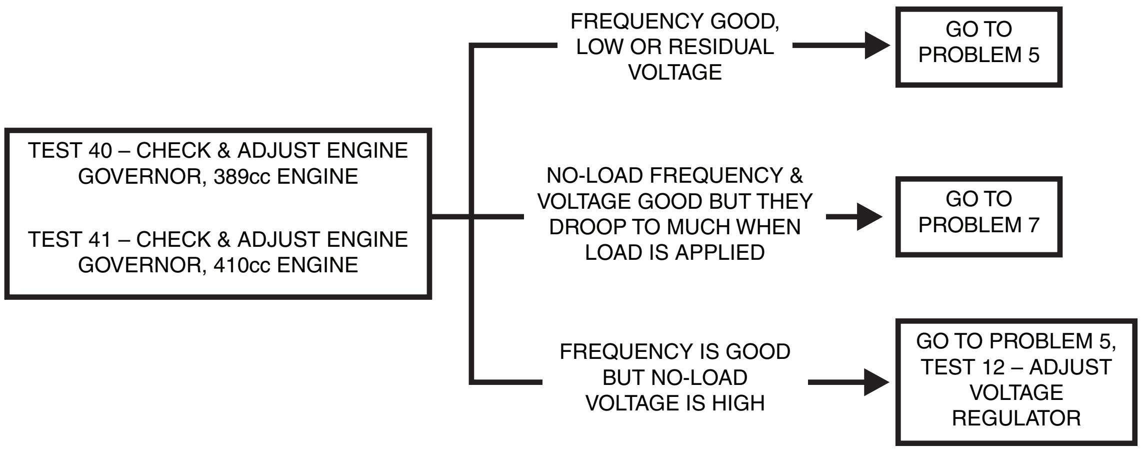
If Problem Involves AC Output



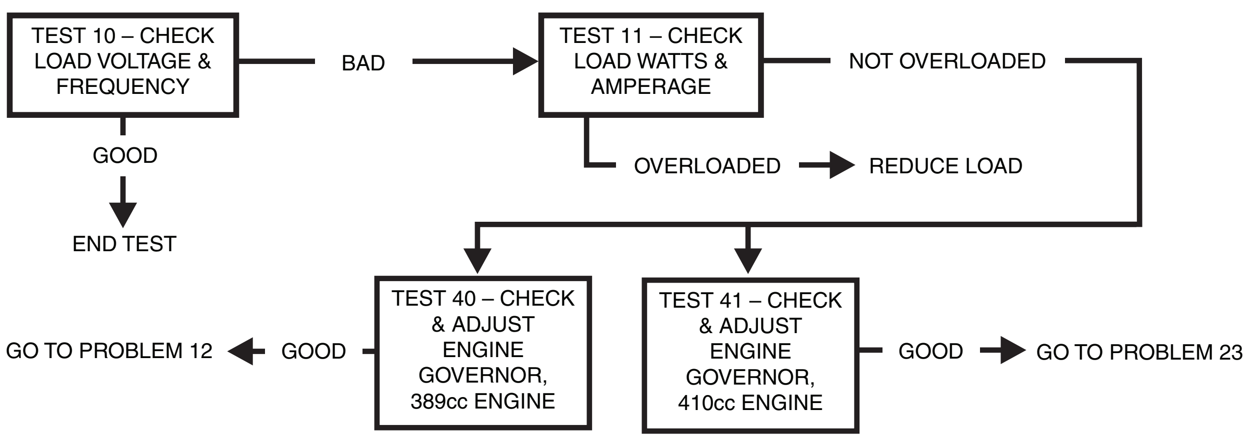
Problem 5 – Generator Produces Zero Voltage or Residual Voltage



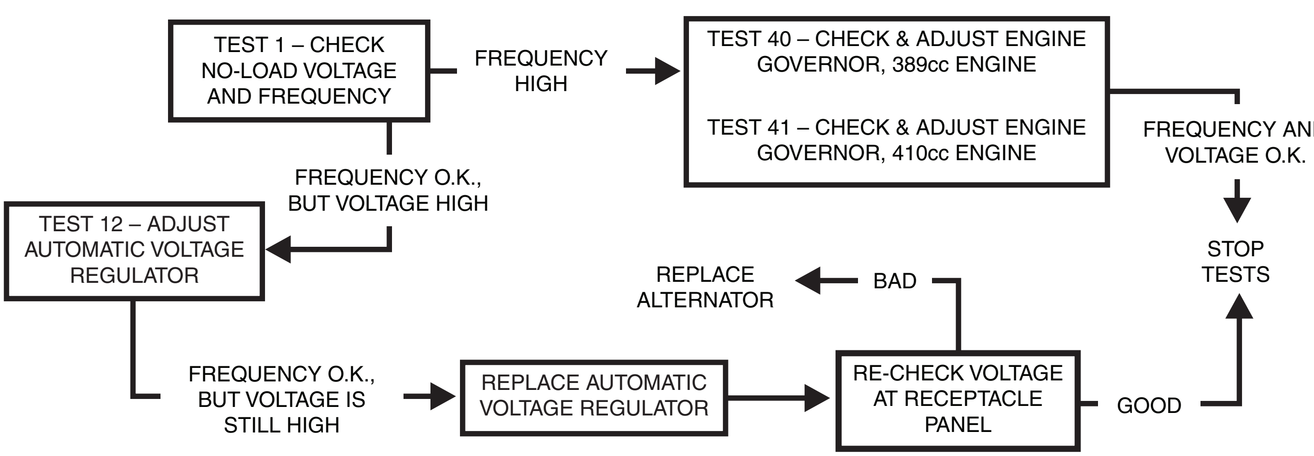
Problem 6 – Voltage & Frequency Are Both High or Low



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



Problem 8 – Generator Produces High Voltage at No-Load



INTRODUCTION

The “Diagnostic Tests” in this chapter may be performed in conjunction with the “Flow Charts” of Section 2.1 and Section 2.2. Test numbers in this chapter correspond to the numbered tests in the “Flow Charts”. It may be helpful to read Section 1.2, “Measuring Electricity.”

NOTE: Test procedures in this Manual are not necessarily the only acceptable 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 ensure that neither his personal safety nor the product's safety will be endangered by the procedure or method that has been selected.

For visual pictures of the different configurations of the stators and the wire numbers associated with different components please see Figures 4 and 5 in Section 1.3, and Figure 3 in Section 1.4.

TEST 1 – CHECK NO-LOAD VOLTAGE AND FREQUENCY

PROCEDURE:

1. Disconnect or turn OFF all electrical loads connected to the generator.
2. Set a VOM to measure AC voltage.
3. Reset all circuit breakers to the on position.
4. Start the engine and let it stabilize and warm up.

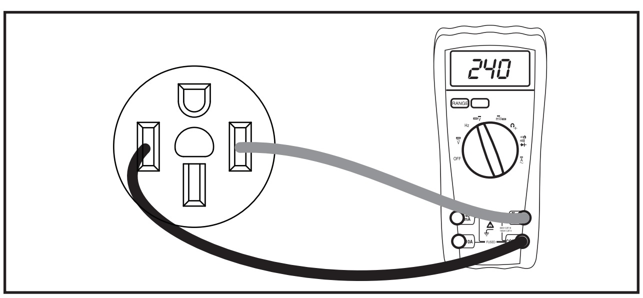


Figure 1. VOM Test Leads Connected to a 240 VAC receptacle

6. Place the meter test leads into an outlet. See Figure 1.
7. Read the AC voltage.
8. Connect a AC frequency meter as described in Step 6.
9. Read the AC frequency.

RESULTS:

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

Refer back to Flow Chart.

TEST 2 – CHECK CIRCUIT BREAKER

PROCEDURE:

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

If a breaker is suspected to have failed, it can be tested as follows:

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

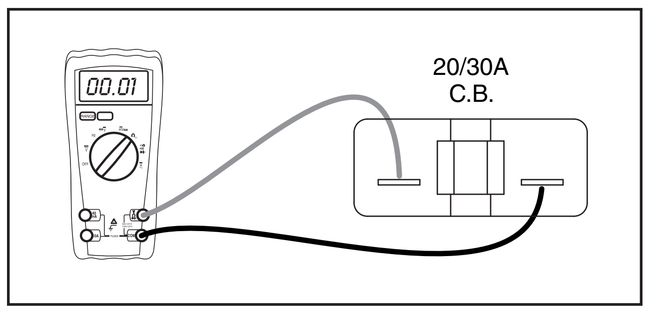


Figure 2. 20/30 Amp Breaker Test Points

RESULTS:

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

TEST 3 – CHECK CONTINUITY OF RECEPTACLE PANEL

DISCUSSION:

Continuity of the receptacle panel is important because it reflects that 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 ohm reading is shown then a poor connection could be the problem preventing that receptacle from receiving power.

PROCEDURE:

1. Set a VOM to measure Resistance.

2. Connect a VOM as shown in Figure 3 to each receptacle on the unit.

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

RESULTS:

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

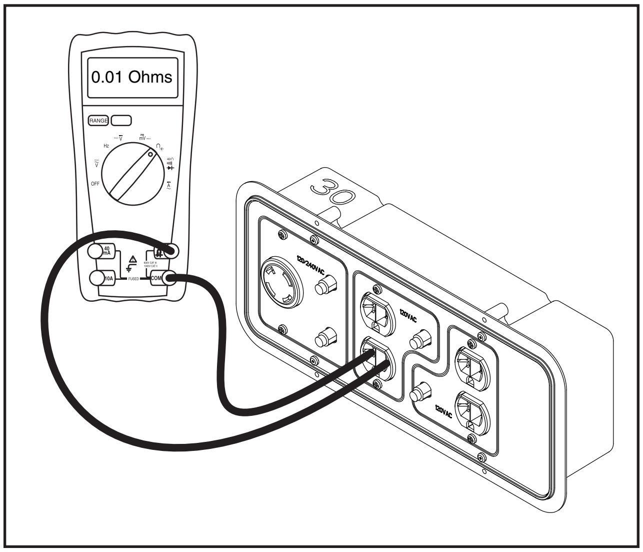


Figure 3. Checking Continuity of Receptacles

TEST 4 – FIELD FLASH ALTERNATOR
(CONFIGURATION "A" ONLY)

DISCUSSION:

The alternator utilizes residual magnetism within the windings to charge the capacitor. If the generator has been sitting for a long period of time with no activity the residual magnetism could be lost within the rotor. Field flashing the rotor while connected in parallel with the capacitor will force a charge of electricity through the DPE winding. The voltage that is induced into the rotor will in turn charge the rotor with enough residual magnetism that it will be able to charge the capacitor during normal operation.

Warning: Please keep safety in mind while performing this test.

PROCEDURE:

1. Construct an energizing cord that is similar to that shown in Figure 4 and connect it as shown in Figure 5 on the next page.
2. Set the START-RUN-STOP switch to the OFF position.

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

3. Momentarily turn on the energizing cord (one second).
4. Disconnect the energizing cord from the capacitor.
5. If the field flash was successful, the generator should now be producing approximately 240 VAC at the main circuit breaker of the generator when the START-RUN-STOP is set to the START position.

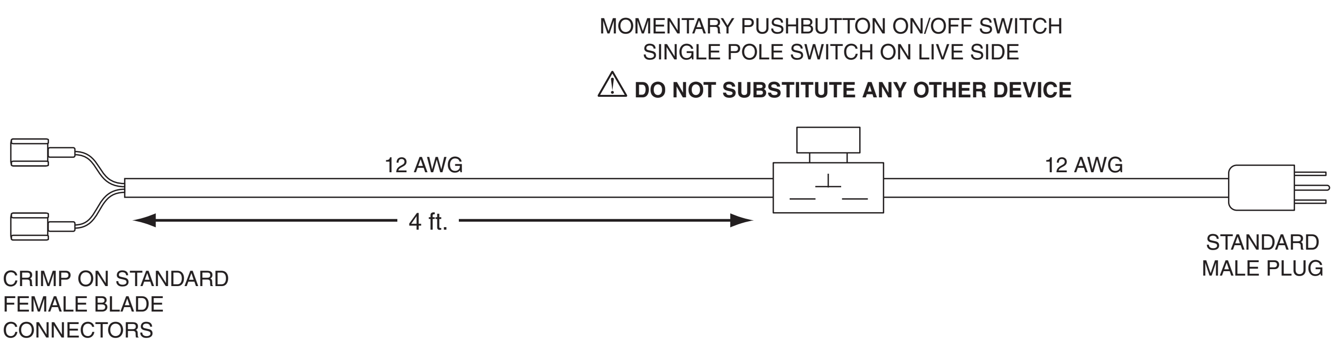


Figure 4. Construction of Energizing Cord

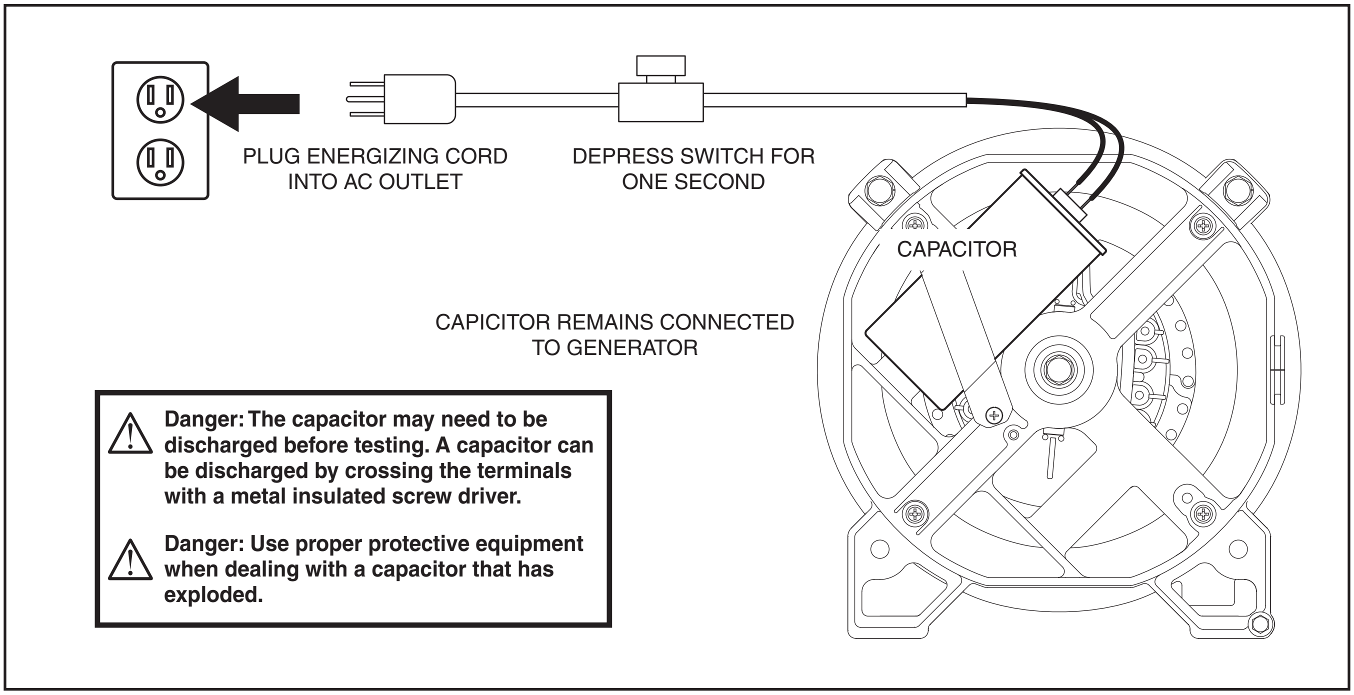


Figure 5. Connecting Energizing Cord

Warning: 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. Refer back to flow chart.

TEST 5 – CHECK BRUSHES

DISCUSSION:

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

PROCEDURE:

1. See Figure 6. Carefully inspect brush wires. Make sure they are properly and securely connected.
2. Disconnect the red and white wire from the brush assembly. Remove the brush assembly from the bearing carrier. Inspect the brushes for excessive wear, or damage.
3. Inspect the rotor slip rings. If they appear dull or tarnished, they may be polished with fine sandpaper. DO NOT USE METALLIC GRIT TO POLISH SLIP RINGS.

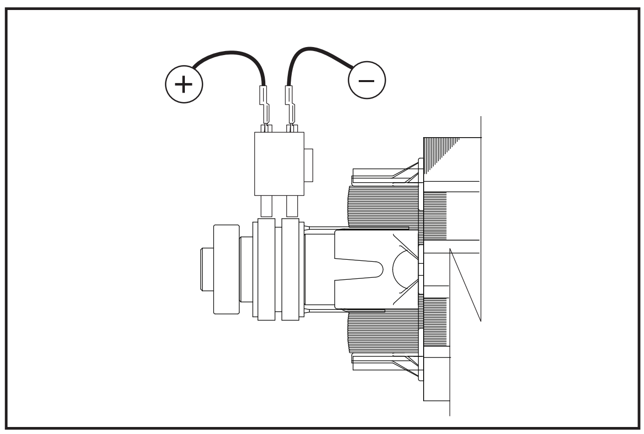


Figure 6. Brushes and Slip Rings

RESULTS:

1. Repair, replace or reconnect wires as necessary.
2. Replace any damaged slip rings or brush holder.
3. Clean and polish slip rings as required.
4. If brush assembly and slip rings look good proceed to Step 5.

TEST 6 – CHECK CAPACITOR

DISCUSSION:

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

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

Warning: 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. Figures 7 and 8 show a typical meter and how to check capacitance.
2. Connect the meter leads directly across the terminals of the 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.

RESULTS:

1. Refer back to flow chart
2. Common observations can be made by visually inspecting the capacitor.
   a. A capacitor that has gone bad can have a tendency to explode. Use caution when dealing with an exploded capacitor, the gel from inside a capacitor can cause skin irritation.
   b. A capacitor is defective if the terminal connections are loose on the canister.
   c. A capacitor is defective if it wobbles while sitting on a flat surface.
   d. If any of the above observations are observed, replace the capacitor.

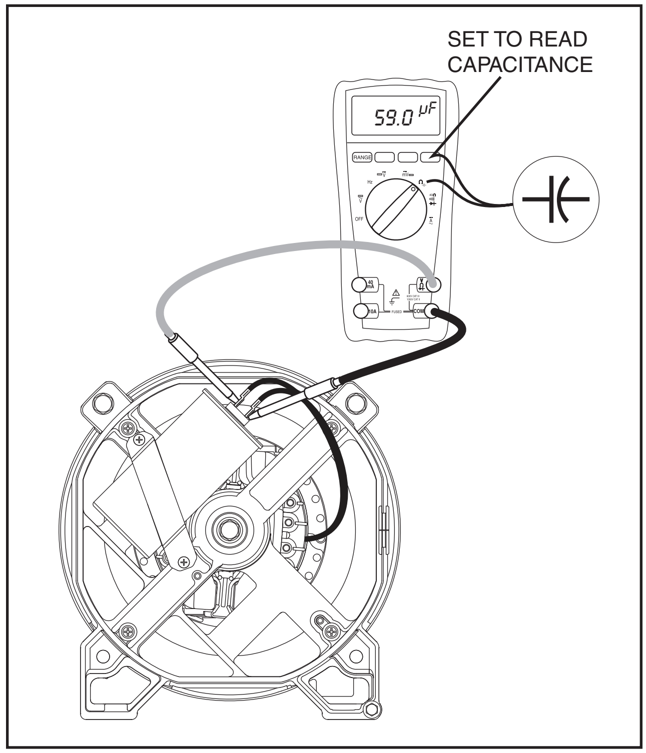


Figure 7. Capacitor Test Points (Alternator Configuration "A")

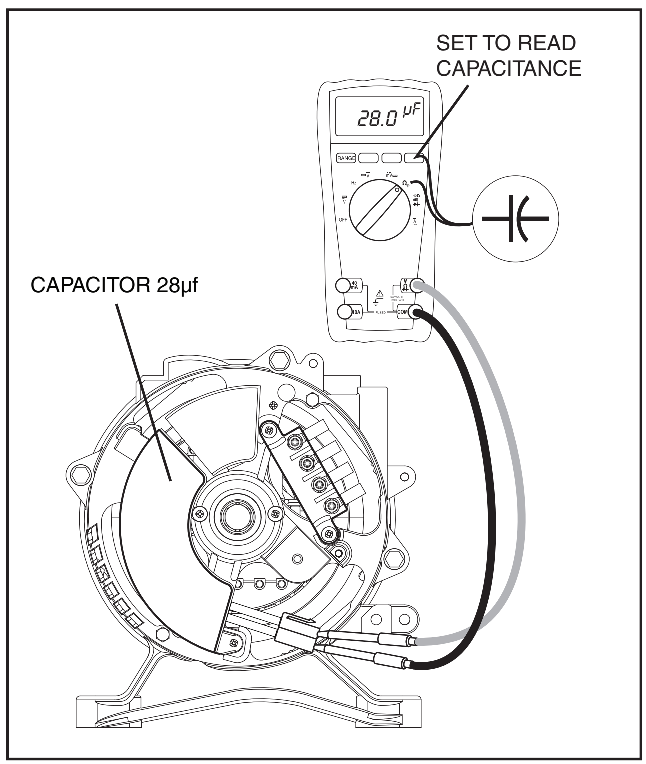


Figure 8. Capacitor Test Points (Alternator Configuration "B")

TEST 7 – TEST BRUSHLESS DPE WINDING

DISCUSSION:

A DPE or Displaced Phase Excitation winding is used to charge a capacitor, which 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.

⚠ **Danger: 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 the capacitor.
2. Set VOM 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 that 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. Stator winding resistance values is a test of winding continuity and resistance. If a very high resistance or INFINITY is indicated, the winding is open or partially open.
2. Testing for a "grounded" condition: Any resistance reading indicates that the winding is grounded.
3. Testing for a "shorted" condition: Any resistance reading indicates that the winding is shorted.
4. If stator tests good and wire continuity tests good, refer back to flow chart.

TEST 8 – TEST BRUSHLESS STATOR WINDINGS

DISCUSSION:

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

A VOM 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: Refer to Figure 4 in Section 1.3 for illustration of Stator 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 that the stator is isolated.
2. Make sure all of the disconnected leads are isolated from each other and are not touching the frame during the test.
3. Set a VOM 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. Make sure 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

DISCUSSION:

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

PROCEDURE:

1. Isolate all stator wires from the control panel and the voltage regulator.
2. Set a VOM to measure resistance.
3. Refer to Configuration "C" in Section 1.4 for proper test points for checking 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 the alternator assembly.
2. If all wires test good for a short to ground, refer back to flow chart.

TEST 10 – CHECK LOAD VOLTAGE & FREQUENCY

PROCEDURE:

Perform this test in the same manner as Test 1, but apply a load to the generator equal to its rated capacity. With load applied check voltage and frequency.

Frequency should not drop below about 59 Hertz with the load applied.

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

RESULTS:

1. If voltage and/or frequency drop excessively when the load is applied, refer back 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 "Measuring Current" in Section 1.2.

A Wattage Reference Guide is provided on the next page to assist in determining how many items the generator can operate at one time.

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

RESULTS:

1. If the unit is overloaded, reduce the load.
2. If load is within limits, but frequency and voltage still drop excessively, refer back 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 the unit:

- Add up the 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 usually 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.

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

1. Figure the 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

PROCEDURE:

1. Remove cover from end of alternator assembly.
2. Remove two screws holding down the voltage regulator (AVR); refer to Figure C in Section 1.4 for identification.
3. Leave AVR connected to stator and brushes
4. Set VOM to measure AC voltage.
5. Connect VOM across a 240VAC socket as shown in Figure 9.

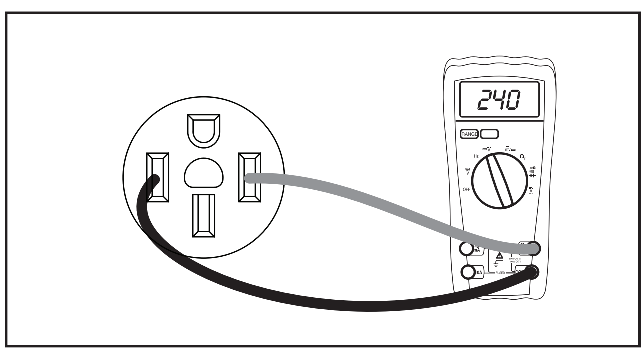


Figure 9. VOM Test Leads Connected to a 240 VAC receptacle

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

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

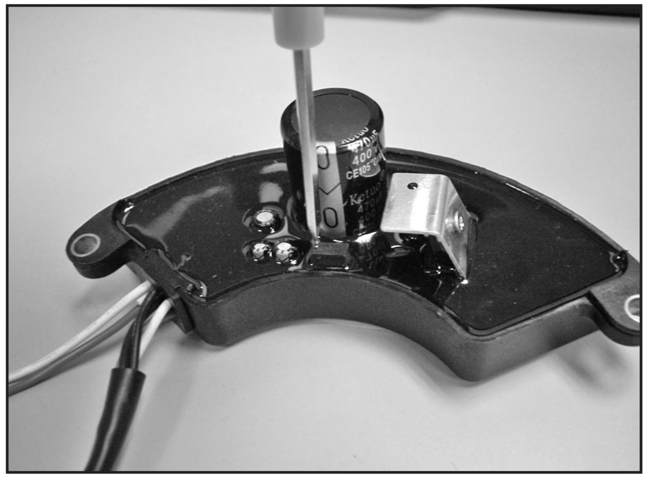


Figure 10. Voltage Regulator Adjustment Screw

WATTAGE REFERENCE GUIDE

Device	Running Watts
*Air Conditioner (12,000 Btu)	1700
*Air Conditioner (24,000 Btu)	3800
*Air Conditioner (40,000 Btu)	6000
Battery Charger (20 Amp)	500
Belt Sander (3")	1000
Chain Saw	1200
Circular Saw (6-1/2")	800 to 1000
*Clothes Dryer (Electric)	5750
*Clothes Dryer (Gas)	700
*Clothes Washer	1150
Coffee Maker	1750
*Compressor (1 HP)	2000
*Compressor (3/4 HP)	1800
*Compressor (1/2 HP)	1400
Curling Iron	700
*Dehumidifier	650
Disc Sander (9")	1200
Edge Trimmer	500
Electric Blanket	400
Electric Nail Gun	1200
Electric Range (per element)	1500
Electric Skillet	1250
*Freezer	700
*Furnace Fan (3/5 HP)	875
*Garage Door Opener	500 to 750
Hair Dryer	1200

Device	Running Watts
Hand Drill	250 to 1100
Hedge Trimmer	450
Impact Wrench	500
Iron	1200
*Jet Pump	800
Lawn Mower	1200
Light Bulb	100
Microwave Oven	700 to 1000
*Milk Cooler	1100
Oil Burner on Furnace	300
Oil Fired Space Heater (140,000 Btu)	400
Oil Fired Space Heater (85,000 Btu)	225
Oil Fired Space Heater (30,000 Btu)	150
*Paint Sprayer, Airless (1/3 HP)	600
Paint Sprayer, Airless (handheld)	150
Radio	50 to 200
*Refrigerator	700
Slow Cooker	200
*Submersible Pump (1-1/2 HP)	2800
*Submersible Pump (1 HP)	2000
*Submersible Pump (1/2 HP)	1500
*Sump Pump	800 to 1050
*Table Saw (10")	1750 to 2000
Television	200 to 500
Toaster	1000 to 1650
Weed Trimmer	500

* Allow 3 times the listed watts for starting these devices.

PART 3
ENGINE
TROUBLESHOOTING

GP Series Portable Generators

TABLE OF CONTENTS

SECTION 3.1
389/206/163cc TROUBLESHOOTING FLOW CHARTS

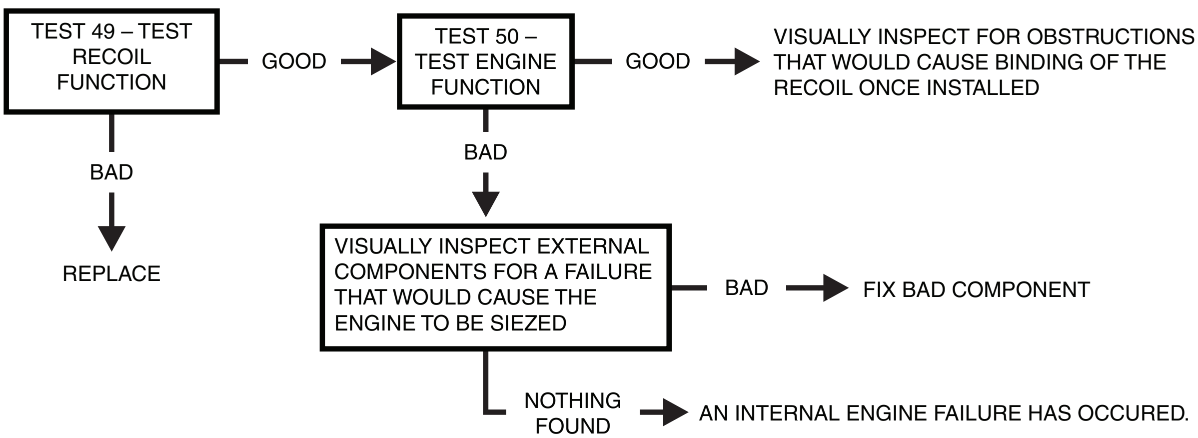
There are 4 different types of engines on the GP Series generators: 410cc, 389cc, 206cc, 163cc. Section 3 is divided into difference subsections that provide engine troubleshooting for each type of engine. It is imperative to identify what type of engine is used in order to effectively troubleshoot the problem.

The Specifications section at the front of this manual provides details about engine displacement for the various GP Series generators.

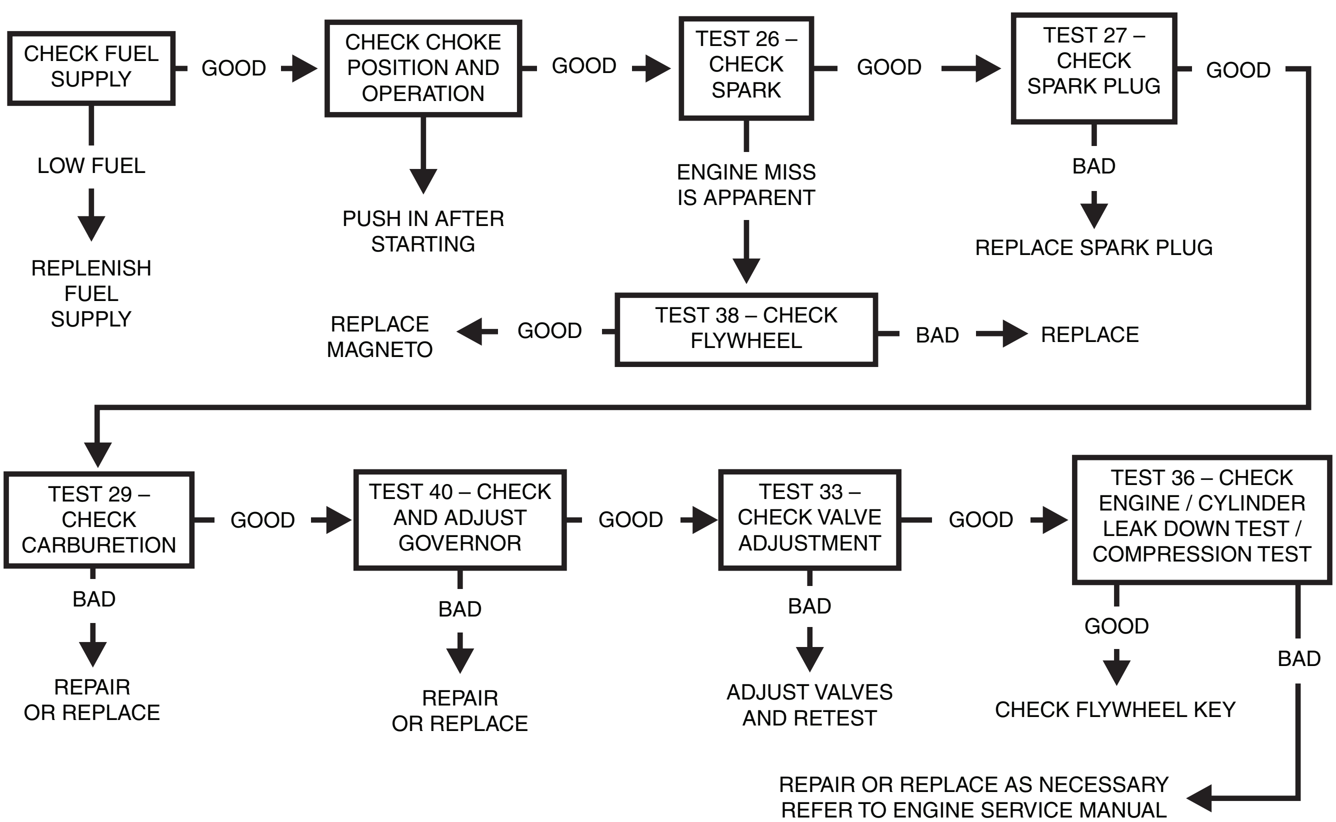
389cc, 206cc and 163cc Engines, use Section 3.1

410cc Engine, use Section 3.2

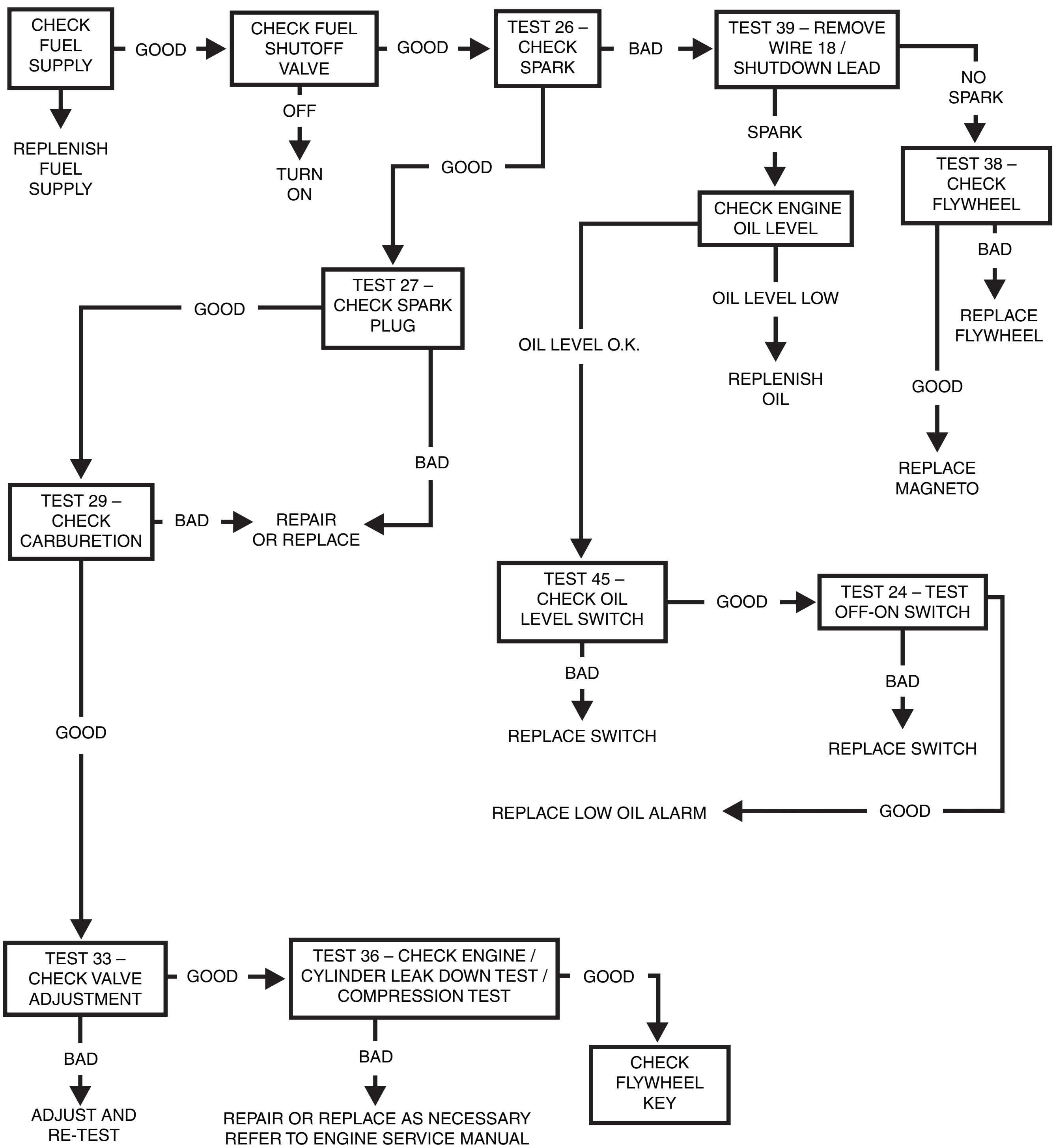
Problem 10 – Recoil Cord Will Not Pull



Problem 11 – Engine Starts Hard and Runs Rough

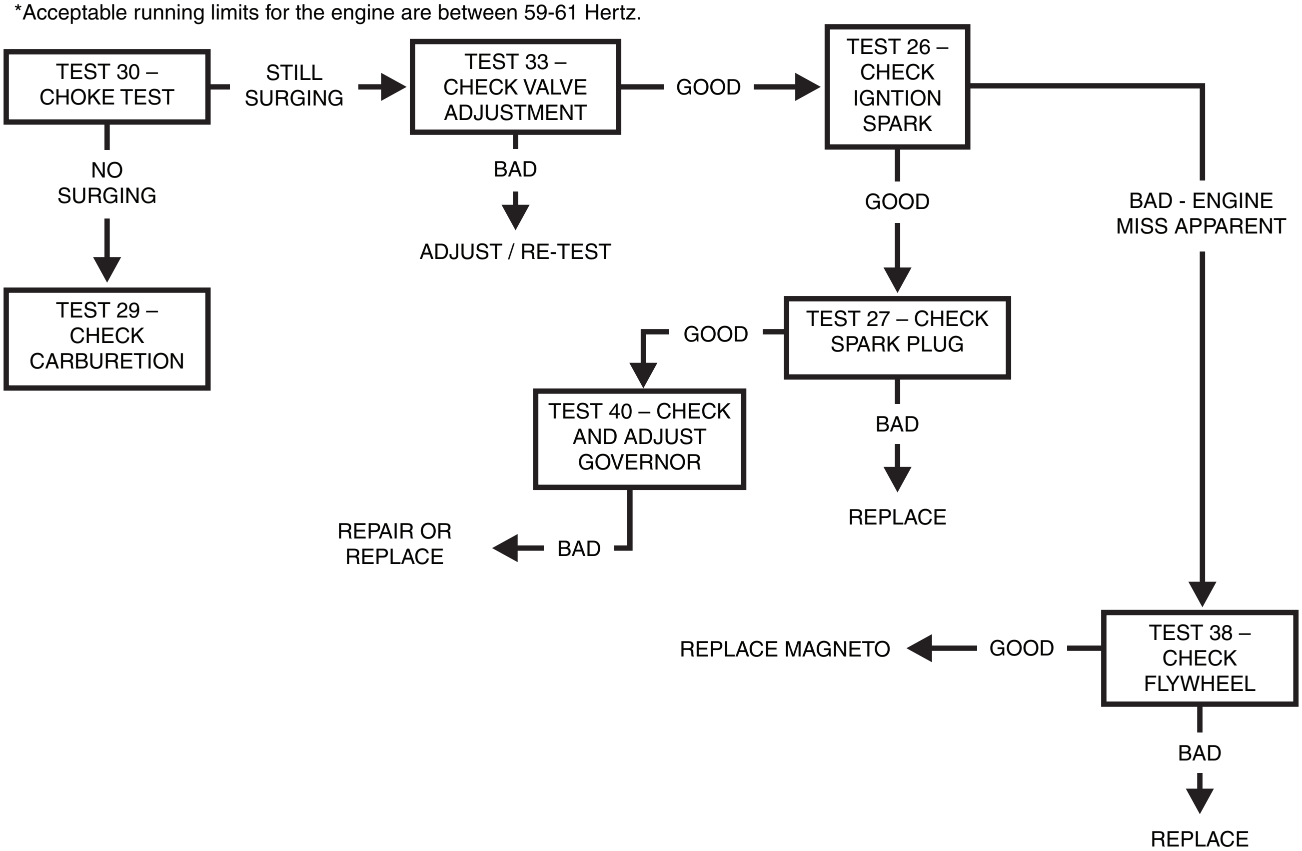


Problem 12 – Engine Turns Over But Will Not Start

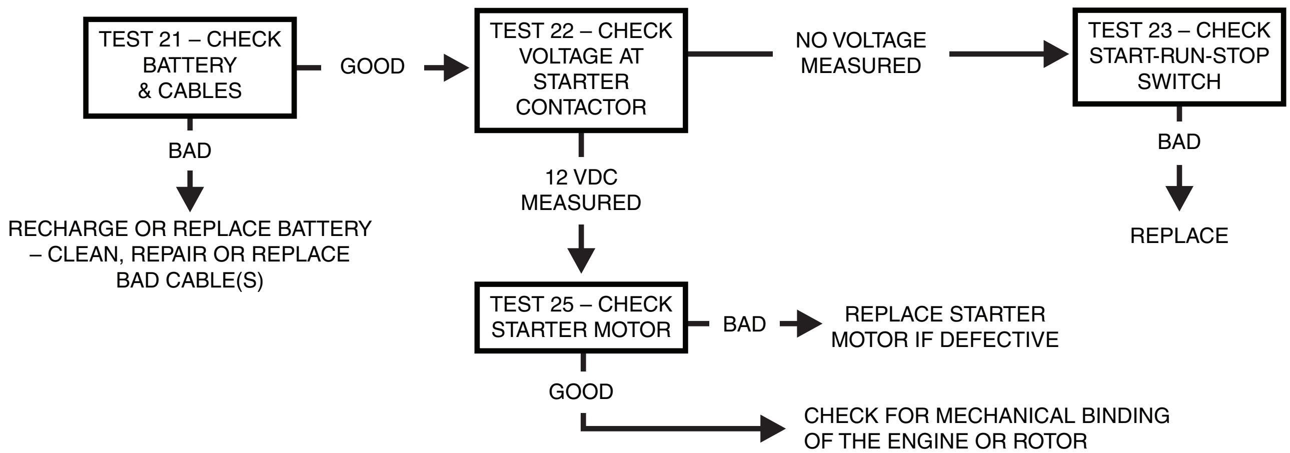


Problem 13 – Engine "Hunts" / Erratic Idle

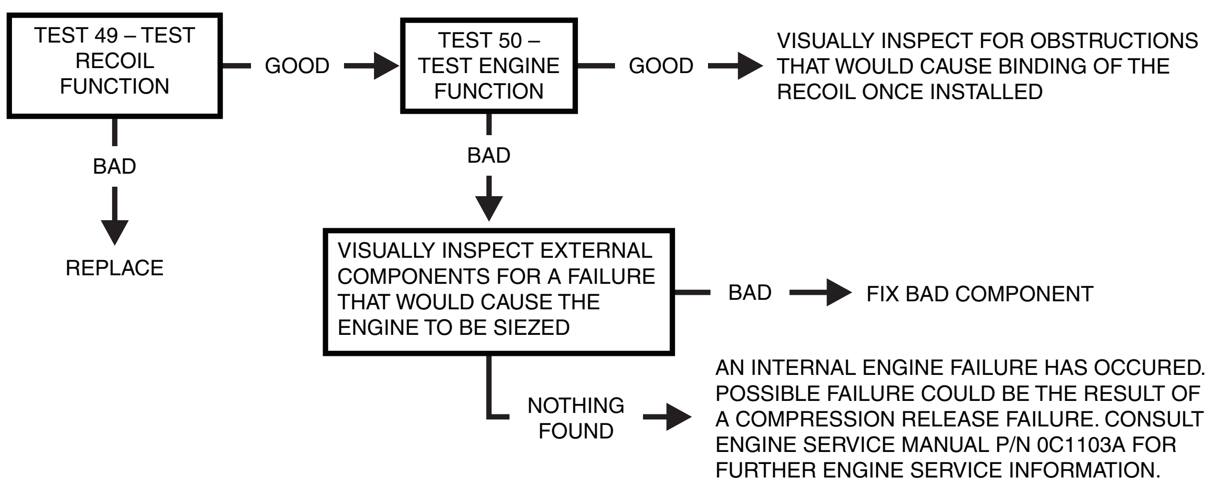
*Acceptable running limits for the engine are between 59-61 Hertz.



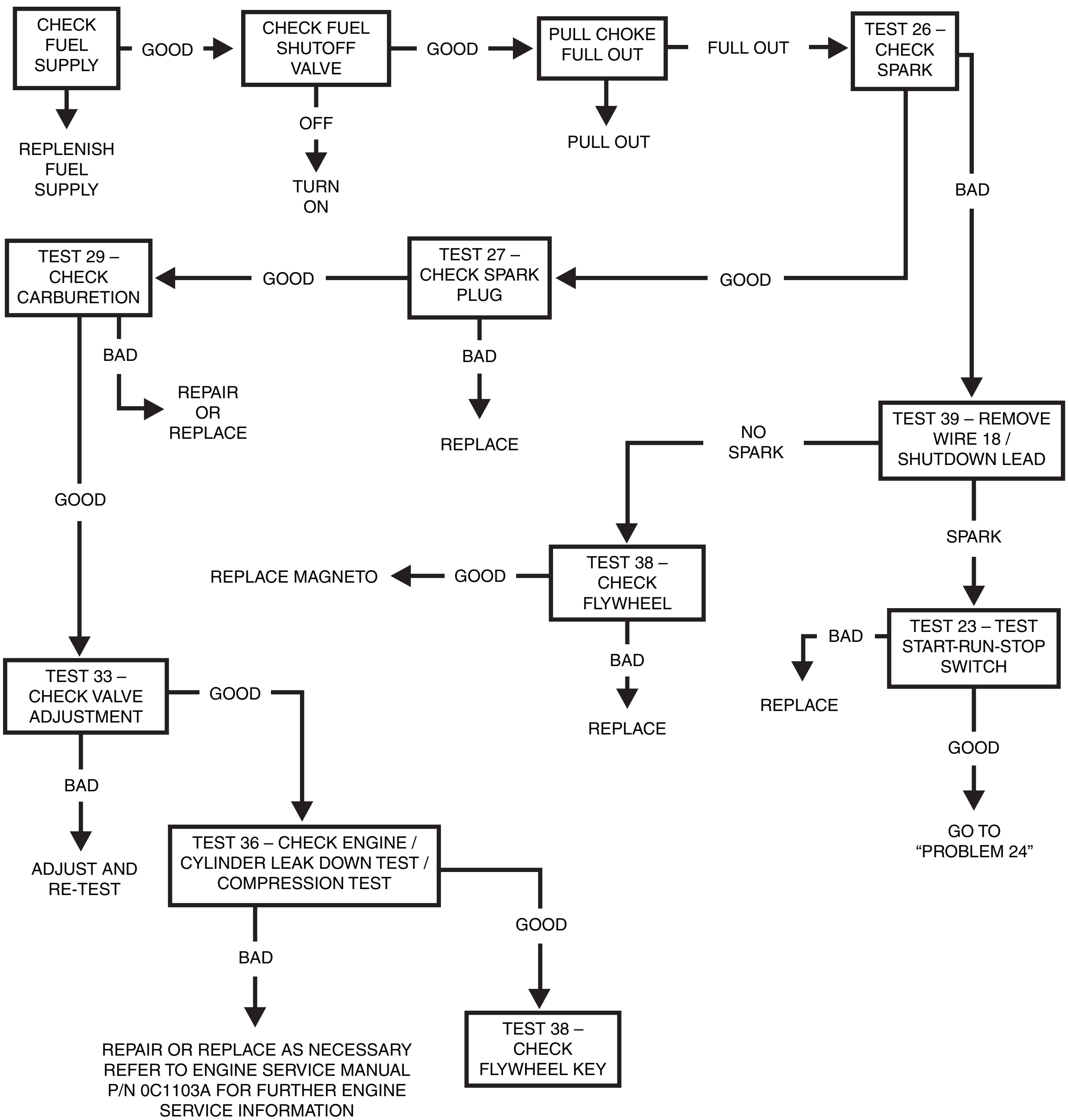
Problem 20 – Engine Will Not Crank



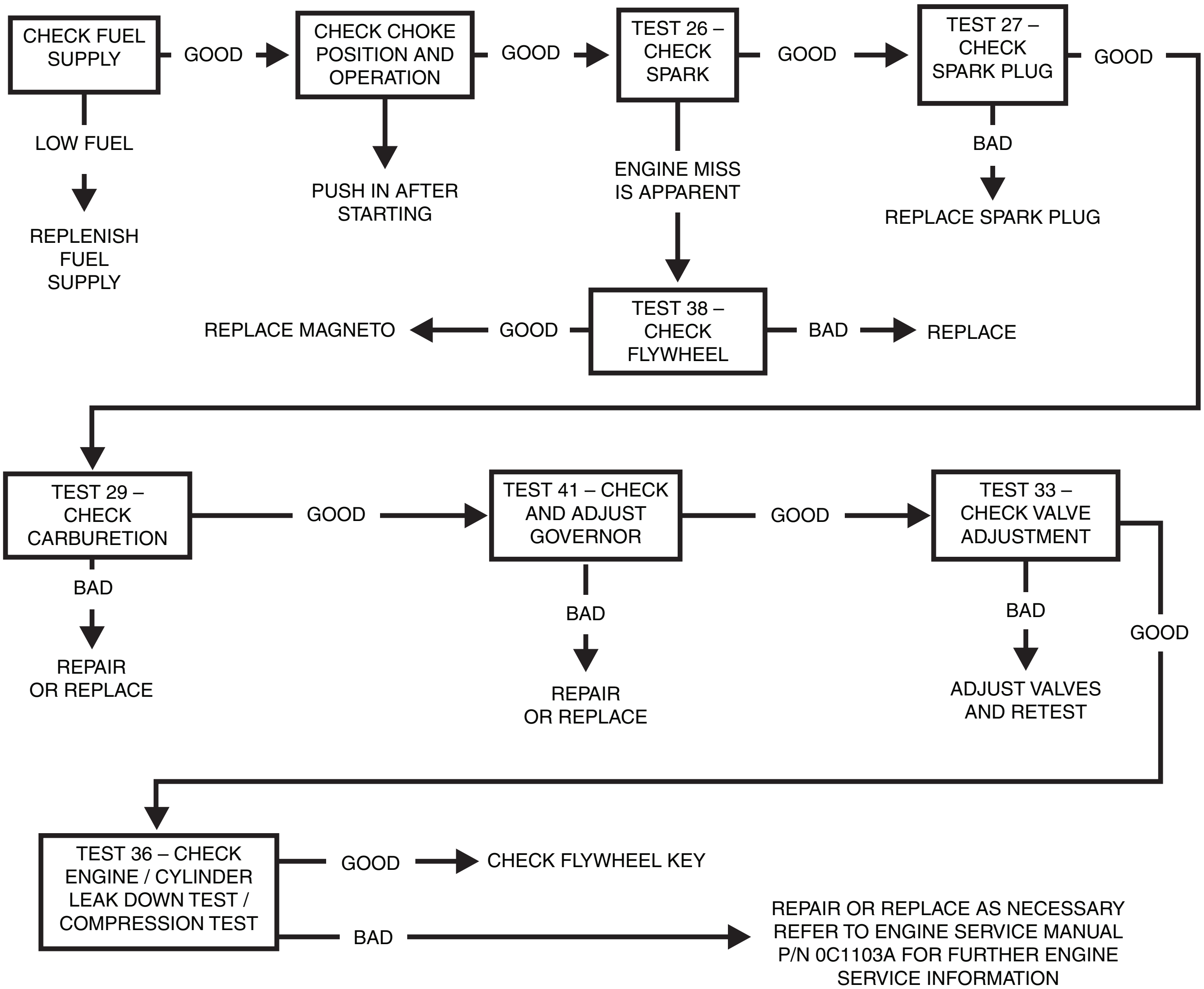
Problem 21 – Recoil Cord Will Not Pull (If So Equipped)



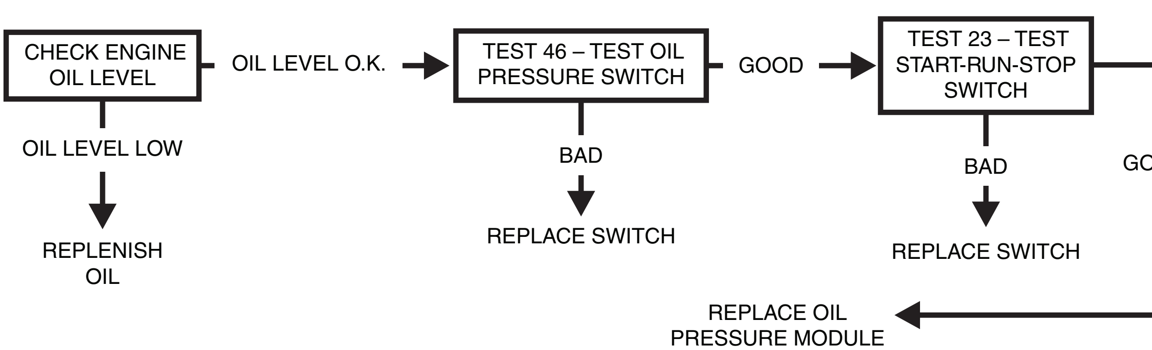
Problem 22 – Engine Cranks But Will Not Start



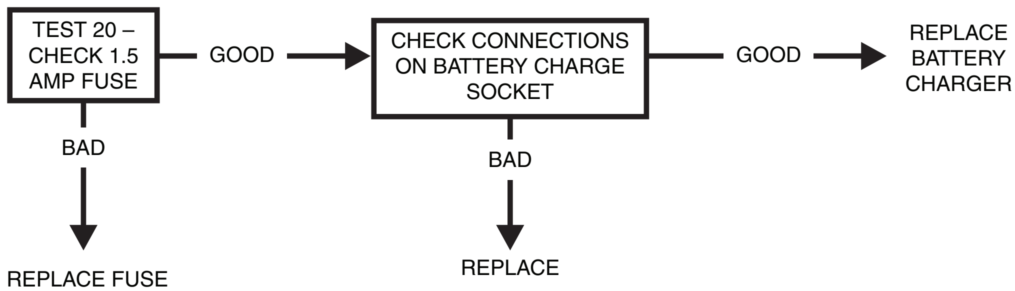
Problem 23 – Engine Starts Hard and Runs Rough



Problem 24 – Engine Starts Then Shuts Down

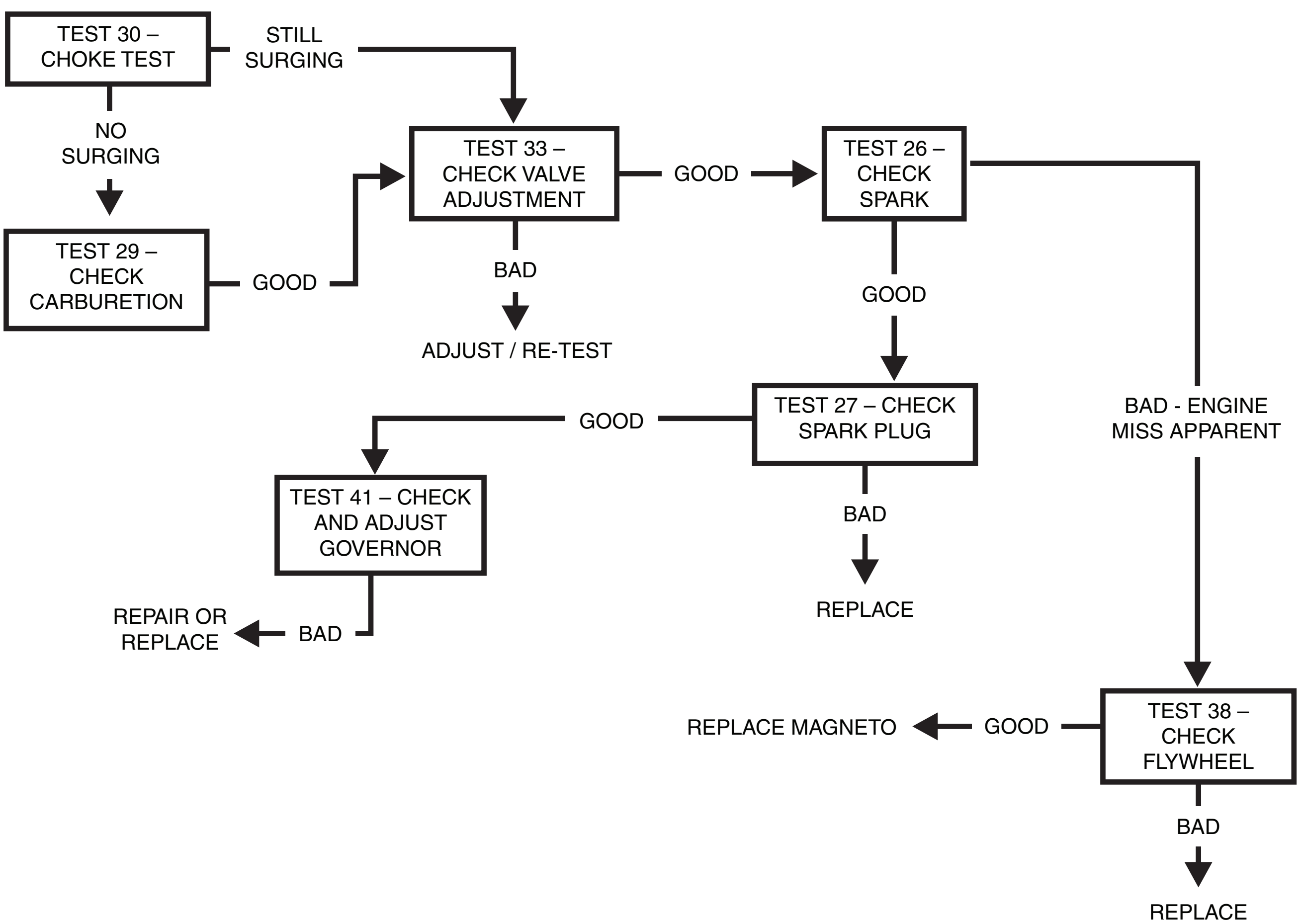


Problem 25 – Battery Will Not Charge



Problem 26 – Engine "Hunts" / Erratic Idle

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



TEST 20 – CHECK 1.5 AMP FUSE

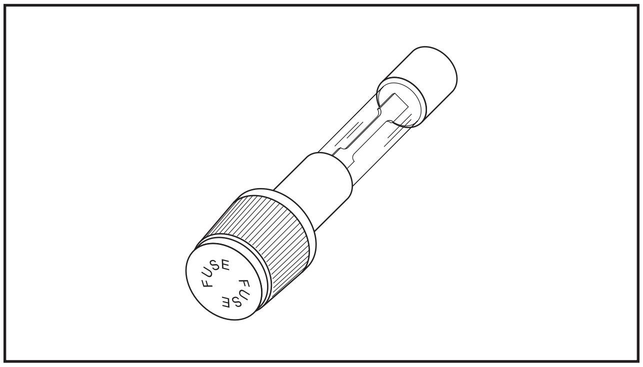


Figure 1. A Typical 1.5 Amp Fuse

DISCUSSION:
The fuse protects the wiring and the battery charger from a short circuit.

PROCEDURE:
Push in on fuse holder cap and turn counterclockwise. Then, remove the cap with fuse. Inspect the fuse.

RESULTS:
If the fuse element has melted open, replace the fuse with an identical size fuse. If fuse is good, refer back to flow chart.

TEST 21 – CHECK BATTERY & CABLES

PROCEDURE:
Inspect the battery cables and battery posts or terminals for corrosion or tightness. Measure the voltage at the terminal of the Starter Contactor and verify 11-12 volts DC is available to the generator during cranking. If voltage is below 11 volts DC, measure at the battery terminals during cranking. If battery voltage is below 11 volts DC, recharge/replace battery. If battery or cables are still suspected, connect an alternate battery and cables to the generator and retest.

RESULTS:
1. Clean battery posts and cables as necessary. Make sure battery cables are tight.
2. Recharge the battery, if necessary.
3. Replace the battery, if necessary.
4. If battery is good, but engine will not crank, refer back to Flow Charts.

TEST 22 – CHECK VOLTAGE AT STARTER CONTACTOR (SC)

PROCEDURE:
1. Set voltmeter to measure DC voltage.
2. Disconnect Wire 16 from the Starter Contactor located on the Starter motor.
3. Connect the positive meter test lead to Wire 16 previously removed. Connect the negative meter test lead to frame Ground.
4. Place the START-RUN-STOP Switch to START. 12 VDC should be measured.
5. Reconnect Wire 16 to the Starter Motor.

RESULTS:
Refer back to flow chart.

TEST 23 – CHECK START-RUN-STOP SWITCH

DISCUSSION:
The START-RUN-STOP switch utilizes ground potential to start and shutdown the engine. When the switch is actuated to the START position a ground is applied to the starter contactor where positive 12VDC is already available allowing the engine to crank. Once the ground is removed by putting the switch in the RUN position it disengages the starter allowing the engine to operate normally. When the switch is actuated to the STOP position a ground is applied to the magneto coils grounding them out and inhibiting spark from occurring.

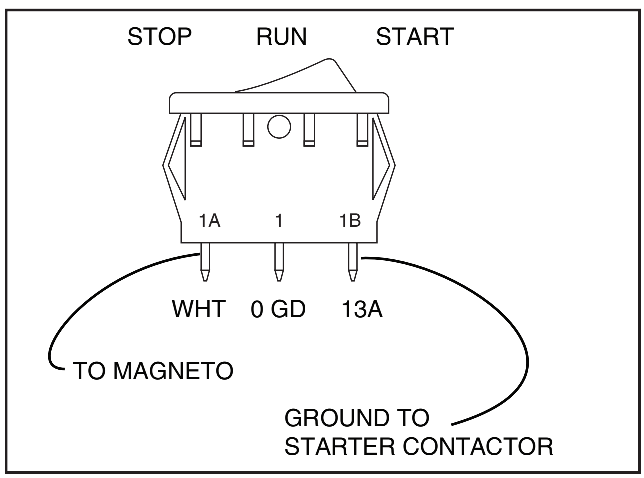


Figure 2. START-RUN-STOP Switch

PROCEDURE:
1. Set a voltmeter to measure resistance.
2. Remove all wires from the START-RUN-STOP Switch (SW1).

3. Connect one meter lead to Terminal 2 and connect the other meter lead to Terminal 1. Actuate switch to the 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 the 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. Reconnect all wires to the switch.

RESULTS:

1. If anything but the readings above were measured replace the START-RUN-STOP switch.
2. Refer back to flow chart.

TEST 24 – TEST OFF-ON SWITCH

DISCUSSION:

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

PROCEDURE:

1. Disconnect Point A from the switch harness (see Figure 3).
2. Connect one meter lead to the female side of the connector and connect other meter test lead to a clean frame ground.
3. Actuate the 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 the OFF-ON switch.
2. If OFF-ON switch is good, refer back to flow chart.

TEST 25 – CHECK STARTER MOTOR

The following conditions can affect starter motor performance:

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

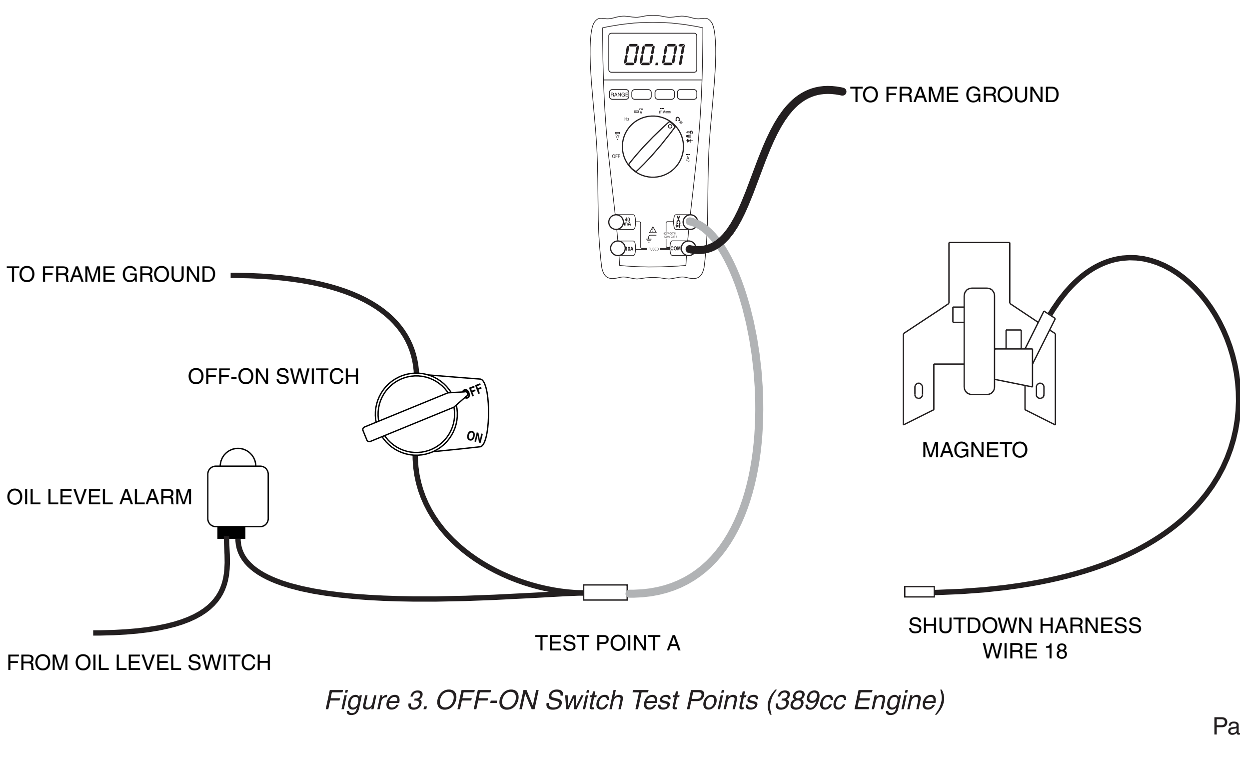


Figure 3. OFF-ON Switch Test Points (389cc Engine)

PROCEDURE:

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

Set a voltmeter to measure DC voltage (12 VDC). Connect the meter positive (+) test lead to the Starter Contactor stud which has the small jumper wire connected to the Starter. Connect the common (-) test lead to the Starter Motor frame.

Set the Start-Stop Switch to its START position and observe the meter. Meter should Indicate battery voltage, Starter Motor should operate and engine should crank.

RESULTS:

1. If battery voltage is indicated on the meter but Starter Motor did not operate, remove and bench test the Starter Motor (see following test).
2. If battery voltage was indicated and the Starter Motor tried to engage (pinion engaged), but engine did not crank, check for mechanical binding of the engine or rotor.

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 a good practice to check the engine for freedom of rotation by removing the spark plugs and turning the crankshaft over slowly by hand, to be sure it rotates freely.

WARNING!: 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.

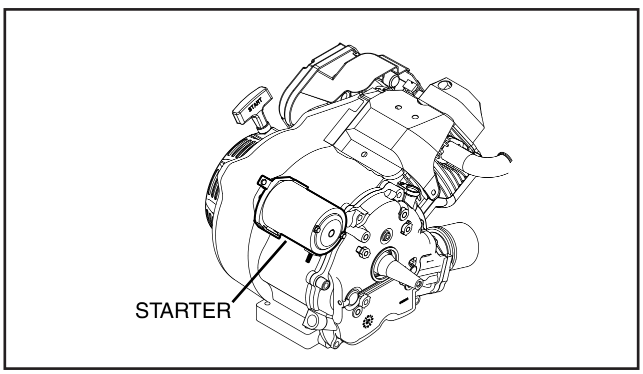


Figure 4. Starter Motor (SM)

CHECKING THE PINION:

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

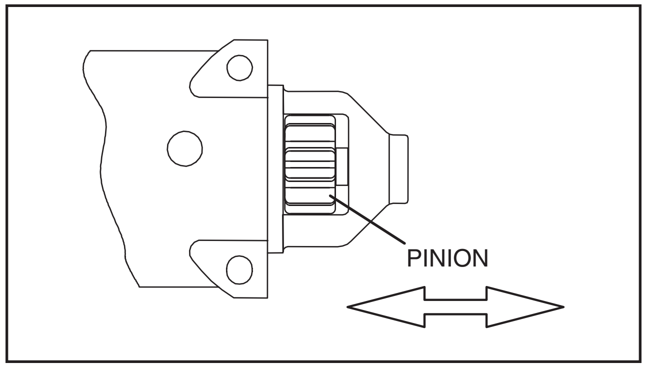


Figure 5. Check Pinion Gear Operation

TOOLS FOR STARTER PERFORMANCE TEST:

The following equipment may be used to complete a performance test of the Starter Motor:

- A clamp-on ammeter.
- A tachometer capable of reading up to 10,000 rpm.
- A fully charged 12 volt battery.

MEASURING CURRENT:

To read the current flow, in AMPERES, a clamp-on ammeter may be used. This type of meter indicates current flow through a conductor by measuring the strength of the magnetic field around that conductor.

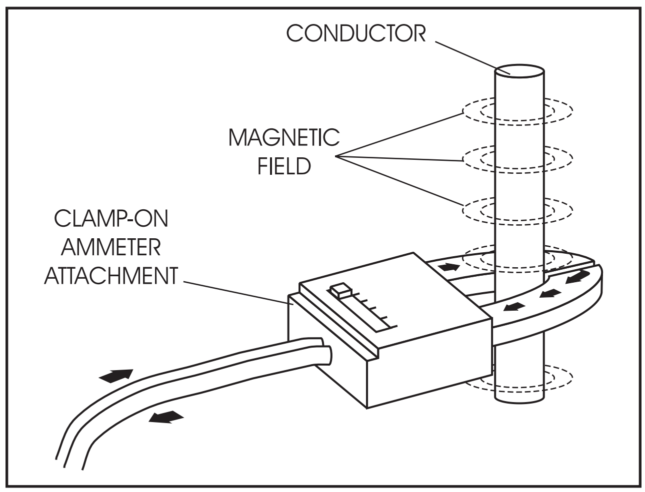


Figure 6. Clamp-On Ammeter

TACHOMETER:

A tachometer is available from your Generac Power Systems source of supply. Order as P/N 042223. The tachometer measures from 800 to 50,000 RPM (see Figure 7).

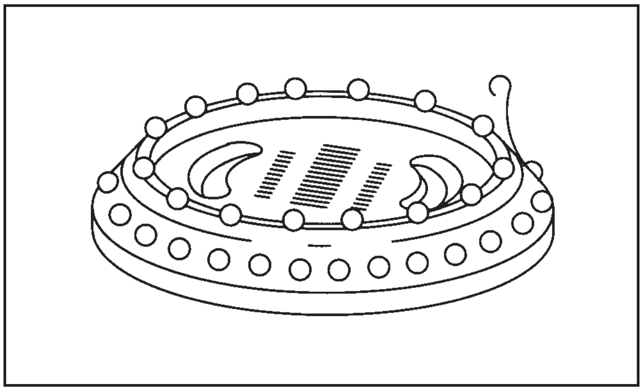


Figure 7. Tachometer

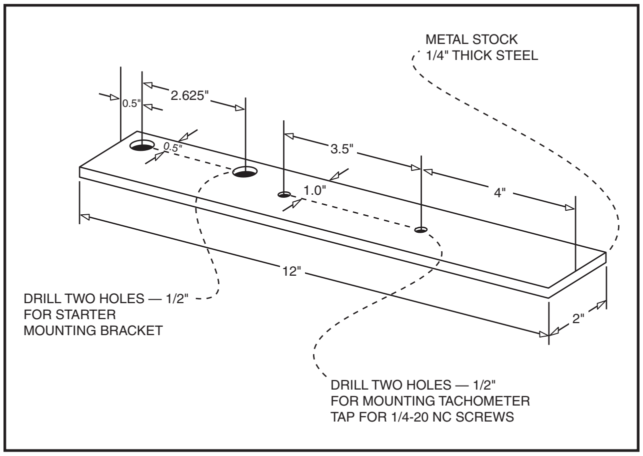


Figure 8. Test Bracket Dimensions

TEST BRACKET:

A starter motor test bracket may be made as shown in Figure 8.

REMOVE STARTER MOTOR:

It is recommended that the Starter Motor be removed from the engine when testing Starter Motor performance. Assemble starter to test bracket and clamp test bracket in vise (Figure 9).

TESTING STARTER MOTOR:

1. A fully charged 12 volt battery is required.
2. Connect jumper cables and clamp-on ammeter as shown in Figure 9.
3. With the Starter Motor activated (jump the terminal on the Starter Contactor to battery voltage), note the reading on the clamp-on ammeter and on the tachometer (rpm).

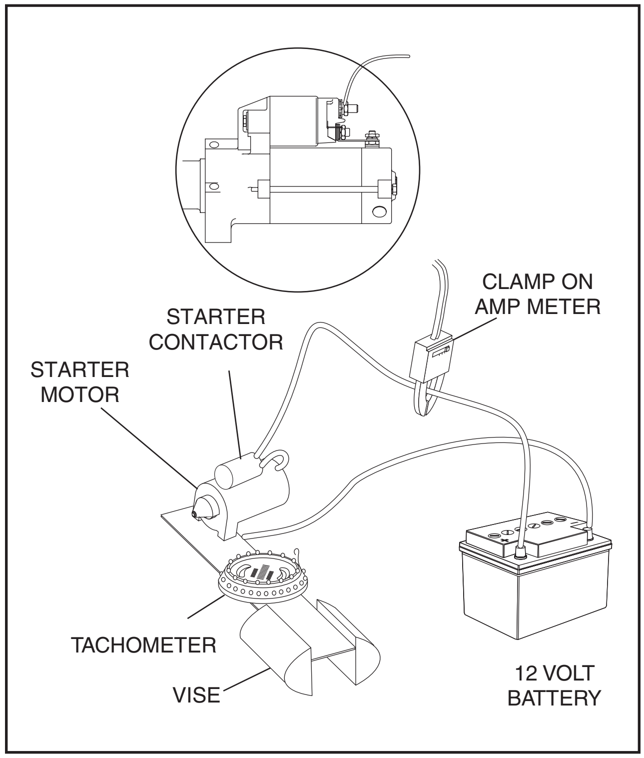


Figure 9. Testing Starter Motor Performance

Note: Take the reading after the ammeter and tachometer are stabilized, approximately 2-4 seconds.

4. A starter motor in good condition will be within the following specifications:

Minimum rpm	**4500**
Maximum Amps	**50**

Note: Nominal amp draw of starter in generator is 60 amps.

TEST 25 – CHECK IGNITION SPARK

PROCEDURE:

A commercially available spark tester may be used to test the engine ignition system. One can also be purchased from Generac Power Systems (Part No. 0C5969).

1. Disconnect the spark plug lead from a spark plug.
2. Attach the high tension lead to the spark tester terminal.
3. Ground the spark tester clamp by attaching to the cylinder head (see Figure 10).

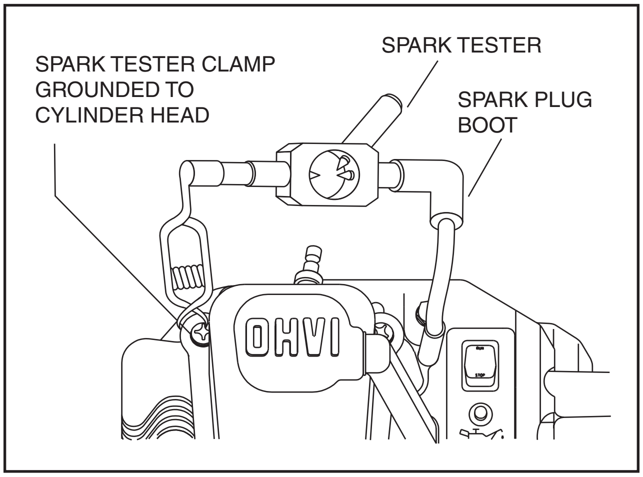


Figure 10. Testing Ignition System

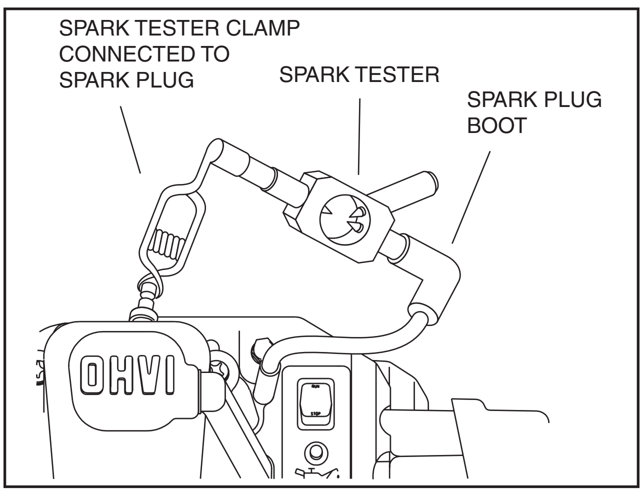


Figure 11. Checking Engine Miss

4. Crank the engine rapidly. Engine must be cranking at 350 rpm or more. If spark jumps the tester gap, you may assume the ignition system is working properly. Repeat on remaining cylinder spark plug.
5. If spark jumps the tester gap intermittently, the problem may be in the Ignition Magneto.

RESULTS:

Refer back to the Flow Chart

TEST 26 – CHECK SPARK PLUGS

PROCEDURE:

Remove spark plugs. Clean with a commercial solvent. DO NOT BLAST CLEAN SPARK PLUGS. Replace spark plugs if badly fouled, if ceramic is cracked, or if badly worn or damaged. Refer to specifications in the front of this manual for proper replacement spark plugs and spark plug gaps.

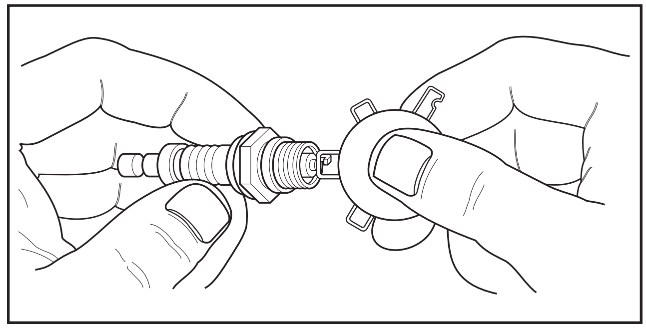


Figure 12. Setting Spark Plug Gap

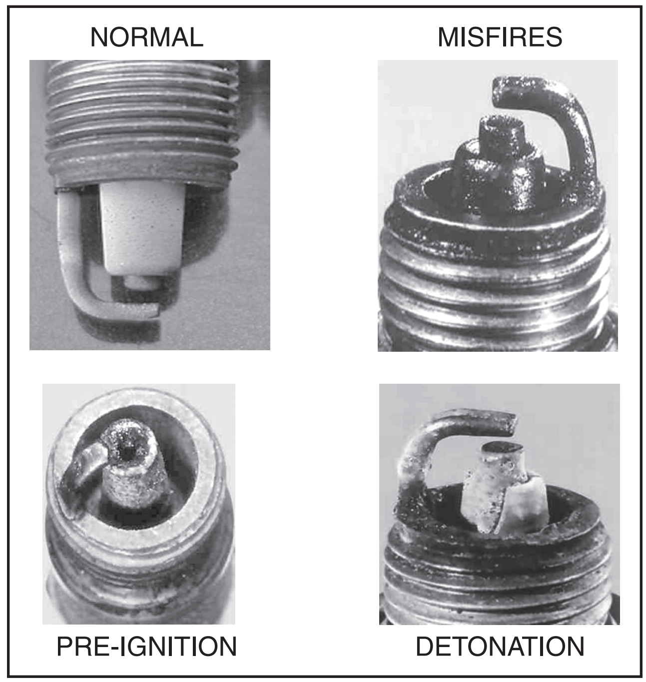


Figure 13. Spark Plug Conditions

RESULTS:

1. Clean and regap or replace sparks plug as necessary.
2. Refer back to the Flow Chart.

TEST 29 – CHECK CARBURETION

PROCEDURE:

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

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

Make sure the choke operates properly.

If the engine will not start, remove and inspect the spark plug. If the 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 the 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 the engine starts hard or will not start, look for the following:
- Physical damage to the AC generator. Check the Rotor for contact with the Stator.
- Starting under load. Make sure all loads are disconnected or turned off before attempting to crank and start the engine.
- Check that the choke is working properly.

1. Remove fuel line at carburetor and ensure that there is an adequate amount of fuel entering the carburetor.
2. Remove the float bowl and check to see if there is any foreign matter in bottom of carburetor bowl.
3. The float is plastic and can be removed for access to the needle so it can be cleaned.
4. With all of this removed, carburetor cleaner can be used to clean the rest of the carburetor before reassembly.
5. After cleaning the carburetor with an approved carburetor cleaner, blow dry with compressed air and reassemble.

Shelf life on gasoline is 30 days. Proper procedures need to be taken for carburetors so that the fuel doesn't varnish over time. A fuel stabilizer must be used at all times in order to ensure that the fuel is fresh at all times.

RESULTS:

If carburetor is varnished, clean or replace. Refer to back to Flow Chart.

TEST 30 – CHOKE TEST

PROCEDURE:

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

TEST 33 – 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 the engine at room temperature. The piston should be at top dead center (TDC) of its compression stroke (both valves closed).

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

Correct valve clearance is given below.

Engine	**Intake Valve**	**Exhaust Valve**
189/206cc	0.0039 inch	0.0059 inch
389cc	0.006 ±0.0008 inch	0.006 ±0.0008 inch
410cc	0.003-0.005 inch	0.003-0.005 inch

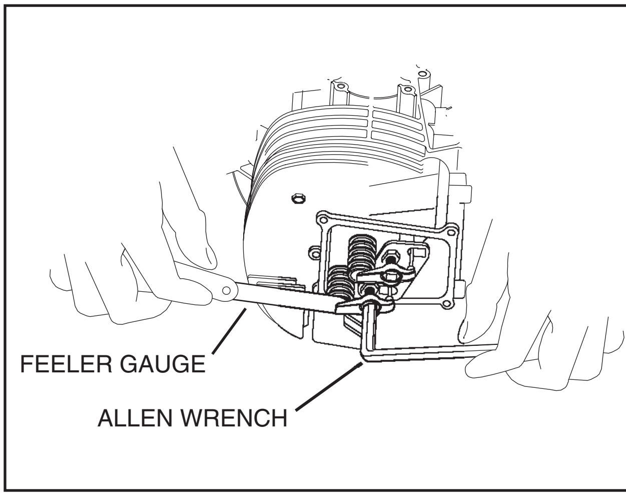


Figure 14. Adjusting Valve Clearance

1. Loosen the rocker arm jam nut. Turn the pivot ball stud while checking the clearance between the rocker arm and valve stem with a feeler gauge (see Figure 14).
2. When clearance is correct, hold the pivot ball stud with the allen wrench and tighten the rocker arm jam nut to the specified torque with a crow's foot. After tightening the jam nut, recheck valve clearance to make sure it did not change.

Rocker Arm Jam Nut	ft-lbs
189cc	7.48
206cc	7.48
389cc	9-12
410cc	14.01

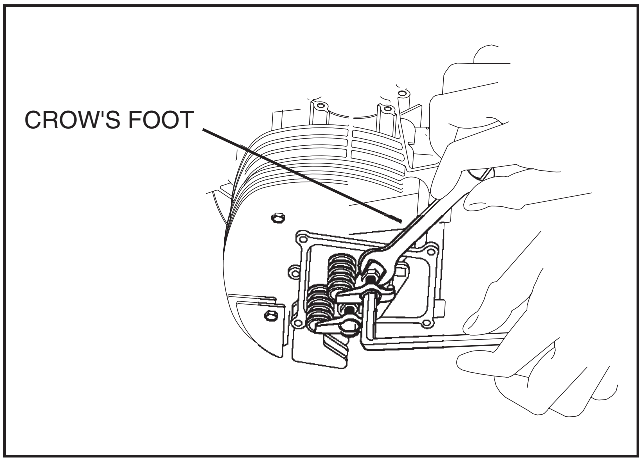


Figure 15. Tightening the Jam Nut

INSTALL ROCKER ARM COVER

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

RESULTS:

Adjust valves to specification and retest. If problem continues, refer to Flow Chart.

TEST 36 – CHECK ENGINE / CYLINDER LEAK DOWN TEST / COMPRESSION TEST

DISCUSSION:

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

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

DISCUSSION:

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

PROCEDURE:

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

RESULTS:

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

CHECK COMPRESSION:

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

MINIMUM ALLOWABLE COMPRESSION PRESSURE COLD ENGINE – 60 psi

If compression is poor, look for one or more of the following causes:

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

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

TEST 38 – CHECK FLYWHEEL

DISCUSSION:

In Test 25, a spark tester was used to check for engine ignition. If sparking or weak spark occurred, one possible cause might be the ignition magneto. This test will check the magnetism of the flywheel and will check the flywheel key.

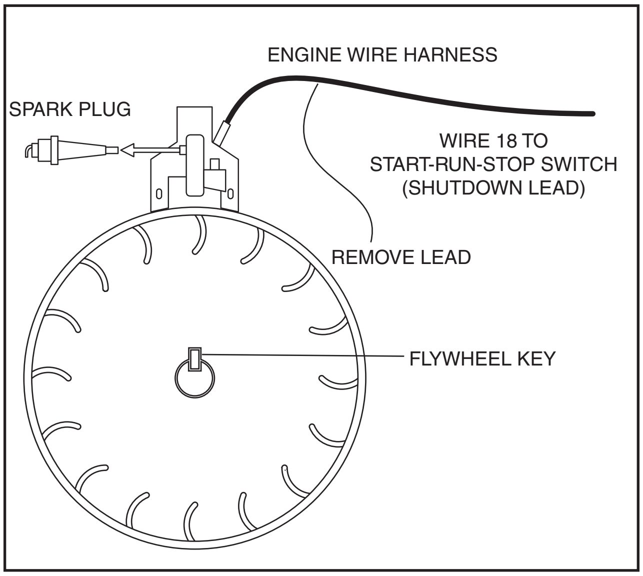


Figure 16. Engine Ground Harness

PROCEDURE:

1. Check the flywheel magnet by holding a screwdriver at the extreme end of its handle and with its point down. When the tip of the screwdriver is moved to within 3/4 inch (19mm) of the magnet, the blade should be pulled in against the magnet.
2. For rough running or hard starting engines check the 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 the flywheel key becomes sheared or even partially sheared, ignition timing can change. Incorrect timing can result in hard starting or failure to start.

TEST 39 – REMOVE WIRE 18 / SHUTDOWN LEAD

DISCUSSION:

Wire 18 on all engines is used to shutdown the unit when either the switch is placed in the OFF position or a low oil condition has occurred. A ground is applied to the magneto in both instances which will inhibit spark and shutdown the 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.

Note: The shutdown lead on units with the 389cc engine will not be identified as Wire 18. Refer to Figure 18 for identification of location.

PROCEDURE:

1. Turn off the fuel supply
2. Remove the flywheel cover so that the magneto is exposed.
3. Disconnect Wire 18 from the magneto.
4. Repeat Test 25, "Check Ignition Spark."

RESULTS:

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

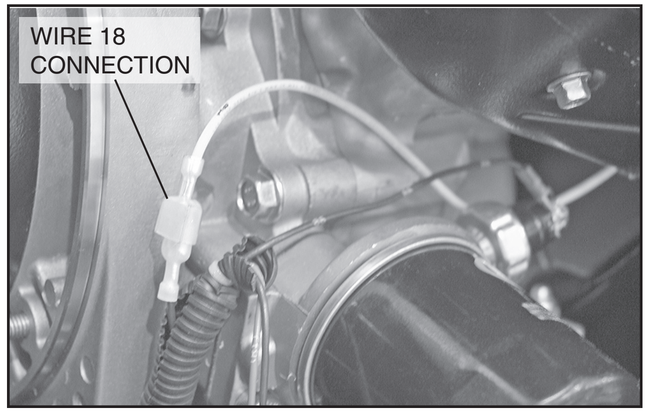


Figure 17. Wire 18 (410cc Engine)

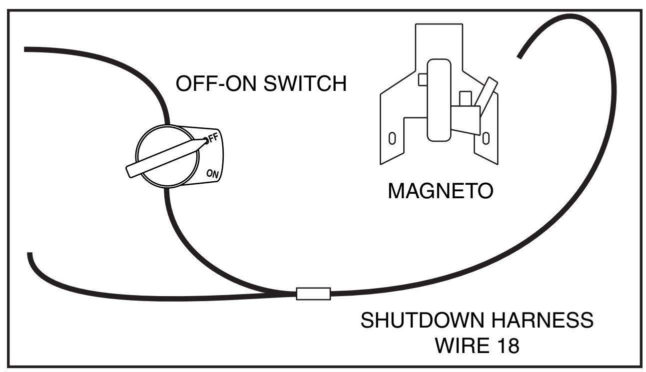


Figure 18. Shutdown Lead (389cc Engine)

TEST 40 – CHECK / ADJUST GOVERNOR (389/206/163cc ENGINES)

INITIAL ADJUSTMENT:

1. Loosen the governor lever clamp bolt (See Figure 19).
2. While holding the governor lever in its full "INC. RPM" position, rotate the governor shaft counter clockwise as far as it will go.

Note: The governor shaft will only turn approximately 20 degrees from a full clockwise position. Do not apply excessive torque to the governor shaft.

3. Tighten the governor lever clamp bolt to 110 inch-pounds.

RUNNING ADJUSTMENT:

After completing the initial adjustment, final adjustment is accomplished with the engine running under no-load.

1. Turn the speed adjustment screw counter clockwise three full turns to avoid a possible engine overspeed condition.
2. Start the engine and let it warm up and stabilize under no-load.
3. Connect an AC frequency meter to one of the AC output receptacles. No-load frequency should be between 62.0 - 62.5 hertz.
4. If the frequency/RPM are incorrect, turn the speed adjust screw until frequency/RPM is within limits. Turn clockwise to increase frequency/RPM, counter clockwise to decrease the frequency/RPM (see Figure 19).
5. After adjustment is complete add a drop of removable loctite (Loctite 241) to the threads of the speed adjust screw (see Figure 19).

TEST 41 – CHECK / ADJUST GOVERNOR (410cc ENGINE)

DISCUSSION:

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 generator is equipped with a “voltage over frequency” type AC voltage regulator. The units 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

1. Loosen the governor clamp bolt (Figure 20).
2. Hold the governor lever at its wide open throttle position, and rotate the governor shaft clockwise as far as it will go. Then, tighten the governor lever clamp bolt to 70 inch-pounds (8 Nm).
3. Start the generator; let it stabilize and warm up at no-load.

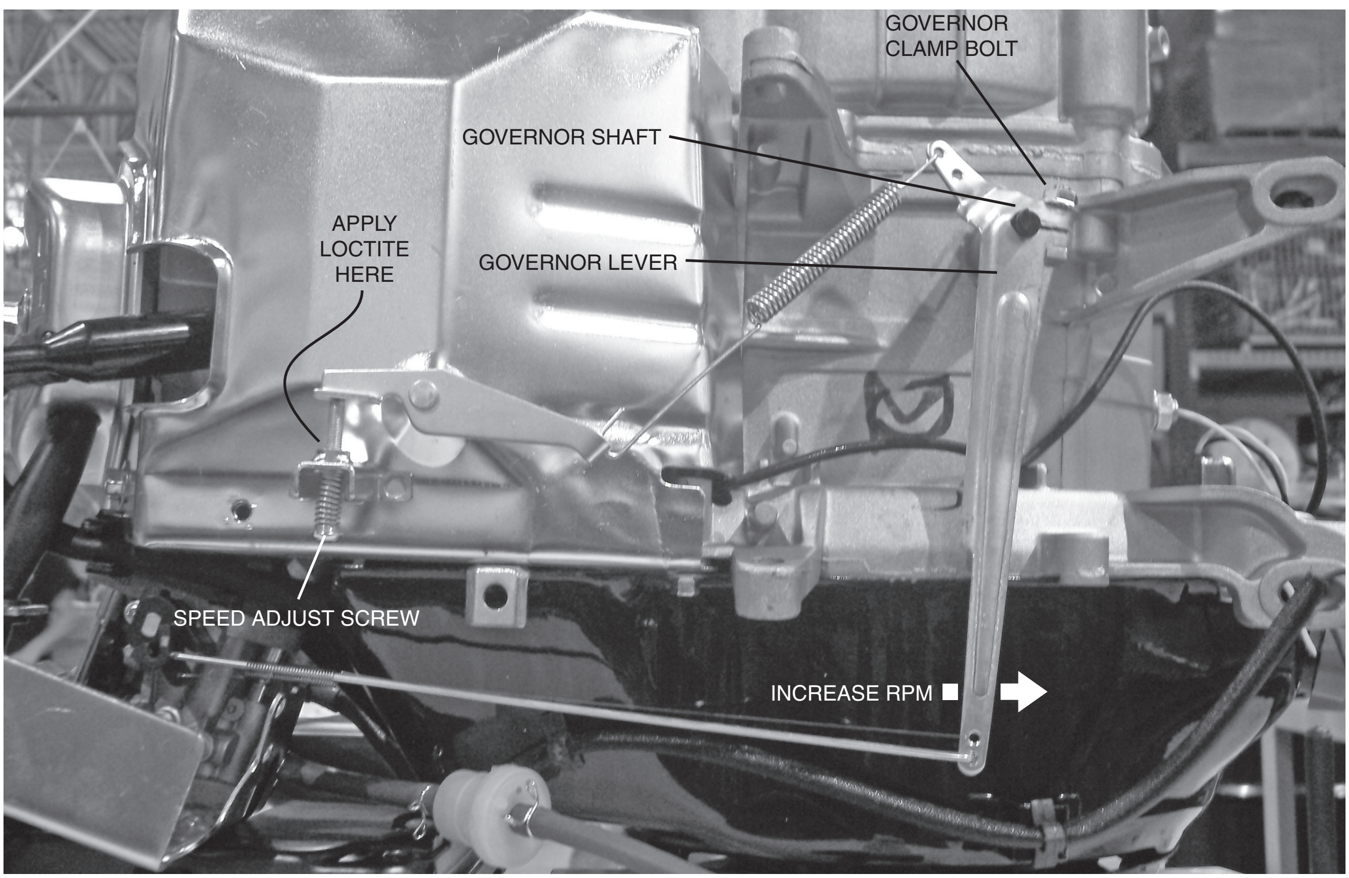


Figure 19. Governor Adjustment Points (389cc Engine)

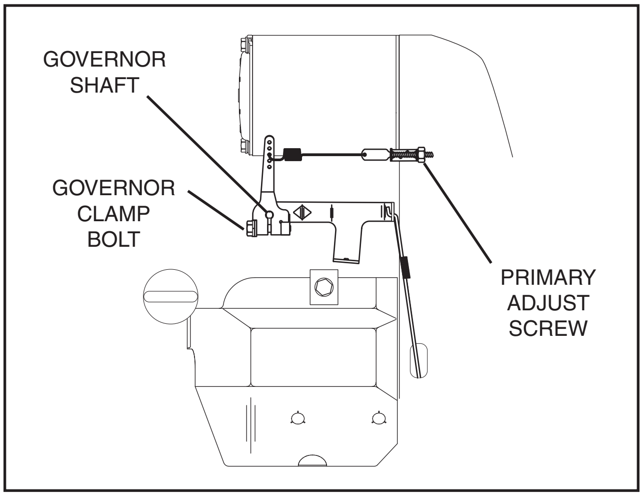


Figure 20. Engine Governor Adjustment (410cc Engine)

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

RESULTS:

1. If, after adjusting the engine governor, frequency and voltage are good, tests may be discontinued.
2. If frequency is now good, but voltage is high or low, refer back 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.
4. If engine appears to run rough and results in low frequency, proceed to Problem 26 Flow Chart.

TEST 45 – CHECK OIL LEVEL SWITCH

DISCUSSION:

The 389cc engine does not utilize oil pressure to lubricate the internal components. It utilizes a splash type lubrication system. The switch should be normally open as long as the engine is filled with oil. The switch will close when the oil level drops to low the switch will close and ground out the magnetos inhibiting spark until the oil level is raised.

PROCEDURE:

1. Verify that the oil level is full.
2. Refer to Figure 3 in Section 3.3. Unplug the wire from the oil level switch.
3. Set VOM to measure resistance.
4. Connect one meter test lead to the previously disconnect wire coming from the oil level switch. Connect the other meter test lead to frame ground. INFINITY should be measured.

RESULTS:

1. A reading of CONTINUITY indicates that the switch is no longer functioning and will need to be replaced.

TEST 46 – CHECK OIL PRESSURE SWITCH

If the engine cranks and starts, then shuts down almost immediately, the cause may be one or more of the following:

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

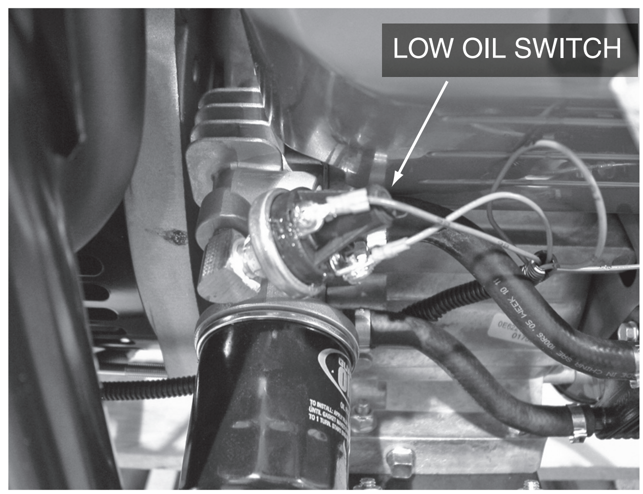


Figure 21. Low Oil Pressure Switch

PROCEDURE:

1. Check engine crankcase oil level.
   a. Check engine oil level.
   b. If necessary, add the recommended oil to the dipstick FULL mark. DO NOT OVERFILL ABOVE THE FULL MARK.
2. Do the following:
   a. Disconnect Wire 86 and Wire 0 from the oil pressure switch terminals. Remove the switch and install an oil pressure gauge in its place.
   b. Start the engine while observing the oil pressure reading on gauge.
   c. Note the oil pressure.
      (1) Normal oil pressure is approximately 35-40 psi with engine running. If normal oil pressure is indicated, go to Step 4 of this test.

(2) If oil pressure is below about 10 psi, shut engine down immediately. A problem exists in the 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 the oil pressure gauge and reinstall the oil pressure switch. Do NOT connect Wire 86 or Wire 0 to the switch terminals.
   a. Set a voltmeter to measure resistance.
   b. Connect the meter test leads across the switch terminals. With engine shut down, the meter should read CONTINUITY.
   c. Crank and start the 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 the engine mount.
4. If the LOP switch tests good in Step 3 and oil pressure is good in Step 2, but the unit still shuts down with a LOP fault, check all wiring connections between the START-STOP-RUN switch and the LOP pressure module and the 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 the respective wire.

RESULTS:

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

TEST 49 – TEST RECOIL FUNCTION

PROCEDURE:

1. Attempt to pull start the engine and make the following observations while doing so.
   a. Does the cord pull easily and smoothly?
   b. Does the cord return with no assistance?
   c. Does the engine turn over as the cord is pulled?

RESULTS:

If the recoil did not perform as the observations are stated above, possible problems that could be present are:

- On the 410cc engine the compression release valve could be broken.
- The engine could be seized.
- The recoil could have become detached from the flywheel.
- The recoil mechanism could be broken and not to properly retracting back into the engine.

TEST 50 – TEST ENGINE FUNCTION

PROCEDURE:

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

RESULTS:

1. If the engine can not turn over freely with the spark plug removed, the engine has suffered some type of internal failure that has seized it and is inhibiting it from running.
2. Refer back to flow chart.

PART 4
DISASSEMBLY

TABLE OF CONTENTS

GP Series Portable Generators

MAJOR DISASSEMBLY

DISCUSSION.

Each generator will have its own unique method of disassembly. Provided 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. All of the GP series generators have these major components and the order of disassembly would not change.

An exploded view of each GP Series generator model is provided on the following pages.

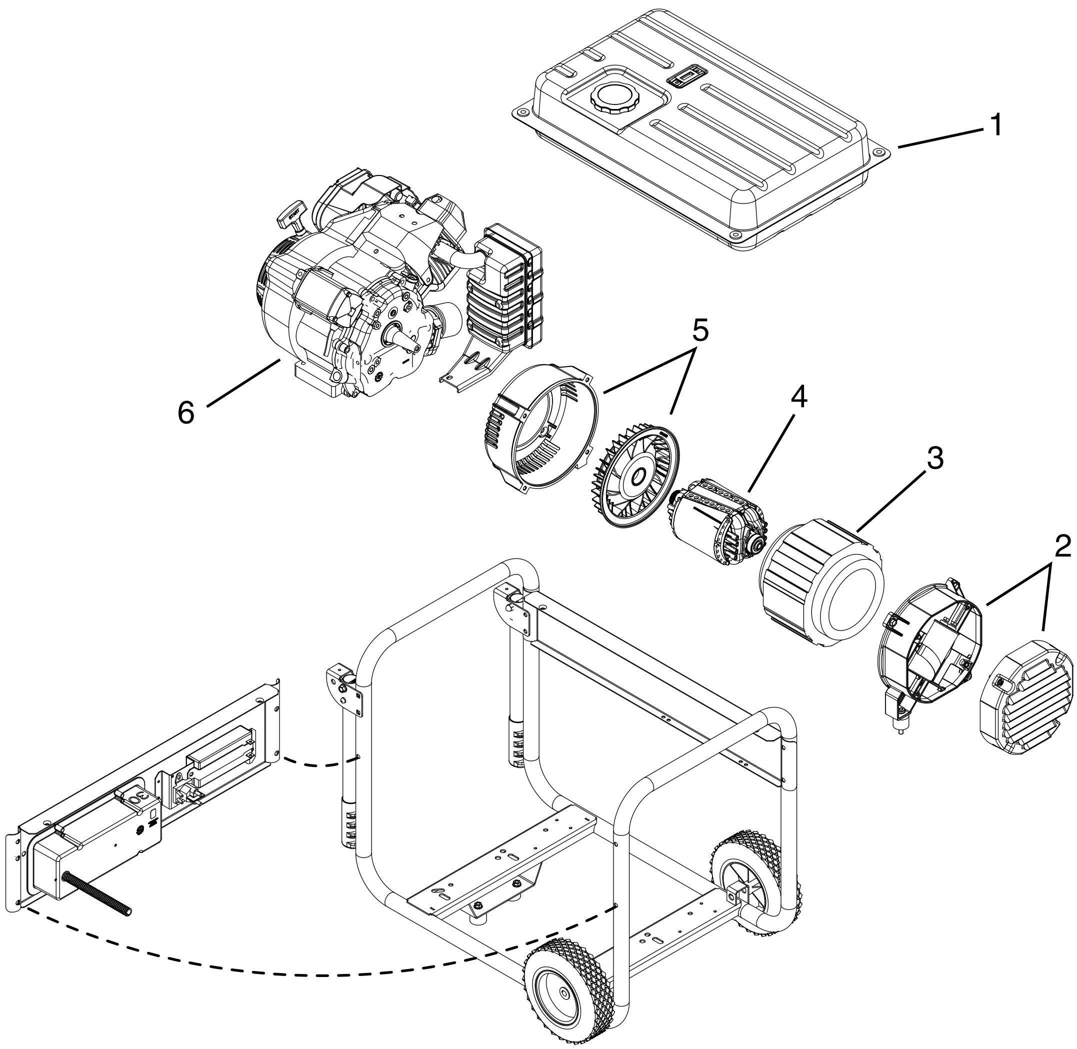
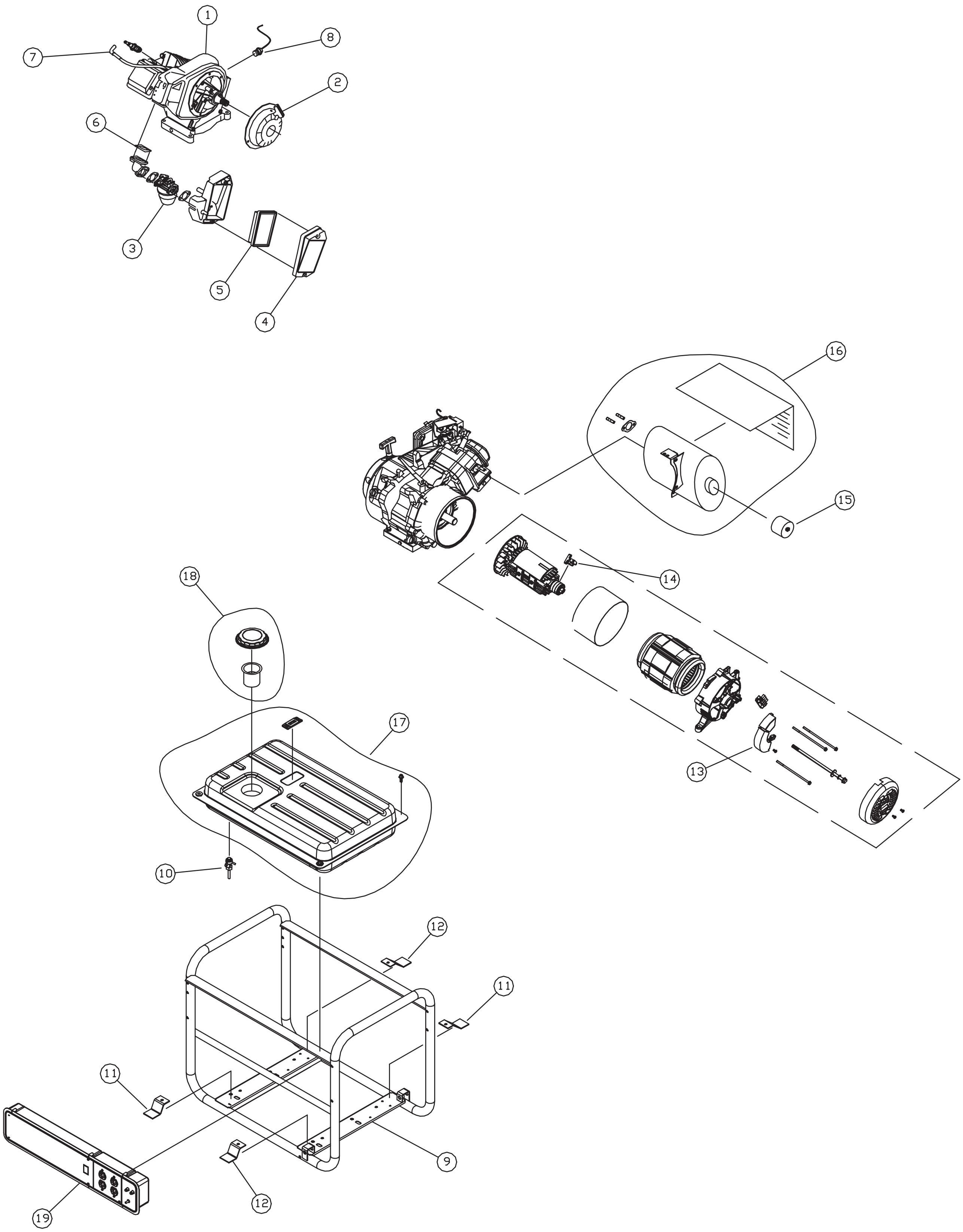


Figure 1. Basic Disassembly Steps

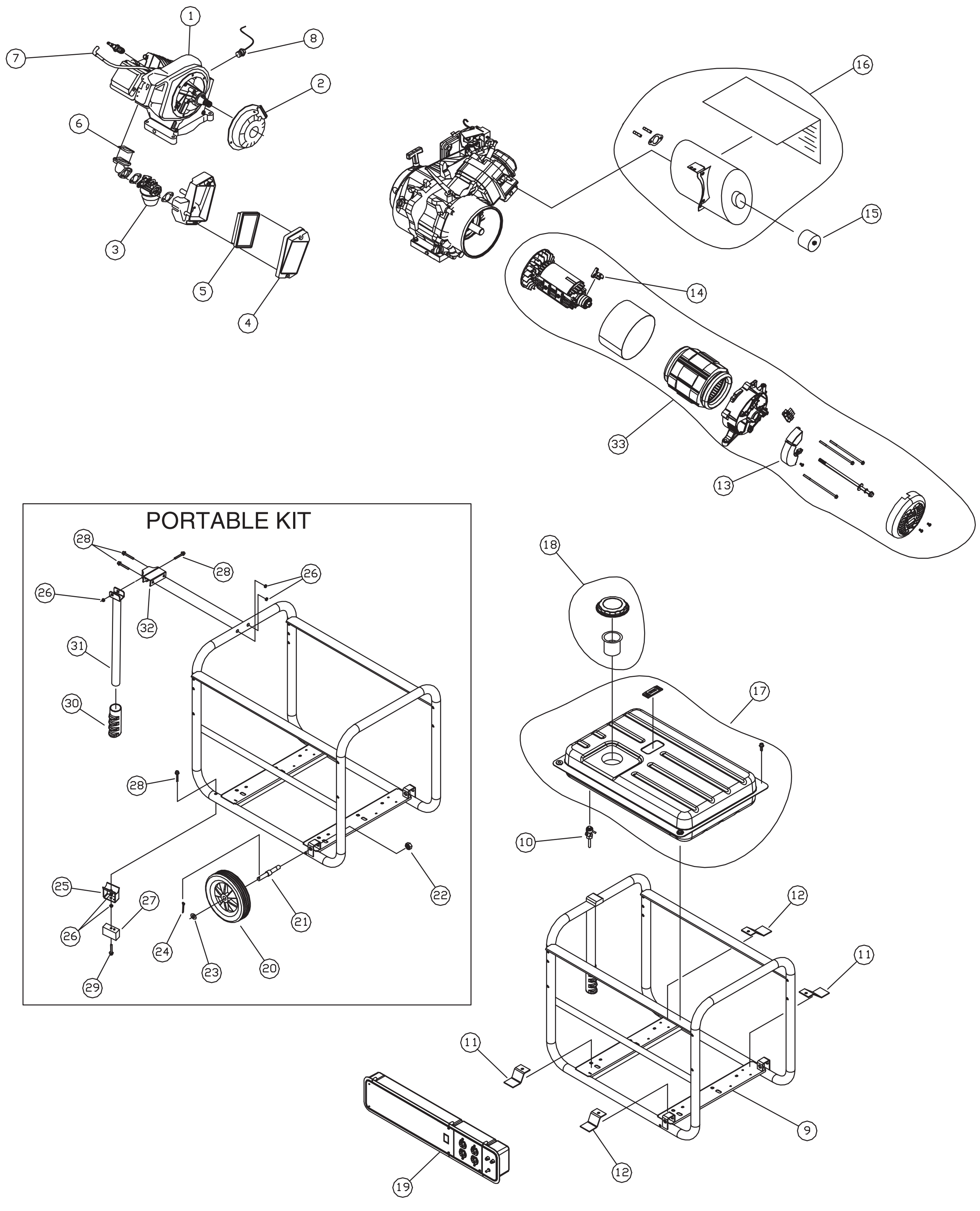
Exploded View – GP1800 – Drawing No. 0H0609-A



ITEM	QTY.	DESCRIPTION
1	1	ENGINE, 196CC
2	1	RECOIL ASSEMBLY
3	1	CARBURETOR
4	1	AIR CLEANER COVER
5	1	AIR FILTER
6	3	CARBURETOR GASKET
7	1	SPARK PLUG BOOT
8	1	OIL LEVEL SENSOR
9	1	FRAME, 1800W
10	1	FUEL SHUTOFF VALVE
11	2	VIBRATION MOUNT, #1
12	2	VIBRATION MOUNT, #2
13	1	AVR
14	1	BRUSH ASSEMBLY
15	1	SPARK ARRESTOR
16	1	MUFFLER ASSEMBLY
17	1	FUEL TANK ASSEMBLY
18	1	FUEL TANK CAP ASSEMBLY
19	1	CONTROL PANEL ASSEMBLY
20	1	ASSEMBLY, ALTERNATOR 1800W

ITEM	QTY.	DESCRIPTION

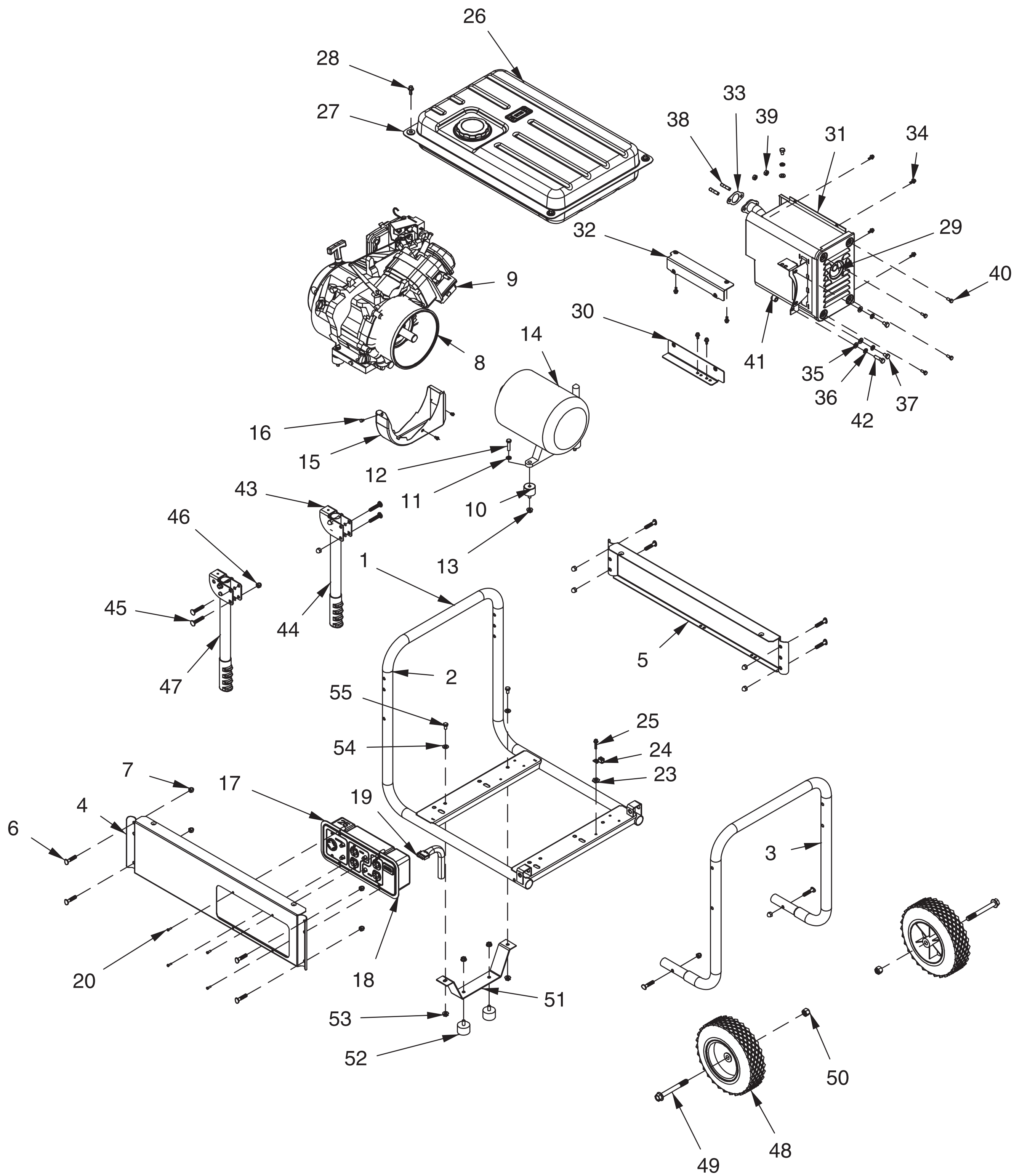
Exploded View – GP3250 – Drawing No. 0H0522-C



ITEM	QTY.	DESCRIPTION
1	1	ENGINE, 208CC
2	1	RECOIL ASSEMBLY
3	1	CARBURETOR
4	1	AIR CLEANER COVER
5	1	AIR FILTER
6	3	CARBURETOR GASKET
7	1	SPARK PLUG BOOT
8	1	OIL LEVEL SENSOR
9	1	FRAME, 3250W
10	1	FUEL SHUTOFF VALVE
11	2	VIBRATION MOUNT, #1
12	2	VIBRATION MOUNT, #2
13	1	AVR
14	1	BRUSH ASSEMBLY
15	1	SPARK ARRESTOR
16	1	MUFFLER ASSEMBLY
17	1	FUEL TANK ASSEMBLY
18	1	FUEL TANK CAP ASSEMBLY
19	1	CONTROL PANEL ASSEMBLY
20	2	WHEEL, 7” DIAMETER 3250W
21	2	WHEEL AXLE M12-1.75 THREADS
22	2	NUT, AXLE M12-1.75
23	2	WASHER, FLAT M12
24	2	COTTER PIN
25	2	BUMPER BRACKET 3250W
26	7	NUT, FLANGE M6-1.0
27	2	RUBBER BUMPER, 3250W

ITEM	QTY.	DESCRIPTION
28	5	BOLT, FLANGE M6-1.0 X 40
29	2	BOLT, FLANGE M6-1.0 X 16
30	1	RUBBER GRIP, HANDLE 3250W
31	1	HANDLE, PORTABLE 3250W
32	1	ASSY, HANDLE BRACKET 3250W
33	1	ASSEMBLY, ALTERNATOR BRUSH TYPE 3250W

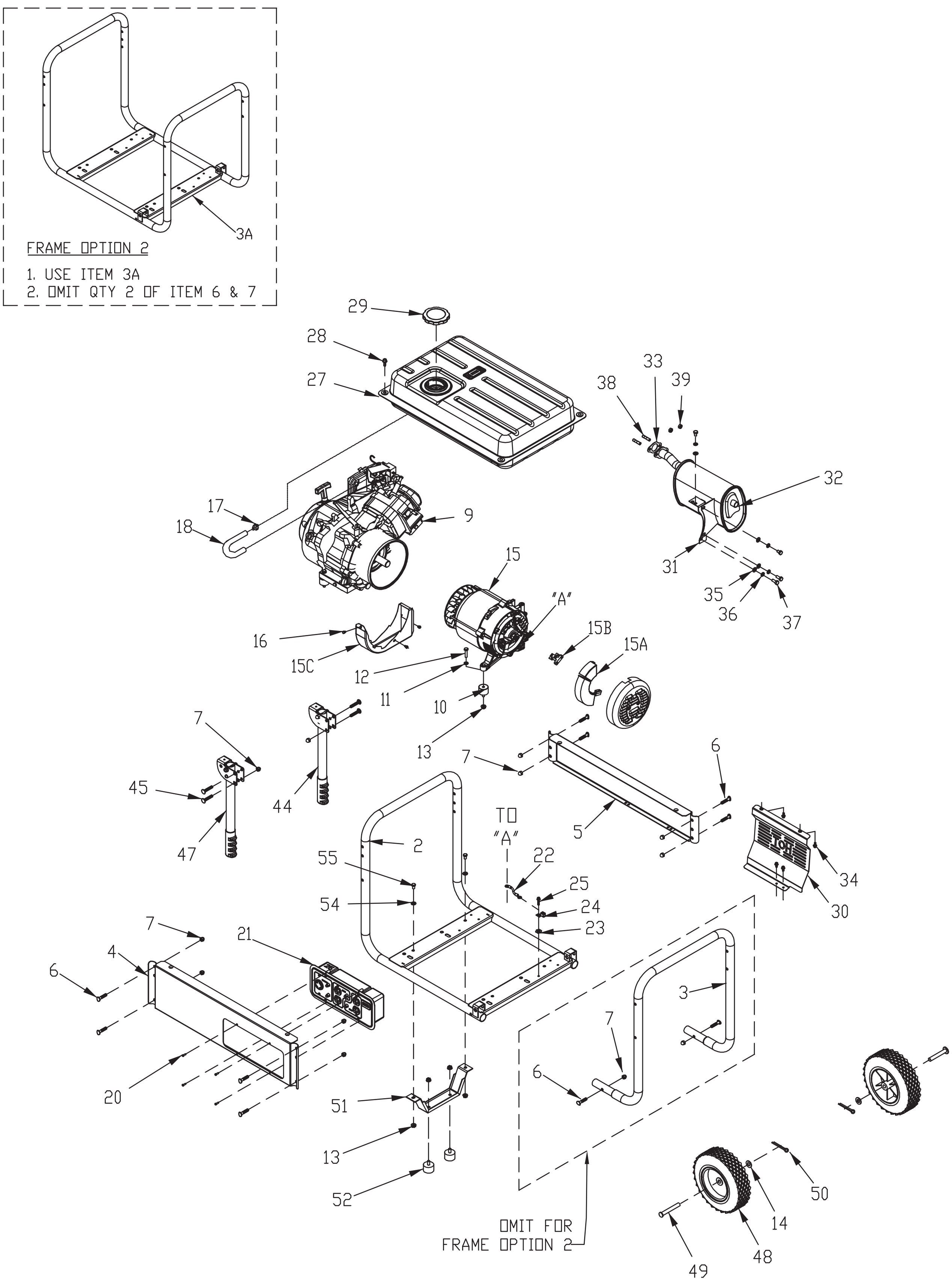
Exploded View – GP5000 – Drawing No. 0G9384A-C



ITEM	QTY.	DESCRIPTION
1	1	FRAME PARTS
2	1	ASSY CRADLE BASE
3	1	CRADLE END
4	1	PANEL RAIL
5	1	BACK RAIL
6	10	CURVED HEAD BOLT 5/16-18 x 1.625" LONG
7	10	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
8	1	ENGINE/ALT PARTS
9	1	ENGINE, 389cc W/O MUFFLER
10	4	VIB MOUNT RUBBER 1.38 x 1.0 x 5/16-18 MALE/FEMALE
11	4	WASHER LOCK M8-5/16
12	4	SCREW HHC 5/16-18 x 1-1/4 G5
13	4	NUT LOCK FLG 5/16-18
14	1	ALTERNATOR 6500W METRIC TAPER SHAFT
15	1	SCROLL, ALTERNATOR, SKU
16	3	SCREW HHC M5-0.8 x 8 PC8.8
17	1	ELECTRICAL PARTS
18	1	ASSY RCP PANEL 30A RD NOHR MTR
19	1	ASSY POWER LEADS
20	4	SCREW PPPH #8-16 x 1/2" BZC
21	1	ASSY GND WIRE PNL TO ALT
22	1	ASSY GND WIRE ALT TO BASE
23	1	WASHER LOCK SPECIAL 1/4"
24	1	LUG SLDLSS #2-#8 x 17/64 CU
25	1	SCREW HHTT M6-1.0 x 25
26	1	FUEL TANK PARTS 6.6GL
27	1	FUEL TANK ASSY 6.6 GAL
28	4	SCREW HHTT M8-1.25 x 20

ITEM	QTY.	DESCRIPTION
29	1	EXHAUST PARTS
30	1	BRACKET, MUFFLER SHIELD, BOTTOM
31	1	ASSY MUFFLER, 389cc
32	1	BRACKET, MUFFLER SHIELD TOP
33	1	GASKET, EXHUAST. 389cc
34	8	SCREW HHTT M6-1.0 x 12
35	4	WASHER FLAT 5/16-M8 ZINC
36	4	WASHER LOCK M8-5/16
37	4	SCREW HHC M8-1.25 x 12 G8.8 FT
38	2	STUD M8-125 x 35 G5 ZINC
39	2	HEX NUT M8-1.25 G8 CLEAR ZINC
40	4	SCREW HHC M6-1.0 x 16 C8.8
41	1	SPACER .34 x .62 x .590 ST/ZNC
42	1	SCREW HHC M8-1.25 x 30 C8.8
43	1	ACCESSORY KIT
44	1	ASSY HANDLE LH
45	4	CARRIAGE HEAD BOLT 5/16-18 x 1.75" LONG
46	2	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
47	1	ASSY HANDLE RH
48	2	TIRE 9.5" DIA RUN FLAT PLASTIC HUB/ RUBBER TREAD
49	2	SCREW HHFC 1/2-13 x 4.5 ZBC
50	2	NUT LOCK HEX 1/2-13 NYL INS
51	1	FRAME, BENT, FOOT BLACK 03
52	2	RUBBER FOOT
53	4	NUT LOCK FLG 5/16-18
54	2	WASHER FLAT 5/16-M8 ZINC
55	2	SCREW HHC 5/16-18 x 1/2 G5

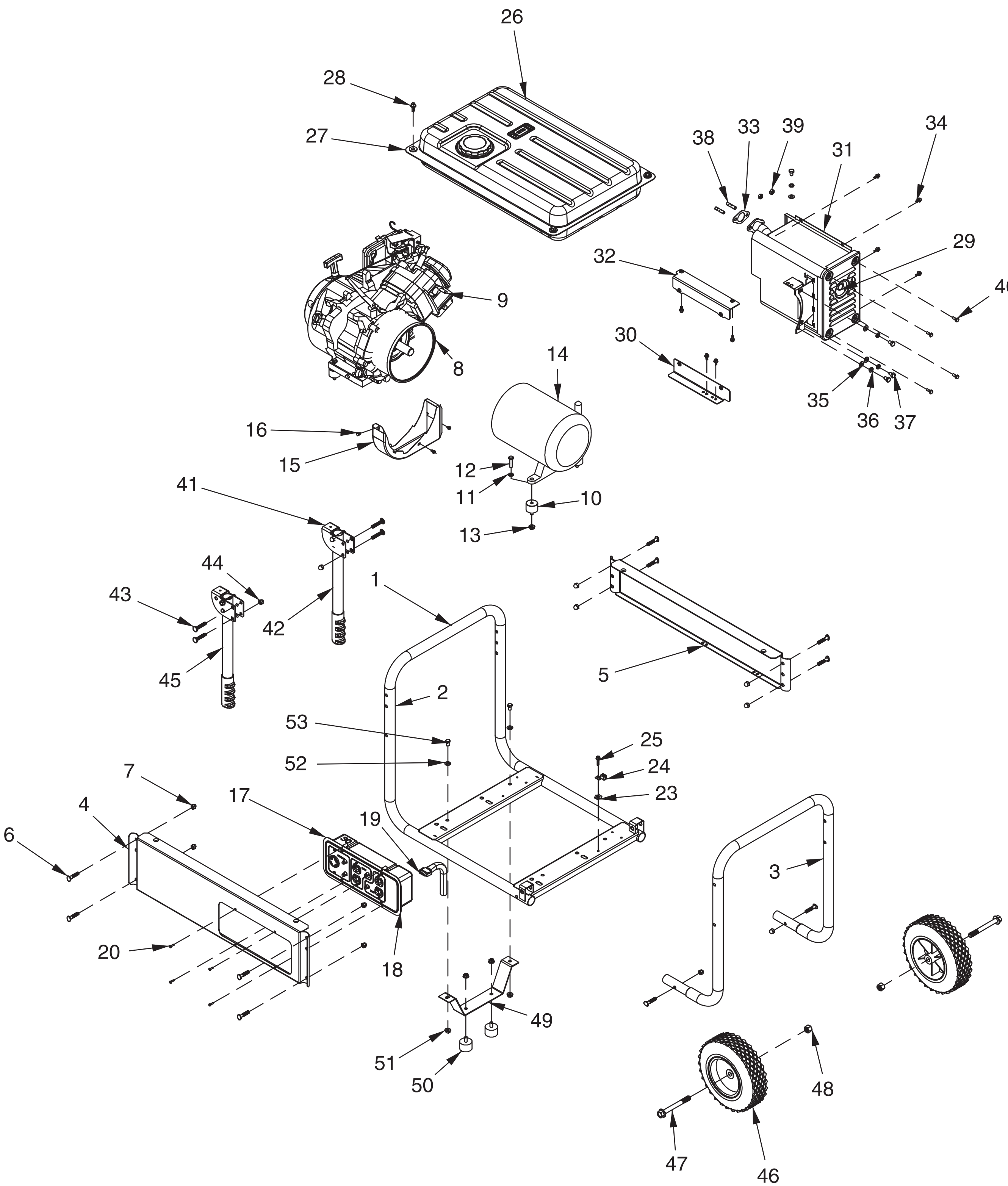
Exploded View – GP5500 – Drawing No. 0H1253-A



ITEM	QTY.	DESCRIPTION
2	1	ASSY CRADLE BASE
3	1	CRADLE END
3A	1	ASSEMBLY, FRAME 1 PIECE
4	1	PANEL RAIL
5	1	BACK RAIL
6	10	CURVED HEAD BOLT M8-1.25 X 42MM
7	11	CAP NUT LOCKING M8-1.25
9	1	ENGINE, 389cc W /0 MUFFLER
10	4	VIB MOUNT RUBBER 35MM X 25.4 X M8-1.25
11	4	WASHER LOCK M8-5/16
12	4	SCREW HHC M8-1.25 X 30
13	8	NUT LOCK FLG M8-1.25
14	2	WASHER FLAT 13mm
15	1	ALTERNATOR
15A	*	AVR
15B	*	BRUSH-ALTERNATOR
15C	1	SCROLL, ALTERNATOR, SKU
16	3	SCREW HHC M5-0.8 X 8 PC8.8
17	1	CLAMP HOSE .38-.87
18	1	FUEL HOSE, 4 ID, 8.5 OD X 120MM
20	4	SCREW PPPH #8-16 X 1/2" BZC
21	1	ASSY RCP PANEL 25A RD W/HR MTR
22	1	ASSY GND WIRE ALT TO BASE
23	1	WASHER LOCK SPECIAL 1/4"
24	1	LUG SLDLSS #2-#8 X 17/64 CU

ITEM	QTY.	DESCRIPTION
25	1	SCREW HHTT M6-1.0 X 25
27	1	FUEL TANK ASSY 6.6 GAL PORTABLE
28	4	SCREW HHTT M8-1.25 X 20
29	1	FUEL CAP, VENTED
30	1	SHIELD, HEAT, SKU
31	1	BRACKET, MUFFLER 389CC
32	1	MUFFLER, 389CC
33	1	GASKET, EXHAUST 389CC
34	4	SCREW HHTT M6-1.0 X 12
35	4	WASHER FLAT 5/16-M8 ZINC
36	4	WASHER LOCK M8-5/16
37	4	SCREW HHC MB-1.25 X 20 G8.8 FT
38	2	STUD M8-1.25 X 35 G5 ZINC
39	2	HEX NUT M8-1.25 G8 CLEAR ZINC
44	1	ASSY HANDLE LH
45	4	CARRIAGE HEAD BOLT M8-1.25 X 46mm LONG
47	1	ASSY HANDLE RH
48	2	TIRE 9,5" DIA RUN FLAT PLASTIC HUB/ RUBBER TREAD
49	2	AXLE PIN, 1/2" X 4", 3/4" HEAD
50	2	COTTER PIN, 1/8" X 1 1/4" ZN PLT
51	1	FRAME, BENT, FOOT
52	2	RUBBER FOOT, M8-1.25
54	2	WASHER FLAT 5/16-M8 ZINC
55	2	SCREW HHC M8-1.25 X 15

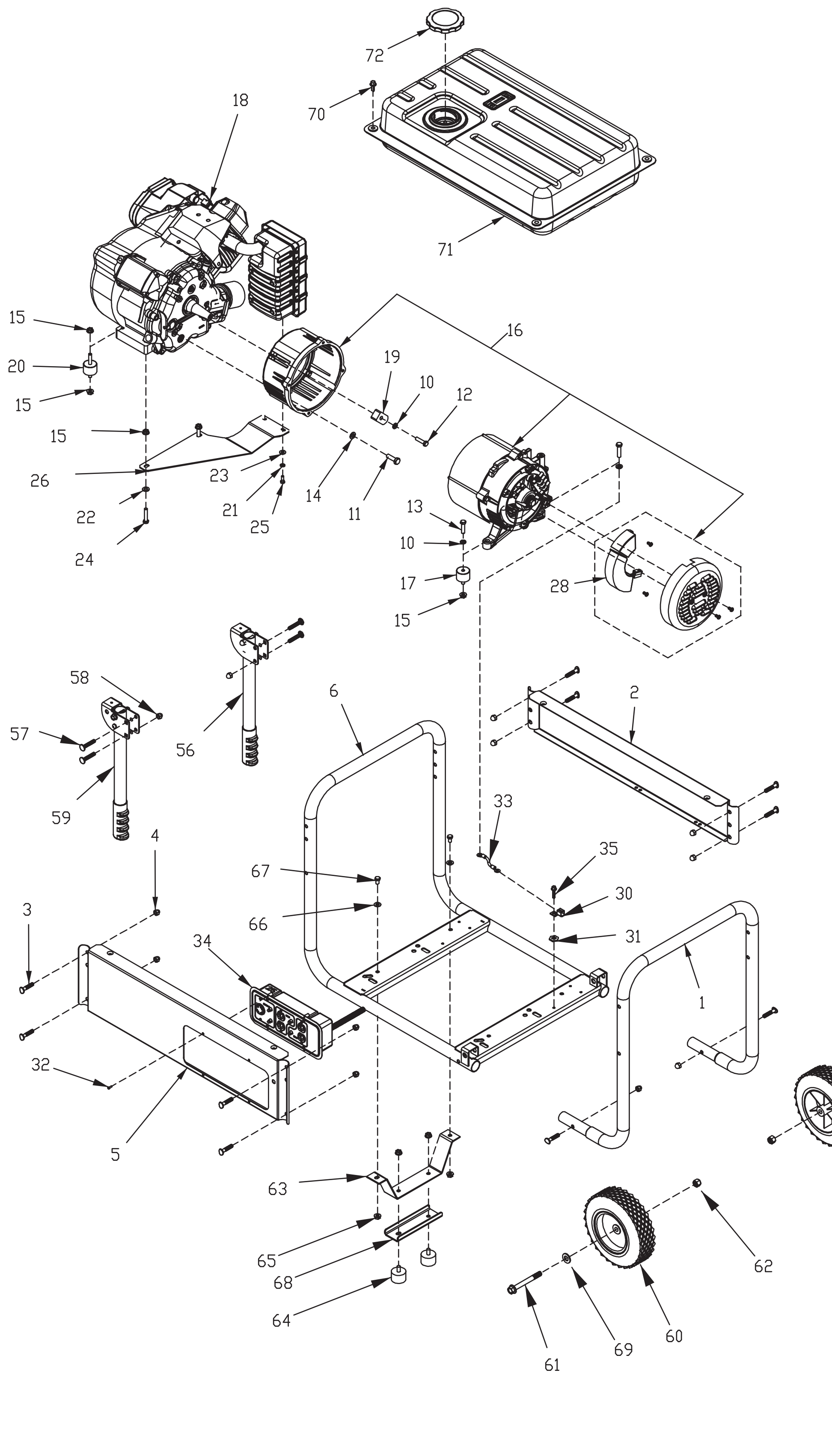
Exploded View – GP6500 – Drawing No. 0G9384B-C



ITEM	QTY.	DESCRIPTION
1	1	FRAME PARTS
2	1	ASSY CRADLE BASE
3	1	CRADLE END
4	1	PANEL RAIL
5	1	BACK RAIL
6	10	CURVED HEAD BOLT 5/16-18 x 1.625" LONG
7	10	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
8	1	ENGINE/ALT PARTS
9	1	ENGINE, 389cc W/O MUFFLER
10	4	VIB MOUNT RUBBER 1.38 x 1.0 x 5/16-18 MALE/FEMALE
11	4	WASHER LOCK M8-5/16
12	4	SCREW HHC 5/16-18 x 1-1/4 G5
13	4	NUT LOCK FLG 5/16-18
14	1	ALTERNATOR 6500W METRIC TAPER SHAFT
15	1	SCROLL, ALTERNATOR, SKU
16	3	SCREW HHC M5-0.8 x 8 PC8.8
17	1	ELECTRICAL PARTS
18	1	ASSY RCP PANEL 30A RD NOHR MTR
19	1	ASSY POWER LEADS
20	4	SCREW PPPH #8-16 x 1/2" BZC
21	1	ASSY GND WIRE PNL TO ALT
22	1	ASSY GND WIRE ALT TO BASE
23	1	WASHER LOCK SPECIAL 1/4"
24	1	LUG SLDLSS #2-#8 x 17/64 CU
25	1	SCREW HHTT M6-1.0 x 25
26	1	FUEL TANK PARTS 6.6GL
27	1	FUEL TANK ASSY 6.6 GAL

ITEM	QTY.	DESCRIPTION
28	4	SCREW HHTT M8-1.25 x 20
29	1	EXHAUST PARTS
30	1	BRACKET, MUFFLER SHIELD, BOTTOM
31	1	ASSY MUFFLER, 389cc
32	1	BRACKET, MUFFLER SHIELD TOP
33	1	GASKET, EXHUAST. 389cc
34	8	SCREW HHTT M6-1.0 x 12
35	4	WASHER FLAT 5/16-M8 ZINC
36	4	WASHER LOCK M8-5/16
37	4	SCREW HHC M8-1.25 x 12 G8.8 FT
38	2	STUD M8-125 x 35 G5 ZINC
39	2	HEX NUT M8-1.25 G8 CLEAR ZINC
40	4	SCREW HHC M6-1.0 x 16 C8.8
41	1	ACCESSORY KIT
42	1	ASSY HANDLE LH
43	4	CARRIAGE HEAD BOLT 5/16-18 x 1.75" LONG
44	2	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
45	1	ASSY HANDLE RH
46	2	TIRE 9.5" DIA RUN FLAT PLASTIC HUB/ RUBBER TREAD
47	2	SCREW HHFC 1/2-13 x 4.5 ZBC
48	2	NUT LOCK HEX 1/2-13 NYL INS
49	1	FRAME, BENT, FOOT BLACK 03
50	2	RUBBER FOOT
51	4	NUT LOCK FLG 5/16-18
52	2	WASHER FLAT 5/16-M8 ZINC
53	2	SCREW HHC 5/16-18 x 1/2 G5

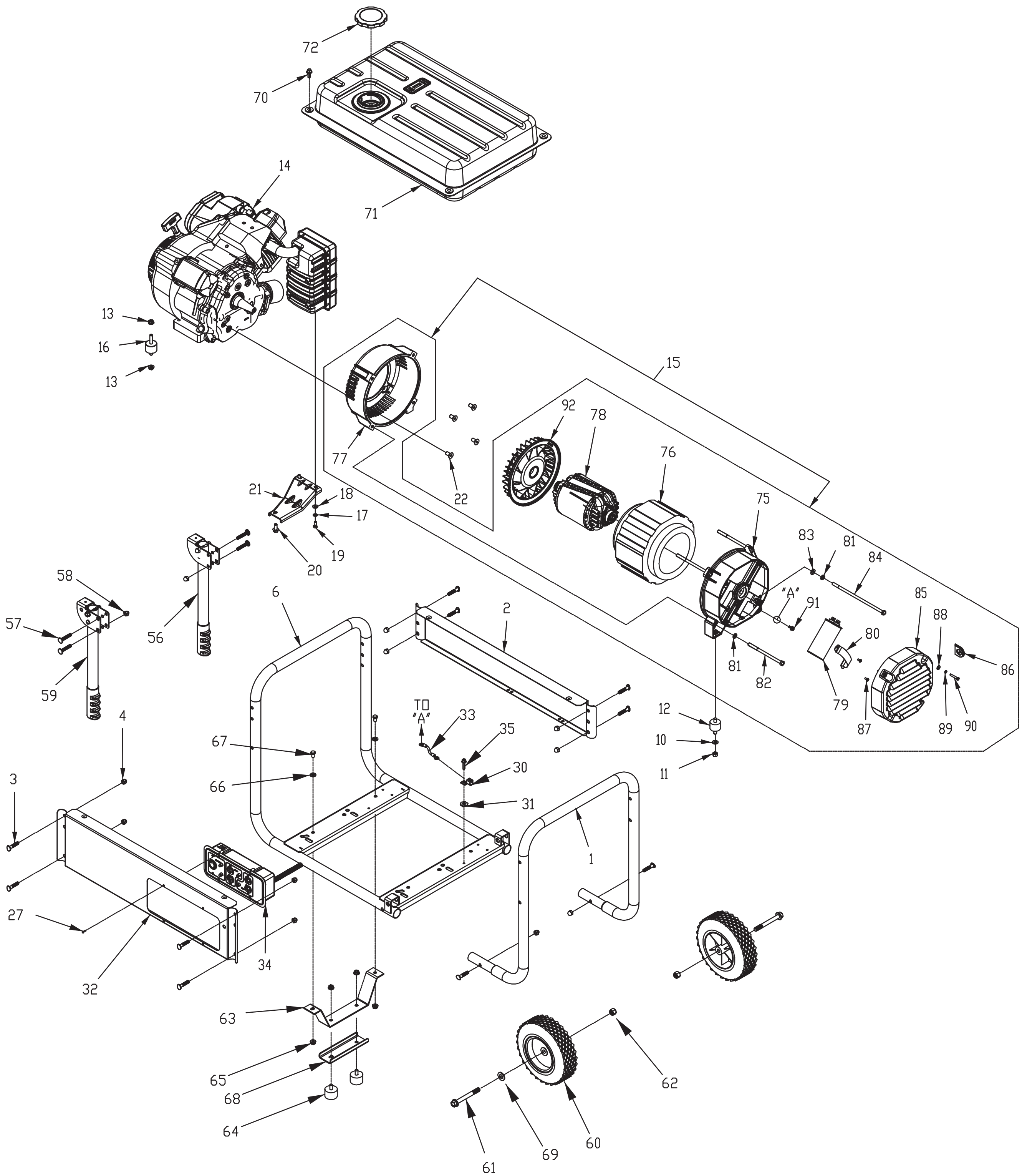
Exploded View – GP7000 – Drawing No. 0G9384D-B



ITEM	QTY.	DESCRIPTION
1	1	CRADLE END
2	1	BACK RAIL
3	10	CURVED HEAD BOLT 5/16-18 x 1.625" LONG
4	10	CAP NUT LOCKING 5/16-18 THREAD, 5/16" OF THREAD
5	1	PANEL RAIL
6	1	ASSY CRADLE BASE
10	3	WASHER LOCK M8-5/16
11	3	SCREW HHC 3/8-16 x 1-1/4 G5
12	1	SCREW HHC 5/16-24 x 1-1/4 G5
13	2	SCREW HHC 5/16-18 x 1-1/4 G5
14	3	WASHER LOCK M10
15	8	NUT LOCK FLG 5/16-18
16	1	ALTERNATOR, 7000W
17	2	VIB MOUNT RUBBER 1.38 x 1.0 x 5/16-18 MALE/FEMALE
18	1	ENGINE, GH410
19	1	BRACKET, MOUNT
20	2	VIB MOUNT RUBBER 1.38 x 1.0 x 5/16-18 M/M
21	2	WASHER LOCK M6-1/4
22	2	WASHER FLAT 5/16-M8 ZINC
23	2	WASHER FLAT 1/4-M6 ZINC
24	2	SCREW HHC 5/16-18 x 1-1/2 G5
25	2	SCREW HHC M6-1.0 x 16 C8,8
26	1	BRACKET, MOUNTING, MUFFLER 410
27	1	CLAMP HOSE .38-.87 [NOT SHOWN, FUEL HOSE]
28	1	CAPACITOR, VOLTAGE REG VS

ITEM	QTY.	DESCRIPTION
30	1	LUG SLDLSS #2-#8 X 17/64 CU
31	1	WASHER LOCK SPECIAL 1/4"
32	4	SCREW PPPH #8-16 x 1/2" BZC
33	1	ASSY GND WIRE ALT TO BASE
34	1	RECEPTACLE PANEL 30A RND W/HR MTR
35	1	SCREW HHTT M6-1.0 x 25 BP
55	1	ACCESSORY KIT
56	1	ASSY HANDLE LH
57	4	CHB CUSTOM 5/16 18 x 46MM LONG
58	2	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
59	1	ASSY HANDLE RH
60	2	TIRE 9.5" DIA RUN FLAT PLASTIC HUB/RUBBER TREAD
61	2	SCREW, HHC 1/2"-13 x 4-1/2" LONG
62	2	NUT, LOCK HEX 1/2-13 NYLON INSERT
63	1	FRAME, BENT, FOOT
64	2	RUBBER FOOT
65	4	NUT LOCK FLG 5/16-18
66	2	WASHER FLAT 5/16-M8 ZINC
67	2	SCREW HHC 5/16-18 X 1/2 G5
68	1	FRAME, BENT, FOOT SUPPORT
69	2	WASHER FLAT 1/2 ZINC
70	4	SCREW HHTT M8-1.25 X 20
71	1	FUEL TANK ASSY 8.0 GAL PORTABLE
72	1	FUEL CAP-VENTED

Exploded View – GP8000 – Drawing No. 0G9384F-B



ITEM	QTY.	DESCRIPTION
1	1	CRADLE END
2	1	BACK RAIL
3	10	CURVED HEAD BOLT 5/16-18 x 1.625" LONG
4	10	CAP NUT LOCKING 5/16-18 THREAD) 5/16" OF THREAD
5	1	PANEL RAIL
6	1	ASSY CRADLE BASE
10	2	WASHER FLAT 5/16-M8 ZINC
11	2	NUT HEX LOCK M8-1.25 NY INS
12	2	VIBE MOUNT 25.0 x 31.8 x M8-1.25 M/M
13	4	NUT LOCK FLG 5/16-18
14	1	ASSEMBLY ENGINE GH-410
15	1	ALTERNATOR 8000W
16	2	VIB MOUNT RUBBER 1.38 x 1.0 x 5/16-18 MALE/MALE
17	2	WASHER LOCK M6-1/4
18	2	WASHER FLAT 1/4-M6 ZINC
19	2	SCREW HHC M6-1.0 x 16 C8.8
20	1	SCREW HHTR 5/16-18 x 3/4
21	1	BRACKET MUFFLER
22	4	SCREW FHSC 3/8-16 x 3/4
23	1	CLAMP HOSE .38-.87 [NOT SHOWN, FUEL HOSE]
30	1	LUG SLDLSS #2-#8 x 17/64 CU
31	1	WASHER LOCK SPECIAL 1/4"
32	4	SCREW PPPH #8-16 x 1/2" BZC
33	1	ASSY GND WIRE ALT TO BASE
34	1	ASSY RCP PNL 8KW 30A W/HR MTR
35	1	SCREW HHTT M6-1.0 x 25 BP
55	1	ACCESSORY KIT
56	1	ASSY HANDLE LH
57	4	CHB CUSTOM 5/16 18 x 46MM LONG
58	2	CAP NUT LOCKING 5/16-18, 5/16" OF THREAD
59	1	ASSY HANDLE RH

ITEM	QTY.	DESCRIPTION
60	2	TIRE 9.5" DIA RUN FLAT PLASTIC HUB/RUBBER TREAD
61	2	SCREW, HHC 1/2"-13 x 4-1/2" LONG
62	2	NUT, HEX LOCK 1-2"-13 NYLON INSERT
63	1	FRAME, BENT, FOOT
64	2	RUBBER FOOT
65	4	NUT LOCK FLG 5/16-18
66	2	WASHER FLAT 5/16-M8 ZINC
67	2	SCREW HHC 5/16-18 x 1/2 G5
68	1	FRAME) BENT, FOOT SUPPORT
69	2	WASHER FLAT 1/2 ZINC
70	4	SCREW HHTT M8-1.25 x 20
71	1	FUEL TANK ASSY 8.0 GAL
72	1	FUEL CAP-VENTED
75	1	BEARING CARRIER REAR
76	1	STATOR 8KW
77	1	(CASTING) ENGINE ADAPTER HOUSING
78	I	ROTOR ASSEMBLY, 8kW
79	I	CAPACITOR
80	I	CLAMP
81	5	WASHER LOCK M8-5/16
82	4	SCREW IHHC M8-1.25 x 140 G8.8
83	1	WASHER FLAT 5/16-M8 ZINC
84	1	SCREW IHHC 5/16-24 x 8-1/2 G5
85	1	COVER ALTERNATOR INLET
86	1	GROMMET WIRE SLEEVE
87	2	SCREW PPHM M4-0,7 x 10
88	4	WASHER FLAT #10 ZINC
89	4	WASHER LOCK #10
90	4	SCREW PPHM M5-0,8 x 30
91	1	SCREW HHTT M6-1.0 x 12
92	1	ALTERNATOR FAN VARIED BLADE SPACING

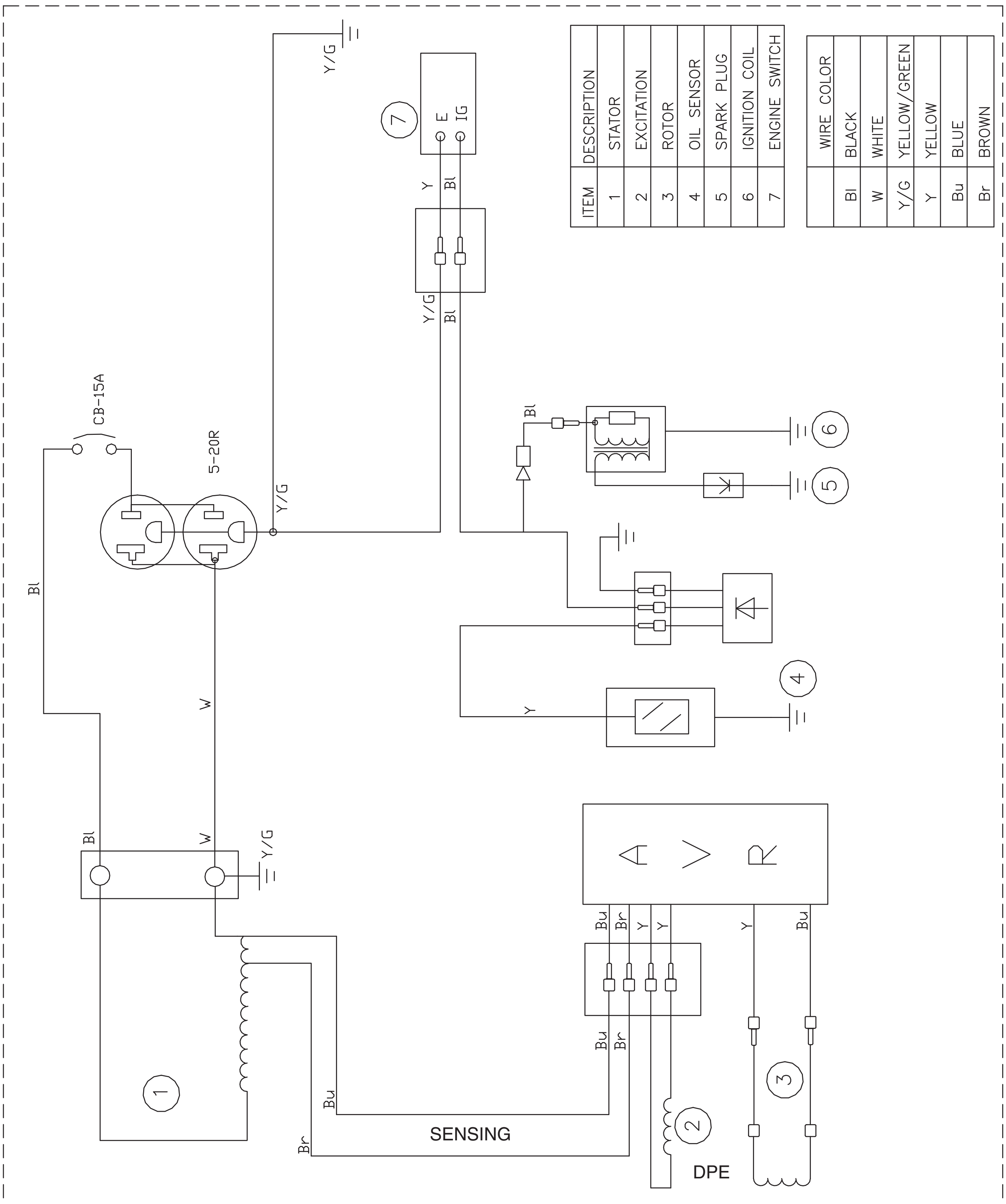
PART 5
ELECTRICAL
DATA

GP Series Portable Generators

TABLE OF CONTENTS

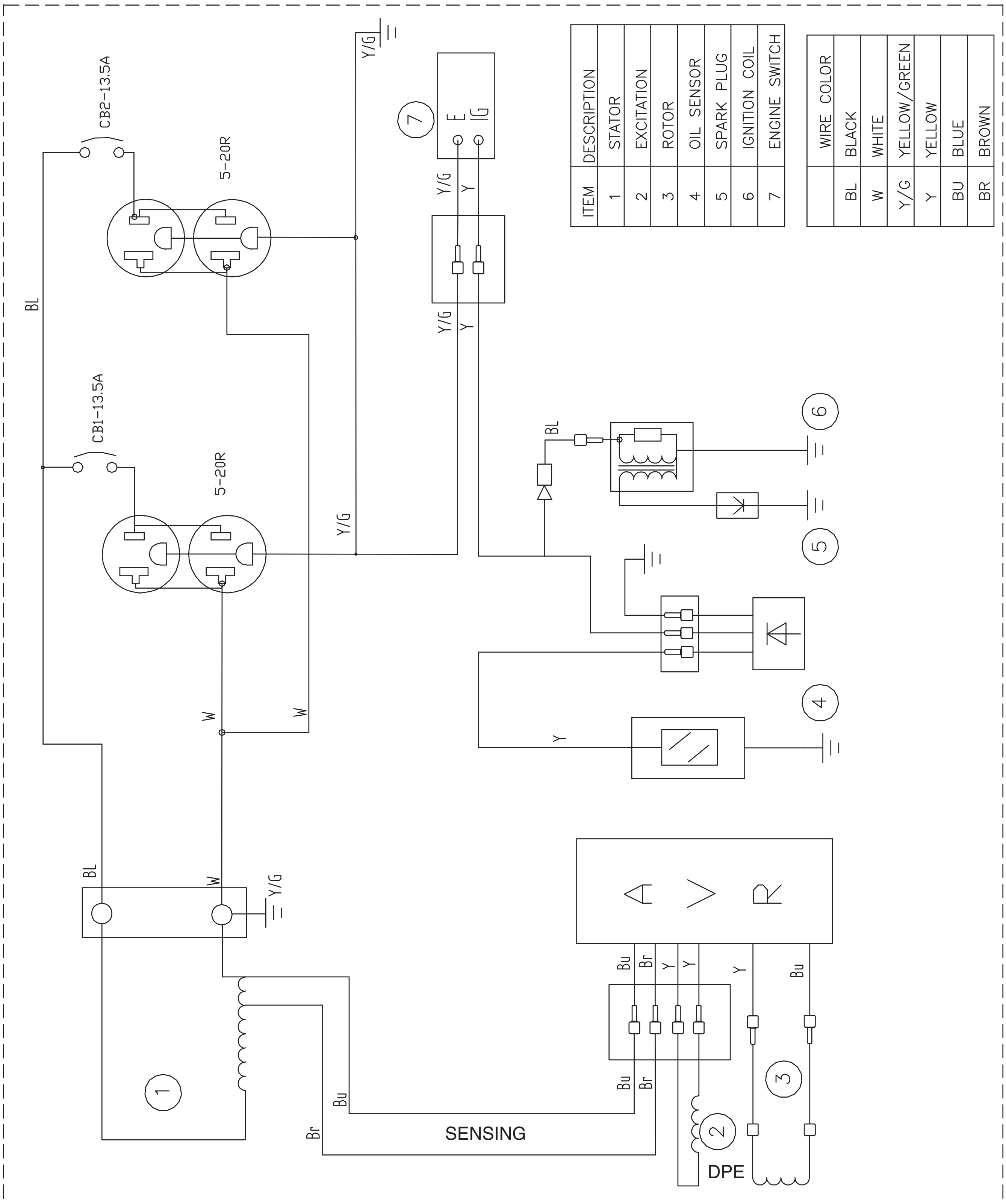
Brushed Alternator Drawing No. 0H0612-A

SCHEMATIC - DIAGRAM



Brushed Alternator Drawing No. 0H0523-A

SCHEMATIC - DIAGRAM

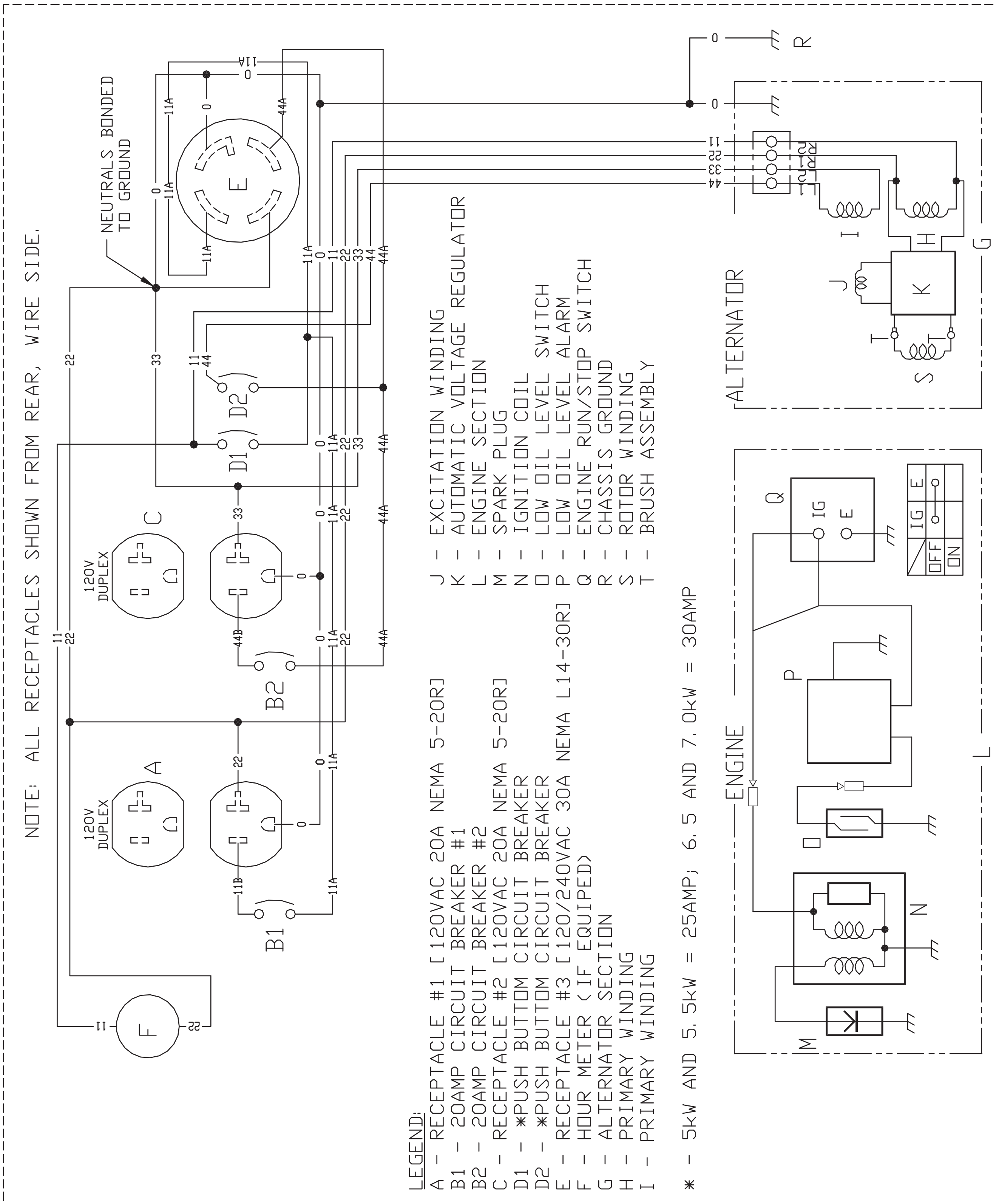


ITEM	DESCRIPTION
1	STATOR
2	EXCITATION
3	ROTOR
4	OIL SENSOR
5	SPARK PLUG
6	IGNITION COIL
7	ENGINE SWITCH

	WIRE COLOR
BL	BLACK
W	WHITE
Y/G	YELLOW/GREEN
Y	YELLOW
BU	BLUE
BR	BROWN

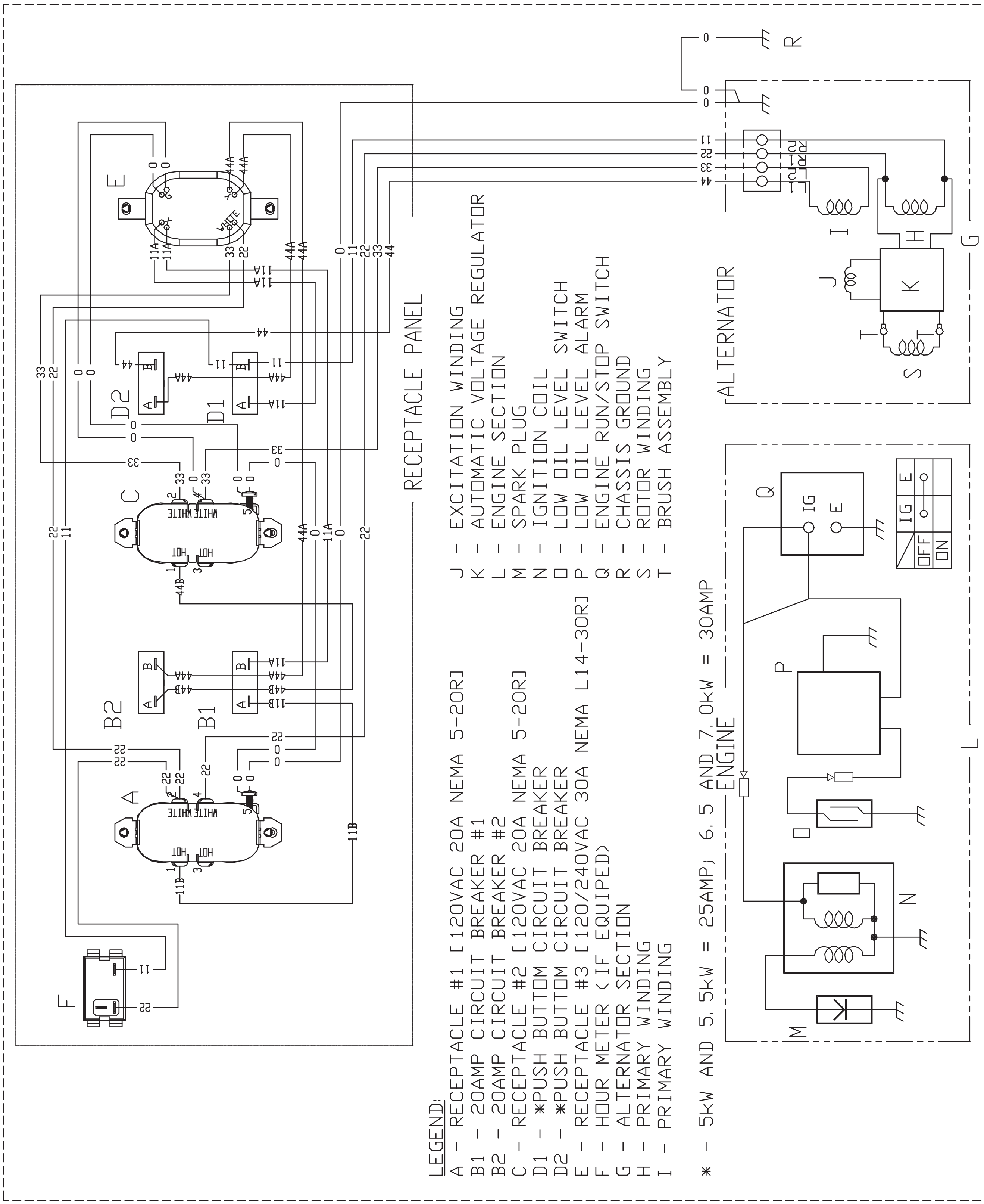
Brushed Alternator Drawing No. 0G9769-C

SCHEMATIC - DIAGRAM



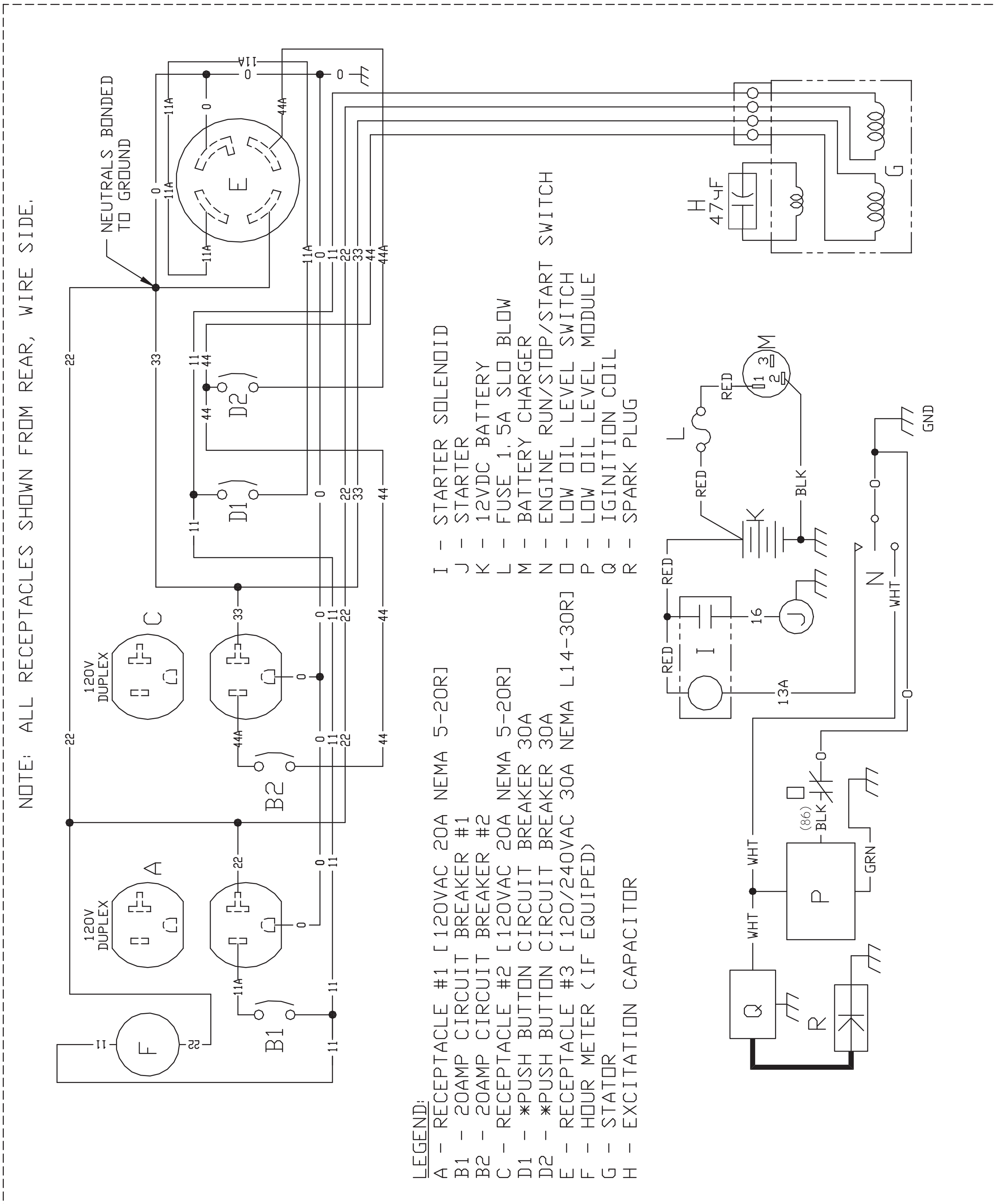
Brushed Alternator Drawing No. 0G9769-C

WIRING - DIAGRAM

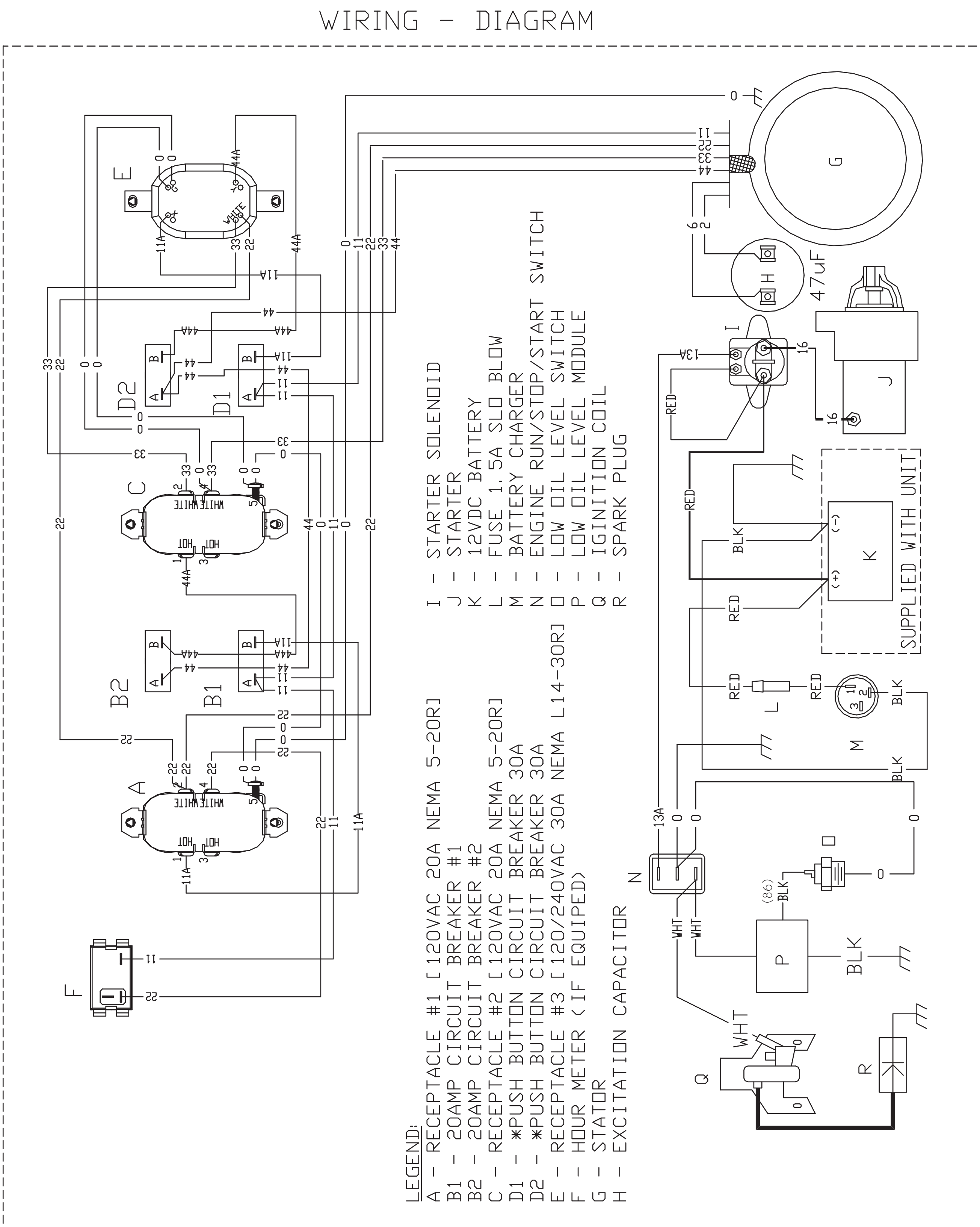


Brushless Alternator Drawing No. 0G9849-A

SCHEMATIC - DIAGRAM



Brushless Alternator Drawing No. 0G9849-A



ELECTRICAL FORMULAS

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

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

NOTES

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