WACKER NEUSON

all it takes!

Service and Repair Manual

Portable Generator

GP2500A / 4000A / 5500A / 7000A

Machine Type	**Portable Generator**
Material Number	**5100071820**
Version	**01**
Date	**05/2023**
Language	**[en-US]**

California Proposition 65 Warning

⚠ WARNING

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

⚠ WARNING

Cancer and Reproductive Harm

www.P65Warnings.ca.gov

⚠ WARNING

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.

This page is intentionally left blank.

Table of Contents

1 Foreword

1.1 Machine Identification

The following machines and variants/options are described:

Machine	Item Number
GP2500A	5100070503
GP4000A	5100070504
GP5500A	5100070505
GP7000A	5100070506

⚠ DANGER

Carbon monoxide hazard

Using a generator indoors CAN KILL YOU IN MINUTES. Generator exhaust contains carbon monoxide (CO). This is a poison you cannot see or smell. If you can smell the generator exhaust, you are breathing CO. But even if you cannot smell the exhaust, you could be breathing CO.

- ► NEVER use a generator inside homes, buildings, garages, crawlspaces, or other partly enclosed areas. Deadly levels of carbon monoxide can build up in these areas. Using a fan or opening windows and doors does NOT supply enough fresh air.
- ► ONLY use a generator outside, and far away from homes, buildings, windows, doors, and vents. Windows, doors, and vents can pull in generator exhaust.
- ► Point the engine exhaust away from homes, buildings, windows, doors, and vents. Also, point the engine exhaust away from combustible materials.
- ► Even when you use a generator correctly, CO may leak into the home or building. ALWAYS use a battery-powered or battery-backup CO alarm in the home or building.
- ► If you start to feel sick, dizzy, or weak after the generator has been running, move to fresh air RIGHT AWAY. See a doctor. You could have carbon monoxide poisoning.

1.2 Machine Documentation

Keep a copy of the operator's manual with the machine at all times.

From this point forward in this documentation, Wacker Neuson America Corporation will be referred to as Wacker Neuson or the manufacturer.

For spare parts information, please see your Wacker Neuson dealer, or visit the Wacker Neuson website at http://www.wackerneuson.com/.

When ordering parts or requesting service information, be prepared to provide the machine model number, item number, and serial number.

1.3 Expectations for Information in This Manual

This manual provides information and procedures to safely operate and maintain this machine. For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.

The manufacturer expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.

The information contained in this manual is based on machines manufactured up until the time of publication. The manufacturer reserves the right to change any portion of this information without notice.

The illustrations, parts, and procedures in this manual refer to the manufacturer's factory-installed components. Your machine may vary depending on the requirements of your specific region.

1.4 Laws Pertaining to Spark Arresters

State Health Safety Codes and Public Resources Codes specify that in certain locations spark arresters be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

1.5 Manufacturer's Approval

This manual contains references to approved parts, attachments, and modifications. The following definitions apply:

- Approved parts or attachments are those either manufactured or provided by the manufacturer.
- Approved modifications are those performed by an authorized service center according to written instructions published by the manufacturer.
- Unapproved parts, attachments, and modifications are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

1.6 Disclaimers

- All information in this publication was based on the latest product information available at the time of printing. Wacker-Neuson reserves the right to change, alter, and/or improve the product and this document at any time, without notice, and without incurring any obligation.
- The pictures and figures in this manual should be used for reference only. There may be differences between the pictures and figures and the physical product.
- This generator may be equipped with a spark arrester muffler. If equipped, the spark arrester must be maintained in effective working order by the owner/operator. In the State of California, a spark arrester is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal lands.

1.7 Limited Warranty

Wacker Neuson, warrants to the original retail purchaser that this Wacker Neuson brand outdoor product is free from defect in material and workmanship and agrees to repair or replace, at Wacker Neuson, discretion, any defective product free of charge within these time periods from the date of purchase.

Three years if the product is used for personal, family or household use;

One year if used for any other purpose, such as commercial or rental.

This warranty extends to the original retail purchaser only and commences on the date of the original retail purchase.

Any part of this product found in the reasonable judgment of Wacker Neuson to be defective in material or workmanship will be repaired or replaced without charge for parts and labor by an authorized service center for Wacker Neuson brand outdoor products. (Authorized Wacker Neuson Service Center).

The product, including any defective part, must be returned to an authorized Wacker Neuson service center within the warranty period. The expense of delivering the product to the service center for warranty work and the expense of returning it back to the owner after repair or replacement will be paid by the owner. Wacker Neuson’s responsibility in respect to claims is limited to making the required repairs or replacements and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sale of any Wacker Neuson brand outdoor product. Proof of purchase will be required by the dealer to substantiate any warranty claim. All warranty work must be performed by an authorized service center.

This warranty is limited to one (1) year from the date of original retail purchase for any Wacker Neuson brand outdoor product that is used for rental or commercial purposes, or any other income-producing purpose.

This warranty does not cover any product that has been subject to abuse, misuse, neglect, negligence, accident, the effects of corrosion or erosion, or that has been operated in any way contrary to the operating instructions as specified in this operator's manual. This warranty does not apply to any damage to the product that is the result of improper maintenance or to any product that has been altered or modified. The warranty does not extend to repairs made necessary by normal wear or by the use of parts or accessories which are either incompatible with the Wacker Neuson brand outdoor product or adversely affect its operation, performance, or durability.

In addition, this warranty does not cover:

Tune-ups – Spark Plugs, Carburetor, Carburetor Adjustments, Ignition, Filters, Oil Change

Wear items–Recoil Starter Rope, Motor Brushes, Alternator Brushes, Cotter Pins, Wheels.

IMPORTANT: The Engine and Emissions Control System of this product are not covered under this Wacker Neuson Limited Warranty, but are instead covered under a separate warranty provided by the manufacturer of those components. Please refer to your Engine and Emissions Control System manuals and warranty statements for details on the terms of those warranties and instructions regarding how to obtain service on those components.

ALL IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE STATED WARRANTY PERIOD. ACCORDINGLY, ANY SUCH IMPLIED WARRANTIES INCLUDING MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, ARE DISCLAIMED IN THEIR ENTIRETY AFTER THE EXPIRATION OF THE APPROPRIATE THREE-YEAR OR NINETY-DAY WARRANTY PERIOD.

WACKER NEUSON OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS AND Wacker Neuson DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR THEM ANY OTHER OBLIGATION. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Wacker Neuson ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO, EXPENSE OF RETURNING THE PRODUCT TO AN AUTHORIZED Wacker Neuson SERVICE CENTER AND EXPENSE OF DELIVERING IT BACK TO THE OWNER, MECHANIC'S TRAVEL TIME, TELEPHONE OR TELEGRAM CHARGES, RENTAL OF A LIKE PRODUCT DURING THE TIME WARRANTY SERVICE IS BEING PERFORMED, TRAVEL, LOSS OR DAMAGE TO PERSONAL PROPERTY, LOSS OF REVENUE, LOSS OF USE OF THE PRODUCT, LOSS OF TIME, OR INCONVENIENCE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

This warranty applies to this Wacker Neuson brand outdoor product manufactured by or for Wacker Neuson and sold in the United States and Canada.

To locate your nearest Authorized Wacker Neuson Service Center, dial 1-800-770-0957.

2 Safety

2.1 Signal Words Used in This Manual

This manual contains DANGER, WARNING, CAUTION, *NOTICE,* and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

⚠ DANGER

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

► To avoid death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ WARNING

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

► To avoid possible death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ CAUTION

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

► To avoid possible minor or moderate injury from this type of hazard, obey all safety messages that follow this signal word.

NOTICE

NOTICE identifies a situation that causes damage if it is not observed.

► To avoid possible damage from this type of hazard, obey all safety messages that follow this signal word.

Note: A Note contains additional information important to a procedure.

2.2 Operator Safety while Using Internal Combustion Engines

⚠ DANGER

Carbon monoxide hazard

Exhaust gas from the engine contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

► Never operate the machine inside an enclosed area, such as a tunnel, unless adequate ventilation is provided through items such as exhaust fans or hoses.

⚠ WARNING

Personal injury hazard

Failure to follow the warnings and safety standards during operation and fueling could result in severe injury or death.

► Read and follow the warning instructions in the engine owner's manual and the safety guidelines below.

Operating Safety

- Keep the area around the exhaust pipe free of flammable materials.
- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine.
- Do not run the machine if fuel leaks are present or the fuel lines are loose.
- Do not smoke while operating the machine.
- Do not run the engine near sparks or open flames.
- Do not touch the engine or muffler while the engine is running or immediately after it has been turned off.
- Do not operate a machine when its fuel cap is loose or missing.
- Do not start the engine if fuel has spilled or a fuel odor is present. Move the machine away from the spill and wipe the machine dry before starting.
- Do not use the machine in areas with risk of explosion or fire.

Refueling safety

- Clean up any spilled fuel immediately.
- Refill the fuel tank in a well-ventilated area.
- Install the fuel tank cap after refueling.
- Use tools specifically meant for refueling (for example, a fuel hose or funnel).
- Do not smoke when refueling the machine.

- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

2.3 Additional Instructions

Along with this manual, be sure to read any additional instructions provided both on and with the product, attached equipment, accessories, and the engine powering the product. Pay careful attention to all additional safety rules and instructions on proper startup, operation, and shutdown procedures. Always use any recommended protective apparel that may be needed to operate the equipment safely.

2.4 Safety Instructions for Working on the Electrical System

- Always switch off the power supply when working on the electrical system.
- Make sure the generator is grounded during all testing stages. If a fault exists within the wiring or alternator, grounding will pass the current directly to ground. Without properly grounding, this current could pass through you. The current produced by the generator is just as dangerous as electricity from the grid.
- The type and amperage of replacement fuses must correspond to the manufacturer's specifications.
- Before working on the battery or the electrical system, remove jewelry and watches made of metal!
- Do not place tools or other electrically conductive objects on the battery.

⚠ DANGER

Electric shock hazard

To prevent an electric shock hazard, be sure to provide the correct ground per the National Electric Code (NEC) 250.3 (sections A , B , and C)

Failure to properly ground the generator will create an electrical shock hazard that could result in severe injury or death.

⚠ WARNING

Explosive and fire hazard due to gases

Explosive hydrogen-oxygen mixture can escape from lead-acid batteries. In the event of an explosion of the mixture, severe personal injury may occur.

- ► Always wear the prescribed protective clothing.
- ► Only use proper tools (non-sparking, with voltage-insulated handles).
- ► Prevent any ignition sources such as sparks, flames or electrical arcs.
- ► Prevent any electrostatic discharges. Wear cotton clothing and ground if necessary before working on the battery. Clean batteries only with water-moistened cotton or paper towels.
- ► If the battery is frozen or the acid level is too low, do not try to start with jumper cables.

2.5 Safety During Testing

⚠ DANGER

Carbon monoxide hazard

Using a generator indoors can kill you in minutes. Generator exhaust contains carbon monoxide (CO). This is a poison you cannot see or smell. If you can smell the generator exhaust, you are breathing CO. But even if you cannot smell the exhaust, you could still be breathing CO.

⚠ DANGER

Electric shock hazard

Failure to properly ground your generator will create an electrical shock hazard that could result in severe injury or death.

- ► To prevent an electric shock hazard, be sure to provide the correct ground for the desired use of the generator per the National Electric Code (NEC) 250.3 (sections A, B, and C) or consult with a local electrician to learn the appropriate grounding requirements.

⚠ DANGER

Electrocution

During all stages of testing, be aware of your positioning toward any live connections. Never assume any wire is dead no matter what the reason for the repair is. Use a digital multimeter or any other CONNECTED metering system to monitor voltage locations. Never touch any wiring while the generator is running.

Generators demand respect during their usage and their testing. As with any engine based device, you need to make sure to properly ventilate the repair area for carbon monoxide as well as other gases. This is best accomplished with mechanical ventilation **(1)**.

Using a minimum of 10AWG stranded wire **(2)**, you need to make sure the generator is grounded during all testing stages. If a fault exists within the wiring or alternator, grounding will pass the current directly to ground.

An 8', 1/2" diameter ground rod **(3)** provides an optimum ground. You can also use a grounded water line or the building electrical ground. DO NOT use gas piping for grounding.

Without properly grounding, this current could pass through you. The current produced by the generator is just as dangerous as electricity from the grid.

Personal Protective Equipment (PPE) should be utilized during all stages of testing. PPE includes ear plugs and safety glasses. Rubber gloves should be worn when working with fuel conveying parts and lubricating oil. Never smoke while working on the generator and wash your hands thoroughly after working on the generator.

Lastly, inspect the engine and fuel system for leaks before starting the generator. Clean up any fuel leaks or spills. Also wipe down the tank if there are spills during fueling of the tank.

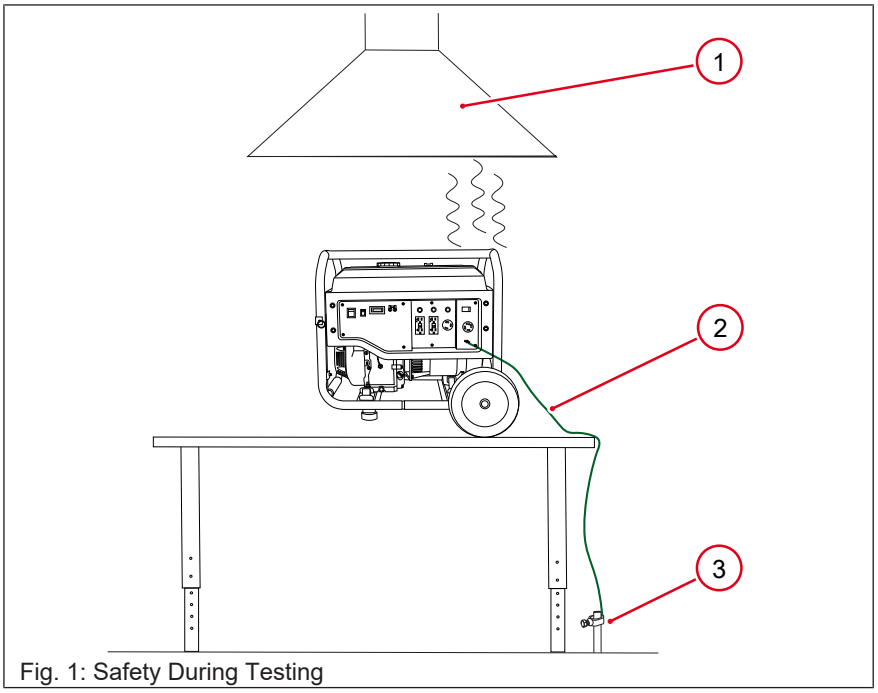


Fig. 1: Safety During Testing

3 General Information

3.1 Standard Torque Values

Torque Values

- Always use torque values listed in the tables below when a maintenance procedure does not provide a specific torque value.
  - Unless otherwise indicated, standard torque tolerance shall be ±10 percent.
  - Torque values listed are based on clean, dry threads.
  - Reduce torque by 25 percent when engine oil is used as a lubricant.
  - Reduce torque by 25 percent if new, plated cap screws are used. If the maintenance procedures do not specify a tightening order, use the following guidelines:
  - Lubricate threads of fasteners as specified in work procedure.
  - Tighten fasteners above 30 ft. lbs. (41 Nm) using torque pattern and tighten to 70 percent of final value.
  - Multiply final value by 0.7 and torque to specifications.
  - Use torque pattern to torque to final value.
  - Tighten circular and straight patterns as shown.

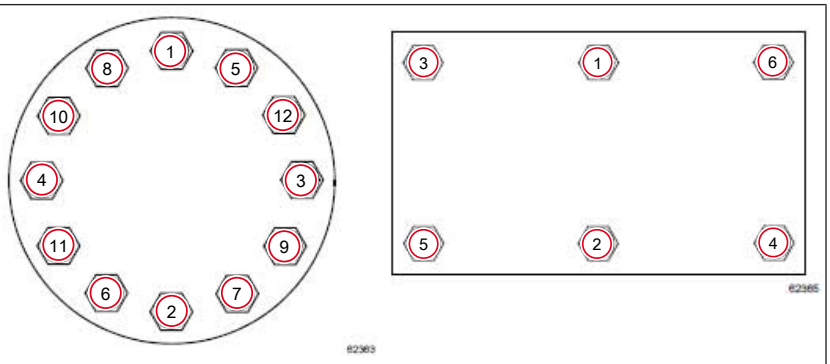


Fig. 2: Circular & Straight Torque Patterns

Cap Screw Head Markings		Torque			
Size		SAE No. 1 or 2	SAE No. 5	SAE No. 6 or 7	SAE No. 8
Dia. Inches	Threads per Inch	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)
1/4	20 28	5 (7) 6 (8)	8 (11) 10 (14)	10 (14) 12 (16)	12 (16) 14 (19)
5/16	18 24	11 (15) 12 (16)	17 (23) 19 (26)	21 (28) 24 (33)	25 (34)
3/8	16 24	20 (27) 23 (31)	30 (41) 35 (47)	40 (54) 45 (61)	45 (61) 50 (68)
7/16	14 20	30 (41) 35 (47)	50 (68) 55 (75)	60 (81) 70 (95)	70 (95) 80 (108)
1/2	13 20	50 (68) 55 (75)	75 (102) 90 (122)	95 (129 100 (136)	110 (149) 120 (163)

Cap Screw Head Markings		Torque			
Size		SAE No. 1 or 2	SAE No. 5	SAE No. 6 or 7	SAE No. 8
Dia. Inches	Threads per Inch	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)
9/16	12 18	65 (88) 75 (102)	110 (149) 120 (163)	135 (183) 150 (203)	150 (203) 170 (230)
5/8	11 18	90 (122) 100 (136)	150 (203) 180 (244)	190 (258) 210 (285)	220 (298) 240 (325)
3/4	10 16	160 (217) 180 (244)	260 (353) 300 (407)	320 (434) 360 (488)	380 (515) 420 (569)
7/8	9 14	140 (190) 155 (210)	400 (542) 440 (597)	520 (705) 580 (786)	600 (813) 660 (895)
1	8 12	220 (298) 240 (325)	580 (786) 640 (868)	800 (1085) 860 (1166)	900 (1220) 1000 (1356)
1-1/8	7 12	300 (407) 340 (461)	800 (1085) 880 (1193)	1120 (1519) 1260 (1708)	1280 (1735) 1440 (1952)
1-1/4	7 12	420 (569) 460 (624)	1120 (1519) 1240 (1681)	1580 (2142) 1760 (2386)	1820 (2468) 2000 (2712)
1-3/8	6 12	560 (759) 640 (868)	1460 (1980) 1680 (2278)	2080 (2820) 2380 (3227)	2380 (3227) 2720 (3688)
1-1/2	6 12	740 (1003) 840 (1139)	1940 (2630) 2200 (2983)	2780 (3796) 3100 (4203)	3160 (4285) 3560 (4827)

Cap Screw Head Markings	Torque		
Thread Dia. - Pitch	Class 8.8	Class 10.9	Class 12.9
Dia. Metric	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)
M6 M8 M8 X 1.25	5 (7) 12 (16) 13 (18)	7 (9) 17 (23) 18 (24)	12 (16) 29 (39) 30 (41)
M10 M10 X 1.25	24 (33) 27 (37)	34 (46) 38 (52)	70 (95) 60 (81)
M12 M12 X 1.5	42 (57) 43 (58)	60 (81) 62 (84)	120 (163)
M14 M14 X 1.5	66 (89) 72 (98)	95 (129) 103 (140)	190 (258)
M16 M16 X 1.5	103 (140) 110 (149)	148 (201) 157 (213)	300 (407)
M18 M18 X 1.5	147 (199) 165 (224)	203 (275) 320 (434)	410 (556)
M20 M20 X 1.5	208 (282) 213 (289)	288 (390) 320 (434)	580 (786)
M22 M22 X 1.5	283 (384) 315 (427)	392 (531) 431 (584)	800 (1085)
M24 M24 X 2	360 (488) 392 (531)	498 (675) 542 (735)	1000 (1356)
M27 M27 X 2	527 (715) 569 (771)	729 (988) 788 (1068)	1475 (2000)

Cap Screw Head Markings	Torque		
Thread Dia. - Pitch	Class 8.8	Class 10.9	Class 12.9
Dia. Metric	ft. lbs. (Nm)	ft. lbs. (Nm)	ft. lbs. (Nm)
M30 M30 X 2	715 (969) 792 (1074)	990 (1342) 1096 (1486)	2000 (2712)
M33	1300 (1763)	1850 (2508)	2150 (2915)
M36	2100 (2847)	3000 (4067)	3500 (4745)

Metric Hose Fittings for Hydraulic Applications (Light Execution, DKOL)				
Nominal Ø	Outer Ø	Thread	Wrench Size	Torque ft. lbs (Nm)
05	6L	M12 X 1.5	WS 14	11 (15)
06	8L	M14 X 1.5	WS 17	15 (20)
08	10L	M16 X 1.5	WS 19	30 (40)
10	12L	M18 X 1.5	WS 22	37 (50)
12	15L	M22 X 1.5	WS 27	55 (75)
16	18L	M26 X 1.5	WS 32	63 (85)
20	22L	M30 X 2	WS 36	74 (100)
25	28L	M36 X 2	WS 41	132 (180)
32	35L	M45 X 2	WS 55	162 (220)

Metric Hose Fittings for Hydraulic Applications (Heavy Execution, DKOL)				
Nominal Ø	Outer Ø	Thread	Wrench Size	Torque ft. lbs (Nm)
05	8S	M16 X 1.5	WS 19	30 (40)
06	10S	M18 X 1.5	WS 22	37 (50)
08	12S	M20 X 1.5	WS 24	44 (60)
10	14S	M22 X 1.5	WS 27	55 (75)
12	16S	M24 X 1.5	WS 30	66 (90)
16	20S	M30 X 2	WS 36	74 (100)
20	25S	M36 X 2	WS 41	133 (180)
25	30S	M42 X 2	WS 50	199 (270)
32	38S	M52 X 2	WS 60	295 (400)

Using a Torque Wrench Extension

Occasionally an extension, crowfoot, or other adapter is necessary to use with a torque wrench to torque a bolt or line fitting. Adding adapters or extensions will alter the torque on the fastener from what the torque wrench reads. Use the following formula to calculate the correct torque wrench setting to achieve a specific torque value.

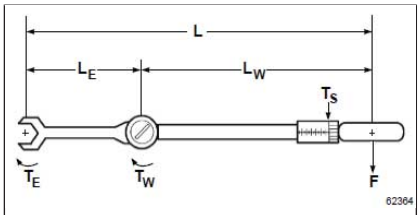


Fig. 3: Torque Wrench and Extension

F - Force applied by technician

L - Total length through which force is applied to fastener

TW - Torque applied at end of torque wrench

TS = TE (LW / (LW + LE))

TS - Torque wrench setting

TE - Torque specified at fastener

LW - Length of torque wrench

LE - Length of extension

Example: A component requires a specified torque value of 65 ft. lbs. and a 6 inch extension is required to reach it. What should the torque wrench setting (TS) be to compensate for the extension?

Torque specified at fastener (TE) = 65 ft. lbs.

Length of torque wrench (LW) = 12 in.

Length of extension (LE) = 6 in.

TS = TE (LW / (LW + LE))

TS = 65 ft. lbs. (12 in. / (12 in. + 6 in.))

TS = 65 ft. lbs. (12 in. / (18 in.))

TS = 65 ft. lbs. (0.666)

TS = 43.33 ft. lbs.

4 Service Information

4.1 Specialized Tools

In order to properly diagnose and the repair the generator, you will need certain special tools. The tools listed below are highly recommended and are sorted by their use.

Note: Images are for reference only.

Engine Tools:

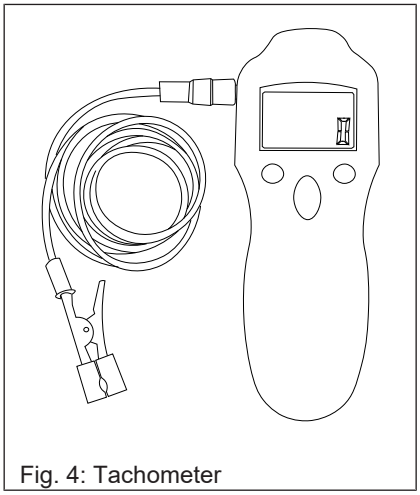


Fig. 4: Tachometer

Tachometer

An electronic, clamp-on tachometer is the best way to monitor the engine speed. Since engine speed directly effects the frequency output of the generator, it is important to use an electronic tachometer. A clamp-on meter attaches to the spark plug lead. By counting each time the spark plug fires, it accurately calculates the engine speed. Read the tachometer's owner's manual for proper calibration, setup and usage.

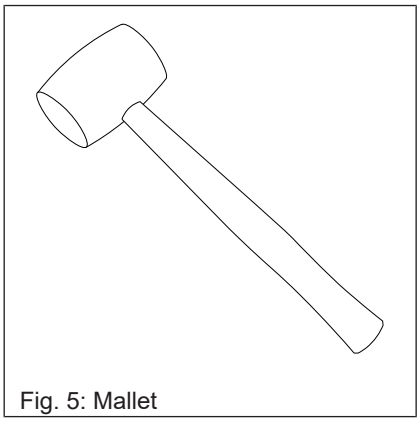


Fig. 5: Mallet

Rubber Mallet

A rubber mallet is used for the removal of the alternator from the engine block.

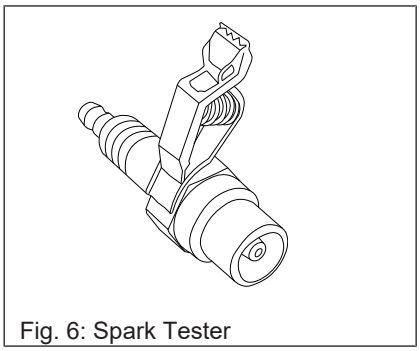


Fig. 6: Spark Tester

Spark Tester

The spark tester gives clear indication if the coil is providing high voltage to the spark plug. A bright, vivid spark indicates that the coil is operating properly.

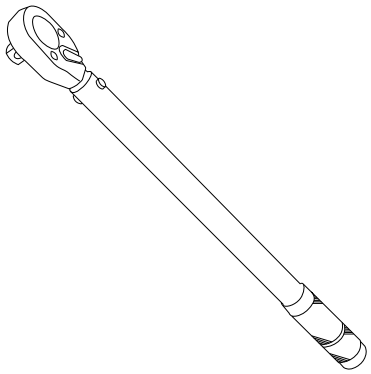


Fig. 7: Torque Wrench

Torque Wrench

When directed as to the torque tolerance of fasteners in this manual, a torque wrench must be used. Engine life and safe operation of the generator is dependent on properly torqued fasteners.

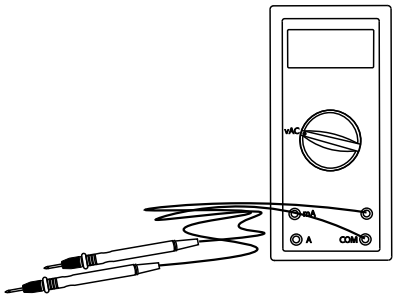


Fig. 8: Digital Multimeter

Electrical Tools:

Digital Multimeter (DMM)

A digital multimeter (DMM) is needed to make most of the measurements while troubleshooting the generator. At minimum, we recommend the DMM should be capable of testing voltages (AC & DC) to 600v, low levels of current, resistance, capacitance and contains a diode tester. The ability to measure frequency at 120 volts is highly recommended. Make sure the DMM has leads that meet a minimum of Category II (600 volts at a maximum of 10 amperes).

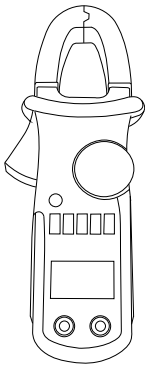


Fig. 9: Clamp-on Ammeter

Clamp-on Ammeter

A clamp-on ammeter able of testing to 100 amperes is required for high current testing. Many clamp-on meters will also have the capabilities of the DMM talked about above. However, having a stand-alone DMM is desired when needing to take voltage measurements while current is being monitored. Some clamp-on ammeters have the ability to do both at the same time. If in doubt, query the manufacturer as to your unit's abilities.

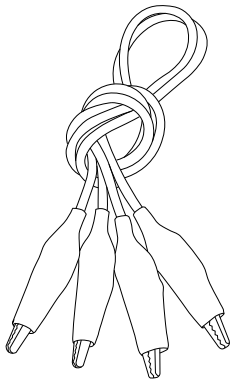


Fig. 10: Alligator Leads

Alligator Leads

Alligator leads will help when making continuity tests. You can use stand-alone leads or alligator clips that attach to the DMM leads.

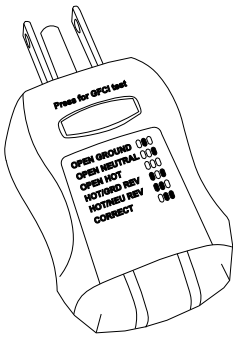


Fig. 11: GFCI Tester

GFCI Tester

A generator that contains Ground Fault Circuit Interrupting (GFCI) receptacles must be tested to make sure the outlets are operating correctly. Do not rely solely on the internal testing ability of the GFCI. Use a GFCI tester to verify the unit is operating correctly. A GFCI tester containing the ability to test circuit polarity is recommended.

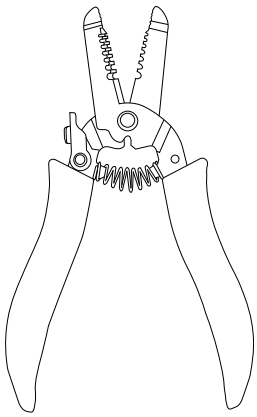


Fig. 12: Wire Stripper

Wire Stripper

Wire strippers are required to make clean cutting and stripping without damaging the conductors. A good quality pair will provide years of service when properly maintained.

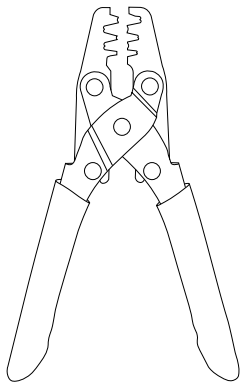


Fig. 13: Crimping Tool

Crimping Tool

A crimping tool will make secure crimping of electrical connectors. Always use the crimping die that matches the connector you will be using.

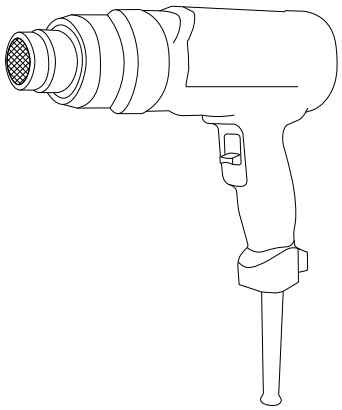


Fig. 14: Heat Gun

Heat Gun

A heat gun is used with heat shrink tubing to create tight, well insulated electrical connections.

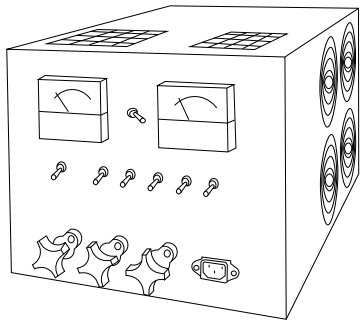


Fig. 15: Resistive Load Bank

Resistive Load Bank (Optional)

The ability to test the generator fully loaded to its wattage rating is needed to determine the engine is properly tuned. A resistive load bank is designed and calibrated to properly load an electrical system. In place of a resistive load bank, you can load the generator using a self-built tungsten load bank or using halogen work lights (see below). In order for Power Factor loading (if required by the customer) an inductive load bank will also be required.

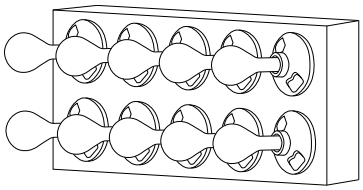


Fig. 16: Tungsten Load Bank

Tungsten Load Bank (Optional)

A tungsten load bank is a good way to test the generator for its rated load capacity. While not as accurate as a resistive load bank, a tungsten bank can be built far cheaper than purchasing a resistive bank. For further information, see Tungsten Load Bank on page 49.

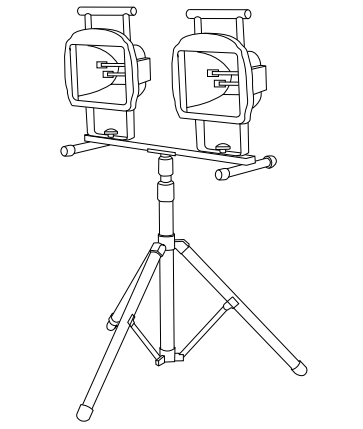


Fig. 17: Halogen Work Light

Halogen Load Bank (Optional)

For infrequent testing, halogen work light(s) can be used to load the generator. Since many work lights are now LED (low power) make sure to only use a true halogen light. You can add more lights to increase the loading of the generator as long as you do not overload the receptacle(s).

5 Transportation

5.1 Transporting the Machine

⚠ WARNING

Explosion hazard

Leaving the generator in an enclosed space on the transport vehicle where temperatures can rise may cause fuel to vaporize and possibly explode. Fire and explosions can cause severe burns and/or death.

- ► Secure the generator in a well-ventilated area on the transport vehicle that is out of direct sunlight and other heat sources.
- ► Do not transport the generator on rough roads unless the fuel has been drained beforehand.

1. Place the fuel valve to the OFF position.
2. Turn the engine control switch to the OFF position.
3. To prevent fuel spillage when transporting, keep the generator upright on a level surface.
4. Secure generator with straps or tie downs to prevent tip over and damage from sliding.

NOTE: Do not operate the generator while it is on the transport vehicle.

6 Maintenance

6.1 Generator Maintenance

⚠ CAUTION

Property damage and personal injury hazard

Improper engine and generator maintenance and failing to correct problems before operation could void the warranty and may result in property damage and injury.

► To prevent these hazards, follow the maintenance procedures and timelines listed in this manual and any other manual that came with this product.

For safety reasons, the manufacturer recommends all generator service and repairs be performed by a qualified service center. Normal maintenance, replacement, and/or repair of emission control devices or systems may be performed by any establishment or individual. However, all warranty replacements or repairs must be performed by an authorized service center. To find an authorized service center near you, to make a warranty claim, or for authorized warranty repair, call 1-800-770-0957 or www.wackerneuson.com.

It is the responsibility of the owner and/or operator to have all scheduled maintenance completed before operating the generator. Before servicing or inspecting the generator, stop the generator, disconnect all electrical devices, and allow the generator and engine to cool down.

6.2 Cleaning

NOTICE

Machine damage hazard

Water can damage the generator windings and other components if allowed to enter through cooling slots or other holes. Damage caused by water intrusion is not covered under warranty.

► Do not use a pressure washer, garden hose, or any other sources of running water to clean the generator.

► Never submerge the generator in any liquids.

Always clean the machine with the engine off and cool. To clean the machine, first use an air compressor set at no more than 25 psi to clear dirt and debris from the machine surfaces, vents, and cooling slots. Then, wipe the exterior clean with a damp cloth.

6.3 Servicing the Air Cleaner

⚠ WARNING

Health hazard

The air filter element and air box assembly may contain polycyclic aromatic hydrocarbons (PAHs). Some PAHs may cause cancer.

► Wear gloves when performing air filter maintenance.

⚠ WARNING

Fire hazard

Flammable liquids pose a fire hazard when cleaning.

► Do not use gasoline or other types of low flash point solvents to clean the air cleaner.

NOTICE

Engine damage hazard

Severe engine damage will occur if the machine runs without the air cleaner.

► Do not run the machine without the air cleaner.

Service the air cleaner frequently to prevent carburetor malfunction.

Procedure

1. Remove the air cleaner cover **(1)**.

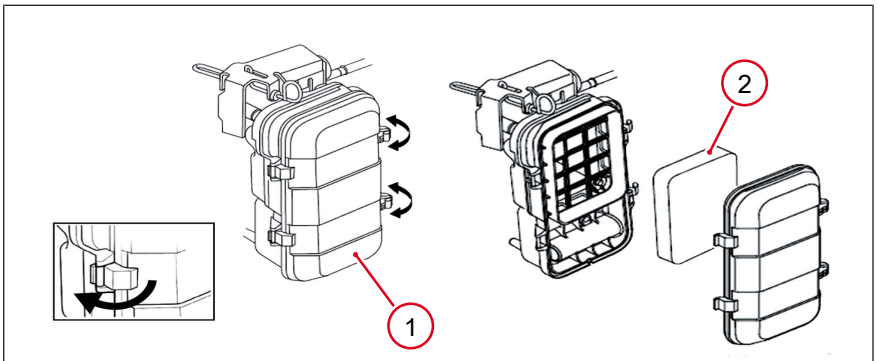


Fig. 18: Air cleaner

2. Inspect the element **(2)** for holes or tears.
   ⇨ Replace the element if it is damaged.
3. Wash the element in a solution of mild detergent and warm water.
4. Rinse it thoroughly in clean water.
5. Allow the element to dry thoroughly.
6. Soak the element in clean engine oil and squeeze out excess oil.

6.4 Adjusting the System Voltage

The following section is used as a guide on how to change the voltage output to bring it into tolerance and produce the correct electrical frequency. No matter the repair, the voltage should be verified before being put back into use. Consult the engine manufacturers service manual for further assistance.

Requirements

- Multimeter
- Generator not connected to any load
- Idle control switch is OFF

⚠ WARNING

Crushing hazard

This product has many parts that move at high speeds. Moving parts can cause crushing injuries, broken bones, severe lacerations, and/or traumatic amputations.

► Never place fingers, hands, feet, or other body parts near running engine.

► Never operate product with covers, shrouds, or other guards removed.

► Do not wear loose-fitting clothing, dangling drawstrings, or any other hanging items that could become entangled in moving parts while operating.

► Tie up long hair and remove jewelry before operating.

NOTICE

Setting the engine speed too high or too low may damage tools and other appliances attached to the generator.

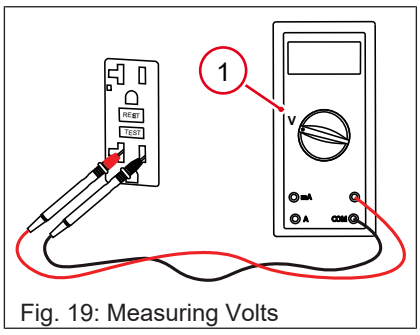


Fig. 19: Measuring Volts

1. Start the engine. Allow it to run for about five minutes so the temperature stabilizes.
2. Connect a digital multimeter, set to read VOLTS AC **(1)**, to the GFCI receptacle.
3. The voltage displayed should be in the range of 122—124vAC. If the reading is within this range, proceed to step #5. If it is outside the range, proceed to step #4.
4. You can adjust the voltage by using the limit screw **(2)** located above the air filter housing **(3)**. Using a Phillips screwdriver, turn the screw clockwise **(4)** to increase the voltage or counterclockwise **(5)** to decrease the voltage.

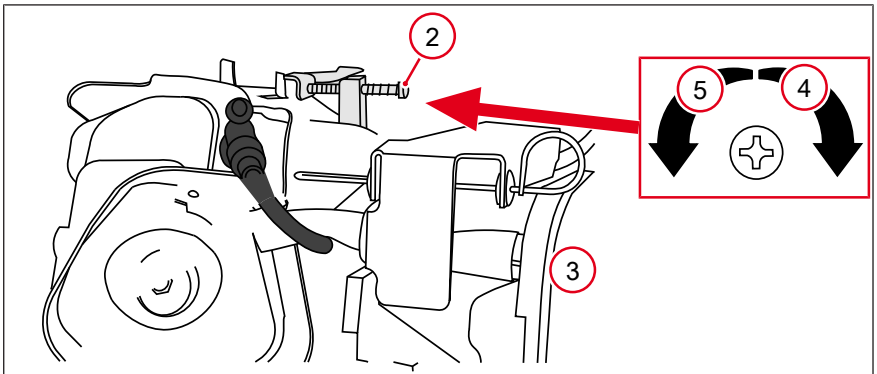


Fig. 20: System Voltage Adjustment

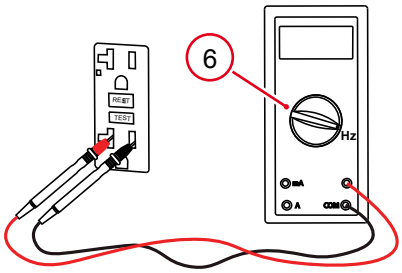


Fig. 21: Measuring Frequency

5. Once the voltage is within the range set in Step #3, verify the unloaded electrical frequency range using the Frequency (Hz) setting **(6)** on the digital multimeter or by using a standalone frequency counter. The range should be 57 to 63Hz.
6. Turn the engine off.

6.5 Changing the Engine Oil

⚠ WARNING

Health hazard

Most used oil contains small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

- ► Take steps to avoid inhaling or ingesting used engine oil.
- ► Wash skin thoroughly after exposure to used engine oil.

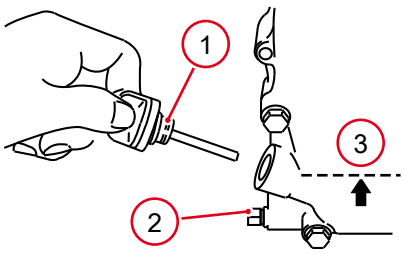


Fig. 22: Engine oil filter plug, drain plug, and crankcase

1. Drain the oil while the engine is still warm.
2. Remove the oil filler plug **(1)** and the drain plug **(2)** to drain the oil. **Note:** In the interests of environmental protection, place a plastic sheet and a container under the machine to collect any liquid that drains off. Dispose of this liquid in accordance with environmental protection legislation.
3. Install the drain plug.
4. Fill the engine crankcase with the recommended oil up to the level of the plug opening **(3)**. For oil quantity and type, see Engine on page 35
5. Install the oil filler plug.

6.6 Cleaning and Checking the Spark Plug

⚠ WARNING

Burn hazard

The engine and muffler become very hot during operation and require cool-down time after the engine is stopped.

► Do not touch the engine, muffler, or spark plug until the machine is cool.

NOTICE

A loose spark plug can become very hot and may cause engine damage.

When

Every 100 hours

Requirements

- Engine stopped and cool to the touch
- Spark plug wrench
- Spark plug gap tool
- Wire brush
- Replacement spark plug as needed. For further information, see Engine on page 35.

Procedure

1. Disconnect the spark plug wire **(2)** and remove the spark plug **(1)**.

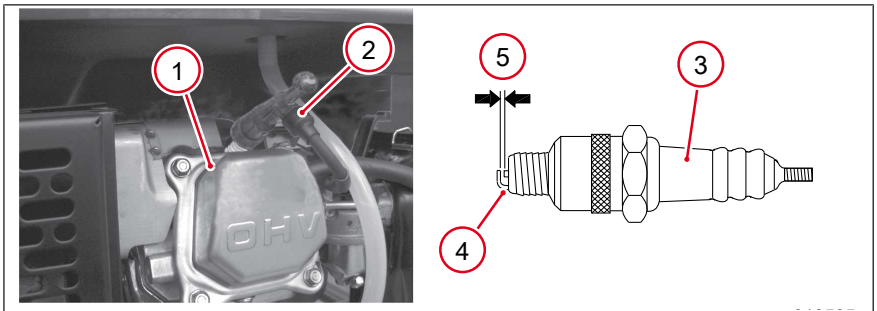


Fig. 23: Spark plug

2. Inspect the spark plug. Replace the spark plug if the insulator **(3)** is cracked or chipped.
3. Clean spark plug electrodes **(4)** with a wire brush to remove carbon deposits.
4. Check the electrode gap **(5)** and adjust as needed. For the recommended gap setting, see Engine on page 35.
5. Reinstall the spark plug.

6.7 Cleaning the Spark Arrester

⚠ CAUTION

Fire hazard

Operation of this product may create sparks that can start fires around dry vegetation.

- ► If the generator will be used around flammable materials, grasslands, woodlands, or other dry vegetation, an approved spark arrester must be installed.
- ► In some areas, a spark arrester is required by law. Contact your local fire agencies for fire prevention laws and regulations and have a spark arrester installed by an authorized service center if needed.

The spark arrester must be maintained per the maintenance schedule in the engine manual. In the State of California, a spark arrester is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal lands. For spark arrester location, see Component Locations—GP2500 on page 33 or see Component Locations—GP4000 / 5500 / 7000 on page 34 depending on your model.

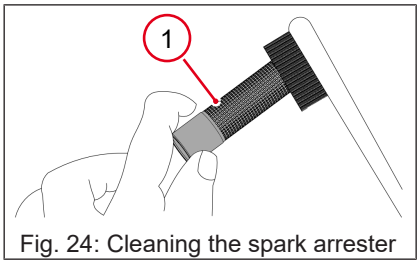


Fig. 24: Cleaning the spark arrester

1. Allow the engine to cool completely before servicing the spark arrester **(1)**.
2. Remove any screw(s) retaining the spark arrester.
3. Remove the spark arrester screen assembly from the muffler/exhaust pipe.
4. Carefully clean the spark arrester by burning the deposits from the screen with a small torch or by gently scrubbing the screen with a soft wire brush.
5. Replace the spark arrester if the screen has holes or other damage.
6. Insert the now cleaned or replaced spark arrester into the muffler/exhaust pipe and replace retaining screw(s).

6.8 Cleaning the Sediment Cup

When

Every 100 hours

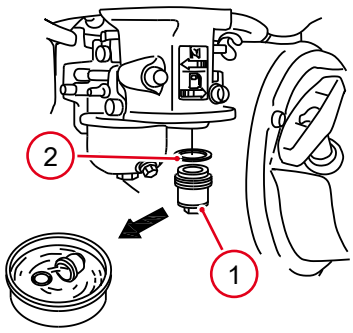


Fig. 25: Sediment cup

Procedure

1. Turn the fuel valve off.
2. Remove the sediment cup **(1)** and the O-ring **(2)**.
3. Wash the sediment cup in a nonflammable solvent.
4. Dry and install the sediment cup.
5. Replace the O-ring with a new one.
6. Turn the fuel valve on and check for leaks.

6.9 Adjusting the Carburetor

1. Start the engine and allow it to warm up to operating temperature.
2. Set the pilot screw **(1)** two turns out.
   Note: On some engines the pilot screw is fitted with a limiter cap **(3)** to prevent excessive enrichment of the air-fuel mixture in order to comply with emission regulations. The mixture is set at the factory and no adjustment should be necessary. Do not attempt to remove the limiter cap. The limiter cap cannot be removed without breaking the pilot screw.

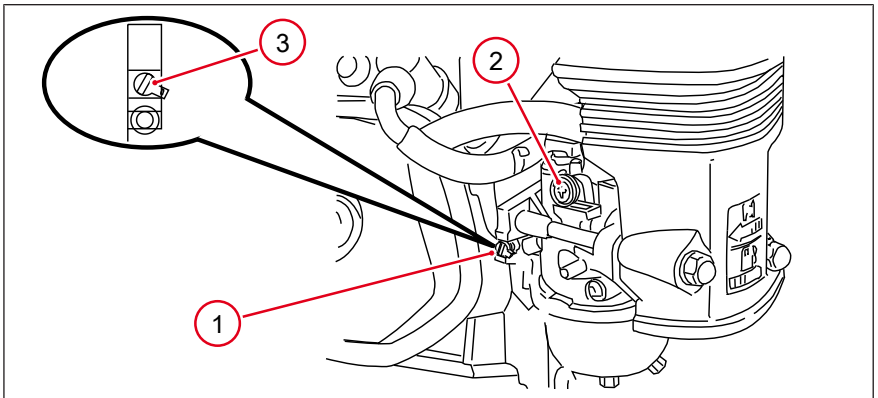


Fig. 26: Carburetor

3. With the engine idling, turn the pilot screw **(1)** in or out to the setting that produces the highest rpm.
4. After the pilot screw is adjusted, turn the throttle stop screw **(2)** to obtain the standard idle speed. For further information, see Engine on page 35.

7 Engine

7.1 Component Locations—GP2500

Note: Line drawings used in this manual may not represent your specific model.

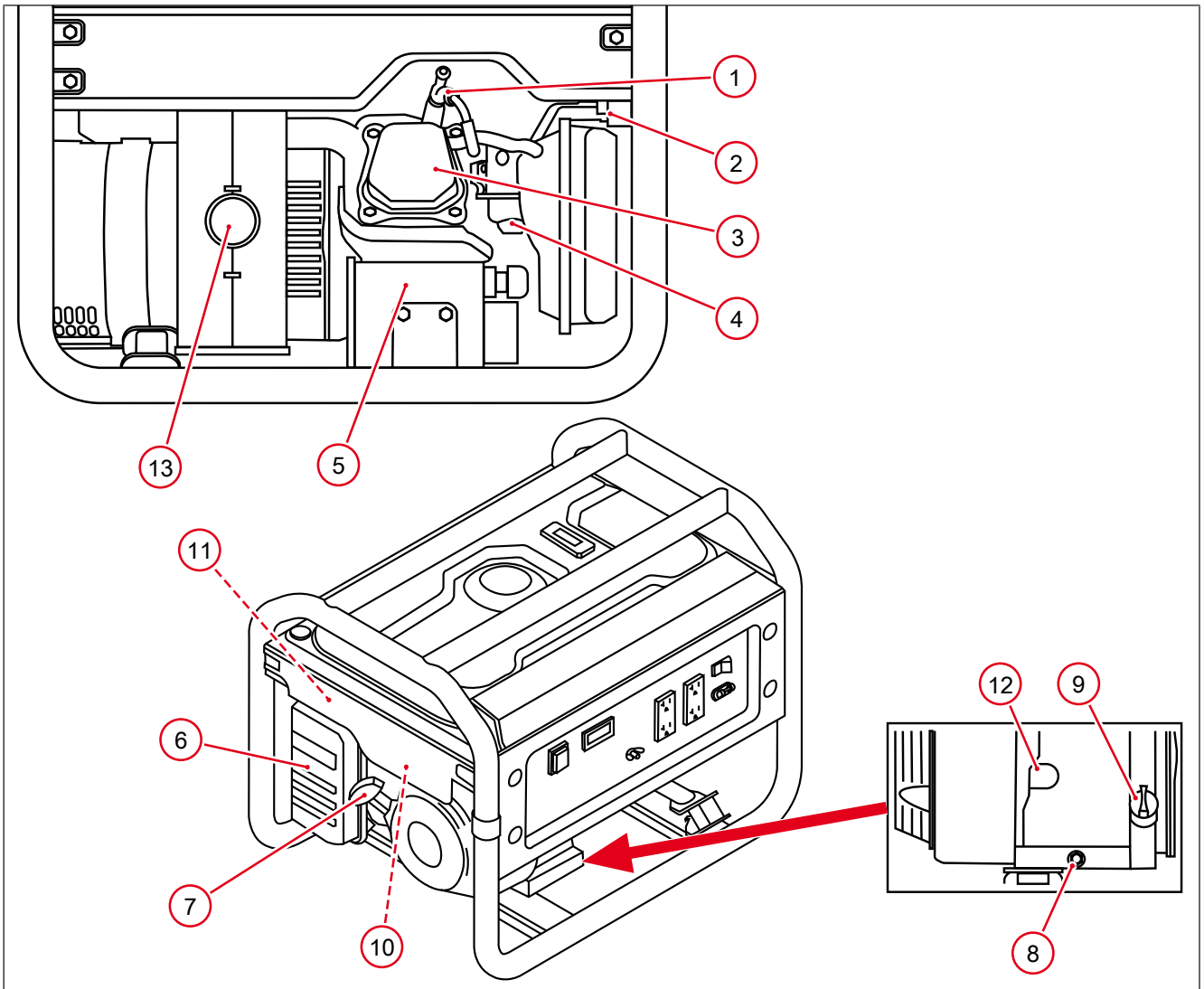


Fig. 27: Engine GP2500 Component Location

Ref.	Component	Ref.	Component
1	Spark plug	8	Engine oil drain plug
2	Engine choke control	9	Oil dipstick/filler
3	Engine valve cover	10	Fuel valve
4	Carburetor	11	Fuel line
5	Carbon cannister	12	Oil sensor
6	Air filter	13	Spark arrestor
7	Starter recoil	—	—

7.2 Component Locations—GP4000 / 5500 / 7000

Note: Line drawings used in this manual may not represent your specific model.

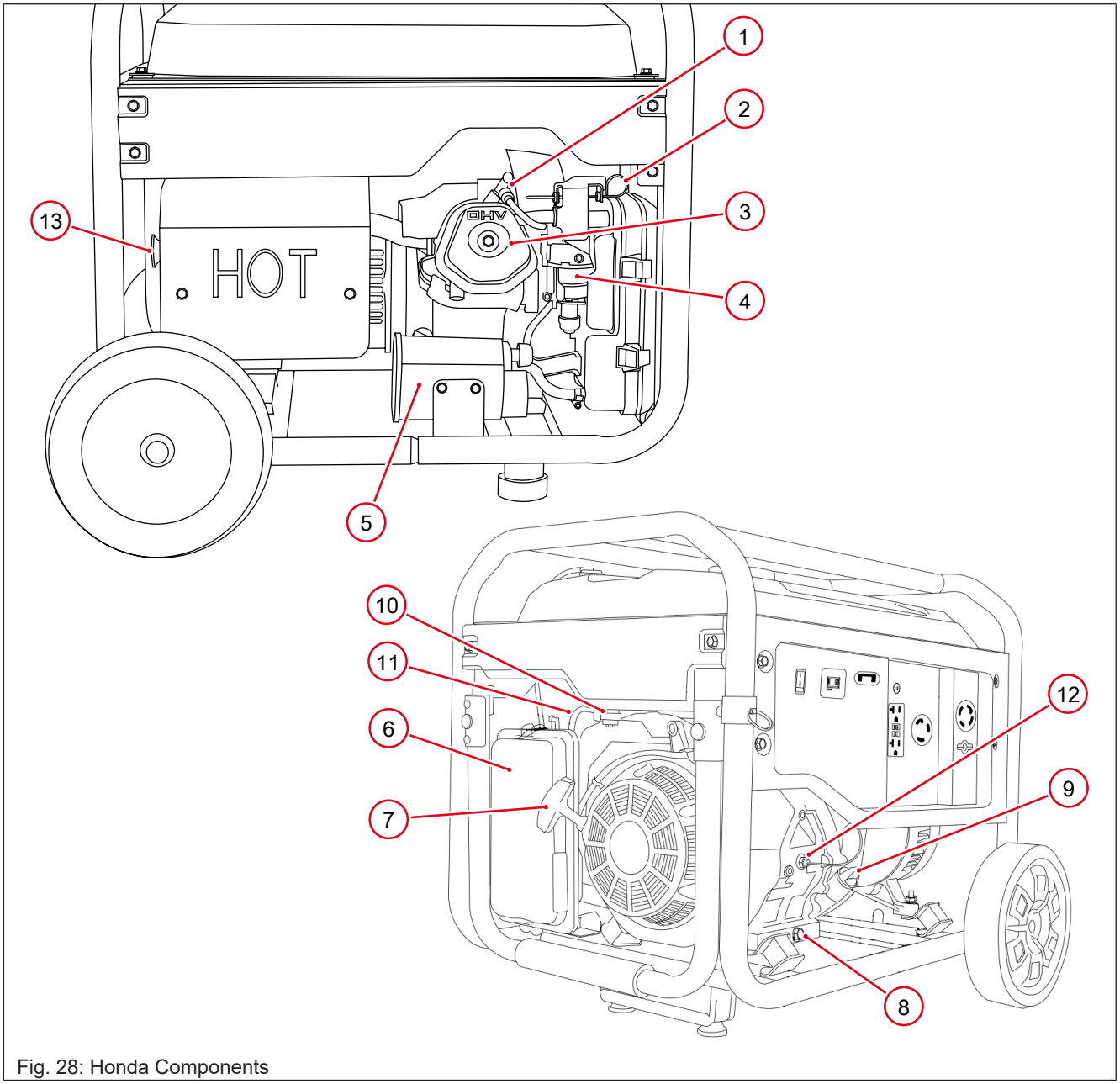


Fig. 28: Honda Components

Ref.	Component	Ref.	Component
1	Spark plug	8	Engine oil drain plug
2	Engine choke control	9	Oil dipstick/filler
3	Engine valve cover	10	Fuel valve
4	Carburetor	11	Fuel line
5	Carbon cannister	12	Oil sensor
6	Air filter	13	Spark arrestor
7	Starter recoil	—	—

7.3 Type Label Engine Number

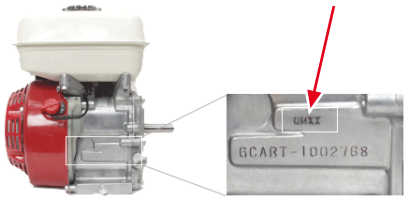


Fig. 29: Honda Engine Type

- The Honda engine type code is stamped into the side of the engine, usually close to the serial number. Engine type codes may be up to 4 characters. If a code is less than 4 characters, you may see asterisks as placeholders (i.e. an engine stamped with QX** is a QX type engine.)

7.4 Technical Data

7.4.1 Engine

	GP2500A	GP4000A	GP5500A	GP7000A
Make	Honda			
Model	GX160	GX270	GX390	
Starting system	Recoil			
Cylinders	1			
RPMs	3600			
Displacement	163cc	270cc	389cc	
Fuel type	Gasoline			
50 state EPA and CARB compliant	Yes			
Low oil shutdown	Yes			
Blower housing cover	Yes			
Engine oil grade	SAE 10W-30			
Engine oil capacity	0.6 L (0.7 qt)	1.1 L (1.16 qt)		
Spark plug	NGK BPR6ES / ND W2OEPR			
gap	0.7—0.8 mm (0.028—0.031 in.)			

7.5 Troubleshooting

7.5.1 Engine

Engine does not start

Probable cause	Remedy
1. Fuel tank is empty	Add fuel to the tank
2. Fuel is old or stale	Drain fuel tank and carburetor bowl of old fuel, refill w/ fresh fuel.
3. Fuel not reaching carburetor	• Turn the fuel valve to the ON position. • Ensure the fuel line is free of blockages, replace if necessary. • Verify fuel tank and fuel valve are clean.
4. Carburetor is dirty	Clean carburetor or replace.
5. Choke not set correctly	Set to CHOKE for a cold engine, RUN for a warm engine.
6. Spark plug cap is loose or unattached	Connect cap to spark plug and make sure of a tight fit.
7. Spark plug is in good condition	Inspect, clean, set gap, or replace the spark plug per the engine manual.
8. Low engine oil	Check the oil level and fill as needed per the engine manual.
9. Air filter is dirty	Clean the air filter per the engine owner's manual or replace.
10. Engine control switch is OFF	Rotate -or- flip the engine control switch to ON.
11. Engine control switch is faulty	Verify with ohmmeter. If not passed, replace. • 0 ohms – closed • 10 ohms – open
12. No spark	See engine manufacture's service manual.

Engine will not stay running or lacks power

Probable cause	Remedy
1. Fuel tank is empty	Add fuel to the tank
2. Choke not set correctly	Set to CHOKE for a cold engine, RUN for a warm engine.
3. Air filter is dirty	Clean the air filter per the engine owner's manual or replace.
4. Spark plug is in good condition	Inspect, clean, set gap, or replace the spark plug per the engine manual.
5. Carburetor is dirty	Clean carburetor or replace.
6. Carburetor out of adjustment	Adjust or replace.
7. Fuel line is blocked	Replace the fuel line; verify fuel tank and fuel valve are clean.

8 Generator

8.1 Component Locations

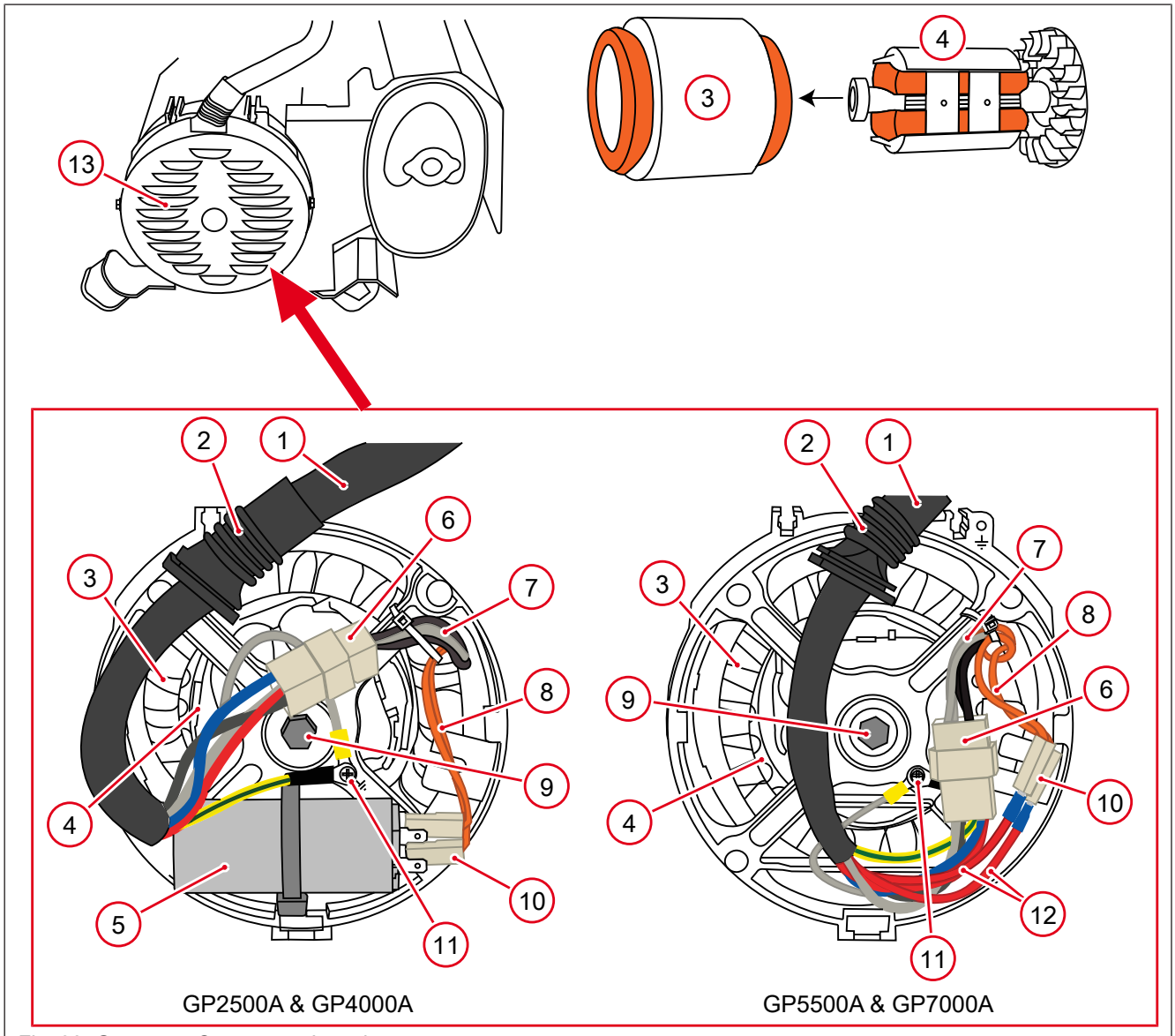


Fig. 30: Generator Component Location

Ref.	Component	Ref.	Component
1	Panel harness	8	Exciter winding leads
2	Grommet	9	Rotor bolt
3	Stator	10	Capacitor connectors
4	Rotor	11	Panel harness ground connection
5	Capacitor	12	Panel harness capacitor leads
6	Harness connector	13	Alternator cover
7	Alternator harness	—	—

8.2 Technical Data

8.2.1 Generator

	Units	2500A	4000A	5500A	7000A
Frequency	hz	60			
Voltage	V	120	120 / 240		
Phase	—	Single			
Running watts	w	2,250	3,800	5,000	6,800
Starting watts	w	2,500	4,000	5,500	7,200
Power factor	—	1.0			
Insulation rate	—	Class “H” (125°C / 40°C)			
Fuel capacity	L (gal)	14.7 (3.9)	30 (7.9)		

8.2.2 Alternator Resistance Chart

The resistances below are taken at a nominal temperature of 70°F (21°c) with the windings completely disconnected from other components.

KvA	Stator 1—2	Stator 3—4	Rotor	Exciter
2.5	0.970Ω	0.970Ω	2.62Ω	5.460Ω
4	0.709Ω	0.709Ω	3.25Ω	5.330Ω
5 / 6.8	0.326Ω	0.326Ω	4.38Ω	2.012Ω

8.2.3 Voltage and Frequency Tolerances

Allow the generator engine temperature to stabilize by running it for a five minute period, unloaded, with the idle control **(13)** set to OFF.

On the GP2500, the voltage and frequency measurements should be made at the GFCI receptacles **(7)** with the power switch in the low power position.

On the GP4000 / 5500 / 7000, the voltage and frequency measurements should be made at the L14-30R receptacle **(11)** with the voltage switch **(6)** in the 120/240v position.

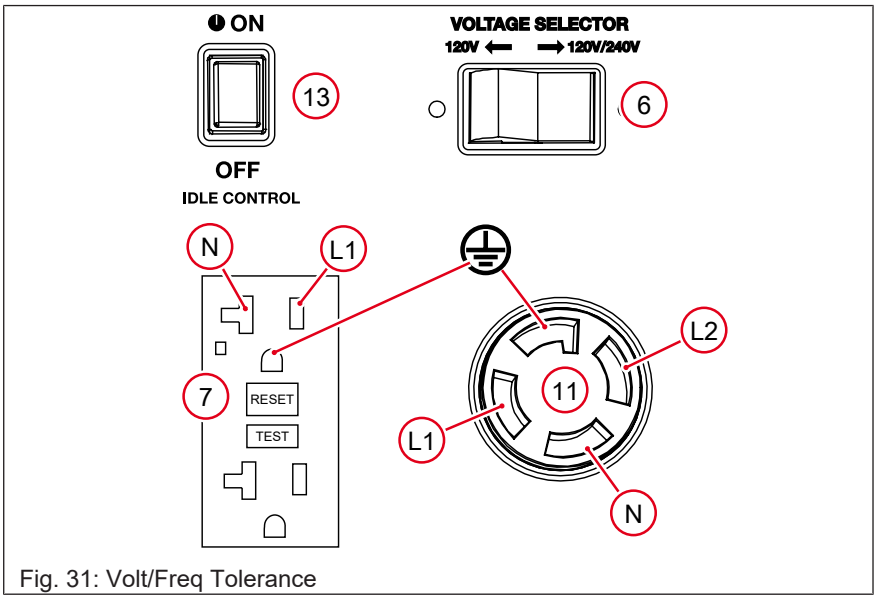


Fig. 31: Volt/Freq Tolerance

Unloaded	
Voltage L1 – N	123v +/- 1v
Voltage L2 – N	123v +/- 1v
Voltage L1 – L2	246v +/- 1v
Frequency	60Hz +/- 3Hz

loaded	
Voltage L1 – N	119v +/- 1v
Voltage L2 – N	119v +/- 1v
Voltage L1 – L2	242v +/- 1v
Frequency	57Hz +/- 3Hz

8.3 Theory of Operation

8.3.1 Electrical Generation

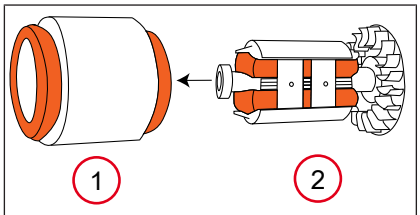
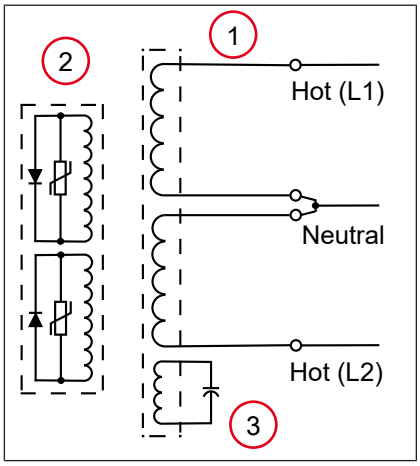


Fig. 32: Rotor & Stator

The generator utilizes a brushless alternator. A brushless unit offers the advantage of longer service life over a traditional brushed alternator. In order for a brushless unit to operate, an exciter winding within the stator **(1)** needs to work in conjunction with the rotor **(2)**.



The rotor **(2)** carries in it weak residual magnetism. When the rotor first begins to rotate, this magnetism causes a weak current to flow in the exciter winding charging a capacitor. As the polarity of the rotor changes in relation to the exciter winding, the capacitor discharges into the exciter coil **(3)** producing a magnetic pulse. This pulse is picked up by the windings of the rotor which in turn produces an electric current that is rectified by a diode creating direct current. As the speed increases, the back and forth between the exciter winding and rotor windings intensifies.

As the magnetic field emitted from the rotor intensifies, the stator windings become energized. This is the usable current that is supplied by the alternator. As the load is increased, this too affects the exciter winding which, through the capacitor, an even stronger magnetic pulse is created which further intensifies the rotor. This effect helps to regulate the voltage keeping voltage lags low while a current demanding load is started or connected to the generator.

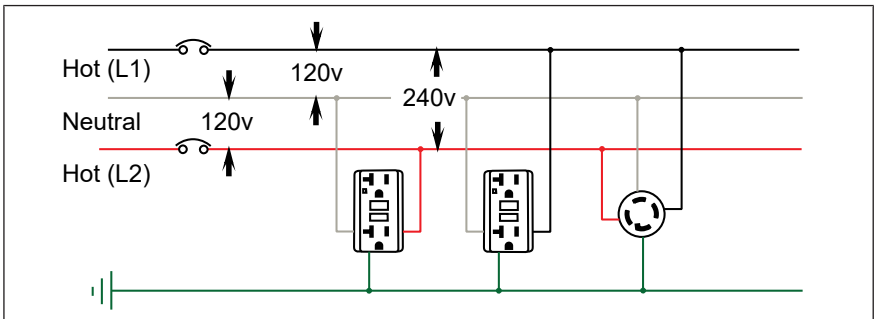


Fig. 33: Electrical Output

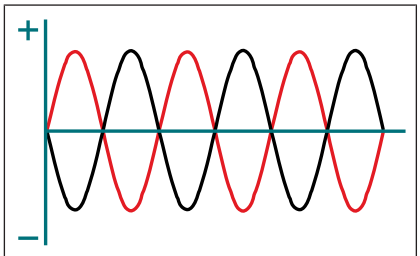


Fig. 34: Oscilloscope Screen

The electrical output is what is known as split, single-phase alternating current. Between each line also known as “Hot”, 240 volts is present. Connected to the midpoint of the stator winding is a conductor known as the “neutral”. Between each hot and the neutral, 120 volts exist. The hots are 180º out of phase with one another which can be seen on an oscilloscope screen.

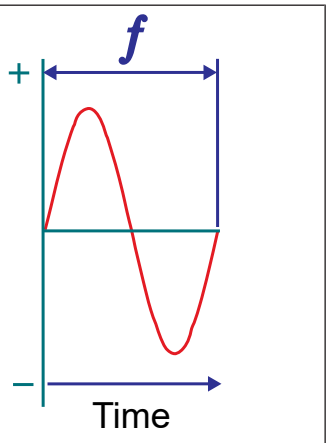


Fig. 35: Frequency /Time

Each cycle of the sine wave is the frequency ƒ. Hertz (Hz) is the measurement of frequency over time. The alternating current produced by the alternator has a frequency of 60 hertz (Hz). This means the sine wave goes from positive to negative and back, 60 times in one second.

60Hz is the standard for North America, Central America and parts of South America. 50Hz is the standard for most of the remaining continents. Frequency is important and is controlled by the speed of the engine. Most electrical and electronic devices can tolerate some deviance from the 60Hz standard. However, a frequency that is too low or too high, can cause electronic items to malfunction and heating in inductive loads like motors and transformers

As stated above, the frequency is controlled by the speed (RPM) of the engine. The equation to calculate the frequency is: f = N x P ÷ 120, where ƒ is the frequency, N is the RPM of the engine and P is the number of poles in the generator.

The number of poles in the alternator is 2 and with the engine speed set to 3600RPM, a frequency of 60Hz is produced (3600 x 2 ÷ 120 = 60). The unloaded speed of the engine is set slightly higher knowing when the generator is loaded, the speed will reduce some.

Typically, the unloaded speed is set 4% higher. This means an RPM of roughly 3744 creating a frequency of 62.4Hz.

When the generator is heavily loaded, the strong magnetic field places extra load on the engine. In this situation, the reduced speed affects the centrifugal governor within the engine causing it to advance the throttle. This allows a larger volume of the air/fuel mixture into the engine creating more power of constant speed. Through the engine governor and the exciter / capacitor regulation, the voltage is maintained in a safe range.

8.4 Troubleshooting

8.4.1 Alternator

Alternator is noisy

Probable cause	Remedy	See Topic
1. Rotor bolt is loose	Torque rotor bolt to 15.5 ft. lbs. (21 Nm).	—
2. Damage to generator internal fan (missing blades, cracking or warping)	Replace the alternator.	[▷ 44]
3. Shaft bearing is worn	Replace the alternator.	
4. Rotor shaft is worn	Replace the alternator.	

8.4.2 Generator

Generator is overheating

Probable cause	Remedy	See Topic
1. Generator is overloaded	Consult the operators manual for proper load of your generator.	—
2. Air vent holes in the generator are full of debris and dirt	Using compressed air (<25 psi) blow out debris and dirt from the vent holes. Remove alternator cover to remove any debris.	—
3. Damage to generator internal fan (missing blades, cracking or warping)	Replace the alternator.	[▷ 44]
4. The system voltage is not 123vAC (+/- 1v)	Adjust the system voltage.	[▷ 28]

No voltage output

Probable cause	Remedy	See Topic
1. Main circuit breaker is turned OFF	Turn the main circuit breaker ON.	—
2. The GFCI is tripped (if equipped)	Reset the GFCI.	—
3. The system voltage is not 123vAC (+/- 1v)	Adjust the system voltage.	[▷ 28]
4. Coils within the alternator are not producing ~120 v	Measure voltage at alternator connector.	[▷ 70]
5. Wires leading from alternator lost continuity	Test for continuity and replace wires with insufficient continuity.	—
6. Alternator lost residual magnetism	Restore lost magnetism.	[▷ 50]
7. Capacitance measurement is out of tolerance	Test the capacitor and replace if necessary.	[▷ 72]
8. Exciter (capacitor) coil resistance is out of tolerance	Test the stator / replace alternator if necessary.	[▷ 54] [▷ 44]
9. Stator coils are out of tolerance	Test the stator / replace alternator if necessary.	
10. Rotor coils are out of tolerance	Replace alternator.	[▷ 44]

Voltage output drops then returns

Probable cause	Remedy	See Topic
1. Generator load affects engine speed	Replace the alternator.	[▷ 44]

Voltage output too high (underloaded)

Probable cause	Remedy	See Topic
1. The system voltage is not 123vAC (+/- 1v)	Adjust the system voltage.	[▷ 28]
2. Capacitance measurement is out of tolerance	Test the capacitor and replace if necessary.	[▷ 72]
3. Stator coils are out of tolerance	Test the stator / replace alternator if necessary.	[▷ 54] [▷ 44]

Voltage output too low (underloaded)

Probable cause	Remedy	See Topic
1. The idle control switch is in ON position	Set idle control switch to OFF.	—
2. The system voltage is not 123vAC (+/- 1v)	Adjust the system voltage.	[▷ 28]
3. Capacitance measurement is out of tolerance	Test the capacitor and replace if necessary.	[▷ 72]
4. Capacitance measurement is within tolerance	Test the capacitor / replace alternator if necessary.	[▷ 72] [▷ 44]

Voltage sags under load

Probable cause	Remedy	See Topic
1. Generator is run with too much load	See operator's manual for proper loading.	—
2. Engine requires maintenance	Perform routine engine maintenance.	—
3. Engine RPM is outside of tolerance	Adjust / replace engine governor. Refer to engine manufacturer's service manual.	—
4. Wiring is overheating	Inspect for signs of melting, darkened and/or cracked insulation. Replace if necessary.	—
5. Connections are loose causing arcing or darkened terminals	Replace overheated connectors and/or parts.	—
6. Alternator is faulty	Replace the alternator.	[▷ 44]

Frequency too high or low

Probable cause	Remedy	See Topic
1. The unloaded frequency is 62Hz (+/- 1Hz)	Adjust the engine speed.	[▷ 28]
2. The system voltage is not 123vAC (+/- 1v)	Adjust the engine speed.	
3. Frequency is out of tolerance when load tested across range of generator	Refer to engine manufacturer's service manual for testing and adjusting procedure.	—

GFCI constantly trips

Probable cause	Remedy	See Topic
1. GFCI trips with no load on generator	Replace the GFCI.	—
2. Device plugged into generator has defective ground fault	Service device.	—

8.5 Repair

8.5.1 Removing and Installing the Alternator

Requirements

- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14
- Engine stopped and spark plug lead disconnected from spark plug
- 8mm open-end wrench
- Phillips screwdriver
- 10mm socket & ratchet
- 13mm open-end wrench
- 14mm open-end wrench (2)
- Assistant or appropriate hoist

⚠ WARNING

Crushing hazard

This product has many parts that move at high speeds. Moving parts can cause crushing injuries, broken bones, severe lacerations, and/or traumatic amputations.

► Never place fingers, hands, feet, or other body parts near running engine.

► Never operate product with covers, shrouds, or other guards removed.

► Do not wear loose-fitting clothing, dangling drawstrings, or any other hanging items that could become entangled in moving parts while operating.

► Tie up long hair and remove jewelry before operating.

⚠ CAUTION

Crushing hazard

The alternator assembly is very heavy. The use of an assistant is recommended. If an assistant is not available, blocking should be placed below the alternator to support its weight. A hoist can be used to move the old alternator and place the new one.

Note: Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Using an 8mm open-end wrench, loosen the bolts **(1)** holding the alternator cover **(2)** and remove.
2. Disconnect the panel harness **(3)** from the alternator harness **(4)**.
3. Using a Phillips screwdriver, unscrew the grounding lead (yellow with a green stripe) & white, neutral bonding wire from the alternator bearing bracket **(5)**.
4. (GP5500 & GP7000 only) Disconnect the capacitor harness leads from the exciter winding leads **(6)** from the alternator.
   Note: The capacitor may still be charged. Discharge the capacitor. For further information, see Testing the Capacitor on page 72
5. Using a 10mm socket & ratchet, remove the three bolts **(7)** holding the alternator side panel **(8)** from the frame.
   Note: For GP5500 & GP7000, be careful of the leads leading to the capacitor. Disconnect the leads to free the panel.
6. Using a 10mm socket & ratchet, remove the six bolts **(9)** holding the control panel housing **(10)** from the frame.
   Note: When removing the housing from the frame being careful of the two wire harnesses leading to the engine. Disconnect the harnesses.

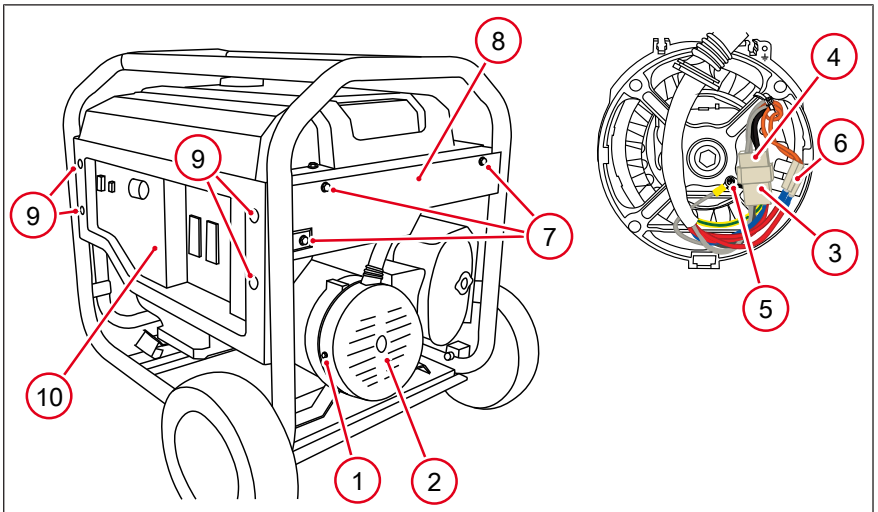


Fig. 36: R&I Alternator

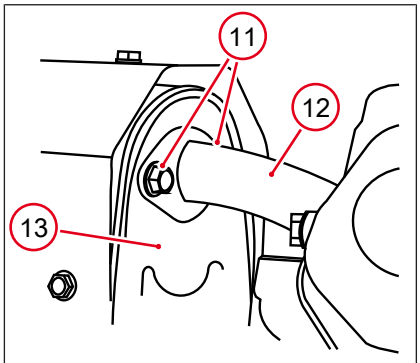


Fig. 37: R&I Muffler

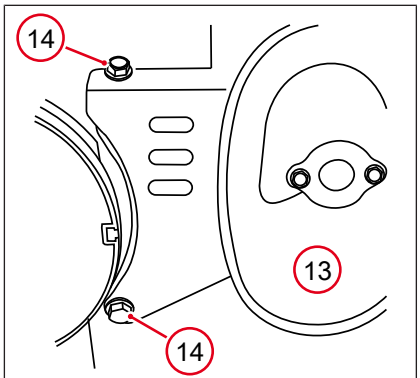


Fig. 38: R&I Muffler

7. Using a 13mm open-end wrench, remove the two bolts **(11)** attaching the exhaust pipe **(12)** to the muffler **(13)**. Use care to not damage the gasket.

8. Using a 13mm socket and ratchet, remove the two bolts **(14)** holding the muffler **(13)** to the muffler mount and remove the muffler.

9. Using two 14mm open-end wrenches, remove the nut **(15)** holding the muffler mount **(16)** to the alternator bracket **(17)** and shock mount **(18)**. Remove the muffler mount.

10. Using a 13mm open-end wrench, loosen the nut **(19)** attaching the alternator **(20)** to the alternator bracket **(17)**.
Note: You do not need to remove the hardware fully.

11. Using two 14mm open-end wrenches, loosen the nut **(21)** holding the alternator bracket to the vibration mount **(22)**. Remove the hardware allowing the grounding wire to hang free from the frame. Slide the bracket out of the slot at the bottom of the alternator.

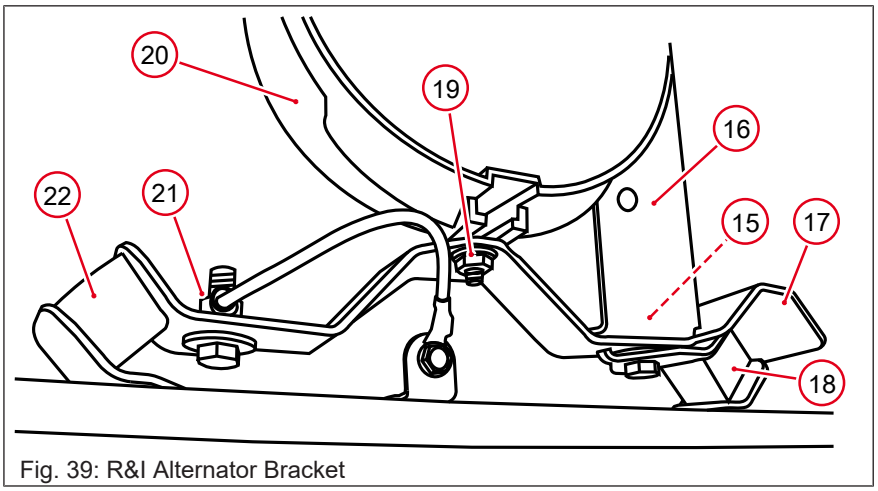


Fig. 39: R&I Alternator Bracket

12. Using a 13mm socket and an impact wrench, remove the rotor bolt **(23)**.

13. Have an assistant cradle the bottom of the alternator with their hands.

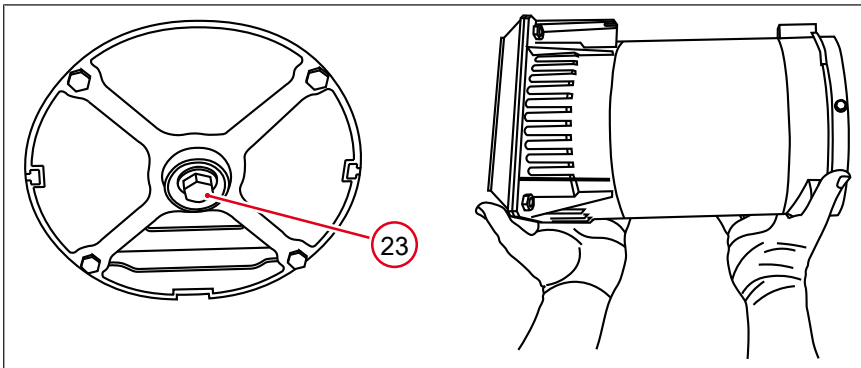


Fig. 40: Alternator Support

14. Using a 13mm socket and ratchet, remove the four flanged nuts **(24)** holding the alternator to the engine mounting bracket.

15. As the assistant cradles the alternator housing, pull the housing straight back out of the frame of the generator.
Note: The rotor may stay attached to the engine shaft.

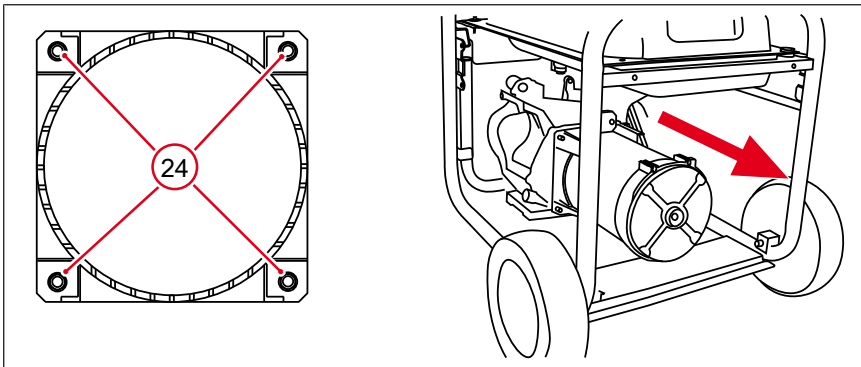


Fig. 41: Alternator Removal

16. Have the assistant cradle the rotor. With the use of a rubber mallet, tap the bearing of the rotor to break the rotor assembly free of the engine shaft **(25)** and remove the rotor.

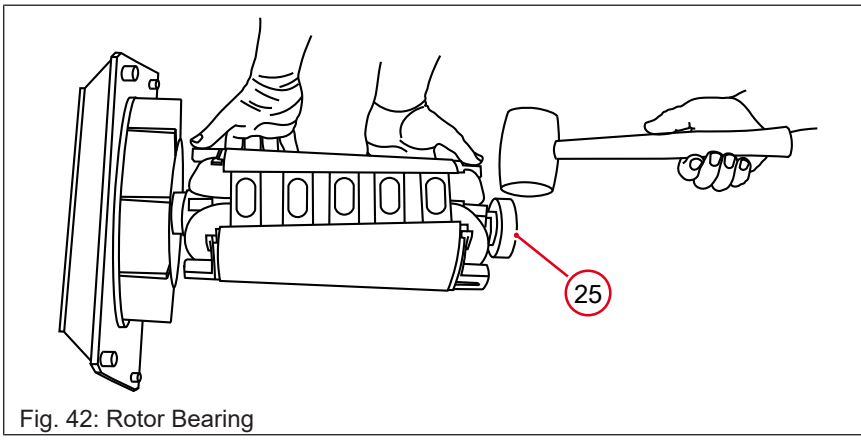


Fig. 42: Rotor Bearing

Installation Notes

During the removal procedure, the alternator mounting flange was not removed from the engine. Inspect it for signs of damage, cracking or any condition that may weaken its integrity. If nothing abnormal is found, it way be reused.

- Using a 13mm socket and ratchet, remove the mounting bracket from the new alternator.
- Install the alternator by reversing the order of removal.
- Torque four alternator mounting nuts **(24)** to 15.5 ft. lbs. (21 Nm).
- Torque the rotor bolt **(23)** to 15.5 ft. lbs. (21 Nm).
- After the alternator has been successfully installed, start the engine.
  - **GP2500**: With the power selection switch in the FULL position, measure for voltage at the GFCI duplex receptacle closest to the PSS. ~123vAC should be measured.
  - **GP4000 / 5500 / 7000**: With the voltage switch in the 120/240 volt position, measure for voltages at the L14-30 receptacle. L1 to neutral, ~123vAC. L1 to L2, ~246vAC.

Note: If you do not measure any voltages, the alternator may have lost its magnetism in storage. For further information, see Restoring Lost Magnetism on page 50

- With voltage present, verify the electrical frequency range using the frequency setting on the digital multimeter or by using a standalone frequency counter. The range should be 57 to 63Hz.

Note: If the frequency is not in this range, the engine speed will need to be adjusted. For further information, see Adjusting the System Voltage on page 28

8.6 Component Testing

8.6.1 Testing for Load

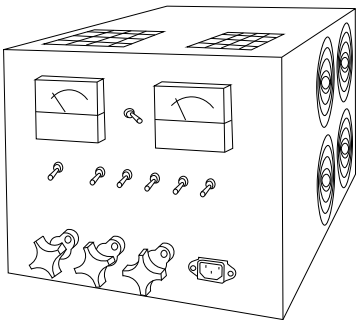


Fig. 43: Resistive Load Bank

It is important during troubleshooting to load the generator across its range. The purpose for this is to determine the engine is tuned properly and that the electrical protective devices do not operate prematurely.

The best way to load the generator is with a dedicated, resistive load bank. With a well-equipped unit, you have the flexibility to incrementally load the generator across its usable range. A resistive load bank is a sizable investment. For further information, see Specialized Tools on page 21.

You can, however, load the generator with other items such as electric heaters, tungsten light bulbs or halogen light bulbs. If at all possible, use an adjustable load (electric heater with multiple heat settings, for example) or many small loads that you plug in one at a time. The purpose for this is to see how the generator reacts (engine speed vs. voltage output). This is where a dedicated load bank is best, but you can build a load bank with tungsten light bulbs.

No matter your load of choice, make sure you load the generator evenly. In the case of a generator that is capable of producing 240 volts, you will have two sections, each 120 volts. If you were to place all of the available load of the generator on only one section of the alternator, you will overheat the alternator and open the over-current protection device(s). If the generator is rated for 5Kw, place 2.5Kw on each of the two sections.

8.6.2 Tungsten Load Bank

You can build a tungsten load bank that will allow you to test a generator in specific increments. Wiring can be made of 10 AWG throughout and use a 40A DPDT contactor or relay with a 120vAC coil.

Below is a schematic for the load bank. Pay close attention to how the circuitry is laid out to create an balanced load on the generator. It also has the ability to be used on a generator that only supplies 120 volts.

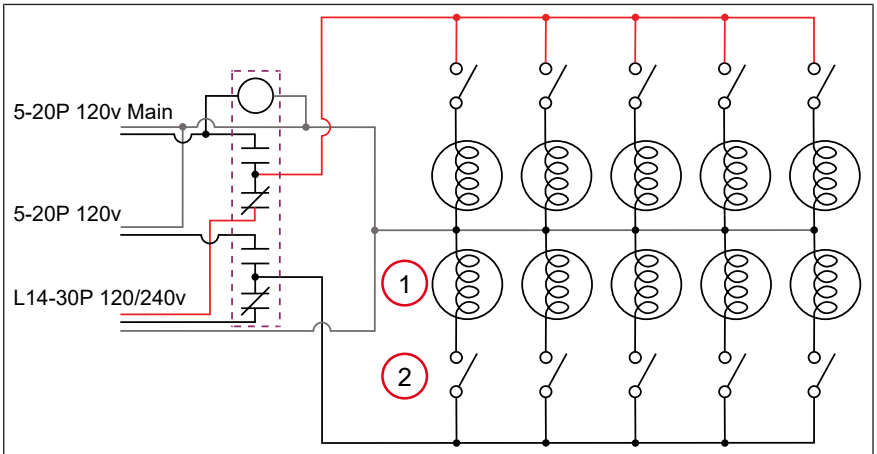


Fig. 44: Tungsten Load Bank Schematic

Each light bulb **(1)** is controlled by its own switch **(2)**. Since the light bulbs can be easily removed, you can place larger bulbs when needed to test a larger generator. The sockets are standard keyless lamp holders, preferably ceramic that are rated to greater than 500 watts. The largest readily available tungsten light bulb is 500 watts. These bulbs have mogul bases and will need an Edison to mogul adapter. When laying out the sockets, make sure to allow ample room from center to center to allow 500 watt light bulbs.

Remember, never exceed the rated wattage for the circuit. A 20 ampere circuit will allow a maximum of 2400 watts whereas the 30 ampere circuit will allow 3600 watts per leg.

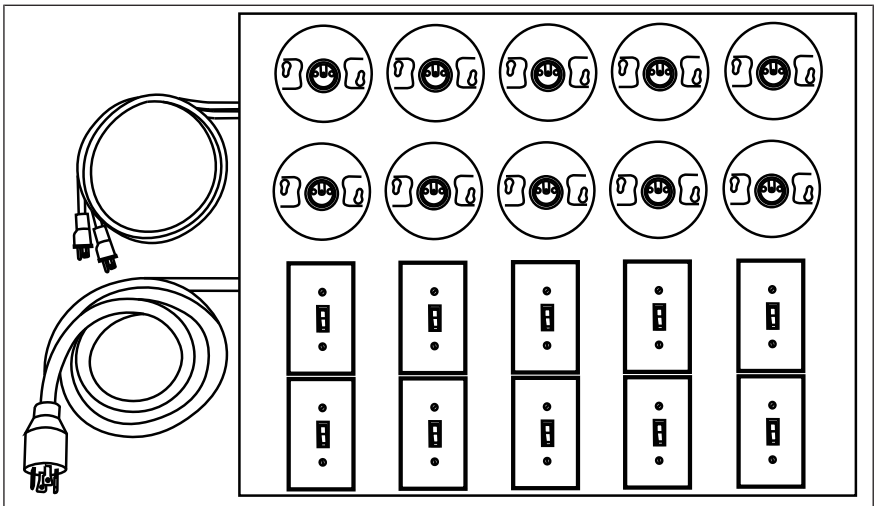


Fig. 45: Tungsten Load Bank

The frame can be made of plywood or sheet metal. If a metallic material is used, make sure to bond the frame to the same electrical ground as the generator. If you are connecting the load bank to a generator that only has 120 volt receptacles, make sure to use the input marked as main as this will energize the contactor which will switch the load bank to the 120 volt inputs.

This load bank should only be used with a generator rated at 7200 watts total or lower. The 10 AWG wiring will safely handle a total of 30 amperes or 3600 watts at 120 volts. If you should need a larger load bank, you can easily build a second unit, but make sure each set of five lights do not exceed 3600 watts. Since 500 watts is the largest tungsten bulb available today, you will never exceed 2500 watts per line.

The load bank is designed to be used for testing of the generator for a short time frame. Do not use the load bank for an extended period of time and allow the lamps to cool between testing sessions. Lastly, the bulbs are bright, so position the load bank so you will not be looking directly at the light bulbs at any time they are energized.

8.6.3 Restoring Lost Magnetism

When the generator has not been used for a long period of time, the residual magnetism within the rotor can be lost. Without residual magnetism, the generator will not create electricity.

Requirements

- Fully charged 12 volt battery
- Enclosed, normally open (N.O.) momentary switch
- Insulated alligator leads
- 6 feet (approx.) 14awg stranded, insulated wire
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14

⚠ DANGER

Carbon monoxide hazard

Engine exhaust contains carbon monoxide, an odorless, colorless, poisonous gas. Running an engine indoors will kill you in minutes.

► Never use this product inside a house, garage, or any other kind of enclosure even if doors and windows are open.

► Run the engine outside at least twenty (20) feet or six (6) meters away from windows, doors, and vents.

► Carefully consider wind direction and air currents when using this product outside to avoid breathing in engine exhaust.

► Always use a carbon monoxide detector in any occupied buildings near the running engine.

⚠ DANGER

Electric shock hazard

Capacitors can hold charges for a long period after the generator was last used. A charged capacitor can cause a lethal shock and/or lead to secondary accident. Always discharge the capacitor before handling, testing or replacing.

Building the flashing fixture

1. Strip about 1/4” of insulation from each end of a three foot piece of 14awg wire.
2. Connect one alligator clip to each end of the wire by soldering it or crimping the wire **(1)**.
3. Cut the remaining three foot piece of wire in half. Strip the ends 1/4”.
4. Connect one end of each of the remaining wires to the momentary switch. If the switch has leads on it, solder the wires to the leads, then cover the sections with two layers of electrical tape.
5. Connect the remaining alligator clips to these leads. The completed fixture should look like **(2)**.

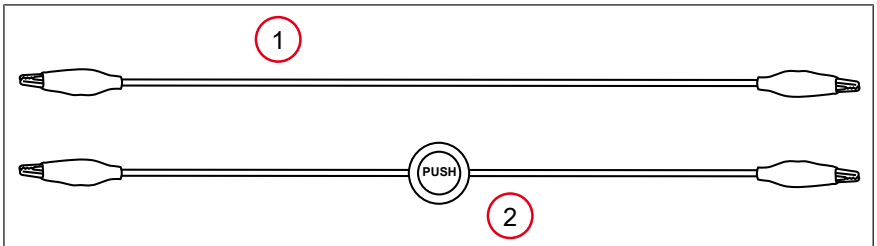


Fig. 46: Flashing Fixture

Flashing the capacitor

To restore the lost magnetism, you will “flash” the capacitor using the above fixture. What you will actually accomplish is inducing the beginning pulse to the rotor which will in turn cause it to magnetize.

1. Remove the rear cover of the alternator on the GP2500 and GP4000, or locate the capacitor attached to the underside of the frame on the GP5500 or GP7000 models.
2. Gently pull back on the wires of the capacitor harness (GP5500 or GP7000), allowing them to keep contact but creating an area for you to connect the alligator clips.
3. Connect one alligator clip from the switch and one end of the free lead to the capacitor terminals **(3)**.
   Note: Make sure they do not touch one another or any part of the generator frame.

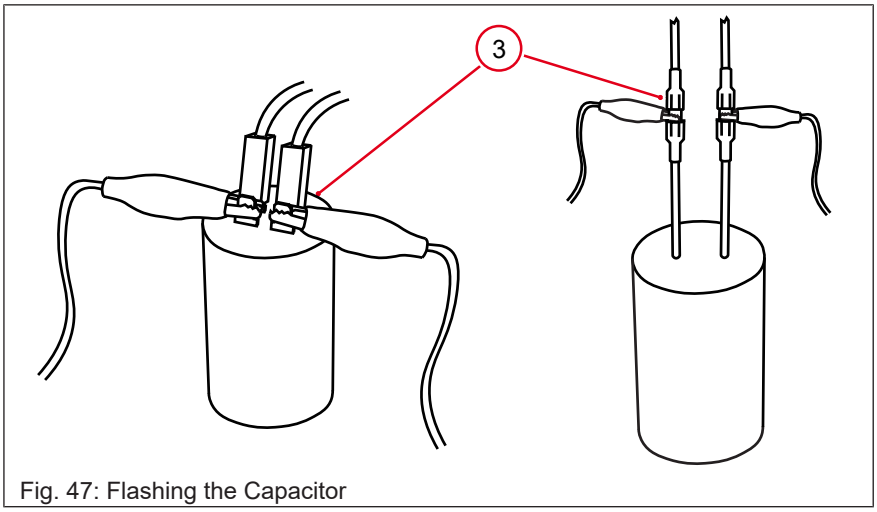


Fig. 47: Flashing the Capacitor

4. Connect the two free alligator leads to the battery **(4)**.
   Note: Polarity is not important.

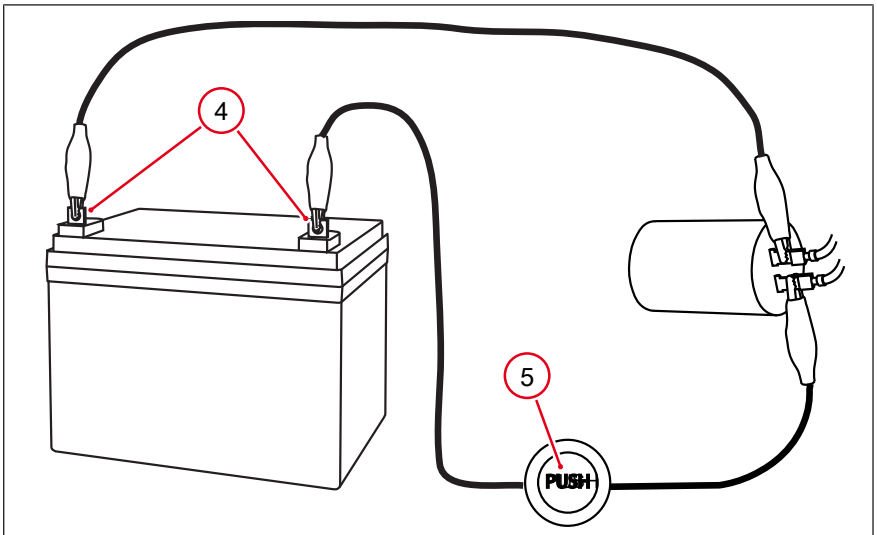


Fig. 48: Flashing the Capacitor

5. Verify your connections.
6. Start the engine.
7. Allow the engine to come up to full speed then push the button **(5)** for no more than a half second.
   Note: You should hear the engine groan slightly.
8. Using your multimeter, measure the voltage at the 120/240v twist-lock receptacle. You should measure approximately 246 volts (hot to hot) or 123 volts (hot to neutral).
   Are 246 or 123 volts measured at the twist-lock receptacle?
   - ⇨ **Yes**—Capacitor has been flashed
   - ⇨ **No**—Verify the circuit breakers are turned ON. Should the generator not come up to full voltage, press the button **(5)** once again. If the generator still does not come up to voltage, the capacitor and the stator should be tested. For further information, see Testing the Capacitor on page 72, see Testing the Stator (120/240 VAC) on page 54.
9. Allow the generator to run for three minutes.
10. Turn the engine off.
11. Carefully disconnect the alligator clips from the capacitor. Use care as the capacitor may still be holding a change. Push the exciter winding leads firmly down onto the capacitor terminals.
12. Place the rear cover back onto the alternator (GP2500 and GP4000 only).
13. After a period of one hour, restart the generator. Verify the unit is continuing to produce electricity. If the unit once again fails to produce electricity, the capacitor may be bad and should be tested. For further information, see Testing the Capacitor on page 72.

8.6.4 Testing the Stator (120/240 VAC)

Requirements

- Multimeter
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14
- Alternator rear cover removed

Note: For referencing the alternator resistance chart, see Alternator Resistance Chart on page 38

The voltage from the stator windings are the usable output of the generator. From the stator **(3)**, the panel harness **(1)** is connected. Problems within the stator can cause no power output, low power output, intermittent output and only half of the receptacles powered.

The stator contains three separate windings. Two of the windings are the main electrical producing windings, the third winding being the exciting winding **(8)**. In testing the stator, always measure the resistance of all three windings and compare the findings to the alternator resistance chart.

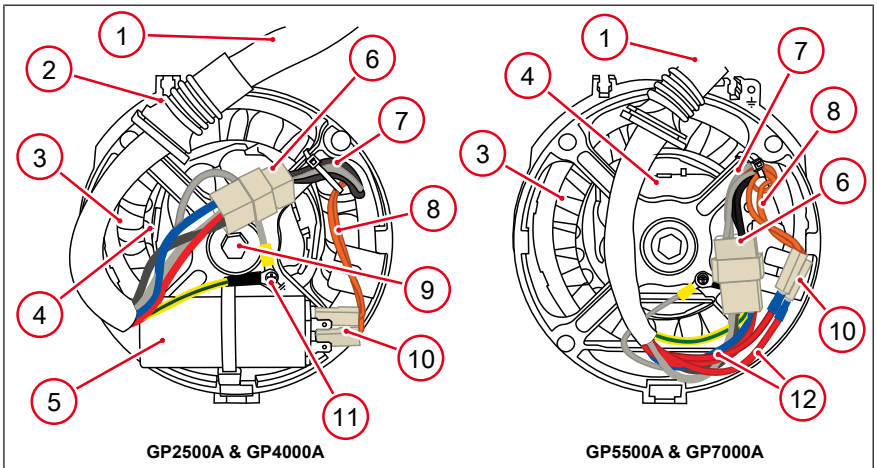


Fig. 49: Alternator Components

Ref.	Description	Ref.	Description
1	Panel harness	7	Alternator harness
2	Grommet	8	Exciter winding leads
3	Stator	9	Rotor bolt
4	Rotor	10	Capacitor connectors
5	Capacitor	11	Panel harness ground connection
6	Harness connector	12	Panel harness capacitor leads

(13) Illustrates the electrical pin-out of the alternator connector including how the windings are connected to show proper phase relation. **(14)** Illustrates the pin-out of the panel harness connector **(6)**.

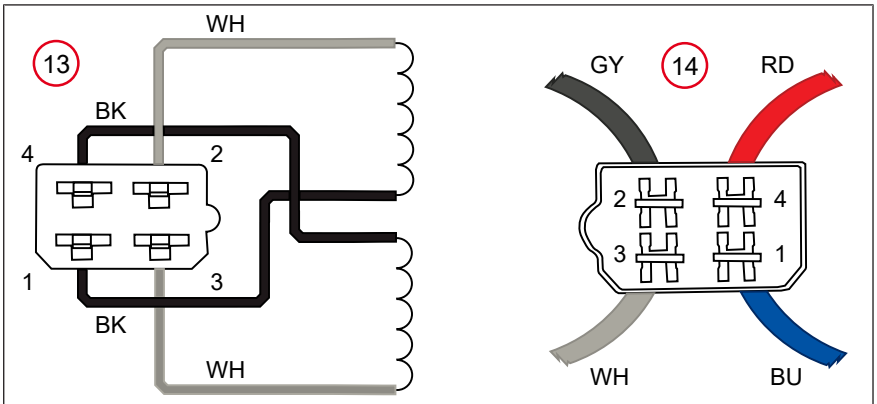


Fig. 50: Connectors

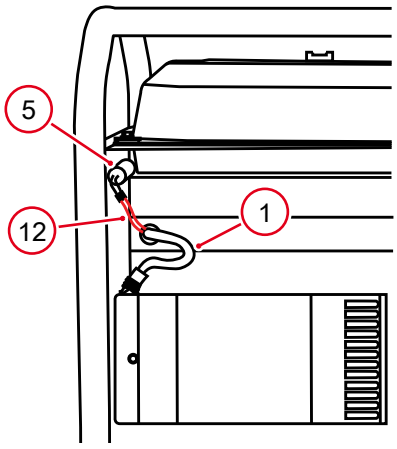


Fig. 51: Capacitor

The capacitor **(5)** on the GP2500 & GP4000 model is located within the alternator cover, but the capacitor **(5)** is located outside the alternator on the GP5500 & GP7000 models. In these units, two extra leads **(12)** are located within the panel harness **(1)** for the remote located capacitor.

1. Disconnect the panel harness **(1)** from the alternator.
2. Start the engine then set the multimeter to read VAC. You should measure ~123 VAC, with the engine running, between terminals 1 & 2 and 3 & 4 of the alternator connector **(13)**.
   Does multimeter read ~123 VAC ?
   - ⇨ **Yes**—Stator is good
   - ⇨ **No**—Proceed to step 3
3. Set the multimeter to read resistance. Measure the resistance of each winding and compare them to the alternator resistance chart. Also measure between the two windings and each winding & the alternator frame. You should see an infinite amount of resistance.
   Does multimeter indicate an infinite amount of resistance?
   - ⇨ **Yes**—Proceed to step 4
   - ⇨ **No**—Stator is faulty. Replace stator.

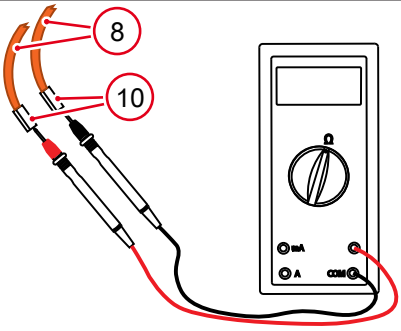


Fig. 52: Measuring Exciter Windings

4. When you test the main winding resistances, you should also test the resistance of the exciter winding. Disconnect the capacitor leads **(10)**.
   Note: The capacitor may still be charged. Discharge the capacitor. For further information, see Testing the Capacitor on page 72
5. Measure the exciter winding **(8)** resistance and compare the finding against the alternator resistance chart. Next measure between the exciter winding and the alternator frame. You should see an infinite amount of resistance.
   Does multimeter indicate an infinite amount of resistance?
   - ⇨ **Yes**—Stator is good.
   - ⇨ **No**—Stator is faulty. Replace stator.

9 Electric

9.1 Component Locations

Note: Line drawings used in this manual may not represent your specific model.

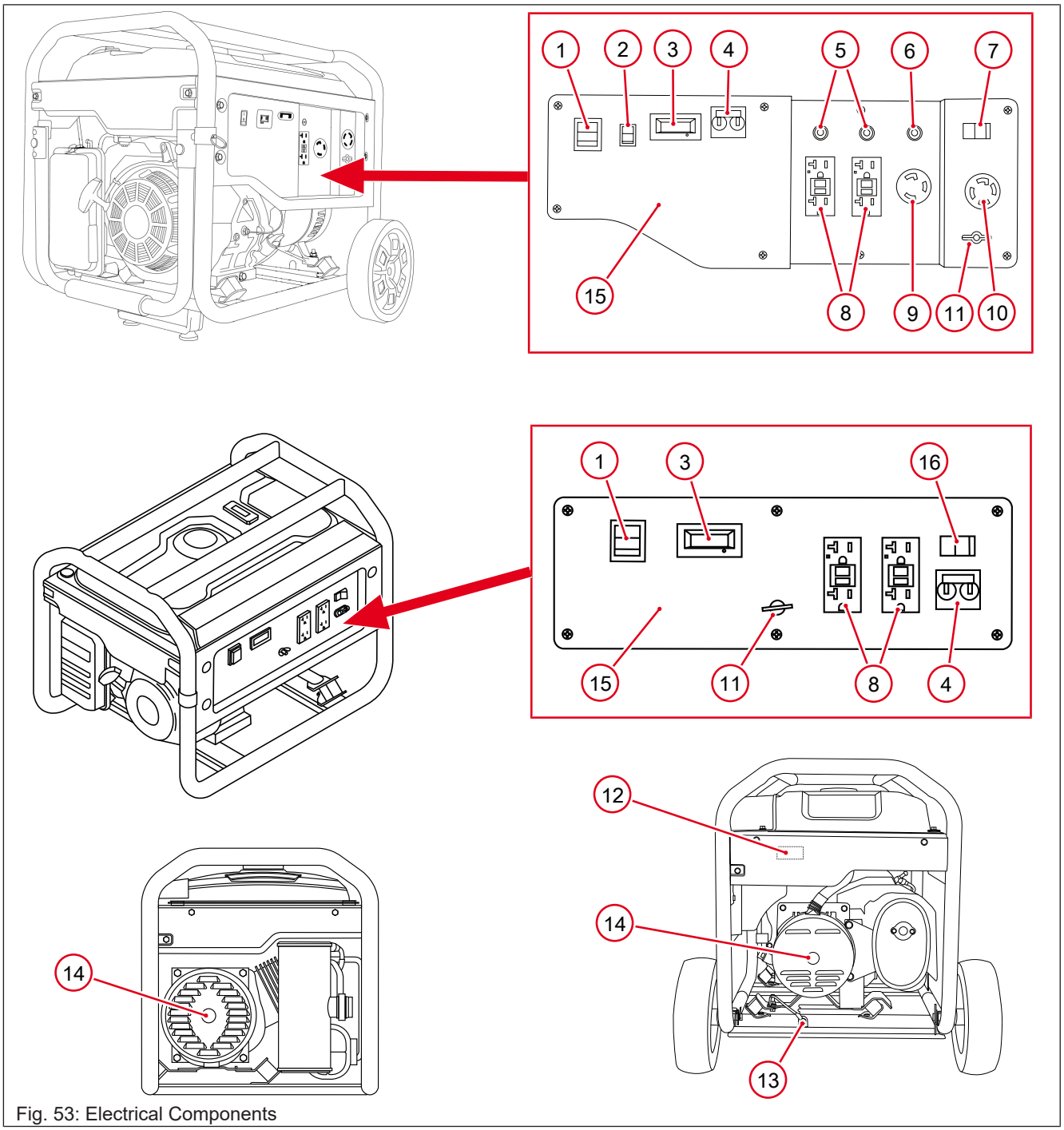


Fig. 53: Electrical Components

Ref.	Description	Ref.	Description
1	Engine control switch	9	Receptacle—120vAC, 30 amp, twist-lock
2	Idle control switch	10	Receptacle—120/240vAC, 30 amp, twist-lock

Ref.	Description	Ref.	Description
3	Hour meter	11	Ground terminal
4	Main breakers: GP2500 10 amp GP4000 16 amp GP5500 21 amp GP7000 27 amp	12	External capacitor (GP5500 & GP7000 only)
5	Circuit breaker—20 amp	13	Frame ground terminal
6	Circuit breaker—30 amp	14	Alternator
7	Voltage selector switch (VSS)	15	Control panel
8	Receptacle—120vAC, 20 amp, duplex GFCI	16	Power selection switch (PSS)

9.2 Theory of Operation

9.2.1 Electrical Circuit—GP2500

Beginning at the alternator **(1)**, the windings are arranged so as to allow them to be placed in parallel effectively creating twice the amount of current when placed in “FULL” mode. Inside the alternator, the neutral connection (gray wire) is bonded to the chassis ground **(20)**. Leading from the alternator, the red and blue wires are the “hot” leads, the white and gray wires are the “neutral” leads depending on the setting of the power selection switch (PSS) **(16)**.

At the panel, the white wire is sent to the PSS **(16)**. The gray wire is tapped off to the PSS before heading to the neutral “line” connection of the continuously powered GFCI receptacle **(7b)**. The red and blue wires are sent to the “line” connection of the 10 amp double-pole main circuit breaker **(4)**.

From the “load” side of the main circuit breaker **(4)**, the red and blue wires lead to the VSS **(6)**. The blue lead is also sent to the hot “line” connection of the continuously powered GFCI receptacle **(7b)**. The hour meter **(5)** hot lead is connected to the load side of the main circuit breaker **(4)** where the red wire is terminated while its neutral lead is connected to the white wire terminated at the PSS **(16)**.

After the power selection switch, the red wire is sent to the intermittently powered GFCI receptacle **(7a)** hot “line” connection. The two white wires leading from the PSS **(6)** are connected to the neutral “line” connection of the intermittently powered GFCI receptacle **(7a)**.

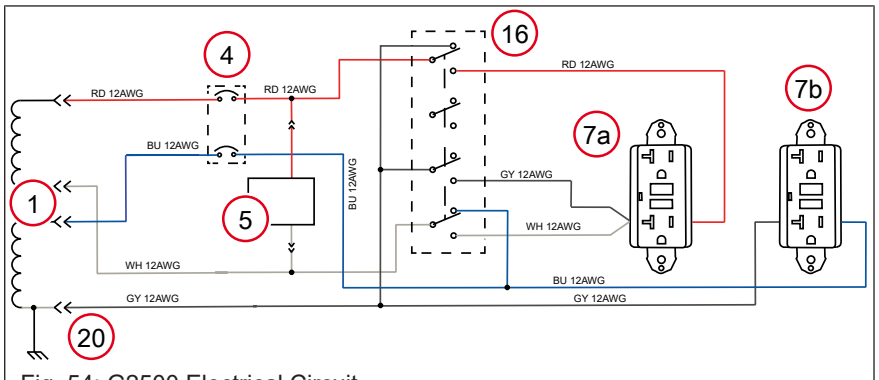


Fig. 54: G2500 Electrical Circuit

9.2.2 Power Selection Switch—GP2500

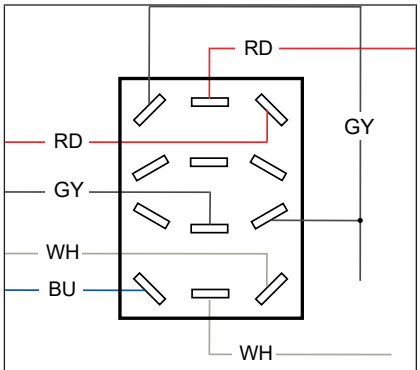


Fig. 55: GP2500 Power Selection Switch

The power selection switch **(6)** is a four pole, double throw (4PDT) rocker style switch. Its purpose is to allow the user to select split operation (10 amps to each receptacle) or a full 20 amps to one receptacle.

9.2.3 Electrical Circuit—GP4000 / 5500 / 7000

Beginning at the alternator **(1)**, the windings are arranged so as to allow them to be placed in parallel allowing twice the amount of current at 120v. Inside the alternator, the neutral connection is bonded to the chassis ground **(20)**. Leading from the alternator, the red and blue wires are the "hot" leads, the white wire is the "neutral" and the gray wire is floating, depending on the setting of the voltage selector switch (VSS) **(6)**.

At the panel, the white and gray wires are sent to the VSS **(6)**. The red and blue wires are sent to the current meter **(3)** where they are passed through the toroidal current transformer. For further information, see Current Meter—GP4000 / 5500 / 7000 on page 60

After the current meter **(3)**, the red and blue wires go to the "line" side of the main circuit breaker **(4)**. The rating of the main circuit breaker varies by the model of the generator. For further information, see Component Locations on page 56. From the "load" side of the main circuit breaker, the red and blue wires lead to the VSS **(6)**. Also connected to the load side of the main circuit breaker with the red wire is the hot lead for the hour meter **(5)**.

After the VSS **(6)**, the hot wires lead to the receptacles **(7)**, **(9)** &**(11)**. One blue wire connected to section 2 of the VSS leads to the L14-30R receptacle **(11)**. The other blue lead comes from sections 3 & 4 of the VSS to L5-30R receptacle **(9)** via the 30A push-button circuit breaker **(10)** and one of the 5-20R GFCI receptacles **(7)** via its 20A push-button circuit breaker **(8)**. One red wire leads from section 1 of the VSS to the L14-30R receptacle **(11)**. The last red wire leads from section 1 & 2 of the VSS to the other 5-15R GFCI receptacle **(7)** via its 20A push-button circuit breaker **(8)**.

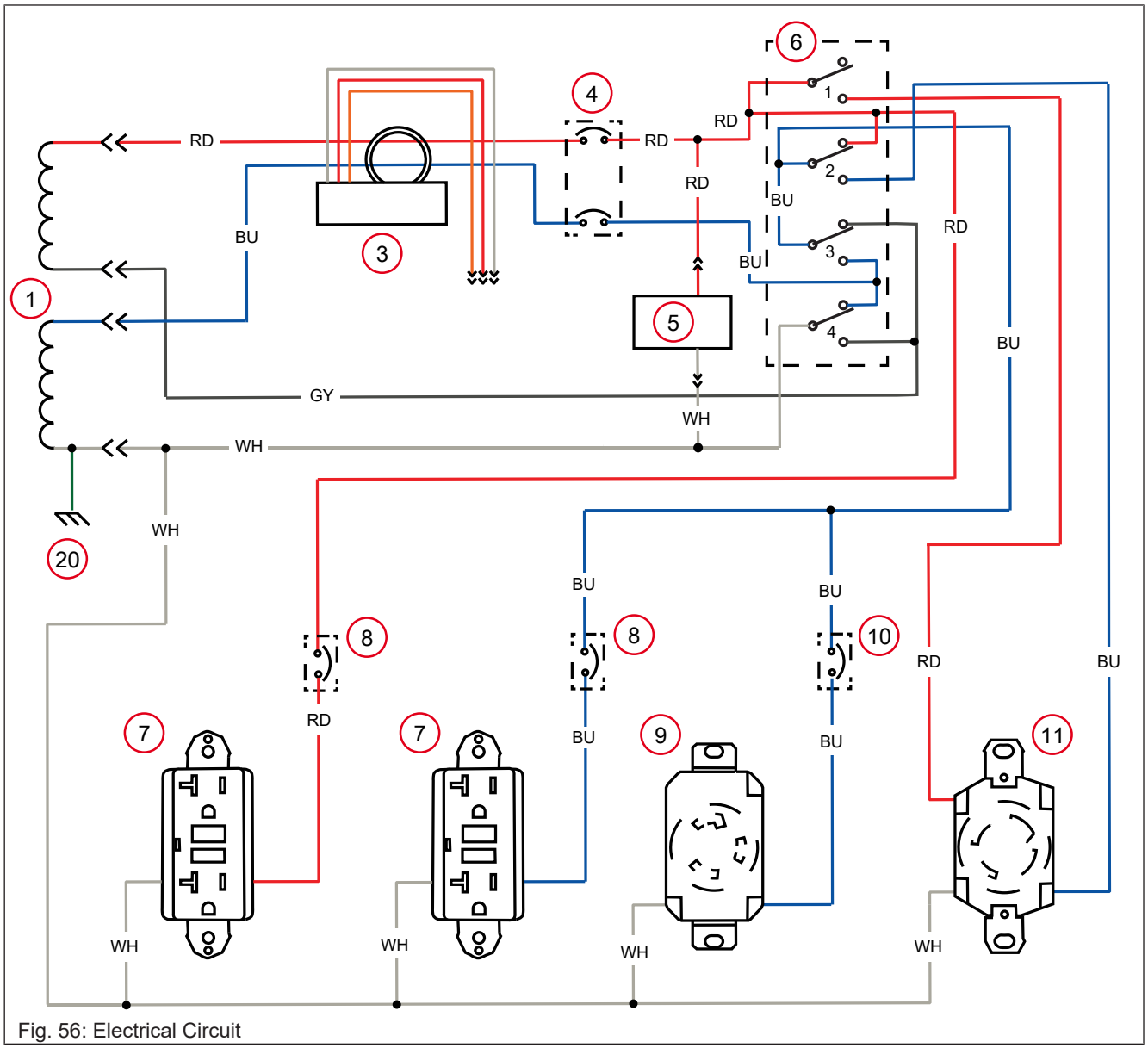


Fig. 56: Electrical Circuit

9.2.4 Voltage Selector Switch—GP4000 / 5500 / 7000

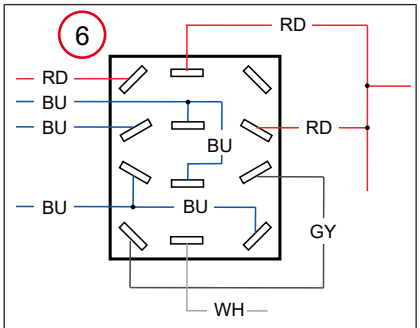


Fig. 57: Voltage Selector Switch

The voltage selection switch **(6)** is a four pole, double throw (4PDT) rocker style switch. Its purpose is to allow the user to select 120/240v operation or 120v operation where the current is effectively doubled.

9.2.5 Current Meter—GP4000 / 5500 / 7000

The purpose of the current meter **(3)** is to sense when a load is applied to the generator. When activated by the idle control switch **(13)**, the current meter circuitry allows the engine speed to be idled down when a load is not connected to the generator.

The circuit is powered by a 12 volt transformer **(21)** that is protected by a 5A fuse **(12)**. The fuse lead comes from the red wire in the alternator harness while the neutral lead comes from the gray wire in the alternator harness. The blue and brown wires from the transformer **(21)** (12 volt winding) go to a 25A bridge rectifier **(22)** to convert the alternating current into direct current.

The black wire from the negative terminal of the 25A bridge rectifier **(22)** leads to the idle control switch **(13)**. Connected to the other terminal of the switch is an orange wire that leads to the current meter **(3)**. The red wire from the positive terminal of the 25A bridge rectifier **(22)** leads to the current meter **(3)** and is tapped by a red wire leading to the throttle solenoid **(15)** on the engine **(14)**. Lastly, the white wire from the current meter **(3)** connects to the throttle solenoid **(15)**.

In addition to the idle control, the panel also contains the engine control switch **(19)** which is utilized to turn off the generator engine. One red wire and one black wire lead from the ignition coil **(18)** of the engine to the engine control switch.

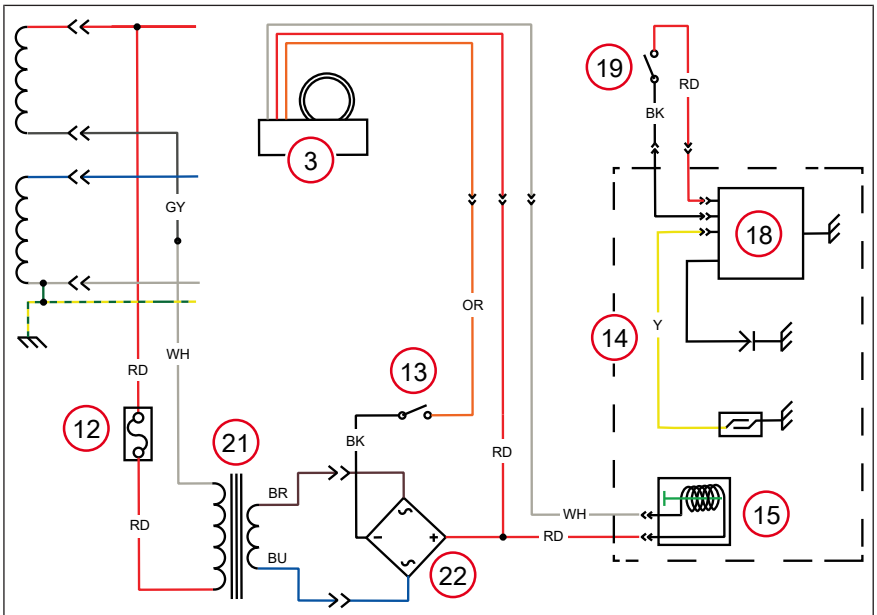


Fig. 58: Current Meter Circuit

9.3 Schematics

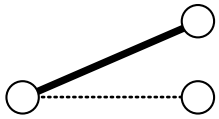
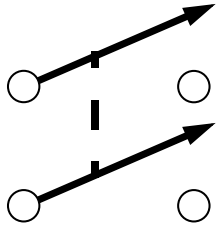
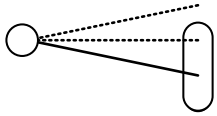
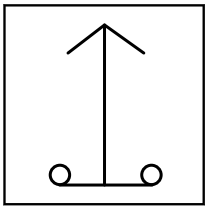
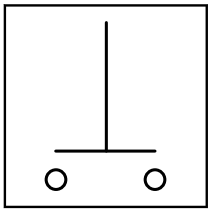
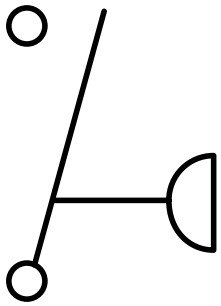
9.3.1 Electrical Component Symbols/How to Read a Schematic

Electrical Component Symbols

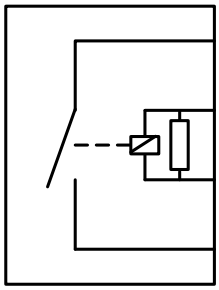
The following symbols are used in the electrical schematics to represent various electrical components.

Switches

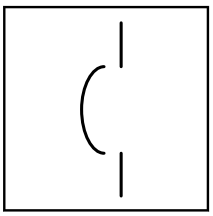
Note: The sample switch symbols shown are just a few of the many switch configurations. Switches are designated by the number of “poles” (circuits controlled) and “throws” (actuator positions). Unless otherwise specified, switches are shown in the “Normally Open” (N.O.) position.

Symbol	Description	Symbol	Description
	Single Pole, Single Throw (SPST)		Single Pole, Double Throw (SPDT)
	Double Pole, Single Throw (DPST)		Single Pole, Triple Throw (SPTT)
	Normally Closed, Momentary		Normally Open
	Pressure Switch	—	—

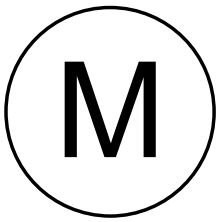
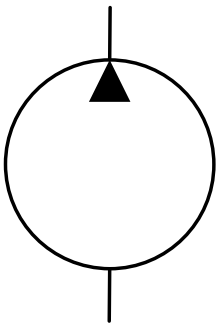
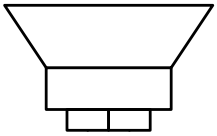
Switching Devices

Symbol	Description	Symbol	Description
	Relay	—	—

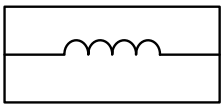
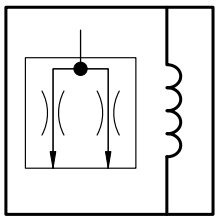
Circuit Protection Devices

Symbol	Description	Symbol	Description
	Fuse		Circuit Breaker

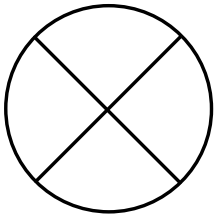
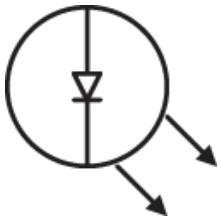
Motors and Generating Devices

Symbol	Description	Symbol	Description
	Electric Motor		Pump
	Loudspeaker	—	—

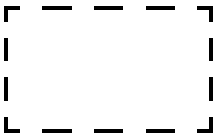
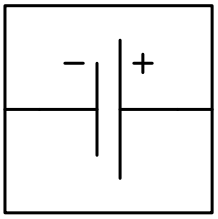
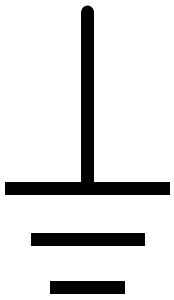
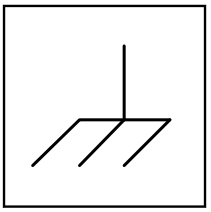
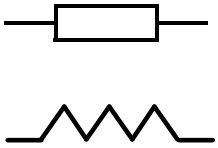
Actuating Devices

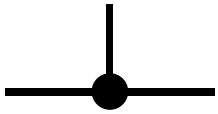
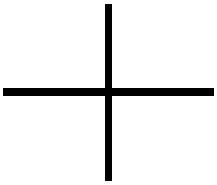
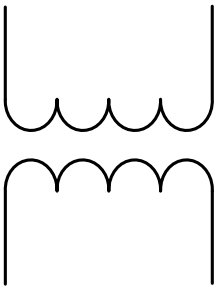
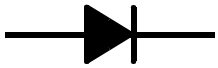
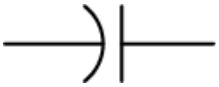
Symbol	Description	Symbol	Description
	Solenoid Valve		Self-Level Valve

Lights

Symbol	Description	Symbol	Description
	Single-Element Light		LED (Light Emitting Diode)

Miscellaneous Symbols

Symbol	Description	Symbol	Description
	Enclosure		Battery
	Ground (to earth)		Ground (to chassis)
	Resistor		Variable Resistor

Symbol	Description	Symbol	Description
	Wiring Connections		Wires (crossing but not connected)
	Coil		Transformer
	Diode		Pin and Socket Connector
	Capacitor	—	—

Wire Colors

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Light blue

9.3.2 Base Schematic w/Panel Layout—GP2500

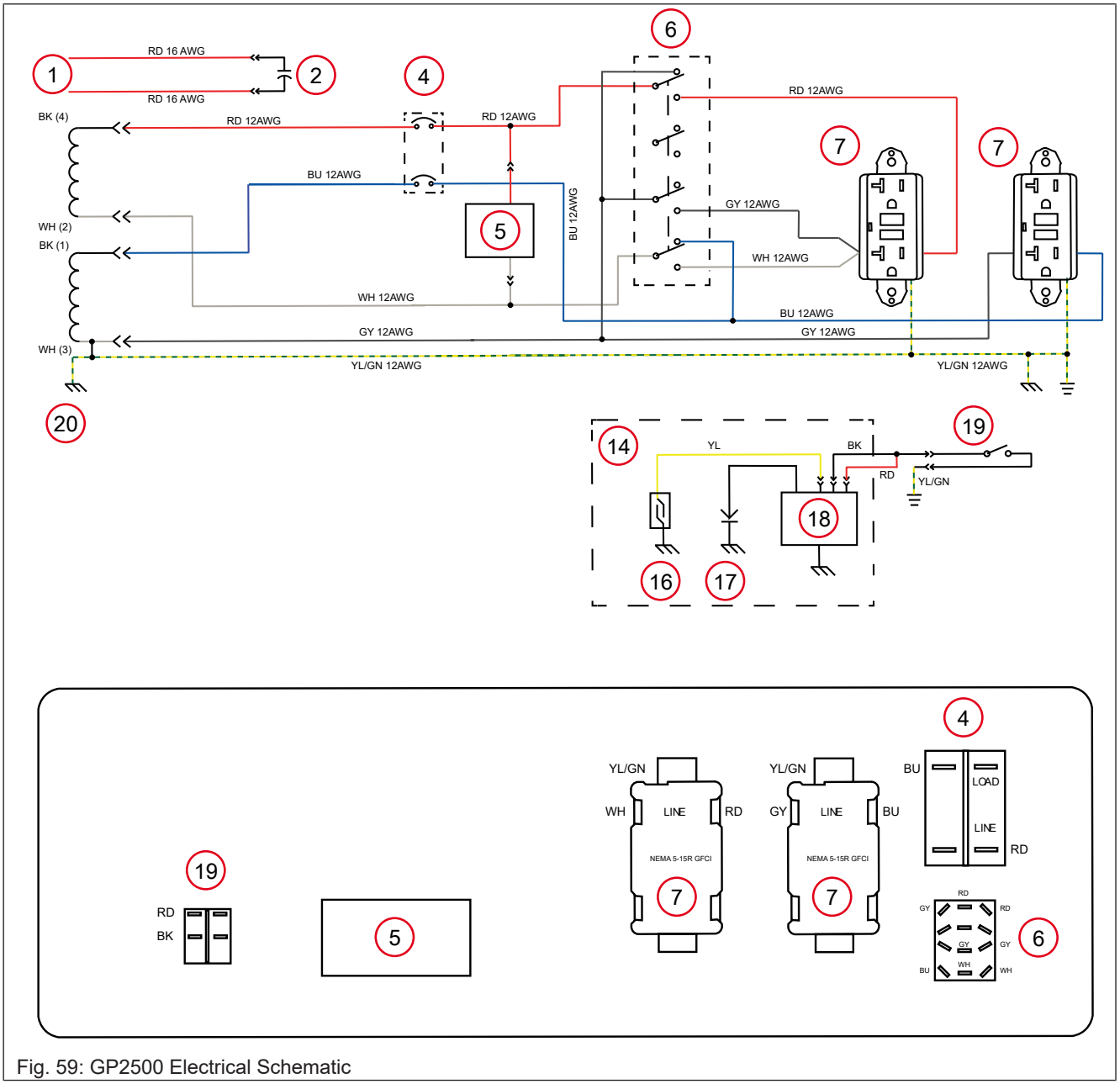


Fig. 59: GP2500 Electrical Schematic

Ref.	Description	Ref.	Description
1	Alternator/Exciter winding	14	Engine
2	Capacitor	16	Oil level sensor
4	Main breaker—10 amp	17	Spark plug
5	Hour meter	18	Ignition coil
6	Power selection switch (PSS)	19	Engine control switch
7	Receptacle—120vAC, 20 amp, duplex GFCI	20	Frame ground

9.3.3 Base Schematic w/Panel Layout—GP4000 / 5500 / 7000

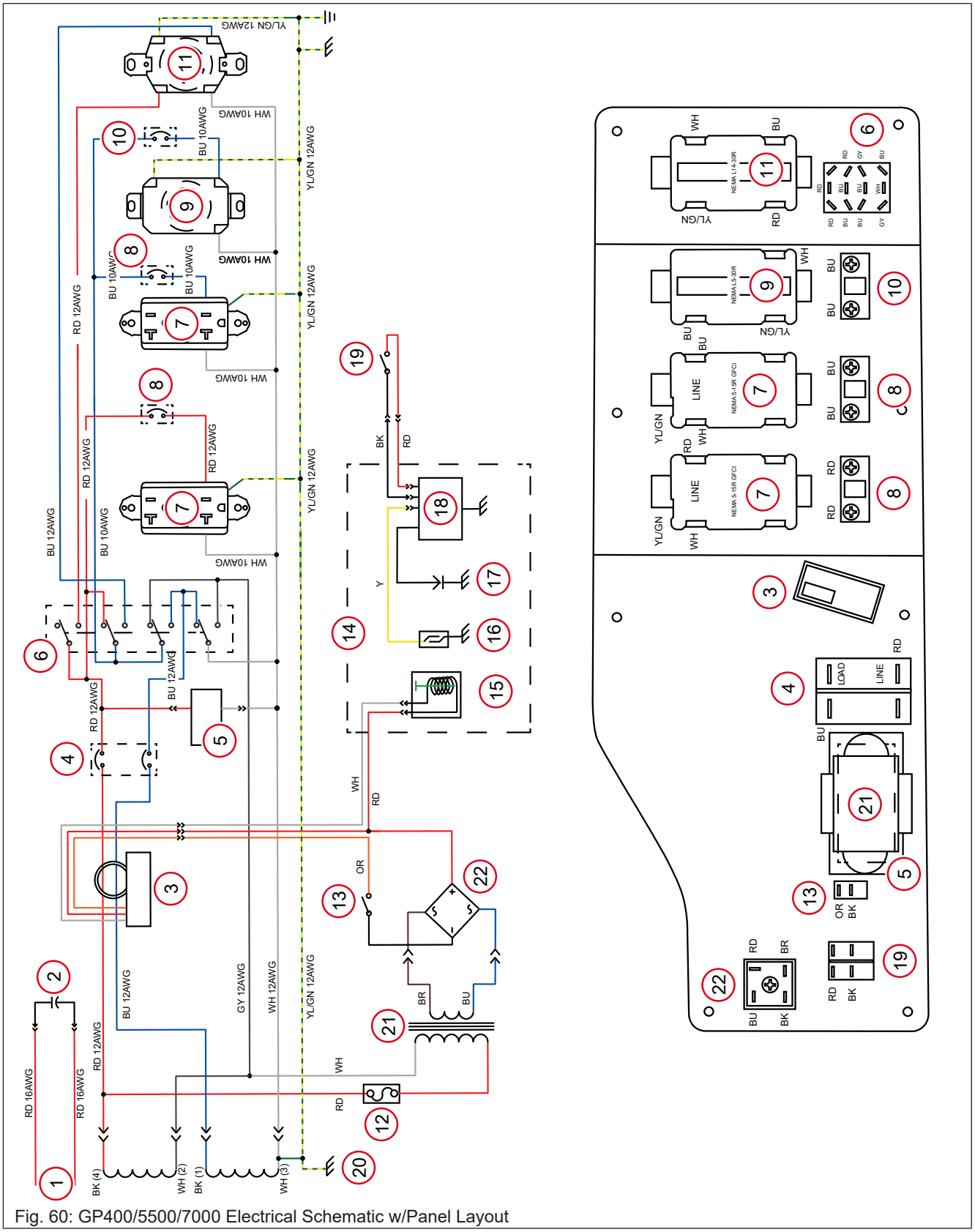


Fig. 60: GP400/5500/7000 Electrical Schematic w/Panel Layout

Ref.	Description	Ref.	Description
1	Alternator/Exciter winding	12	Fuse—5 amp
2	Capacitor	13	Idle control switch
3	Current meter	14	Engine
4	Main breaker: GP4000 16 amp GP5500 21 amp GP7000 27 amp	15	Throttle solenoid
5	Hour meter	16	Oil level sensor
6	Voltage selector switch (VSS)	17	Spark plug
7	Receptacle—120vAC, 20 amp, duplex GFCI	18	Ignition coil
8	Circuit breaker—20 amp	19	Engine control switch
9	Receptacle—120vAC, 30 amp, twist-lock	20	Frame ground terminal
10	Circuit breaker—30 amp	21	Transformer—12v
11	Receptacle—120/240vAC, 30 amp, twist-lock	22	Rectifier—25 amp

9.4 Repair

9.4.1 Removing and Installing the Control Panel

Requirements

- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14

To remove the front electrical panel, begin by disconnecting the main electrical harness from the alternator.

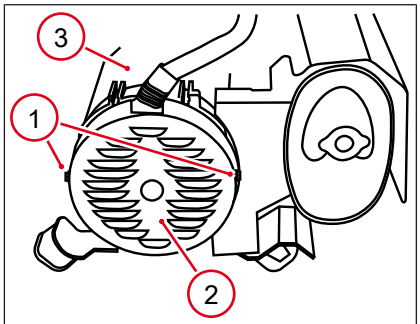


Fig. 61: Alternator Cover

1. Remove two screws **(1)** mounting the cover **(2)** to the alternator **(3)**.

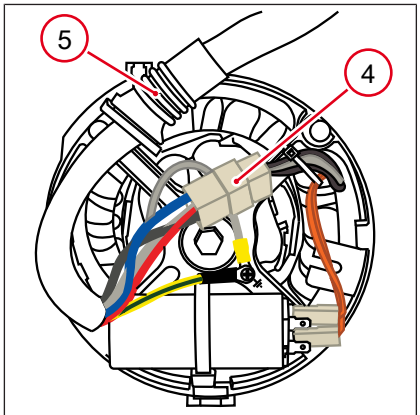


Fig. 62: Alternator Harness

2. Once the cover is removed, disconnect the harness **(4)** by pulling the connector free then slide the harness grommet out of the relief in the cover **(5)**.
3. Disconnect the two smaller harnesses leading to the engine.
4. Remove the screws **(6)** holding in the panel. Gently pull the panel out from the housing making sure not to damage the wiring.
   Note: You can pull the wiring harness through the grommets if needed, but make sure not to damage the connectors.

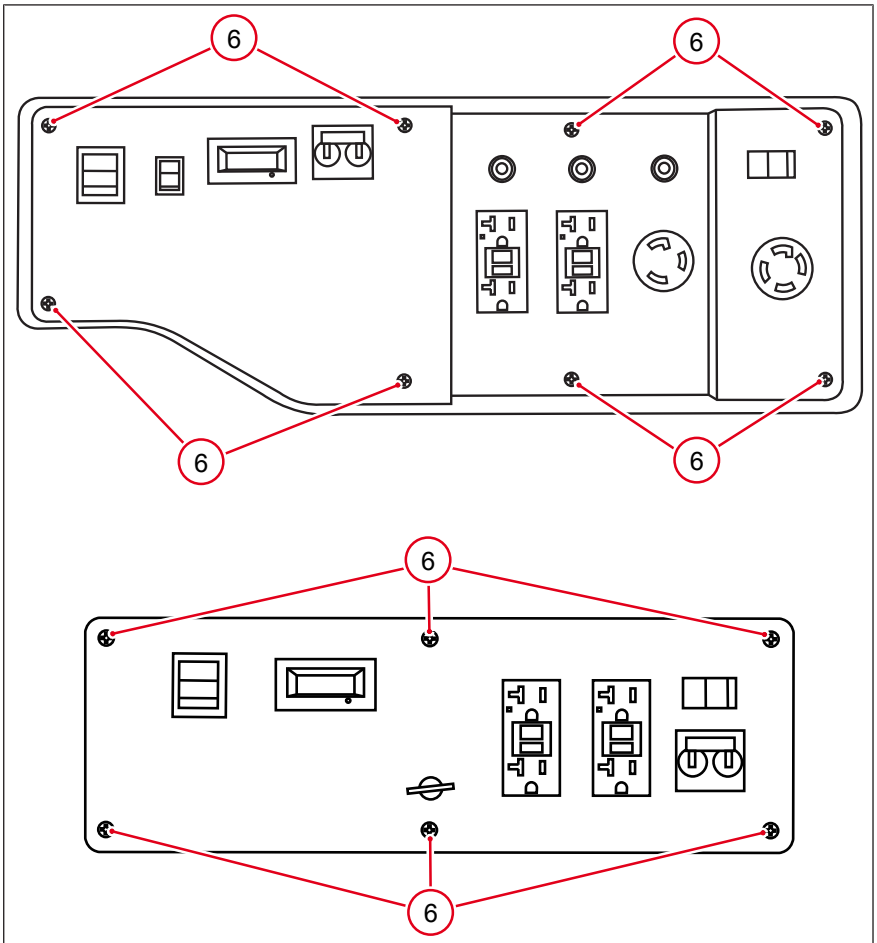


Fig. 63: Control Panel GP4000/5500/7000 upper / GP2500 lower

Installation Notes

- Install the control panel by reversing the order of removal.

9.5 Component Testing

9.5.1 Testing the Electrical Circuitry

⚠ CAUTION

Electric shock hazard

When testing the circuitry, never rely upon non-contact testers. They are unreliable and can lead you coming into contact with lethal voltages. Only use a tester (DMM) where you are physically touching the electrical components with probes. Never assume any part of the circuitry is dead.

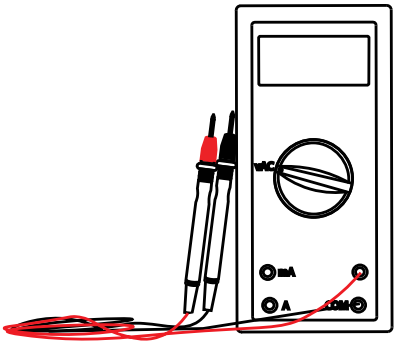


Fig. 64: Digital Multimeter

The most valuable troubleshooting tool is the digital multimeter. With a well-equipped multimeter, you will be able to test voltages, resistance, capacitance, frequency and diodes.

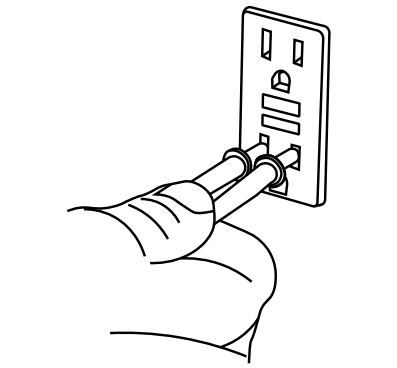


Fig. 65: DMM Testing

When it comes to troubleshooting the electrical circuits of the generator, you will find the multimeter to make the task easy and fast. Before any testing, make sure you read and understand the multimeter manual fully.

Never contact any conductor/terminal when the generator is running unless using insulated probes (multimeter leads).

9.5.2 Testing for Voltage

⚠ DANGER

Electric shock hazard

During all stages of testing, be aware of your positioning toward any live connections. Never assume any wire is dead no matter what the reason for the repair is. Use a digital multimeter or any other CONNECTED metering system to monitor voltage locations. Never touch any wiring while the generator is running.

For issues of no voltage, always start with the logical places; a tripped circuit breaker or a tripped GFCI receptacle. If they appear to be properly set, test for voltages at each receptacle. If you do not measure any voltages, then move onto the alternator itself.

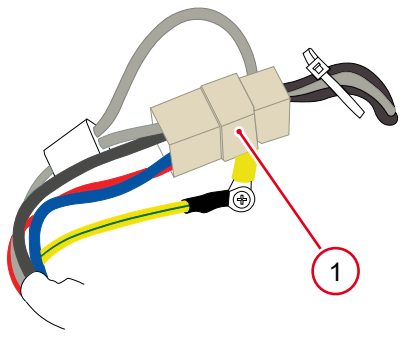


Fig. 66: Voltage Testing

1. With the engine OFF, remove the cover on the alternator to expose the harness connector.
2. Start the engine then carefully test for voltages at the alternator harness connector **(1)**. If you find voltages here, turn OFF the generator and remove the control panel containing the receptacles and the circuit breakers. For further information, see Removing and Installing the Control Panel on page 68. The trouble is between the alternator and the receptacles; most likely the wiring itself.

9.5.3 Testing for Current

Testing for current is done by loading the generator and using an ammeter to measure the current. The best ammeter to use is a clamp-on ammeter. The reason for this is so you do not have to break into the wiring as you would with a traditional ammeter. However, you do need to be careful on how you take the measurement.

When making a current measurement, clamp the ammeter around only one hot wire **(1)**.

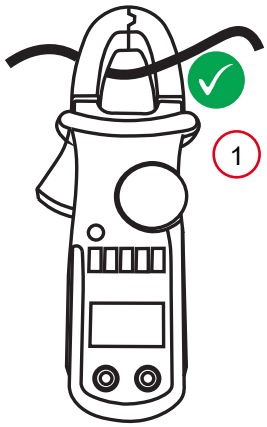


Fig. 67: Ammeter Testing

Do not clamp around both hot leads **(2)**. This would cause the magnetic fields to cancel each other out and the reading to be incorrect.

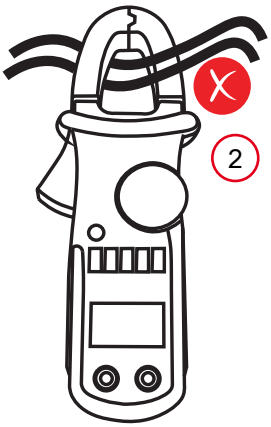


Fig. 68: Ammeter Testing

Do not clamp around both the hot and neutral leads **(3)**. As above, this would cause the magnetic fields to be canceled out.

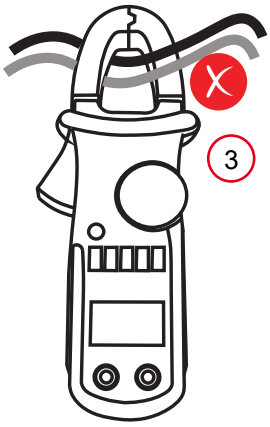


Fig. 69: Ammeter Testing

9.5.4 Testing the Capacitor

Requirements

- Multimeter
- Alligator leads
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14
- Alternator rear cover removed (GP2500 & GP4000)

⚠ DANGER

Electric shock hazard

Capacitors can hold charges for a long period after the generator was last used. A charged capacitor can cause a lethal shock and/or lead to secondary accident. Always discharge the capacitor before handling, testing or replacing.

Low or no voltage output in some cases may be caused by the capacitor **(1)**. The purpose of the capacitor is to help excite the field in the alternator and for voltage regulation.

Time, heat and vibration can take a toll on the capacitor. This can cause the capacitance to change (typically decrease), the internal plates to touch (short) or one of the plates to break free from its lead (become open).

The capacitor function of the multimeter can easily determine any of the conditions above by measuring the capacitance. The capacitance displayed should be within the tolerance printed on the case. For example, the capacitor is rated 35uF with a tolerance of 5%; any reading between 33uF and 37uF is acceptable and indicates a good capacitor.

Depending on your particular multimeter, an open or shorting condition may show as no reading or an indication stating SHORT or OPEN.

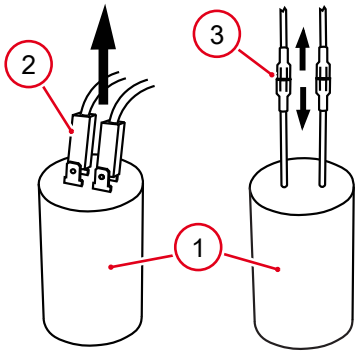


Fig. 70: Testing the Capacitor

1. Carefully remove the connectors from the capacitor **(2)**, or capacitor harness **(3)**. If needed, use insulated handled needle-nosed pliers by gripping the terminal body and pulling the connector off.

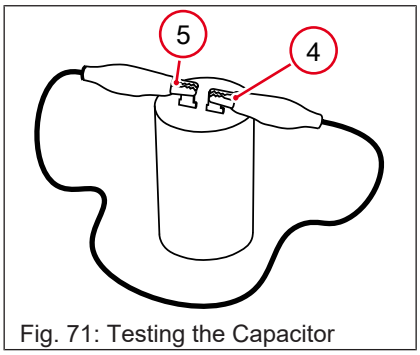


Fig. 71: Testing the Capacitor

2. Use a pair of insulated alligator leads to discharge the capacitor. Clip one lead onto one terminal **(4)** then place the other lead onto the other terminal **(5)**. You may see a spark, this is normal. Leave the leads connected until you are ready to test the capacitor.

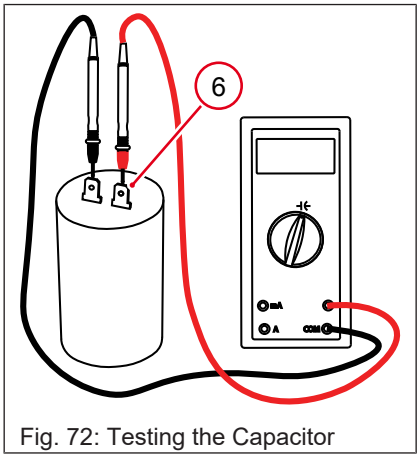


Fig. 72: Testing the Capacitor

3. Remove the alligator leads from the capacitor. Using the capacitor function of the multimeter, touch and hold the leads to the capacitor terminals **(6)**. The multimeter will display the measured capacitance.
Is the measured capacitance within the tolerance of the capacitor?
   - ⇨ **Yes**—Capacitor is good
   - ⇨ **No**—Capacitor is faulty. Replace excitation capacitor.

9.5.5 Testing the Idle Control

Requirements

- Multimeter
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14.

Fig. 73: Idle Control Switch

If the idle control is not working properly, there are a few things to troubleshoot and test.

1. Check to see if the idle control switch **(1)** is placed in the ON position.
Is the switch in the ON position?
   - ⇨ **Yes**—Proceed to step 2.
   - ⇨ **No**—Place switch in the ON position.
2. Engine idle with no load connected to the generator.
Does the engine idle down?
   - ⇨ **Yes**—If the engine idles up when load is applied, idle control is working properly.
   - ⇨ **No**—Proceed to step 3.
3. With no load applied to the generator and the idle control switch in the ON position, using a multimeter you should measure approx. 12vDC at the connector leading to the solenoid.
Is the measurement approx. 12vDC?
   - ⇨ **Yes**—If by removing the load the voltage drops to zero, see engine manufacturer service manual.

⇨ **No**—Proceed to step 4.

4. Check the measurement at the AC terminals of the bridge rectifier. It should be >12vAC.
Is the measurement >12vAC?

   ⇨ **Yes**—Proceed to step 5.

   ⇨ **No**—If the 5 amp fuse is open, replace the fuse and proceed to step 7. If not then replace the transformer.

5. Check the measurement at the DC terminals of the bridge rectifier. It should be >12vDC.
Is the measurement >12vDC?

   ⇨ **Yes**—Proceed to step 6.

   ⇨ **No**—Replace the bridge rectifier.

6. With no voltage applied, check the idle control switch using an ohmmeter. Measurement should be 0 ohms closed and >10M ohms open.
Are the measurements 0 ohms closed and >10M ohms open?

   ⇨ **Yes**—Replace the idle control module.

   ⇨ **No**—Replace the idle control switch.

7. (From step 4) After installing the new 5 amp fuse, apply voltage.
Did the new 5 amp fuse open?

   ⇨ **Yes**—Proceed to step 8.

   ⇨ **No**—The idle control is good.

8. Using an ohmmeter, measure the resistance of the transformer windings. It should read ~50 ohms primary and ~0.8 ohms secondary.
Are the measurements ~50 ohms primary and ~0.8 ohms secondary?

   ⇨ **Yes**—Proceed to step 9.

   ⇨ **No**—Replace the transformer.

9. Disconnect the secondary winding of the transformer from the bridge rectifier.
Did the 5 amp fuse open?

   ⇨ **Yes**—Replace the transformer.

   ⇨ **No**—Proceed to step 10.

10. With the idle control switch in the OFF position, connect the secondary winding of the transformer into the bridge rectifier.
Did the 5 amp fuse open?

    ⇨ **Yes**—Replace the bridge rectifier.

    ⇨ **No**—Proceed to step 11.

11. Place the idle control switch in the ON position.
Did the 5 amp fuse open?

    ⇨ **Yes**—Replace the idle control module.

    ⇨ **No**—End

9.5.6 Testing the Circuit Breaker

Fig. 74: Main Circuit Breaker

Requirements:

- Multimeter
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14.

1. Using a voltmeter, check that voltage is present on the LINE side of main circuit breaker **(4)**.
   Are voltages present?
   - ⇨ **YES**—Proceed to Step 2.
   - ⇨ **NO**—Proceed to step 5.
2. Check that voltage is present on both legs of the LOAD side of main circuit breaker.
   Are voltages present?
   - ⇨ **YES**—Proceed to Step 3.
   - ⇨ **NO**—Replace the main circuit breaker.
3. Check that voltage is present on the LINE side of secondary circuit breakers.
   Are voltages present?
   - ⇨ **YES**—Proceed to Step 4.
   - ⇨ **NO**—Trace the wiring for where the voltage is lost. Replace damaged / broken wire(s).
4. Check that voltage is present on both legs of the LOAD side of secondary circuit breakers.
   Are voltages present?
   - ⇨ **YES**—Trace the wiring to the receptacle(s) for where the voltage is lost. Replace damaged / broken wire(s).
   - ⇨ **NO**—Verify the circuit breaker could not be reset. Replace the circuit breaker.
5. (From step 1) Using a voltmeter, measure at the connector in the alternator that both windings are producing ~120v.
   Are both windings producing ~120v?
   - ⇨ **YES**—Trace the wiring for where the voltage is lost. Replace damaged / broken wire(s).
   - ⇨ **NO**—Replace the alternator. For further information, see Removing and Installing the Alternator on page 44

9.5.7 Testing the GFCI Receptacle

Requirements:

- Multimeter
- GFCI tester
- Prior to performing this procedure, see Safety Instructions for Working on the Electrical System on page 14

No matter the cause of repair, the Ground Fault Circuit Interrupting (GFCI) receptacles should be tested for proper operation. This includes using the TEST button on the receptacle as well as using a plug-in GFCI testing device.

A properly operating GFCI receptacle will show a RED LED indication **(1)** when tripped as well as NOT passing electricity. When reset, the LED will be GREEN **(2)** and the receptacle will pass electricity.

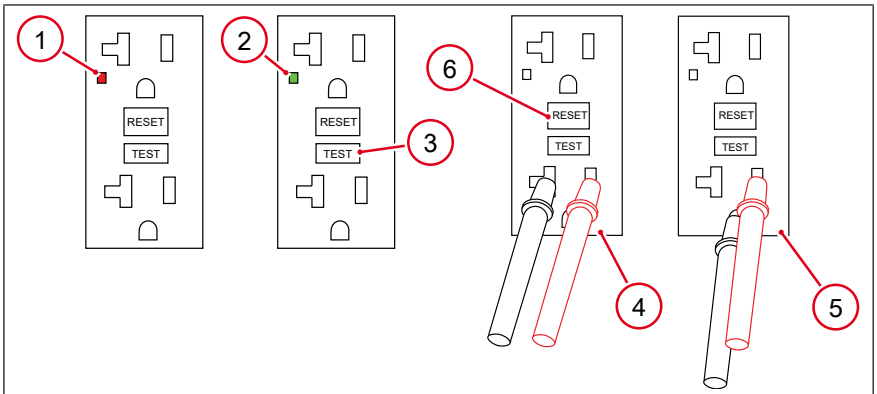


Fig. 75: Testing GFCI Receptacle

1. Start the engine.
2. With a green indication on the receptacle, press the TEST button **(3)**.
3. Verify the LED indicator is now RED.
4. Using digital multimeter, test for volts AC, probe the receptacle for voltage. You should measure 0 volts from Hot to Neutral **(4)** and Hot to Ground **(5)**.
   Are 0 VAC indicated?
   ⇨ **YES**—Proceed to step 5.
   ⇨ **NO**—Receptacle is faulty. Replace receptacle.
5. Press the RESET button **(6)**.
6. Verify the LED indicator is now GREEN.
7. Using digital multimeter, test for volts AC, probe the receptacle for voltage. You should measure 123 volts from Hot to Neutral and Hot to Ground.
   Are 123 VAC indicated?
   ⇨ **YES**—Proceed to step 8.
   ⇨ **NO**—Receptacle is faulty. Replace receptacle.

8. Plug the GFCI tester into the receptacle and follow the instructions with the tester to test the receptacle.
9. Verify the LED indicator is now RED.
10. Press the RESET button and verify the LED indicator is now GREEN.
    Are the LED colors verified?
    - ⇨ **YES**—Receptacle is good.
    - ⇨ **NO**—Receptacle is faulty. Replace receptacle.

Wacker Neuson America Corporation
N92W15000 Anthony Ave
Menomonee Falls, WI 53051, USA

Tel.: +1 800-770-0957
technical.support@wackerneuson.com
www.wackerneuson.us

Material Number: 5100071820
Language: [en-US]