KOHLER

PowerPro

Models 2.25 MBM
3.5 MM
3.5 MBM
5 MM
5 MBM

Service Manual

KOHLER GENERATORS

Reprinted
40998026

Safety Precautions

Read these instructions carefully. Failure to follow instructions and safety rules could result in serious bodily injury and/or damage to the generator or test equipment.

WARNING

LETHAL EXHAUST GAS! The engine powering your generator discharges deadly carbon monoxide as part of the exhaust gas when operating. Carbon monoxide is particularly dangerous in that it is odorless and colorless. Keep in mind that it can cause death if inhaled for even a short period of time. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside an occupied building. Avoid breathing exhaust fumes when working on or near the generator set.

WARNING

DANGEROUS FUELS! Use extreme caution when handling, storing, and using fuels — all fuels are highly explosive in a vapor state. Store fuel in a well ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running to prevent spilled fuel from igniting on contact with hot parts or from ignition spark. Keep fuel lines and connections tight and in good condition — don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Additional precautions should be taken when using the following fuels:

Gasoline — Store gasoline only in approved red containers clearly marked GASOLINE. Don't store gasoline in any occupied building.

WARNING

FLASH FIRE! To avoid the possibility of a flash fire, do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump or other potential sources of spilled fuel or fuel vapors.

WARNING

BACKFIRE! A sudden backfire can cause serious burns. Keep hands and face away from the carburetor when the air cleaner is removed.

WARNING

HIGH VOLTAGE! Remember that the function of a generator set is to produce electricity and wherever electrical energy is present, there is the potential danger of electrocution. Keep everyone, especially children, away from the set while it is running and take precautions to prevent unqualified personnel from tampering with or attempting to operate your generator set. Have the set and electrical circuits serviced only by qualified technicians. Wiring should be inspected frequently — replace leads that are frayed or in poor condition. Do not operate electrical equipment when standing in water, on wet ground, or when your hands are wet.

WARNING

EXPLOSIVE GASES! The gases generated by a battery being charged are highly explosive. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Any room containing charging batteries should be well ventilated to prevent accumulation of explosive gases. To avoid sparks do not disturb battery charger connections while battery is charging, and always turn charger off before connecting or disconnecting.

WARNING

DANGEROUS ACID! Avoid contact with battery electrolyte. It contains acid which can eat holes in clothing, burn skin, and cause permanent damage to eyes. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in dangerous spattering of electrolyte.

WARNING

MOVING PARTS! Keep hands, hair, necktie, loose clothing and test leads well away from moving parts, as serious injury could result from entanglement. Never run generator set with guards, covers, or screens removed.

WARNING

ELECTRICAL SHOCK! Battery can cause electrical burns and shocks. Exercise reasonable care when working near the battery to avoid electrical connections through tools. Remove wristwatch, rings and any other jewelry.

Table of Contents

Section 1
INTRODUCTION AND SPECIFICATIONS

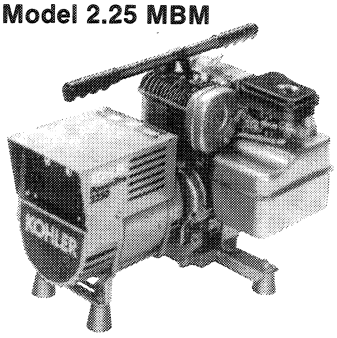
Introduction

This manual covers the Operation; Scheduled Maintenance; Troubleshooting and Corrective Maintenance; Component Testing; Disassembly/Reassembly; Carburetor, Governor and Econo-Throttle Adjustments and Wiring Diagrams for Kohler PowerPro Portables. Your PowerPro generator set is either Kohler or Briggs and Stratton powered, differences are indicated throughout the manual. Read through this manual, then carefully follow all recommendations and safety precautions to keep your generator functioning properly and to avoid any serious bodily injury.

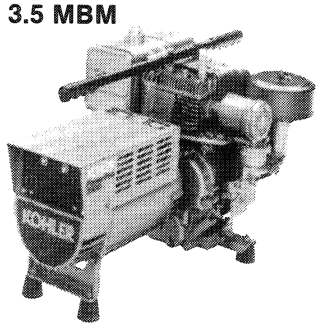
Specifications

	2.25 MBM	3.5 MM	3.5 MBM	5 MM	5 MBM
Engine	Briggs & Stratton 130232	Kohler K181	Briggs & Stratton 190412	Kohler K301	Briggs & Stratton 252412
Horsepower (kW)	5 (60 Hz) — 3.7 (50 Hz)	8 (60 Hz) — 7.3 (50 Hz)	8 (60 Hz) — 7 (50 Hz)	12 (60 Hz) — 11.5 (50 Hz)	11 (60 Hz) — 9.8 (50 Hz)
Bore	2-9/16" (65 mm)	2-15/16" (74.6 mm)	3" (76.2 mm)	3.38" (86 mm)	3.43" (87 mm)
Stroke	2-7/16" (62 mm)	2-3/4" (69.8 m)	2-3/4" (69.85 mm)	3.25" (83 mm)	2.62" (68 mm)
Displacement	12.57 cu. in. (206 cc)	18.6 cu. in. (305.4 cc)	19.44 cu. in. (318.8 cc)	29.07" (476.4 cc)	24.36 cu. in. (399.2 cc)
Oil Capacity	1-1/4 pts (0.61 liter)	2-1/2 pts (1.2 liter)	2-3/4 pts (1.3 liter)	2 qts (1.9 liters)	3 pts (1.4 liter)
Fuel Tank Capacity	3/4 gallon (2.8 liter)	2 gallons (7.5 liter)	1 gallon (3.7 liter)	2 gallons (7.5 liter)	2 gallons (7.5 liter)
Fuel Consumption					
25%	.29 gal/hr (1.1 liter/hr)	.35 gal/hr (1.3 liter/hr)	.46 gal/hr (1.7 liter/hr)	.78 gal/hr (2.9 liter/hr)	.59 gal/hr (2.2 liter/hr)
50%	.36 gal/hr (1.4 liter/hr)	.51 gal/hr (1.9 liter/hr)	.58 gal/hr (2.2 liter/hr)	.88 gal/hr (3.3 liter/hr)	.75 gal/hr (2.8 liter/hr)
75%	.43 gal/hr (1.6 liter/hr)	.58 gal/hr (2.1 liter/hr)	.71 gal/hr (2.7 liter/hr)	.98 gal/hr (3.6 liter/hr)	.93 gal/hr (3.4 liter/hr)
100%	.50 gal/hr (1.9 liter/hr)	.71 gal/hr (2.7 liter/hr)	.83 gal/hr (3.1 liter/hr)	1.1 gal/hr (4.1 liter/hr)	1.09 gal/hr (4.0 liter/hr)
Fuel Type	Regular	Regular	Regular	Regular	Regular
Spark Plug Type	J-8 Champion	J-8 Champion	J-8 Champion	H10, RH10 Champion	J-8 Champion
Spark Plug Gap	.030" (.762 mm)	.025" (.635 mm)	.030" (.762 mm)	0.025" (.635 mm)	.030" (.762 mm)
Point Gap	.020" (.508 mm)	.020" (.508 mm)	.020" (.508 mm)	0.020" (.508 mm)	.020" (.508 mm)
Wattage	2250 @ 60 Hz; 1800 @ 50 Hz	3500 @ 60 Hz; 3200 @ 50 Hz	3500 @ 60 Hz; 3200 @ 50 Hz	5000 @ 60 Hz; 3900 @ 50 Hz	5000 @ 60 Hz; 3900 @ 50 Hz
rpm/Hz	3600 @ 60 Hz; 3000 @ 50 Hz	3600 @ 60 Hz; 3000 @ 50 Hz	3600 @ 60 Hz; 3000 @ 50 Hz	3600 @ 60 Hz; 3000 @ 50 Hz	3600 @ 60 Hz; 3000 @ 50 Hz

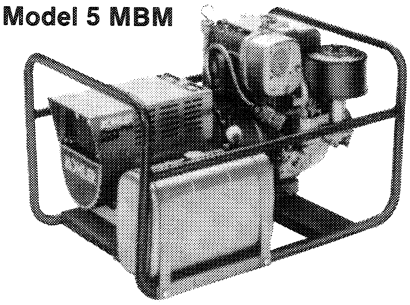
Model 2.25 MBM



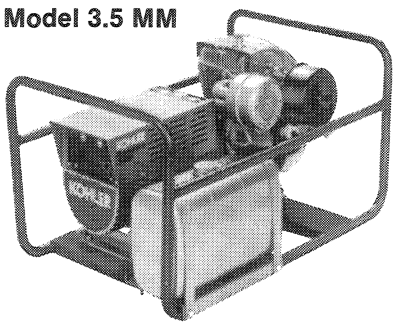
Model 3.5 MBM



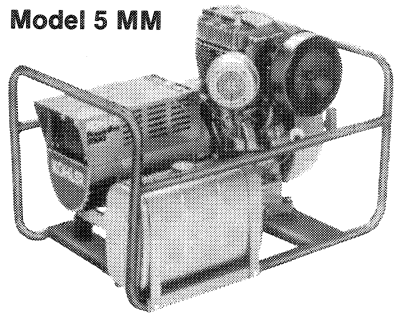
Model 5 MBM



Model 3.5 MM



Model 5 MM



Oil Specifications

KOHLER POWERED

Recommended oil types must meet SAE service classifications SC, SD, SE or SF.

Temperature	Oil Type
Above 32° F (0° C)	SAE 30, 10W-30, 10W-40
Below 32° F (0° C)	SAE 5W-20, 5W-30

BRIGGS & STRATTON POWERED

Recommended oil types must meet SAE service classifications SC, SD, SE or MS. If recommended oils are not available use 5W-20, 5W-30 or 5W-40.

Temperature	Oil Type
Above 40° F (4° C)	SAE 30, 10W-30, 10W-40
0° -60° F (-18° -15° C)	SAE 10W-30, 10W-40
20° F (-6° C) and Below	SAE 5W-20, 5W-30

Fuel Specifications

Use a good quality regular grade of gasoline with a pump sticker rating of at least 85 octane (90 octane-research method). Low lead or nonleaded gasoline is recommended as this helps keep combustion chamber deposits at a minimum. Do not use gasohol. Oil must not be mixed with the fuel. Avoid using gasoline that is not fresh as stale fuel will cause gum deposits to form in the carburetor. Add fuel stabilizers if the gasoline will remain in the tank more than six months.

Section 2
OPERATION

Prestart Check

1. Check Engine Oil Level.
2. Fill Fuel Tank.
3. Inspect Generator Set — make sure air cleaner, muffler, fuel tank, guards and shrouds are tight and properly installed. Inspect fuel tank, lines, pump and carburetor for fuel leaks.

WARNING

FLASH FIRE! Should any fuel leakage occur, the generator set must not be operated to avoid the possibility of a flash fire. Leaks must be repaired by a qualified service specialist before resuming set operation.

To Start

1. Engage choke — turn lever in direction of arrow or pull plunger outward, depending on model.
2. Open fuel valve, if equipped.
3. Move stop lever away from spark plug on Briggs and Stratton powered models.
4. Pull starter rope.
5. Open choke, rotate to open or push plunger in as engine warms.

To Stop

1. Unplug lights and appliances from power panel receptacles. Run generator set for a **few minutes to cool.**
2. Push stop lever against spark plug or push red stop button on breaker cover (hold until generator comes to a complete stop), depending on model.
3. Close fuel valve (if equipped).

Section 3
SCHEDULED MAINTENANCE

General

Scheduled maintenance is "preventive" maintenance. Major repair can be avoided by correcting problems when they are small. When performing maintenance, always look for signs of potential trouble, such as loose connections or dirty components. When running the set, listen for any unusual noises. Follow all safety precautions listed in front of this manual.

Scheduled Maintenance

Refer to Table 3-1 for scheduled maintenance requirements. Perform each function at the indicated time interval. For each function, refer to the applicable paragraph for instructions.

IMPORTANT

For maintenance work on engine components, refer to the Kohler or Briggs and Stratton engine service manual which covers the engine model.

Function	Before Each Startup	Every 25 Hours	Every 50 Hours	Every 100 Hours	Every 200 Hours
Air Inlet and Outlet — Clean	X				
Oil Level — Check	X				
Check Exhaust Pipe/Muffler, Spark Arrestor	X				
Oil — Change		X			
Air Cleaner Element — Clean (change every 200 hours)			X		
Fuel Sediment Bowl (if equipped) — Remove and clean			X		
Spark Plug — Clean and regap*				X	
Point Contacts — Service or replace				X	
Brushes and Slip Rings — Check and service				X	
Ignition Timing — Check and correct					X
Engine External Surface — Clean screen, cooling fins, block, oil fill area					X
Valve Clearance — Check and adjust valve stems and tappets					X
Cylinder Head — Remove, clean and inspect*					X

Table 3-1. Scheduled Maintenance

*Service more frequently when using leaded fuel.

Section 4
TROUBLESHOOTING

General

When troubleshooting a generator set, always consider the simplest causes first. Narrow the problem down to a functional system, such as fuel or ignition. To operate efficiently, an engine must have sufficient fuel, a good ignition spark and good compression. All adjustments must be correct. For a generator to produce the required electricity, all parts must be clean, all connections tight, and all components in working order. Follow all safety precautions listed in front of this manual.

Engine Troubleshooting

Refer to Table 4-1 for engine troubleshooting. To make engine repairs, refer to the Kohler or Briggs and Stratton engine service manual which covers the engine model. A troubleshooting chart cannot cover every possible cause of malfunction. Always consider every possible cause of malfunction. Knowledge of four cycle engines and ignition systems can be applied.

Condition	Possible Cause
A. Hard Starting or Loss of Power	1. Faulty ignition. a. Loose or grounded high tension or breaker point leads. b. Improper breaker point gap and timing. c. Defective breaker points. d. Faulty spark plug or improper gap. e. Faulty condenser or coil 2. Faulty fuel system. a. Gasoline not getting to carburetor. 1. Fuel tank cap vent plugged. 2. Dirt or gum in fuel line or sediment bowl. 3. Fuel pump faulty. b. Dirt in carburetor. c. Carburetor improperly adjusted. d. Air cleaner dirty.
B. Overheating	1. Insufficient available cool air. 2. Dirty air intake screen, shroud or cooling fins. 3. Improper fuel. 4. Fuel mixture too lean. 5. Improper ignition timing. 6. Engine overloaded. 7. Tight valve tappet clearance.
C. Backfiring	1. Fuel mixture too lean. 2. Improper timing. 3. Valve not closing properly.
D. Occasional "Skip" at High Speed	1. Spark plug gap too wide. 2. Improper carburetor setting or lack of fuel. 3. Wrong type spark plug. 4. Improper timing. 5. Faulty condenser or point gap.
E. Operating Erratically	1. Clogged fuel line. 2. Water in fuel. 3. Faulty choke control. 4. Improper fuel mixture. 5. Loose ignition connections. 6. Air leaks in carburetor connections or intake. 7. Vent in fuel tank cap plugged. 8. Fuel pump faulty. 9. Faulty condenser or point gap.

Table 4-1. Engine Troubleshooting
Refer to Kohler or Briggs and Stratton Engine Service Manual

Generator Troubleshooting

The flow table below is a guide to troubleshoot your generator set. Refer to Table 4-2. Before beginning the troubleshooting procedures, read all safety precautions at the beginning of this manual. Additional safety precautions are included with the tests; do not neglect these precautions.

RESET CIRCUIT BREAKERS

Make certain power panel circuit breakers have not tripped. Reset if necessary.

FLASH FIELD

If your generator has no or low AC output, it may be necessary to magnetize the rotor. The rotor usually holds enough magnetism for 3-5 volts (AC), which is needed for initial start-up. If your generator has not run for a long length of time or the generator has been disassembled, it may be necessary to flash your generator. Use the following steps:

1. Unscrew power panel from the end bracket. Figure 4-1.
2. Raise the brushes from the slip rings and insert a length of wire or a paper clip. Figure 4-2.

WARNING

ELECTRICAL SHOCK! Use extreme caution when removing battery power, do not touch wires or severe electrical shock will occur.

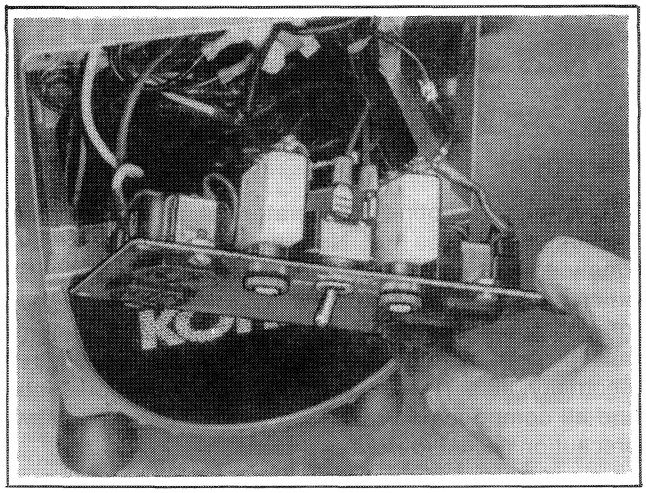


Figure 4-1. Removing Power Panel

3. Using a 9-volt transistor, 6-volt lantern or a 12-volt automotive battery, place the positive (+) lead on the outside slip ring and the negative (-) lead on the slip ring nearest the rotor core, for approximately 2 seconds. Figure 4-3.
4. Remove wire or paper clip to set the brushes on the slip rings, make sure the brushes are centered within the holder and held in proper contact by the springs.
5. Remount the power panel. Start engine and check for rated voltage. Figure 4-4. If there is no AC output, proceed to Separate Field Excitation.

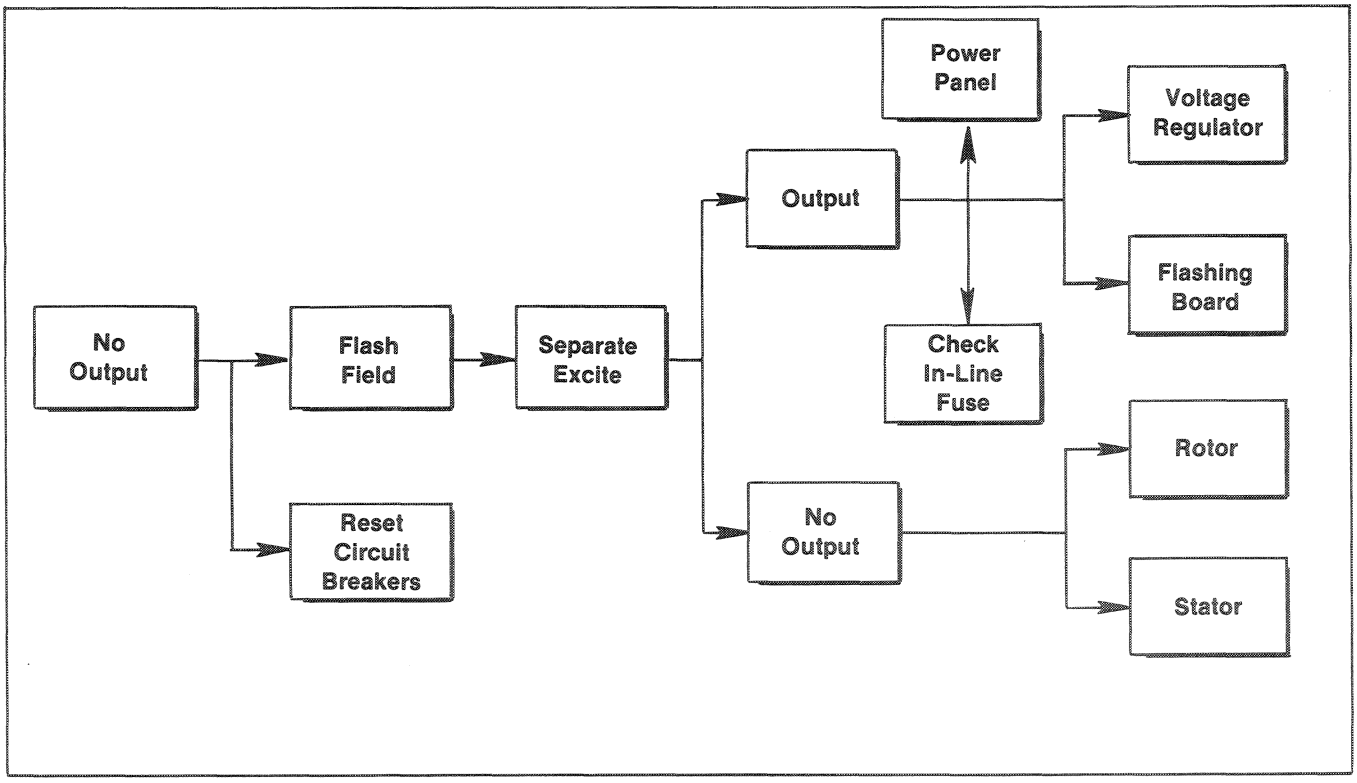


Table 4-2. Generator Troubleshooting

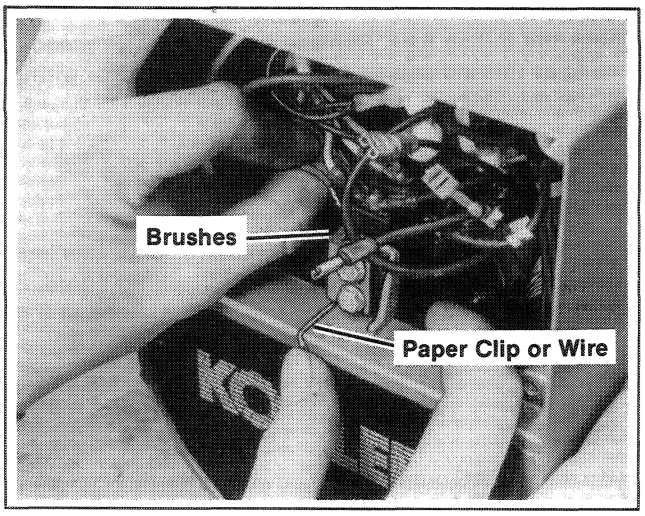


Figure 4-2. Raising Brushes

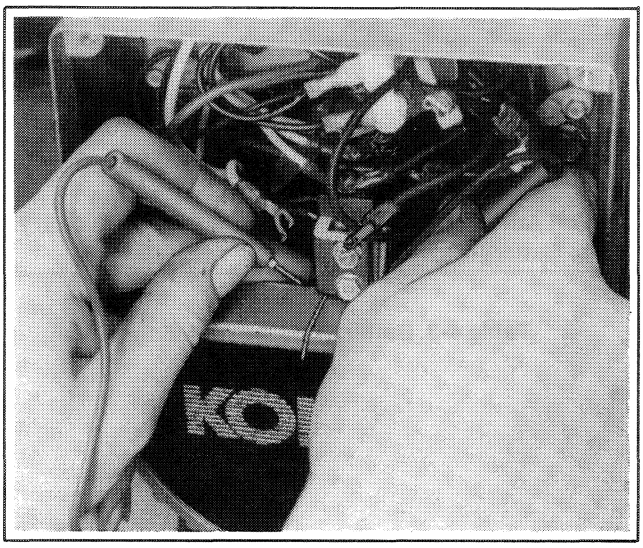


Figure 4-3. Flashing Field

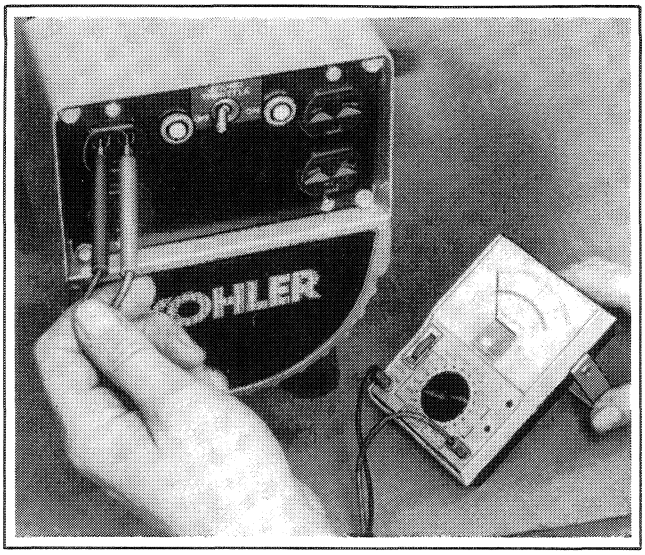


Figure 4-4. Checking for Output

SEPARATE FIELD EXCITATION

As an aid to troubleshooting, the generator field (rotor) may be excited (magnetized) using an outside power source with the following procedure.

WARNING

HIGH VOLTAGE! Remember the function of a generator set is to produce electricity whenever electrical energy is present, there is the potential danger of electrocution. Be sure that generator and appliances are properly grounded. Do not touch electrical equipment when standing in water or on wet ground or when your hands are wet.

WARNING

HIGH VOLTAGE! Voltage regulator heat sink contains high voltage. When testing or working with voltage regulator do not allow regulator heat sink, or regulator leads to touch your person or ground. Electrical shock or voltage regulator damage can occur.

WARNING

ELECTRICAL SHOCK! Use extreme caution when removing battery power, do not touch wires or severe electrical shock will occur.

1. Remove generator cover from generator set.
2. Unscrew voltage regulator and disconnect all leads. Figure 4-5. Unscrew power panel and disconnect all leads.
3. Using a 6-volt lantern battery or a 12-volt automotive battery, attach battery positive (+) lead to voltage regulator positive (+) lead and battery negative (-) lead to voltage regulator negative (-) lead. Figure 4-6. Connect a DC amp meter in series with this circuit.
4. Start generator set and check DC amp meter reading.

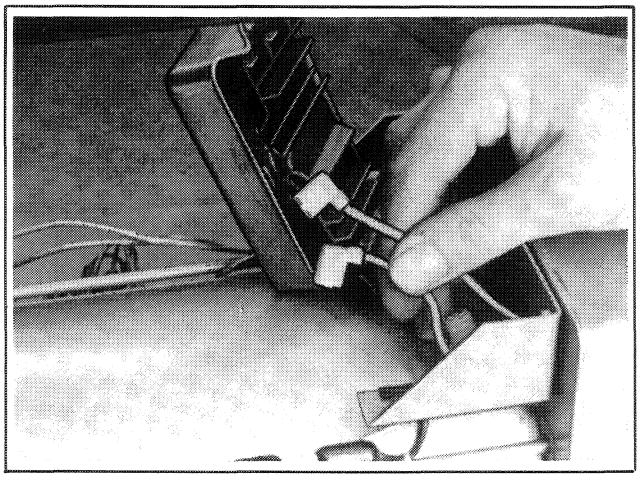


Figure 4-5. Disconnecting Regulator Leads

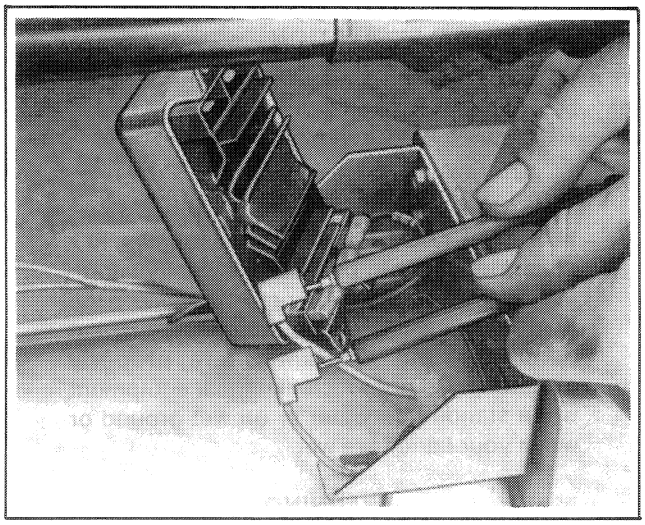


Figure 4-6. Connecting Battery Power to Voltage Regulator Leads

Reading should fall within the approximate ranges given in Table 4-3. If readings are incorrect, this indicates a faulty rotor or brush circuit.

5. While generator is still running, check generator output leads for AC output with a voltmeter. Check leads 1 and 2; 3 and 4; 33 and 44; and 55 and 66. Readings should fall within the ranges given in Table 4-3. If readings are incorrect, this indicates a faulty stator.

IN-LINE FUSE

Check the in-line fuse. Replace if necessary. Proceed in testing as this indicates a fault either in generator wiring, voltage regulator or rotor.

OUTPUT

If you read AC output at all the generator leads, this indicates a fault in the voltage regulator, flashing board, or power panel. Refer to Component Testing, Section 5 or Wiring Diagrams, Section 8.

NO OUTPUT

If you read no AC output at the power panel, this indicates a fault in the rotor or stator. Refer to Component Testing, Section 5.

Battery Type	Voltmeter Readings (Approximate)	DC Amp Reading (Approx.)
6-Volt Lantern Battery	70-75 Volts AC	6/10 (0.66)
12-Volt Automotive Battery	120-135 Volts AC	1-1/2 (1.57)

Table 4-3. Battery Charger Readings

Section 5
COMPONENT TESTING

This section guides you in checking your generator components for proper operation. Follow the safety precautions in front of this manual. Additional safety precautions are included with the tests; do not neglect these precautions.

Voltage Regulator Test

This test is designed to check regulator output. To test, you will need the following components:

1 Variable Transformer, 0-140 Volts (less .5 amps)
1 to 1 Isolation Transformer (less .6 amp)
1 120 Volt AC Plug (60 Hz)
1 Single Pole, Single Throw Switch
1 120 Volt, 100 Watt Lamp
1 2 Amp Fuse
1 AC Voltmeter
Recommended #14 AWG Copper Wire (Minimum)

HIGH VOLTAGE! Remember the function of a generator set is to produce electricity and whenever electrical energy is present, there is the potential danger of electrocution. Be sure that generator is properly grounded. Do not touch electrical equipment when standing in water or on wet ground or when your hands are wet.

HIGH VOLTAGE! The heat sink of the voltage regulator contains high voltage. Do not touch when testing voltage regulator, or electrical shock will occur.

1. Connect components as shown in Figure 5-1.
2. Plug in variable transformer and AC plug.
3. Turn switch S1 on. Lamp should be on.
4. Turn variable transformer on. Slowly increase variable transformer, the lamp should go out at approximately 110 volts.
5. If the lamp does not go out or stays at a dull glow, this indicates a faulty regulator and should be replaced.

Flashing Board Test

This test is designed to check the flashing board for proper operation. To test, you will need the following components:

1 120 Volt AC Plug (60 Hz)
1 Single Pole, Single Throw Switch
1 5 Amp Fuse
1 DC Amp Meter (Milliamp Scale)
1 Ohmmeter

1. Connect the components as shown in Figure 5-2.
2. Plug in the AC plug.
3. With switch (S1) in an open circuit:
   a. Using an ohmmeter, the posistor should measure approximately 15-30 ohms. If not, this indicates a faulty posistor and circuit board should be replaced.

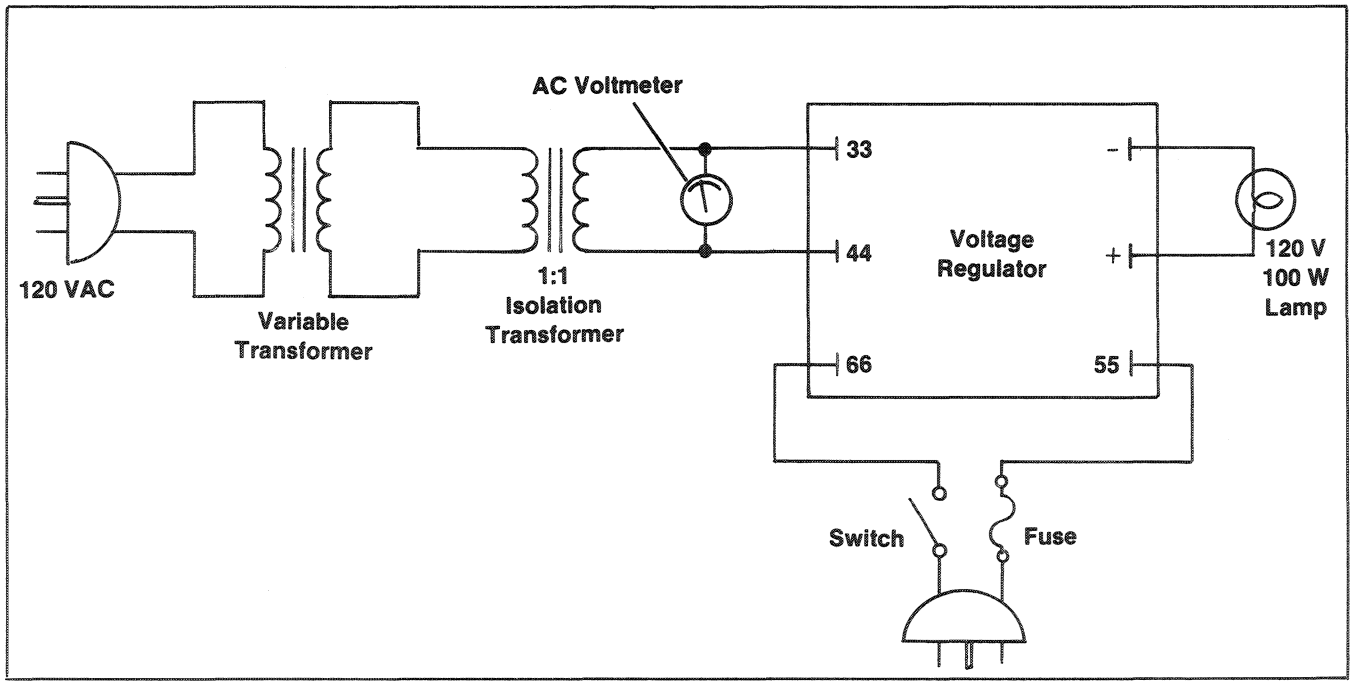


Figure 5-1. Voltage Regulator Test

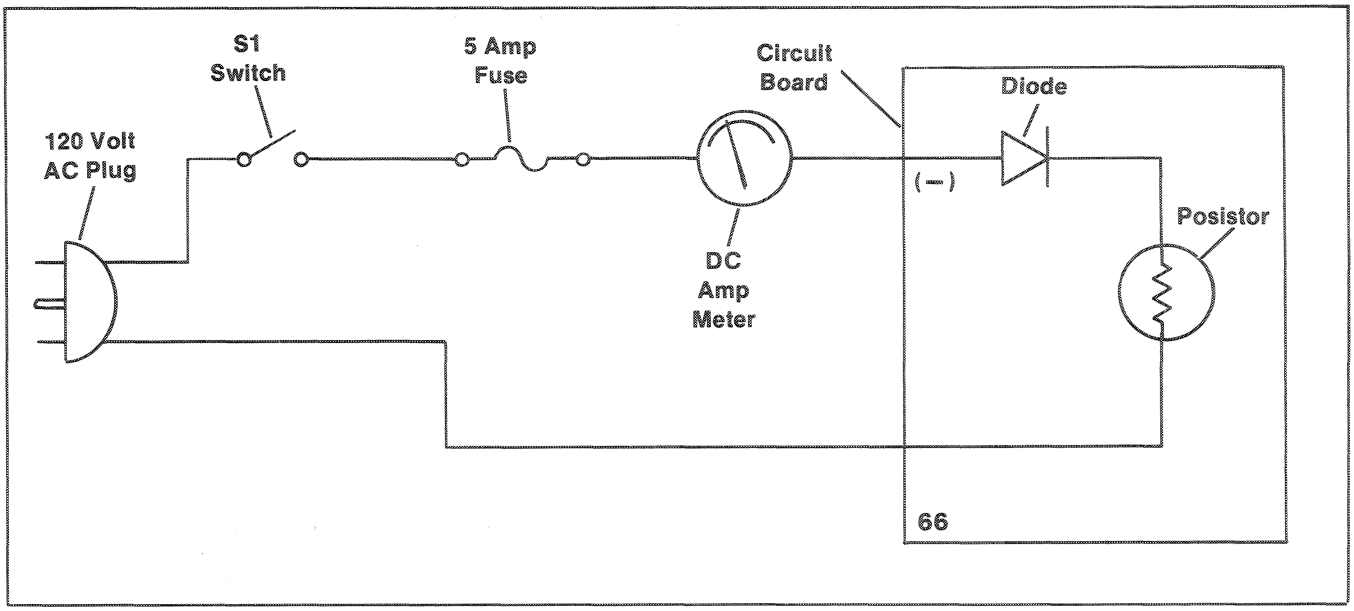


Figure 5-2. Flashing Board Test

b. Using an ohmmeter, the diode should measure very high resistance in one direction and very low resistance in the opposite direction. If not, this indicates a faulty diode and circuit board should be replaced.

4. With switch (S1) in a closed circuit:

   a. Using a DC amp meter on the DC milliamp scale, the circuit should read less than 30 milliamps (DC). If not, circuit board should be replaced.

Stator

The stator consists of a series of coils of wire laid in a laminated steel frame. The stator leads supply voltage to the AC load and exciter regulator.

Prior to testing, inspect stator for visible damage to lead wires, exposed coil windings, exposed and varnished areas of frame laminations and housing, make sure stator is securely riveted in housing.

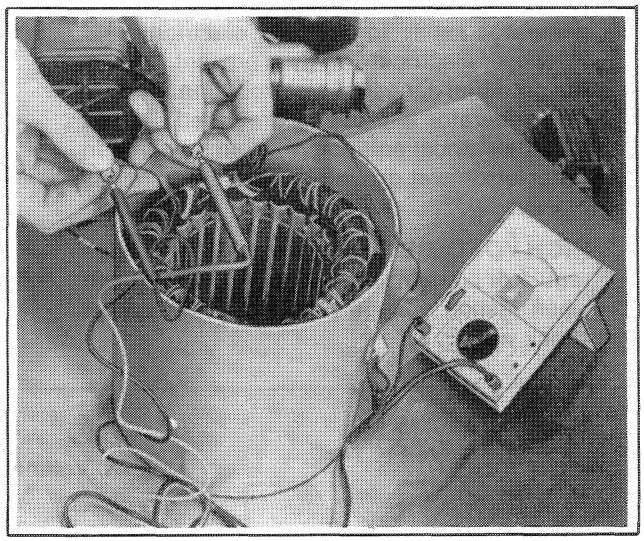


Figure 5-3. Checking Stator Continuity

CHECKING STATOR CONTINUITY AND RESISTANCE

1. To check stator continuity, set ohmmeter on 1 ohm (1 x Ω) scale. Figure 5-3. Contact red and black meter leads; adjust meter to zero ohms. Check stator continuity, contacting meter leads to stator leads.
   - There must be continuity between leads 1 and 2.
   - There must be continuity between leads 3, 4, 33 and 44.
   - There must be continuity between leads 55 and 66.
   - There should be no continuity between lead 1 and leads 3, 4, 33, 44, 55 and 66.
   - There should be no continuity between lead 4 and leads 55 and 66.
   - There must be no continuity between any stator lead and ground on the stator housing or frame laminations.
2. Contact red and black meter leads and readjust to zero ohms. Check cold resistance of stator windings contacting meter leads to stator leads 1 and 2, leads 3 and 4, leads 33 and 44, then to leads 55 and 66. Slight resistance readings of less than one ohm should register. Readings should be in the area of 0.35 ohms for 50 Hz sets and 0.25 ohms for 60 Hz sets. Contact meter leads to stator leads 55 and 66, readings of approximately 1.5 ohms should register.

Should any fault be found with the stator in any of the above tests, the stator must be repaired or replaced.

Rotor

The rotor creates the magnetic field needed to raise alternating current in the stator windings. Rotors used in models covered by this manual have two poles and two slip rings. Prior to testing, inspect rotor for visible damage to pole shoes, insulation, exposed coil windings, slip ring surfaces, and threads in engine end of shaft. Check bearing for noise when rotated, wear, or heat discoloration.

Using a small thin-blade screw driver, carefully pry rubber seal from bearing. Inspect bearing for proper lubrication. Repack bearing with high temperature grease, or replace bearing as necessary.

Contact each slip ring with a meter lead as shown in Figure 5-4. Resistance readings for cold rotors at room temperature should be as follows:

2.25 kW — 4.3-4.9 ohms
3.5 kW — 6.0-6.8 ohms
5 kW — 4.5-5.1 ohms

Should visual inspection or meter testing reveal any rotor faults, rotor must be replaced.

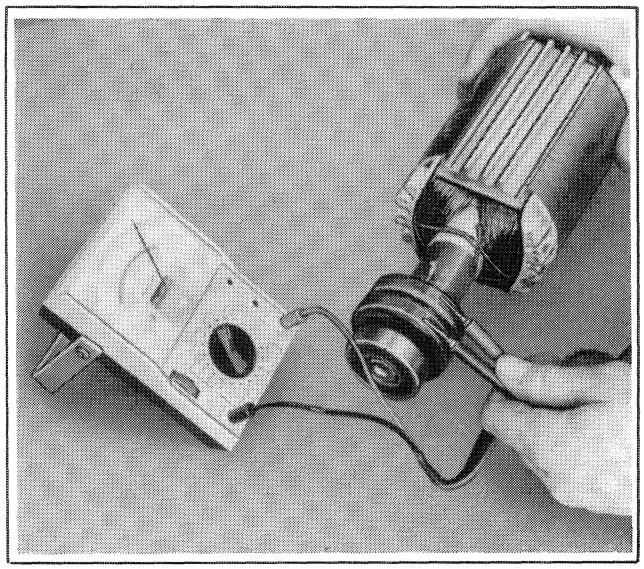


Figure 5-4. Checking Rotor Resistance

Slip rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright, newly-machined appearance. Ordinary cleaning with a dry, lint free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove roughness. Use light pressure on the sandpaper. Do not use emery or carborundum paper or cloth. Clean out all carbon dust from the generator. If the rings are black or pitted, remove the rotor and remove some of the surface material by using a lathe.

Check rotor for continuity and resistance. Set ohmmeter at highest scale. Touch ohmmeter leads together and adjust meter to zero ohms. Contact meter leads and adjust to zero. Touch one ohmmeter lead to either slip ring and other lead to rotor poles or shaft. Meter should register no continuity.

Brushes

The brushes transfer current from the voltage regulator to slip rings. The brushes carry a very low current (approximately 2 amps) and should last the life of the generator set. Abrasive dust on the slip rings could, however, shorten the life of the brushes. Excessive arcing at the brushes could damage the voltage regulator. Arcing could be caused by weak springs, damaged slip rings, sticking brushes, loose holder, or poor brush contact.

The brushes must be free to move within the holder and held in proper contact by the springs. When properly positioned, spring pressure on the brush surface will cause the brush to wear evenly. Figure 5-5 shows normal brush wear.

Replace the brushes if worn excessively or unevenly.

Replace the springs if damaged or discolored.

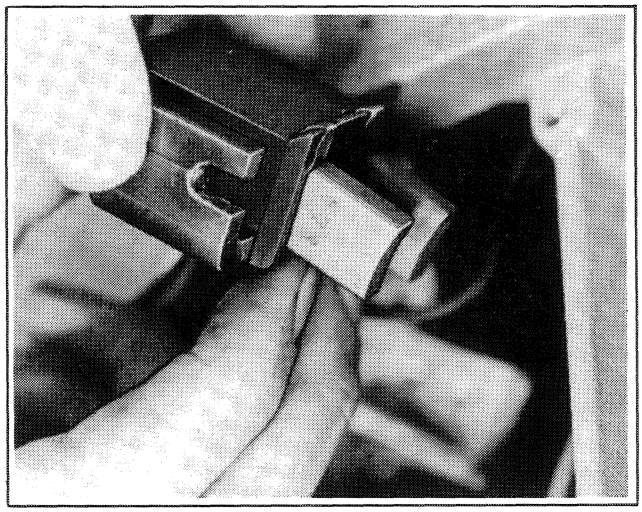


Figure 5-5. Brushes