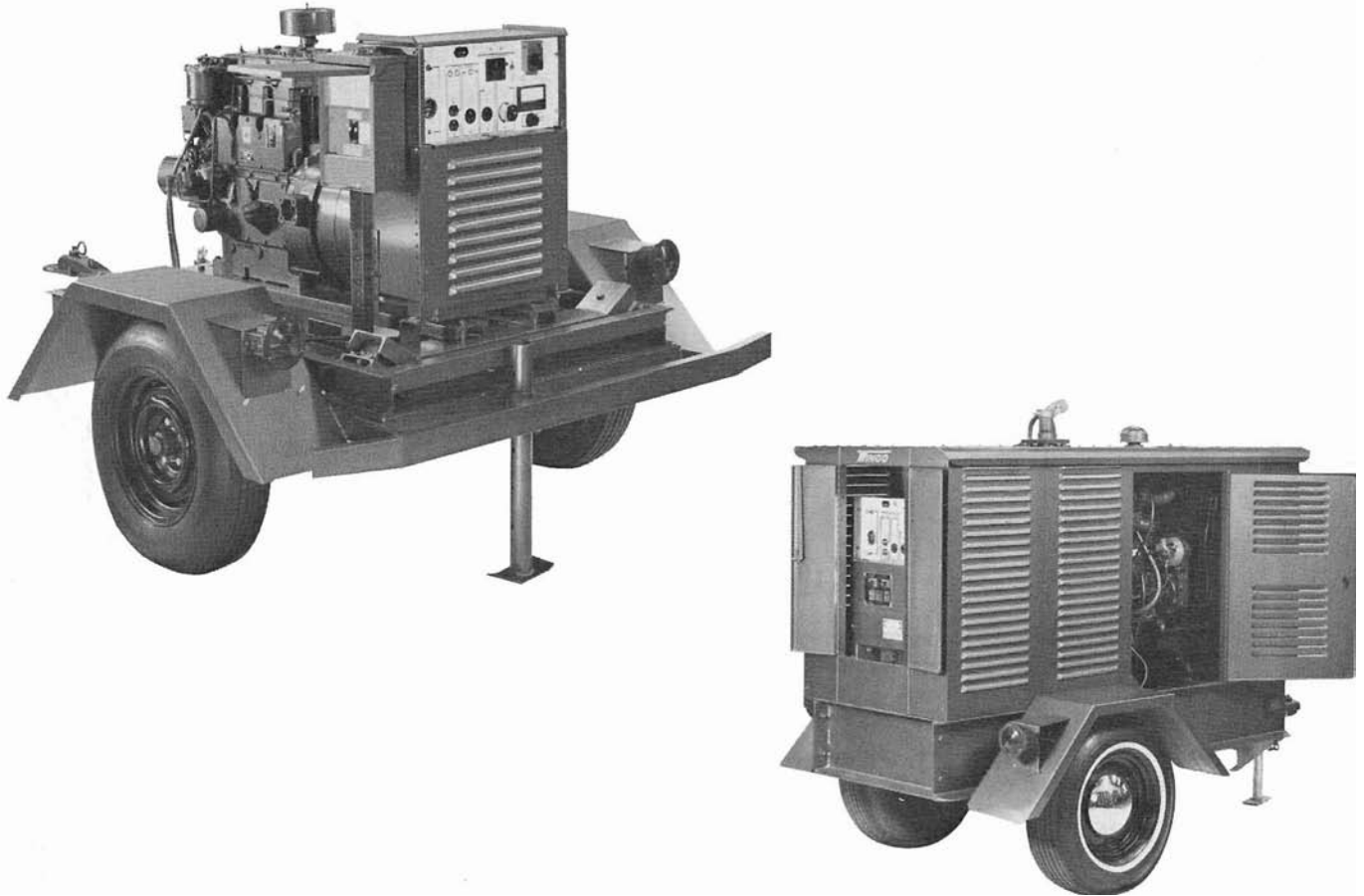


WINCO[®] **GENERATORS**

SWITCHABLE VOLTAGE TRAILER MOUNTED GENERATOR

OPERATION and MAINTENANCE INSTRUCTIONS



Attention: Read all instructions in this manual before attempting to operate or service your WINCO generator. This manual covers all WINCO switchable voltage Generators.



WINCO[®] POWER PLANTS—Over 45 Years of Leadership



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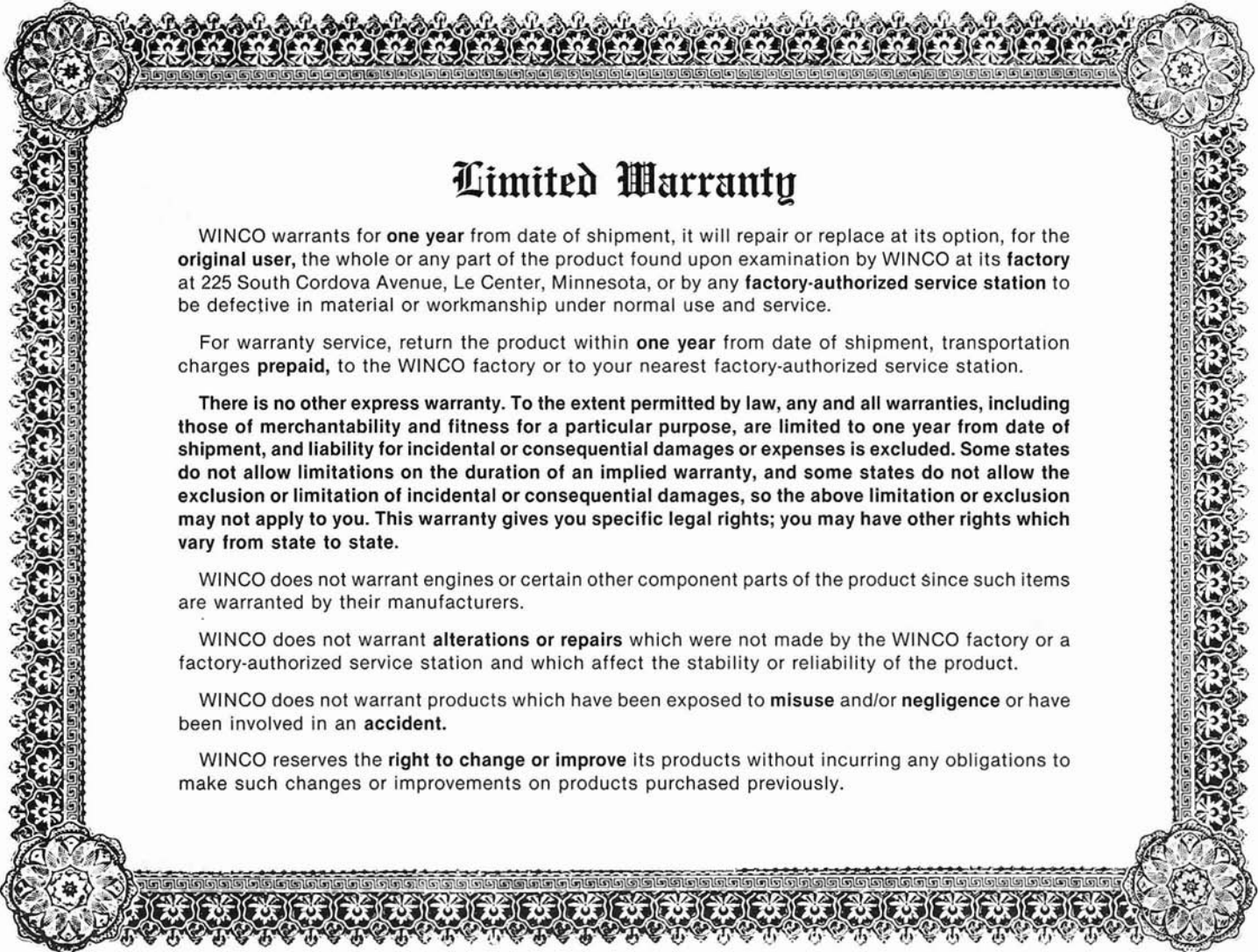
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Testing Policy

Before any generator is shipped from the factory, it is fully checked for performance. The generator is loaded to its full capacity, and the voltage, current, and frequency are carefully checked. A test card with this data is filed by unit serial number for permanent record of performance.

Rated output of generators is based on factory tests of typical units, and is subject to, and limited by, the temperature, altitude, fuel, and other conditions specified by the manufacturer of the applicable engines.

NOTE: This instruction book covers only the generator, **not** the engine. See the engine manufacturer's operator's manual regarding any problems pertaining to the engine.



Limited Warranty

WINCO warrants for **one year** from date of shipment, it will repair or replace at its option, for the **original user**, the whole or any part of the product found upon examination by WINCO at its **factory** at 225 South Cordova Avenue, Le Center, Minnesota, or by any **factory-authorized service station** to be defective in material or workmanship under normal use and service.

For warranty service, return the product within **one year** from date of shipment, transportation charges **prepaid**, to the WINCO factory or to your nearest factory-authorized service station.

There is no other express warranty. To the extent permitted by law, any and all warranties, including those of merchantability and fitness for a particular purpose, are limited to one year from date of shipment, and liability for incidental or consequential damages or expenses is excluded. Some states do not allow limitations on the duration of an implied warranty, and 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; you may have other rights which vary from state to state.

WINCO does not warrant engines or certain other component parts of the product since such items are warranted by their manufacturers.

WINCO does not warrant **alterations or repairs** which were not made by the WINCO factory or a factory-authorized service station and which affect the stability or reliability of the product.

WINCO does not warrant products which have been exposed to **misuse** and/or **negligence** or have been involved in an **accident**.

WINCO reserves the **right to change or improve** its products without incurring any obligations to make such changes or improvements on products purchased previously.

General Information

Descriptions and Features:

The switchable voltage trailer mounted engine-generator sets are single bearing, brushless, rotating field type generators with solid state voltage regulation of $\pm 2\%$ of rated voltage. Frequency regulation will not exceed 3 cycles from no load to full rated load.

The control panel features a lockable selector switch for convenient selection of the following voltage:

- 120 Volt Single Phase: Constant at the duplex plug.
- 240 Volt Single Phase: Control panel receptacles.
- 240 Volt Three Phase: Delta.
- 277 Volt Single Phase: WYE(Star)
- 480 Volt Three Phase: WYE(Star)

NOTE: The 240 Volt three phase, 277 single phase and the 480 Volt are available only at the main circuit breakers.

NOTE: When the selector switch is in the 277/480 volt position the 240 volt receptacles are NOT energized.

The panel also includes a voltmeter, voltage adjust rheostat, running time meter, receptacles and circuit breakers. The engine start/stop switch and the safety latching relay for low oil pressure engine shut down.

The trailer mounted engine-generator sets are fully assembled on highway type trailers with integral fuel tanks.

All models meet CSA, IEEE and NEMA standards and have Class F insulation. Rotors are wet wound with fungus proof, thixotropic single component epoxy and then assembled and baked for permanent, rattle-free performance. All units are dynamically balanced during manufacture. Each generator is equipped with an outboard mounted, single coil Lundell exciter, which can be disassembled in a single piece to greatly simplify servicing. The exciter armature is also easily removable, fully exposing the heavy-duty rotor bearing.

Safety Information

CAUTION: Possible damage to equipment

CAUTION

Caution notes indicate any condition or practice, which if not strictly observed or remedied, could result in damage or destruction of the equipment.

WARNING: Personal danger




Warning notes indicate any condition or practice, which if not strictly observed, could result in personal injury or possible loss of life.

General Safety

1. Do not allow anyone to operate the generator without proper instruction.
2. Hot engine parts, moving parts, and generator output all can seriously injure the generator operator. The operator must use caution and remain alert when using this generator.
3. Be extremely careful if operating this generator in rain or snow.
4. Avoid touching live terminals or receptacles.
5. Do not make or break electrical receptacle connections under load.
6. Use only grounded receptacles and extension cords.
7. When operating this generator, do not wear neckties, loose articles of clothing, or anything else that can be caught in moving parts.
8. Engine exhaust fumes are poisonous. Do not inhale them. Provide adequate ventilation if prime mover for generator is gas or diesel engine. Be sure generator itself is well ventilated.
9. Keep the generator and the area around it clean. Remove all material that can create slippery conditions, such as grease, water, ice and snow. Also remove oily rags and other flammable material from the area.
10. Excessive noise is tiring and continual exposure to it can cause some degree of temporary and permanent hearing loss. Muffle engine noise with the best available noise suppression equipment; wear noise protection devices when necessary.
11. Keep a fire extinguisher near the generator. Extinguishers rated ABC by the NFPA are appropriate for this use. Consult the local fire department if you have questions regarding fire extinguisher ratings. Keep the extinguisher properly maintained and be familiar with its proper use.

12. The generator manufacturer recommends that only qualified electrical technicians be allowed to service (install, maintain, repair, or replace parts) this generator, and that only factory approved repair parts be used in it.
13. Do not work on this generator when fatigued.



Despite the safe design of this generator, operating it imprudently, neglecting its maintenance, or being careless with it can cause serious injury or death. This generator is powerful enough to deliver a fatal electric shock. Allow only a responsible and capable person to operate this generator.

Unpacking and Inspection

Before accepting shipment from the transportation company, carefully inspect the unit and sub-pak carton to determine if damage or loss has occurred during transit. If damage or loss is noted, have the representative of the transportation company write the nature of the damage or loss on the freight bill so that a claim may be filed later if necessary.

Operation

Unlike the conventional or rotating armature type generator which picks the output voltage from the armature slip rings through brushes, the brushless, rotating field type generator's output voltage is produced in the stationary windings.

The brushless, rotating field generator consists of a stator, rotor, rectifier assembly, and an exciter generator. The exciter generator is made up of a stationary field coil of the Lundell type and a rotating armature which produces the AC excitation voltage. This voltage is rectified in the rotating rectifier assembly. The rectified voltage is applied to the rotor field windings setting up an electromagnetic field. When this rotating electromagnetic field cuts the stationary windings (stator) current is produced. The voltage to the stationary exciter field coil is controlled externally by an electronic voltage regulator. The sensing voltage for this regulation is taken from the generator stator windings.

Preventive Maintenance

Timely preventive maintenance can keep costly repairs and generator down-time to a minimum. Compliance with the following list will insure long life for your generator.

1. Adequate cooling air is very important for long life and correct operation of the generator. Check regularly to insure that air intakes and vents are clear of any obstruction.
2. As a precaution against moisture and dust collecting in the generator and to keep the engine properly lubricated, the engine-generator set should be operated at least once a week. Engine-generator exercising may be required more frequently in areas of high humidity or blowing sand.
3. Check drive components and generator regularly for loose nuts, bolts and fasteners.
4. The bearings used are factory lubricated and double sealed and require no maintenance under normal conditions. Bearings should be checked if the generator is disassembled for other maintenance and should be replaced if worn.
5. The following items should be checked and/or serviced daily or prior to use.
 - A. Tire pressure
 - B. Battery
 1. Fluid level
 2. Connections
 - C. Light assemblies
 - D. Electrical plug and wiring

Wheel bearings should be repacked every 10,000 miles or every six months.

6. ENGINE: Refer to engine manufacturers manual for maintenance requirements of the engine, oil replacements, changing of filters and cleaners and other recommended services.

Simplified Schematic

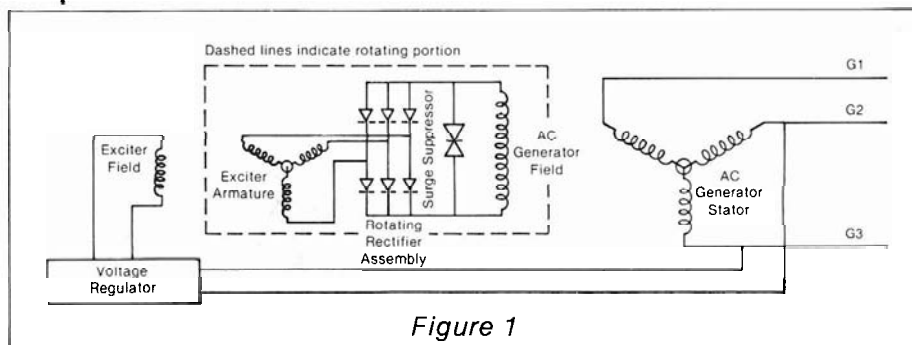
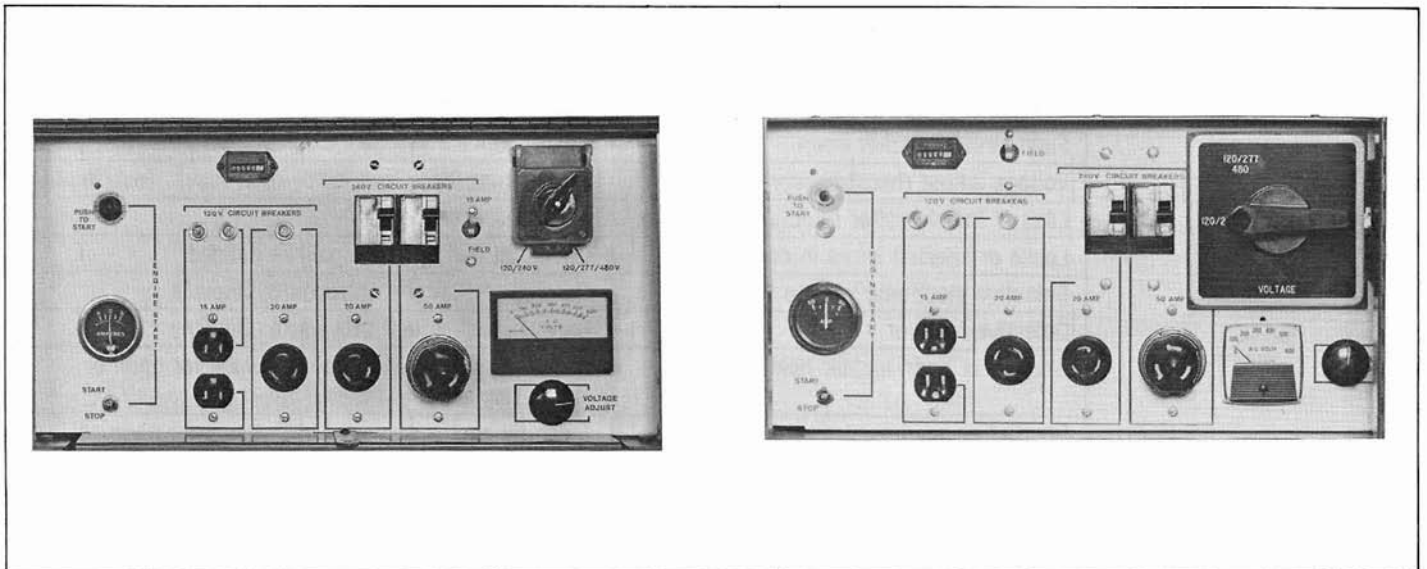


Figure 1



Pre-Start Check List:

1. TRAILER
 - A. Rear jack stand down and pinned (If equipped).
 - B. Check trailer level (within 15 degrees).
 - C. Check tire pressure (32 PSI).
 - D. Check battery for hold down security, connections (negative ground), fluid level.
 - E. Loose bolts and hardware.
2. ENGINE:
 - A. Check engine oil level, add as required (see engine manual).
 - B. See engine operator's manual for special engine preparation instructions.
 - C. Check for loose mounting/hold down hardware and accessories.
 - D. Check for debris or obstructions in or around the engine-generator cooling systems.
3. GENERATOR:
 - A. Voltage selector switch locked in correct position for required voltage.
 - B. Check all circuit breakers for proper position.
 - C. If using the main circuit breaker, check that connections are tight.

Starting Procedure:

1. On the control panel, press and hold the safety latching relay button down.
2. Push the start/stop switch to the start position until the engine starts, hold the safety latching relay until the engine comes up to speed. If the engine fails to start in approximately 5 to 10 seconds in moderate or warm weather, 15 to 20 seconds in cold weather, release the start switch and safety latching relay. Refer to the engine operators manual for possible causes.

3. With the engine running smoothly, check the oil pressure gauge. Refer to engine operator's manual for the normal pressure of your model engine. Check the ammeter, which should indicate a positive charge. Check the output voltage, adjust if necessary.

Trouble Shooting

As with any machine, trouble can develop in engine-generator sets and their associated control equipment. The following trouble shooting chart lists various symptoms of poor generator operation as well as possible causes and what corrective action can be taken. Engine-generator sets are under continuous vibration while running; therefore, it is advisable to check for loose wires or connectors whenever the generator control box is opened.

The following minimum test equipment should be on hand for field trouble shooting and maintenance. (See the section on test procedures when the problem area is pin-pointed.)

1. Volt-ohmmeter—20,000 ohms per volt
 2. Frequency Meter—58 to 62 Hertz (cycles per second)
 3. Clamp-on Ammeter—0 to 100 ampere range
- The trouble shooting chart lists the following malfunctions and their possible causes and corrections.
1. No Output Voltage
 2. Low Output Voltage
 3. High Output Voltage
 4. Fluctuating Voltage
 5. Generator Overheating
 6. Generator Noise and Vibration

Trouble Shooting Table

Symptom	Possible Cause	Correction
No output voltage	Load circuit breaker open	Reset/Replace
	Field circuit breaker open	Reset/Replace
	Voltage adjust rheostat dirty	Rotate knob back and forth, then reset. Test/Replace
	Loss of initial exciter residual magnetism	Flash the exciter field
	Loose or shorted wires in control box	Check all wiring and repair as needed
	Defective electronic voltage regulator	Carefully follow test procedure. Replace
	Defective rectifier	Carefully follow test procedure. Replace
	Shorted or open exciter field coil	Measure exciter field coil resistance for open or short. Replace
	Shorted or open exciter armature	Measure exciter armature resistance for open or short. Replace
	Shorted or open rotor	Measure rotor resistance for open or short. Replace
	Shorted or open stator	Measure stator resistance for open or short. Replace
Low output voltage	Engine speed too low	Check no load engine speed with a frequency meter and adjust governor to give 61.5 Hertz
	Generator overloaded	Calculate load being run and compare with name plate rating. With 3-phase generators, the load on each leg should be as evenly balanced as possible and should not exceed the rated current on any leg.
	Defective electronic voltage regulator	Carefully follow test procedure. Replace
	Defective rotating rectifier	Carefully follow test procedure. Replace
	Defective rotor winding	Measure resistance between rotor leads and compare with the unit's Technical Data Sheet. Replace
	Defective stator winding	Measure resistance between stator leads and compare with the unit's Technical Data Sheet. Replace
High output voltage	Engine speed too high	Check no load engine speed with a frequency meter and adjust governor to give 61.5 Hertz
	Defective electronic voltage regulator	Carefully follow test procedure. Replace
Fluctuating voltage	Erratic engine speed	Refer to the engine manufacturer's maintenance manual
	Loose terminal or load connection	Make better mechanical and electrical connection
	Voltage regulation unstable	Carefully follow electronic voltage regulator test procedure. Replace
	Intermittent short in exciter field coil	Measure exciter field coil resistance for short
Generator overheating	Air vents obstructed	Clear obstruction
	Inadequate ventilation	Provide adequate compartment ventilation. Provide a fresh air inlet duct.
	High intake air temperature	Improve ventilation. Allow at least two feet clearance around generator.
	Generator overloaded or unbalanced	Calculate load being run and compare with name plate rating. With three-phase generators, the load on each leg should be as evenly balanced as possible and should not exceed the rated current on any leg.
	Shorted turns in either rotor or stator	Measure rotor and stator resistance for short. Replace
Generator noisy and/or vibrates	Loose sheetmetal	Check hold-down fasteners. Tighten
	Rotor or impeller rubbing	Repair or replace defective part
	Bearing defective	Replace bearing
	Rotor unbalanced	The rotor should have small balancing washers or bars attached at one or both ends. If these are missing, contact the distributor.
	Drive engine unbalanced	Refer to the engine manufacturer's maintenance manual

Testing Procedures

Test procedures should be carefully followed when it has been learned from the Trouble Shooting Chart that symptoms point to a particular problem area. It should be noted that most maintenance and testing will require removal of the control box top and/or the louvered front cover.



High voltage test equipment should not be used. All tests should be conducted using a volt-ohm meter.

Exciter Assembly

- 1. Testing the Exciter Field:** The exciter field is checked for shorts and opens. Disconnect exciter field leads F1 and F2 from the voltage regulator. The resistance between F1 and F2 should be about 25 ohms. Resistance between either F1 or F2 and ground should be infinite. Replace the exciter field coil and ring assembly if resistance readings are incorrect.
- 2. Separate Excitation of the Exciter Field:** Disconnect the F1 (positive) and F2 (negative) leads from the voltage regulator. Connect a 12 volt DC power source with Off/On switch in series with the F2 exciter field lead. Maintain polarity of positive to F1 and negative to F2.

CAUTION

Insulate connections so they cannot short against other components or against the control box itself.

Restart the unit and close the switch to the 12 volt DC power source. Voltage should build up with near normal voltage being measured at output terminals. If voltage builds to the correct level, continue to "tests of the electronic voltage regulator." If voltage does not build, continue to the next test.

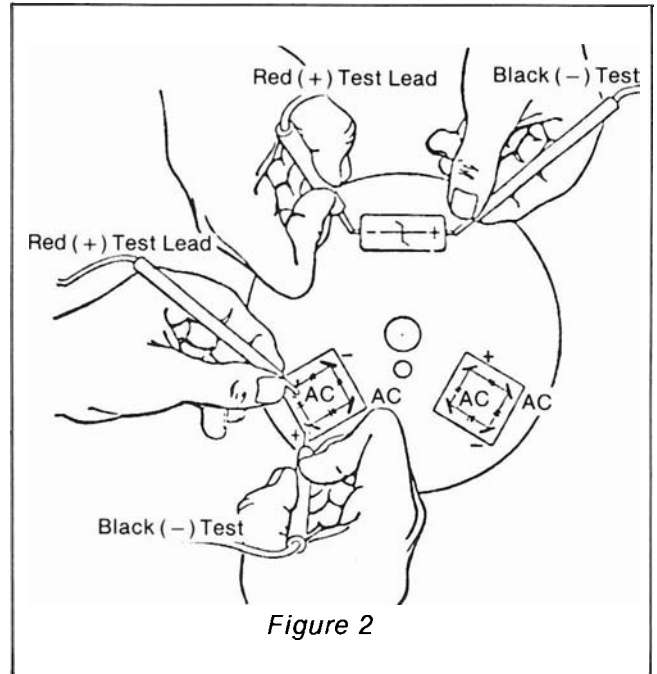
- 3. Testing the Exciter Armature:** The exciter armature is checked for shorts and opens. Disconnect the three exciter armature leads from the rotating rectifiers. Connect an ohmmeter lead to one lead of the armature and the other ohmmeter lead to each of the remaining armature leads in turn. The resistance measured should be too small to read on most test equipment. Resistance between each exciter armature lead and the rotor shaft should be infinite.
- 4. Testing Rotating Rectifiers and Surge Suppressors:** See Figure 2. Disconnect the positive lead and one AC lead from the rectifier to be tested. Mark if necessary for identification. Place one ohmmeter lead on the positive terminal and the other lead on each

AC terminal in turn. These readings should be the same whether high or low. Reverse the ohmmeter leads and repeat the test. These readings should be opposite. Repeat these tests between the negative terminal and each AC terminal in turn. If resistance readings are incorrect, replace the rectifier.

The surge suppressor is tested in like manner. Set volt-ohmmeter to RX 10,000. Disconnect the two field leads, marking if necessary to identify which is positive and which negative. Disconnect the negative (-) leads from the two rotating rectifiers. Place an ohmmeter lead on each end of the surge suppressor and then reverse the leads. Readings should be infinite one direction, and a high resistance the other direction. If resistance readings are incorrect, replace the surge suppressor.

Testing the Rotor

1. Disconnect both rotor leads. These are connected to the surge suppressor on the rotating rectifier assembly. Measure the resistance between leads. The resistance should measure approximately 2.5 to 5 ohms. If the reading is correct, connect one ohmmeter lead to the rotor shaft and the other ohmmeter lead to one of the rotor leads. The reading should show infinite resistance. If the rotor proves to be defective, it must be returned to the factory for repair or replacement. Do not rewind.



Voltage Regulator

1. Testing for Sensing Voltage: With the selector switch in the 120/240 volt, position the voltage between E1 on the voltage regular and ground should be 125 volts AC. With the selector switch in the 120/277/480 volt position read between E3 and ground for the same voltage.
2. Regulator Voltage Output to Exciter: Using a voltmeter set to read at least 25 volts DC, connect the positive lead to F1 and the negative lead to F2. The reading should be between 10 and 20 volts DC at no load.
3. Consult voltage regulator instruction manual for testing, trouble shooting and adjustment procedures.

Testing the Stator

1. To test the stator for opens and shorts, the windings must be isolated.

CAUTION Mark all leads for correct reconnection.

Disconnect the load leads from G1, G2, and G3. Disconnect the neutral leads. Disconnect the voltage regulator voltage sensing leads. Using a volt/ohmmeter, test the coil groups for continuity, and shorts to ground. If the stator proves defective it must be returned to the factory for repair or replacement.

Flashing the Field

1. Disconnect the F1 (positive) and F2 (negative) leads from the electronic voltage regulator. Connect a 12 volt DC power source across the exciter field leads for 1-3 seconds. Battery positive must go to F1 (positive) lead and negative to F2 (negative) lead. Touch F1 lead to F2 lead to neutralize any stored charge. Reconnect F1 and F2 exciter field leads to the electronic voltage regulator. Be careful to maintain F1 to positive and F2 to negative.

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