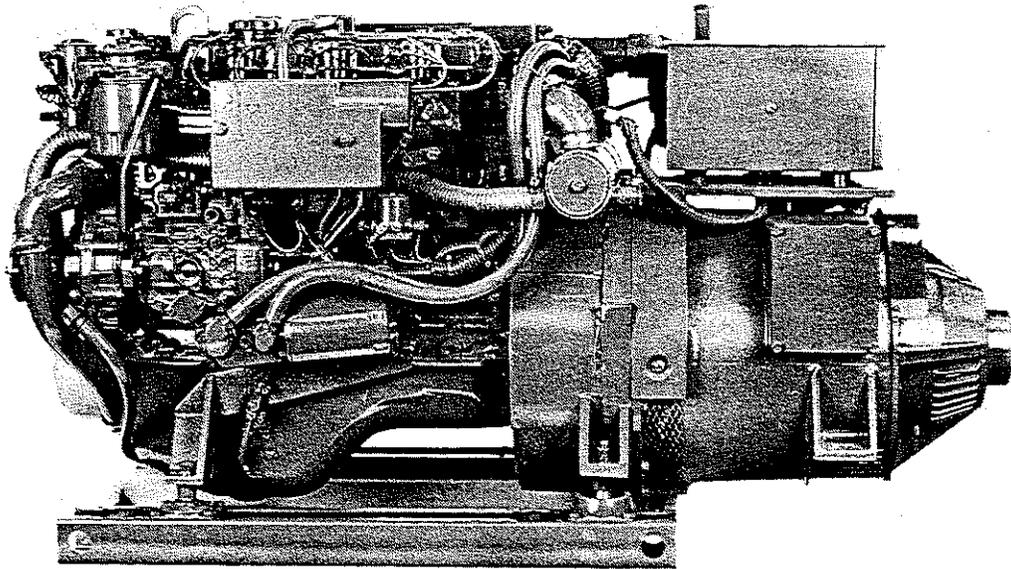


**BASIC TROUBLESHOOTING AND
FAMILIARIZATION GUIDE
WESTERBEKE MARINE GENERATOR
MODELS**

**WTA15KW, WTA20KW & WTA25KW - 60 HERTZ
WTA12KW, WTA16KW & WTA20KW - 50 HERTZ**



 WESTERBEKE
WESTERBEKE CORPORATION
AVON INDUSTRIAL PARK, AVON, MA 02322 • TEL: (508) 588-7700

The following text is designed to give insight into problems which may be encountered with the 15 KW, 20 KW, and 25 KW Westerbeke brushless generators. Owing to the simplicity of the equipment and controls, troubleshooting is relatively easy, once the relationship between cause and effect is understood.

Most potential problems are covered in the text of this guide; however, should an omission or an error be found, we would greatly appreciate your notifying us of it.

Keep in mind that basic fundamental knowledge of electricity is required for this troubleshooting and always remember that lethal voltages are present in the circuitry and; therefore, extreme caution is essential when working on or troubleshooting a generator.

Only a few basic tools are necessary for diagnosis and repair. These are hand tools: an amp probe and a quality volt-ohmmeter capable of reading less than one ohm due to the precision required in reading component winding resistances.

NOTE: Do not always rely on the instruments on the vessel as being accurate; try to bring your own.

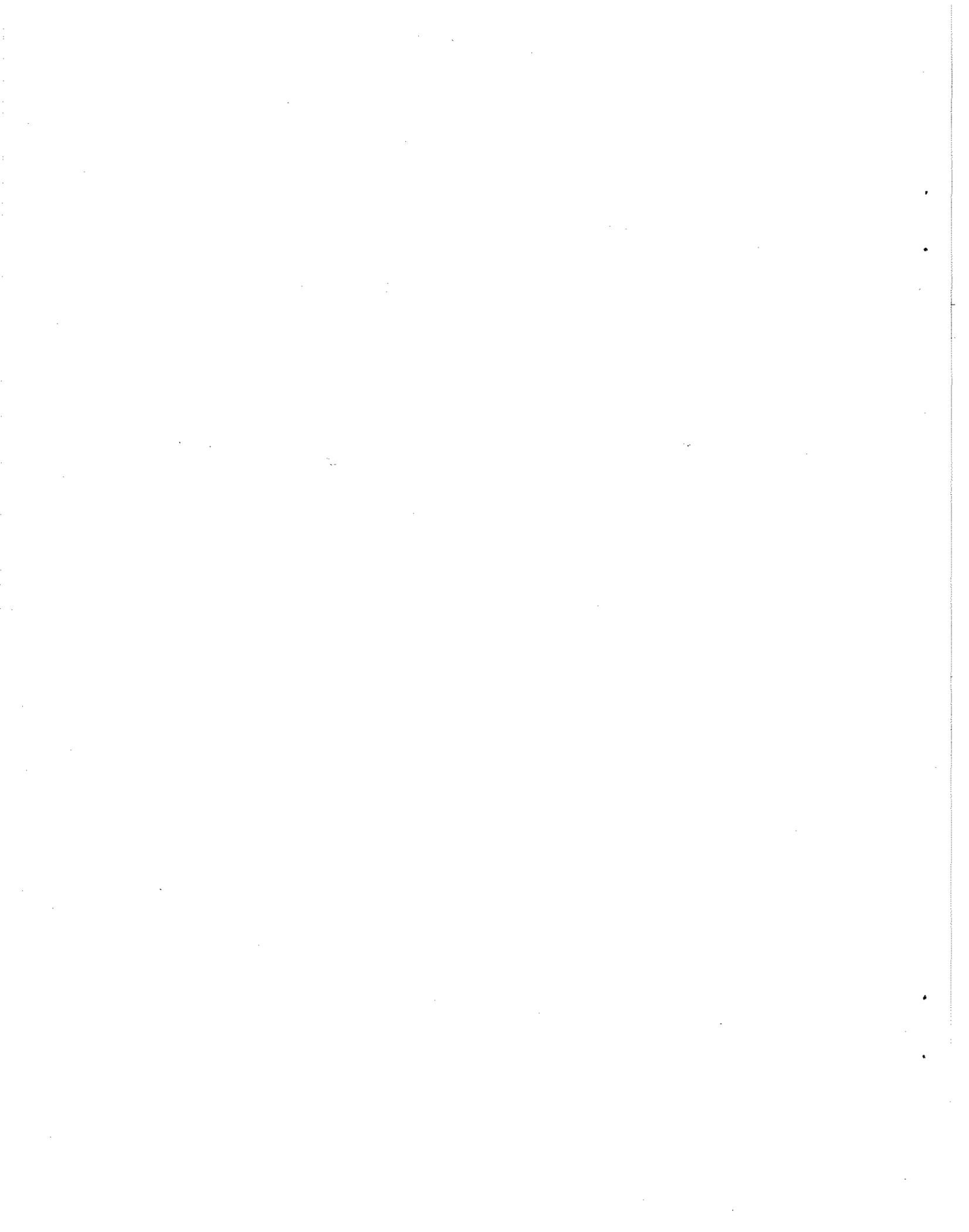
Before attempting repair, get as clear an explanation of the problem as possible, preferably from an individual witnessing the problem. In some cases, this may bring to light a problem which is related to the method of operation rather than equipment fault.

Bring basic repair parts with you on the initial trip to the problem equipment such as a regulator board, housing diode and bridge rectifier so that, if the problem should be found in one of these easily replaceable parts, the problem can be remedied early and efficiently.

Sections A-G are specific problems and their causes. Please bear in mind that specifications listed are not exact but are intended to show relative symptoms and their probable cause.

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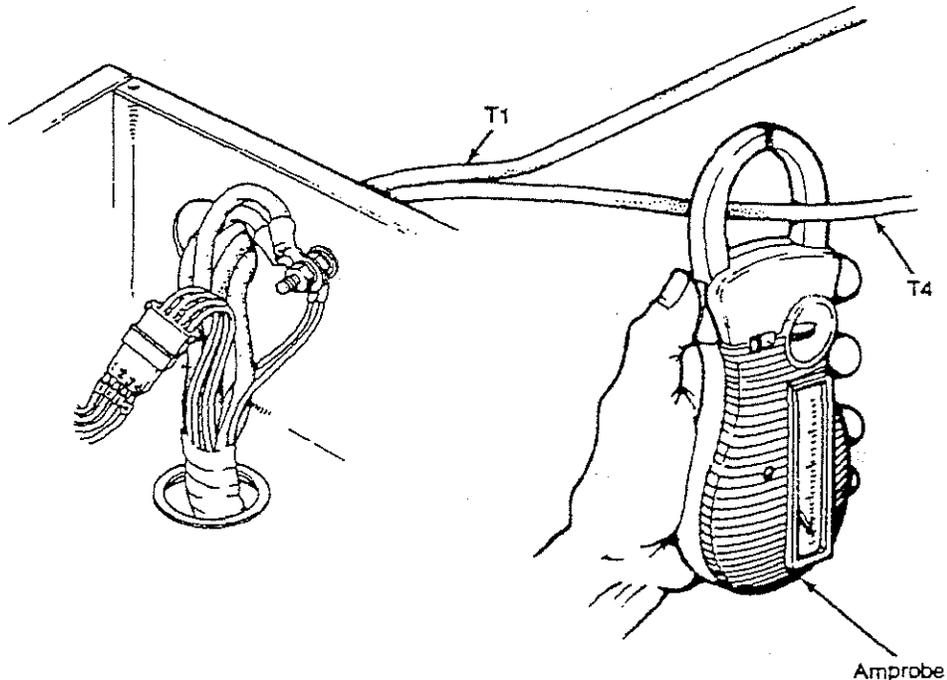
SECTION A

LOW VOLTAGE: 70-110 VOLTS

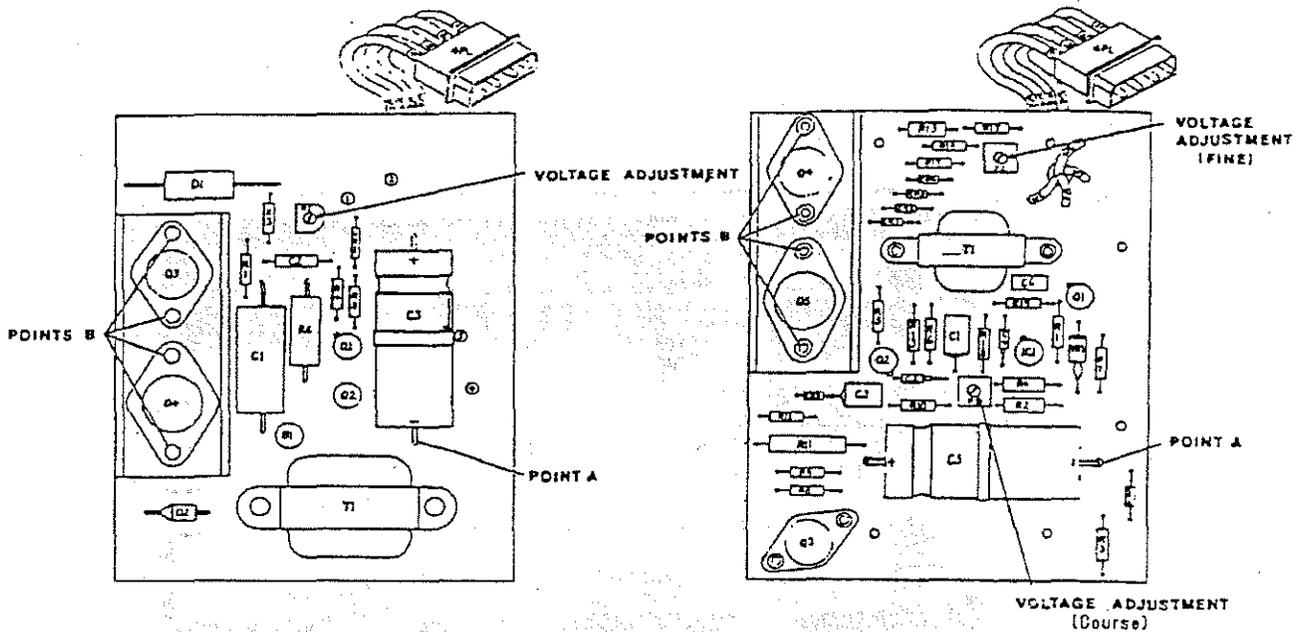
Check for Overload.

- A. Check the generator data plate and load the generator per the data plate. Monitor the load with an amp probe clipped to output leads of the generator.

		J. H. WESTERBEKE CORP.	
<small>AVON INDUSTRIAL PARK, AVON, MASSACHUSETTS 02322</small>			
GENERATOR MODEL	WTA-20-614		
Engine Ser. No.	[]		
Generator Ser. No.	G2060-507-XXXX		
KW	20.0	KVA	20.0
PF	1.0	Hertz	60
Phase	1	Wires	4
Rating	CONT.		
Volts	120/240	Amps	135/82.5
Frame	-		
Insul. Class	F	Temp. Rise	105C @ 40C Ambient
Exciter Voltage	[]	Amperes	[]
Bat.	12VDC		
Engine HP	40	CID	154.2
RPM	1800		
24130			

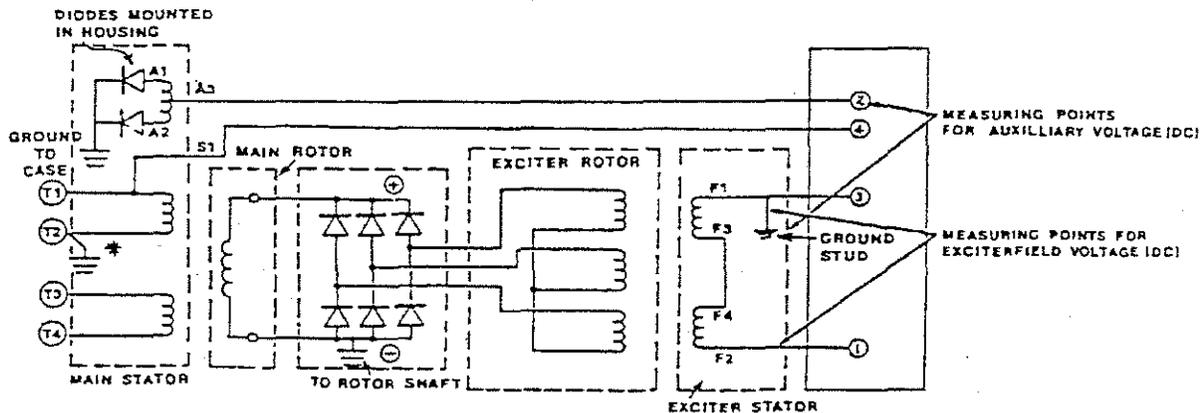


B. Checking the generator load for possible overload when an amp probe isn't available is done with a voltage regulator board/field saturation check.



With the generator loaded and displaying low voltage symptoms, check the DC voltage present in the field circuit for a possible indication of generator overload when an amp probe or ampmeter for the system is not available or suspect for inaccuracy.

For a better understanding of this check, refer also to the generator internal schematic shown below.



NOTE: F3 and F4 are tied together with the butt connector in a harness from the generator to control panel. A1 and A2 are accessible only at diodes located in the generator housing. F1 black is a #16 wire connected to a ground stud. #3 white is a #16 wire which originates at the regulator plug and connects to the ground stud.

Field voltage, supplied to the exciter field via the voltage regulator, will always be greater in an overload condition than in normal operating conditions. When only a small difference or no difference between the auxiliary voltage (pin #2) and the exciter field voltage (pin #1) is found, it could be an indication of a generator overload. (On a fully loaded generator, normal auxiliary voltage is between 27-29 volts DC and normal exciter field voltage is between 15-20 volts DC.)

The DC voltage measurements being discussed here are the simplest indication (although not completely accurate) that a low level power factor overload (motor load) is present. The low power factor (motor load) portion of the load is not felt by the engine and is indicated only partially in output current, but is indicated clearly and relative to rotor current by measuring exciter field voltage.

STEP ONE: Measure the auxiliary voltage of the loaded alternator. Place the plus of the meter (DC scale 50 volts) to the generator case or common ground stud and the negative to points "A" on the regulator board (refer to the illustrations on the previous page) or Pin #2 of the generator/regulator plug. This voltage (DC) at rated full-load should be 27-29 volts approximately.

STEP TWO: Measure the field voltage of the loaded alternator. Check the voltage between the plus lead, remaining as ground on the generator case, or the common ground stud and place the negative lead on one of the screws Point B holding Q3 or Q4 to the heat sink on the regulator board, or Pin #1 of the generator/regulator plug. This voltage (DC) should read between 17-20 volts DC at full rated load on the generator.

NOTE: If removal of the load corrects the voltage problem, an overload or a problem in the load is likely to be the problem.

NOTE: Voltage adjustment potentiometer(s) are located on the early and present regulator boards. Refer to the diagram for locations. These potentiometers allow for a no-load voltage adjustment for the rated voltage (AC) of the generator 120/240 (60 Hertz). The potentiometer adjusters should be used to adjust to these exact voltages. The regulator board should maintain this voltage from no-load to full-load within $\pm 2\%$.

Check for under-speed condition at a full rated load. The injection pump governor should maintain engine RPM and generator frequency to $\pm 2\%$. Should the frequency drop as the load is being applied, this may be an indication of contaminated/poor quality fuel, clogged filters, air or faulty injection pump governor. Check system as needed. Running an alternator system of this nature at less than rated speed can damage electrical loads.

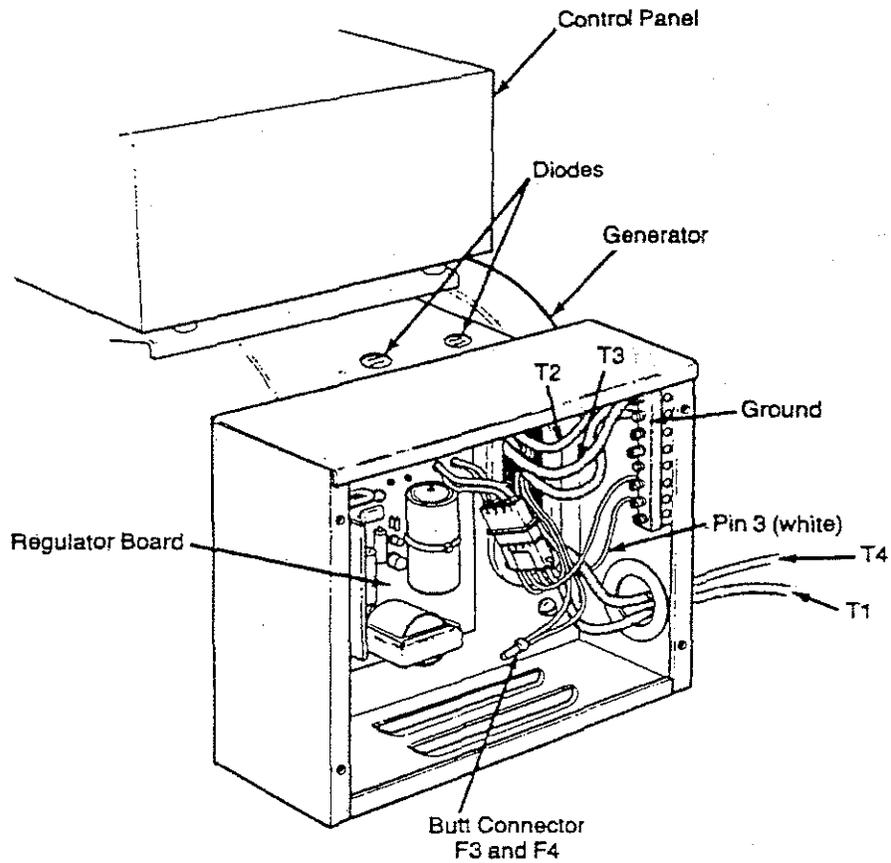
Check for an unbalanced load being taken off the generator output leads. No-load being taken off the "sensed" lead T1, with the "unsensed" T4 line loaded, would show as a low voltage on the loaded "unsensed" line T4.

NOTE: Generator output voltage is "sensed" off output lead T1 through Pin #4 on the generator/regulator plug to ground. The regulator senses 120 volts only.

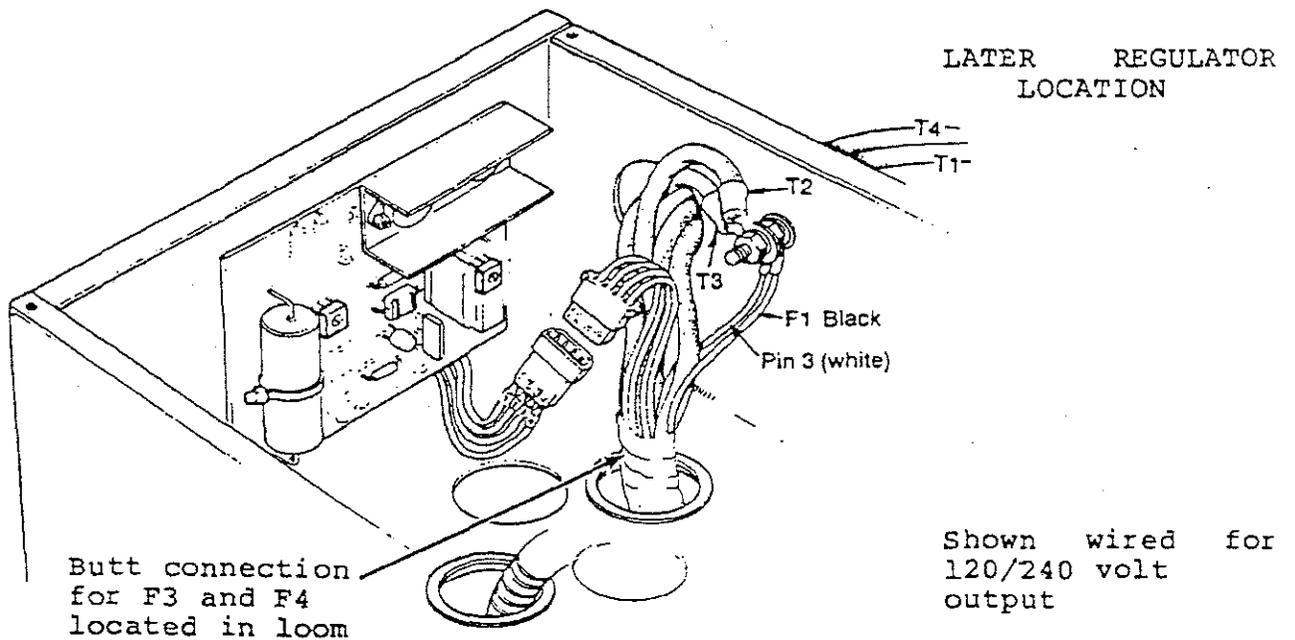
If no problems are found to this point, disconnect the load from the generator and measure the residual voltage output of the generator. This is best done right at the output lead at the generator. Try to insure that no load is on the generator. Any circuit breaker or ship to shore switch between the generator and load must be open.

AUXILIARY VOLTAGES (Regulator Board Plugged In)

	<u>NO-LOAD</u>		<u>FULL-LOAD</u>
WTA-15	Measured between Aux diodes Measured Aux Diode to grd	39.0 VAC 26.5 VDC	40.5 VAC 27.5 VDC
WTA-20	Measured between Aux diodes Measured Aux diode to grd	40.0 VAC 28.0 VDC	42.5 VAC 28.7 VDC
WTA-25	Measured between Aux diodes Measured Aux diode to grd	40.5 VAC 27.5 VDC	43.5 VAC 28.5 VDC



Restart unit and check for balanced voltages off all main output leads T1-T2 and T3-T4 (120 volts AC from each pair). Unbalanced voltages indicate a problem within the main stator output leads or connections. Check resistance values and tighten connections as needed.

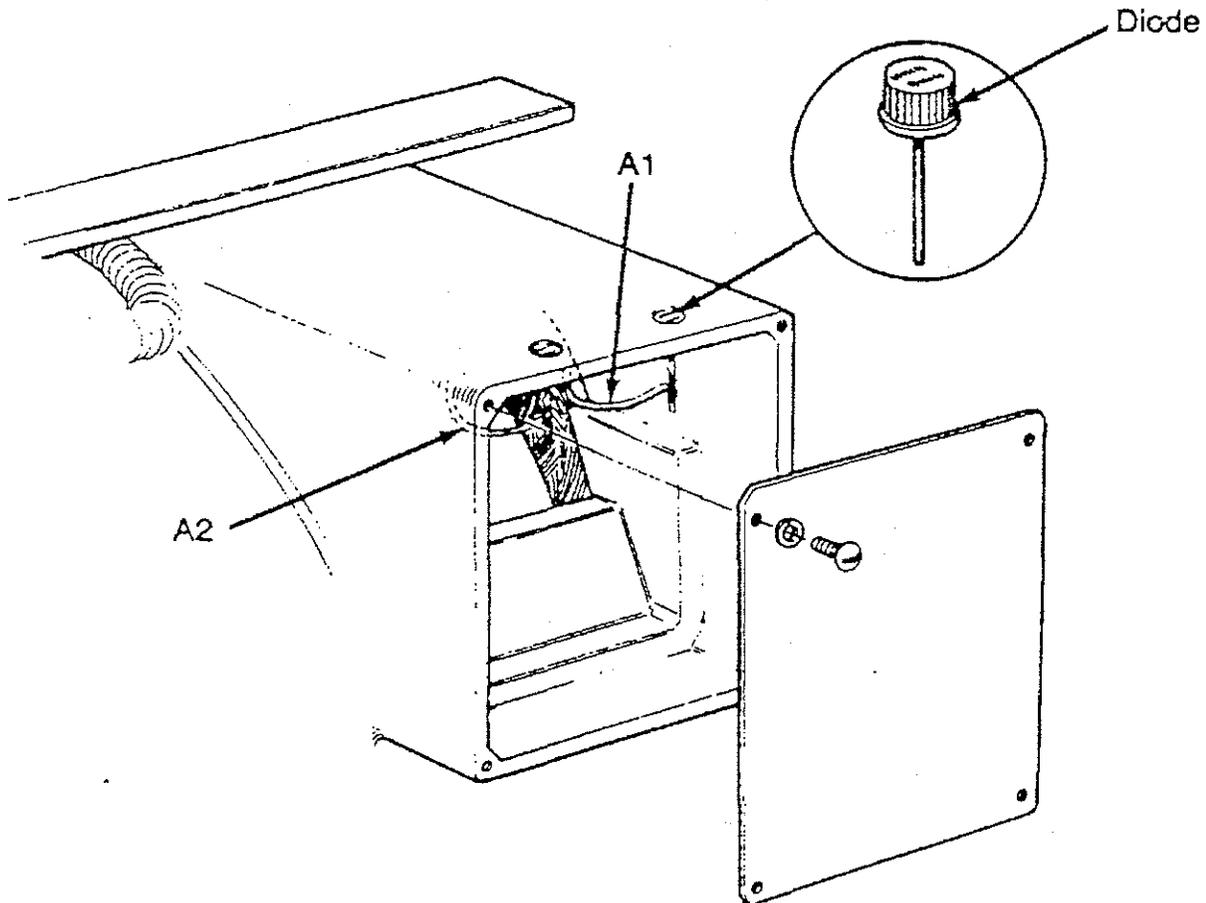


RESIDUAL VOLTAGE MEASUREMENT

This refers to the measurement of auxiliary and main output voltages while the generator is operating with the regulator disconnected, and is under the influence of its internal permanent magnets only. Comparison of residual voltages to the voltages attained while flashing the exciter field (reference section C) can give valuable insight in troubleshooting a defective generator.

Main output residual voltages are best measured as individual groups of coils (T1 and T2) (T3 and T4)- the 120 volt leads. This avoids the possibility of mistaking an open coil as no output for both groups.

1. With the generator stopped, unplug the regulator board and expose the two generator output lines (T1 and T4) so that measurements can be read from them. Start the generator and measure the AC voltage found between leads T1-T2 and T3-T4. This should be 25-35 volts AC between each of these two pairs of leads with no load on the generator.
2. Measure auxiliary voltage next. Measure DC voltage between Pin #2 (generator/regulator plug) and the ground. This voltage should be between 5-6 volts DC (no-load on the generator). If access to the diodes in the generator housing is available, measure directly at each diode to the generator case (ground). Measure the AC voltage across the diodes (A1 and A2). This should be 10-12 volts AC.

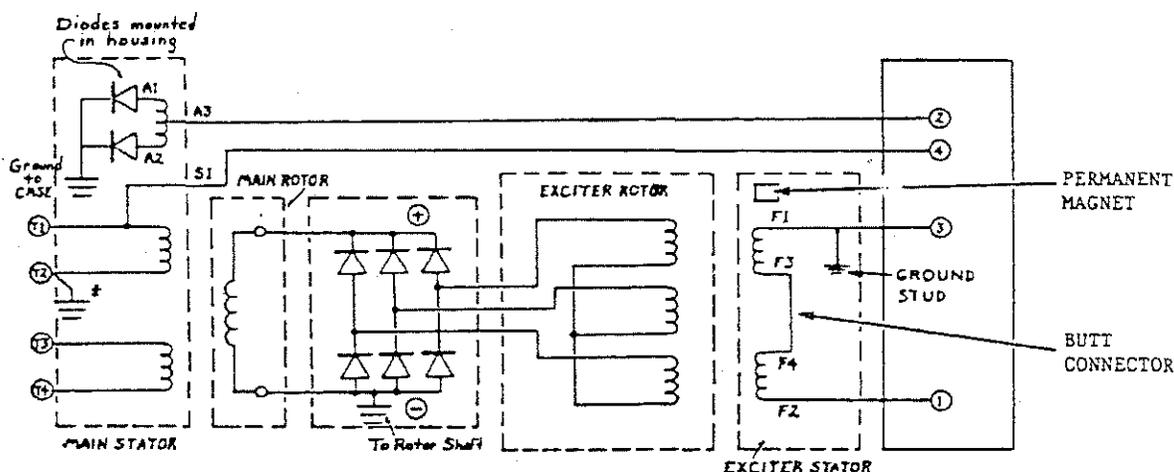


SECTION B

MODERATELY LOW VOLTAGE 50-70 VOLTS

Main stator residual voltage check indicates moderately Low Voltage. 50-70 volts AC measured between T1 and T4 or 25-35 volts AC measured between T1-T2 and T3 and T4.

1. This indicates that a fault is preventing the energizing of the stationary exciter field and that only the permanent magnets in the stationary exciter field are having an effect on voltage output from the generator's rotating parts.



*User to insure this ground connection is made.

NOTE: F3 and F4 are tied together with butt connector in harness from generator to control panel. A1 and A2 are accessible only at diodes located in the generator housing. F1 black is a #16 wire connected to the ground stud. #3 is a white #16 wire from the regulator plug connected to the ground stud.

2. Check continuity and resistance of the field windings between F1 and F2 in the exciter stator. This resistance check is best made between the heat sink on the voltage regulator board and the alternator's common ground stud in the control box (early models). This check takes into consideration all connections within the stationary field circuit of the exciter stator. Total resistance is 5-6 ohm. Should an "open" be found (infinite resistance), refer to the generator internal schematic above to check further and locate the "open". Should less than 5 ohm be measured, indicating a short or partial short to ground, unplug the regulator and measure between Pin #1 of the generator plug and the common ground stud. If low ohms are still measured, lift the F1 ground connection from the common ground stud isolating the exciter field coil windings of the generator. If low ohms are still measured, the windings are shorted to the generator case. Refer to the internal generator schematic to determine which pair of windings is shorted to ground. Some shorts are undetectable with a VOM or DMM. In some cases, a winding repair shop may have to be consulted for insulation testing.

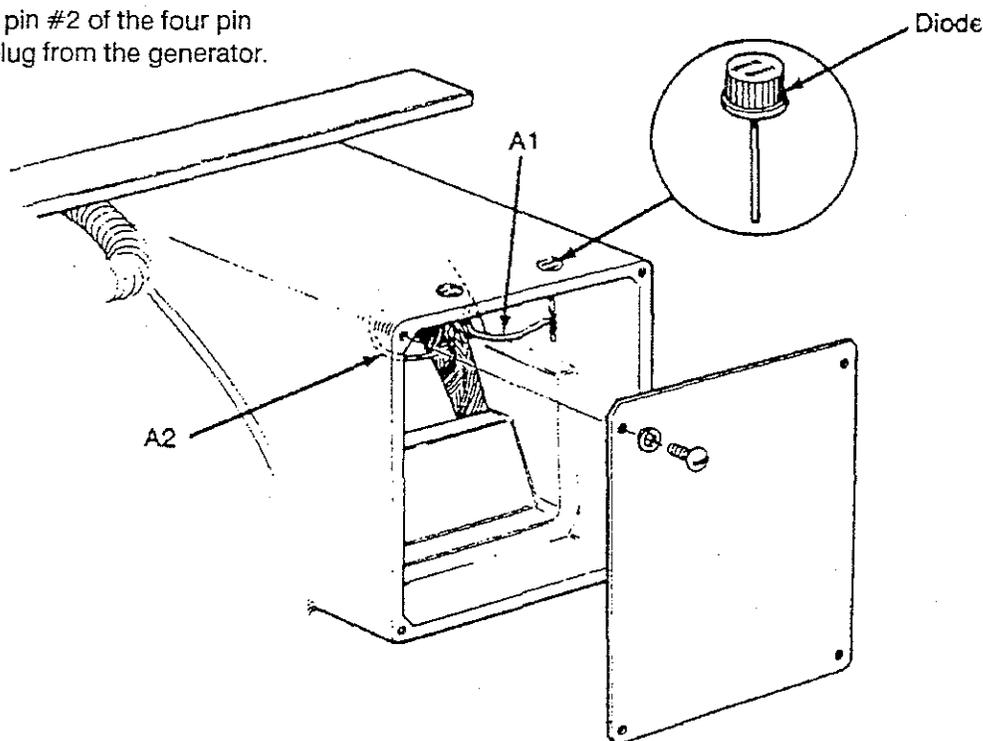
3. If the stationary field windings (F1-F3 and F2-F4) are found to be O.K., the problem could be in the auxiliary circuit supplying DC power to the voltage regulator through Pin #2 of the generator/regulator plug. Check the resistance of the diodes in this circuit by placing an ohmmeter between the negative side of the large capacitor on the regulator board Pin #2 and the case of the generator. Resistance should be 8.5 ohm in one direction and, with reversing the ohmmeter leads, infinite in the other.

NOTE: This check does not draw reference to the possibility of one diode being open (these diodes are in parallel), therefore, if this check does not show any problems, it is best to check the diodes individually with their leads unsoldered.

If continuity is indicated both ways or not at all, you should check the diodes individually by unsoldering the lead A1 and A2 at the diodes. Check also the resistance values of the auxiliary coil windings. (A1 & A2, A2 & A3, A1 & A3).

NOTE: A chart of complete resistance values for the WTA 15 KW, 20 KW, and 25 KW generators, both early and late models, is found at the end of this text. Check the resistance of these auxiliary coil windings by placing your ohmmeter leads between Points (A1 & A2), (A2 & A3) and (A1 & A3).

Point A3 is pin #2 of the four pin regulator plug from the generator.



Two diodes (#32609) are pressed into the alternator housing behind the cover on later models and behind the regulator/output box on early models located on the left-hand side (generator viewed from the rear). These diodes rectify AC power from an auxiliary single phase winding within the main stator to supply DC power through Pin #2 on the generator/regulator plug to the regulator board for the field windings of the stationary exciter stator.

NOTE: Early model generators had the regulator board and output leads located in a box in place of the cover shown. Refer to the illustration on page 7.

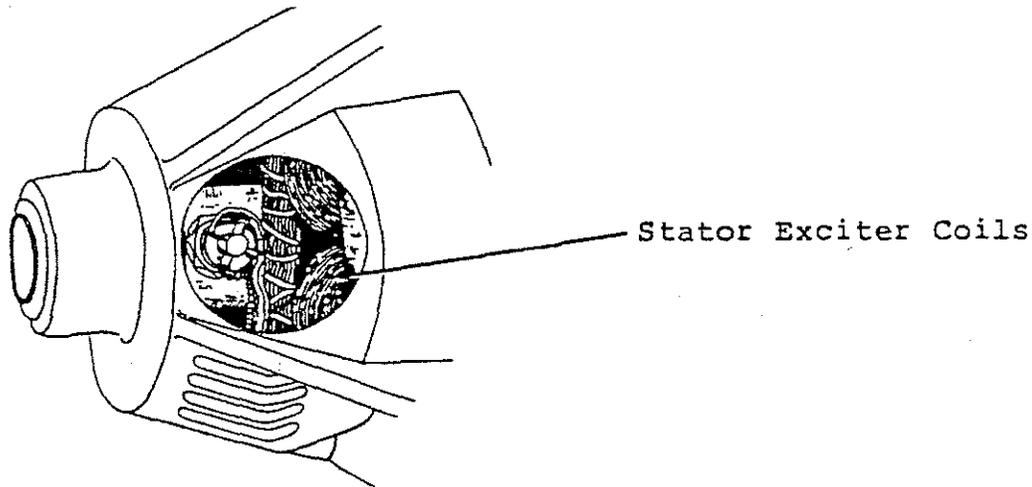
The diodes are pressed into the generator housing to achieve good electrical contact. In replacing them, the diode should be driven out with a suitable drift and the diode replaced with the aid of a deep well socket that will catch the outside edge of the diode. A C-clamp should be used to press it into the generator housing and to aid in maintaining good alignment and diode contact with the housing.

4. If both the auxiliary coil and exciter field winding's circuits check O.K. but the alternator's output voltage is still low, flashing the field is recommended. This is outlined in Section C.

SECTION C

MAIN OUTPUT VOLTAGE IS EXTREMELY LOW
Less than 50 volts AC (T1-T4) or 25 volts AC (T1-T2 and T3-T4)

1. This could be the result of very weak or loose permanent magnets in the stationary exciter stator. These can be viewed and checked with the aid of a steel screw driver through the access hole in the rear of the generator housing. The stator exciter has six poles, one of which is a permanent magnet.



2. Field flashing can rectify a weak magnet. Loose or dislodged magnets will have a tendency to fall onto the rotating exciter and short out its windings as it wears on the exciter rotor surface. Magnets can be weakened either by opening the field circuit while the unit is operating or by prolonged storage. Weakened magnets should charge themselves sufficiently under normal operation to prevent future needs for flashing.
3. Check the voltage regulator visually including the plug connection. Observe for any burned components, foil strips or dislodged parts.
4. Record auxiliary DC voltage and main output line voltage before field flashing with the generator running. DC auxiliary voltage should be measured from Pin #2 at the generator/regulator plug and the common ground stud. Main output voltage AC should be measured from each hot line to neutral T1 & T2 and T3 & T4. This is to avoid measuring an open main stator coil as having no voltage.
5. Field Flashing-Apply 12 VDC to the stationary exciter stator windings. This is done by connecting the DC Battery negative to the heat sink of the regulator board and the positive DC connection to the generator case. These Connections need only be made for a few seconds while the generator is running for field flashing.

WARNING

The DC battery used for field flashing must be completely independent from the generator's DC starting battery to prevent a short circuit in the regulator board from damaging it.

During flashing using 12 volts DC, AC output voltage from each line to neutral should peak at 140-150 volts. When flashing voltage is removed, it should drop back to 120 volts as the regulator board maintains to generator output. If voltage is maintained by the board, all is well, except that the permanent magnets are weak, voltage adjustment with the potentiometers may be needed to finally adjust the AC voltage to 120 volts

Apply load several times and allow the unit to run loaded for some time. Shut the unit down and restart to assure proper start-up in the future.

Refer to the symptoms chart on page 15 for comparison to actual results if normal operation is not restored.

SECTION D

SYMPTOMS EXPERIENCED WHILE FIELD FLASHING

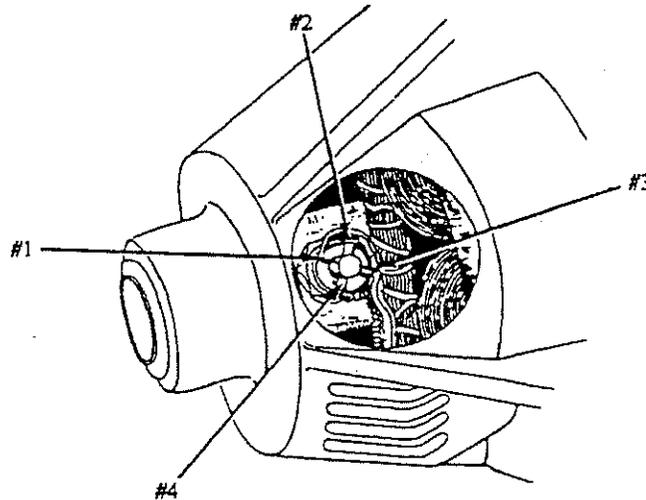
AUXILIARY VOLTAGE INCREASE	MAIN LINE VOLTAGE INCREASE	PROBABLE CAUSE AND ITEMS TO CHECK
NO	YES	Auxiliary winding circuit problem. Check diodes and winding resistances. Normal auxiliary voltage should be approximately 1/4 line to neutral voltage in DC.
YES	NO	If all lines are same, check for short circuit or all lines open. If only some lines are affected, check for open or shorted coils.
NO YES (PARTIAL)	NO YES (PARTIAL)	Check stationary exciter for open or short. If O.K., check all rotating components (Resistance or exciter and main rotor bridge rectifier current test of main rotor).
YES	YES	If voltages drop after flashing is removed, voltage regulator needs replacement.
YES	YES	If normal operation is restored, permanent magnets have been weakened. Normal operation should restore charge.

*A 9 volt power source capable of 2 amps applied to the field is sufficient to duplicate a normal generator output voltage at no-load. If output voltage increase is only partial, this would indicate a problem.

**Refer to bridge rectifier test procedures and main rotor test procedures.

CHECKING EXCITER ROTOR RESISTANCE

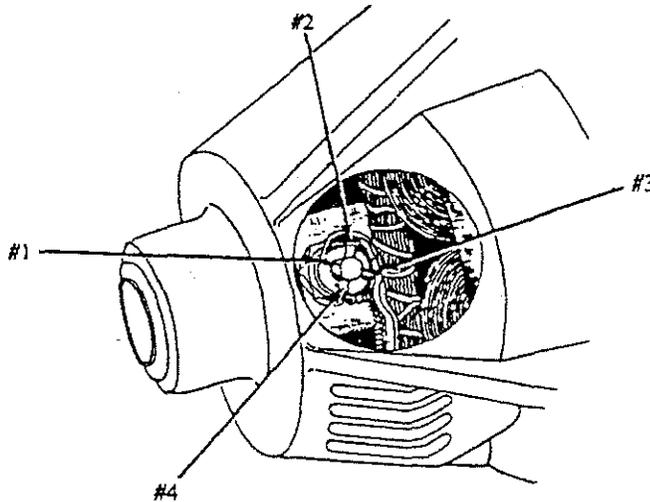
This can be done with the bridge rectifier still connected. Measure the resistance of the exciter rotor windings with an ohmmeter measuring between points 1 & 2, 2 & 3, and 3 & 1 (.7-.8 ohm). If 0 ohm (short) or infinite (open) exist in the windings, unsolder the leads from the bridge rectifier connections and check windings individually.



DC connection to rotating field identified by red dot on landing and 2 solid wires connected to it. (This unit is with stationary armature. Brush type units have rotating armature.)

CHECKING THE MAIN ROTOR WINDING RESISTANCE

With an ohmmeter Rx1 scale, place the plus (+) lead on the connection to the DC output connection on the bridge rectifier (red dot) point #4 and the negative (-) lead to the rotor shaft or rotor ground terminal when accessible. (3.0-3.2 ohm should be read.) Please bear in mind that a shorted bridge rectifier can influence this reading.



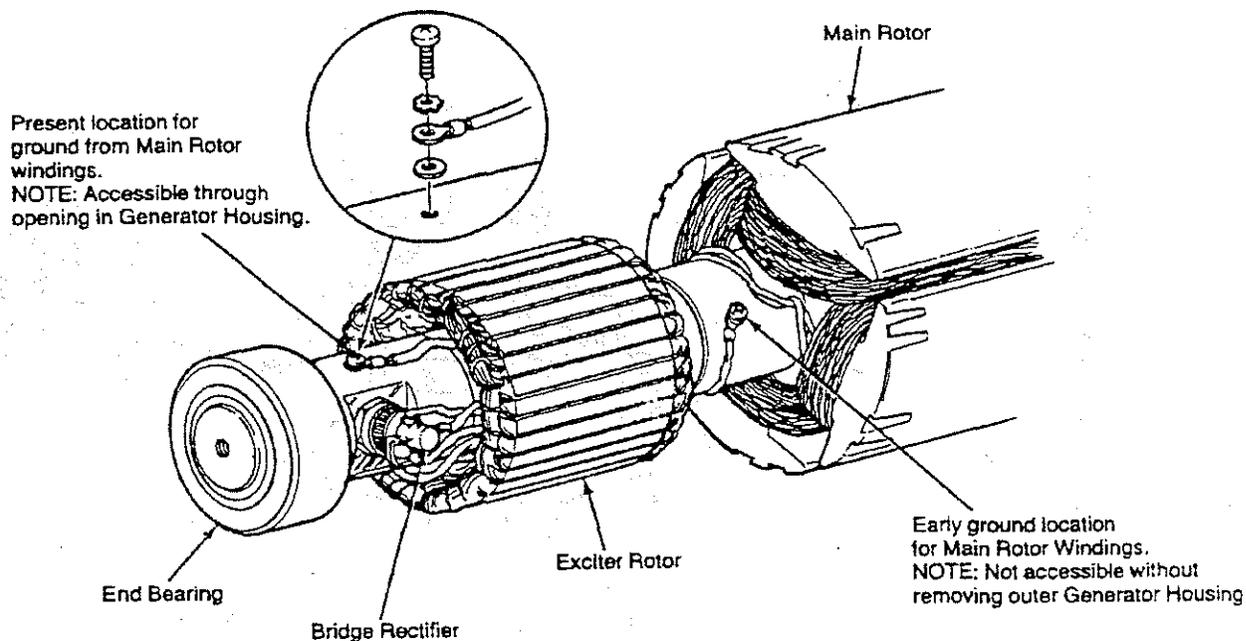
If any variation in the above readings are found, isolate the rotor windings by unsoldering the DC lead from the rectifier and lifting the ground lead from the shaft, if accessible, and measure the resistance with the rectifier removed from the circuit. If ground connection to shaft (early models) is not accessible, measure resistance from DC lead to shaft.

NOTE: With the ground lead disconnected from the shaft, there should be no continuity to the shaft from these windings

CHECKING MAIN ROTOR WINDINGS FOR SHORT WITH OUTER GENERATOR HOUSING REMOVED

Make this check by disconnecting the two main rotor winding leads (DC leads off the bridge rectifier and the ground lead from the rotor shaft) and attach a 24 volt DC source across these leads ([+] to the DC lead and [-] to the ground lead off the shaft). This will create a magnetic field in the windings of the main rotor. Pass a long metal scale or hacksaw blade around the armature outer surface and observe for an obvious difference in magnetic strength that may indicate a shorted area. Allow the DC Voltage passing through the armature windings to heat the windings until they become uncomfortable to the touch, then remove the DC source and measure the resistance of the windings again. If some of the poles in the armature showed a noticeable weakness and the resistance measured hot is much lower than the cold measurement, the main rotor most likely has shorted windings.

NOTE: This is intended only as a final check to confirm suspicions of a rotor winding defect.



NOTE: The possibility of thermal damage from the 24 volt DC battery does exist if not monitored and controlled during the test.

BRIDGE RECTIFIER TEST PROCEDURES

In order to test this rectifier without removing it from the circuit, the main rotor DC connection must be completely removed either at the ground connection to the main rotor shaft (late model units) or from the soldered DC output connection on the bridge rectifier (marked with a red dot).

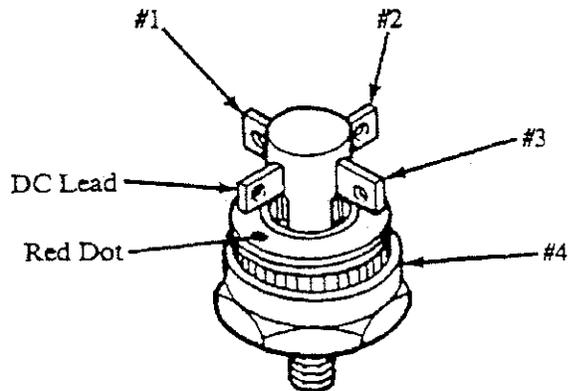
Test the rectifier with an ohmmeter set on low scale Rx1 as follows (refer to the illustration). Readings taken using a Simpson Meter #260 analog.

1. Connect the (+) lead of the ohmmeter to the DC lead of the rectifier (red dot) and with the negative lead, contact points 1,2,3, and 4. No deflection of the meter should occur.
2. Reverse the connections and with the (+) lead, contact points 1,2,3, and 4. Half to three-quarter scale deflection of the meter needle should occur.

Points 1,2,3 (8-9 ohm)
Point 4 (30-40 ohm)

*Readings are approximate and may vary with meter.

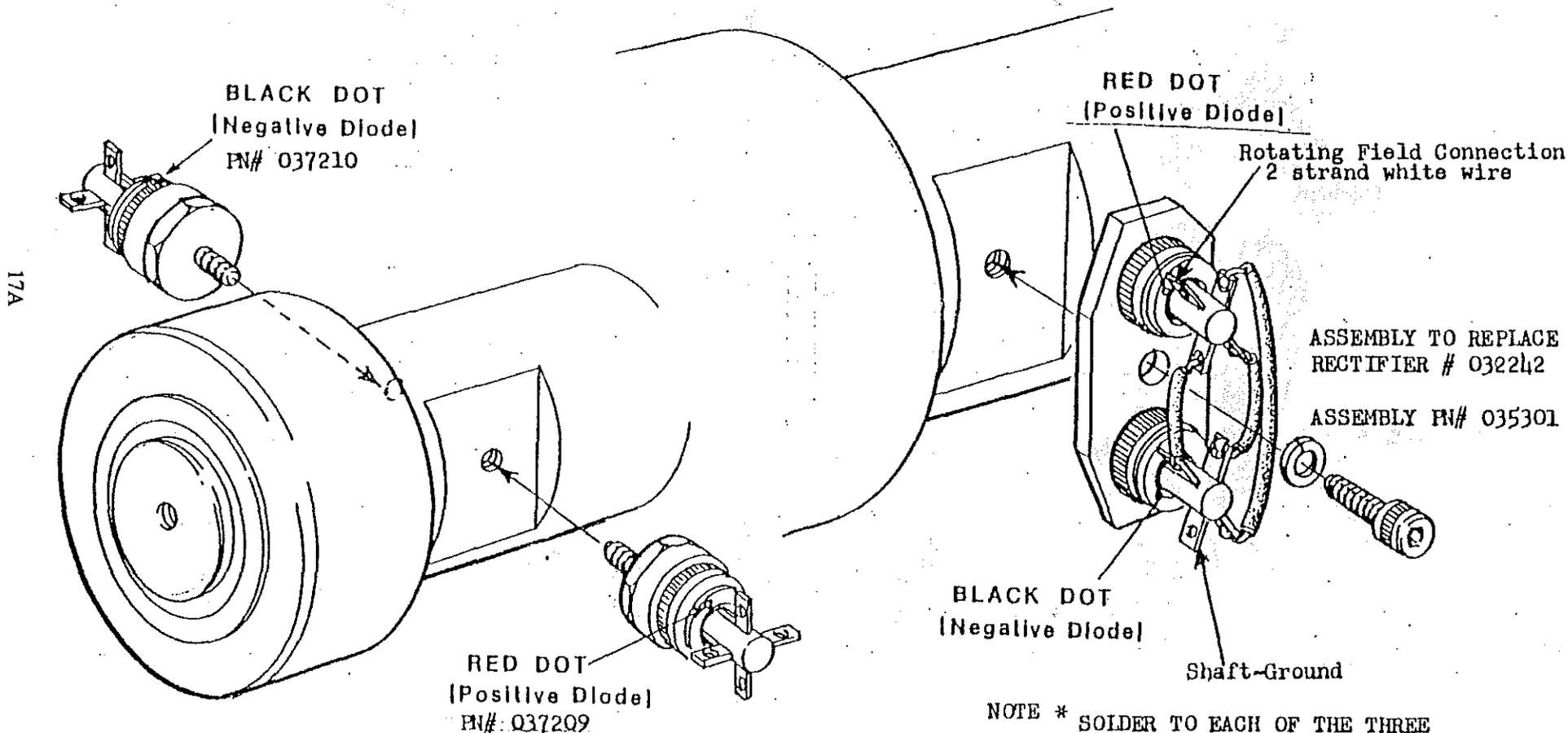
If readings between points 1,2, and 3 vary, the bridge rectifier should be removed, tested independently and then resistance between the three rotor rectifier leads should be checked for similarity.



REFERENCE SERVICE BULLETIN #157 DTD 26 AUGUST 1985

SINGLE STYLE THREE-PHASE, FULL WAVE BRIDGE RECTIFIER OBSOLETE BY TWO SEPARATE AND DIFFERENT LOW POWER RECTIFIERS ONE (+) PLUS AND THE OTHER (-) NEGATIVE.

TO REPLACE THE EARLY SINGLE STYLE RECTIFIER THE ASSEMBLY PN# 035301 MUST BE USED.



NOTE * SOLDER TO EACH OF THE THREE INTERCONNECT WIRES BETWEEN THE THREE TERMINALS OF THE TWO RECTIFIERS ONE OF THE AUXILIARY WINDING LEADS TO EACH OF THESE THREE SEPARATE INTERCONNECT WIRES.

SECTION E

SPECIAL CONSIDERATIONS FOR LOW VOLTAGE PROBLEMS

1. Voltage drops under load but corrects when load is removed. This symptom could be caused by an overload condition (check load with amprobe, field saturation check, shorts in generator components or electrical shorts in or to the load). Check resistance of windings in generator components.
2. Voltage drops under load and stays low when the load is removed but normal voltage is restored when the generator is cool. This symptom would indicate a high probability of a heat-sensitive short. Cold and hot resistances should be checked for all components, concentrating on the main rotor windings since these are susceptible to heat damage from overloadings.

SECTION F

HIGH VOLTAGE 130 VOLTS +

1. This is most likely to be a voltage regulator related problem. If sensing voltage is not present at Pin #4 of the voltage regulator (this senses AC voltage from T1), the voltage regulator will attempt to bring up the voltage by going into full power operation. Consequently, the line voltage will increase without the voltage regulator sensing it. Check the sensing circuit for an open and correct as needed.
2. If sensing voltage (120 volts AC) is present at Pin #4 of the voltage regulator and this is the same as found on output lead T1, the voltage regulator is most likely defective and should be replaced.

As a precautionary step to prevent installing a new voltage regulator board into a defect-causing environment, it is wise to check that the auxiliary circuit diodes found pressed in the generator housing are O.K. and that the auxiliary residual voltage (10-12 volts AC across these diodes) is present when the generator is running with the voltage regulator unplugged.

3. Incorrectly isolating neutral from ground.

SECTION G

FLUCTUATING VOLTAGE

Voltage fluctuation can be caused usually by one of these problems:

1. Check for an overload condition. Check the load with the amprobe off each lead. Measure the exciter field as shown in Section A (low voltage). If the alternator is being operated in an overloaded condition and the voltage regulator is operating at its maximum capacity to try and maintain AC Voltage output, the variations in the engine's speed , (in some cases the engine horsepower output can no longer support the overload demands on the generator) as it goes through its power cycles, will be observed as a voltage variation with a regular characteristic and can be very visible when lights are part of the load. This type of overload condition must be corrected; otherwise alternator damage will result.
2. A defective voltage regulator can also cause output voltage to fluctuate. This can be checked by replacing the voltage regulator with a DC power source to excite the field (9 volts DC). This DC voltage applied to the exciter field (generator plug #1 pin [+] and the common ground stud [-]) should produce 120 volts AC output from each lead T1 and T4 under no-load conditions. Replacing the voltage regulator board with a new piece will accomplish the same.
3. Voltage fluctuation can also be the result of loose electrical connections or electrical shorts. A thorough check of all connections and component resistances can often find the cause of this problem, once the possibility of a defective voltage regulator is eliminated. Voltage fluctuation with engine RPM variations (cycles) and no overload condition can be the result of inadequate fuel delivery to the engine, clogged fuel filters, air in the fuel system, poor fuel quality, injectors misfiring or a faulty injection pump.

VOLTAGE REGULATOR TROUBLESHOOTING

The voltage regulator can be bench checked only for proper operation. Without elaborate equipment, the actual detailed defects possible in a voltage regulator cannot be accurately diagnosed. A simple "Go-No-Go" tester schematic for function testing follows. The easiest and most accurate method would be to check the voltage regulator on an alternator known to be operating O.K. Some possible defects and symptoms are listed on the next page.

1. EARLY REGULATOR BOARD:

HIGH OUTPUT VOLTAGE CAN BE CAUSED BY:

1. Misadjusted Potentiometer.
2. Defective transformer T1.
3. Shorted Q3 and/or Q4.
4. Open R1, R2, VR1, R4.
5. Open Q1, Q2.
6. No connection pin #4. Check for line voltage at circuit board.

LOW OUTPUT VOLTAGE CAN BE CAUSED BY:

1. Misadjusted potentiometer.
2. Shorted Q1, Q2.
3. Open Q3, Q4, D1, R6.
4. No Connection Pins 1, 2, or 3.

2. LATE REGULATOR BOARD:

HIGH OUTPUT VOLTAGE:

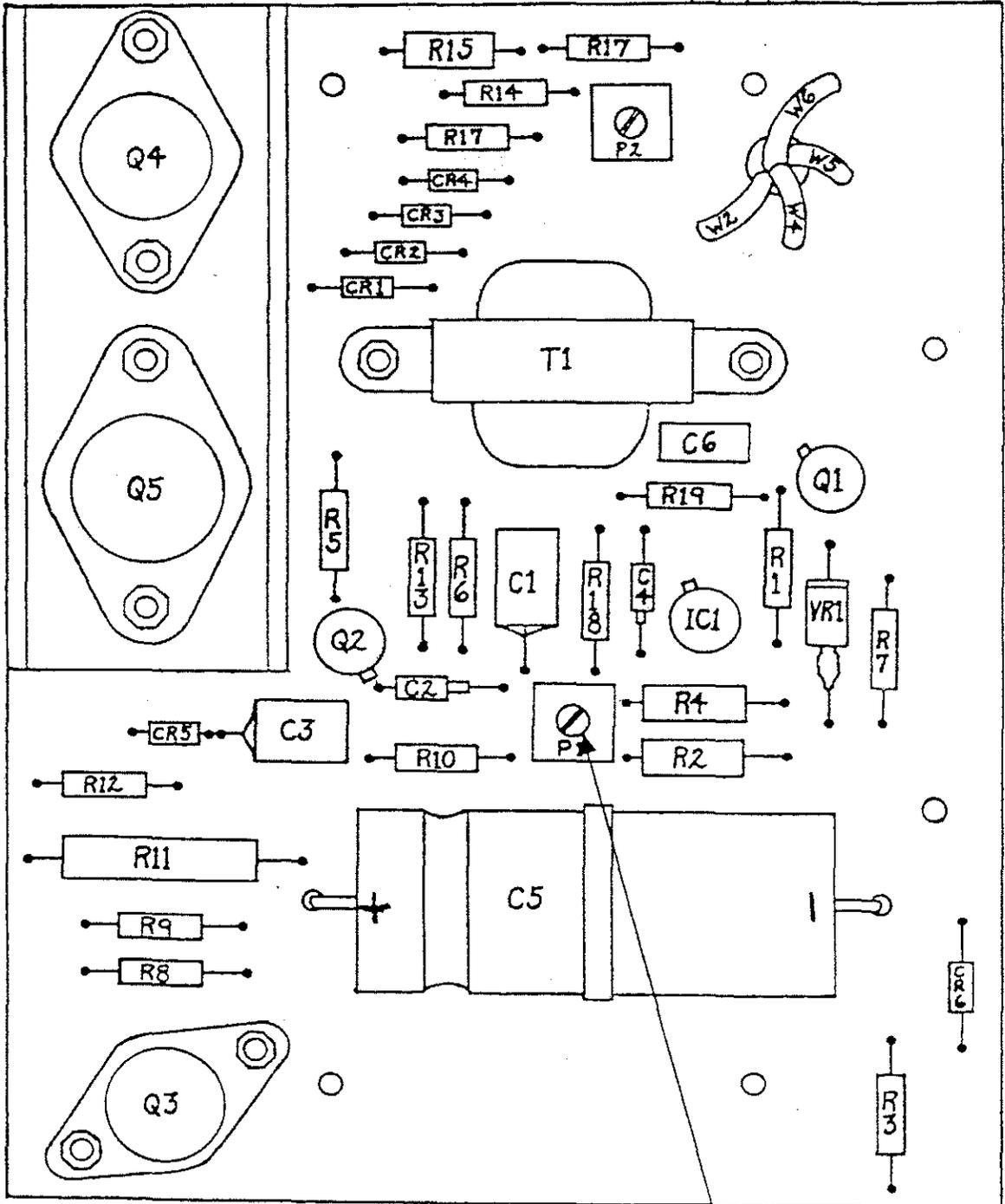
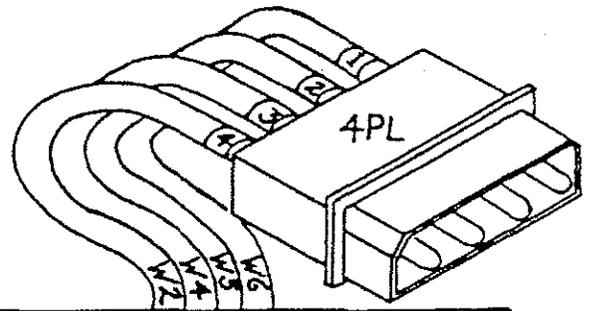
1. Misadjusted P1.
2. No Connection to pin #4.
3. Shorted Q2, Q3, Q4, Q5.
4. Any open component from T1 to IC1.
(lower part of circuit diagram)

LOW OUTPUT VOLTAGE:

1. Misadjusted P1
2. No connection to pins 1, 2, or 3.
3. Open Q2, Q3, Q4, Q5.
4. Defective IC1.
5. Defective C5

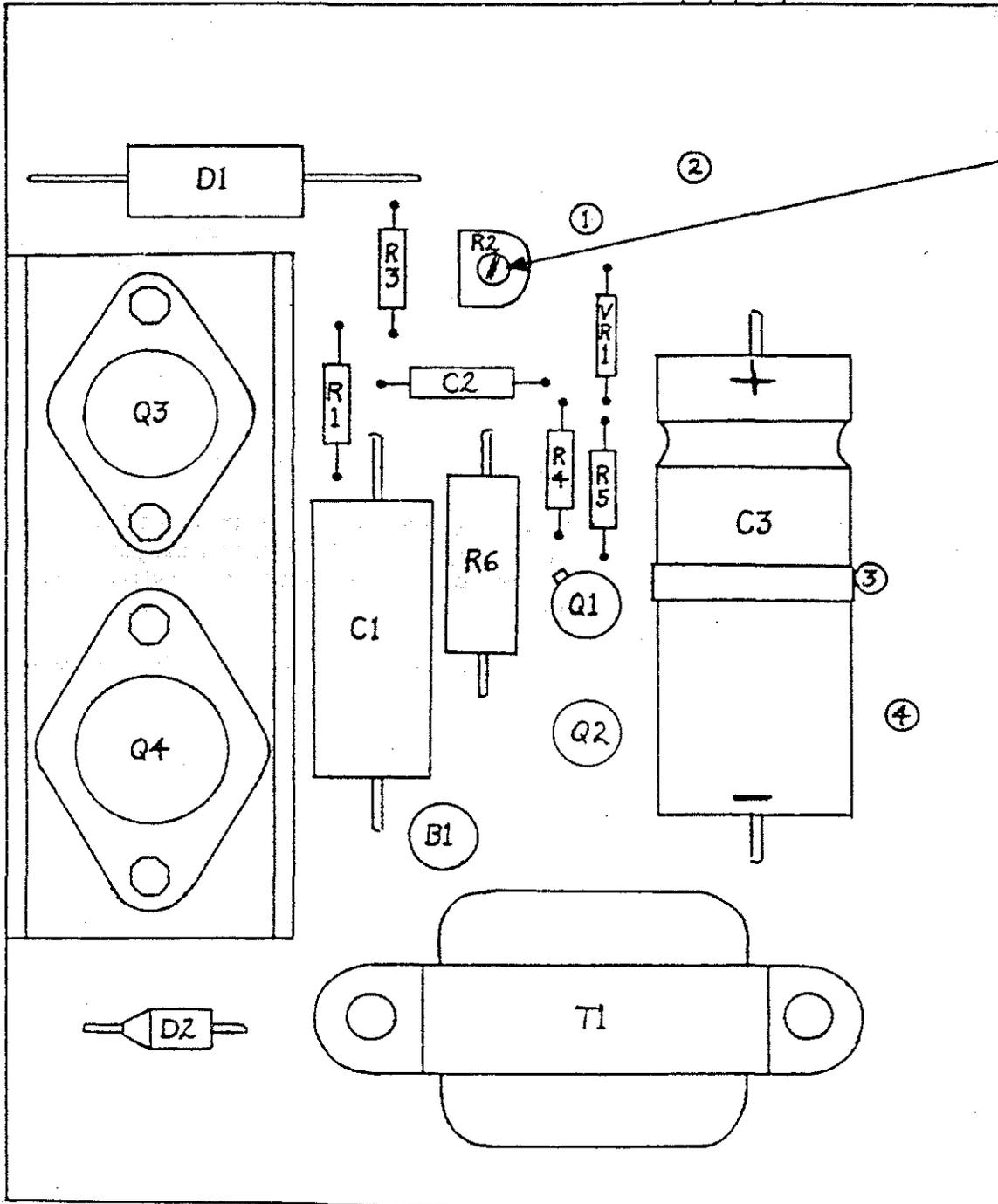
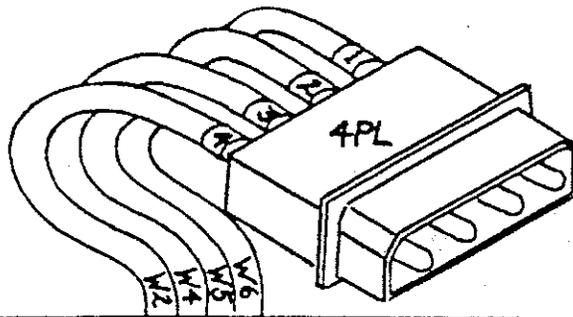
FLUCTUATING VOLTAGE (NOT DUE TO GENERATOR SATURATION):

1. C1 defective.
2. IC1 defective.
3. Q1 defective.



VOLTAGE ADJUSTMENT

LATE MODEL REGULATOR BOARD



VOLTAGE
ADJUSTMENT

EARLY MODEL REGULATOR BOARD

Provided below are resistance values for early and late model WTA generator units.

SINGLE PHASE ELECTRICAL RESISTANCES FOR MODELS WTA 15, 20, AND 25 KW

MODEL WTA	MAIN STATOR		AUX. COILS			EXC. STATOR		MAIN ROTOR	EXC. ROTOR
	T1-T2	T3-T4	A1-A2	A2-A3	A1-A3	F1-F3	F2-F4		
15 & 20	0.05	0.05	0.15	0.09	0.09	2.0	3.0	3.2*	0.7*
15,20,25	0.04	0.04	0.14	0.08	0.08	2.3	3.4	3.0*	0.8*

(Values are in Ohms)

NOTES

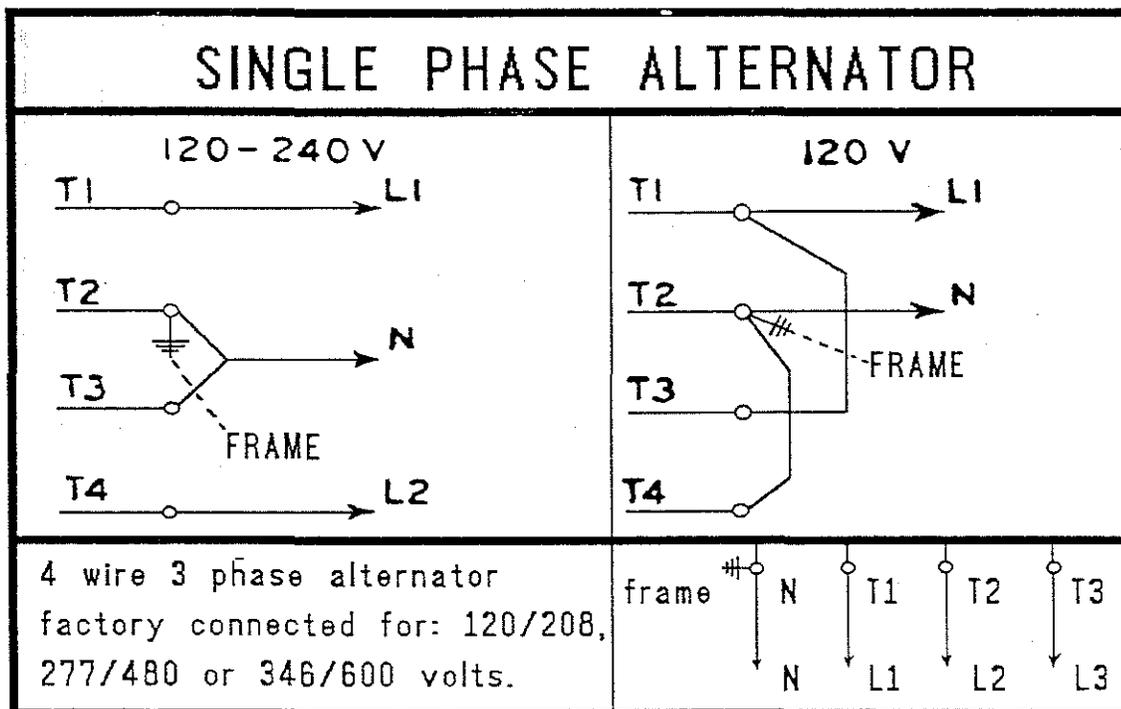
*These values represent measurements taken with leads connected to the bridge rectifier. Measurements for the main rotor are taken from the red dot terminal on the rectifier to the ground. Exciter measurements can be taken from the terminal. Refer to the preceding pages for rectifier testing.

1. The above chart is intended for reference use only, as a ten percent tolerance on these figures is common. Comparison of ratios of actual readings to the above figures is often a more accurate method of troubleshooting.
2. If any abnormal variations cannot be isolated and symptoms are still evident, contact your distributor.
3. Early model WTA 15 and 20 KW generator units can be distinguished from later model WTA 15, 20 and 25 KW generators when checking resistance values by removing one of the screens from the generator exhaust fan area and visually looking squarely into the generator. On early model WTA 15 and 20 KW units, no windings will be visible extending beyond the opening exposed when this screen is removed.

Later model WTA 15, 20, and 25 KW units will have about 1/2 to 5/8 inches of windings visible in the opening. Reference the drawing attached. Figure A (early models 15 and 20 KW). Figure B (later models 15, 20, and 25 KW).



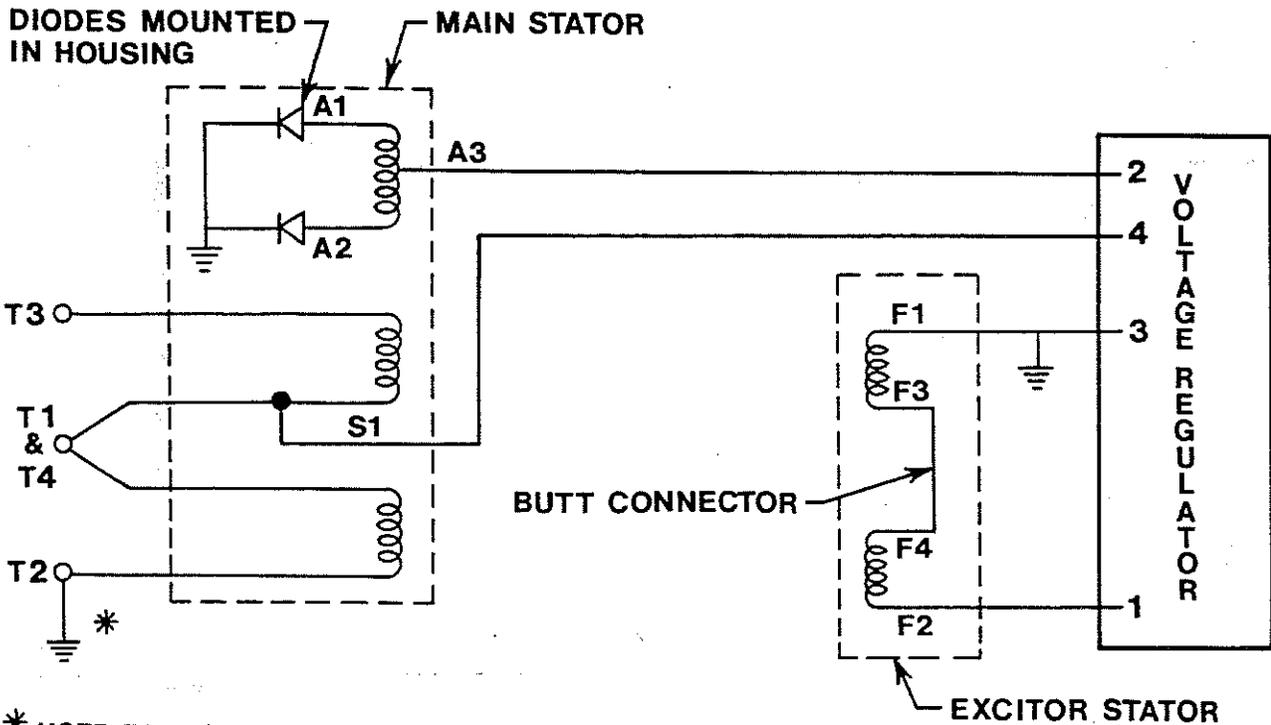
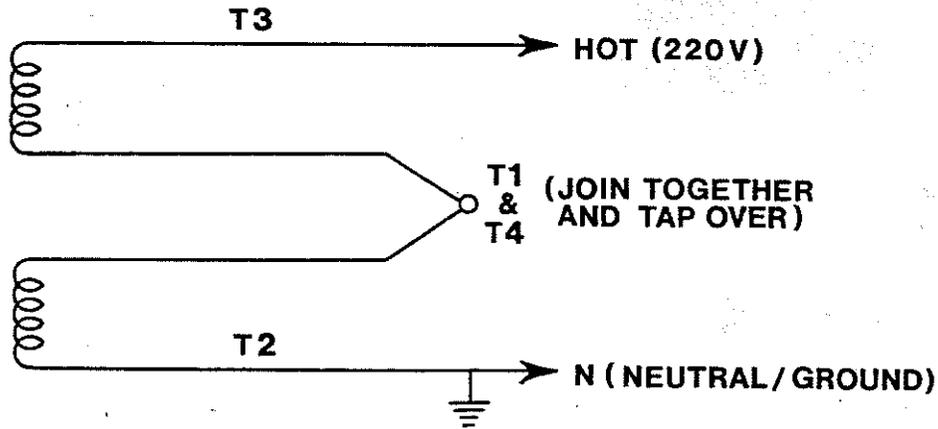
Alternator Connection Diagram



WTA GENERATOR MODELS (ALL)

AC OUTPUT LEAD CONNECTIONS

50 HERTZ 220 VOLTS



* USER TO INSURE THIS GROUND CONNECTION IS MADE.

INTERNAL GENERATOR SCHEMATIC (ROTOR ASSEMBLY NOT SHOWN)