

Onan

Service Manual

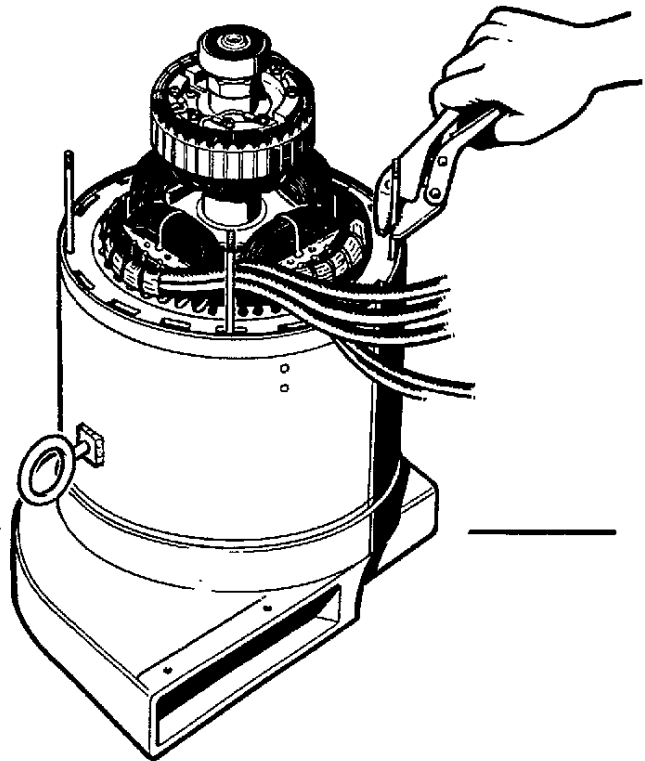
YD

Generators and Controls

4.5 to 30.0 kW

USED ON:

- J-SERIES SETS
- SK AND DTA SERIES SETS
- PTO ALTERNATORS
- TWO BEARING ALTERNATORS



SAFETY PRECAUTIONS

The following symbols in this manual highlight conditions potentially dangerous to service personnel, or equipment. Read this manual carefully. Know when these conditions can exist. Then take necessary steps to protect personnel as well as equipment.

▲WARNING *This symbol warns of immediate hazards which will result in severe personal injury or death.*

▲CAUTION *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

▲DANGER *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

PROTECT AGAINST MOVING PARTS

Avoid moving parts of the unit. Avoid use of loose jackets, shirts or sleeves due to danger of becoming caught in moving parts.

Make sure all nuts and bolts are secure. Keep power shields and guards in position.

If you must make adjustments while the unit is running, use extreme caution around hot manifolds,

moving parts, etc.

Do not work on this equipment when mentally or physically fatigued.

GUARD AGAINST ELECTRIC SHOCK

Disconnect electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

Disconnect batteries to prevent accidental engine start. Jewelry is a good conductor of electricity and should be removed before working on electrical equipment.

Use extreme caution when working on electrical components. High voltages cause injury or death.

Follow all state and local codes. To avoid possible personal injury or equipment damage, a qualified electrician or an authorized service representative must perform installation and all service.

▲WARNING

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:

- *Dizziness*
- *Nausea*
- *Headache*
- *Weakness and Sleepiness*
- *Throbbing in Temples*
- *Muscular Twitching*
- *Vomiting*
- *Inability to Think Coherently*

IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.

Protection against carbon monoxide inhalation includes proper installation and regular, frequent visual and audible inspections of the complete exhaust system.

Supplement 900-1002

Date: 12-94

Insert with-

**Title: YD Generators and Controls
Service Manual**

Number: 900-0184 Date: 11-83

This supplement to the YD Service Manual adds information specific to the Onan PROTEC series of YD PTO AC generator/voltage regulator systems.

NOTE: The YD PTO product referred to in the YD Service Manual is an earlier Onan product, no longer being manufactured.

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GENERATOR/VOLTAGE REGULATOR TROUBLESHOOTING

This section contains troubleshooting information for the generator and its electronic voltage regulator. Determine the problem and then refer to the appropriate flow chart (A, B, C, D, or E) for troubleshooting procedures.

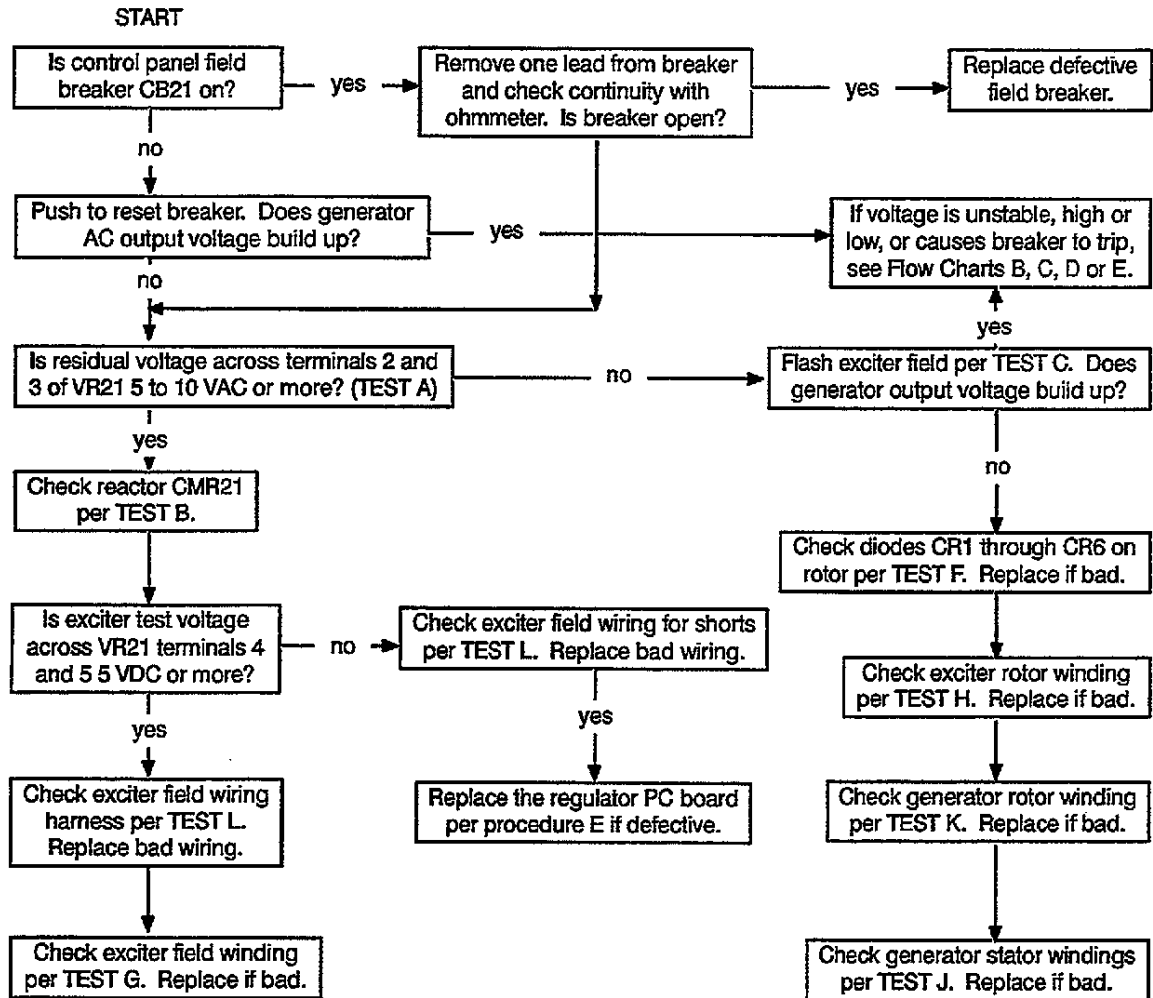
- A. NO AC OUTPUT VOLTAGE AT RATED RPM.**
- B. UNSTABLE OUTPUT VOLTAGE, ENGINE SPEED STABLE.**
- C. OUTPUT VOLTAGE TOO HIGH OR LOW**
- D. EXCITER FIELD BREAKER TRIPS**
- E. UNBALANCED GENERATOR OUTPUT VOLTAGE**

To troubleshoot a problem, start at upper left corner of the chart related to the problem, and answer all questions either YES or NO. Follow the chart until the problem is found, performing referenced Adjustment and Test procedures following the Flow Charts.

Referenced components in the Flow Charts and Adjustment and Test procedures can be found on the schematic and wiring diagrams found in this supplement, and in the assembly drawings found in the Installation Manual.

NOTE: Generator disassembly/assembly procedures and PROTEC series YD PTO generator configurations may be found in the YD Service Manual (900-0184) and in the PROTEC Operator's Manual (929-0100) and Installation Manual (929-0600).

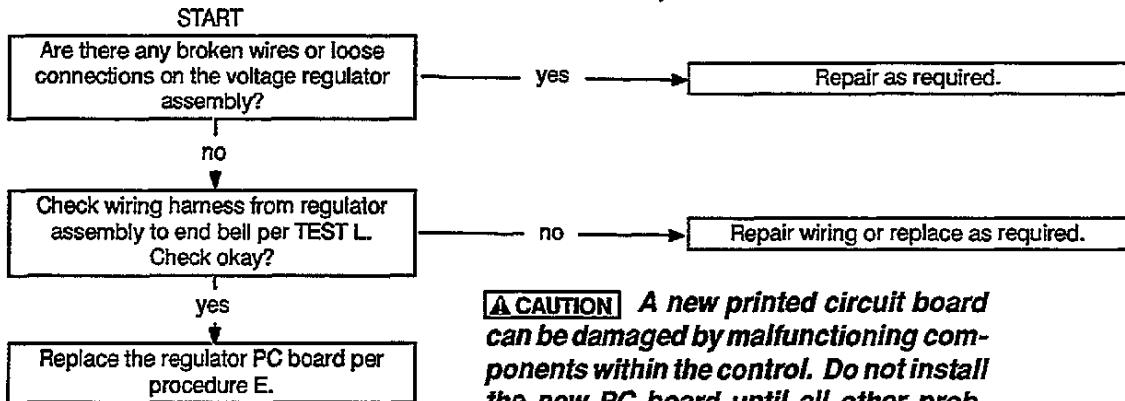
FLOW CHART A. NO AC OUTPUT VOLTAGE AT RATED ENGINE RPM



⚠ WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

⚠ CAUTION A new printed circuit board can be damaged by malfunctioning components within the control. Do not install the new PC board until all other problems have been located and corrected.

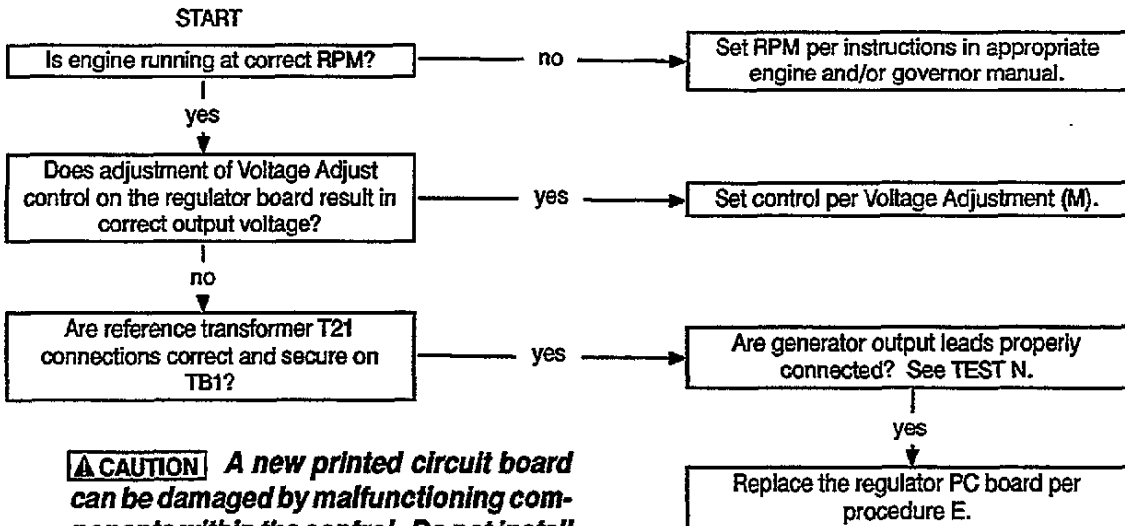
FLOW CHART B. UNSTABLE VOLTAGE, ENGINE SPEED STABLE



⚠ CAUTION A new printed circuit board can be damaged by malfunctioning components within the control. Do not install the new PC board until all other problems have been located and corrected.

⚠ WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

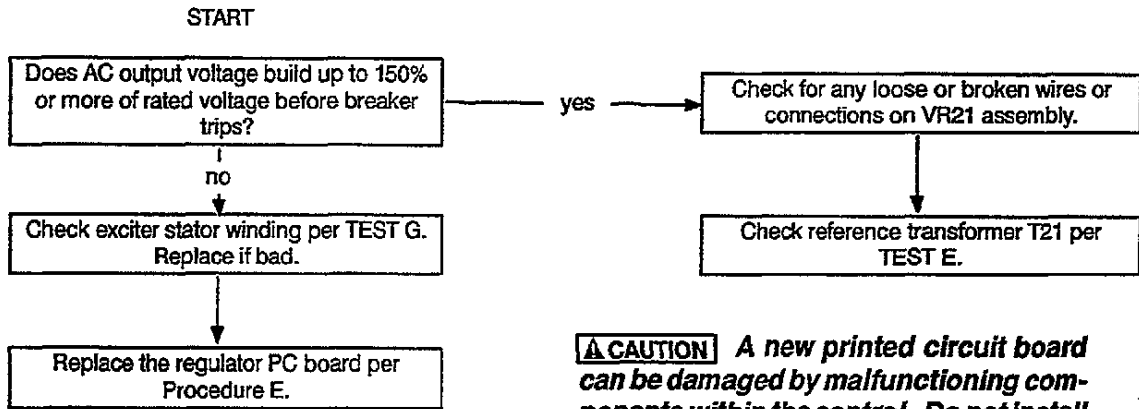
FLOW CHART C. OUTPUT VOLTAGE TOO HIGH OR LOW



⚠ CAUTION A new printed circuit board can be damaged by malfunctioning components within the control. Do not install the new PC board until all other problems have been located and corrected.

⚠ WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

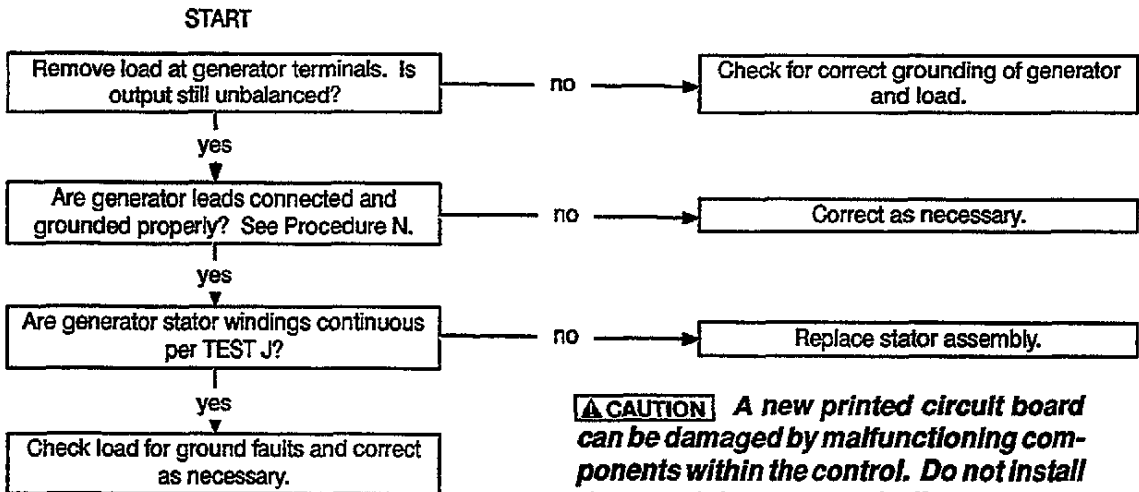
FLOW CHART D. FIELD BREAKER TRIPS



CAUTION A new printed circuit board can be damaged by malfunctioning components within the control. Do not install the new PC board until all other problems have been located and corrected.

WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

FLOW CHART E. UNBALANCED GENERATOR OUTPUT VOLTAGE



CAUTION A new printed circuit board can be damaged by malfunctioning components within the control. Do not install the new PC board until all other problems have been located and corrected.

WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

GENERATOR/REGULATOR TESTS

General

All the following adjustments and tests can be performed without disassembling the generator. They should be used for testing generator regulator components in conjunction with the troubleshooting flow charts earlier in this supplement.

A - Testing AC Residual Voltage

Test for residual AC voltage if there is no AC power output from the generator. Disconnect propulsion engine battery cables, negative (-) lead first, before connecting test leads to generator leads 1 and 2. Reconnect battery cables, positive (+) cable first, start the engine, PTO and generator and operate at normal speed.

⚠ WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before connecting test leads to the controls or generator.*

Check voltage between generator leads 1 and 2 while the set is running (see the schematic diagram included later in this supplement). Use extreme caution when performing this test (see warning, below). Residual voltage should be 5 to 10 VAC.

⚠ WARNING *Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.*

B - Testing Commutating Reactor

⚠ WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before beginning this test.*

The commutating reactor is shown in Figure 1. It is called CMR21 on the schematics, and is located inside the voltage regulator housing (mounted near the generator; see Installation and Operator's Manuals). Only one winding of the reactor (leads 1 and 2) is used on this model. Disconnect propulsion engine battery cables, negative (-) lead first. Then remove reactor leads from the terminal board for testing.

Resistance across leads 1 and 2 should be 330 to 390 milliohms at 77° F (25° C). Resistance between the winding and the reactor frame should be infinity.

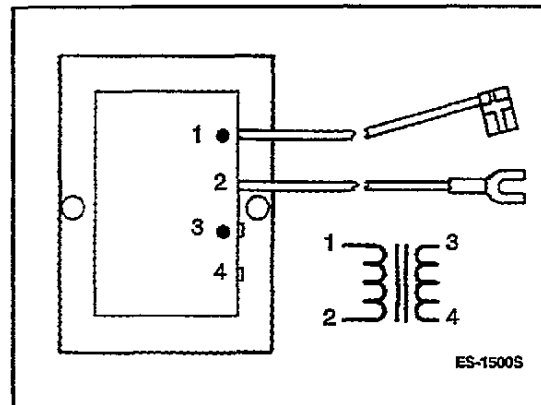


FIGURE 1. COMMUTATING REACTOR

C - Flashing the Field

If output voltage does not build up, it may be necessary to restore residual magnetism by flashing the field. Assemble a 12 volt storage battery, 10 amp fuse, momentary-on switch, and diode as shown in Figure 2.

Disconnect propulsion engine battery cables, negative (-) lead first, before connecting field flashing leads. Connect the positive lead to the F1 (+) exciter stator lead, and the negative lead to the F2 (-) exciter lead. Reconnect battery cables, positive (+) cable first, then start the engine, PTO and generator and operate at normal speed. Close the switch just long enough for the generator output voltage to build up.

⚠ CAUTION *Incorrect flashing procedure can damage the voltage regulator. Do not keep excitation circuitry connected longer than 5 seconds.*

⚠WARNING Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any part of the body, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.

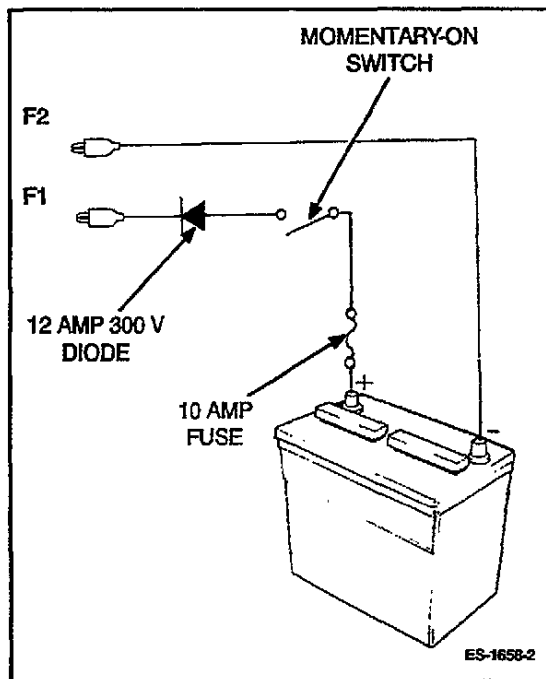


FIGURE 2. FIELD FLASHING CIRCUIT

D - Testing Reference Transformer

Reference transformer T21 is located inside the voltage regulator housing, mounted near the generator. T21 has four leads; two primary leads marked H1 and H2 and two secondary leads marked X1 and X2. See Figure 3.

Stop the engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first. Disconnect transformer T21 leads and make resistance readings. The resistance of either coil should be 100 ohms \pm 10% at 75° F (25° C). Resistance between leads and transformer frame should be infinity.

⚠WARNING Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before disconnecting the reference transformer for resistance testing.

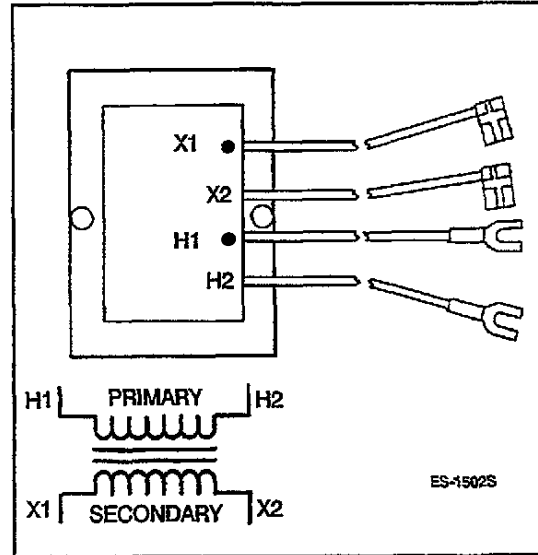


FIGURE 3. REFERENCE TRANSFORMER

E - VR21 Replacement

Use the following procedure for replacing the voltage regulator PC board or VR chassis.

1. Stop engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first.

⚠WARNING Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before continuing with this PC board replacement procedure.

2. Open the voltage regulator housing. Disconnect the regulator and if necessary, label wires. Refer to the AC control wiring diagram included later in this supplement.
3. Remove four screws at corners of the PC board to remove it.
4. Install new PC board; secure with four screws.
5. Reconnect wires removed in step 2 at proper terminals.

6. Reconnect battery cables, positive (+) cable first. Start the engine and PTO and set voltage as outlined in test (M), Voltage Adjustment.

F - Testing Rotating Rectifiers

Two different rectifier assemblies make up the rotating rectifier bridge assembly, Figure 4. Using an accurate ohmmeter, test each CR using negative and positive polarities. Test rectifiers as follows:

1. Stop engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first.

⚠ WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before continuing with this test procedure.*

2. Disconnect all leads from assembly to be tested.
3. Connect one test lead to F1+ stud and connect other lead to CR1, CR2, and CR3 in turn; record resistance value of each rectifier.
4. Connect one lead to F2- stud and connect other lead to CR4, CR5 and CR6 in turn; record resistance value of each rectifier.
5. Reverse ohmmeter leads from steps 2 and 3 and record resistance value of each rectifier F1+ to CR1, CR2, and CR3 and F2- to CR4, CR5, and CR6.
6. All the resistance readings should be high in one test and low in the other test. If any reading is high or low in both tests, rectifier assembly is defective.

Use 23 to 26 inch-lbs (2.6 to 2.9 N•m) torque when replacing nuts of F1+ and F2-, CR1, CR2, CR3, CR4, CR5 and CR6.

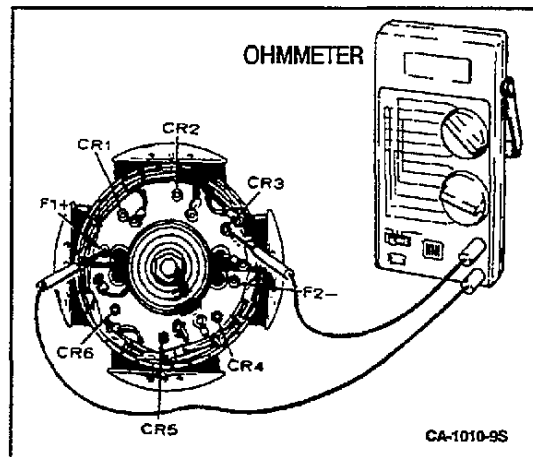


FIGURE 4. TESTING ROTATING RECTIFIERS

G - Testing Exciter Stator

Test the exciter stator (Figure 5) for open or shorted windings and grounds as follows:

Testing for Open or Shorted Windings: Stop engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first.

⚠ WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before continuing with this test procedure.*

Disconnect F1+ and F2- exciter field leads from terminal block in generator end bell. The resistance between field leads should be **12.4 ohms ± 10%** at 77° F (25° C).

Testing for Grounds: Stop engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first.

⚠ WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before continuing with this test procedure.*

Connect ohmmeter between either field lead and exciter stator laminations. Use ohmmeter set at the highest resistance range. Resistance must be one megohm (1,000,000 ohms) or greater.

The preferred test is with a megger or insulation resistance meter that applies 500 VDC or more to the test leads. Readings should be 100,000 ohms or greater.

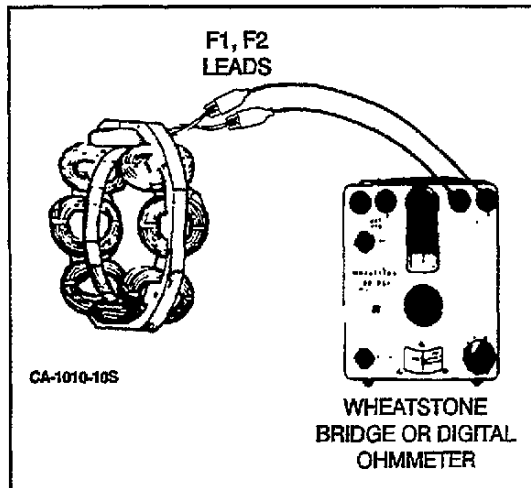


FIGURE 5. MEASURING EXCITER STATOR RESISTANCE

H - Testing Exciter Rotor

Stop engine and PTO unit. Disconnect leads to engine starting battery, negative (-) lead first.

⚠WARNING *Accidental starting of the generator can cause severe personal injury or death. Disconnect the propulsion engine battery cables, negative (-) lead first, before continuing with these test procedure.*

Test the exciter rotor (Figure 6) for open or shorted windings or grounds as follows:

Testing for Open or Shorted Windings: Use a wheatstone bridge or digital VOM for this test. Disconnect main rotor field leads which connect to rotating rectifier assemblies at F1+ and F2-. Disconnect lead wires from diodes CR1, CR2, CR3, CR4, CR5 and CR6. Test between exciter lead pairs T1-T2, T2-T3, and T1-T3. Resistance at 77° F (25° C) should be **645 milliohms ± 10%**.

Testing for Grounds: Connect leads of ohmmeter between any CR lead and exciter rotor laminations. Use an ohmmeter set at the highest resistance range. An ohmmeter reading less than one megohm (1,000,000 ohms) indicates defective ground insulation.

The preferred test is with a megger or insulation resistance meter that applies 500 VDC or more to the test leads. Be sure all exciter leads are disconnected from the diodes. Readings should be **100,000 ohms** or greater.

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