

82091

J87222 RECTIFIER
24 VOLTS, 100 AMPERES
OPERATING METHODS

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	1	Tables	
2. APPARATUS	2	A. No DC Output Current (Power Stages)	8
3. OPERATION	2	1. GENERAL	
4. ROUTINE CHECKS	4	1.01 This section covers the operation of the J87222A and J87222B rectifiers in conjunction with the J87214C regulator unit and the J87222C and J87222D rectifiers in conjunction with the J87277 regulator unit. The J87222A, J87222B, J87222C, and J87222D rectifiers are intended to automatically charge and float storage batteries of the 110A, 111A, and 300-type power plants.	
5. TROUBLES	6		
TROUBLECLEARING PROCEDURES	7		
6. CHARGE FUSE CONNECTIONS	7		
Figures		◆ Note: The J87222A, J87222B, J87222C, and J87222D rectifiers are rated Mfr Disc.◆	
1. Locally Constructed Equivalent of ITE-4175 Tool	3	1.02 Revision arrows are used to emphasize the more significant changes. The Equipment Test List is affected. This section is being reissued for the following reasons:	
2. Typical 70-Type Fuse Cap	5	(a) To substitute the KS-20599, L4, digital multi-meter (DMM) for the KS-14510 volt-ohm-milliammeter	
3. Fuse Alarm Testing Cord—Tool Connection	6	(b) To add the ITE-4175 socket and 100-watt lamp bulb to the List of Test Equipment	
4. J87214C, CP1 Regulator Unit	10	(c) To add a procedure to charge the output filter capacitors in paragraph 3.03	
5. J87214C, CP2 Regulator Unit	11	(d) To add a procedure for tightening loose connections to the internal charge fuse or fuse holder in Part 6.	
6. J87277B, CP2 Regulator Unit	12	1.03 The rectifier is adaptable for connection to a 190- to 250-volt or 380- to 500-volt, 60 Hz ±1.2	
7. J87277B, CP1 Regulator Unit	13		
8. ED-82091-30, CP3 Error Detector Circuit	14		
9. ED-82092-30, CP4 Error Detector Circuit	15		

NOTICE

Not for use or disclosure outside the
AT&T Companies except under written agreement

Hz, 3-phase ac input and has a rated output of 0 to 100 amperes at ± 24 volts dc. The dc output voltage regulation is ± 0.5 percent for load and line variation. The rectifier utilizes PNP devices for 3-phase, full-wave rectification and a self-contained transistorized regulating circuit which controls the PNP devices and automatically limits the output current. In addition, an alarm circuit is provided to shut down the rectifier when the charge fuse or control fuse blows or when the rectifier is putting out current at higher than normal voltages.

1.04 DANGER: Voltages inside the rectifier case are over 150 volts to ground. Avoid all contact with terminals when performing procedures in this section. Do not allow a test pick to touch two metal parts at the same time or destructive and dangerous short circuits may occur. Disconnect the ac supply and battery before working on the rectifier except when necessary to make tests.

1.05 This rectifier is designed to mount on a 23-inch relay rack and can be serviced and maintained from the front. Access to the rear is made possible by a removable rear cover.

1.06 The meter, controls, and fuses are mounted on a hinged panel for easy access, maintenance, or replacement.

1.07 Routine checks are intended to detect defects in the equipment and, insofar as possible, to guard against circuit failures. Checks other than those required by trouble conditions should be made during a period when they will not interfere with service.

1.08 This issue of this section is based on the following drawings:

- SD-81553-01, Issue 13D— J87222A, J87222B Rectifiers
- SD-81753-01, Issue 25D— J87222C, J87222D Rectifiers
- SD-81543-03, Issue 8— J87214C Regulator Unit
- SD-81760-01, Issue 6— J87277 Regulator Unit.

If this section is used with equipment or apparatus reflecting a later issue of the drawing, refer to the SDs and CDs to determine the extent of the changes and the manner in which this section may be affected.

Note: When a rectifier is connected to the plant load and controlled by the plant control circuit, the appropriate plant operation section supersedes the individual rectifier Operating Methods section.

2. APPARATUS

2.01 List of Tools and Test Equipment: The following tools and test equipment are used in this section.

TOOLS	DESCRIPTION
141	Cord Tip
411C	Test Pick
720A	Test Battery Pickup
ITE-4175	Weatherproof Socket (or equivalent)
W1AF	Cord
—	3-Inch C Screwdriver
—	100-Watt, 120-Volt Lamp Bulb
—	Test Cart (T-Cart)

TEST EQUIPMENT

T921	TEKTRONIX* Oscilloscope (or equivalent)
KS-8039	Volt-Milliammeter
KS-20599, L4	Digital Multimeter (DMM)

3. OPERATION

3.01 DANGER: When using any portable instrument to perform checks in this part,

* Registered trademark of Tektronix, Inc.

the leads should be carefully examined to make sure the insulation is undamaged. The leads should be properly connected to the instrument before making any contact with the circuit to be tested.

3.02 Preparing to Start ♦Rectifier♦: When preparing the rectifier for service, check that:

- (a) The ON/OFF key is in the OFF position.
- (b) The proper size fuses are provided and removed from the rectifier.

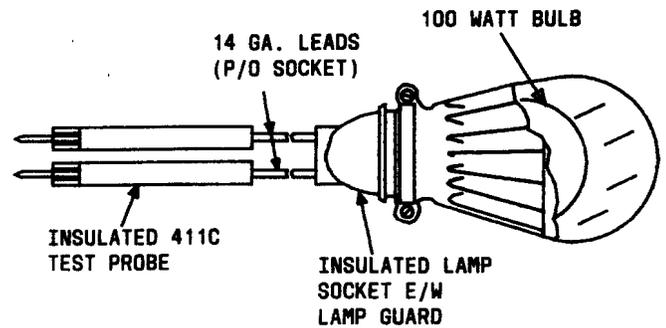
Note: The charge (CHG) and associated alarm fuses, the control alarm fuse, and a fine voltage adjust feature may be located externally, but in close proximity to the rectifier.

- (c) All external connections are made in accordance with the schematic drawing covering the associated circuit of which the rectifier is a part.
- (d) The option wiring is correct for the service to be used.
- (e) The T1, T2, and T3 input transformer taps are correct for the power supply voltage as measured with a ♦KS-20599 DMM♦.
- (f) The ADJ VOLTS potentiometer is rotated to the maximum ccw position.
- (g) The FINE ADJ VOLTS potentiometer is adjusted to the center position.

3.03 Starting: ♦To initially power up the rectifier or to restore rectifier to service after shutdown, proceed as follows:

- (1) Check that the rectifier ON/OFF key is in the OFF position.♦
- (2) Install all fuses **except** the CHG and the associated alarm fuse.
- (3) ♦**Warning:** If the tool lamp fails to light or does not dim out in approximately 30 seconds, remove the tool promptly. DO NOT INSTALL THE CHG FUSE until the trouble has been located and cleared.

Connect the ITE-4175 tool or a locally constructed equivalent (Fig. 1) across the CHG fuse block terminals.



♦Fig. 1—Locally Constructed Equivalent of ITE-4175 Tool♦

Requirement: The lamp in the tool glows brightly initially and then dims out in approximately 15 seconds. When the tool lamp extinguishes, the filter capacitors should be charged.

- (4) **Warning:** The rectifier filter capacitors start to discharge as soon as the tool is removed from the fuse holder terminals. Install the CHG fuse quickly to avoid loss of charge voltage.

When the tool lamp extinguishes, remove the tool from the fuse holder terminals and promptly install the CHG fuse and associated alarm fuse.♦

- (5) Apply the input power by operating the ON/OFF key to the ON position.
- (6) ♦On the rectifier charge fuse and voltage adjust panel, connect the KS-20599 DMM to the RC and RG test jacks (if equipped). If the rectifier is equipped with an internal charge fuse, connect the KS-20599 DMM between either charge fuse holder terminal and ground.♦
- (7) Rotate the ADJ VOLTS potentiometer cw until the ♦KS-20599 DMM♦ indicates plant float voltage requirements (typically 2.17 volts per cell).
- (8) Adjust the FINE ADJ VOLTS potentiometer if a vernier adjustment is required. Rotate the

potentiometer cw to increase the output and ccw to decrease the output.

- (9) Disconnect the ♦KS-20599 DMM♦.

Note: The CC potentiometer on the J87222A and J87222B rectifiers (CL on the J87222C and J87222D rectifiers) is factory set to current limit at 100 amperes. If an adjustment is required, see paragraph 4.05.

- 3.04 Stopping:** To stop the rectifier, operate the ON/OFF key to the OFF position.

Note: It will not be necessary to remove the fuses or adjust the potentiometers unless the rectifier will be out of service for an extended period of time.

4. ROUTINE CHECKS

- 4.01** If the relays are mounted on circuit boards, they cannot be checked and must be replaced in case of malfunction. If possible, check all other relays for condition of contacts, making sure that they are in accordance with the Circuit Requirements Table.

- 4.02 Output Voltage Check:** To check the rectifier output voltage, proceed as follows:

Note: Output voltage check instructions on the associated power plant maintenance section supersede the information in the following paragraph. This check should be made only when the rectifier is at a partial load below its current limit setting. Output voltage adjustments when the rectifier is in current limit or at no load are not valid.

- (1) Check the battery float voltage on the associated power plant voltmeter.
- (2) The TST switch should be in the midposition.
- (3) If output voltage adjustment is needed, the ADJ VOLTS potentiometer should be adjusted to the desired output.
- (4) If a vernier adjustment is required, adjust the FINE ADJ VOLTS potentiometer. The full range of the FINE ADJ VOLTS potentiometer is about 1 volt.

- 4.03 Regulator Check:** To check the regulator unit, proceed as follows:

- (1) Momentarily operate the TST switch to the FL position.

Requirement: The rectifier output increases.

- (2) Momentarily operate the TST switch to the NL position.

Requirement: The rectifier output decreases.

- (3) Verify that rectifier output goes back to normal after the TST switch is released.

Note: The TST switch should be held operated only long enough to check the proper operation of the regulator unit. Do not hold it operated longer than necessary since it can affect plant operation.

- (4) If requirements in Steps (1) and (2) are not met, refer to Part 5.

- 4.04** Electrolytic capacitors should be maintained in accordance with Section 032-110-701.

- 4.05 Current Limit Check:** To check the adjustment of the current limit, proceed as follows:

Note 1: The current limit potentiometer is designated CC for J87222A and J87222B rectifiers and CL for J87222C and J87222D rectifiers.

Note 2: A minimum load of 110 amperes must be available to load the rectifier to be checked either by using the office load or adding an artificial load or a combination of both. ♦Turning down one or more rectifiers which are multiplied with the rectifier being tested should transfer plant load to the rectifier under test.♦

- (1) Operate the ON/OFF key to OFF.
- (2) Rotate the ADJ VOLTS potentiometer fully ccw.
- (3) Set the FINE ADJ VOLTS potentiometer to midposition.

- (4) Operate the ON/OFF key to ON.
- (5) **Warning: Do NOT exceed 110 amperes if the rectifier fails to limit.**

Rotate the ADJ VOLTS potentiometer cw.

Requirement: The rectifier current limits at 100 amperes.

Note: If the requirement in Step (5) is met, proceed to Step (8). If the rectifier limits under 100 amperes, proceed to Step (6). If the rectifier limits above 100 amperes, proceed to Step (7).

- (6) If the rectifier current limits under 100 amperes, rotate the current limit potentiometer cw until the rectifier limits at 100 amperes. It may be necessary to readjust the ADJ VOLTS potentiometer.
- (7) If the rectifier current limits above 100 amperes, rotate the current limit potentiometer ccw until the rectifier limits at 100 amperes.

- (8) Operate the ON/OFF key to OFF.

4.06 70-Type Fuse Alarm Check: To check the 70-type fuses, proceed as follows:

Note: The later designed fuse caps for 70-type fuses contain an aperture or slot adjacent to the hole for the colored bead, providing access to the alarm test point. (See Fig. 2.)

- (1) **Warning: Due to possible fuse and/or equipment damage, the former procedure of testing fuse alarms by inserting a 411C tool or a 266C tool (wire burnisher) held in a 265C tool (contact burnisher holder) beside the colored bead on older fuse caps without the slot or aperture should be discontinued. This admonishment pertains to Steps (2) through (8).**

- (2) Prepare the alarm test cord by connecting one end of the W1AF testing cord to the 141 cord tip and 720A battery pickup tool. (The KS-6278 connecting clip may be used to replace the 720A battery pickup tool.) On the opposite end of the W1AF testing cord, connect the 411C test tool. (See Fig. 3.)

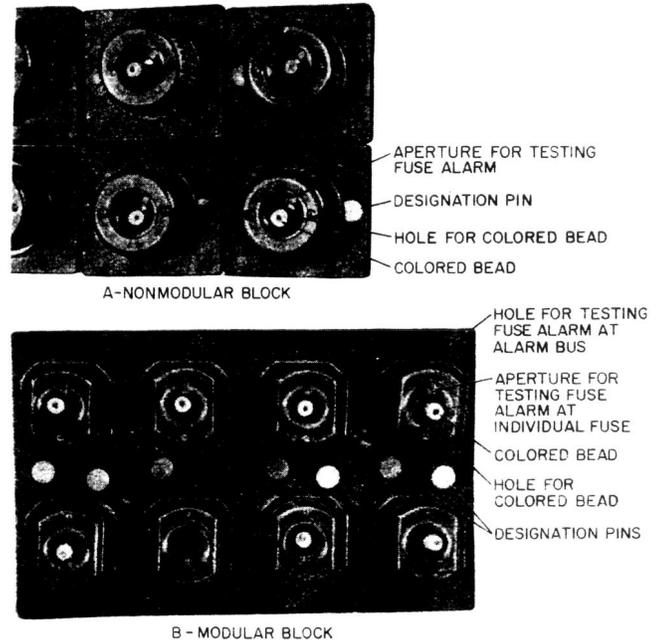


Fig. 2—Typical 70-Type Fuse Cap

- (3) **Warning: Test only the fuses associated with the same polarity voltage supply.**

Install the 720A battery pickup tool in a spare 70-type fuse position.

Note: If the rectifier is equipped with F6 FL ALM fuse per YF option, no spare positions will be available on the rectifier. If spare fuse position is not available on rectifier or plant, do not attempt to test fuse alarms.

- (4) With the tip of the 411C tool (attached to the battery connected W1AF cord), touch the exposed alarm test point on the fuse cap of the CHG B ALM (F2) fuse (rectifiers equipped with P option).

Requirement: The RFA lamp is lighted; the rectifier shuts down and locks out.

- (5) Remove the 411C tool from the fuse cap.
- (6) Operate the ON/OFF key to OFF and then to ON to restart the rectifier.
- (7) Repeat Steps (3), (4), and (5) for the F3, F4, and F5 fuses. Also repeat for F1 CHG B and

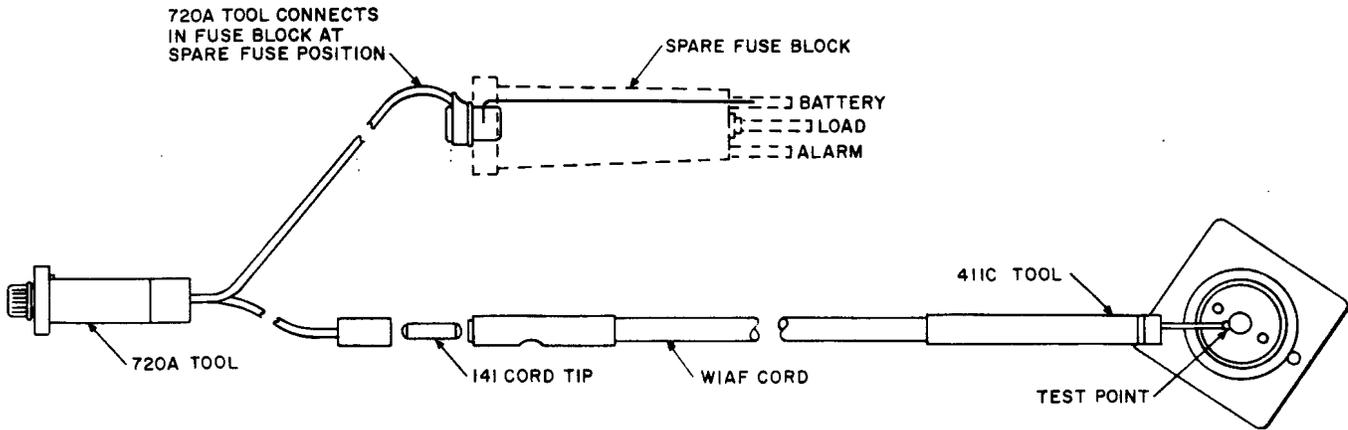


Fig. 3—Fuse Alarm Testing Cord—Tool Connection

F5 CONT ALM on rectifiers equipped with N option, F3 CONTR, F4 ALM, F6 FL ALM on rectifiers provided with YF option.

- (8) Remove the 720A tool from the spare fuse position.

5. TROUBLES

5.01 Troubles which occur in the rectifier are indicated by alarm lamps. The RFA lamp indicates a blown 70-type fuse in the rectifier. The ac input power will also be disconnected from the rectifier and the rectifier will remain locked out until the trouble condition is eliminated, the operated fuse replaced, and the ON/OFF key operated to OFF and then to ON to restart the rectifier.

5.02 Table A and Fig. 4 through 9 provide information to locate troubles in the rectifier and connecting circuits.

5.03 The procedures are arranged to check the most probable cause of rectifier failure first. The procedures start with a visual inspection, voltage measurements with the KS-20599 DMM, and finally, signal tracing with an oscilloscope. Typical waveforms are given in the attached trouble charts. The measurement procedures for dc voltages shall be shown with the first terminal number as the positive terminal.

Note 1: To restart the rectifier after a trouble condition cleared, follow the procedure in paragraph 3.02.

Note 2: The following admonishments should be observed prior to and during the interval of detecting and clearing trouble of a faulty rectifier.

5.04 DANGER: *If, for any reason, the regulator card or error detector card is to be removed in the following trouble tests, care should be taken to prevent a short from the RC or RB lead to the RG lead. It is recommended that the REG fuse in the power plant be removed. These leads have battery connected to them even though the rectifier is turned off and the CHG fuse is removed.*

5.05 Warning: *When using an oscilloscope to perform any test, select a properly grounded scope. Connect only one lead from the scope to the rectifier. Do not connect the ground lead of the oscilloscope to any part of the rectifier.*

5.06 Other rectifier trouble conditions such as no dc output current or inability to readjust the rectifier to a desired regulating level may be a result of a damaged regulator or error detector card. The conditions which damage the circuit cards are rare, and an investigation of the regulator or error detector circuits should not be made until the preceding tests and wiring continuity check have been made.

TROUBLECLEARING PROCEDURES

5.07 The following chart should be consulted for the following rectifiers.

Note: All voltages shown in Fig. 4 through Fig. 9 are for rectifiers operating with normal output voltage and normal load unless otherwise shown.

RECTIFIER	TROUBLECLEARING INFORMATION
J87222A	Fig. 4 and 5
J87222B	Fig. 4 and 5
J87222C	Fig. 6, 7, 8, and 9
J87222D	Fig. 6, 7, 8, and 9.

6. CHARGE FUSE CONNECTIONS

6.01 Introduction: In rectifiers equipped with an internal charge fuse, loose connections may occur which cause the rectifier output current to fluctuate. These loose connections may result from thermal variations or from vibrations in the rectifier cabinet.

6.02 Checking Internal Charge Fuse Connections: To tighten connections to internal charge fuses or fuse holders, proceed as follows:

- (1) Operate the rectifier ON/OFF key to the OFF position.

(2) **DANGER:** Voltages inside the rectifier case are over 150 volts to ground. Do not allow a test pick or any other tool to touch two metal parts at the same time or destructive and dangerous short circuits may occur. This admonishment pertains to Steps (3) through (9).

(3) Shut off the ac service to the rectifier at the ac switchboard.

(4) Remove the rectifier REG fuse from the power plant control panel.

(5) Disconnect the rectifier output BAT and GRD leads from the power plant charge bus.

(6) Remove the F1 charge fuse from its mounting.

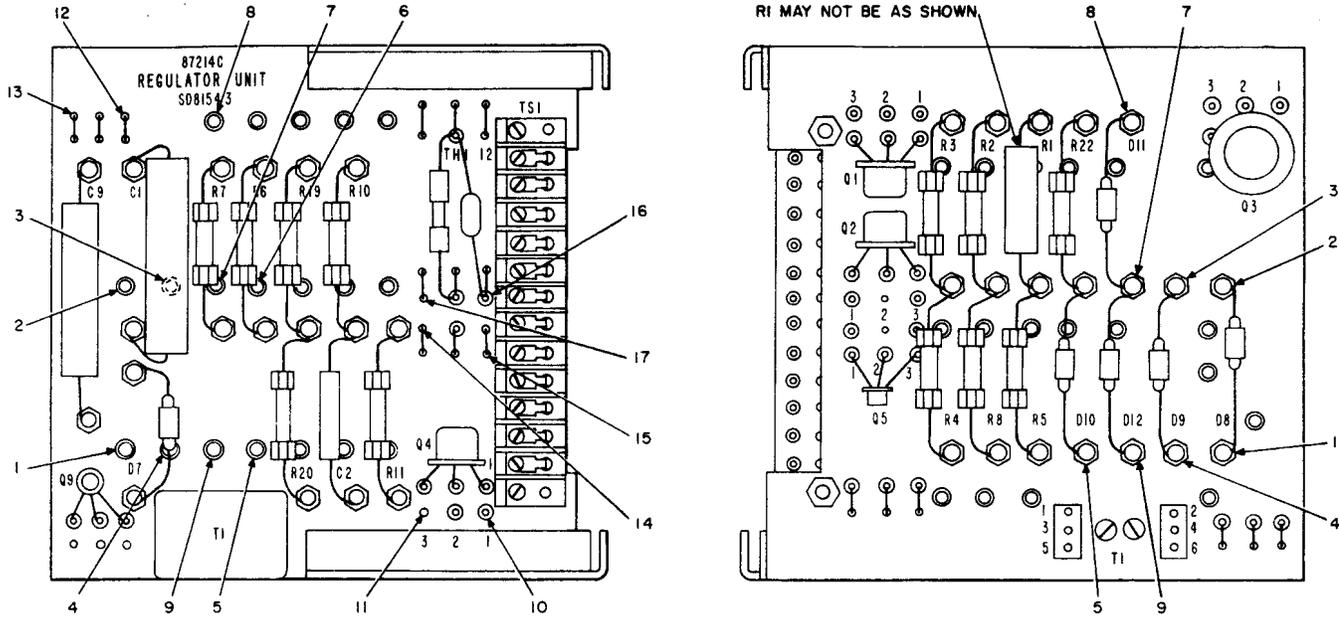
(7) Disassemble the F1 charge fuse mounting assembly, clean all parts, replace defective parts, and reassemble the unit in accordance with the rectifier drawings.

(8) Reconnect BAT and GRD leads disconnected in Step (5).

(9) Return rectifier to service per paragraph 3.03.4

♦TABLE A♦		
NO DC OUTPUT CURRENT (POWER STAGES)		
TROUBLE CONDITION	CHECK OUT PROCEDURE	CORRECTIVE ACTION REQUIRED
A. Rectifier will not restart after the ON/OFF key is turned OFF, then ON		Reverse any two of the three input leads.
B. Rectifiers tend to float the batteries at an improper voltage level	Slowly rotate ADJ VOLTS potentiometer to see if charging current can be varied	Set ADJ VOLTS potentiometer to proper float value.
C. Rectifier output fluctuates	This may be due to loose connections to internal charge fuse	Tighten connections to fuse per paragraph 6.02.
D. No ac input	Measure ac voltages across terminals L1-L2, L2-L3, and L1-L3 of ac contactor	If there is no voltage at these points, replace ac input fuses.
E. AC contactor not operating	Operate the ON/OFF key to ON. Check for battery voltage across the output filter capacitors, observing proper polarity. Check contactor fuse which is located on the front panel of the rectifier to see if it has failed	Make sure that the TR relay and RFA relay are not operated. Also, check to see that contact springs are seated properly in their holders. Replace fuse. Verify that the ON/OFF key is in the OFF position when the fuse is being replaced.
F. AC contactor will not remain operated after the rectifier is turned on	This may be due to an operated RFA1 relay. The RFA1 relay is also operated by placing ground on the HV lead. Check to see if ground potential is present at the HV lead	If the battery float voltage is incorrect, rotate ADJ VOLTS potentiometer of the rectifier until proper voltage setting is reached. If ground still appears on the HV lead, check wiring to charge and discharge circuit; also consult the associated power plant maintenance section.
G. Rectifier does not show any indication of the dc output current	(1) After checking for failed ac input fuses, check to see if the CHG B (F1) fuse has failed	Replace the F1 fuse. Do not replace the CHG alarm fuse until the main dc output fuse is replaced.

TABLE A (Contd)		
NO DC OUTPUT CURRENT (POWER STAGES)		
TROUBLE CONDITION	CHECK OUT PROCEDURE	CORRECTIVE ACTION REQUIRED
G. Rectifier does not show any indication of dc output current (Contd)	<p>(2) Blown output filter capacitor fuse (option YF only) F7 (FL) and F6 (FL ALM) due to:</p> <p>(a) Open thyristor or diode in rectifier stack</p> <p>(b) AC input voltage to input transformers exceeded maximum allowable for the taps to which they are connected</p> <p>(c) Unequal magnitude of the three phases at the ac inputs</p> <p>(d) Inadequate or absent pulse at the gate terminal of an SCR</p>	<p>Check thyristor and diode and replace defective stack.</p> <p>Change taps on input transformers.</p> <p>For unequal magnitude contact your commercial power company.</p> <p>Check gate lead connections and resistors R1, R2, and R3 to gate terminals.</p>
H. No output from the CR1 bridge	Measure ac input to bridge	If there is no ac voltage appearing at the input of the bridge but there is proper ac voltage appearing at the transformer secondary, check lead connections from transformer to CR1 bridge. Turn the rectifier OFF before physically checking leads.
I. No output from the CR1 bridge and/or the ac input fuses repeatedly fail when the rectifier is turned on. This happens even though the lead connections to the power transformer and CR1 bridge have been checked for possible faults.	Check the CR1 bridge for possible damaged diodes or SCRs. A damaged diode or SCR will indicate a complete short circuit.	If any components are found damaged in the CR1 bridge, replace the entire assembly.

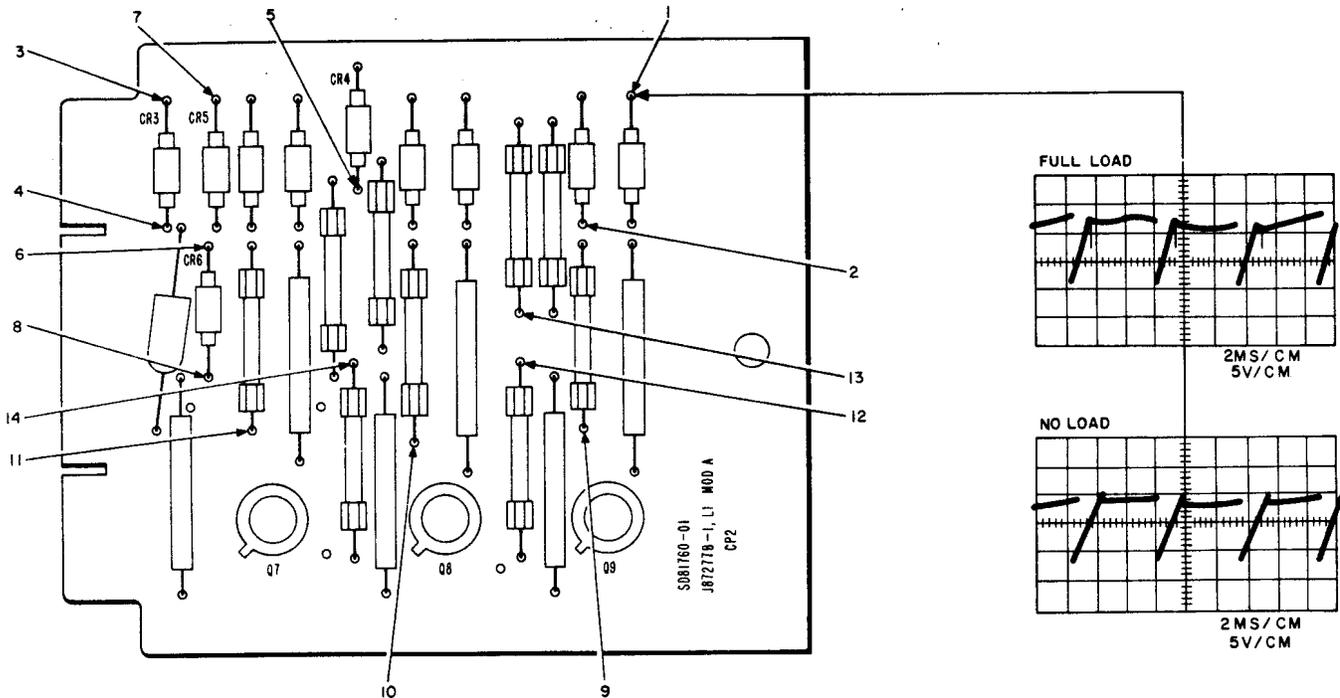


VOLTAGE AT TERMINALS	APPROX. READING	POSSIBLE CAUSE FOR INCORRECT READING AND REMEDY
3 - 4	5.5 - 6.6 VOLTS - DC	DEFECTIVE D9. REPLACE REGULATOR UNIT.
5 - 6	5.5 - 6.6 VOLTS - DC	DEFECTIVE D10 " " "
7 - 8	5.5 - 6.6 VOLTS - DC	DEFECTIVE D11 " " "
9 - 7	5.5 - 6.6 VOLTS - DC	DEFECTIVE D12 " " "
10 - 11	0.5 - 13 VOLTS - DC	REMOVE THE CHG. FUSE AND TURN THE VOLTS ADJ. POT CW. THE VOLTAGE ACROSS 10 - 11 SHOULD GO FROM 13 VOLTS TO A LOWER VALUE. IF THIS DOES NOT HAPPEN AND THE VOLTAGE AT 10 - 11 IS ZERO AND THE RECTIFIERS OUTPUT VOLTAGE IS EXTREMELY HIGH, Q3 AND/OR Q4 DEFECTIVE. REPLACE REGULATOR UNIT.
12 - 13	25 VOLTS - DC	IF LOWER THAN 20 VOLTS, REPLACE REGULATOR UNIT.
14 - 15	12 - 24 VOLTS - DC	THIS VOLTAGE SHOULD GO FROM 24 VOLTS TO 12 VOLTS AS THE VOLT ADJ. POT IS TURNED CW. IF THIS DOES NOT HAPPEN, REPLACE REGULATOR UNIT.
16 - 17	0 - 18 VOLTS - DC * 0 - 12 VOLTS - DC †	THIS VOLTAGE SHOULD VARY WITH THE VOLTS ADJ. POT. AS THE POT IS TURNED CW, THE VOLTAGE SHOULD DECREASE. IF THIS DOES NOT HAPPEN, REPLACE REGULATOR UNIT.

* 48 VOLT AND 150 VOLT RECTIFIERS ONLY.

† 24 VOLT RECTIFIERS ONLY.

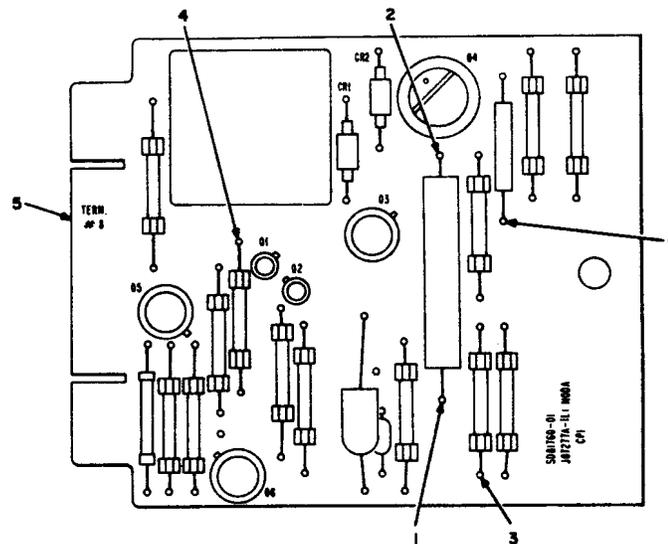
◆Fig. 4—J87214C, CP1 Regulator Unit ◆



VOLTAGE AT TERMINALS	APPROX. READING	POSSIBLE CAUSE FOR INCORRECT READING AND REMEDY
1 - 2	0.5 - 12 VOLTS - DC	THIS VOLTAGE WILL VARY DEPENDING ON THE LOAD. AS THE LOAD IS INCREASED, THIS VOLTAGE WILL DECREASE.*
3 - 4	5.5 - 6 VOLTS - DC	DEFECTIVE ZENER DIODE, CR3 REPLACE REGULATOR UNIT.
5 - 3	5.5 - 6 VOLTS - DC	" " " " " CR4 " " " "
6 - 7	5.5 - 6 VOLTS - DC	" " " " " CR5 " " " "
8 - 6	5.5 - 6 VOLTS - DC	" " " " " CR6 " " " "
8 - 9	4.5 VOLTS - DC	DEFECTIVE Q9 REPLACE REGULATOR UNIT.
8 - 10	4.5 VOLTS - DC	" " Q8 " " " "
8 - 11	4.5 VOLTS - DC	" " Q7 " " " "
12 - 13	25 VOLTS - AC	NO SECONDARY VOLTAGE FROM TRANSFORMER/S OR OPEN LEAD FROM TRANSFORMER TO CARD. CLEAR TROUBLE PER SD-81553-01 OR SD-81753-01.
12 - 14	25 VOLTS - AC	
13 - 14	25 VOLTS - AC	

* THIS IS NOT A TROUBLE CONDITION, IT IS NORMAL OPERATION.

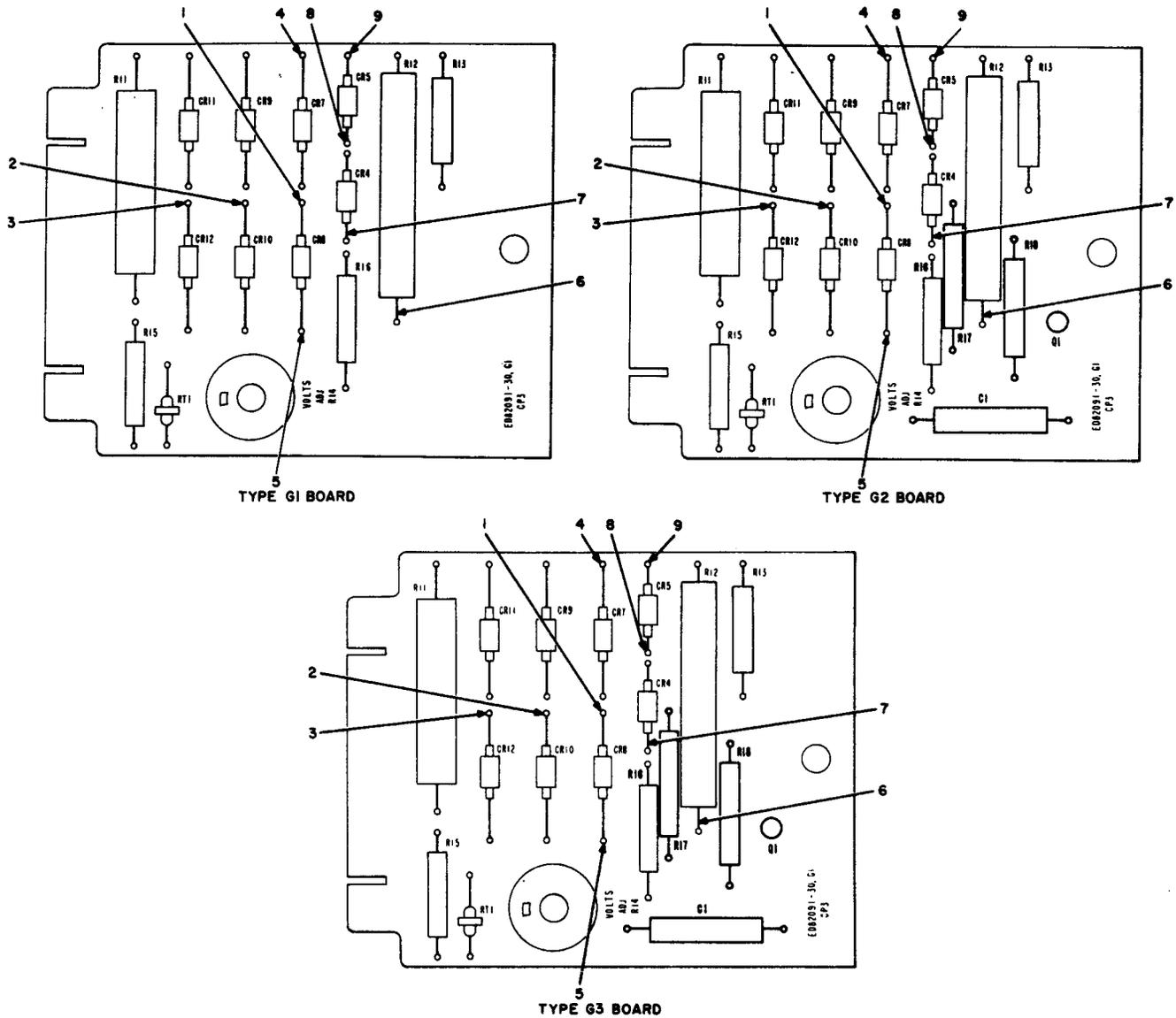
◆Fig. 6—J87277B, CP2 Regulator Unit ◆



VOLTAGE AT TERMINALS	APPROX. READING	POSSIBLE CAUSE FOR INCORRECT READING AND REMEDY
1 - 2	25 VOLTS - DC	IF LOWER THEN 20 VOLTS, THEN Q4 IS DEFECTIVE. REPLACE REGULATOR UNIT.
3 - 4 *	0 - VOLTS - DC	AS THE VOLTS ADJ. POTENTIOMETER IS TURNED FROM THE MAXIMUM CW POSITION TO THE MAXIMUM CCW POSITION, THIS VOLTAGE SHOULD GO FROM ZERO TO APPROX. 10 VOLTS. IF NOT, THEN Q1 AND/OR Q2 IS/ARE DEFECTIVE. REPLACE REGULATOR UNIT.
5 - 6	0 - 8 VOLTS - DC	AS THE VOLTS ADJ. POTENTIOMETER IS TURNED FROM THE CW POSITION TO THE CCW POSITION, THE VOLTAGE SHOULD GO FROM ZERO TO APPROX. 8 VOLTS. IF NOT, Q3 IS DEFECTIVE. REPLACE REGULATOR UNIT.

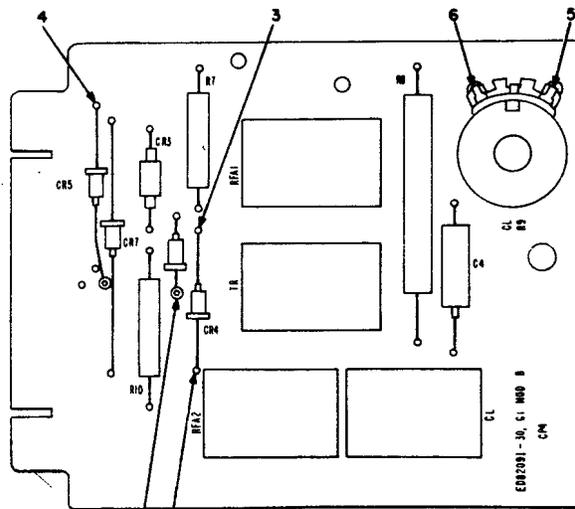
* WHEN MEASURING TERMINALS 3 AND 4, 5 AND 6, REMOVE THE CHARGE FUSE.

◆Fig. 7—J87277B, CP1 Regulator Unit ◆

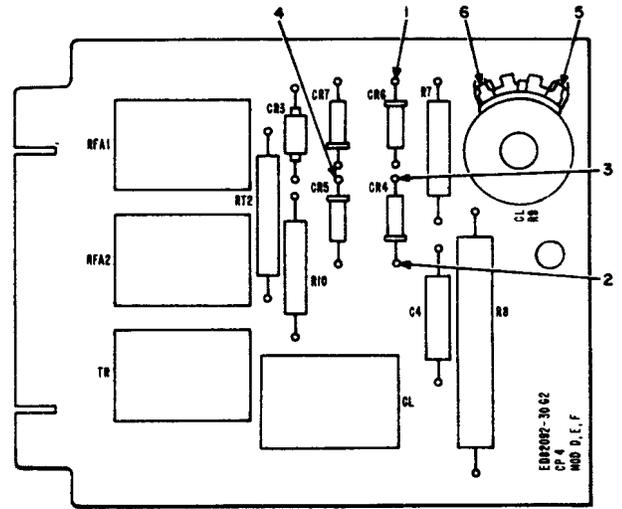


VOLTAGE AT TERMINALS	APPROX. READING	POSSIBLE CAUSE FOR INCORRECT READING AND REMEDY
1 - 2 2 - 3 1 - 3	30 VOLTS - AC $\pm 10\%$ 30 VOLTS - AC $\pm 10\%$ 30 VOLTS - AC $\pm 10\%$	NO SECONDARY VOLTAGE FROM ASSOCIATED TRANSFORMER OR BROKEN CONNECTION TO CARD. CLEAR TROUBLE PER SD-81553-01 OR SD-81753-01.
4 - 5	44 VOLTS - DC $\pm 10\%$	DEFECTIVE CR7 - CR12 (IT COULD BE ONE DIODE OR ALL SIX). REPLACE ERROR DETECTOR.
6 - 7	BATTERY VOLTAGE	OPERATED REG. FUSE, BROKEN LEAD FROM TS1 CHECK FOR BATTERY VOLTAGE AT TS1 TERMINALS 1 - 2
8 - 7 9 - 8	5.5 - 6.6 VOLTS - DC 5.5 - 6.6 VOLTS - DC	DEFECTIVE DIODE CR4. REPLACE ERROR DETECTOR CIRCUIT. DEFECTIVE DIODE CR5.

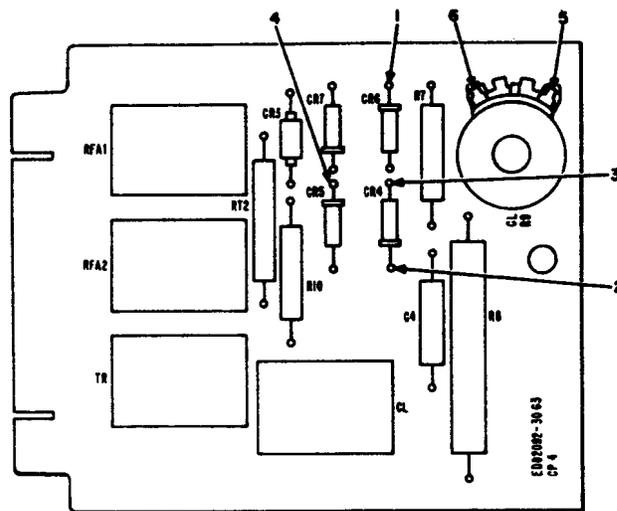
◆Fig. 8—ED-82091-30, CP3 Error Detector Circuit ◆



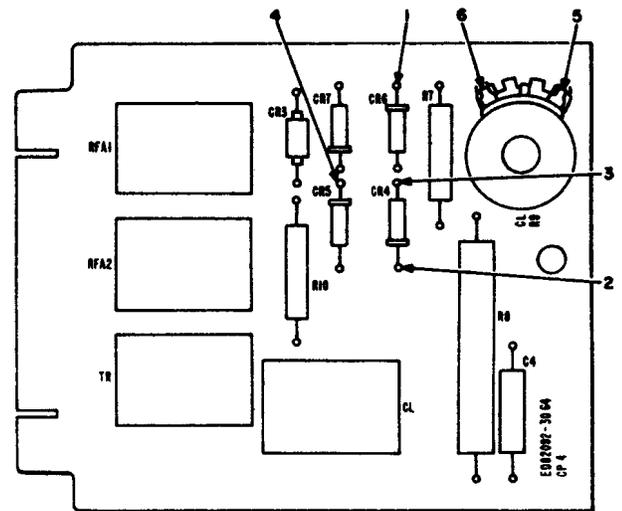
TYPE G1 BOARD



TYPE G2 BOARD



TYPE G3 BOARD



TYPE G4 BOARD

VOLTAGE AT TERMINALS	APPROX. READING	POSSIBLE CAUSE FOR INCORRECT READING
1 - 2	75 VOLTS - AC / 100% LOAD 35 VOLTS - AC / 50% LOAD 6 VOLTS - AC / 10% LOAD	CHECK CONNECTIONS FROM CURRENT TRANSFORMER. CHECK CR4 - CR7 AS SHOWN BELOW. CLEAR PER SD-81553-01 OR SD-81753-01.
3 - 4	85 VOLTS - DC / 100% LOAD 10 VOLTS - DC / 10% LOAD	DEFECTIVE DIODES CR4 - CR7. REPLACE ERROR DETECTOR CIRCUIT.
5 - 6	CHECK WITH OHMMETER	REMOVE THE CARD FROM THE RECTIFIER. CHECK TO SEE THAT THE OHMIC VALUE OF THE POTENTIOMETER AGREES WITH THAT OF THE SCHEMATIC.

◆Fig. 9—ED-82092-30, CP4 Error Detector Circuit ◆