GEK-1250

INSTRUCTIONS

Switchgear
SCR Battery Chargers

Model Numbers

6RW980AN3, 6, & 12

6RW980ZN3, 6, & 12

6RW985AN3, 6, & 12

6RW985ZN3, 6, & 12

SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONTENTS

SCR BATTERY CHARGERS

FOREWORD

This manual describes the operation of the General Electric Switchgear line of silicon controlled rectifier (SCR) regulated battery chargers. The Appendix contains a functional tabulation of components, elementary diagrams, and photographs.

INTRODUCTION

The following instructions contain descriptive data, directions for installation, operation, and maintenance. The units covered under these instructions are:

6RW980AN3, 6, and 12

6RW980ZN3, 6, and 12

6RW985AN3, 6, and 12

6RW985ZN3, 6, and 12

RECEIVING AND HANDLING

Immediately upon receipt of the battery charger, inspect it for damage. Look for bent or deformed panels, broken terminal blocks, and other evidence of rough handling. Claims for transportation damages should be made against the transportation company, and the nearest General Electric Company Sales Office should be notified.

DESCRIPTION

GENERAL

The SCR regulated battery charger is self-contained and can be operated in any normal indoor location. 3/8-16 mounting holes in both the front and rear panels are provided to accomodate either panel or wall mounting of this equipment.

These units are convection cooled and must be so mounted as to allow a free passage of air to cool the components.

MECHANICAL

The standard line battery charger contains a panel mounted:

D-c voltmeter (±2 percent)

D-c ammeter (±2 percent)

Power ON pilot light

Equalize switch

A-c input circuit breaker

The equalize, output voltage, d-c overvoltage, d-c undervoltage, adjustments, and d-c circuit breakers are located internally and can be reached by removing the top and/or right side covers.

ELECTRICAL

Input: The standard input power is 115/208/230 volts a-c, 1-phase, 60 cycles per second, or 50 cycles per second as specified by model number.

Output: Output voltages are 48, and 129 volts d-c.

Output currents of 3, 6, and 12 amperes are standard.

OPTIONAL FEATURES

The following features can be provided in any combination:

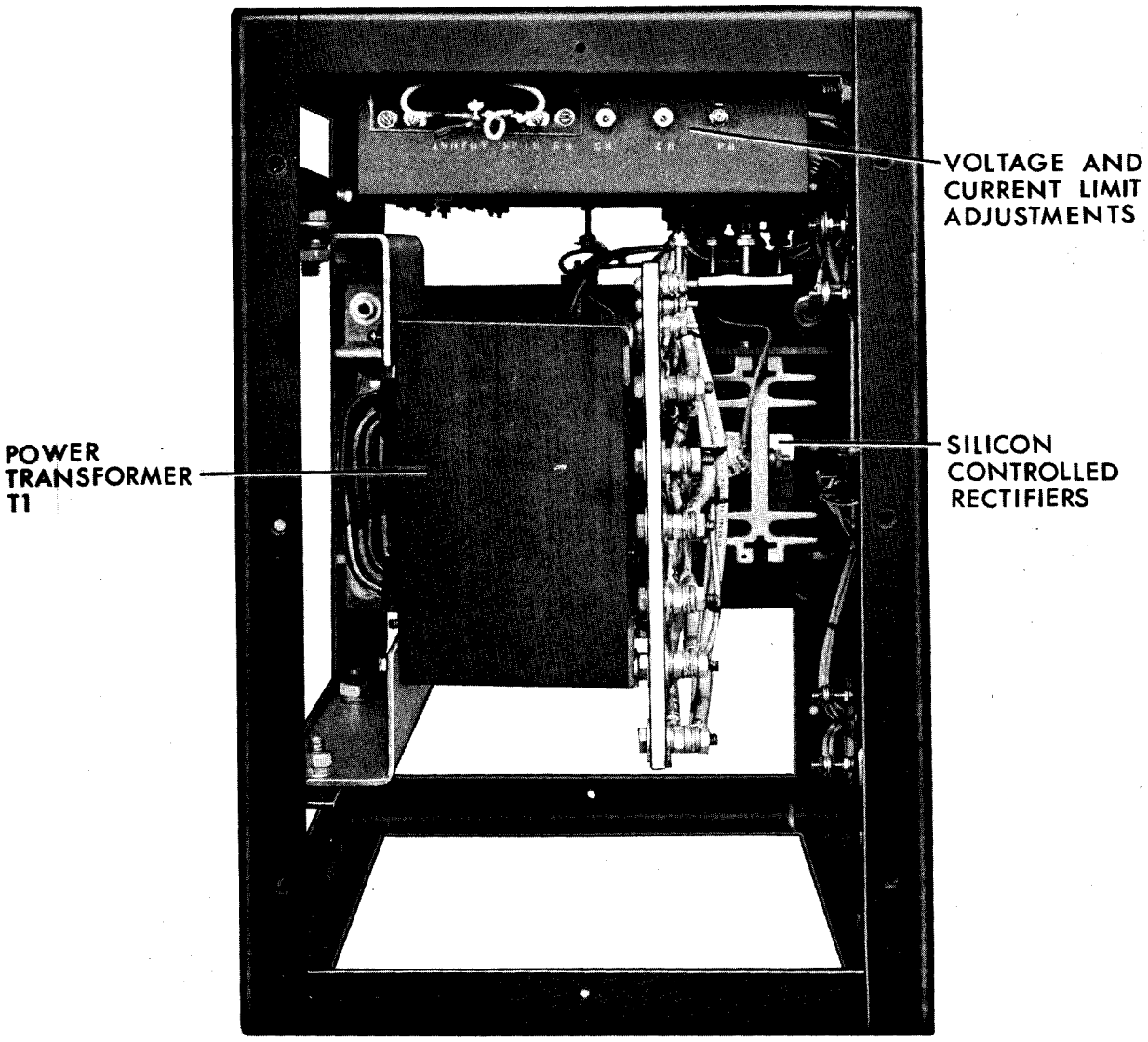
A-C FAILURE ALARM

Provides a "C" type contact on K1 which is de-energized upon the loss of the a-c input line.

D-C OVERVOLTAGE ALARM

This circuit is a factory adjustment and provides a "C" type contact on K3 which is energized during an overvoltage condition. Customer may adjust as required.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.



Switchgear line SCR battery charger, top view without cover

D-C UNDERVOLTAGE ALARM

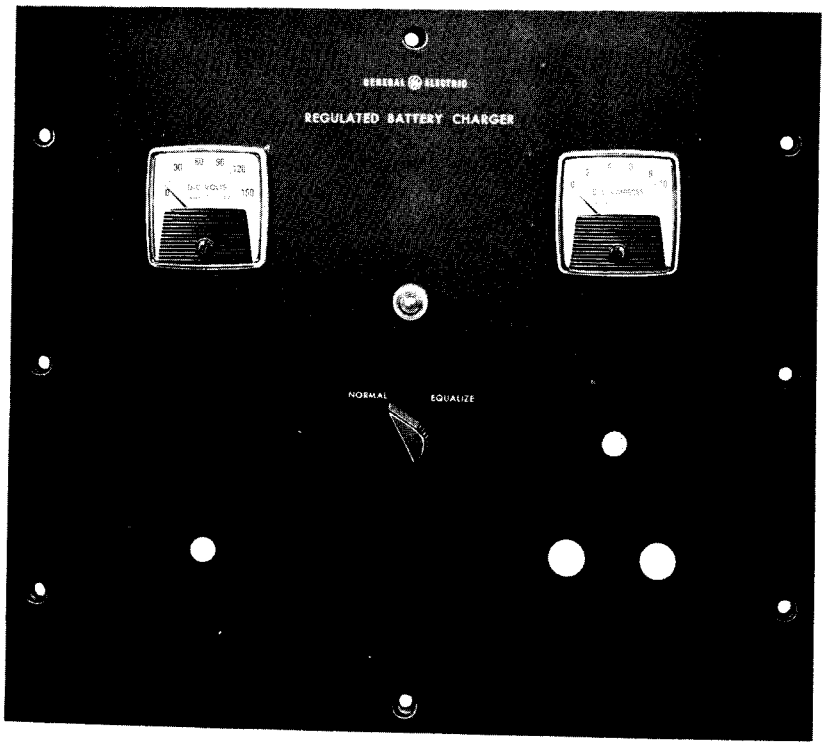
This circuit is also a factory adjustment and provides a "C" type contact on K2 which is de-energized during an undervoltage condition. Customer may adjust as required.

GROUND DETECTOR LAMP CIRCUIT

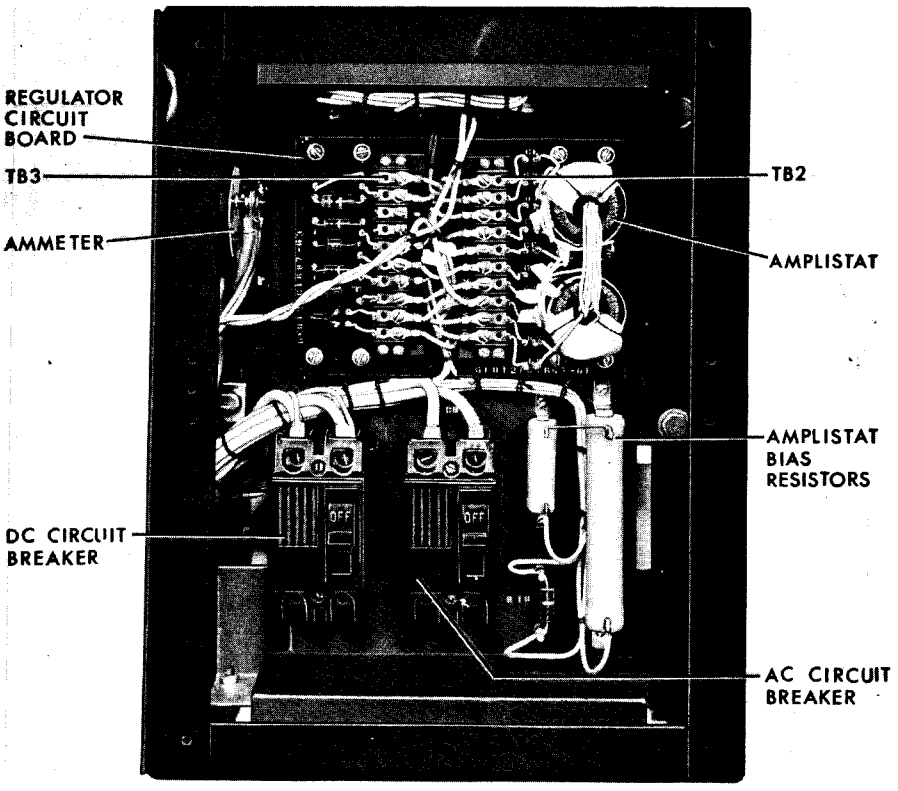
This circuit continuously senses the output circuit for a grounded condition on both the positive and negative lines. The appropriate front panel lamp will indicate a grounded condition with respect to the charger chassis, by turning on until the condition has been corrected.

0-48 HOUR EQUALIZE TIMER

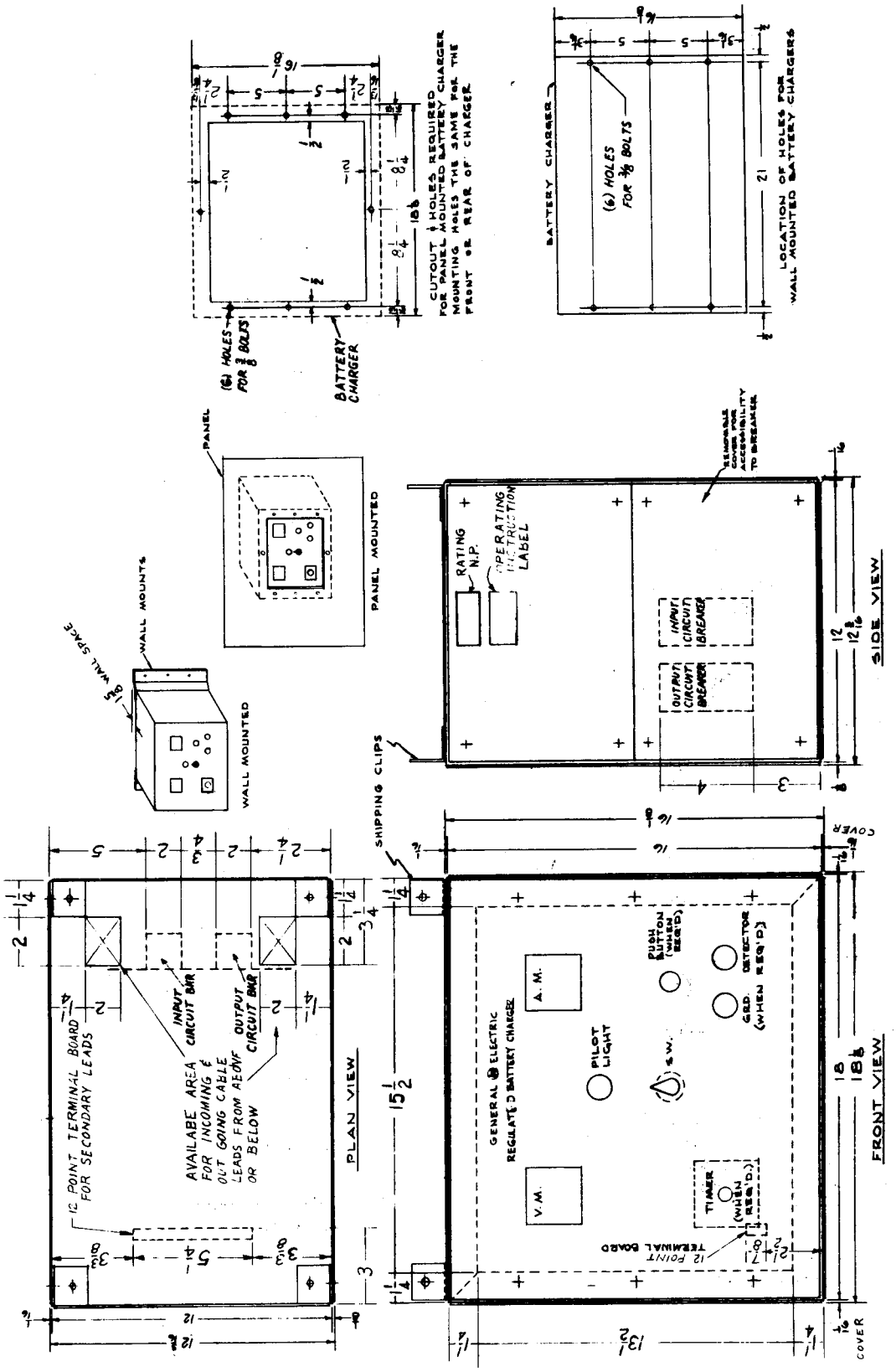
This optional feature will allow unattended equalize charging for the desired period up to 48 hours. After the desired time has elapsed (timer returned to zero), the charger will automatically resume normal charging until turned off manually.



Switchgear line SCR battery charger, front view



Switchgear line SCR battery charger, right side view without cover



Outline diagram for Switchgear line battery charger (0121C2456)

INSTALLATION

3/8-16 mounting holes in both the front and rear panels are provided to accomodate either panel or wall mounting of this equipment.

This equipment is convection cooled and care must be taken to permit free flow of cooling air into and out of the unit.

Input connections are located at the input circuit breaker on the front panel.

NOTE

Chargers will be shipped connected for 230 volts a-c input unless otherwise specified.

Output connections are located internally at the d-c circuit breaker (observe polarity markings).

TRANSFORMER CONNECTIONS

For 230 volts a-c, 60 cycles per second, jumper T1-2 to T1-3. Apply 230 volts a-c to T1-1 and T1-5.

For 115 volts a-c, 60 cycles persecond, jumper T1-1 to T1-3 and T1-2 to T1-5. Apply 115 volts a-c to T1-1 and T1-2.

For 208 volts a-c, 60 cycles per second, jumper T1-2 to T1-3. Apply 208 volts a-c to T1-1 and T1-4.

A-c circuit breaker should be in the OFF position before power is connected and applied to the a-c input connections of the unit. See elementary diagram on page 15.

OPERATION

1. Connect the battery to be charged (observe polarity markings). D-c circuit breaker closed.

NOTE: Battery must always be connected to charger when making adjustment. The charger output voltage will be less than normal without batteries connected, approximately 70%.

2. Energize the unit by operating CB-1 (input circuit breaker on front panel).

3. Normal Charge

Output voltage may be adjusted approximately ±1 volt with R-7 while in normal charge mode of operation. The units are adjusted for the following voltages at full load before leaving the factory.*

6RW985 130.2 volts DC
6RW980 50.0 volts DC

R-7 is located on top of the control circuit board inside the unit and is equipped with a lock nut which must be released prior to adjustment.

4. Equalize Charge

Output voltage may be adjusted approximately ±1 volt with R-4 while in the equalize mode of operation. The units are adjusted for the following voltages at full load before leaving the factory.**

6RW985 140.5 volts DC
6RW980 53.8 volts DC

R-4 is located on top of the control circuit board inside the unit. It is equipped with a lock nut which must be released prior to adjustment.

5. Current Limit

This charger is equipped with a current-limit feature for protection against short circuit and overload conditions. Current limit is factory set at 15 percent above full load output rating and is adjusted by rheostat R5. Adjustment should be made only when necessary as, for example, when a change is caused by replacing a defective part.

R-5 is located on top of the control circuit board inside of unit and is equipped with a lock nut which must be released prior to adjustment.

6. Bias Adjustment

R-9 is a dividohm resistor for bias adjustment. This is a factory adjustment and should not be changed ordinarily. If a defective part is replaced it may be necessary to readjust this resistor. See ALIGNMENT PROCEDURE.

ALIGNMENT PROCEDURE

1. Preset rheostats R4, R9, and R7 to midpoint.

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* Indicates check battery manufacturer's recommended cell FLOAT voltage. Recommended cell voltage may be different than above.

** Indicates check battery manufacturer's recommended cell EQUALIZE voltage. Recommended cell voltage may be different than above.

2. Preset rheostat R5 to full reisitance in circuit, and set SW-1 to NORMAL position.

3. Apply input voltage to unit.

4. Set the output voltage to slightly less than rated voltage with R9 (coarse control).

5. Load unit to rated capacity. (See nameplate for rating.)

6. Set output voltage to 2.17 volts per cell with R7 (fine control).*

7. Set SW-1 to EQUALIZE position.

8. Set output voltage to 2.33 volts per cell with R4 (fine control).**

9. Set the current limit for 115 percent of rated load (15 percent above rated load) with R-5.

NOTE

When the above steps are complete, the output voltage should be adjustable approximately ±1 volt with R-4 for equalize and R7 for normal charge.

If the range of output voltage adjustment is not sufficient to allow float and/or EQUALIZE as recommended by cell manufacturers a minor adjustment of R-9 may be necessary using the above alignment procedure.

CIRCUIT OPERATION

The battery charger operates from a single-phase input and may be used for 230 or 115 volts. See Transformer Connections, page 7.

Conversion to DC takes place through CR2 and CR4 in a full wave, center-tap rectifier connection.

The amplistat is powered by a separate secondary winding and a rectifier section.

The output of the supply is maintained constant by the silicon controlled rectifiers CR2 and CR4 used as phase control regulators.

Current and voltage feedback are used to control magnetic amplifier L1.

The bias is set to drive the gate windings into the saturation region. The necessary current is approximately 190 milliamperes. R8 acts as a current limiting resistor for the bias winding.

Both the voltage control winding and the current limit winding drive the gate windings into the non-saturation region where the gates hold off voltage.

The control current required is from 2 to 5 milliamperes.

AM acts as the sensing element for the current limit winding. The drop across this meter is used to control the respective gate windings. R5 is a current limiting resistor which may be used to set the current limit to the desired level.

The voltage reference diode CR6 is connected across the drop of R2, R4, and R9. Whenever this drop exceeds the zener voltage, control current flows through the voltage control winding of the amplistat, and the gate windings are desaturated. The output voltage level may be adjusted by R9 coarse voltage control rheostat and R7 fine voltage control rheostat.

When the current level in both of the two control windings is such that the gate windings of the amplistat are in saturation, a constant gate signal is applied to the silicon controlled rectifier placing the regulator element into the conduction region.

As the current level in the control windings rises and reaches the critical point, the gate windings are desaturated causing them to delay the gate signal to the SCR. Once each cycle (at a 60 cycle rate), battery voltage appears at the cathode of each SCR and forces current in the reverse direction thereby placing the junction of the semiconductors in a reverse bias state.

The equalize switch S1, when closed, takes a portion of the resistance of R4 (the equalize voltage level control) out of the circuit. This effectively reduces the voltage drop across which the zener diode CR6 is connected. The zener current decreases by a proportionate amount moving the amplistat a little further towards saturation which increases the conduction angle of the series-regulator and results in a desired higher output voltage. The equalize control is normally set for an output voltage of 2.33 volts per cell.

Note that both sets of gate windings are independent and, to provide a gate signal to the SCR, each of these will have to be biased in the saturation region.

The silicon controlled rectifiers are protected against transient surges and commutation spikes by an R-C network.

The unit is protected by the input circuit breaker against internal faults.

The output circuit breaker protects against failure of the current limit circuit.

MAINTENANCE

This equipment is essentially maintenance-free and requires only a periodic dust removal from the top of the screen-type cover and interior.

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* Indicates check battery manufacturer's recommended cell FLOAT voltage. Recommended cell voltage may be different than above.

** Indicates check battery manufacturer's recommended cell EQUALIZE voltage. Recommended cell voltage may be different than above.

TROUBLE SHOOTING GUIDE

Trouble	Possible Cause	Check Point and Remedy
1. Charger will not turn on (pilot light off)	1a. Line input disconnected 1b. Faulty circuit breaker	1a. Make connection to a-c input terminals 1b. Replace circuit breaker
2. Light will not operate when charger is on	2a. Lamp burned out	2a. Replace lamp
3. Charger is on (pilot light is on) but no d-c output current	3a. Supply output terminals shorted 3b. Loose connection on plug board 3c. D-c output circuit breaker opened 3d. Faulty silicon controlled rectifier - CR2 or CR4	3a. Check loading of charger 3b. Check printed circuit board connection 3c. Close output circuit breaker. Also check battery connections for polarity. (Positive side of battery to positive side of charger, etc.) 3d. Replace CR2 or CR4
4. Charger will not regulate at proper load current and voltage	4a. Faulty reference diode cell DZ1. 4b. Excessively discharged battery on charge 4c. Improper input voltage 4d. Improper adjustment of control circuit	4a. Replace DZ1 (on regulator board) 4b. Check battery. If battery is not defective, allow time for charger to return battery to normal condition. Current-limit features of charger should prevent damage from occurring. 4c. Check input voltage and nameplate of charger 4d. See "Alignment Procedure", p.7.
5. Voltmeter does not function	5a. Loose connection on meter 5b. Faulty meter	5a. Tighten connections 5b. Replace meter
6. Ammeter does not function	6a. Faulty meter	6a. Replace meter

PARTS LIST

Reference Designation to 0121C2300 elementary diagram	Ordering Information	48 VDC			129 VDC		
		6RW980ZN			6RW985ZN		
		6	12	3	3	6	12
DS-1	Pilot Light #95410-937 Dialco	1	1	1	1	1	1
*DS-1	Lamp Type 47 (6-8V Type T3 1/4)	1	1	1	1	1	1
R-10	Pilot Light Resistor GE N7002P22010 22 ohm 2 watt Carbon	1	1	1	1	1	1
AX	Amplistat GE 0121C1687 G-1	1	1	1	1	1	1
SW-1	Switch Cat. 81715 AH&H (SPST)	1	1	1	1	1	1
Knob	Dnob for SW-1 Cat. 90-42 1/4" Shaft Raython	1	1	1	1	1	1
*Control Circuit	Control Circuit Board GE 121C1687 G-3	1	1	1	1	1	1
VM (voltmeter)	GE Type DW-91-138B251 P-110	1	1	1			
VM (voltmeter)	GE Type DW-91-138B251 P-112				1	1	1
*AM (ammeter)	GE Type DW-91-138B250 P-105	1				1	
*AM (ammeter)	GE Type DW-91-Cat. #513X66			1	1		
*AM (ammeter)	GE Type DW-91-138B250 P-106		1				1
CB-1	GE TQ2115WL (2-Pole 15A)			1	1		
CB-1	GE TQ2120WL (2-Pole 20A)	1	1				
CB-1	GE TQ2140WL (2-Pole 40A)					1	1
CB-2	TQ2115WL GE			1	1		
CB-2	TQ2120WL GE	1				1	
CB-2	TQ2130WL GE		1				1
*CR2 CR4	GE SCR 6RW59T (1000 V)				2	2	2
*CR2 CR4	GE SCR 6RW59K (500 V)	2	2	2			
R8A	N7005P13150, 15 ohm, 20 watt				1	1	1
R8B	N7007P13500, 500 ohm, 50 watt				1	1	1
R8A	N7005P13200, 200 ohm, 20 watt	1	1	1			
R8B	N7004P12300, 30 ohm, 10 watt	1	1	1			

*Recommended Spare Parts.

PARTS LIST (Cont'd)

Reference Designation to 0121C2300 elementary diagram	Ordering Information	48 VDC			129 VDC		
		6RW980ZN			6RW985ZN		
		6	12	3	3	6	12
**Transformer T-1	130V 12A 0195A3620 P-4						1
**Transformer T-1	130V 6A 0195A3620 P-5					1	
**Transformer T-1	48V 12A 0195A3620 P-8		1				
**Transformer T-1	48V 6A 0195A3620 P-9	1					
**Transformer T-1	130V 3A 0195A3620 P-20				1		
**Transformer T-1	48V 3A 0195A3620 P-21			1			
△Transformer T-1	48V 3A 0195A3620 P-25			1			
△Transformer T-1	48V 6A 0195A3620 P-26	1					
△Transformer T-1	48V 12A 0195A3620 P-27		1				
△Transformer T-1	130V 3A 0195A3620 P-22				1		
△Transformer T-1	130V 6A 0195A3620 P-23					1	
△Transformer T-1	130V 12A 0195A3620 P-24						1

**Indicates 60 cycle per second transformer.

△Indicates 50 cycle per second transformer.

DEVICE LIST

CB1	AC CIRCUIT BREAKER
CB2	DC CIRCUIT BREAKER
CR2,4	SILICON CONTROLLED RECTIFIER (SCR)
CR5,7	AMPLISTAT DIODES
VR1	VOLTAGE REFERENCE DIODE (ZENER)
DS1	"ON" INDICATING LAMP
DS2,3	GROUND DETECTION LAMPS
K1	AC FAILURE RELAY
K2	DC UNDERVOLTAGE RELAY
K3	DC OVERVOLTAGE RELAY
R4	EQUALIZE CURRENT ADJUSTMENT
R5	CURRENT LIMIT ADJUSTMENT
R7	VOLTAGE LEVEL ADJUSTMENT
R9	BIAS ADJUSTMENT
R21	OVERVOLTAGE ALARM ADJUSTMENT
R22	UNDERVOLTAGE ALARM ADJUSTMENT
SW1	CHARGE EQUALIZE SWITCH
SW2	ALARM RESET SWITCH
T1	MAIN TRANSFORMER

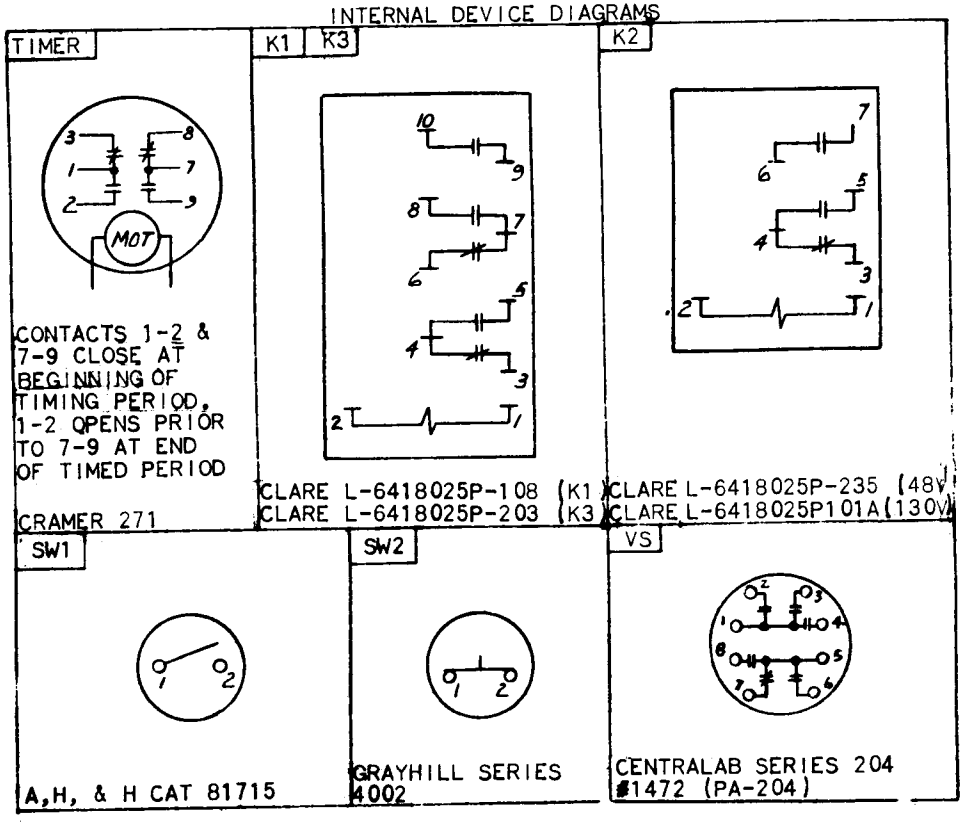
MODEL NUMBER STRUCTURE

6RW	985	Z	N	03	S	24
A	B	C	D	E	F	G

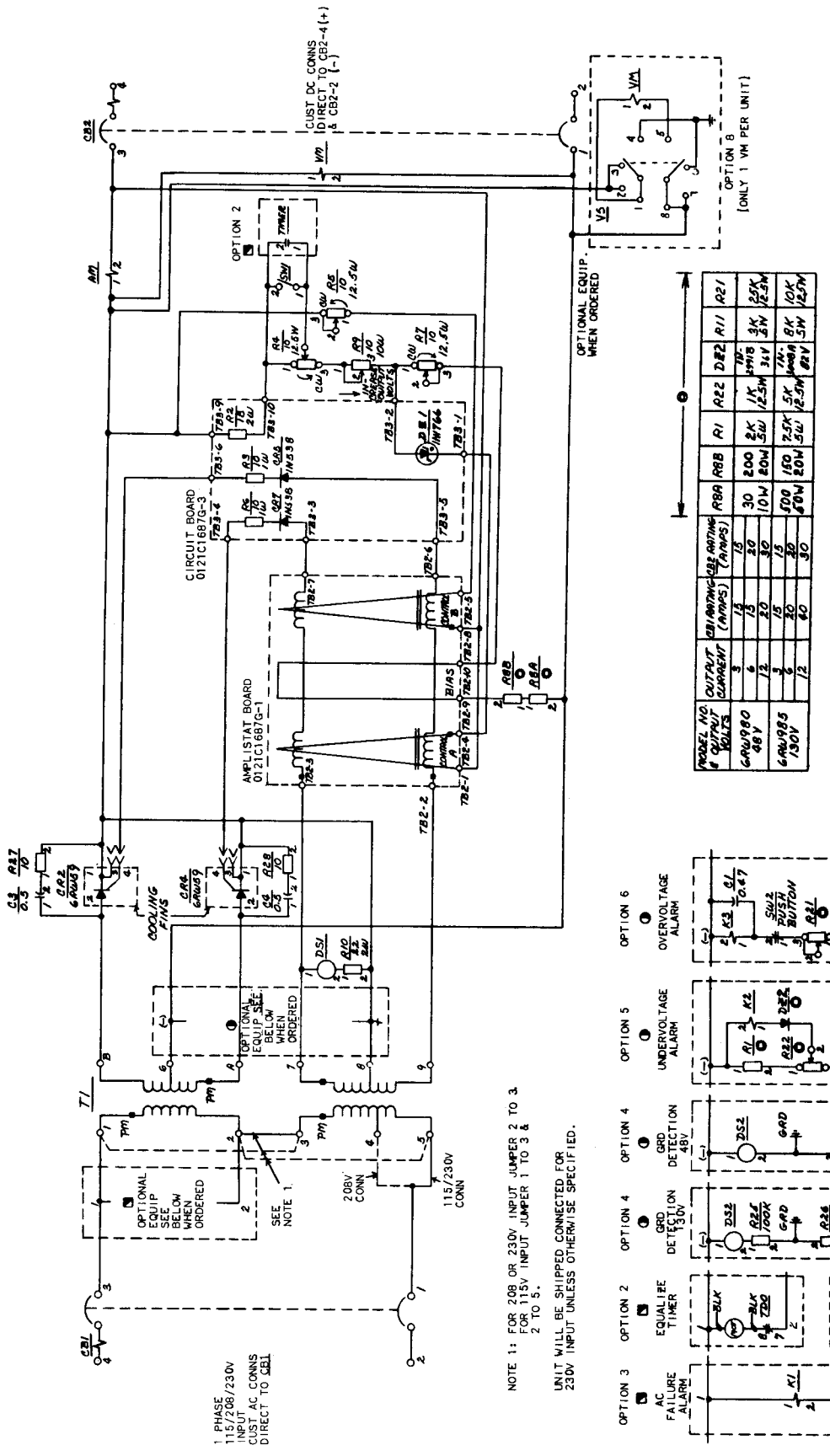
A	6RW	SILICON RECTIFIER EQUIP
B	980	48VDC (OUTPUT)
	985	130VDC (OUTPUT)
C	Z	60 CYCLE INPUT POWER
	A	50 CYCLE INPUT POWER
D	N	NO FAN (CONVECTION COOLED)
E	03	3 AMPS DC OUTPUT CURRENT
	06	6 AMPS DC OUTPUT CURRENT
	08	8 AMPS DC OUTPUT CURRENT
	10	10 AMPS DC OUTPUT CURRENT
	12	12 AMPS DC OUTPUT CURRENT
F	S	SWITCHGEAR STYLE
G	1	STANDARD- BASIC UNIT
	2	0-48 HOUR TIMER
	3	A.C. FAILURE ALARM
	4	GROUND DETECTOR LIGHTS
	5	D.C. UNDERVOLTAGE ALARM
	6	D.C.OVERVOLTAGE ALARM
	7	OUTPUT FILTER TRAY (EXTERNAL)
	8	GROUND DET.SWITCH ON VOLTMETER (NO LIGHTS)
	9	28 DAY AUTOMATIC EQUALIZE TIMER

IF (2) OR MORE OPTIONAL CIRCUITS ARE REQUIRED, COMBINE THE NUMBERS AS IN THE ABOVE SAMPLE. THE SAMPLE NUMBER INDICATES THAT BOTH THE TIMER AND GROUND DETECTOR CIRCUITS ARE SUPPLIED.

INTERNAL DEVICE DIAGRAMS



Elementary diagram (0121C2300 sheet 1)



Elementary diagram (0121C2300 sheet 2)

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- *† Tucson 85711 — 151 S. Tucson Blvd.

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- † Pine Bluff 71602 — P. O. Box 1033

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- ‡§ Los Angeles 90005 — 3325 Wilshire Blvd.
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- * Redwood City 94063 — 55 Veterans Blvd.
- *† Sacramento 95816 — 2407 "J" St.
- *† § San Diego 92103 — 2560 First Ave.
- *†‡§ San Francisco 94106 — 235 Montgomery St.
- * San Jose 95128 — 2155 So. First St.

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- *†‡ Hartford 06105 — 764 Asylum Ave.

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- * Coral Gables 33146 — 250 Bird Road
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- † Miami 33134 — 4100 West Flagler St.
- † Pensacola 32503 — First Bank Bldg.
- *‡ Tampa 33609 — Henderson Blvd. at Lois Ave.
- * Tampa 33609 — 2106 S. Lois Ave.

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- *† Savonnah 31405 — 5002 Paulsen St.

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- *† Boise 83706 — 1524 Idaho St.

ILLINOIS
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- *† Peoria 61603 — 2008 N.E. Perry Ave.
- * Rockford 61105 — 4223 East State St.
- † Springfield 62701 — 607 E. Adams St.

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- *†‡ Evansville 47714 — 2709 Washington Ave.
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- *† Fort Wayne 46806 — 3606 S. Calhoun St.
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IOWA
- *† Cedar Rapids 52401 — 210 Second St., S.E.
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- * Lake Charles — 1424 Ryan St.
- †§ New Orleans 70112 — 837 Gravier St.
- * New Orleans 70125 — 4747 Earhart Blvd.
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MAINE
- † Augusta — 152 State St.
- * Bangor 04402 — 77 Central St.

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- † Hagerstown — 49 East Franklin St.

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- * Flint 48503 — 316½ W. Court St.
- *‡ Grand Rapids 49508 2821 Madison Ave., S.E.
- *† Jackson 49201 — 210 W. Franklin St.
- * Kalamazoo — 927 S. Burdick St.
- † Lansing 48901 — 501 Bank of Lansing Bldg.
- * Saginaw 48607 Second National Bank Bldg.

MINNESOTA
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- † Fergus Falls 56537 — 106 E. Washington St.
- *†‡ Minneapolis 55402 — 12 S. Sixth St.

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- † Jackson 39201 — 210 S. Lamar St.

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- *†‡ Kansas City 64105 — 106 W. Fourteenth St.
- *‡ St. Louis 63101 — 1015 Locust St.

MONTANA
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- *† Butte 59701 — 103 N. Wyoming St.

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- *†‡ Buffalo 14202 — 625 Delaware Ave.
- *† § New York 10022 — 570 Lexington Ave.
- *†‡ Rochester 14604 — 89 East Ave.
- *†‡ Syracuse 13206 — 3532 James St.
- * Utica 13501 — 1001 Broad St.
- ‡ Waverly 14892 — P.O. Box 308

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- *† Raleigh 27602 — 16 W. Martin St.

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OHIO
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- *† Canton 44701 — 515 Third St., N.W.
- *†‡ Cincinnati 45206 — 2621 Victory Pkwy.
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- *† Columbus 43215 — 395 E. Broad St.
- ‡ Columbus 43212 — 937 Burrell Ave.
- *‡ Dayton 45402 — 11 W. Monument Ave.
- *†§ Dayton 45402 — 118 W. First St.
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- *† Medford 97501 — 107 E. Main St.
- *†‡ Portland 97210 — 2929 N.W. 29th Ave.

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- * Erie 16501 — 1001 State St.
- *† Johnstown 15902 — 841 Oak St.
- *†‡§ Philadelphia 19102 — 3 Penn Center Plaza
- *†‡ Pittsburgh 15222 The Oliver Bldg., Mellon Sq.
- §Pittsburgh 15238 — 733 Washington Rd.
- *‡ York 17403 — 56 N. Harrison St.

SOUTH CAROLINA
- *† Columbia 29201 — 1310 Lady St.
- * Greenville 29602 — 108 W. Washington St.

TENNESSEE
- *†‡§ Chattanooga 37402 — 832 Georgia Ave.
- * Kingsport 37662 — 322 Commerce St.
- *† Knoxville 37916 — 1301 Hannah Ave., N.W.
- *† Memphis 38104 — 1420 Union Ave.
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