POWER SYSTEMS
REGULATED RECTIFIER
SEMI-CONDUCTOR TYPE
48 VOLTS, 11 AMPERES DC
115/230 VOLTS, 60 CYCLE AC
J87211A

CHANGES

B. Changes in Apparatus

B.1	Superseded	Superseded By
	D1 Diode 425L	D1 Diode 485L
	D2 Diode 425H	D2 Diode 485H

D. Description of Changes

D.1 The CR1 "U" option was changed to include only the KS-15989,L9 Diode.

D.2 The G.E. Co. 2N3656 SCR was designated as an "F" option.

D.3 Circuit note 108 was removed.

D.4 Circuit note 109 was added.

D.5 Circuit note 104 was changed.

D.6 The 14 gage wire designation was moved from above to below the "H" option.

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DEPT 5147-RRG
WECo 8143-WLL-TRC-EAF

POWER SYSTEMS
REGULATED RECTIFIER
SEMICONDUCTOR TYPE
48 VOLTS 11 AMPERES DC
115/230 VOLTS 60 CYCLE AC
J87211A

CHANGES

B. Changes in Apparatus

	Superseded	Superseded By
B.1	R9 Resistor, 21.5Ω, KS14603, L3D	R9 Resistor 1.0Ω, KS14603, L3D
B.2	M1 Meter, KS14784, L4	M1 Meter, KS14507, L24

D. Description of Changes

D.1 The "F" option was added to decrease the series gate resistor thereby increasing the available gate current to CR1.

D.2 Circuit Note 108 was added.

D.3 Circuit Note 104 was changed

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DEPT 5454-RR-CSK-EAF

Printed in U.S.A.

POWER SYSTEMS
REGULATED RECTIFIER
SEMICONDUCTOR TYPE
48 VOLTS 11 AMPERES DC
115/230 VOLTS 60 CYCLES AC
J87211A

CHANGES

D. Description of Changes

D.1 The commercial code for the KS-15989, List 9 CR1 silicon controlled rectifier was furnished.

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DEPT 5454-RR-CSK-EJO'

POWER SYSTEMS
REGULATED RECTIFIER
SEMICONDUCTOR TYPE
48 VOLTS, 11 AMPERES DC
115/230 VOLTS, 60 CYCLES AC
J87211A

CHANGES

D. Description of Changes

D.1 Circuit Note 107 is added.

D.2 The "G" option is required when the rectifier is used in the battery reserve power plant of the 2A Automatic Call Distributor. This option provides control circuit voltage directly from the battery instead of the rectifier terminals to overcome the blocking effect of the power diode in the charge leads of the 2A Automatic Call Distributor power plant.

D.3 The following drawing changes are made "For Record Only"

(a) "J" option symbol added to R14 resistor of Fig. 1.

(b) Transistor leads designations of Q1 in Fig. 3 corrected.

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DEPT 5154-RR-CSK-EAF

POWER SYSTEMS
REGULATED RECTIFIER
SEMICONDUCTOR TYPE
.48 VOLTS, 11 AMPERES DC
115/230 VOLTS, 60 CYCLES AC
J87211A

CHANGES

B. Changes in Apparatus

B.1 Removed

Q1 transistor 30A - Fig. 3, "H" option

B.2

Removed	Replaced By
Q1 transistor 2N3766 - Fig. 3, "G" option	Q1 transistor 2N3766 - Fig. 3
D3 diode 446A - Fig. 3, "G" option	D3 diode 446A - Fig. 3

D. Description of Circuit Changes

D.1 The designation of the 511 ohm resistor in series with the "PG" lead was changed from R13 to R14 since the R13 designation is already used.

D.2 The battery alarm "J" option and ground alarm "R" option features were added to the Feature Or Option table in note 102.

D.3 An undesignated capacitor symbol was removed from the schematic in Fig. 3.

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DEPT 5154-RS-CSK-EAF

POWER SYSTEMS
REGULATED RECTIFIER
SEMICONDUCTOR TYPE
48 VOLTS. 11 AMPERES DC
115/230 VOLTS, 60 CYCLE AC
J87211A

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit in conjunction with control regulator circuit SD-81541-01, automatically provides dc power from an ac source, and regulates the load voltage.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 This rectifier was developed to be used in conjunction with a regulator control circuit such as that shown on SD-81541-01. An over-all description of the operation of this type circuit is given in CD-81541-01.

1.02 The T1 transformer, CR2 diodes, and L1 inductor comprise a full wave rectifier. The M1 meter measures the rectifier output current and the 15-ampere pole of CB1 circuit breaker provides output protection. The CR1 pnpn device is a controlled rectifier which exhibits thyratron tube-like characteristics. It has two stable states, an "on" state and an "off" state. In the "on" state, the CR1 controlled rectifier presents a low impedance to current in the forward direction; in the "off" state, it presents a high impedance to forward current flow. A synchronizing signal is fed to the regulator over the C lead. Pulses are fed over the B and D leads from the regulator circuit synchronized with the ac power service to trigger the controlled rectifier into its "on" condition. At the end of each half cycle, CR1 is turned "off" due to the "flyback" action of the D1 diode. From the end of the previous half cycle until the CR1 controlled rectifier is triggered, load current is forced to flow through the D1 flyback diode by the action of the L1 inductor. Regulation is accomplished by advancing or retarding the triggering pulses in the cycle. The voltage developed across R3 resistor provides a signal over the G lead to the regulator for current limiting. The REG BAT. and REG GRD leads are connected in the discharge circuit at the point where voltage regulation is desired. The signal for voltage regulation is fed over the E, H, and J leads to the regulator. Power for the regulator is fed over the A lead.

1.03 If either the load current or the output voltage is too high, CB1 circuit breaker will trip to disconnect the rectifier from the discharge circuit and battery, and auxiliary contacts on CB1 will apply ground to the RFA lead when "R" option is used or battery through 500-ohm to the PG lead when "J" option is used. Pole A of CB1 circuit breaker regardless of option "X" or "W" will always remain in the battery lead. Tripping on high voltage is controlled by Q1 transistor and associated high voltage detecting circuitry. The Q2 transistor provides a selective shut down feature, such that if rectifiers are operated in parallel, the rectifier that is delivering current at high voltage, will be shut down permitting the other rectifiers to regulate within proper voltage limits. The R2 resistor provides a holding current path to keep the controlled rectifier in the "on" state at no-load or light loads where L1 inductor is below critical inductance.

2. RECTIFIER OPERATION

Placing the Rectifier in Service

2.01 To place the rectifier in service, select primary tap on T1 transformer as shown in Circuit Note 105. Check to see that all fuses are in place, then operate the S1 switch and the CB1 circuit breaker to the ON position.

ADjustments

2.02 To adjust rectifier output voltage rotate the R7 potentiometer, VOLTS ADJ, to the maximum counterclockwise (ccw) position. This R7 potentiometer is located in the regulator circuit and is shown on SD-81541-01. Rotate the R7 potentiometer in a clockwise (cw) direction until the rectifier is charging the batteries at 2.17 volts per cell.

2.03 The CC slide wire resistor located in the regulator circuit SD-81541-01, which limits the output current of the rectifier, and the R8 resistor which determines the voltage level at which the high voltage shut down operates, are factory adjustments and should only be readjusted in the field in case of trouble conditions.

2.04 To adjust the current droop, move the slider of the CC resistor to extreme left. Load rectifier to approximately 13 amperes. Move the slider of the CC resistor to the right until M1 ammeter reads 11 amperes.

Caution: Checking and adjustment of the high voltage shut down circuit requires raising the battery voltage above float limits; and as such, may cause damage to connected equipment.

2.05 To adjust the high voltage shutdown circuit, proceed as follows:

Figure 2 (Mfr Disc.) R8 Slide Wire Resistor

(1) Turn off the rectifier (S1 switch and CB1 circuit breaker in OFF position) and remove F1 fuse.

(2) Position the slider of the R8 resistor at the approximate midpoint of its travel.

(3) Replace F1 fuse and turn on rectifier.

(4) Load rectifier to approximately 2 amperes and increase the output voltage to the specified value, if no value is specified adjust the 2.45 volts per cell by rotating the VOLTS ADJ potentiometer in a cw position.

(5) If the rectifier shuts down at less than the specified value or 2.45 volts per cell, turn the rectifier off and remove the F1 fuse. Move the slider to the right about 1/8 inch. This will cause the high voltage shutdown circuit to operate at a higher output voltage. (Moving the slider to the left will cause shutdown at a lower voltage.) Repeat steps (3), (4), and (5) as required.

(6) Readjust the VOLTS ADJ potentiometer for proper float voltage.

Figure 3 R8 Potentiometer "G" Option

(1) Rotate the R8 potentiometer to its extreme cw position.

(2) Load the rectifier to approximately 8 amperes and rotate the VOLTS ADJ potentiometer in a cw direction increasing the output voltage to the specified value. If no voltage is specified adjust to 2.45 volts per cell.

(3) Slowly rotate the R8 potentiometer in a ccw direction until the rectifier shuts down.

(4) Readjust the VOLTS ADJ potentiometer for proper float voltage.

Figure 3 R8 Potentiometer "H" Option

(1) Turn off the rectifier (S1 switch and CB1 circuit breaker in the OFF position) and remove the F1 fuse.

(2) Rotate the R8 potentiometer to its extreme ccw position and disconnect pole B of the CB1 circuit breaker by removing the LINE lead on pole B.

(3) Replace F1 fuse and turn ON the rectifier. With the rectifier loaded to approximately 8 amperes, rotate the VOLTS ADJ potentiometer in a cw direction increasing the output voltage to the specified value. If no voltage is specified, adjust to 2.45 volts per cell.

(4) Using a KS-14510, L5 multimeter on the 3 Volt DC range, monitor the voltage between terminals 2 and 1 of the Q1 transistor, positive to negative respectively. The meter reading should be a small positive value. Slowly rotate the R8 potentiometer cw until the meter reads 0 volts, then remove the multimeter.

(5) Rotate the VOLTS ADJ potentiometer in a cw direction increasing the output 0.5 volt above the value specified in step (3). Then, touching the LINE lead to pole B of the CB1 circuit breaker should cause the breaker to operate. If the breaker does not operate within several seconds, repeat step (4) adjusting the R8 potentiometer until the multimeter reads 0.05 volt positive. This will cause shutdown at a lower voltage.

(6) Turn the rectifier OFF and reconnect the LINE lead to pole B of the CB1 circuit breaker. Rotate the VOLTS ADJ potentiometer ccw, turn ON the rectifier and readjust the VOLTS ADJ potentiometer for the proper float voltage.

Caution: The preceding steps (1) to (6) will set the shutdown value to within 1/4 volt of the desired value. To avoid operating the High Voltage Shutdown circuit outside its design limits, do not increase the output voltage slowly to verify this value.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 AC Input

105-, 115-, or 125-; or 210-, 230- or 250-, ±10 percent ac volts rms applied to the proper taps. 60 cycle ±2 percent, single phase.

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1.02 DC Output

Amperes	Volts
0 to 11	49 to 55

1.03 DC Output Voltage Regulation: ±1 percent for output current 0 to 10 amperes, including the ±10 percent line voltage variation.

2. FUNCTIONS

2.01 This rectifier is designed to perform the following functions.

(a) To furnish filtered dc power to a battery at a constant voltage within the designed load range.

(b) To limit the output current to a safe value under overload.

(c) To disconnect the rectifier from the load in event of a high voltage trouble condition.

(d) To provide negative output "X" option, or positive output "W" option, dc voltage.

3. CONNECTING CIRCUITS

3.01 This rectifier uses the J87214A regulator control circuit per SD-81551-01.

SECTION IV - REASONS FOR REISSUE

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded By
Q1, 30A Transistor H Option	Q1, 2N3766 Transistor G Option and D3, 446A Diode G Option

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