

J87329A RECTIFIER
48 VOLTS, 15 AMPERES
OPERATING METHODS

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J87329A RECTIFIER

OPTION	INPUT	OUTPUT
X	120V	52.08V
WS	208V	52.08V
WT	240V	52.08V

- 1.04** Additional options are provided for operation as follows:
- (a) For use in a 48-volt negative plant (positive ground)—Option Z
 - (b) For use in a 48-volt positive plant (negative ground)—Option Y
- 1.05** The rectifier is equipped with a high-voltage shutdown feature that turns the rectifier off if the output voltage level exceeds a predetermined value.

1. GENERAL

1.01 This rectifier provides a regulated dc power from a single-phase ac power source for use in charging and floating storage batteries of the 105D, 105E, 111A, and 131 power plants. This rectifier has a ferroresonant regulation feature that provides a relatively constant (± 1 percent) dc output. (See Fig. 1.)

1.02 This section does not require an Equipment Test List.

1.03 The rectifier is arranged for single phase, 105 to 129 volts, 60 ± 3 Hz, ac input, with 0.1 to 15 amperes load current. The rectifier is adaptable for the following variations.

Caution: *Voltages inside the rectifier case are over 150 volts to ground. Do not allow a test pick to touch two metal parts at the same time as destructive and dangerous short circuits may occur. Disconnect the alternating current supply before working on the rectifier except when necessary to make tests.*

1.06 This rectifier is designed to mount on a 23-inch relay rack and can be serviced and maintained from the front. All electrical connections can be made with the front cover removed. The meters, controls, and fuses are mounted on a hinged panel for access, maintenance, or replacement.

1.07 The instructions are based on schematic drawing SD-82009-01. For a detailed description of operation, see the corresponding circuit description.

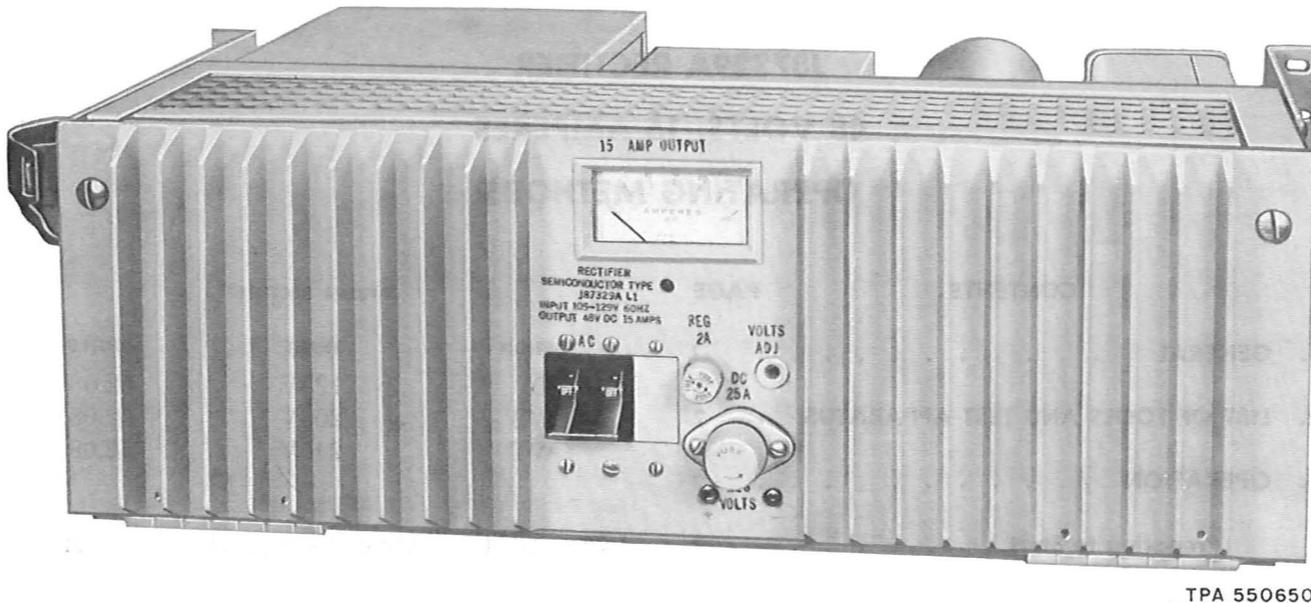


Fig. 1—J87329A Rectifier—Front View

1.08 The abbreviations cw and ccw refer to clockwise and counterclockwise, respectively.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-Inch C Screwdriver
TEST APPARATUS	
KS-8039	DC Volt-Milliammeter
KS-14510	Volt-Ohm-Milliammeter

3. OPERATION

3.01 The rectifier is completely automatic in the regulation of float voltage and should require no day-to-day routine adjustments. In addition to manual turnoff, it may shut down automatically upon occurrence of certain conditions.

3.02 The rectifier circuit has an inherent output current limiting characteristic. It is also designed to operate the circuit breaker CB1 to turn off the rectifier, in case of high output voltage.

3.03 **Preparing to Start:** When putting the rectifier in service, check that—

- (a) The T1 transformer taps used are correct for the ac input voltage.
- (b) The output leads are connected to the battery.
- (c) The ac service fuses are installed.
- (d) The CB1 circuit breaker is in the OFF position.

Note: When the alarm leads are connected and the CB1 circuit breaker is in the OFF position, the alarms are activated.

3.04 **Starting:** To start the rectifier, proceed as follows.

- (1) Rotate the VOLT ADJ (R4) potentiometer fully ccw.
- (2) Connect the KS-8039 volt-milliammeter, set to the 75 VOLT DC scale, to the battery terminals.

- (3) Operate the CB1 circuit breaker to the ON position.
- (4) Rotate the VOLT ADJ (R4) potentiometer cw until the KS-8039 volt-milliammeter indicates 52.08 volts dc at partial load.
- (5) Check that the OUTPUT dc ammeter indicates the normal office load.
- (6) Disconnect the KS-8039 volt-milliammeter.

3.05 Rectifier Adjustments: If several rectifiers are operated in parallel, it may be necessary to adjust the output of the rectifiers to obtain the proper output voltage and to achieve a degree of load sharing. Refer to the appropriate power plant Bell System Practice. If no power plant section is available, adjust as follows.

Note: The ideal adjustment would be to have each rectifier share the load equally. However, because of the extreme accuracy of the voltage regulating circuits, equal load sharing is not a practical requirement.

- (a) If the battery voltage is high, adjust the rectifier whose ammeter indicates the greatest output current as follows. Gradually rotate the VOLT ADJ potentiometer on the rectifier counterclockwise until the rectifier ammeter indicates a slight decrease in battery charging current. Recheck the voltage indication on the plant voltmeter. Repeat this procedure, if necessary, for the other rectifiers until the plant voltmeter indicates 52.08 volts.
- (b) If the battery voltage is low, adjust the rectifier whose ammeter indicates the least amount of battery charging current as follows. Gradually rotate the VOLT ADJ potentiometer on the rectifier clockwise until the rectifier ammeter indicates a slight increase in battery charging current. Recheck the voltage indication on the plant voltmeter. Repeat this procedure, if necessary, for the other rectifiers until the plant voltmeter indicates 52.08 volts.

3.06 Stopping: To stop the rectifier, proceed as follows.

- (1) Operate the CB1 circuit breaker to the OFF position.

Note: The alarms will be activated if the alarm leads are connected.

- (2) If the rectifier is to be left out of service for an extended period of time, remove the ac service fuses and the dc output fuses.

Caution: All power should be disconnected before attempting maintenance in the power sections of the rectifier. The battery should be disconnected when the rectifier is shut down for extended periods or for maintenance. Be careful not to short circuit the battery or sensing terminals.

3.07 High-Voltage Shutdown Adjustment: To adjust the high-voltage shutdown circuit, proceed as follows.

Caution: Checking and adjustment of the high voltage shutdown circuit require raising the battery voltage above the float limits which may cause damage to connected equipment.

Note: The HV SHUTDOWN (R3) potentiometer is factory adjusted and should only be readjusted in the field in case of trouble conditions.

- (1) Remove DC OUTPUT (F1) fuse to disconnect the battery and load.
- (2) Connect the KS-8039 volt-milliammeter, set to the 75 VOLT DC scale, to the output terminals of the rectifier.
- (3) Rotate the HV SHUTDOWN (R3) potentiometer fully ccw.
- (4) Rotate the VOLT ADJ (R4) potentiometer cw until the KS-8039 volt-milliammeter indicates 54.5 volts dc.
- (5) Slowly rotate the HV SHUTDOWN (R3) potentiometer cw until the CB1 circuit breaker just operates to shut down the rectifier.
- (6) Rotate VOLT ADJ (R4) potentiometer fully ccw.
- (7) Wait one minute. Then reset the CB1 circuit breaker and operate it to the ON position.

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- (8) Rotate VOLT ADJ (R4) cw to check that high-voltage shutdown occurs between 54.2 and 54.8 volts. If it does, proceed to (9). If it does not shut down, readjust the high-voltage shutdown as per (1) through (7).
- (9) Rotate R4 to its approximate midrange position.
- (10) Replace the DC OUTPUT (F1) fuse.
- (11) Wait one minute. Then reset the CB1 circuit breaker and operate it to the ON position.
- (12) Rotate the VOLT ADJ (R4) potentiometer cw until the KS-8039 volt-milliammeter indicates float voltage at partial load (52.08 volts).
- (13) Disconnect the KS-8039 volt-milliammeter.

4. ROUTINE CHECKS

4.01 Routine checks are intended to detect defects particularly in infrequently operating parts of the equipment and insofar as possible to guard against circuit failures which interfere with service. Checks and adjustments, other than those required by trouble conditions, should be performed during a period when there will be a minimum interference.

4.02 Periodically check the output float voltage on the associated power plant voltmeter when the unit is operating on voltage control. If the voltage is not correct, readjust the rectifier float voltage as outlined in 4.04.

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

Caution: *When using a portable instrument, 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. If connections are to be changed from one instrument range to another, the power should first be disconnected from equipment being tested or, if test picks are being used, they should be removed from the equipment under test.*

4.04 Circuit Check: Periodically check the dc output voltage and current and the setting of the high-voltage shutdown circuit as follows.

- (1) Remove the DC OUTPUT (F1) fuse to disconnect the battery and load.
- (2) Connect the KS-8039 volt-milliammeter, set to the 75 VOLT DC scale, to the output terminals of the rectifier.
- (3) Rotate the VOLT ADJ (R4) potentiometer cw until the CB1 circuit breaker just operates.

Requirement: The KS-8039 volt-milliammeter indicates 54.2 to 54.8 volts just prior to the operation of the CB1 circuit breaker.

Note: If the requirement in (3) is not met, refer to 3.07 for the adjustment procedure of the high-voltage shutdown circuit.

- (4) Adjust the VOLT ADJ (R4) potentiometer to its approximate midrange position.
- (5) Replace the DC OUTPUT (F1) fuse.
- (6) After one minute, reset the CB1 circuit breaker and operate it to the ON position.
- (7) Adjust the VOLT ADJ (R4) potentiometer until the KS-8039 volt-milliammeter indicates float voltage at partial load (2.17 volts per cell).
- (8) With multiple rectifiers, use R4 potentiometer to give approximately equal load on each at float voltage.
- (9) Disconnect the KS-8039 volt-milliammeter.

5. TROUBLES

5.01 If there is no output from the rectifier, the first items to be investigated should be the input and output fuses. If possible, the cause of the trouble should be determined and corrected before replacing the fuse. A blown fuse may be due to trouble in the rectifying element. If a new fuse does not blow when the load is disconnected and does blow when the load is reconnected, the trouble is probably external to the unit.

5.02 Various troubles and possible causes are listed in 5.05. Since some unsatisfactory

conditions will damage more than one component, all checks listed under a given cause should be made even though defective components are revealed before the entire checking procedure has been completed.

5.03 Component test procedures are made with the rectifier disconnected from the external output circuit. Before testing components, operate the CB1 circuit breaker to the OFF position and remove the fuses associated with the rectifier at the equipment fuse panel. Disconnect the output connector.

Caution: *In making continuity checks, use the ohmmeter portion of the KS-14510 volt-ohm-milliammeter. Do not use the X10,000 position for testing semiconductor devices as the higher voltage may damage them.*

5.04 If it is necessary to disconnect any leads, mark and record the connection.

Caution: *Soldering operations on semiconductors should be done at the lowest possible temperature and in the shortest time practical in order to localize the heating effect and thus prevent damaging the semiconductors. For the protection of the semiconductors, use the P long-nose pliers as a heat sink.*

Trouble Chart

5.05 Should any of the following troubles develop, it is suggested that the possible causes listed be checked. If the trouble is not found, look for loose or open connections or short circuits due to foreign matter lying across wiring terminals.

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TROUBLES	POSSIBLE CAUSES
(a) No dc output voltage or current. [INPUT (CB1) circuit breaker not operated.] (Input ac line fuse not blown.)	(1) CR5 diode open. (2) L1 inductor open. (3) Circuit wiring open.
(b) No dc output voltage or current. Input ac line fuse blown. [INPUT (CB1) circuit breaker not operated.]	(1) Defective T1 transformer.
(c) VOLT ADJ potentiometer does not control the output voltage.	(1) Defective Q4 transistor. (2) Defective CR2 diode or RV1 or RV2 varistor (CP1). (3) Defective Q1 transistor. (4) Defective VOLT ADJ (R4) potentiometer. (5) Defective R6 resistor.
(d) Output voltage high. [Voltage does not exceed 55.0 volts and the INPUT (CB1) circuit breaker is not operated.]	(1) VOLT ADJ (R4) potentiometer improperly adjusted. (2) High ac line voltage (higher than 130 volts.) (3) Defective Q1 transistor. (4) Defective CR2 diode or RV1 or RV2 varistor (CP1).
(e) Output voltage exceeds 55.0 volts. [INPUT (CB1) circuit breaker operates to shut down rectifier.]	(1) Q1 triac (open Anode 1 to Anode 2.) (2) Defective CR2 diode or RV1 or RV2 varistor (CP1).
(f) INPUT (CB1) circuit breaker does not operate to shut down the rectifier when the output voltage exceeds 55.0 volts.	(1) HV SHUTDOWN potentiometer improperly adjusted (see 3.07). (2) Defective Q2 transistor. (3) Defective INPUT (CB1) circuit breaker. (4) Circuit wiring open. (5) Defective R2, R3, or R4 resistor.
(g) Output voltage low.	(1) VOLT ADJ potentiometer improperly adjusted. (2) Low ac line voltage. (3) Rectifier overloaded.
(h) Output voltage low. (Voltage is not controlled by VOLT ADJ potentiometer.)	(1) Defective Q1 triac (short Anode 1 to Anode 2). (2) Defective CR2 diode or RV1 or RV2 varistor (CP1). (3) Q4 shorted. (4) Defective T1 transformer. (5) Defective R4.
(i) Excessive ac ripple on output.	(1) Rectifier overloaded. (2) Defective C1.1 or C1.2. (3) Defective C2 capacitor. (4) L1 inductor shorted.