

**RECTIFIER**  
**J87232A**  
**24 VOLTS, 30 AMPERES**  
**OPERATING METHODS**

**1. GENERAL**

**1.01** This section covers the operation of the J87232A rectifier in conjunction with the J87214B Regulated Rectifier Control Circuit. The rectifier is intended to automatically charge and float storage batteries of the 111A plant.

**1.02** This section is reissued to reference a change in the rectifier failure alarm circuit and to add a fuse alarm and high voltage shutdown check. This reissue does affect the Equipment Test List.

**1.03** This rectifier operates on nominal 230-volt, 60-Hz, single-phase power source and has a rated output of one to thirty amperes at 24 volts dc. The dc output voltage regulation is  $\pm 1$  percent for load and line variation. The rectifier utilizes PNP devices for single-phase full-wave rectification and a self-contained transistorized regulating circuit which controls the PNP devices and automatically limits the output current.

**Warning 1:** *Voltages inside the rectifier case are over 150 volts to ground. Avoid all contact with terminals. 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 alternating current supply before working on the rectifier except when necessary to make tests.*

**Warning 2:** *When checking components in the rectifier where the 24 volts battery potential is present, the rectifier must be isolated from the batteries as described in 5.03.*

**1.04** 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. Terminal

strips for ac input and dc output are provided at the top of the unit.

**1.05** Options are provided for operation as follows:

- (a) For use in a 24-volt positive plant (negative ground).
- (b) For use in a 24-volt negative plant (positive ground).

**1.06** 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.

**1.07** The instructions are based on drawings SD-81596-01, Issue 8 for the rectifier and SD-81543-02, Issue 4 for the Regulated Rectifier Control Circuit. For detailed description of operation, see the corresponding circuit description. If this section is to be used with equipment or apparatus that is associated with an earlier or later issue of the schematic drawing, reference should be made to the SD and CD to determine the extent of the changes and the manner in which the section may be affected.

**1.08** For more detailed information on the operation and maintenance of individual equipment or apparatus, refer to the appropriate Bell System Practices.

**2. TOOLS AND TEST APPARATUS**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
—	3-Inch Screwdriver

## SECTION 169-260-301

CODE OR  
SPEC. NO.

DESCRIPTION

Starting

### TEST APPARATUS

KS-14510,L1 Volt-Ohm-Milliammeter

### 3. OPERATION

#### Preparing to Start

**3.01** When placing the rectifier into service initially, check that:

- (a) The OUTPUT circuit breaker is in the OFF position.

**Note:** This rectifier circuit has been modified so that the RFA relay operates providing alarm indications when the CB1 OUTPUT circuit breaker is tripped either manually or automatically. The RFA relay can be released and the alarms retired by depressing the ACO key.

- (b) The proper size fuses are provided and removed from 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 and T2 input transformer taps used are correct for the power supply voltages as measured with KS-14510, L1 meter.

**Caution:** When using 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.

- (f) The ADJ VOLTS potentiometer is in the maximum counterclockwise (ccw) position.

**3.02** Proceed as follows:

- (1) Install control circuit fuses A and B.
- (2) Operate CB1 OUTPUT circuit breaker to ON position.

**Requirement:** All alarm indications should be retired.

- (3) Rotate the ADJ VOLTS potentiometer clockwise (cw) until the voltage output of the rectifier is equal to the battery float requirement at the associated power plant.

**Note:** The CC (R9) potentiometer is factory adjusted and should not be readjusted unless the rectifier fails to limit the output current to 30 amperes. (See 4.04).

### 4. ROUTINE CHECKS

**4.01** As often as local experience demands, the relays should be inspected for condition of contacts, making sure that they are in accordance with the circuit requirements table and Bell System Practices which apply.

**4.02** The dc output should be checked frequently to make certain that it is correct.

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

**4.04** **Current Limiting Circuit Check:** Check the adjustment of the CC (R9) potentiometer as follows:

- (1) Increase the load on the rectifier until the OUTPUT meter indicates 30 amperes; then, add more load.

**Requirement:** As more load is added, the output should remain at approximately 30 amperes.

**Note:** If the requirements are not met in step 1, proceed with step 2.

- (2) Rotate CC (R9) potentiometer fully cw.

- (3) Increase the load on the rectifier until the OUTPUT meter indicates 31 amperes.
- (4) Rotate CC (R9) potentiometer slowly ccw until the output meter indicates 30 amperes.
- (5) Remove the load from the rectifier.

**4.05 High Voltage Shutdown Check:** Verify that the rectifier is operating normally and proceed as follows.

- (1) Connect ground to the HV lead of the rectifier.

**Requirement:** The RFA relay operates providing alarm indications and the CB1 circuit breaker trips shutting down the rectifier.

- (2) Remove the ground from the HV lead.
- (3) Depress the ACO key.
- (4) Operate the CB1 circuit breaker to the ON position.

**Requirement:** The rectifier should restart and all alarm indications should be retired.

**4.06 Fuse Alarm Check:** Check the fuse alarm circuit as follows.

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

**Requirement:** The rectifier is shut down. If alarms are activated, they can be retired by depressing the ACO key.

- (2) Remove the B fuse and replace it with a blown fuse.
- (3) Operate the CB1 circuit breaker to the ON position.

**Requirement:** The RFA relay operates providing alarm indications and the CB1 circuit breaker trips shutting down the rectifier.

- (4) Replace the fuse removed in (2)
- (5) Operate the CB1 circuit breaker to the ON position.

**Requirement:** The rectifier restarts and all alarm indications are retired.⚡

## 5. TROUBLES

**5.01** Should a diode or PNP device in the rectifier stack become defective, replace the complete rectifier stack.

**5.02** Should any component of the Regulated Rectifier Control Circuit become defective, replace the complete regulator.

**5.03** ⚡A 24-volts battery potential is present at several points in the rectifier even when the AC supply is disconnected. When checking for defective components in the rectifier, the rectifier should be isolated from the batteries. This can be done by removing the REG fuse and disconnecting the charge lead at the bus bar in the power board.

**Warning:** Due to the limited clearance to ground at this connection point, extreme care must be exercised to avoid short circuits. The plant cabling may have to be rearranged to gain access to the cable lugs.⚡

### Trouble Chart

**5.04** Should any of the following troubles develop, check the possible causes listed. If trouble is not found, look for loose or open connections or short circuits due to foreign matter lying across wiring terminals.

TROUBLE	POSSIBLE CAUSE
No direct current	Failure or disconnection of the input power. Blown ac power fuses or fuses in the rectifier.
Low dc voltage (with output less than 30 amperes)	Low input voltage. Shorted capacitors. Incorrect transformer taps used. Defective diode or PNP device in rectifying element. Potentiometer out of adjustment.
High dc voltage	Potentiometer out of adjustment. Defective diode or PNP device in rectifying element.
Erratic dc current or voltage	Loose connections at potentiometers or resistors. Intermittent open or short in any component.