RECTIFIER
J87447A
24 VOLTS, 15 AMPERES
OPERATING METHODS

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1. GENERAL

1.01 The J87447A rectifier is a general purpose rectifier and is used in the 105D, 105E, 111A, 130A, and Manual PBX power plants. The rectifier operates from 120/208/240 volts, single-phase 60 ±3 Hz ac input and provides filtered and regulated 24 volts dc at 15 amperes maximum, to float a 12-cell battery.

1.02 Whenever this section is reissued, the reasons for reissue will be given in this paragraph. This issue affects the Equipment Test List.

1.03 This section is based on drawings SD-82466-01 Issue 1, and CD-82466-01, Issue 1. If this section is to be used with equipment or apparatus that is associated with a later issue of the 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.

1.04 The J87447A rectifier includes the following circuit features: ferrorsonance control, current limit, fuse alarm, high-voltage shutdown, backup high-voltage shutdown, circuit board installation check, and manual start and stop.

1.05 The rectifier has the following additional features: Automatic crossover to internal sense should the external leads open, capability of floating 12 lead-acid cells at 2.17 volts per cell plus a 2-volt battery feed loop drop between the rectifier and the point of regulation, manual adjustment of output volts, visual indication of rectifier failure, test jacks for reading output volts at the point of regulation, output current ammeter, and fuse failure shutdown.

> ***Note:*** The high-voltage shutdown feature is dependent upon the rectifier delivering load current of at least 1.50 amperes. In addition, it requires high voltage to be present at the output of the rectifier.

1.06 The output polarity of the rectifier is determined by wiring Options Y and Z. Option Y is required for those applications in which the negative side of the battery is grounded. Option Z is required in those applications in which the positive side is grounded.

1.07 Regulation is obtained by the use of a controlled ferroresonant regulator, consisting of a ferroresonant transformer and an electronic control circuit. The control circuit acts upon the transformer to provide output voltage regulation against input voltage, frequency, and load current variations.

1.08 The rectifier is rack mounted and is 7 inches high, 23 inches wide, and 12 inches deep.

1.09 To simplify maintenance; the circuit associated with alarm, power control, voltage regulation, current limiting, and voltage walk-in, are mounted on replaceable circuit packs. Input and output power connections, filter capacitors, and printed

circuit packs are accessible through a door in the front of the cabinet.

1.10 Keep ventilating passages of the rectifier unobstructed to ensure adequate cooling during operation.

1.11 If the rectifier is held in stock or otherwise out of service for a period exceeding 30 months, the polarized electrolytic capacitors should be checked and serviced in accordance with Section 032-110-701.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-Inch C Screwdriver
TEST APPARATUS	
KS-20599, L4	Digital Multimeter or
KS-8039	Volt-Millammeter

3. OPERATION

3.01 ***Preparing to Start:*** Prepare the rectifier for service as follows:

(1) Operate the ENABLE/DISABLE switch (S1) to DISABLE. Make sure that the output circuit breaker (CB2) is OFF and the input circuit breaker (CB1) is OFF.

Danger: Voltages inside the rectifier may exceed 150 volts to ground. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time since destructive and dangerous short circuits may occur.

(2) Rotate the OUTPUT VOLTS ADJ control fully counterclockwise (ccw).

(3) Verify that ac input power is present at the input terminals of the rectifier.

(4) Connect the KS-20599, L4, digital multimeter, set to the 1000-volt ac scale, to measure the ac voltage applied to the J87447A rectifier. Measure the voltage at the input terminals of the rectifier located inside the cabinet.

Requirement: The input ac voltage should measure according to option as follows:

NOMINAL AC VOLTAGE LIMITS	
OPTION	INPUT
208 (Option S)	184 to 220
240 (Option S)	212 to 254
120 (Option S)	105 to 129

(5) Check that the regulation and control circuit fuses F1 (+V) and F2 (-V) are installed.

3.02 ***Starting:*** To place the rectifier in service, proceed as follows:

(1) Verify that the procedures of paragraph 3.01 have been completed.

(2) Adjust the manual OUTPUT VOLTS ADJ to the minimum voltage ccw position.

(3) Connect the KS-20599, L4, digital multimeter, set to the 100-volt dc scale, to the battery positive and negative bus bars.

(4) Operate the ENABLE/DISABLE switch (S1) to ENABLE.

(5) Operate the input circuit breaker (CB1) to ON to precharge the filter capacitors of the rectifier.

(6) After 30 seconds, operate the output circuit breaker (CB2) to ON to connect the rectifier to the load.

(7) Adjust the manual OUTPUT VOLTS ADJ so that the voltage measured at the battery terminals is 26.04 (2.17 volts per cell).

(8) If the meter reads above 26.04 volts and there are other rectifiers on the line, they should be adjusted down until 26.04 volts are

reached. The rectifier placed into service should be adjusted until it picks up load.

Note: If the rectifier goes into current limit and 26.04 volts are not reached, do not adjust the rectifier any higher. Allow time for the batteries to charge until the rectifier drops out of current limit. If the rectifier does not drop out of current limit after some time and 26.04 volts are not reached, more rectifiers must be added to the plant to support the load.

(9) Disconnect the test leads of the KS-20599, L4, digital multimeter from the battery.

3.03 ***Stopping:*** To stop the rectifier, operate the ENABLE/DISABLE switch (S1) to DISABLE.

Note: The input circuit breaker (CB1) will operate to OFF.

3.04 ***Taking the Rectifier Out of Service:*** To take the rectifier out of service, proceed as follows:

(1) Operate the ENABLE/DISABLE switch (S1) to DISABLE.

Requirement: The input circuit breaker (CB1) operates to OFF.

(2) Operate the output circuit breaker (CB2) to OFF.

(3) Remove fuses F1 and F2.

(4) Remove the associated ac input fuses from the power service cabinet.

4. ROUTINE CHECKS AND ADJUSTMENTS

Danger: Voltages inside the rectifier may exceed 150 volts to ground. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time since destructive and dangerous short circuits may occur.

Caution: Routine checks and adjustments are intended to detect and correct defects and abnormal operating conditions that may cause service interruptions. Routine checks should be made only when they will not interfere with service.

4.01 ***Output Voltage Adjustment:*** To adjust the output voltage, proceed as follows:

(1) Connect the KS-20599, L4, digital multimeter, set to the 100-volt dc scale, to the terminals of the battery.

(2) Check that the ENABLE/DISABLE switch (S1) is in the ENABLE position and the input circuit breaker (CB1) is operated to ON. Check that the output circuit breaker (CB2) is closed.

(3) Adjust the OUTPUT VOLTS ADJ to obtain 26.04 volts at the battery terminals.

Note: Turning the OUTPUT VOLTS ADJ control clockwise (cw) causes the output voltage to increase rapidly up to the terminal voltage of the battery. Above this level, the voltage increases slowly and the charging current increases rapidly as the OUTPUT VOLTS ADJ control is turned cw.

(4) After the battery voltage is adjusted to 26.04 volts dc, disconnect the KS-20599, L4, digital multimeter leads from the battery.

5. TROUBLES

5.01 The possible causes of troubles in the rectifier and the corrective actions to be taken are given in the following chart. In addition to the action specified, check for loose and open connections. Check for short circuits due to foreign matter lying across wiring terminals.

5.02 If the trouble is not corrected by following the trouble charts, refer to the circuit schematic drawing for additional information. Refer to Section 032-173-301 for testing, replacing, and storing circuit packs and semiconductor devices.

TROUBLE CHART

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
No output (RECT FAIL lamp illuminated)	(1) No input power ac power failure	Locate and correct fault. Restore input power.
	(2) Input fuses operated in ac power service cabinet	Locate and correct cause of operated fuse. Replace operated fuse.
	(3) Fuse F1 and F2 for alarm and control circuit operated	Replace fuse. If fuse operates a second time, replace circuit pack CP1.
	(4) Input power circuit breaker CB1 will not stay closed due to:	
	(a) Fuse F1 or F2 operated or removed	Correct cause of trouble. Replace fuse F1 or F2.
	(b) Components on HV shutdown PC board CP1 defective: Q1, Q2, CR1, CR2, CR3, associated resistor	Replace CPS SP1.
	(c) Components on CPS SP4, in HV shutdown circuit, defective: IC1, R12, C11, R53	Replace CPS SP4.
	(5) Output circuit breaker tripped open	Check that load is ready to receive charge. Close output circuit breaker.
	(6) Rectifier/filter circuit components defective: CR3, CR4, L1, C3, C4, M1	Locate and replace defective components.
Output current low	(1) OUTPUT VOLTS ADJ (R13) out of adjustment or open	Readjust OUTPUT VOLTS ADJ (R13). Replace R13 if defective.
	(2) Defective components in regulation control circuit on CPS SP4.	Replace CPS SP4.
Output current high	(1) OUTPUT VOLTS ADJ (R13) shorted or out of adjustment	Readjust R13. Replace R13 if defective.

TROUBLE CHART
(Contd)

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Output current high (contd)	(2) Current control circuit components defective on CPS SP4: R25, R17, R34, R40, IC1, CR8	Replace CPS SP4.
		Danger: There are high voltages present in this area of the circuit.
Output current not limited to 15 amperes	(1) Resistors R16 or R17 open (on each side of meter M1 shunt R18)	Replace R16 or R17.
	(2) Defective components in current limiting circuit	Replace CPS SP4.
Selective high-voltage shutdown circuit inoperative	(1) Rectifier not delivering at least 1.50 amperes	Operation is normal. Circuit operates only when output current is 1.50 amperes or more.
	(2) External high-voltage shutdown signal (ground) not applied to CPS SP4	Check external high-voltage shutdown signal connections. Repair as required.
	(3) Components of high-voltage shutdown circuit defective: R14, IC1C, R53, C11, and CR15	Replace CPS SP4.