RECTIFIERS
MISCELLANEOUS FERRORESONANT-TYPE
OPERATING METHODS

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1. GENERAL

1.01 This section covers semiconductor-type ferroresonant regulated rectifiers used in power plant applications. The rectifiers provide a dc output of 48 volts at 8.0 amperes for batteryless applications, where an external capacitor bank is furnished, with the exception of the KS-19642 L3 and KS-19867 L1 and L2 rectifiers which have an internal capacitance. The rectifiers are arranged for a nominal 117-volt 60-Hz, single-phase input. The rectifiers consist of a ferroresonant transformer and associated ac capacitor, silicon diodes, filter capacitors, filter inductor, and a bleeder resistor. They are arranged for 23-inch rack mounting.

1.02 This section is reissued to specify appropriate resistor values for use in performing routine checks, to rate KS-19642 L1, 2, 4, and 5 Mfr Disc., and to add KS-19642, L6. This reissue does not affect the Equipment Test List.

1.03 The rectifiers covered in this section are as follows:

▮KS-19642 L1, L2, L4, and L5 (Mfr Disc.)▮

KS-19642 L3

▮KS-19642 L6▮

KS-19867 L1

KS-19867 L2

1.04 These rectifiers, with the exception of the KS-19642 L3 rectifier, will function with the following systems and may be used for other applications where the power requirements correspond to the capabilities of these rectifiers.

- 101 Electronic Switching System Phase 3A (J86857)
- 2A Automatic Call Distribution System (J86818B, C, and D)
- 756A PBX System (J86464L)
- 757 PBX System (J86808B, C, and D)
- 400 Switching System (J86812A)

The KS-19642 L3 rectifier is used with the Broad-Band Restoration Order Wire (J68883).

1.05 Routine checks are intended to detect defects and to guard against circuit failures which may interfere with service. Checks and adjustments, other than those required by trouble conditions, should be made during a period when they will cause the least unfavorable reaction to service.

> ***Note:*** If the equipment is out of service for an extended period of time, the electrolytic capacitors shall be connected to a source of direct current of suitable voltage and polarity, as covered in Section 032-110-701.

2. LIST OF TOOLS, MATERIALS, AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	4-Inch E Screwdriver
MATERIALS	
—	50-Ohm Resistor 100 Watts Minimum
—	25-Ohm Resistor 150 Watts Minimum (7 req'd)
KS-19319	7000 μF, 55V DC Capacitor (3 reqd)
TEST APPARATUS	
KS-14510	Volt-Ohm-Milliammeter
—	Variac, W10, General Radio (or equivalent)
—	Electronic Voltmeter, Ballantine Model 300U/3 (or equivalent)

3. OPERATION

3.01 The rectifier output voltage is regulated to limit the output voltage variations between 46 and 52.6 volts direct current for line voltage ($\pm$10%) and load (0.5 to 8.0 amperes) variations. The output voltage will vary approximately 1.5 percent for each 1 percent change in input line frequency.

Preparing to Start

3.02 When preparing to place the rectifier into service, check that:

(a) All external connections are made in accordance with the schematic drawing covering the associated circuit of which the unit is a part.

(b) The ON-OFF switch is in the OFF position.

(c) The proper size fuse is installed in F1 fuse socket and spare fuses are available. If it is necessary to replace the fuse, replace only with an F1 fuse, Bussman MDA 10 (FN) or Littelfuse 314010 (FN) Multiple Element (time delay), 10 ampere, or equivalent.

Starting

3.03 Operate the ON-OFF switch to the ON position. The rectifier is regulated and no adjustment is necessary for proper operation.

3.04 Connect the KS-14510 volt-ohm-milliammeter, set to the 60 VOLT DC range, to the J1 and J2 test jacks.

Requirement: The KS-14510 volt-ohm-milliammeter indicates between 46 and 52.6 volts direct current (nominal 48 volts output).

4. ROUTINE CHECKS

4.01 Periodically check the rectifiers as follows.

Note: All checks of the rectifiers shall be made with an external 21,000-μF capacitance connected in parallel with the load, with the exception of the KS-19642 L3 rectifier which has a self-contained, 12,000-μF capacitance and the KS-19867 L1 and L2 rectifiers which have self-contained 20,000-μF capacitance. In the following checks, do not connect the 21,000-μF capacitance across the load when checking the KS-19642 L3 or KS-19867 L1 and L2 rectifiers.

(1) Operate the ON-OFF switch to the OFF position.

(2) Disconnect the ac input voltage.

(3) Using the 4-inch E screwdriver, loosen the screw head fasteners and remove the cover from the rectifier.

(4) Disconnect the office load from TS2, terminals 1 and 2.

(5) Connect the three KS-19319 capacitors (see note under 4.01) and the 50-ohm resistor, in parallel, to TS2, terminals 1 and 2.

(6) Connect the Variac to the input of the rectifier.

(7) Connect the Variac to an ac source and adjust the Variac for 105 volts alternating

current, 60 Hz, at terminals 1 and 2 of the rectifier input transformer, as measured on a KS-14510 volt-ohm-milliammeter set to the 300 VOLT AC range.

(8) Operate the ON-OFF switch to the ON position.

(9) Connect the KS-14510 volt-ohm-milliammeter, set to the 60 VOLT DC range, to the J1 and J2 output test jacks.

Requirement: The rectifier output voltage shall not exceed 52.6 volts direct current.

(10) Increase the input voltage to 129 volts alternating current, 60 Hz.

Requirement: The rectifier output voltage shall not exceed 52.6 volts direct current for any input voltage in the range of 105 to 129 volts alternating current, 60 Hz.

(11) Adjust the Variac for 105 volts alternating current, 60 Hz.

(12) Operate the ON-OFF switch to the OFF position.

(13) ♦Disconnect the 50-ohm resistor and connect the four 25-ohm resistors, connected in parallel, in its place.♦

(14) Operate the ON-OFF switch to the ON position.

Requirement: The rectifier output voltage shall not be less than 48.5 volts direct current.

(15) Increase the input voltage to 129 volts alternating current, 60 Hz.

Requirement: The rectifier output voltage shall not be less than 48.5 volts direct current for any input voltage in the range of 105 to 129 volts alternating current, 60 Hz.

(16) Adjust the Variac for 105 volts alternating current, 60 Hz.

(17) Remove the KS-14510 volt-ohm-milliammeter from the J1 and J2 output test jacks.

(18) Connect the Ballantine Model 300U/3 electronic voltmeter, set to the 0.1 VOLT AC range, to the J1 and J2 output test jacks.

(19) Increase the input voltage to 129 volts alternating current, 60 Hz.

Requirement: The meter indication shall be equal to or less than the voltages given for the following rectifiers:

♦KS-19642 L1, L2, L4, L5 and L6—20 millivolts rms♦

KS-19642 L3—40 millivolts rms

KS-19867 L1—20 millivolts rms

KS-19867 L2—20 millivolts rms

(20) Disconnect the Ballantine Model 300U/3 electronic voltmeter from the J1 and J2 output test jacks.

(21) Adjust the Variac for 105 volts alternating current, 60 Hz.

(22) Operate the ON-OFF switch to the OFF position.

(23) ♦Disconnect the four 25-ohm resistors connected in parallel and connect seven 25-ohm resistors, connected in parallel, in their place.♦

(24) Connect the KS-14510 volt-ohm-milliammeter, set to the 60 VOLT DC range, to the J1 and J2 output test jacks.

(25) Operate the ON-OFF switch to the ON position.

Requirement: The rectifier output voltage shall not be less than 46.0 volts direct current.

(26) Increase the input voltage to 129 volts alternating current, 60 Hz.

Requirement: The rectifier output voltage shall not be less than 46.0 volts direct current for any input voltage in the range of 105 to 129 volts alternating current, 60 Hz.

(27) Operate the ON-OFF switch to the OFF position.

(28) Disconnect the Variac from the ac source and from the rectifier.

(29) ◆Remove the three KS-19319 capacitors, if used, and the seven 25-ohm resistors, connected in parallel.◆

(30) Remove the KS-14510 volt-ohm-milliammeter.

(31) Connect the office load to TS2, terminals 1 and 2.

(32) Connect the ac input to the rectifier.

(33) Operate the ON-OFF switch to the ON position.

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

4.03 Semiconductor devices should be maintained in accordance with Section 032-173-301.

5. TROUBLES

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

TROUBLES	POSSIBLE CAUSES
No dc output	Short in load. F1 fuse blown. Capacitor shorted. L1 inductor open.
Low dc output	Overload Low ac line voltage. Defective diode. Defective dc capacitor. Open ac capacitor.
High dc output	L1 inductor shorted. Bleeder resistor open.
Excessive ac ripple on output	Rectifier overloaded. Line voltage too low. External capacitor not connected for the KS-19642L1, L2, L4, L5, and L6 rectifiers. Defective diode. Defective dc capacitor. L1 inductor shorted.