RECTIFIERS
KS-15907 L1 (PORTABLE)
KS-15907 L2 (RACK MOUNTED)
OPERATING METHODS

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1. GENERAL

1.01 This section covers the operation of the KS-15907 L1 (portable) and KS-15907 L2 (rack mounted) semiconductor-type rectifiers. These rectifiers are initially intended for maintaining float charge conditions on the plate battery of the 425A power plant while making cell-to-cell voltage measurements.

1.02 The section is reissued to revise Fig. 1, 2, and 3.

1.03 These rectifiers are adaptable for connection to either a 117- or 230-volt, 60-cycle power source and will deliver 120 to 130 volts dc at 1 ampere continuously. The output voltage variation is approximately 1.5 per cent for a 1 per cent change in input line frequency. These rectifiers use ferroresonant regulating transformers with load compensating networks to provide a regulated dc output. Jacks for measuring the output voltage are accessible without removal of the rectifier cover.

Caution: The voltages in these units exceed 500 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.

1.04 The KS-15907 L1 rectifier is shock mounted in a portable carrying case and is provided with a 3-wire cord and plug for input power connection. An adapter is furnished for use where 3-wire power outlets are not available. Connections to the output are made by means of individual cords terminating in insulated battery clips.

1.05 The KS-15907 L2 rectifier is designed for 19-inch rack mounting. It is the same as the KS-15907 L1 rectifier except that the carrying case and input and output cords are not furnished.

1.06 Keeping the ventilating passages clean is especially important to avoid excessive heating.

1.07 Routine checks are intended to detect defects, particularly in infrequently operated 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 made during a period when they will not interfere with service.

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

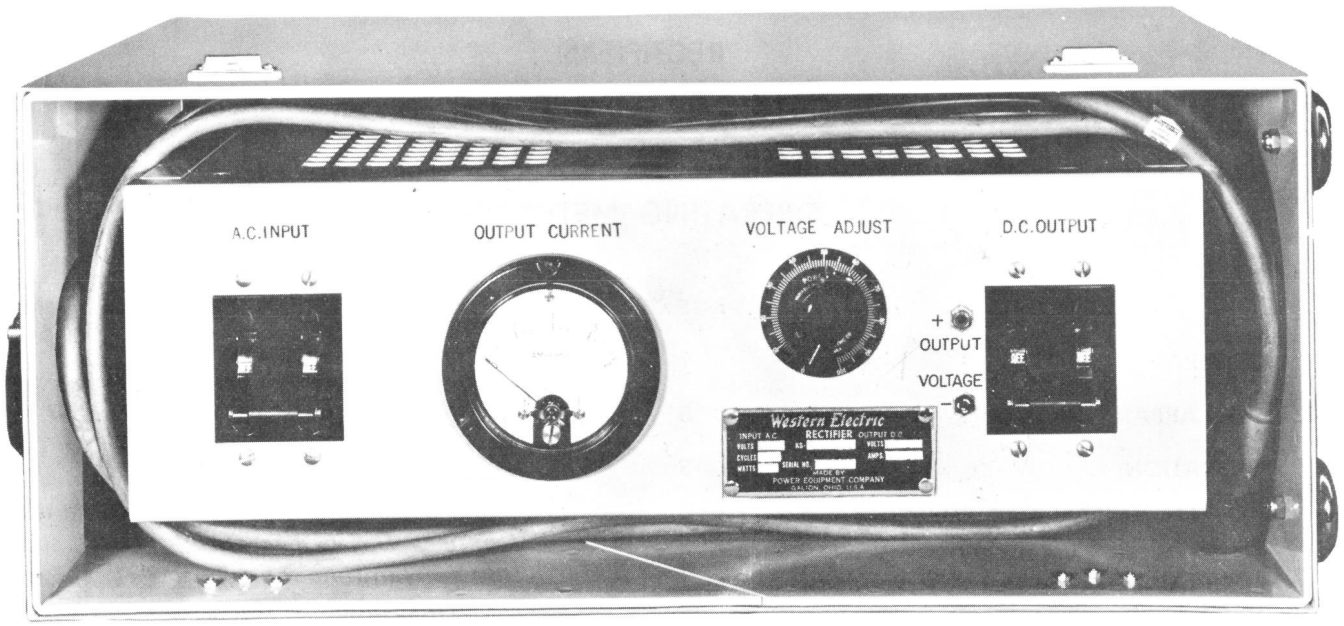


Fig. 1 – KS-15907 L1 Rectifier
(carrying case cover removed)

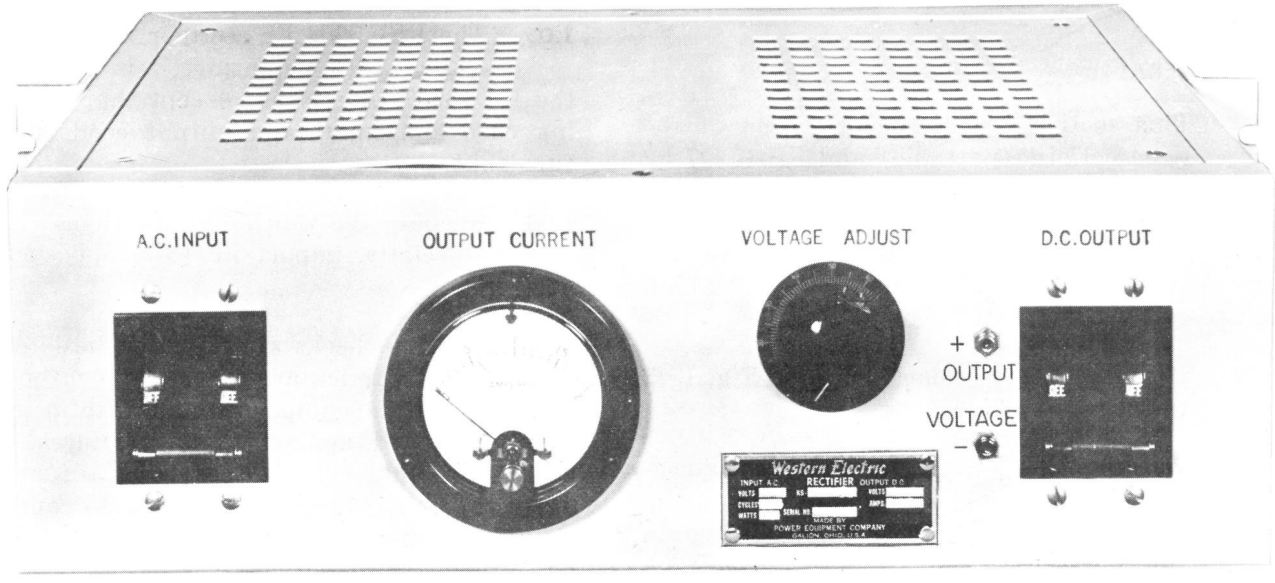


Fig. 2 – KS-15907 L2 Rectifier

2. TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TEST APPARATUS	
KS-14510 L1	Volt-Ohm-Milliammeter

3. OPERATION

How the Rectifier Unit Works (see Fig. 3)

3.01 Sixty-cycle power is supplied through the CB1 circuit breaker to the primary of the T1 single-core constant voltage transformer, which consists of a section that saturates magnetically and a section that does not saturate. The C1 tuning capacitor is connected across part of the secondary winding of the transformer on the saturable section of the core. At the operating output voltage level, this capacitor resonates with the winding, causing high saturation of the transformer core and resulting in an output voltage on the transformer secondary that is relatively insensitive to voltage variations on the primary. Part of the secondary of the T1 transformer is connected to the T2 continuously variable transformer by which the output voltage is adjusted from 120 to 130 volts dc. The load compensating network, consisting of the T3 transformer, the C2 capacitor, and the L1 inductor, produces a voltage which varies directly with the load, thereby tending to compensate for the voltage drop due to output regulation. The alternating current is rectified by the CR1 germanium full-wave rectifier stack. The C3 and C4 capacitors with the L2 inductor comprise the filter section. The R1 resistor maintains a minimum load on the output of the rectifier and also discharges the filter capacitors when the rectifier is disconnected from input power and load. The M1 ammeter measures the dc output current and the dc output voltage may be measured by connecting an external voltmeter to J1 and J2 pin jacks. The CB2 circuit breaker connects the power to the load and provides overload protection to the rectifier unit.

3.02 When this rectifier unit is used as a battery charger, the maximum output current is limited to a safe value due to the inherent current limiting action of the T1 ferroresonant transformer and the battery serves as a second section of the filter network.

3.03 When this rectifier unit is used to supply power to a resistance load, it may be necessary to use external filtering capacitors to satisfy ac ripple requirements.

Preparing to Start Initially

3.04 When preparing to put the rectifier into service initially, check that:

(a) The strapping on the T1 transformer terminal block is proper for the input voltage service available.

(b) The AC INPUT circuit breaker is in the OFF position.

(c) The DC OUTPUT circuit breaker is in the OFF position.

(d) The VOLTAGE ADJUST control is in the maximum counterclockwise position.

(e) The rectifier is connected to the power source.

Initial Adjustments

3.05 Proceed as follows.

(a) Connect the rectifier output to the battery and check that the connections are properly polarized with respect to the battery.

(b) Operate the AC INPUT circuit breaker to the ON position.

(c) Adjust the VOLTAGE ADJUST control clockwise until the voltage output of the rectifier is equal to the battery float voltage requirement. (See Section 157-601-301.)

(d) Operate the DC OUTPUT circuit breaker to the ON position.

Routine Adjustments

3.06 After following the procedure stated in 3.05, readjust the VOLTAGE ADJUST control as required to maintain battery float voltage. If the battery is large, the rectifier output current will be near the 2-ampere value. The current will reduce as the voltage builds up. Voltage regulation is effective at loads less than 1 ampere. When stable float conditions have been attained, cell-to-cell measurements of the battery may be made.

4. ROUTINE CHECKS

4.01 The following should be performed.

(a) The output voltage should be checked from time to time using the KS-14510 meter connected across the J1 and J2 jacks to make certain that the proper voltage is being maintained.

(b) Electrolytic capacitors should be maintained in accordance with Section 032-110-701.

5. TROUBLES

→Component Replacement

5.01 Replacements of the T1 ferroresonant transformer, the C1 tuning capacitor, or any component in the load compensating network (C2 capacitor, L1 inductor, and T3 transformer) should be made at the factory of the supplier. All other components can be replaced in the field.

5.02 ***CR1 Germanium Rectifier Stack:*** Do not attempt to replace a diode in the stack assembly. When replacements are required, replace the entire stack. ←

Trouble Chart

5.03 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.

Caution: The ac voltage across the terminals of the C1 tuning capacitor exceeds 500 volts. When making tests inside the rectifier, take care to avoid any contact with the leads and terminals of this capacitor.

TROUBLE	POSSIBLE CAUSE
(a) No output voltage	Failure or disconnection of the input power
	Defective circuit breaker
	Defective T1, T2, and/or T3 transformer
	Defective L2 inductor
	Shorted capacitors or resistor
(b) Low output voltage	Low input power voltage
	Incorrect transformer strapping
	Excessive load on rectifier
	Breakdown of C1 and/or C2 capacitor
	Defective T1, T2, and/or T3 transformer
	Defective L2 inductor
	Defective rectifying element
(c) High output voltage	High input power voltage
	Incorrect transformer strapping
	Defective T1 and/or T2 transformer
	Open R1 resistor
(d) High ripple voltage	Open C3 and/or C4 capacitor
	Defective L2 inductor
	Defective rectifying element
(e) Erratic output voltage	Intermittent open or short in any component
	Defective connections
(f) Input circuit breaker operates	Shorted C3 and/or C4 capacitor
	Defective rectifying element
	Defective T1 transformer
(g) Output circuit breaker operates when connected to battery	Shorted C3 and/or C4 capacitor
	Defective rectifying element
(h) Input circuit breaker holds but output circuit breaker operates when connected to battery	Improperly polarized connections to battery

6. POINT-TO-POINT VOLTAGES

6.01 As long as the rectifier unit operates satisfactorily, point-to-point voltage values are not needed and are not operating requirements to be checked in routine. In case the rectifier output cannot be obtained, they may be useful in locating defects or trouble conditions.

6.02 High voltages to ground are present within the rectifier unit, and every precaution should be observed to avoid any bodily contact with exposed metal parts or terminals when the rectifier unit is in operation, or when not in operation, but connected to either power source or battery.

Caution: When using any portable instrument, the leads should be carefully examined to make sure the insulation is undamaged. The leads should be properly connected at 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 the equipment being tested, or if test picks are being used, they should be removed from the equipment under test.

6.03 Readings should be made with a KS-14510 meter. The output of the rectifier will not be appreciably affected by connecting the meter leads to the circuit elements.

Caution: The values shown in the table in 6.04 are for a typical rectifier in good working condition. A defect in the rectifier may leave a high-voltage charge on a capacitor and other parts of the circuit with the power off. A defective rectifier with the power connected may have quite different voltages than those shown; therefore, it may be desirable to use a higher voltage scale until readings indicate the proper scale to use for the defective condition.

6.04 ***Table of Point-to-Point Voltages:*** The rectifier adjusted as follows:

Input Power

117 volts, 60 cycles ac

DC Output

No load

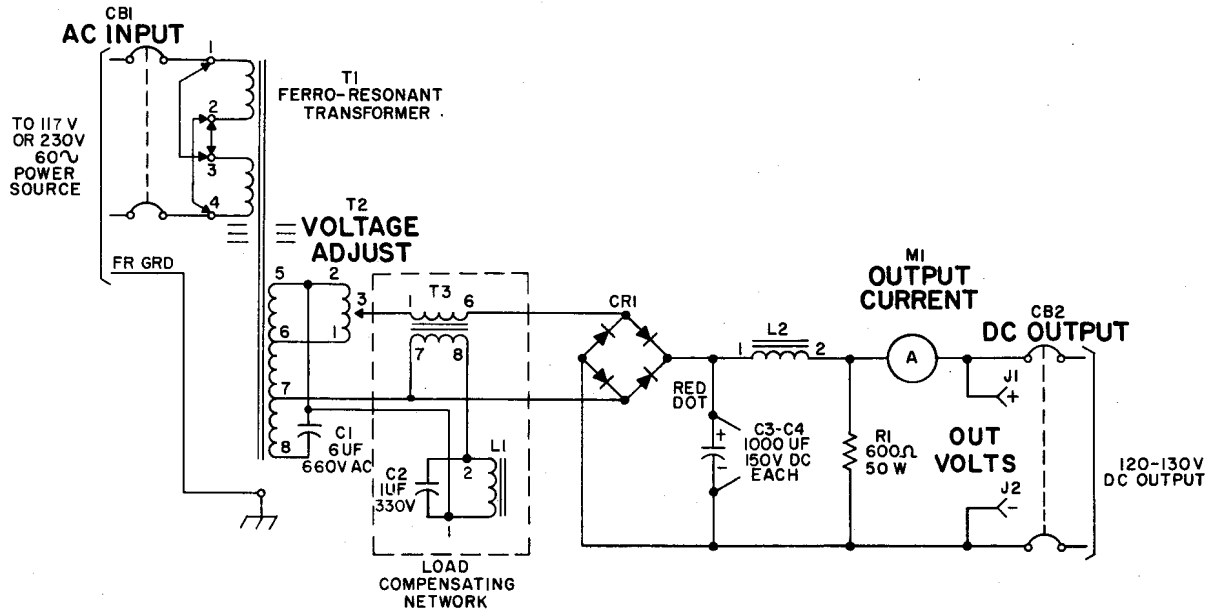
VOLTAGES FOR KS-15907 RECTIFIER

VOLTAGE ACROSS	MEASUREMENT MADE				SCALE AC OR DC	KS-14510 METER	
	FROM		*TO			RANGE (volts)	READING (volts)
	APP	TERM.	APP	TERM.			
T2	T2	1	T2	2	AC	60	20.5
C1	—	—	—	—	AC	600	530
T3	T3	1	T3	6	AC	12	3 to 4
CR1	T1	7	T3	6	AC	300	**
C3	—	—	—	—	DC	300	***
R1	—	—	—	—	DC	300	***

* TO terminal should be connected to the negative jack of the meter.

** 105 volts ac with the VOLTAGE ADJUST control in the maximum counterclockwise position. 125 volts ac with the VOLTAGE ADJUST control in the maximum clockwise position.

*** 110 volts dc with the VOLTAGE ADJUST control in the maximum counterclockwise position. 135 volts dc with the VOLTAGE ADJUST control in the maximum clockwise position.



INPUT TERMINAL BLOCK STRAPPING	
FOR 117 V AC	TERMINALS 1 TO 3 AND 2 TO 4
FOR 230V AC	TERMINALS 2 TO 3

Fig. 3 – KS-15907 Rectifier Simplified Schematic