J86249A, B, AND C RECTIFIERS
AND
J86249E L2 RELAY OUTPUT CONTROL
OPERATING METHODS

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1. GENERAL

1.01 The J86249A, B, or C rectifiers, in conjunction with the J86249E L2 relay output control, were designed to provide regulated dc power from an ac power service for use in charging storage batteries in 301 and 302 type plants.

1.02 This section is reissued to add a switch cleaning procedure and a reference to the KS-20522 controller. This reissue does affect the Equipment Test List.

1.03 The rectifiers and the relay output control circuit were designed to provide regulated dc power from an ac power service for use in charging storage batteries in 301 and 302 type plants. The rectifiers are available in ratings as follows:

J86249A, 44 to 65 volts, 100 amperes dc;
J86249B, 22 to 33 volts, 100 amperes dc;
J86249C, 22 to 33 volts, 200 amperes dc.

The input power requirement is 210 volts ± 8 percent, 3-phase, 3-wire, 60 Hz ± 2 percent alternating current, but, with transformers, they may be connected to nominal 230- or 250-volt power service. The output is automatically adjusted by operation of relays in response to signals from the connecting circuit. They are suitable for use in room temperatures from 50 to 104°F (10 to 40°C).

1.04 ⧫The instructions given in this practice are based on circuit schematic drawing SD-81129-01, Issue 23D. For a detailed description of operation, see the corresponding circuit description. If this section is to be used with equipment or apparatus that is associated with a later or earlier issue of the schematic drawing, reference should be made to the CD(s) and SD(s) to determine the extent of the changes and the manner in which the section may be affected.⧫

1.05 Routine checks are intended to detect defects, and to guard against circuit failures liable to 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.

Warning 1: Voltages inside the rectifier are over 400 volts to ground. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time, as destructive or dangerous short circuits may occur.

Warning 2: The door switches, when open, disconnect the 3-phase power from the transformers but leave the incoming terminals of the AC contactor connected. The door switches also disconnect battery from the main rectifier elements but leave the CHARGE fuse and certain other equipment connected. Battery voltage will be present on the terminals of the OUTPUT (S3) rotary switch and elsewhere in the rectifier when the CHARGE fuse is removed. The door switches are provided for the protection of personnel and should not be made inoperative.

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

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

1.08 Jacks mounted on the front panel provide connections for a portable voltmeter for use in checking the voltage in various parts of the circuit when locating troubles.

1.09 For normal operation, under control of the connecting circuit, the MAN-TEST key will be in its normal (mid) position and the ON-OFF key in the ON position. Operation of the MAN-TEST key to either MAN or TEST position removes the rectifier from the control of the connecting circuit. The rectifier is then under manual control. Operating the MAN-TEST key to the TEST position will place the RAISE-LOWER key in the control circuit. Operating the RAISE-LOWER key to either position will control the rectifier output. Operating the MAN-TEST key to the MAN position will place the MAN potentiometer in the control circuit. Rotating the MAN potentiometer cw will increase the rectifier output and the ccw will decrease the rectifier output.

1.10 The SAT CURRENT milliammeter is provided to give an indication of output load. The current indicated on the SAT CURRENT milliammeter is approximately 250 milliamperes for half load and will range between 20 and 800 milliamperes.

1.11 The CHG-FLOAT switch will normally be in the FLOAT position. Usually, a boost charge of the battery can be made with the CHG-FLOAT switch in the FLOAT position. The CHG position is required when the battery and emergency cells are charged in service.

1.12 The OUTPUT (S3) rotary switch marked OPEN is a 3-position switch. The center position OPEN disconnects the negative charging lead from the associated battery to remove battery from components while servicing the rectifier. The other two positions are not marked on the rectifier, but the top position connects the rectifier negative charging lead to the normal office batteries. The bottom position connects the rectifier negative charging lead to the normal office batteries and the emergency end cells, which are in series with the normal office batteries, for charging after a prolonged power failure.

CAUTION: The CHG-FLOAT (S2) rotary switch and the OUTPUT (S3) rotary switch marked OPEN should be operated only while the rectifier is shut down. Never, in normal operation, turn the rectifier on before battery or load is connected; otherwise, the metallic rectifying cells may be punctured and fail.

2. LIST OF GAUGES, MATERIAL, AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
R-1032, Detail 1	Thermometer
MATERIAL	
—	Felt Pad
TEST APPARATUS	
—	35-Type Test Set
*KS-8039	DC Volt-Milliammeter
KS-14510	Volt-Ohm-Milliammeter (See Note) or
◗KS-16979◖	Volt-Ohm-Milliammeter

* A digital type meter is a suitable substitute for this meter.

Note: When using the KS-14510 meter to test semiconductor devices, care must be exercised to obtain correct polarity. For further information refer to Section 100-520-101.

3. OPERATION

3.01 ***Perparing to Start:*** When putting the rectifier unit into service, check that:

(a) The ON-OFF key is in the OFF position.

(b) The MAN-TEST key is in the normal position.

(c) If input transformers are provided, the taps used are correct for the power supply voltage.

(d) Correct tubes are in the sockets.

(e) The correct CHARGE and VM fuses are in place.

(f) The correct AC CONTROL fuses are in place in the rectifier, and the supply fuses are in the supply panel.

(g) The MAN potentiometer is in the extreme ccw position.

(h) The CHG-FLOAT (S2) rotary switch is operated to the FLOAT position.

(i) The OUTPUT (S3) rotary switch marked OPEN is operated to the desired position (see 1.12).

Caution: Do not start the rectifier with the OUTPUT (S3) rotary switch in the OPEN position, except as covered in 5.04.

(j) Covers and doors are tightly closed so that the door switches are operated.

(k) CONT and CHG ALM circuit breakers are closed.

(l) There is available sufficient office load to load the rectifier fully or a variable load of adequate capacity.

(m) VM voltmeter has been calibrated.

(n) The OUTPUT CURRENT (AR) ammeter relay high and low contacts are set at 90 percent and 5 percent of full rectifier output, respectively.

Note 1: If the office load is less than 5 percent of rated rectifier output, set the low contact lower (minimum of 2 percent) to prevent a false rectifier failure alarm.

Note 2: ▶In some installations the KS-20522 Controller may have been substituted for the ammeter relay contacts. For information on the adjustment of the controller refer to Section 024-360-201.◀

3.02 ***Starting:*** To place the rectifier in service, observe the directions in 3.01 and proceed as follows:

(1) Operate ON-OFF key to ON.

(2). Allow 1 minute for the tubes to warm up.

The rectifier will assume its share of the load and the rectifier output is automatically adjusted by the operation of relays in response to signals from the connecting circuit.

3.03 ***Stopping:*** To take the rectifier out of service, proceed as follows:

(1) Operate MAN-TEST key to TEST.

(2) Operate RAISE-LOWER key to LOWER, and allow time for other rectifiers or charging generators to assume the load.

(3) Reduce the rectifier output to zero.

(4) Operate the ON-OFF key to OFF.

(5) If the rectifier is to be left out of service, remove the ac service fuses and the dc CHARGE fuse.

3.04 ***AHR and AHL Potentiometers:*** The AHR and AHL potentiometers are adjusted with a normal office load. The purpose of the adjustment is to minimize fluctuations of the battery voltage. The change in the rectifier output should be rapid enough for the purpose but it should not cause hunting. In general, lowering of the output should be slightly faster than raising. The change in the charge voltage of C12 capacitor is not only dependent on the adjustment of the potentiometer, either AHR or AHL, but also on the duration of the signal from the regulating device in the associated plant, the condition of the battery and the fluctuations in the load. Readjustment may be necessary with changes in the office load. Rotating the shaft of either potentiometer cw or ccw will increase or decrease, respectively, the speed of the correction. The procedure for adjusting these potentiometers is given in Part 4.

4. ROUTINE CHECKS

4.01 Periodically check the condition of the electron tubes, using whatever electron tube tester

is available, in accordance with the information for the tester.

4.02 Periodically inspect the contactor and relays for adjustment and condition of contacts to make sure they are in accordance with the circuit requirements and Bell System Practices which apply.

4.03 Keep the ventilating passages and rectifier cells clean to prevent excessive heating.

4.04 ***Rectifier Circuit Checks:*** When checking the rectifier, adjust the load to the battery or adjust the output of the other rectifiers supplying it, as required, to avoid service reaction when adjusting the rectifier output.

4.05 ***OUTPUT VOLTS Meter Calibration***

(1) Operate MAN-TEST key to TEST.

(2) Operate RAISE-LOWER key to LOWER until the rectifier output current is reduced to zero.

(3) Operate ON-OFF key to OFF.

(4) Connect the KS-8039 volt-milliammeter, set to the 30 or 75 VOLTS DC range, in parallel with the OUTPUT VOLTS voltmeter.

Warning: The door switches, when open, disconnect the 3-phase power from the transformers but leave the incoming terminals of the AC contactor connected. The door switches also disconnect battery from the main rectifier elements but leave the CHARGE fuse and certain other equipment connected. Battery voltage will be present on the terminals at the (S3) rotary switch and elsewhere in the rectifier when the CHARGE fuse is removed. The door switches are provided for the protection of personnel and should not be made inoperative.

(5) Operate MAN-TEST key to MAN.

(6) Operate ON-OFF key to ON.

(7) Allow one minute for tubes to heat.

(8) Rotate MAN potentiometer cw.

Requirement: The KS-8039 voltmeter indicates the float voltage.

(9) Adjust the zero adjust screw on the OUTPUT VOLTS voltmeter until it agrees exactly with the KS-8039 meter.

(10) Rotate MAN potentiometer to NOR.

(11) Operate ON-OFF key to OFF.

(12) Disconnect the KS-8039 voltmeter.

4.06 ***Output Current (AR) Ammeter Relay***

(1) Connect the KS-8039 voltmeter, set to the 1.5 VOLTS DC range, to terminals 2 and 3 of the AR ammeter relay shunt.

(2) Adjust the high and low contacts of the OUTPUT CURRENT (AR) ammeter relay to the extreme right and left positions, respectively.

(3) Operate ON-OFF key to ON.

(4) Rotate MAN potentiometer slowly cw.

Requirements: The KS-8039 voltmeter indicates 225 millivolts(0.225 volts) and the OUTPUT CURRENT (AR) ammeter relay indicates 90 $\pm$3 amperes for the 100-ampere rectifier or 180 $\pm$6 amperes for the 200-ampere rectifiers.

Note: Increase the load to the battery or decrease the output of the other rectifiers supplying it, as required, to prevent service reaction.

(5) Rotate MAN potentiometer to NOR.

(6) Operate ON-OFF key to OFF.

(7) Disconnect the KS-8039 voltmeter.

The KS-20522 Controller has been developed to provide in a solid state unit the same functions as contacts in the ammeter relays. The controller contains no moving parts or heated filaments; therefore it should provide more reliable service with far less maintenance than the mechanical contacts. The KS-20522 Controller is

available as part of a modification kit which includes mounting hardware, wire, installation and wiring information, and, where required, some minor external components. There will be a modification kit available for several different applications. The modification kits for these particular applications are coded as follows:

CODE OR SPEC. NO.	APPLICATION
J86741A Lists 10 and 13	Modification of J86249A 48-V, 100-Ampere Rectifier
J86741A Lists 11 and 14	Modification of J86249B 24-V, 100-Ampere Rectifier
J86741A Lists 12 and 15	Modification of J86249C 24-V, 200-Ampere Rectifier

For further information on the operation and adjustment of the controller refer to Section 024-360-201.◀

4.07 ***Overload Limit (OL Relay)***

Note: ▶When using the 35-type test set refer to Sections 100-101-101 and 100-101-301 for information on connection and operation of the test set.◀

(1) Connect BAT and GRD terminals, of the 35-type test set, to terminals 3 and 2 of the AR ammeter shunt, respectively, to measure the output current.

(2) Adjust the sliders of the 35-type test set so approximately 25 ohms are in the circuit.

(3) Strap terminals T and R of the 35-type test set together.

(4) Operate ON-OFF key to ON.

(5) Allow one minute for the tubes to heat.

(6) Rotate MAN potentiometer slowly cw until the rectifier output current is 90 percent of rated rectifier output.

Note: Increase load to the battery or reduce the output of the other rectifiers supplying it, as required, to avoid service reaction.

(7) Adjust the slider of the 35-type test set to give an indication of 9 milliamperes on the 15-milliampere scale.

Note: Full load will be indicated by 10 milliamperes and 10 percent overload will be indicated by 11 milliamperes. Do not adjust the sliders on the 35-type test set after the 9 milliamperes is set.

(8) Adjust the rectifier output, using the MAN potentiometer to 110 percent of rated rectifier output or as specified in the circuit requirements.

Requirement: The OL relay shall operate.

Note: There is a time delay of 1-1/2 to 3 minutes before the AT relay will operate.

(9) If the requirement in (8) was not met, adjust the A potentiometer until the requirement is met.

(10) Rotate MAN potentiometer to NOR.

Note: Decrease the load to the battery or increase the output of the other rectifiers supplying it, as required, to avoid service reaction.

4.08 ***AHR and AHL Potentiometer Adjustment***

(1) Operate the MAN-TEST key to TEST.

(2) Operate the RAISE-LOWER key to RAISE.

Requirement: The rectifier output should increase from 0 to 110 percent of rated rectifier output in 20 seconds.

Note: The overload relay will operate. Increase the load to the battery or decrease the output of the other rectifiers supplying it, as required, to avoid service reaction.

(3) Operate the RAISE-LOWER key to LOWER.

Requirement: The rectifier output should decrease from 110 to 0 percent of rated rectifier output in 15 seconds.

Note: If the plant requirements differ from the requirements in (2) and (3), the plant requirements take precedence.

(4) Operate ON-OFF key to OFF.

(5) Disconnect the BAT and GRD terminals of the 35-type test set from terminals 3 and 2 on the AR ammeter relay shunt.

(6) Operate the MAN-TEST key to its normal (mid) position.

(7) Set the high and low contacts of the OUTPUT CURRENT (AR) ammeter relay as covered in 3.01 (n).

(8) Operate the ON-OFF key to ON.

Requirement: The rectifier shall assume its share of the load.

(9) Adjust the load to the battery for normal office load.

4.09 ***Switch Cleaning:*** In accordance with the Equipment Test List, periodically exercise the S3 switch (KS-5716, L3) as follows to reduce voltage drop.

(1) Remove the rectifier from service in accordance with 3.03.

(2) Remove the dc CHARGE fuse.

(3) Operate the S3 switch back and forth from the top position through the bottom position (see 1.12) 5 or 6 times.

(4) Return the S3 switch to the OPEN position.

(5) Replace the dc CHARGE fuse and return the rectifier to service as covered in 3.01 through 3.02.

Note: Due to reported failures of the KS-5716, L3 switches, a new switch coded KS-5716, L15 was developed to replace it. The KS-5716, L15 switch also proved unsatisfactory so silver plating was added to the contact surfaces of the KS-5716, L15 switch. If the KS-5716, L3 switch or the earlier KS-5716, L15 switch should fail, it should be replaced with the KS-5716, L15 switch with the silver plated contact surfaces.

5. TROUBLES

5.01 In general, the components most likely to become defective with use are the electron tubes, electrolytic capacitors, and semiconductor stacks and diodes.

5.02 Selenium rectifier stacks will age with use and after a period of years, it may be necessary to change the transformer connection from the NEW to the AGED tap (see 5.03). When replacement is required due to aging, replace the stacks as covered in 5.05 and 5.06.

5.03 Aging taps are provided on T1 through T3 transformers for use when the main rectifier element has aged. The connections should not be changed from taps 3 to taps 2 until the rated output cannot be obtained from the rectifier and until a thorough check has been made to be sure that there are no other troubles. If rated output can be obtained with manual control, it will indicate that the transformer taps do not need to be changed.

5.04 The taps on T14 transformer should be factory adjusted for a minimum rectifier output voltage not greater than 44 volts for J86249A rectifiers or not greater than 22 volts for J86249B and J86249C rectifiers. If any of the following parts, C17, C18, T14, L6, or SR13, are replaced during maintenance, the T14 transformer taps may have to be reselected to meet the minimum voltage requirement. Check the rectifier minimum voltage with the rectifier operating at no load, OUTPUT (S3) rotary switch in the OPEN position, on manual control (MAN-TEST key on MAN and MAN potentiometer maximum ccw), and with the regulating circuit disabled (V1 tube removed). As the adjustable tap lead is moved over the tap range, the rectifier output voltage should decrease to a minimum and then rise. Connect to the tap causing minimum voltage. On the later type rectifiers if the voltage decreases as numerically lower taps are used but does not meet the minimum voltage requirement when tap 6 is reached, try the following tap arrangement.

(a) Remove the strap between T14 transformer terminals 10 and 11, and connect a strap between terminals 6 and 13.

(b) Connect the adjustable tap to terminal 11 or 12 as required to meet the minimum voltage limit.

Warning: When changing taps, disconnect the rectifier from the power supply before touching the terminals.

5.05 ***Selenium Rectifier Stack:*** Selenium rectifier cells may fail due to aging, which is an increase in the resistance of the cells. The replacement of only the defective stack in the rectifying element that consists of more than one stack may result in an unbalanced condition in the rectifying element. To avoid unbalance, replace stacks as follows:

(a) When replacing a defective stack or stacks in a multiple stack element, replace all other stacks in the element that have been in service 2 years or longer.

(b) Do not combine stacks of different list numbers or different manufacturers.

(c) Never attempt to replace part of the rectifier cells in a stack or bolt assembly. Always replace the entire stack.

5.06 ***Silicon Rectifier Stack:*** Do not attempt to replace a diode in the stack assembly. When replacements are required, replace the entire stack. Do not combine stacks of different list numbers or different manufacturers.

5.07 If the selenium rectifier stacks seem hot, check the temperature with the R-1032 thermometer. Hold the bulb of the thermometer against the stack, covering that part of the bulb which is not in contact with the stack with a piece of felt or equivalent. If the temperature exceeds 90°C, the stacks are probably nearing the end of their useful life and the supervisor should be notified so replacement of stacks may be considered.

Trouble Chart

5.08 Should any of the following troubles develop, it is suggested that the possible cause 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. If a check of the possible causes listed or the use of the point-to-point voltage table does not lead to the location of the trouble, it is advisable to make resistance measurements with the circuit completely de-energized, comparing the measured values with the values shown on drawing SD-81129-01.

TROUBLE	POSSIBLE CAUSE
No dc output current	Power failure.
	Blown ac supply or control fuse.
	Blown CHARGE fuse.
	Door switch open.
	Failure of V1 or V2 tube.
	Shorted C31 through C35 capacitors.
	Plant voltage regulator out of adjustment.
	RL relay operated continuously.
	AC, CA, or ST relay not operated.
	LC relay not operated or make contact failing.
Low dc output current, low saturating current	Plant voltage regulator out of adjustment.
	Low line voltage.
	V2 tube failure.
	Low emission or aged V1 or V2 tube.
	Aged SR13 rectifier stacks.
	RL relay break contact failing.
	RR relay make contact failing.
Rated output current not obtainable with saturating current maximum, under MAN control	One of three line leads open or high resistance connection in line circuit.
	CHG-FLOAT switch on FLOAT when charging,

TROUBLE	POSSIBLE CAUSE
	especially emergency cells.
	Main selenium rectifier cells high resistance due to aging.
High dc output current, high saturating current	Plant voltage regulator out of adjustment.
	High line voltage.
	RR relay operated continuously.
	RL relay make contact failing.
	LC relay break contact failing.
	Grid emission in V2 tube.
	Near zero grid voltage in V2 tube caused by failure of a component of the relay control circuit.
Low dc output current, high saturating current	Unbalance in ac line voltages.
	The ac voltages applied to the rectifying element (AC1, AC2, AC3 terminals) differ by more than 5 percent.
	CHG-FLOAT switch on FLOAT when charging, especially emergency cells.
	Main selenium rectifier cells high resistance due to aging.
Output excessively noisy	AC voltages applied to the rectifying element (AC1, AC2, AC3 terminals) differ by more than 5 percent.
	Filter capacitors aged or defective.
	Filter capacitor connections loose or open.
	Defective cells in one or more of the selenium rectifier stack assemblies constituting the main rectifying element.
Output excessively noisy (cont)	Defective diode in two or more silicon rectifier stack assemblies constituting the main rectifying element.
Cannot reduce dc output current to zero with saturating current minimum under MAN control	CHG-FLOAT switch on CHG instead of FLOAT.
	High line voltage.
Output voltage varying	AHR or AHL potentiometer not correctly adjusted.
Blown fuse in the silicon rectifier stack	Defective spike suppression capacitor across the diode in the silicon rectifier stack.

6. POINT-TO-POINT VOLTAGES

6.01 As long as the rectifier 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.

Warning: High voltages over 400 volts to ground are present within the rectifier and every precaution should be observed to avoid any bodily contact with exposed metal parts or terminals when the rectifier is in operation or not in operation but connected to the input power source.

Caution: When using any portable instrument, leads should be carefully examined to make sure the insulation is

undamaged. The leads should be connected at the instrument before making 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.

6.02 The readings are measured with the KS-16979 volt-ohm-milliammeter. They apply to the specified rectifier operating at its normal float voltage, with the output current at the values specified in the table. The output of the rectifier will not be appreciably affected by connecting the KS-16979 volt-ohm-milliammeter to check the values given in the tables. In general, door switches are not intended for use in disconnecting power, but, for convenience, they may be so used during the infrequent taking of point-to-point voltages.

TABLE A — POINT-TO-POINT VOLTAGES

J86249A RECTIFIER — RATED OUTPUT 100 AMPERES, 48 VOLTS

VOLTAGE ACROSS	MEASUREMENT MADE				KS-16979 METER			
	FROM		*TO			READING VOLTS		
	APP	TERM.	APP	TERM.	RANGE (VOLTS)	10 AMP OUTPUT	50 AMP OUTPUT	100 AMP OUTPUT
V2	Jack	SP	Jack	S+	600 DC	380	345	300
Sat. Ckt	Jack	S+	Jack	S—	60 DC	8.5	14	23
SR13	T14	4	T14	1	60 AC	20	40	—
SR13	TS	39	TS	40	60 DC	8.5	23	—
Main Rectifying Element	Term.	AC1**	Term.	AC2**	60 AC	40	41.3	—
	Term.	AC2**	Term.	AC3**	60 AC	40	41.3	—
	Term.	AC3**	Term.	AC1**	60 AC	40	41.6	—
	See Note 1		See Note 2		60 DC	49.5	49	—

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

** Where furnished.

Note 1: Positive bus bar common to SR1 through SR6 (SR12).

Note 2: Negative bus bar common to SR1 through SR6 (SR12).

TABLE B — POINT-TO-POINT VOLTAGES

J86249B RECTIFIER — RATED OUTPUT 100 AMPERES, 24 VOLTS

VOLTAGE ACROSS	MEASUREMENT MADE		KS-16979 METER		
	FROM	*TO		READING VOLTS	
	APP TERM.	APP TERM.	RANGE (VOLTS)	10 AMP OUTPUT	50 AMP OUTPUT	100 AMP OUTPUT
V2	Jack SP	Jack S+	600 DC	380	345	300
Sat. Ckt	Jack S+	Jack S—	60 DC	8	12	21
SR13	T14 4	T14 1	60 AC	21	37	—
SR13	TS 39	TS 40	60 DC	9	23	—
Main Rectifying Element	Term. AC1**	Term. AC2**	60 AC	19.5	20	—
	Term. AC2**	Term. AC3**	60 AC	19.5	20	—
	Term. AC3**	Term. AC1**	60 AC	19.5	20	—
	See Note 1	See Note 2	60 DC	26.4	26.5	—

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

** Where furnished.

Note 1: Positive bus bar common to SR1 through SR6 (SR12).

Note 2: Negative bus bar common to SR1 through SR6 (SR12).

TABLE C — POINT-TO-POINT VOLTAGES

J86249C RECTIFIER — RATED OUTPUT 200 AMPERES, 24 VOLTS

VOLTAGE ACROSS	MEASUREMENT MADE		KS-16979 METER		
	FROM	*TO		READING VOLTS	
	APP TERM.	APP TERM.	RANGE (VOLTS)	20 AMP OUTPUT	100 AMP OUTPUT	200 AMP OUTPUT
V2	Jack SP	Jack S+	600 DC	375	340	295
Sat. Ckt	Jack S+	Jack S—	60 DC	10	16	23
SR13	T14 4	T14 1	60 AC	20	40.5	—
SR13	TS 39	TS 40	60 DC	10	26	—
Main Rectifying Element	Term. AC1**	Term. AC2**	60 AC	19.5	20	—
	Term. AC2**	Term. AC3**	60 AC	19.5	20	—
	Term. AC3**	Term. AC1**	60 AC	19.5	20	—
	See Note 1	See Note 2	60 DC	25.5	26	—

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

** Where furnished.

Note 1: Positive bus bar common to SR1 through SR6 (SR12).

Note 2: Negative bus bar common to SR1 through SR6 (SR12).