

KS-20490 RECTIFIERS
DC OUTPUT (S1) SWITCH
TEST, INSPECTION, CLEANING, AND LUBRICATION

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1. GENERAL

1.01 This section provides a maintenance procedure for testing, inspecting, cleaning, and lubricating the DC OUTPUT (S1) switch of the KS-20490 rectifiers (Fig. 1).

1.02 This section is reissued to delete references to and instructions for dismantling the DC OUTPUT switch and other minor changes throughout. Revision arrows are used to emphasize the more significant changes. The Equipment Test List is affected.

1.03 The DC OUTPUT (S1) switch should be tested and inspected at a time interval specified in the Equipment Test List, or more often, if experience indicates the need.

Warning: Voltages inside the rectifier cabinet are over 150 volts to ground. Do not attempt any work operations without carefully following the procedure out-

lined in this section and the Bell System safety standards.

2. APPARATUS

2.01 List of Tools and Test Apparatus: The following tools and test apparatus are used in this section.

TOOLS	DESCRIPTION
R-1032	Thermometer
R-6440	Ratchet Wrench, 3/8-inch Drive Sockets; 5/16; 1/2; 9/16 inch
R-1324	Screwdriver, 3/8-inch blade
—	File, 6-inch, flat smooth cut
R-2671	Allen Wrench, 1/4 inch
TEST APPARATUS	
KS-20538	Volt-Ohm-Milliammeter
—	Simpson, Model 388-3L Temperature Meter
KS-14666	Cloth, Cleaning
KS-19578, L1	Trichloroethane
—	Cloth, Crocus
—	Rouge, Jewelers
—	◆REFRASIL*◆ Insulating Material
—	Petrolatum, Chemically Pure.
—	Light bulb capacitor charging tool

*Registered trademark of Hitco Materials Division.

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

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3. TESTS, INSPECTIONS, AND LUBRICATION OF DC OUTPUT (S1) SWITCH

3.01 Open all doors on the cabinet to maximum open position. This gives maximum working space plus maximum visibility of the switch.

3.02 **DC OUTPUT (S1) Switch Electrical Test:** Perform the following electrical tests.

Caution: The DC OUTPUT (S1) switch has battery potential on it. Extreme care must be used when performing inspections or maintenance to avoid a short circuit between the switch and other metal parts of the rectifier cabinet.

Note: The rectifier should be operating at full load for 4 hours or more before voltage measurements are taken.

(1) **Rectifier Operating in BAT Mode:** If the DC OUTPUT (S1) switch is in the BAT position, the voltage measurements should be taken as follows:

(a) Measurements will be taken on the back side of the DC OUTPUT (S1) switch.

(b) The negative lead of the voltmeter should be placed inside the letter O stamped on the bus link directly below the lower left contact. This bus is stamped COMMON. Refer to Fig. 2.

(c) The positive lead of the voltmeter should be placed inside the letter O stamped above the upper right switch contact \blacklozenge E1 \blacklozenge [BAT terminal assembly of DC OUTPUT (S1) switch]. The normal voltage drop at the test points should be 15 millivolts.

Note: If the rectifier is delivering less than full load, reduce the voltage drop value by the same percentage that the observed load is less than the rated load. For example, if the load is 200 amperes instead of 400 amperes the maximum allowable voltage drop should be reduced to 7.5 millivolts.

(d) Disconnect the voltmeter.

(2) **Rectifier Operating in EC Mode:** If the DC OUTPUT (S1) switch is in the EC position the voltage measurements should be taken as follows:

(a) Measurements will be taken on the back side of the DC OUTPUT (S1) switch.

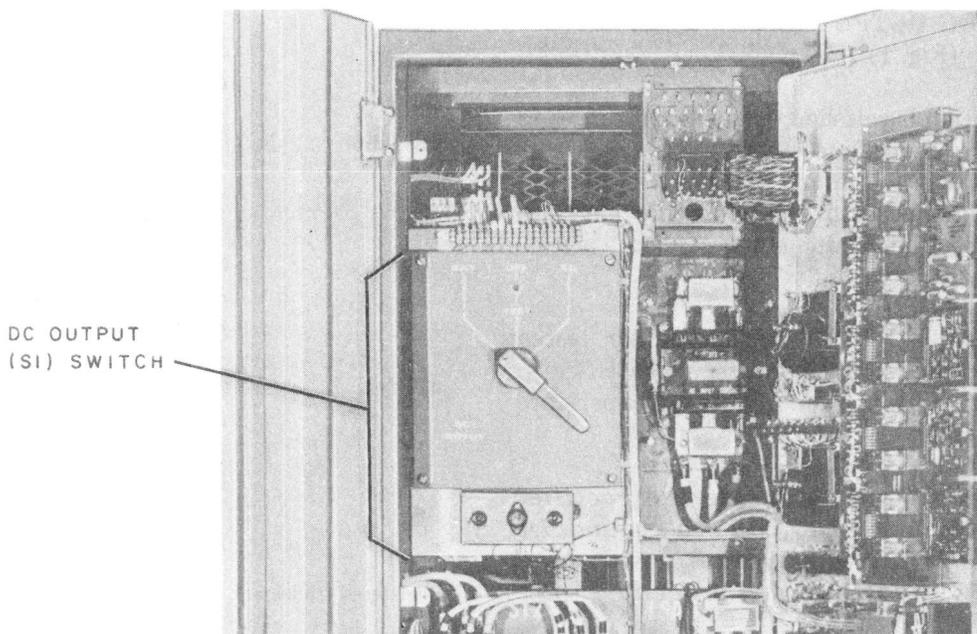


Fig. 1 — DC OUTPUT (S1) Switch—Front View

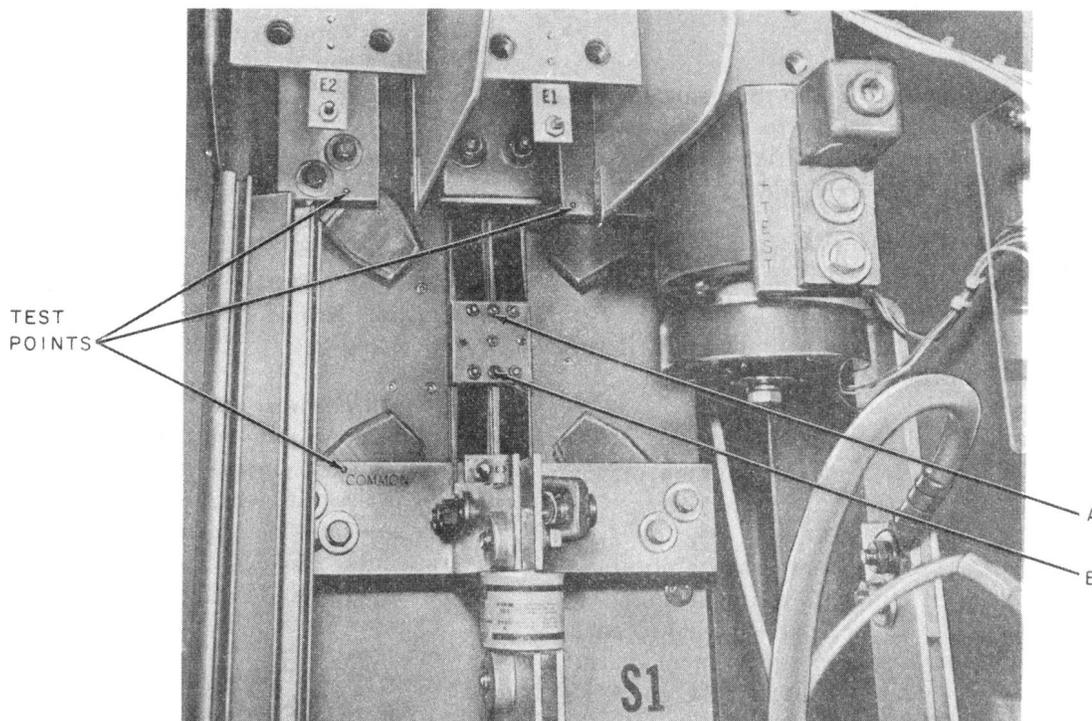


Fig. 2—DC OUTPUT (S1) Switch—Rear View

(b) The negative lead of the voltmeter should be placed inside the letter O stamped on the bus link directly below the lower left contact. This bus is stamped COMMON. Refer to Fig. 2.

(c) The positive lead of the voltmeter should be placed inside the letter O stamped above the upper left switch contact [EC terminal assembly of DC OUTPUT (S1) switch]. The normal voltage drop at the test points is 15 millivolts.

Note: If the rectifier is delivering less than full load, reduce the voltage drop value by the same percentage that the observed load is less than the rated load. For example, if the load is 200 amperes instead of 400 amperes the maximum allowable voltage drop should be reduced to 7.5 millivolts.

(d) Disconnect the voltmeter.

3.03 DC OUTPUT (S1) Switch Temperature Rise Tests: To perform the DC OUTPUT switch temperature rise test, proceed as follows:

Note 1: The following measurements should be taken on the back side of the DC OUTPUT (S1) switch.

Note 2: The rectifier doors should be closed for half an hour before taking the following measurements. The measurements should be taken as quickly as possible upon opening the rectifier doors. The temperature of the switch contacts will decrease when the doors are opened. If the measurements cannot be taken within two minutes, close the doors for half an hour and then repeat the following procedure.

Note 3: If Simpson Model 388-3L temperature meter is not available, and if the measurements are taken with the R-1032 thermometer, cover the exposed part of the bulb with REFRASIL and hold the thermometer securely against each check point. Make sure that none of the REFRASIL comes between the thermometer bulb and the surface to be checked. If the temperature approaches the maximum limit of 45°C, a more accurate measurement should be

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taken, using the Simpson Model 388-3L temperature meter, or equivalent.

- (1) Connect the probe of the Simpson Model 388-3L temperature meter to the test points listed below and close the rectifier doors for 1/2 hour before taking measurements.♦
 - (a) The upper left fixed contact ♦E1♦, if the switch is in the EC position.
 - (b) The upper right fixed contact ♦E2♦, if the switch is in the BAT position.
 - (c) Both contact end portions of the rotary center pole regardless of the position of the switch.
- (2) The temperature rise (temperature obtained from check point minus the ambient temperature in the area of the rectifier cabinet) of each check point when measured in a room in which the temperature of the ambient air is 20°C to 50°C, shall not exceed 45°C.

Example: With an ambient room temperature of 25°C (77°F)♦, the temperature of the test point will not exceed 70°C, that is 25°C + 45°C. This temperature (70°C) is equivalent to a temperature reading of 158°F allowable under these conditions [using °F 9/5 (°C) + 32°].

Note 1: Do not convert the two Centigrade readings separately to Fahrenheit and add the separate Fahrenheit readings since this gives incorrect results.

Note 2: The rectifier is not designed to operate in a room with an ambient temperature exceeding 50°C.

3.04 Requirements and Corrective Actions (if needed): Verify that the following requirements are met:

Requirement 1: If all measurements in paragraphs 3.02 and 3.03 are within limits, no further action is necessary. However, the contacts should be cleaned annually in accordance with paragraph 3.05.

Requirement 2: If any of the measurements in paragraphs 3.02 and 3.03 exceed the

specified limits, clean and lubricate only the switch contacts in accordance with paragraph 3.05. Then repeat the tests in paragraphs 3.02 and 3.03.

Requirement 3: If after performing Requirement 2, the voltage drops and temperature rise measurements are not within limits, the DC OUTPUT (S1) switch must be disassembled, cleaned, and adjusted in accordance with paragraphs 3.05 and 3.07. Then repeat paragraphs 3.02 and 3.03.

Requirement 4: If after performing Requirement 3, the voltage drop and temperature rise measurements are not within limits, the defective Rotor assembly and/or defective terminals must be replaced and the defective components handled in accordance with local instructions. It should not be necessary to change the switch unless a major failure has occurred.

3.05 Cleaning and Lubrication of DC OUTPUT (S1) Switch Contacts: Clean and lubricate the DC OUTPUT switch as follows:

- (1) Remove the rectifier from service in accordance with Section 169-742-301.
- (2) Operate the POWER ON/POWER OFF (S2) switch to the POWER OFF position. The POWER OFF lamp lights and the POWER ON lamp extinguishes.
- (3) Operate the DC OUTPUT (S1) switch to the OFF position. The RECT FAIL lamp lights and the RFA or RFA-RTN alarm is activated. The rectifier is shut down and locked out.
- (4) Operate the associated ac switch and fuse unit in the bus duct or in the power service cabinet to the OFF position.

Note: When the rectifier is shut down, the output filter capacitor should fully discharge through resistors in approximately one minute.

- (5) Operate the RELAY AND ALARM POWER circuit breaker (CB2) to OFF.
- (6) Disconnect the CP-P900 PLANT CONTROL DISCONNECT from its connector. The RFA or RFA-RTN alarm is deactivated.

Caution: The DC OUTPUT (S1) switch has battery potential on it. Unless the battery potential is removed, extreme care must be used when performing inspections or maintenance to avoid a short circuit between the switch and other metal parts of the rectifier cabinet. The switch should be insulated from surrounding parts using canvas, plastic sheeting, or other appropriate insulating material before cleaning. Use insulated tools and equipment.

- (7) Using a clean KS-14666 cloth soaked with KS-19578, L1, trichloroethane, wipe all contact surfaces, fixed and rotary. Using a clean dry cloth, wipe all surfaces dry. Continue cleaning until all surfaces are clean.
- (8) If black tarnish is present, remove with crocus cloth or jeweler's rouge. Wipe all surfaces clean and dry.
- (9) Apply a thin coating of chemically pure petrolatum to both fixed and rotary switch contacts.
- (10) Charge output filter capacitors in accordance with subparagraphs 3.06(1) through 3.06(5).
- (11) Restore the rectifier to service in accordance with subparagraphs 3.06(3) through 3.06(8).

3.06 Capacitor Charging Procedure: In order to prevent damage to the switch contacts when the DC OUTPUT (S1) switch is operated from the OFF position to the BAT or EC positions, the output capacitors C2 through C12 must be charged as follows:

- (1) Depress POWER ON/POWER OFF (S2) switch to OFF position. POWER ON lamp extinguishes. POWER OFF lamp lights.
- (2) Operate the associated ac switch and fuse unit in the bus duct or power service cabinet to OFF position.
- (3) Operate the OFF-TEST (S4) switch to the TEST position. The TEST lamp lights.

◆Caution: Always connect the light bulb capacitor charging tool to the COMMON

terminal E3 first, then to terminal E1 for BAT position or E2 for EC position to prevent dangerous shorts to ground from occurring.

- (4) Connect the light bulb capacitor charging tool between terminal E3 and E1 for the BAT position or between terminals E3 and E2 for the EC position.◆
- (5) ◆With the light bulb capacitor charging tool connected, screw in the light bulb. When the light bulb is at maximum brilliance, verify that the rectifiers OUTPUT VOLTAGE (M2) voltmeter indicates 48 to 52 volts dc.◆

Caution: Verify that the POWER ON/POWER OFF (S2) switch is in the POWER OFF position and that the associated ac switch and fuse unit in the bus duct or power service cabinet is in the OFF position, before operating the DC OUTPUT (S1) switch from one position to the other.

- (6) When the OUTPUT VOLTAGE (M2) voltmeter indicates 48 to 52 volts dc battery voltage or battery plus end-cell voltage, operate the DC OUTPUT (S1) switch to the desired BAT or EC position.

◆Note 1: The voltage indicated on the OUTPUT VOLTAGE (M2) voltmeter before the DC OUTPUT (S1) switch is operated to the desired BAT or EC position will be slightly lower than the normal battery or battery plus end-cell voltage.◆

Note 2: The END CELL lamp lights when the DC OUTPUT (S1) switch is in the EC position.

Caution: When disconnecting the combination circuit from the rectifier always disconnect both ends of the circuit at the same time to prevent shorts from occurring.

- (7) ◆Disconnect the light bulb capacitor charging tool from the rectifier terminals.◆
- (8) Operate the associated ac switch and fuse unit in the bus duct or in the power service cabinet to the ON position.

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- (9) Restore the rectifier to service in accordance with Section 169-742-301.

3.07 Clean, Inspect, and Lubricate the DC OUTPUT (S1) Switch: To clean, inspect, and lubricate the DC OUTPUT switch, proceed as follows:

Note: Complete disassembly of the DC OUTPUT switch is not recommended. The center arm rotary contact is equipped with sacrificial contacts. These contacts prevent damage to the main contacts by accepting the inrush of current when the switch is operated to the BAT or EC position. These sacrificial contacts are replaceable. The remainder of the DC OUTPUT switch must be replaced as a unit. The center arm rotary contact assembly is the only part that should be removed from the switch assembly for performing maintenance.◆

- (1) In order to do a more complete cleaning job of both the fixed and rotary poles, the DC OUTPUT (S1) switch may be disassembled as follows:

(a) Remove the rectifier from service in accordance with subparagraph 3.05(1) through 3.05(6).

(b) Rotate the center pole until it is in a horizontal position. Remove the two screws A and B shown in Fig. 2. The entire center pole assembly may now be withdrawn. This allows easier access to the fixed contacts for cleaning and inspection. The inner surfaces of the center arm rotary contacts can now be cleaned in accordance with subparagraphs 3.05(7) through 3.05(9).

- (c) ◆The center arm rotary contact assembly is equipped with sacrificial contacts (Fig. 3).

Opening and closing the DC OUTPUT (S1) switch will cause the sacrificial contacts to erode. If any prominent projections exist, remove the center arm rotary contact from the rectifier and remove them with a file. If the sacrificial contacts are severely damaged, replace them with new contacts. Reassemble the center arm rotary contact assembly by reversing the disassembly procedure.◆

- (2) After reassembling the DC OUTPUT (S1) switch, restore the rectifier to normal service in accordance with Section 169-742-301.

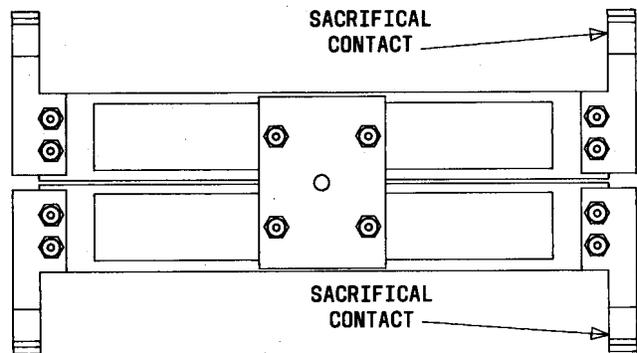


Fig. 3 — DC OUTPUT (S1) Switch — Rotary Contact