KS-21520 RECTIFIER

TESTS, INSPECTIONS, CLEANING, AND ADJUSTMENTS

WARREN G-V COMMUNICATIONS

CONTENTS PAGE

1. GENERAL

1.01 This section provides a maintenance procedure for:

- General rectifier maintenance
- DC OUTPUT switch testing, inspecting, cleaning, and adjustment
- Maintenance of the bolted connections within the rectifier.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph. This issue does affect the Equipment Test List.

1.03 The DC OUTPUT (S1) switch (Fig. 1 and 2) is provided to connect the rectifier output to the battery or to isolate the power secondary of the rectifier from battery and load. This switch can be operated to the BAT, OFF, TEST, or EC (List 11 and List 12 only) positions.

Danger: Battery potential is always present on the BAT and EC output terminals, terminals of the S2, CAP CHG switch and terminals of the RELAY ALARM, F604 fuseblock (on meter panel) regardless of the position of the DC OUTPUT switch.

1.04 The rectifier (Fig. 3) is completely solid state and with a minimum of moving parts that are subject to wear. Therefore, a minimum of routine maintenance is required.

1.05 Maintenance tests, inspections, and cleaning should be performed according to the schedules established in the Equipment Test List.

Danger: Voltages inside the rectifier cabinet are over 150 volts to ground. Do not attempt any work operations without carefully following the procedure outlined in this section.

2. LIST OF TOOLS, TEST APPARATUS, AND MATERIALS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	Offset Box End Wrench—J. H. Williams & Co. #8725 or equivalent
R-2812	3/16-Inch Allen Wrench 3-Inch C Screwdriver
TEST APPARATUS	
KS-8039	Volt-Milliammeter (or suitable Digital Multimeter)
—	Ground Fault Circuit Interrupter, Hubbell No. GFP 115 or equivalent
—	Isolation Plug, Hubbell No. BL-12-767 or equivalent

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

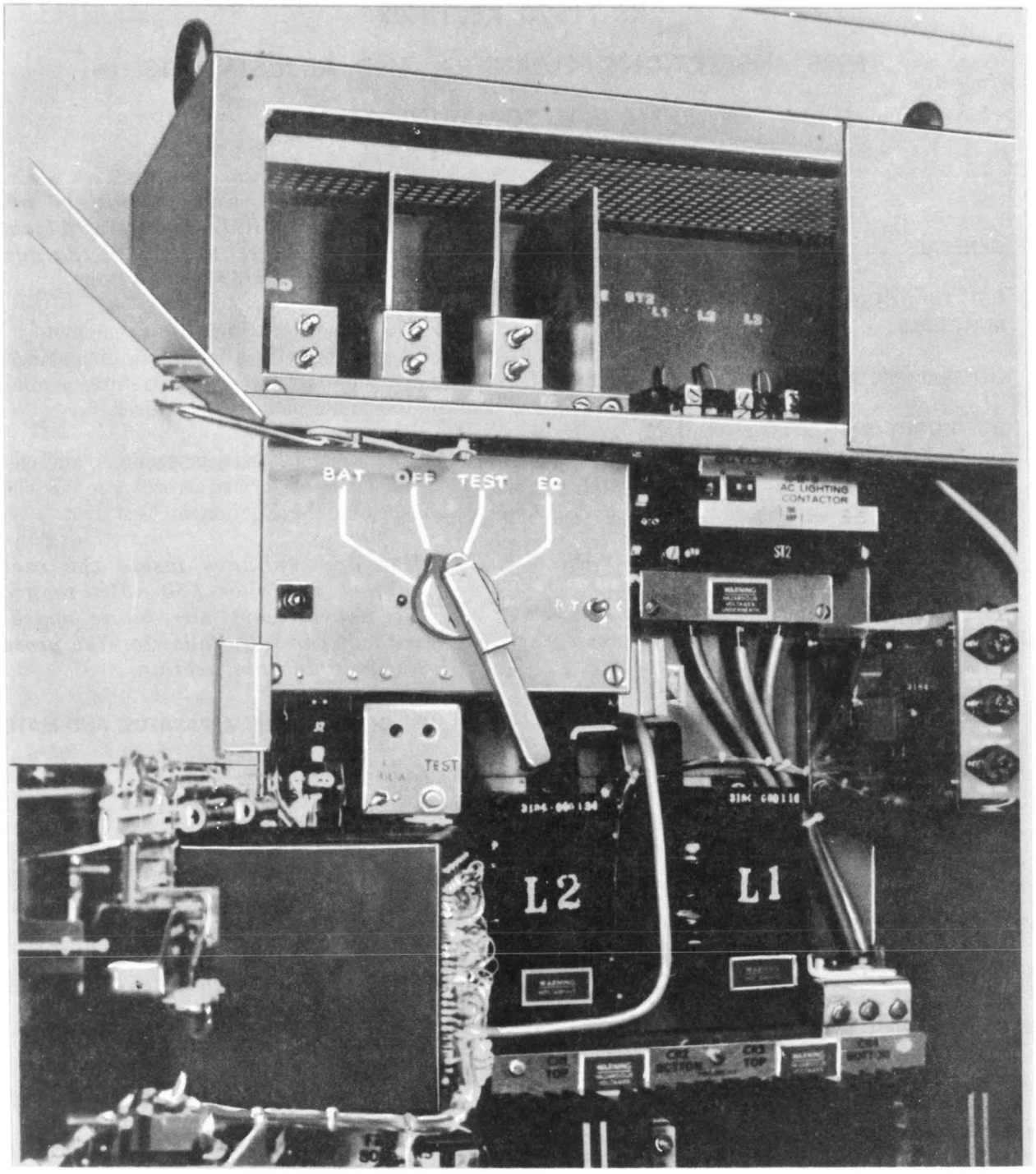
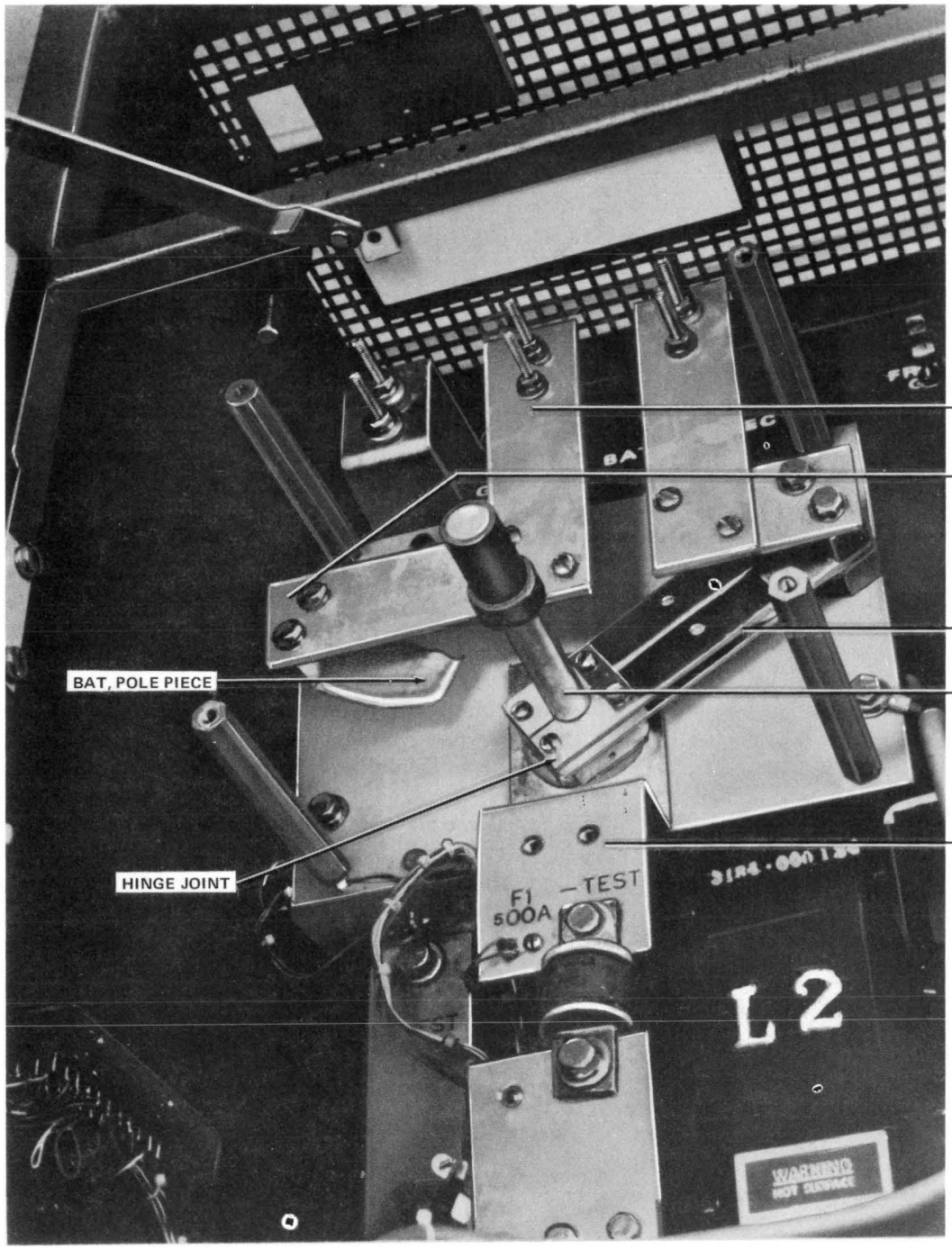


Fig. 1—Front View of DC OUTPUT Switch-Warren G-V Communications



NOTE:
SWITCH SHOWN IN EC POSITION. READ MILLIVOLT TO BAT. CONNECTION OR BAT. POLE PIECE WHEN SWITCH IS IN BAT POSITION.

Fig. 2—DC OUTPUT Switch (Faceplate Removed)

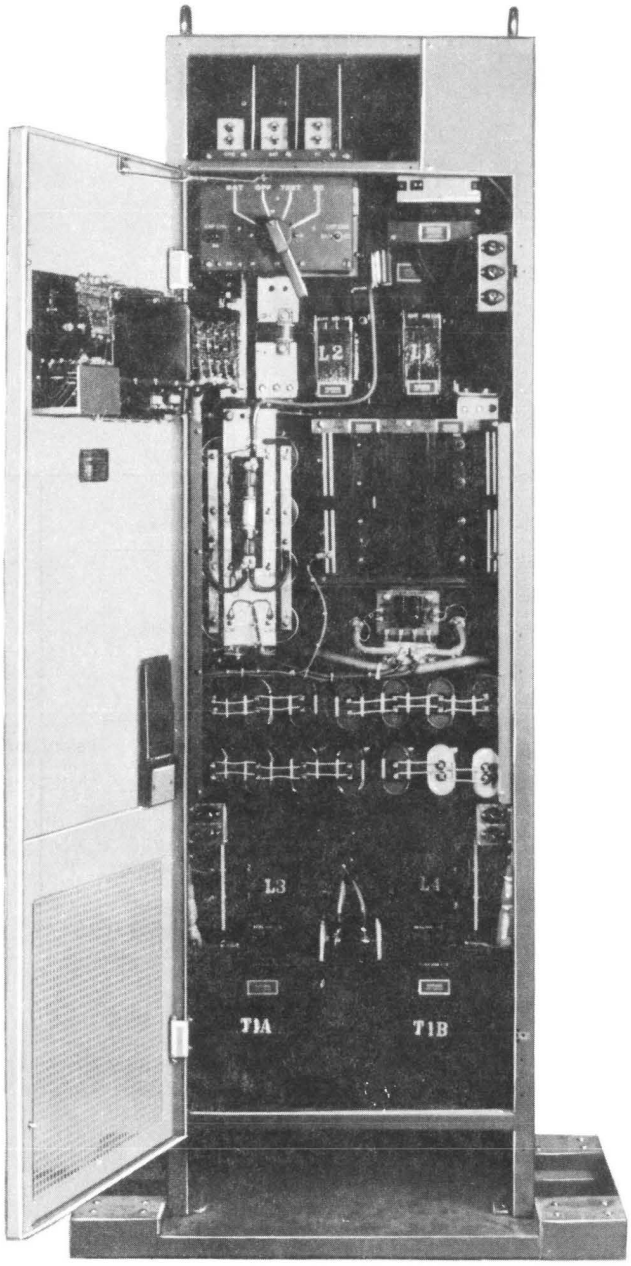


Fig. 3—KS-21520 Rectifier Warren G-V Communications

MATERIALS

KS-14666 or KS-2423	Cloth, Cleaning
KS-19578 L1	Trichloroethane
—	Petrolatum

3. GENERAL RECTIFIER MAINTENANCE

3.01 The interior of the rectifier cabinet should be cleaned and kept free of accumulations of foreign material. Care should be taken that air intakes and outlets are unobstructed.

4. DC OUTPUT SWITCH MAINTENANCE

4.01 ***Preparing DC OUTPUT (S1) Switch for Tests:*** Before performing a test on the DC OUTPUT (S1) switch, proceed as follows:

(1) Provide adequate lighting to observe the switch area.

(2) Operate the rectifier under full load for at least 1 hour with the cabinet doors closed.

4.02 ***DC OUTPUT (S1) Switch Electrical Test:*** A direct indication of the resistance on the contacts of the switch is the millivoltage across the switch when current is passing through it. Readings are given below assuming a 400-ampere load. If the rectifier is carrying less load the maximum reading should be reduced proportionately. Measure the voltage drop across the terminals of the output switch as follows.

Note: Refer to Fig. 2 for the points on the switch assembly between which the millivoltmeter leads are connected.

Danger: To avoid the shock hazard inherent in using an ac operated instrument that has been isolated from ground, use the following procedure.

(1) Connect the ground fault circuit inuerrupter, Hubbell No. GFP 115 or equivalent, to a 115-volt source.

(2) Insert the isolation plug, Hubbell No. BL-12-767 or equivalent, into the ground fault circuit interrupter.

(3) Connect the ac operated instrument to the isolation plug.

(1) Set the KS-8039 volt-milliammeter (or digital multimeter) to the 50 millivolts scale. Connect the meter between the test points as specified in Table A(a).

TABLE A			
MEASURED		VOLTAGE DROP	
FROM	TO	TYPICAL	MAXIMUM ALLOWABLE
(a) - TEST TERMINATION	BAT CONNECTION	15mV	25mV
(b) SWITCH ARM CENTERED BETWEEN POLE AND ROUND SHAFT	BAT POLE PIECE	5mV	10mV
(c) - TEST TERMINATION	ROUND SHAFT	5mV	10mV

Requirement: The test meter indicates the switch voltage drop which should not exceed 25 millivolts.

(2) Disconnect the test meter. The first reading above should be performed in accordance with the ETL interval. The other values are measured across the slip joints of the switch and are the points where aging could take place. If the first reading exceeds or is near the maximum allowable value, check the other points to verify that neither joint exceeds its maximum.

Note: If maximums are exceeded, operate the switch several times over its full range to determine if operation will wipe the contacts clean. Retest switch and, if maximums are still exceeded, disassembly and cleaning are necessary. Perform the operations listed below to clean, lubricate, and adjust the DC OUTPUT switch.

Warning: Charge the output filter capacitors to the BAT or EC potential per Section 169-748-302 before operating the DC OUTPUT switch to these positions.

4.03 ***Cleaning, Lubrication, and Adjustments***

(1) Remove the rectifier from service per Section 169-748-302 and allow 5 minutes for the DC capacitor bank to fully discharge. Open the AC switch or circuit breaker in the power service cabinet.

Danger: Battery potential is always present on the BAT and EC output terminals, terminals of the S2, CAP CHG switch and terminals of the RELAY ALARM, F604 fuseblock (on meter panel) regardless of the position of the DC OUTPUT switch.

(2) Disconnect the following apparatus. This will prevent an inrush of current into the unit in the event accidental contact is made across the open switch and allow the switch to be operated rapidly to wipe contacts.

(a) Plant connector J1

(b) DC OUTPUT switch connector P2

(c) DC output fuse F1 and the alarm fuse F601

(d) The two brown 22-gauge wires terminating at the — TEST connection.

DANGER 1: Once the faceplate is removed, the BAT and EC buses are exposed. Always use extreme caution when working near line battery connections.

DANGER 2: Without the stops located on the face plate, it is possible to freely turn the switch arm to the BAT and EC positions and past the pole pieces. The F1 fuse must be removed to prevent arcing due to

inadvertent charging of the DC output capacitors.

Note: References to EC position apply to Z and Y option units only.

(3) Using the 3-inch C screwdriver, remove the guards between the DC output busses by removing the single screw at the front of each guard.

(4) Remove the handle from the switch by removing the cap screw from the side of the handle using an R-2182 Allen wrench.

(5) Remove the face plate by removing the four bolts at the corners using an offset box end wrench J. H. Williams #8725 or equivalent socket and socket handle.

(6) Replace the handle on the switch shaft and loosely fasten the cap screw in place.

(7) Rotate the switch clockwise until the switch arm clears the EC pole piece.

(8) Remove the entire switch arm assembly by removing the two flat head screws above and below the hinge.

(9) Disassemble the hinge by removing the cotter pin and castle nut from the rear of the shaft. Carefully examine the end of the switch arm for signs of overheating or annealing of the copper. A switch which shows softening or distortion in the arm cannot be cleaned and must be replaced.

Note: The switch is silver plated and normal tarnish of this plating should not be mistaken for signs of heating.

Warning: Do not use abrasive materials on the switch as this will remove the silver plating and cause permanent damage to the contacts.

(10) Using a KS-14666 cloth and KS-1957 L1 trichloroethane, carefully remove all accumulated lubricant from the contact surfaces and both sides of the hinge area.

(11) Verify that the gap at the end of the switch arm is approximately 1/8 inch.

Note 1: A small piece of 1/8-inch thick material should slide easily between the ends of the arm without noticeable spreading of the contact pieces, but should be held in place by the contacts.

Note 2: The guards removed from between the output busses are 1/8-inch thick and may be used as a gauge.

(12) Check both parts of the bifurcated arm independently. Adjust the screws holding the tension springs on the arm if necessary to obtain the correct spacing.

(13) Using a KS-14666 cloth and KS-19578 L1 trichloroethane, clean the BAT and EC tangs. Apply a thin coat of petrolatum to the clean tangs.

(14) Using a KS-14666 cloth, apply a thin coat of petrolatum to the BAT and EC pole pieces, the switch arm contact surfaces, and both sides of the hinge joint.

Note: Avoid excessive use of petrolatum.

(15) Reassemble the hinge joint with the spring, flatwasher, cotter pin, and castle nut. Tighten the nut to compress the spring 3/16 inch which is two full turns after the nut bears against the washer and spring.

Requirement: The dimension from the bus to the top of the spring should be approximately 1-5/16 inches.

Note: Wipe off all excess petrolatum around the hinge.

(16) Reassemble the switch arm to the back panel and securely tighten the two flat head screws.

(17) Operate the switch over its entire range several times, making certain that the switch turns freely and that the arm aligns correctly with the poles.

Note: Wipe off all excess petrolatum.

(18) Place the arm approximately vertical (OFF position) and remove the handle.

(19) Reassemble parts in the following sequence:

(1) Faceplate

(2) Handle

(3) Guards between output busses

(4) Two brown 22-gauge wires at - TEST connection

(5) DC output fuse F1

(6) Alarm fuse F601

(7) J2 Connector

(8) J1 Connector.

(20) Recheck the voltage drop per 4.02.

(21) Restore rectifier to service in accordance with Section 169-748-302.

5. BOLTED ELECTRICAL CONNECTION MAINTENANCE

5.01 Bolted connections are normally under very high pressure and are not subject to aging and failure. However, any loosening of hardware could allow resistance to develop in a connection and lead to overheating. On the interval established by the Equipment Test List, perform the following operations.

(1) Remove the rectifier from service per Section 169-748-302 and allow 5 minutes for the DC capacitor bank to fully discharge. Open the ac switch or circuit breaker in the power service cabinet.

(2) Remove the protective guards over the bolted connections.

(3) Inspect the bolted connections for any signs of overheating or looseness.

(4) Any connection which appears loose or shows signs of heating shall be taken apart and cleaned using a KS-14666 cloth and KS-19578 Ll trichloroethane.

(5) Reassemble connection and tighten.

(6) Reassemble protective guards.

(7) Restore rectifier to service in accordance with Section 169-748-302.