

**KS-19214 RECTIFIER
SOLID STATE AMMETER RELAYS
OPERATING METHODS**

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1. GENERAL

1.01 The AR1 and AR2 solid state ammeter relays are designed to replace the existing mechanical type relays and their associated assemblies used in the KS-19214 rectifier. The solid state units require negligible maintenance, whereas the mechanical type relays require periodic contact maintenance.

1.02 This section is reissued to revise the general information, the list of test apparatus, and routine checks and adjustments. Revision arrows are used to emphasize the more significant changes. This issue does not affect the Equipment Test List.

1.03 The AR1 and AR2 solid state ammeter relays are mechanically interchangeable with the existing units. These ammeter relays consist of paralleled component boards. Their function is to operate a relay at any selectable value of load current from zero to full scale ammeter reading. The respective values are set by an externally adjustable potentiometer for each component board. A set of lamps is provided on the ammeter relay assembly which functions along with the associated relay to indicate the operating point of load current.

1.04 This issue of the section is based on SD-81631-01, Issue 8B. For a detailed

description of the operation, see the corresponding circuit description. If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

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

1.06 Checks and adjustments other than those required by trouble conditions, should be performed during a period when they will least interfere with service.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR
SPEC NO.

TOOLS	DESCRIPTION
—	6-Inch C Screwdriver with a 3/16-Inch Blade

TEST APPARATUS

KS-8039	DC Volt-Milliammeter
♦KS-20599, L4	Digital Multimeter (or equivalent)♦

3. OPERATION

3.01 The AR1 and AR2 solid state ammeter relays are automatically controlled by the rectifier. It is recommended that OPERATION procedures for the appropriate rectifier be followed.

NOTICE

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

4. ROUTINE CHECKS

4.01 The following preliminary procedures should be performed before adjusting AR1 or AR2 ammeter relays.

Note 1: The rectifier OFF-NOR (S4) switch should be in the OFF position before changing the AC TAP (S1) switch from one position to another.

Note 2: Do not operate the DC OUTPUT (S2) switch to either the BAT or EM CELL position without first charging the output filter capacitors. Failure to do so may ultimately lead to degeneration of the DC OUTPUT (S2) switch contacts due to high current. Refer to the appropriate rectifier section for capacitor charging information.

Note 3: All adjusting potentiometers, MIN, FULL, OL, Simulated Low Current (R480), LOW, and HIGH, on the AR1 and AR2 ammeter relays are multiturn types with clutches. The arm can be rotated more than 25 turns without damage to the potentiometer; however, after the full cw or ccw rotation, no further change is made in the position of the arm.

Note 4: The AR1 and AR2 ammeter relays have an intentional dead band so that they do not pick up and drop out at the same value of load current. The MIN and LOW relays drop out about 15 amperes below their pick-up points. The FULL and HIGH relays have a 30-ampere difference, and the OL relay has a 20-ampere difference.

Note 5: If in the following procedures, the relay lamps cannot be made to light, the bulbs should be checked. When removing the bulb, turn the plastic only. **Do not** turn the knurl. The small metal washer found under the plastic caps covering these lamps **must** be in place to ensure proper contact of the bulbs in the sockets.

(a) **Lists 2 and 5:**

- (1) Operate S1 switch to 1.
- (2) Operate S2 switch to OFF, using care to avoid actuation of the S9 switch.

- (3) Operate the TST-R NOR key to the TST-R position.
- (4) Operate the OFF-NOR switch to NOR.
- (5) Close CB1, CB2, and CB3 circuit breakers.
- (6) Operate the MAN-AUTO key to the AUTO position.
- (7) Set AMPL TST-NOR switch to NOR.
- (8) Set REG TST-NOR switch to NOR.
- (9) Set CON CUR TST-NOR switch to NOR.

(b) **Lists 3 and 6:**

- (1) Operate S1 switch to 1.
- (2) Operate S2 switch to OFF, using care to avoid actuation of the S9 switch.
- (3) Operate the OFF-NOR switch to NOR.
- (4) Close CB1, CB2, and CB3 circuit breakers.
- (5) Operate the TST-NOR-MAN key to TST.
- (6) Set AMPL TST-NOR switch to NOR.
- (7) Set CON CUR TST-NOR switch to NOR.

4.02 **AR1 MIN Relay Adjustment:** Observe the preliminary procedures in paragraph 4.01 and proceed as follows:

- (1) Operate the simulated low current switch (S480) to the TEST position and hold. [The CON CUR TST (S3) switch should not be operated.]
- (2) Rotate the simulated low current potentiometer (R480) cw and observe that the current increases until the MIN lamp extinguishes.
- (3) Rotate R480 ccw until the MIN lamp lights.

Requirement: The MIN lamp must light with decreasing current in the range of 40 to 50 amperes. (Refer to Table A for relay settings.)

TABLE A

AMMETER RELAY SETTINGS

ITEM	LIST 2 & 5	LIST 3 & 6
AR1 Min Contact	40 Amps	40 Amps
AR1 Full Contact	800 Amps	800 Amps
AR2 Low Contact	200 Amps	
AR2 High Contact	600 Amps	

Note: If the MIN lamp does not light in accordance with (3), adjust the MIN-INC potentiometer cw to increase or ccw to decrease the MIN lamp operating current. Repeat Steps (2) and (3) to check new setting.

- (4) Release the simulated low current switch (S480).◆

4.03 AR1 FULL Relay Adjustment: Observe the preliminary procedures in paragraph 4.01 and proceed as follows:

- (1) Operate the CON CUR TST-NOR (S3) switch to the TST position and hold.
- (2) Rotate the CON CUR TST (R37) potentiometer cw until the AR1 meter reads 800 amperes.

Requirement: The AR1 FULL lamp lights at 800 amperes.

Note: If the requirement in (2) is met, proceed to (3). If the FULL lamp lights before the AR1 meter indicates 800 amperes, rotate the FULL potentiometer ccw, or if the FULL lamp does not light at 800 amperes, rotate the full potentiometer cw and repeat (2) until the FULL lamp just lights at 800 amperes. ◆(Refer to Table A for relay settings).◆

- (3) Release the CON CUR TST-NOR (S3) switch.

4.04 AR1 OL Relay Adjustment: Observe the preliminary procedures in paragraph 4.01 and proceed as follows:

- (1) Operate the CON CUR TST-NOR (S3) switch to the TST position and hold.

- (2) Rotate the CON CUR TST (R37) potentiometer cw until the AR1 meter reads 950 amperes.

Requirement: The AR1 OL lamp lights.

Note: If the requirement in (2) is met, proceed to (3). If the OL lamp lights before the AR1 meter indicates 950 amperes, rotate the OL potentiometer ccw, or if the OL lamp does not light at 950 amperes, rotate the OL potentiometer cw and repeat (2) until the OL lamp just lights at 950 amperes.

- (3) Release the CON CUR TST-NOR (S3) switch.

4.05 OL Thermal Relay: The adjustment for the OL thermal relay, mounted on the rectifier control panel, is the same as covered in the appropriate Bell System Practice, except that the AR1 OL relay must be operated before the OL thermal relay will operate.

Caution: Make sure that the rectifier shuts down within a few seconds of operation of the AR1 OL relay.

4.06 AR2 LOW Relay Adjustment: Observe the preliminary procedures in paragraph 4.01 and proceed as follows:

- (1) Operate the simulated low current switch (S480) to the TEST position and hold.
- (2) Rotate the simulated low current potentiometer (R480) cw and observe that the current increases to 250 amperes. The LOW lamp should be out.

Note: If the LOW lamp remains lighted, rotate the associated control cw until the LOW lamp extinguishes.

- (3) Rotate R480 ccw until the LOW lamp lights.

Requirement: The AR1 ammeter relay meter indicates between 190 and 210 amperes. ◆(Refer to Table A for relay settings).◆

Note: If the ammeter relay meter does not indicate the value in (3), rotate the LOW potentiometer cw to increase or ccw to decrease the meter reading and repeat (2) and (3) to make sure the LOW lamp lights in the range

of 190 to 210 amperes on slowly decreasing current.

- (4) Release the simulated low current switch (S480).

4.07 AR2 HIGH Relay Adjustment: Observe the preliminary procedure in paragraph 4.01 and proceed as follows:

- (1) Operate the CON CUR TST-NOR (S3) switch to the TST position and hold. The HIGH lamp should be extinguished.

Note: If the HIGH lamp remains lighted, turn the associated adjustment cw until the lamp goes out.

- (2) Rotate the CON CUR TST (R37) potentiometer cw until the AR2 meter reads 75 percent or 600 amperes.

Requirement: The AR2 HIGH lamp lights.

Note: If the requirement in (2) is met, proceed to (3); if not, rotate the associated control cw until the HIGH lamp just lights. Repeat (2) until the HIGH lamp lights at 75 percent or 600 amperes. (Refer to Table A for relay settings.)

- (3) Rotate the CON CUR TST (R37) potentiometer fully ccw.

- (4) Release the CON CUR TST-NOR (S3) switch.

4.08 Rectifier Checkout: After adjusting the AR1 and AR2 relays, the rectifier should be checked for all functions pertaining to the ammeter relays, and for overload shutdown, in accordance with the appropriate Bell System Practice.

5. TROUBLES

5.01 When testing AR1 and AR2 ammeter relays, all functions, MIN, LOW, HIGH, FULL, and OL, should be checked before replacing relays.

5.02 AR1 and AR2 Relay Failure: If a relay fails to operate in accordance with Part 4, it is suggested that the 50-volt supply from the rectifiers be checked and the relay adjustment be checked. If the relay proves to be defective, it is advisable to replace the faulty ammeter unit with a new one and to send the faulty unit to the supplier for repair and return. This is necessary to prevent damage in replacing sensitive components, since certain factory adjustments are peculiar to each unit.