N2 REPEATERED LINE
REGULATED POWER SUPPLY
CONSTANT-CURRENT REGULATOR CIRCUIT
DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the constant-current regulator circuit used for powering remote N1-, N1A-, or N2-type carrier repeaters and 240-type flat gain amplifiers via the simplex circuit of the transmission pairs. The regulator may power as many remote repeaters and 240-type amplifiers, with or without sealing current, as is feasible from a 260-volt (±130 volts) source protected by two "ohm-per-volt" fault current limiting resistors.

1.02 The regulator output current is maintained to within ±5 percent of the nominal value with maximum office variations of input source voltage and output load resistance.

2. EQUIPMENT DESCRIPTION

2.01 The constant-current regulator circuit may be plugged into an N2 repeater bay as a separate plug-in unit per J99321AC. The constant-current regulator circuit may also be provided as part of a line build-out circuit per J99323AA if required in the line build-out bay. The constant-current regulator coded J99321AC consists of a printed wiring board mounted in a casting approximately 4-1/4 inches wide, 2-1/2 inches high, and 12 inches deep. On the front of the regulator unit are test points for measuring line current and fins for radiating the heat dissipated in the circuit transistors. The printed wiring board mounts the circuit components and screw-type switches used to select the required amount of supply voltage and the desired amount of line current. The J99321AC regulator plugs into a standard N3 carrier terminal shelf which is used in the N2 repeater bay. Electrical connection is made via a 503A-type plug mounted at the back of the unit. It is secured in place on the shelf by a latch which also ejects the unit when the latch is depressed.

2.02 The constant-current regulator circuits used in applications where the new line build-out and cross connection arrangements are used is physically a part of the line build-out circuit which plugs into the line build-out bay. Sections pertaining to the line build-out bay provide a physical description of this unit.

3. CIRCUIT DESCRIPTION

3.01 A schematic of the constant-current regulator circuit is shown in Fig. 1. The leads designated V1 and V2 connect to the simplex legs of the transmission pairs powered from the east toward the west. Switch S5, S6, or S7 is operated according to the type of power arrangement for the installation. The operation of switches S1 through S4, either individually or in combination, controls the value of resistance in the circuit to obtain the different operating currents required over the line for the different combinations of repeaters and 240-type amplifiers. Transistors Q1 and Q2 provide the regulation at the specific value of operating current. Bias for transistor Q1 is obtained from a voltage divider consisting of diode CR1, varistors RV17, RV18, and RV19, and resistor R19. Bias for transistor Q2 is provided by a resistor in a remote unit. This resistor also bypasses some of the line current around the transistors.

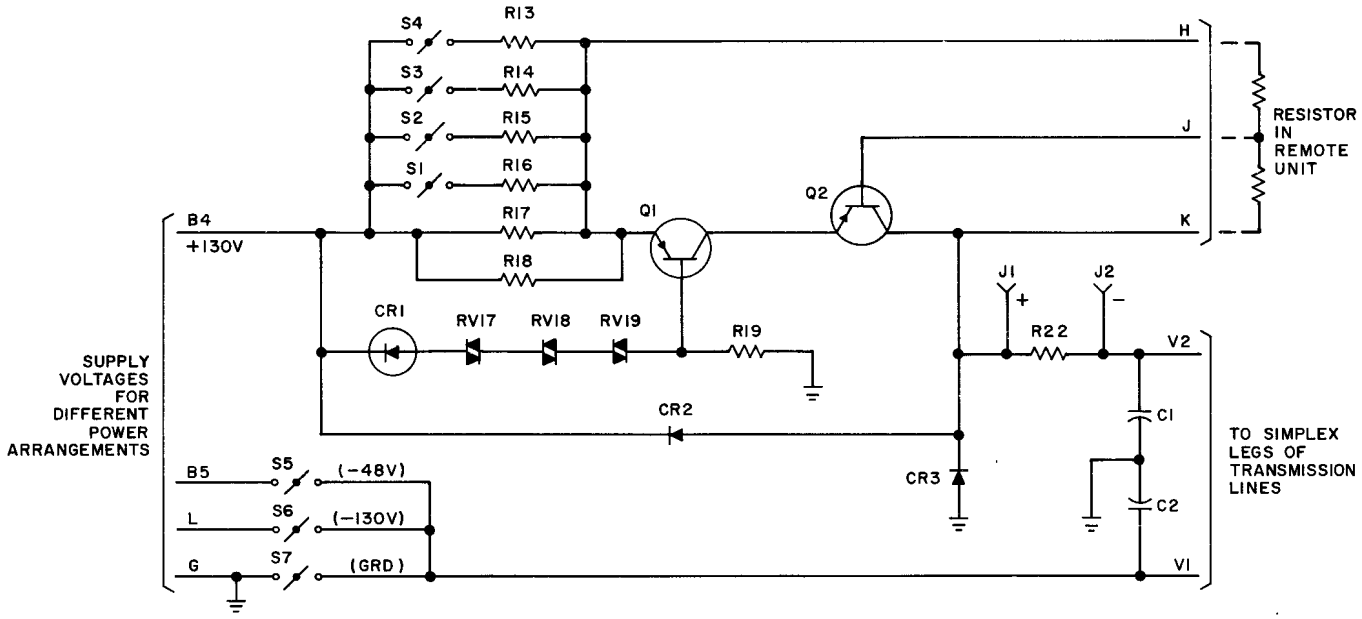

Fig. 1 — Constant-Current Regulator Circuit — Schematic

3.02 The regulator circuit enables a specific line current to be maintained independent of line resistance variations due to temperature changes or varying line lengths. The regulated line current is also independent of supply voltage changes. To understand the principle of this regulating action it should be noted that the overall emitter-to-collector circuits are connected in series with the power line across the supply voltage. Since the base bias of Q1 is maintained reasonably constant by the action of diode CR1, the overall emitter-to-collector voltage drop increases for either an increase in supply voltage, a decrease in line resistance, or both. Thus, in either case, the emitter-to-collector circuit acts as a variable impedance to control the magnitude of the current in the power line.

3.03 Varistors RV17, RV18, and RV19, which are connected in series with regulator diode CR1, compensate for the effects of temperature changes on the diode and transistor Q1. Test points J1 and J2, across resistor R22, are used to measure the regulated line current. Diodes CR2 and CR3 and resistor R22 provide over-voltage or lightning protection for the regulator. Capacitors C1 and C2 prevent the sustaining of an arc by the output current after lightning or other high potential has caused breakdown of an external protector. When the external protector breaks down, the capacitor discharges through the arc and its voltage quickly drops below the sustaining voltage of the arc. The time constant of the capacitor and the resistance between it and the battery supply delay the voltage buildup across the capacitor and the external protector until the protector gap has deionized, thus preventing recurrences of breakdown.

4. DRAWINGS (NOT ATTACHED)

4.01 The following schematic and equipment drawings (not attached) provide detailed information.

SD-97272-01 — Application Schematic for Powering N1, N1A, N2, ON1, and ON2 Repeaters

SD-97374-01 — Application Schematic for N2 Repeater

SD-97391-01 — Application Schematic for Line Build-Out and Cross-Connect Circuits

SD-97399-01 — Distribution and Alarm Circuit for Use with Line Build-Out Circuit or N2 Repeater

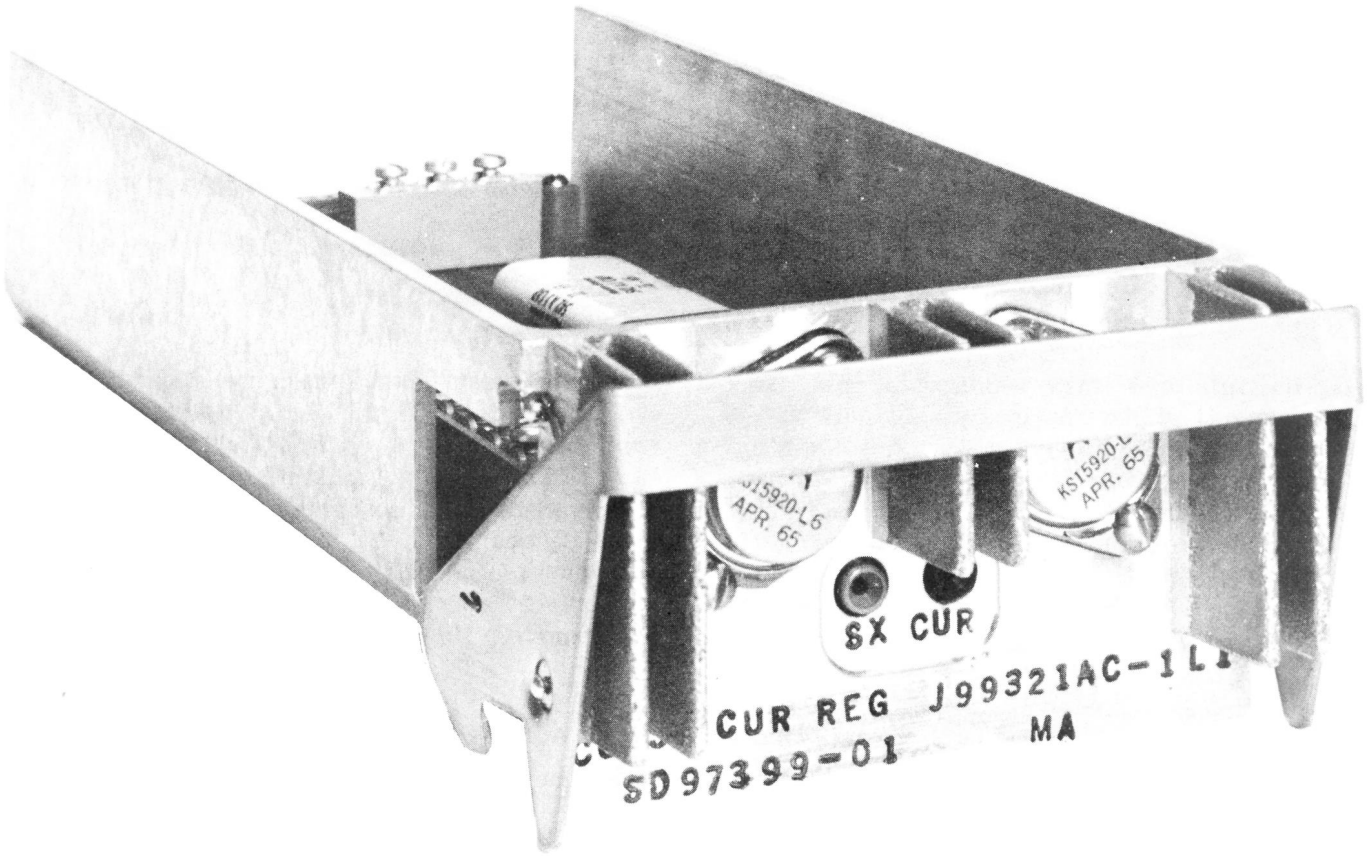

Fig. 2 – Constant Current Regulator Unit