

TYPE N2 CARRIER TERMINAL LINE TERMINATING UNIT DESCRIPTION

1. GENERAL

- 1.01** The line terminating unit is used to interconnect the carrier frequency line pairs and the group units, to build out the loss of the carrier line to a nominal value, and to provide low-voltage protection against induced voltages.
- 1.02** The carrier frequency signals are handled on a 4-wire basis. Output from the transmitting group unit is applied to two transmitting switching jacks connected in parallel. The signal is passed through shorting plugs in the switching jacks to the transmitting span pad. The span pad provides the proper attenuation for coordination of line levels, if required, in the particular cable route used. The output of the span pad is applied to the transmitting carrier frequency line pair through a transformer.
- 1.03** The input signal from the receiving carrier frequency line pair is passed through a well balanced transformer in order to obtain adequate longitudinal balance to suppress longitudinal noise. It is then passed through the receiving span pad, which provides the proper attenuation to build out the loss of the particular cable circuit being used. The output of the span pad is applied to two receiving switching jacks connected in parallel. The signal is fed to the input of the receiving group unit through shorting plugs normally connected into the switching jacks.
- 1.04** The line terminating unit contains circuitry for feeding dc supply power to either one remote electron tube repeater, or one, two, or three remote transistor repeaters. Provision is also made for providing sealing current only in the carrier frequency line when necessary.
- 1.05** Lightning protection, supplementing the carbon blocks at the cable terminal or terminal block, is provided for the transistorized circuitry by varistors connected across the output of the receiving span pad and across the input of the transmitting span pad. The line terminating unit also contains a relay which is required to interrupt the dc power feed to the group transmitting unit for a short period of time during the carrier failure alarm cycle.

2. DETAILED DESCRIPTION

2.01 *Over-all Unit:* The line terminating unit consists of three major parts: the transmission circuits, the power feed circuits, and the alarm circuit relay.

2.02 *Transmission Circuits:* The transmission circuits consist of noise reducing and dc separation transformers, span pads, lightning protection varistors, and switching jacks. (See Fig. 1.)

2.03 Transmitting transformer T1 and receiving transformer T2 couple the carrier line pairs to the 125-ohm span pads. Capacitors C3 and C4 connected across both sides of the receiving transformer improve the transmission characteristic. The transformers provide the simplex connection to the carrier frequency line for the purpose of supplying power over the line. The receiving transformer also maintains an adequate longitudinal balance to the receiving line to suppress longitudinal noise.

2.04 Transmitting and receiving span pads AT1 and AT2, respectively, provide the required attenuation for the particular cable circuits being used. The span pads are plug-in units which provide attenuation of 0 to 30 db in 2-db steps.

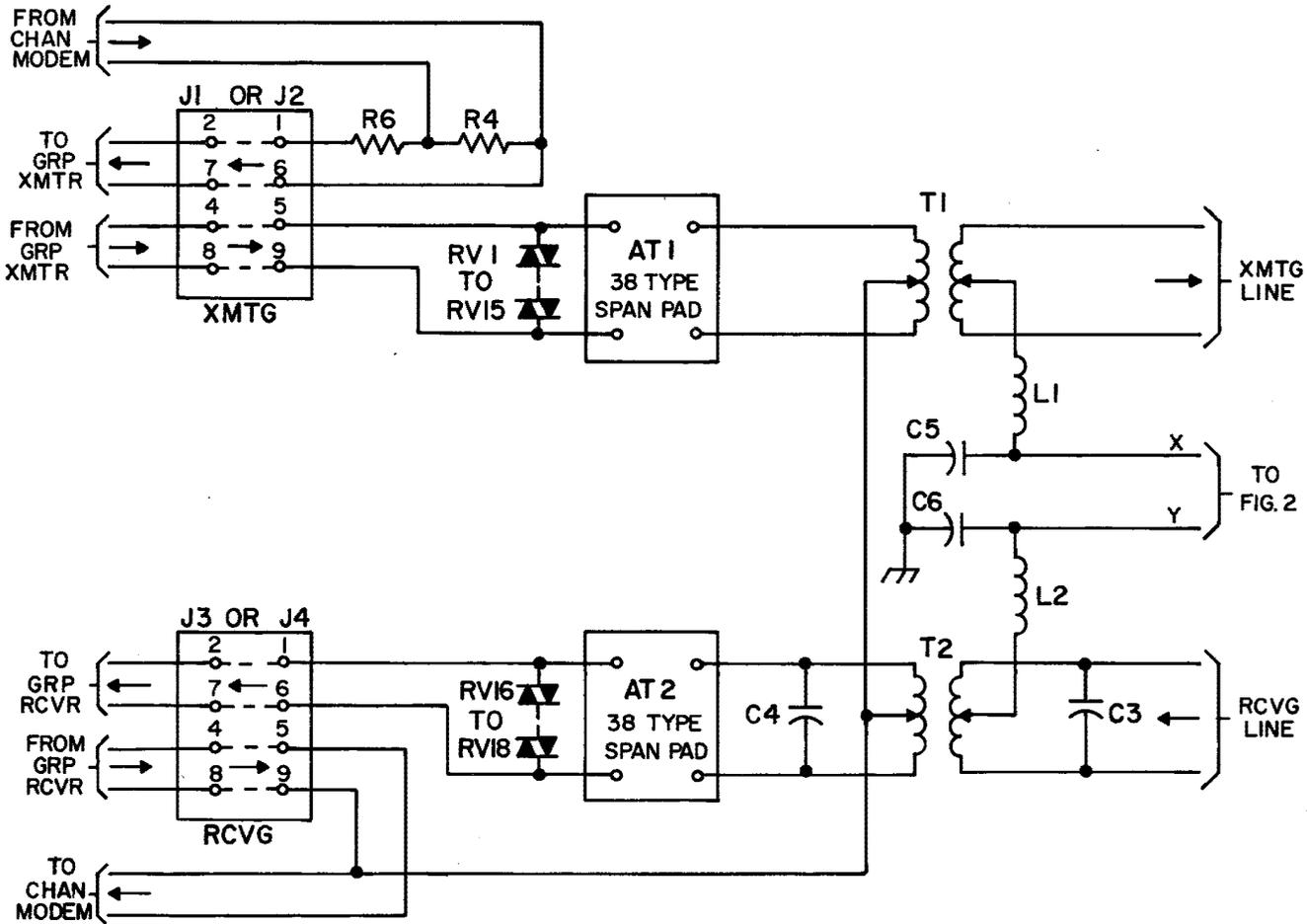


Fig. 1 - Transmission and Protection Circuit

2.05 The N2 carrier terminal is partially protected from lightning surges induced in the transmission lines by carbon lightning protection blocks exterior to the terminal. These blocks are placed from each conductor to ground so that electrically they are at both the receiving and transmitting sides of the line terminating unit, and limit surge voltages to approximately 500 volts. Additional protection must be provided in the line terminating unit since a 500-volt transverse surge would damage the transistor circuits in the group equipment. The terminal transmitting circuits are protected from transverse surges by varistors RV1 to RV15 which shunt the input of the transmitting span pad. The terminal receiving circuits are protected by varistors RV16, RV17, and RV18 connected in shunt across the output of the receiving span pad. The 15 varistors in the trans-

mitting side and the 3 varistors in the receiving side are necessary to prevent peak clipping and intermodulation of the correspondingly high- and low-level carrier signals.

2.06 Since the group units are shared by 12 message channels, it is necessary to provide facilities for switching partially or potentially defective group units out of service and new units into service without interfering with message service. This is accomplished by providing two transmitting jacks J1 and J2 connected in parallel and two receiving jacks J3 and J4 connected in parallel. During normal operation, plugs are connected into J1 and J2 which short terminals 1 to 2, 6 to 7, 4 to 5, and 8 to 9. Similarly, plugs are connected into J3 and J4 which short terminals 1 to 2, 6 to 7, 4 to 5, and 8 to 9. Under these conditions, the carrier frequency line pairs are connected to the two

group units, and the group units are connected to the channel modem units.

2.07 The switching method is described in detail in another section. Resistors R4 and R6 are mounted in the line terminating unit rather than in the transmitting group unit so that they are not switched with the group unit.

2.08 Power Feed Circuits: The power connections to the receiving and transmitting cable pairs are made at the center taps of transmitting transformer T1 and receiving transformer T2, respectively, through choke coils L1 and L2 (see Fig. 1). Capacitors C5 and C6, together with the resistors in the positive and negative voltage supplies, ensure that any carbon block lightning protector, which had broken down during a surge, will extinguish its arc and establish an open circuit between the conductor and ground after the surge.

2.09 The power feed circuit for powering remote repeaters over the carrier frequency line consists of fixed and adjustable resistors and a strapping arrangement to select the proper combination. A means is provided for measuring the line current. (See Fig. 2.)

2.10 Adjustable resistor R1, fixed resistors R2 and R3, and the screw-type connector arrangements of S1, S2, and S3 make it possible to power either one remote electron tube repeater, or one, two, or three remote transistor repeaters. Provision is also made for providing sealing current only in the transmission lines when necessary. Sealing current may also be supplied to the cable section beyond the last powered repeater over the cable by providing the proper wiring options at the repeater mounting brackets. There are additional resistors in the bay cable terminating panel at the top of the N2 bay. The resistors are in the ± 130 volt

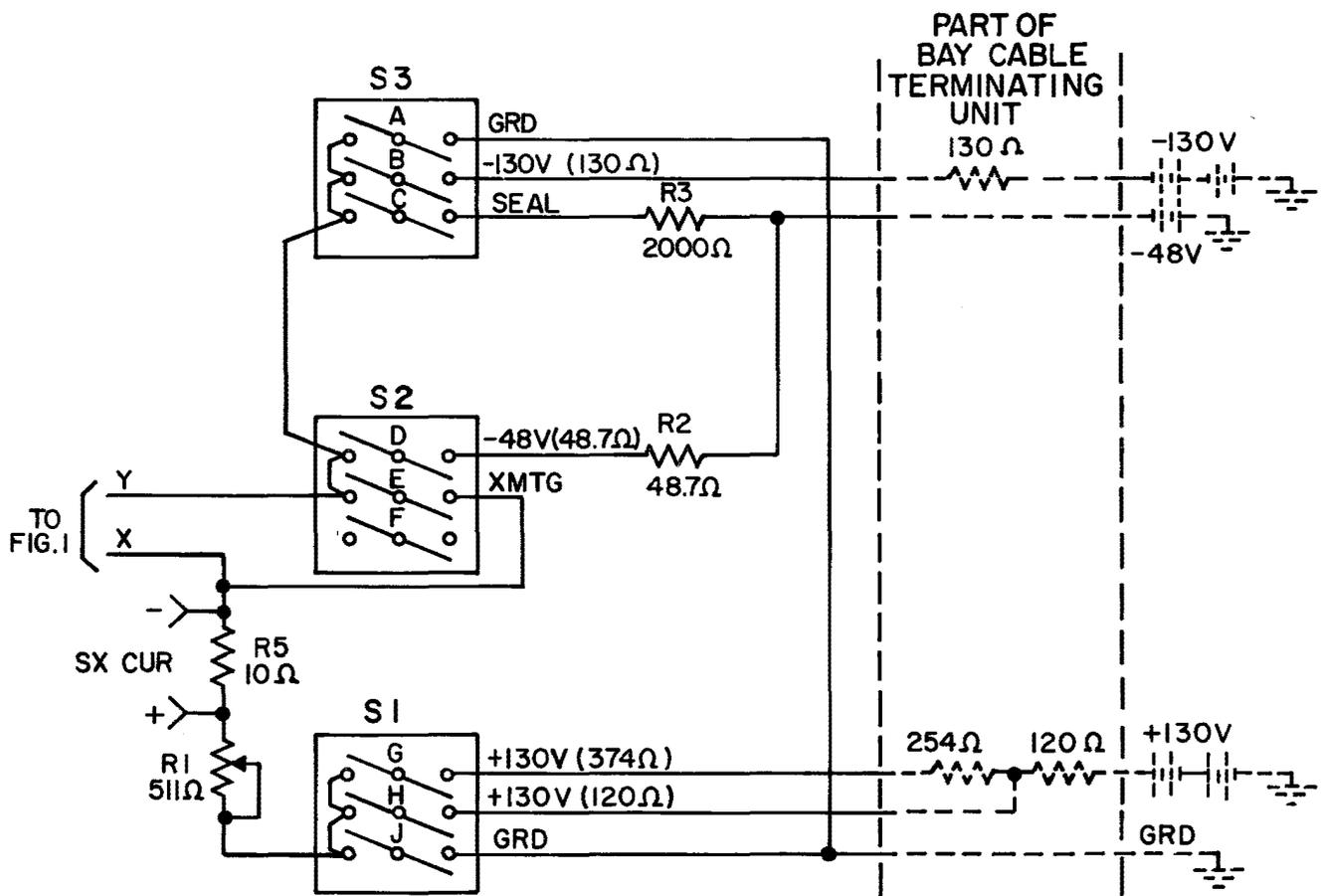


Fig. 2 - Power Feed Circuit

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paths, 130 ohms in the -130 volt circuit, and 374 ohms tapped at 120 ohms in the +130 volt path. A minimum resistance of 1 ohm per volt is required in each power circuit feeding from an office to limit fault currents due to wiring or cable troubles to 1 ampere and so provide fire protection.

2.11 A 10-ohm resistor R5 and jacks (+)SX CUR(-) are used to measure the direct current being fed over the cable. The 10 ohms, combined with the 120 ohms of minimum resistance provided in the bay cable terminating panel, when screw connection H is made, make up the 130-ohm protection resistance for the +130 volt battery.

2.12 Table A indicates the screw connections to be made on S1, S2, or S3 for the power feed feature required. The table also provides information as to the power supplies required for each feature. Screw connection H provides 130 ohms (120 ohms in the power distribution unit plus the 10-ohm test resistor) in the +130 volt path, and screw connection G inserts 254 ohms in addition to the 130 ohms in the +130 volt path. This resistance is provided in the bay cable terminating panel as mentioned in 2.10. Screw connection G should be used where feasible to minimize the power being dissipated by adjustable resistor R1, thus limiting the heat generated in the line terminating unit.

TABLE A				
Power Feed Options				
POWER FEATURE OR OPTION		BATTERY SUPPLY	POWER CONNECTION SCREWS USED	APPROX MAX TOTAL CABLE LOOP RESISTANCE (INCLUDING LINE BUILD OUT)
		volts		ohms
Power to Transistorized Repeaters	1 HL Rep	-48	D + J	150
		+130	A + (G or H)	
	1 LH Rep	+130	A + (G or H)	
	2 Rep (HL + LH)	+130	A + H	400
		+130 & -48	D + (G or H)	
	3 Rep (2HL + 1LH)	+130 & -48	D + H	570
+130 & -130		B + (G or H)		
Power to Electron Tube-type Repeater		+130 & -130	B + (G or H)	
Sealing Current Only		-48	C + J	
No Power Transmitted			E	

2.13 Alarm Circuit Relay: Relay K3, which is part of the alarm circuit, is located in the line terminating unit. (See Fig. 3.)

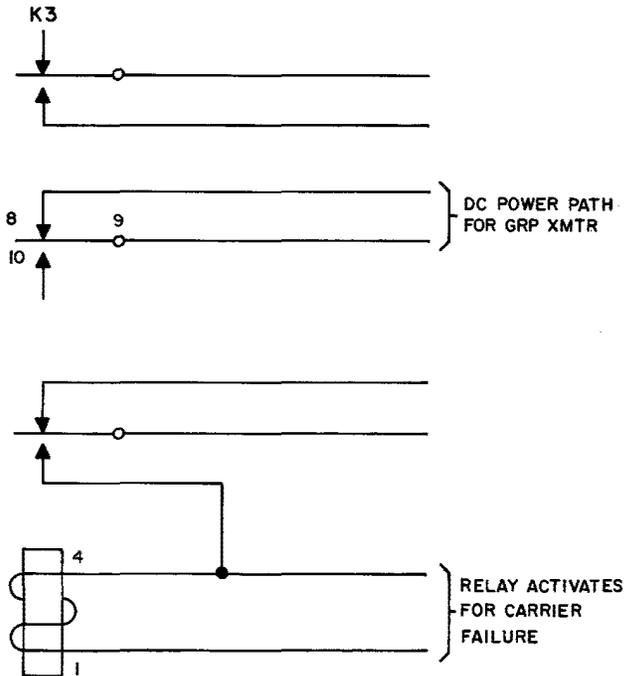


Fig. 3 – Alarm Circuit Relay

2.14 During the carrier failure alarm cycle, it is necessary to interrupt the transmission of carrier power to the line for a short period of time to produce an indication of carrier failure at the distant N2 terminal. This is accomplished by connecting the dc power to the transmitting group unit through contacts 8 and 9 (break contacts) of relay K3. When the alarm control unit responds to a received carrier failure of sufficient duration, it causes control winding 1-4 of relay K3 to be activated. Contacts 8 and 9 are then opened and dc power is removed from the group unit. It is desirable that the alarm and control unit be removable without interfering with the operation of the N2 terminal. This is accomplished by mounting relay K3 in

the line terminating unit rather than in the alarm and control unit where it otherwise would be located.

3. EQUIPMENT ARRANGEMENTS

3.01 Description: The line termination unit is made up of two subassemblies connected by brackets (see Fig. 4). One subassembly is referred to as the transmission side, and contains the transformers, switching jacks and plugs, mounting sockets for the 38-type span pads, and the protection capacitors and varistors. The other subassembly, referred to as the power side, contains the screw-type connector blocks, relay K3, repeater power supply resistors, and line current test points. Instructional information is included on the power subassembly as shown in Fig. 5. The location of components on the power side is shown in Fig. 6.

3.02 Components in the transmission subassembly are mounted on an Amplas board which is mounted on a metal casting. The power subassembly mounting surface is a metal plate which is also mounted on a metal casting. The two castings are connected together by four brackets, two of which can be seen in Fig. 4. Each subassembly has a 20-pin connector on the back to mate with a jack in the terminal mounting.

4. DRAWINGS

4.01 The following schematic drawings (not attached) are listed for reference:

DESIGNATION	SUBJECT
SD-97117-01	Line Terminating Circuit
SD-97118-01	Application Schematic — Shop-wired Terminal Bay

4.02 The following equipment drawing (not attached) is listed for reference:

DESIGNATION	SUBJECT
ED-97112-30	Line Terminating Unit — Transmission Subassembly

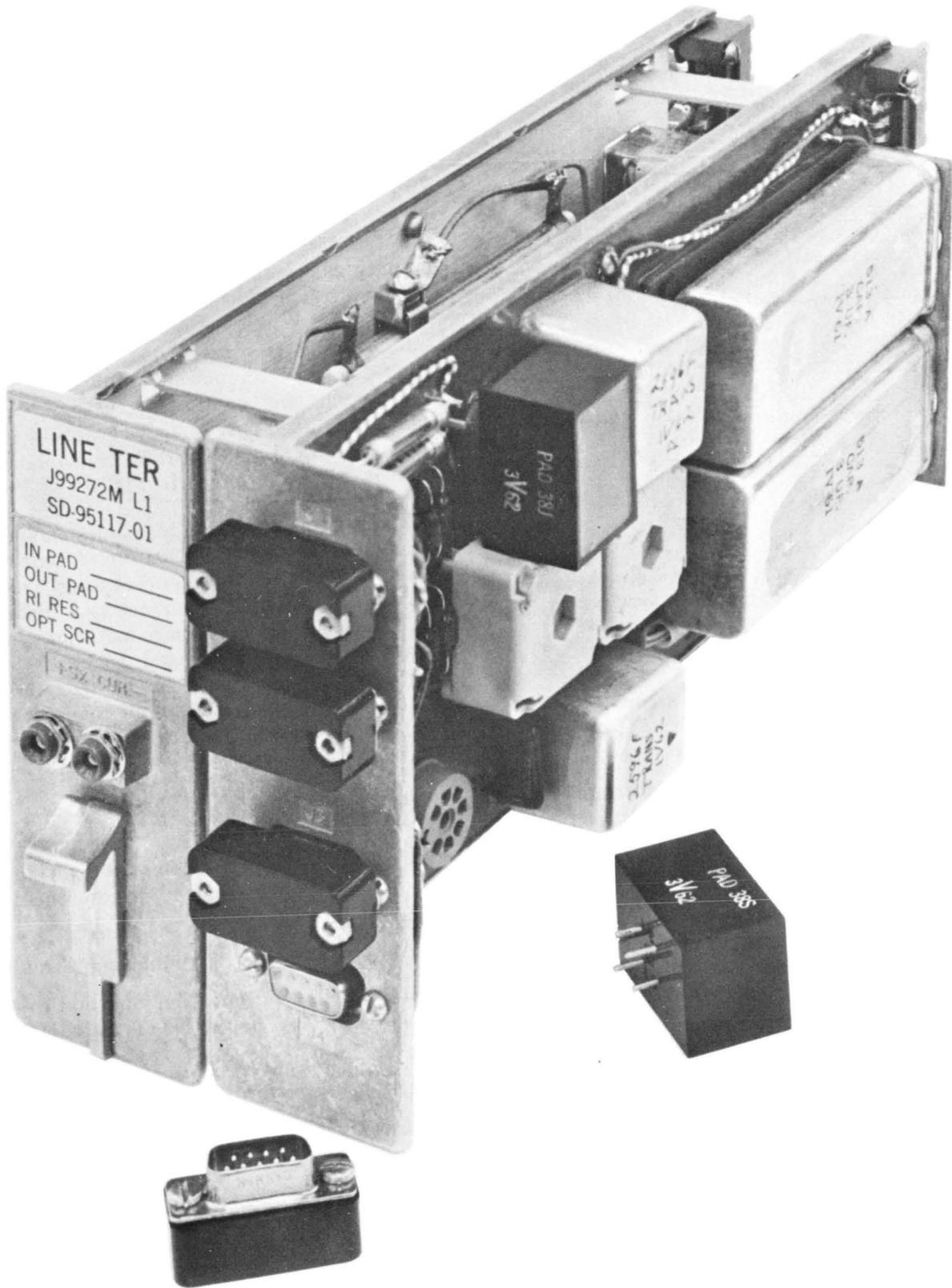


Fig. 4 - Line Terminating Unit

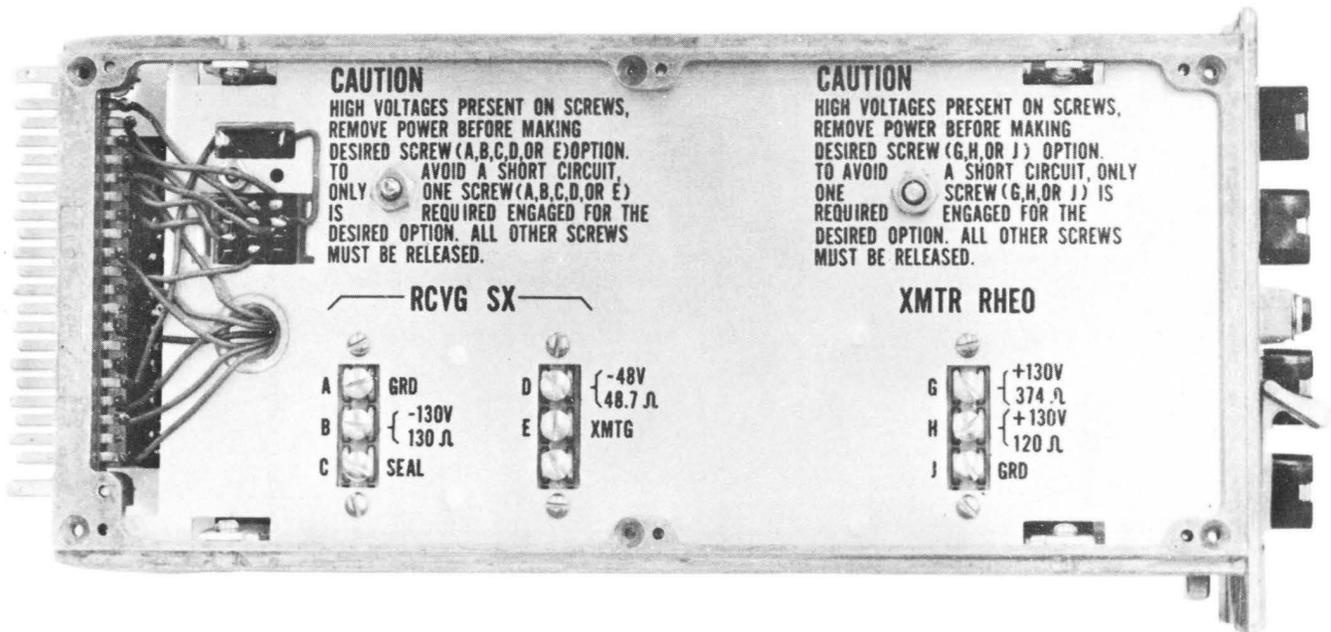


Fig. 5 – Line Terminating Unit — Operating Information and Screw Connectors

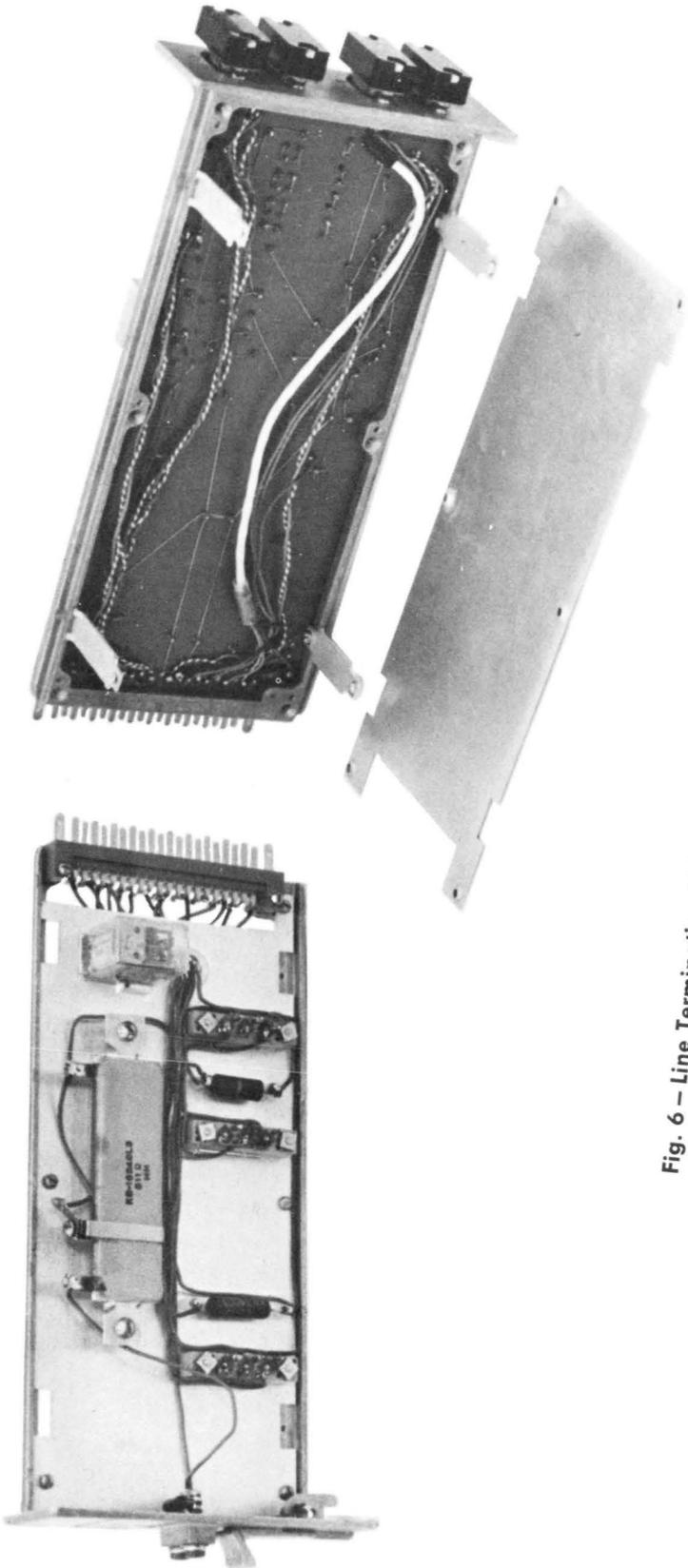


Fig. 6 - Line Terminating Unit - Power Side Component Layout