EXCHANGE SPECIAL SERVICES

ARRANGEMENT OF V3 REPEATERS

CONTENTS

1. GENERAL

1.01 This section is issued to describe a simplified arrangement of V3 type repeater equipment adapted to special service uses in those offices where large standard arrangements of the equipment are not available or contemplated. Since it is expected that the application of this arrangement will be somewhat limited it is not planned to standardize the equipment arrangements described in this section nor to issue standard equipment drawings at this time. However, informal drawings are available for those cases where it is desired to assemble the equipment on a local basis. The transmission features of the V3 application to special service lines are discussed in Section AB22.328.

1.02 The arrangement described in this section includes several features especially useful in special service applications. The long line circuits frequently used in these lines are wired between the repeater terminals to avoid balancing problems. A disabling feature is included to prevent instability in the idle circuit condition and provision is made for simplex signaling arrangements where increased signaling range is required.

1.03 In this section the two sides of the V3 repeater will be designated as the STATION side and LINE side. This notation is convenient, for in many special service cases the signaling and battery supply circuits must be so arranged. The STATION side is arranged for connection to a telephone instrument or station line equipment and the LINE side to a line circuit at a PBX or central office. In the case of PBX tie lines designed for switching at both ends the designation serves merely to identify equipment items for assignment and testing purposes.

2. BAY ARRANGEMENTS

2.01 This arrangement is based on fully equipped bays of 10 repeaters although only five may be equipped if desired. Each repeater includes two amplifiers, two sets of line equipments, and two sets of line and network jacks.

2.02 Each bay also provides space for signaling equipment suitable for use with V3 repeaters. A fully equipped bay might be arranged to include eight dial long line circuits and five composite bypass circuits to provide some flexibility in assignment or arranged to include ten composite bypass circuits only.

2.03 Additional equipment may be included in some bays for testing purposes. These test bays are arranged to serve two adjoining bays on each side of the test bay. Initially, the first bay installed should include the test equipment but as growth occurs the test equipment should be in the third bay of a four-bay or larger lineup to permit maximum usage.

2.04 Figs. 4 to 7 show a typical arrangement of this equipment. Signaling equipment is mounted below the distributing unit which has a removable cover. A test bay includes a writing shelf and a set of test equipment mounted below the amplifiers. Space is available above the line equipment for fuse panels and, if required, battery supply filters.

3. APPARATUS ITEMS

3.01 Each V3 repeater uses two amplifiers (J68647A) one for each direction of transmission. Each amplifier is a plug-in unit with tube socket, gain control potentiometer, and testing pin jacks. A detailed description of the V3 repeater is given in Section E43.121.1.

3.02 The maximum gain of the amplifier unit is approximately 36 db, essentially flat over the voice-frequency band. The gain may be controlled over the entire range by the potentiometer adjustment on the front. This gain control is protected from accidental movement by a shield. The 408A electron tube used is a high gain pentode, using 130-volt plate supply and a heater supply adaptable to either 24- or 48-volt operation. Each amplifier will require

about 5 mils plate current and 50 mils heater current. The pin jacks on the amplifier unit are for monitoring and cathode activity measurement. The V3 amplifier unit is shown in detail on Drawing SD-95112-01.

3.03 Each V3 repeater requires two sets of line equipments arranged as shown in Fig. 1. The two coils of each set are connected as hybrid coils to provide 2-wire operation. These coils are of the 120-type: the 120P which is frequently used (SD-96463-01) provides a choice of two ratios to provide a nominal repeater impedance of 900 (Y strapping in Fig. 1) or 1500 ohms (Z strapping, Fig. 1). To obtain a 600-ohm nominal repeater impedance the 120N coil should be used.

3.04 Associated with each hybrid coil are 128-type filters to prevent instability at high frequencies, the filter used depending on the nominal cutoff of the line facilities. The highest cutoff filter permitted by a given line facility should, of course, be used.

3.05 A capacitor is associated with the amplifier input windings of each repeating coil to reduce the low-frequency gain. This is designated A in Fig. 1. A value of about 0.18 mc provides sufficient equalization for a representative gain-frequency characteristic which is about 10 db higher at 200 cycles than at 1000 cycles. Other values of capacity may be used depending on the desired frequency characteristic. A 0.1 mf capacitor across the output terminals of each amplifier reduces a gain peak normally present around 2400 cycles thus increasing high-frequency stability. In cases requiring high echo return losses the (A) capacitor, shown in Fig. 1, may be omitted.

3.06 Balancing networks of the 115 type are normally used with each set of line equipment, the adjustable 115D being used for nonloaded facilities. Subset balancing networks and compromise networks may also be used where applicable.

3.07 Building-out capacitance may be added to the loading end sections to improve the line balance against the network. Spare terminals on the distributing block are used as a support for the building-out capacitors. Values of capacitance which require one or two units may be specified. The terminals are cross-connected to the repeater line terminals on the line or station side or both as required.

3.08 Test jacks are provided to permit picking up line, network and repeater terminals in either direction.

3.09 Requirements for ringing, dc supervision, and dial pulsing are provided for by composite bypass or dial long line circuits connected to the electrical center of the line windings as shown in Fig. 1. These circuits also include a disabling feature to prevent instability in the idle circuit condition by shorting the input terminals to the LINE amplifier (see Paragraph 3.12). Unassigned but active repeaters in a bay may be held stable by a strap which provides this same input short. ("X" wiring, Fig. 1.)

3.10 Dial long line circuits used with the V3 repeaters are arranged between the hybrids rather than connected in the line external to the repeater, thereby avoiding an unbalance between line and network or requiring network balancing equipment to match the line equipment.

3.11 As shown in Fig. 2 arrangements are provided for either metallic or simplex signaling on either side of the repeater. The use of simplex signaling will, of course, require a modification of the distant signaling equipment to operate with the repeater equipment.

3.12 The repeater disabling feature which avoids instability in the idle circuit condition may be provided as shown in Fig. 2A. This feature operates as follows: On a STA line closure the P_1 relay operates and removes the short between the C and D leads by operation of the B relay. On a line break the short between the C and D leads is applied by the operation of the fast operating C relay pending the release of the B relay which maintains the short until the line is again closed.

3.13 When the long line circuit is not used at the repeater, a composite bypass circuit is used to complete the low-frequency path around the repeater. This circuit, shown in Fig. 3 also provides the disabling feature, the (B) and (C) relays of Fig. 2A being controlled by the (P) relay of Fig. 3.

3.14 Strappings are provided for three signaling conditions as outlined below and as shown in Fig. 3 for metallic or simplex line operation and for use with a disassociated long line circuit not wired into the repeater.

(a) Metallic signaling wiring is used when the dc signaling current flows on a metallic basis and when long line equipment is not required at the repeater location.

(b) Simplex wiring is used when the dc signaling current flows over the line wires in parallel to ground. In this usage the distant signaling equipment must, of course, be arranged for simplex operation.

(c) Auxiliary long line circuit wiring is used where long line equipment is required in the repeater office but is not available in the repeater bay.

3.15 A distribution unit consisting of two terminal blocks is shown for cross connections. Terminals of the V3 repeaters appear on the upper block. Terminals of the dial long line circuits, bypass circuits, and pairs to the MDF appear on the lower block. The necessary cross connections are made by jumpers between the blocks.

4. TESTING ARRANGEMENTS

4.01 Each bay arranged for testing includes a telephone set, test circuit panel, and jack panel as described in Section E43.121.2. This circuit includes two 11-pin sockets to which the amplifiers of the V3 repeater may be transferred for test. Jacks are provided to which are patched the sockets from which the amplifiers under test were removed. Other jacks permit measurement of amplifier gain and singing points to be made with the amplifier operating in its normal circuit. Monitoring may be performed either by patching the TEL LINE jack to the pin jacks on the amplifiers or to the MON jacks of the test circuit.

4.02 The test bay equipment as shown also includes attenuators with key controlled pads for use in setting amplifier gains and making singing point tests. A jack outlet for standard 1000-cycle, 1 milliwatt testing power is provided.

4.03 In the usual installation of this type equipment, portable transmission measuring equipment will be economical. Other portable equipment available should include a volt-ohm-milliammeter similar to the KS-14510 type and decade capacitors for adjustment of network building-out capacitance.

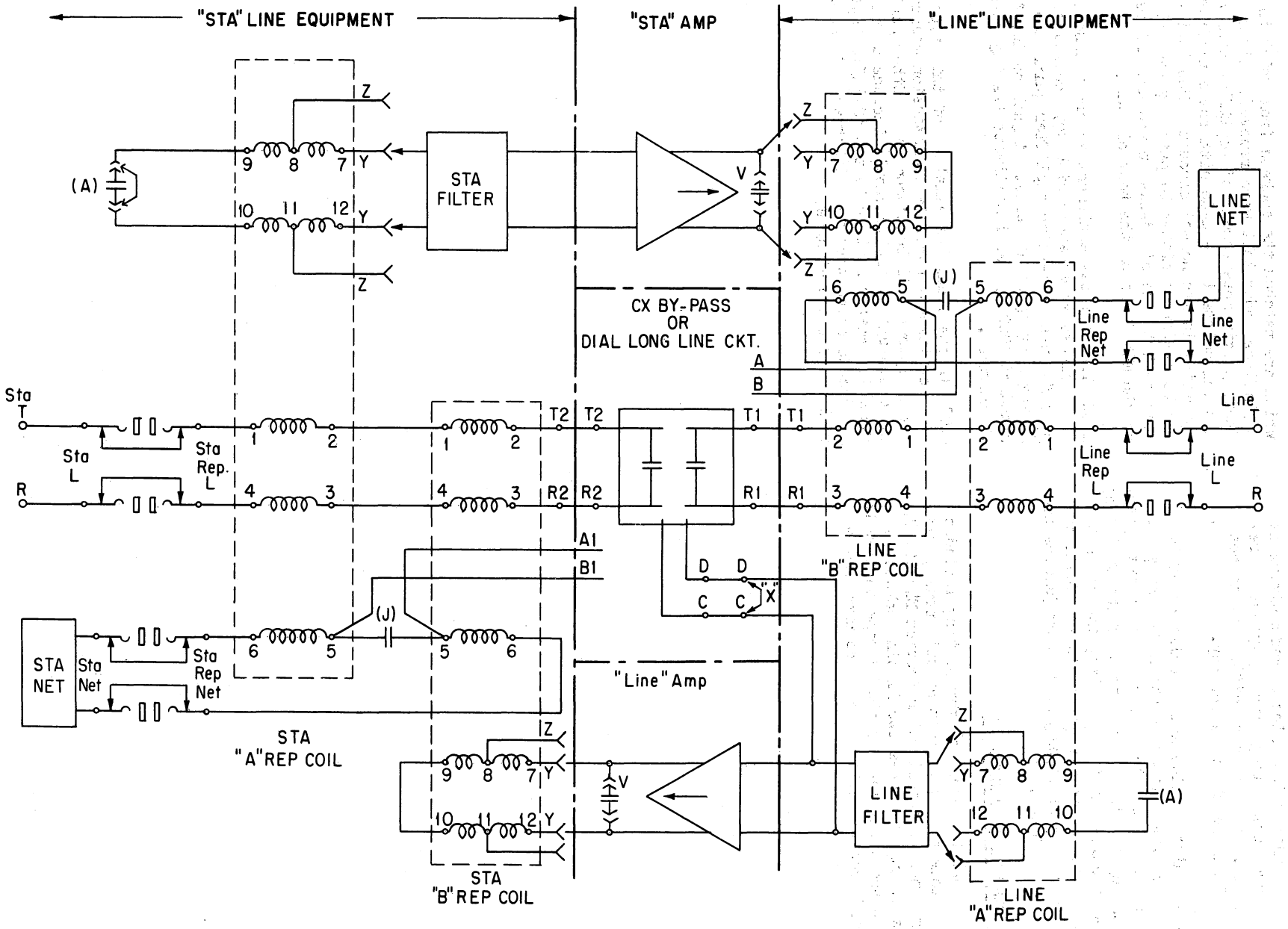
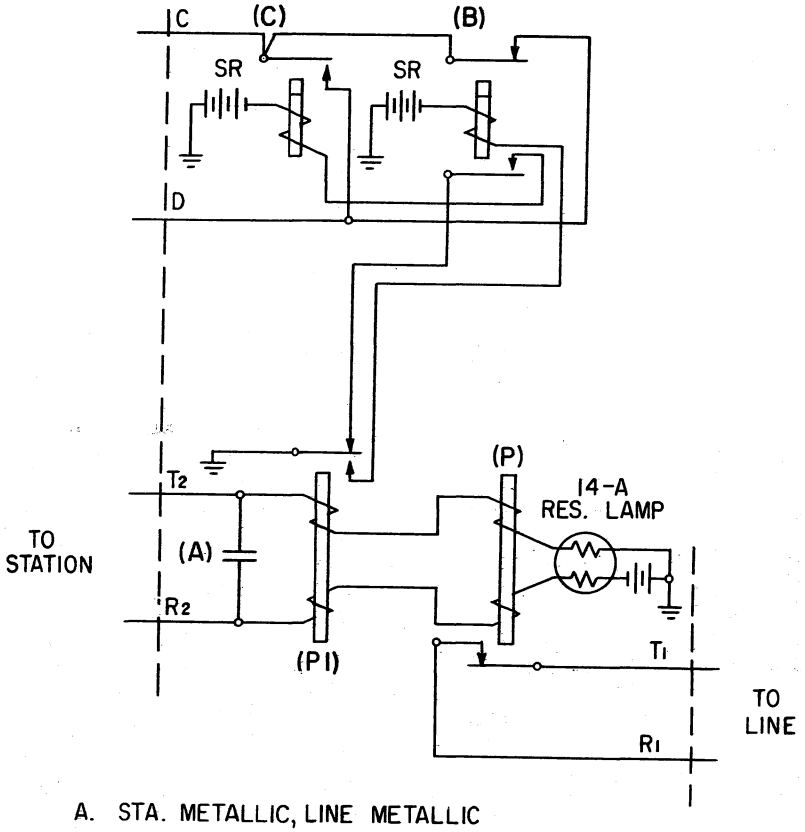
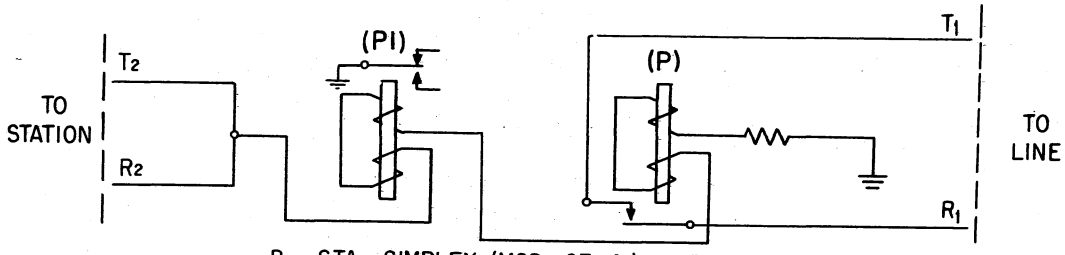


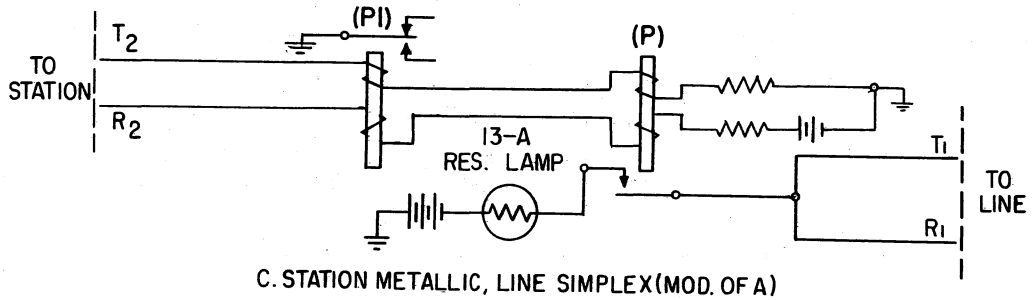
Fig. 1 - Schematic of V3 Repeater Line Equipment



A. STA. METALLIC, LINE METALLIC



B. STA. SIMPLEX (MOD. OF A.) LINE METALLIC



C. STATION METALLIC, LINE SIMPLEX (MOD. OF A)

Fig. 2 - Signaling Arrangements - Dial Long Line Circuit

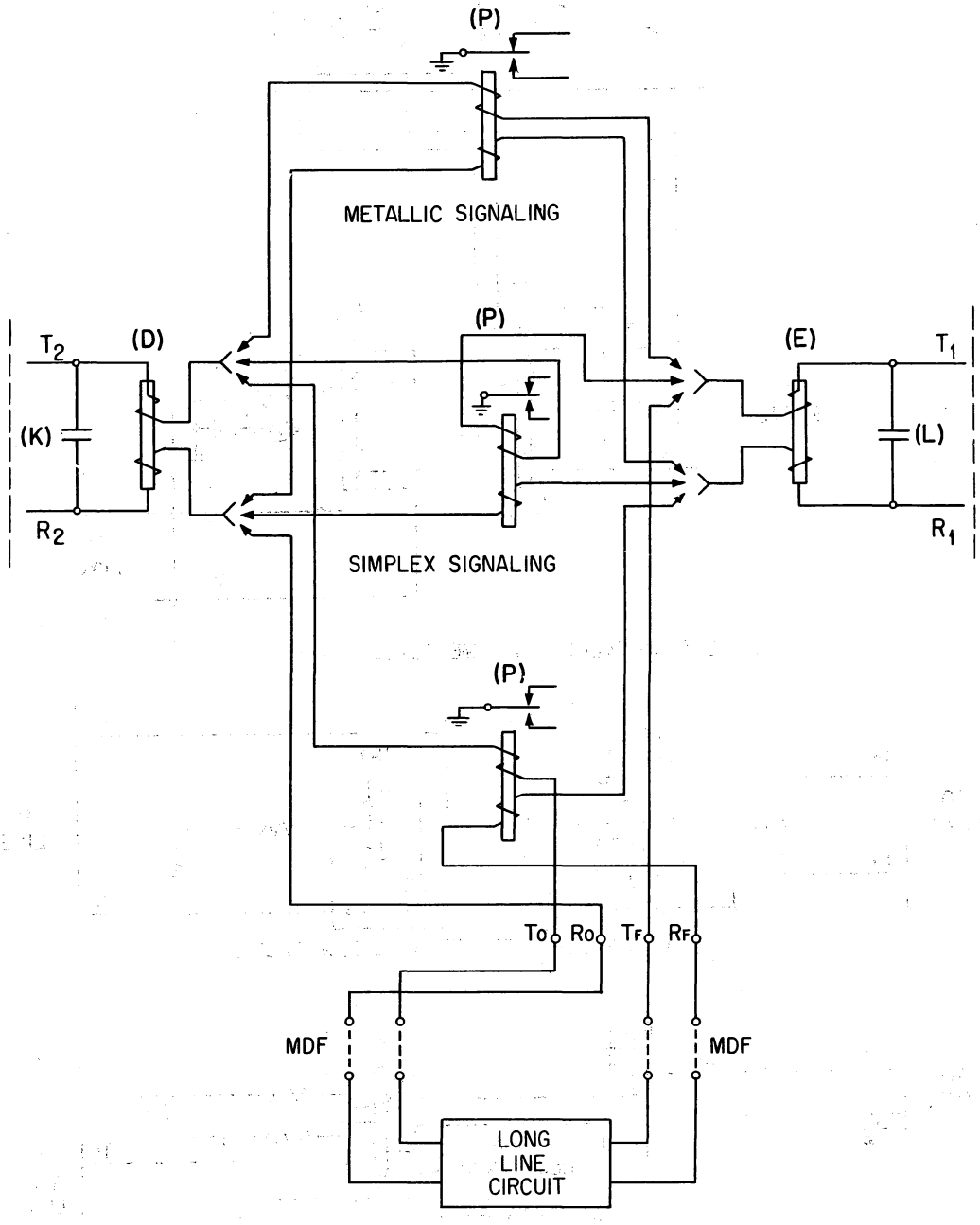
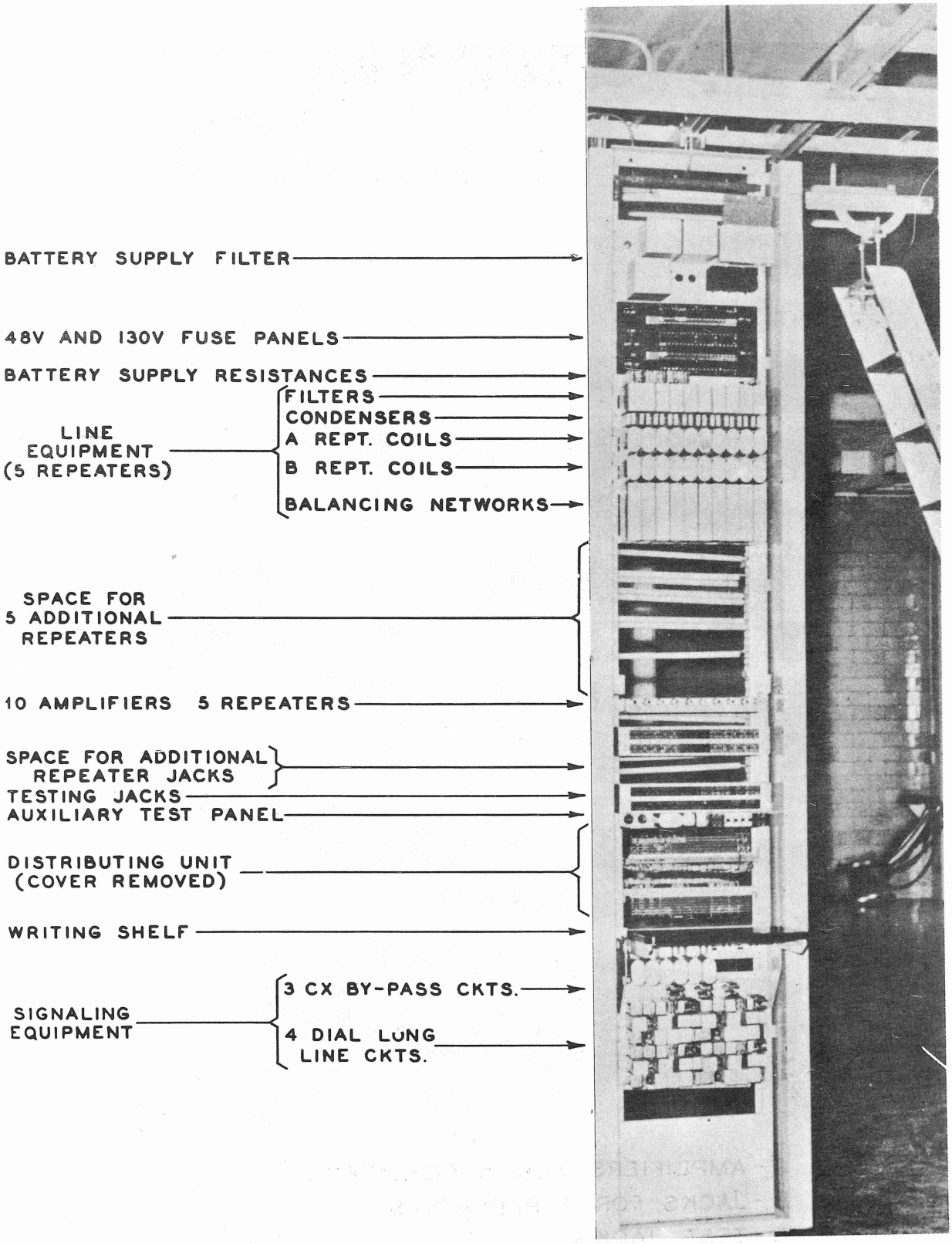
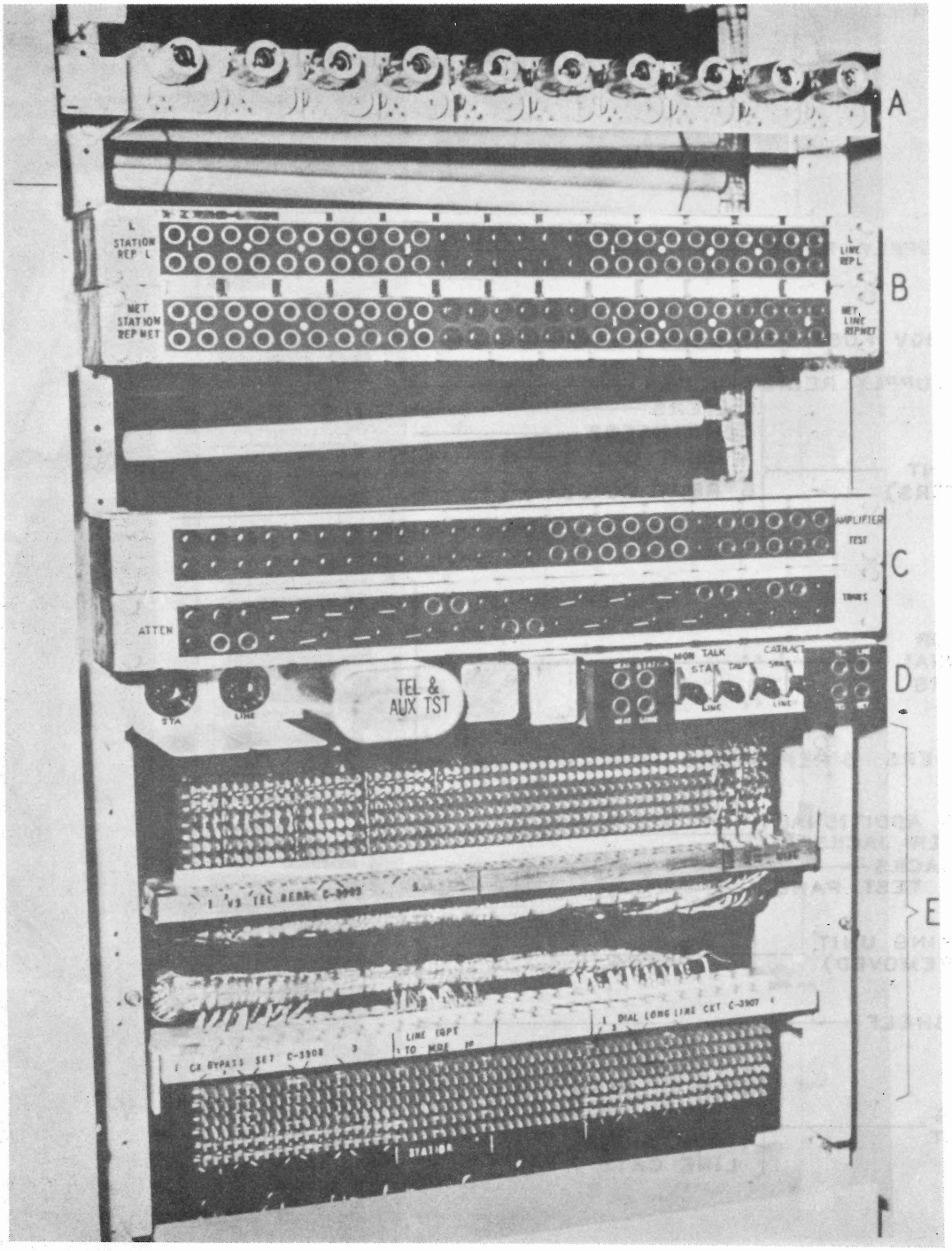


Fig. 3 - Signaling Arrangement - CX By-Pass Circuit



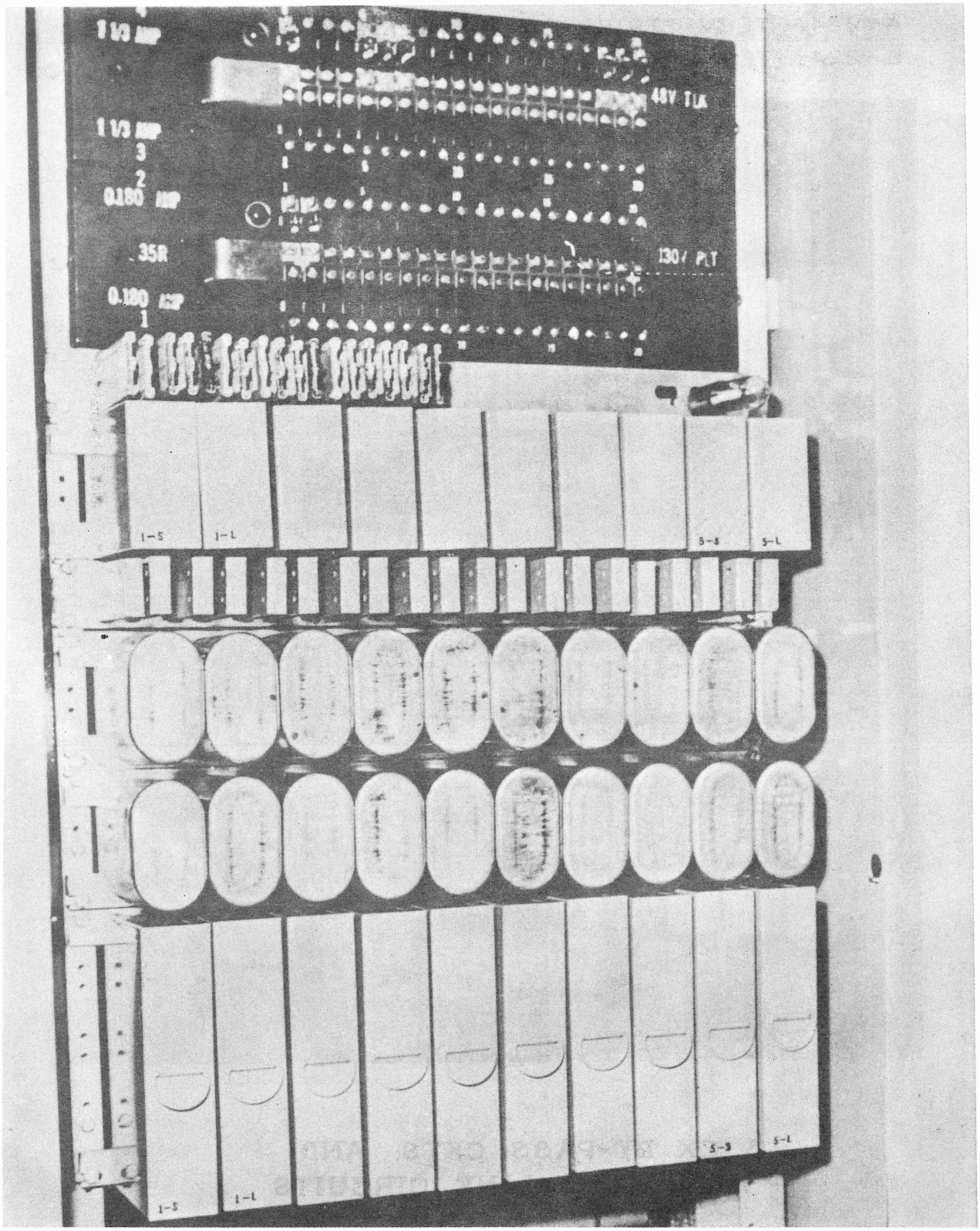
TEST BAY EQUIPPED WITH 5 V3 REPEATERS

Fig. 4



A - AMPLIFIERS FOR 5 REPEATERS
B - JACKS FOR 5 REPEATERS
C - TEST JACKS
D - AUXILIARY TEST PANEL
E - DISTRIBUTING UNIT

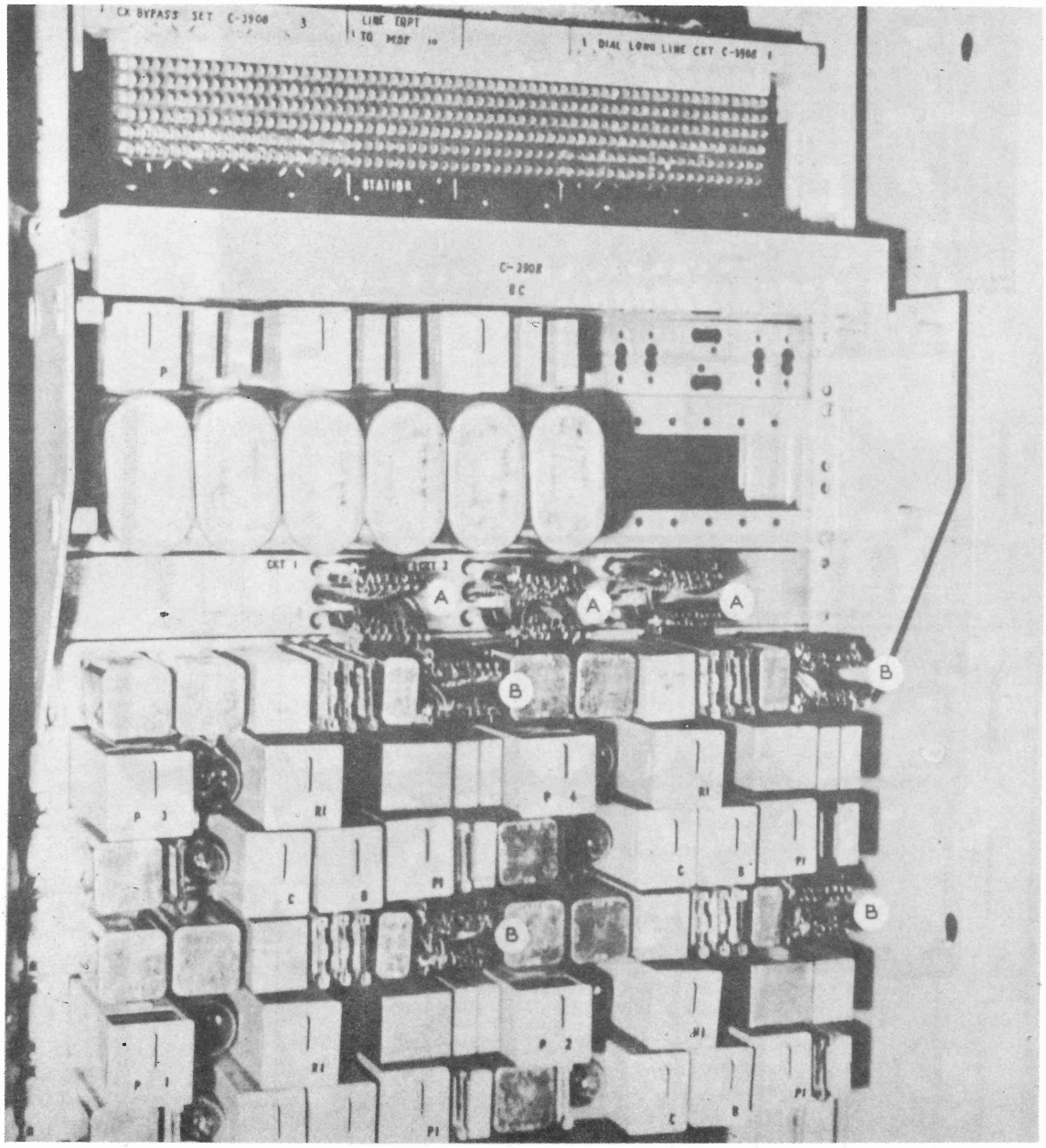
Fig. 5



LINE EQUIPMENT FOR 5 REPEATERS

Fig. 6

A - 224A TERM. STRIPS FOR CX BY PASS CKTS.
B - 224A TERM. STRIPS FOR DIAL LONG LINE CKTS.



3 CX BY-PASS CKTS. AND
4 DIAL LONG LINE CIRCUITS

Fig. 7