

GFELLER LINE CONCENTRATORS  
49-9-2, 49-11 + 1-2, 49-12-2  
DETAILED CIRCUIT OPERATION  
DC OPERATION

1. GENERAL

1.01 This appendix is issued to include the necessary information on units converted to DC battery operation.

1.02 The following additional information and alteration of the main section is necessary for DC operation. The main section text is valid, as is, for AC operation.

1.03 The following paragraphs, figures and charts of the main section are replaced:

1.05 .	4.05	4.10 .	4.12 .	4.23 .
4.04	4.06	4.11	4.14	5.07
5.14	8.03	8.16	Fig.1	Fig.2
SC 1	SC 2	SC 4	OS 1	

1.05 The remote unit is powered from the central office unit and 3-1/2 cable pairs are required for power feeding and circuit control functions. See Figure 2A attached.

4. INITIAL CIRCUIT OPERATION AND TRUNK PRESELECTION

4.04 The application of +45 volts DC to RI and RII connections and of -48 volts DC to RIII at the central office unit causes relays RA to RF to operate in both units. Tables B and C, respectively, show the various combinations of RA to RF relays along with the control and lead cut-in relays used for the selection of particular vertical and horizontal bars.

4.05 The principle of operation for these marking relays can be followed by referring to Fig. 1A which replaces Fig. 1 of the original section and shows the modified circuitry. All six pairs of relays are pictured. The normal contacts of only 12 of the marking control relays are used in the figure. Actually, more control relays are used in the circuits in order to control the required number of selections.

4.06 The Power Equipment Company (PEC) power supply furnishes 70 volt alternating current to the rectifier. One rectifier output lead is grounded and the other supplies +45 volts dc through RI and RII. Resistor RIII is supplied -48 volts dc from the central office battery. The remote ends of all the relay circuits are tied together and grounded. The currents applied to the circuit can be varied by the adjustment of variable resistors RI, RII, and RIII. When the line up of the equipment has been correctly completed, as specified in the appendix to Section 067-201-201, the signaling currents through RI, RII, and RIII, in combination with other circuit currents which flow during the concentrator idle (no switching occurring) condition, will cancel each other at the remote end. Thus, only a negligible current should flow in the common earth return when the switching mechanism is inactive.

4.10 Direct current from the rectifier divides between RI and RII and is then further divided between relays RA, RD, RB, and RE. This current operates these 8 relays, four in the central office unit and four in the subscriber unit. Similarly, central office battery current flows in the RC and RF relay pairs and in resistor RIII and operates these four relays. Although the current in relays RC and RF is flowing in the opposite direction with respect to the currents in RA, RD, RB, and RE, this does not affect the circuit function, because the direction of current flow in the relay does not change its manner of operation.

4.11 If the above established circuits are now interrupted at either end by the operation of the PA or G1 relay, no current will flow through the RA relays and both will be released. However, current will still flow through the RD, RB, RE, RC, and RF relays keeping them operated. When the PA or G1 relay, depending on which was considered operated, is released, current will again

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APPENDIX 1

flow, re-operating the RA relays in both units. This circuit arrangement provides control of two sets of relays; one set in the central office unit, the other at the remote subscriber unit. The other pairs of relays, RD, RB, RE, RC, and RF, function in the same way.

4.12 The winding of each relay RA through RF is shunted by a capacitor whose purpose is to regulate relay switching speeds. The capacitors tend to make the relays somewhat slower in operating and slightly slower in releasing, due to the respective charging and discharging effect.

4.14 The circuit function of marking the vertical bar (trunk) 1 for selection proceeds with the M relay operating relay N. Relays M and W operate relay VB1, which closes a circuit from ground through the winding of the BSU relay through the previously loaded vertical bar 1 sleeve flag contact and horizontal bar 50 sleeve contact finger to 600-ohm battery through the AK key normal. Relay VB1 operated also releases relay W.

49-9-2 and 49-12-2

The operation of relay BSU operates relay PD, one of the four marking control relays used for vertical bar selections. The PD relay opens the path of current to the RD relays, releasing them in both units. Continued at 4.15.

49-11 + 1-2

The operation of the V2 relay (4.13) opens the path of current to the RF relay to the remote unit and transfers the current through R17 to ground. The release of the RF relay in the remote unit releases the SCH. This prevents any operation from an originating call interfering with the operation of the central office unit until a vertical can be preselected. The operation of relay X, (4.13) operates relay V. Although relay X releases almost immediately due to the operation of relay UB, the V relay is held operated from ground through normal D relay contacts, operated C relay contact, operated contacts of the V2, BSU, V2 relays, released K, operated SCH through the winding of the V relay to battery. The V relay operates the V1 relay and the operation of the V1 relay, releases relay V2.

The release of relay V2, closes the path of current to the RF relay in the remote unit reoperating the RF relay. The RF relay operates the SCH. Relay V2 released, opens the ground for relay V and prepares an operate path for relay PD. The time interval for the operation of the PD relay is determined by the slow release of relay V. With the release of relay V, relay PD operates, slow release relay V1 starts to release but relay PD establishes a locking path so that relay V1 will not release. The release of the V2 relay also operates relay V3. The operation of relay PD opens the path of current to the RD relays, releasing them in both units.

4.23 The central office unit A1 relay operates relay V which releases the marking control relay PD, re-establishing the flow of current to the RD relays, reoperating them. Relay V, in the 49-9-2 model with serial numbers 448 and up, all 49-12-2 models, operates relay V1. Relay V1 on the above models, operates relay AB1. The RD relays operate their respective SCH relays. The A1 relay also provides a path to hold the UB relay, which is one of the trouble detecting features of the line concentrators. It will be covered in detail later under trouble detecting features.

## 5. ORIGINATING CALL

5.07 The G6 and F1 marking control relays operated in the remote unit now function to condition the two sets of marking relays RA to RF. Relay F1 opens the circuit to the RD relays and they release. The G6 relay opens the circuits for the RB and RC relays and they release. The released RB, RC, and RD relays release the SCH relays in their respective units. The SCH relays released, close battery through the windings of the PIRT and RT1 relays in series to ground through the normal contacts of relay RD and operated contacts of relays RE and RF in their respective units. The RT-relays close through the leads from the horizontal bar magnets T1 to T49 in each unit. The RT1 relay closes through the leads for magnets T1, T2, and T3. Only T2 magnet will be operated at each unit, however, due to the combination of RA operated and RB, RC relays released. The PIRT relay in the central office unit operates the KO and KO1 relays. The KO, KO1, and PIRT relays

open the operating path of all RA to RF marking relays, preventing, in this case, the possible reoperation of relays RB, RC, and RD until this call is established. The operated RA, RE, and RF relays are locked through their own contacts.

5.14 At the central office unit the released D relay reoperates relay C and magnet T50. It also opens the circuit to lead cut-in relay RT1 and slow release relay PIRT, releasing them. The released PIRT relay releases relays KO and KO1. These three relays released close through the dc current to marking relays RB, RC, and RD, respectively, reoperating them. Released relay KO1 also operates relay AB1.

#### 8. ALL-TRUNKS-BUSY FEATURE — 49-11 + 1-2

8.03 Slow release relay V1 will release because marking control relays PA-PD did not operate to indicate that a vertical

bar (trunk) is idle. Relay V1 released, operates relay V2. Relay V2 operated, opens the path of current to control lead VII which causes the release of relay RF in the remote unit. Relay RF released, releases relay SCH. Relay SCH released, prevents the remote unit from setting up a call until the all-trunks-busy condition is removed. In the central office unit, the operation of relay V2 prevents the release of relay RF by transferring the current from control lead VII to ground through R17, releases relay V3 which is made slow release. The combination of an operated V2 and slow release V3 will give a tabulation on the all trunks busy register, if provided.

8.16 Relay V operated, operates relay V1 which in turn releases relay V2. The release of relay V2 re-establishes the current in control lead VII operating marking relay RF which in turn operates relay SCH in the remote unit. The release of relay V2 also operates relay V3 and releases relay A1.

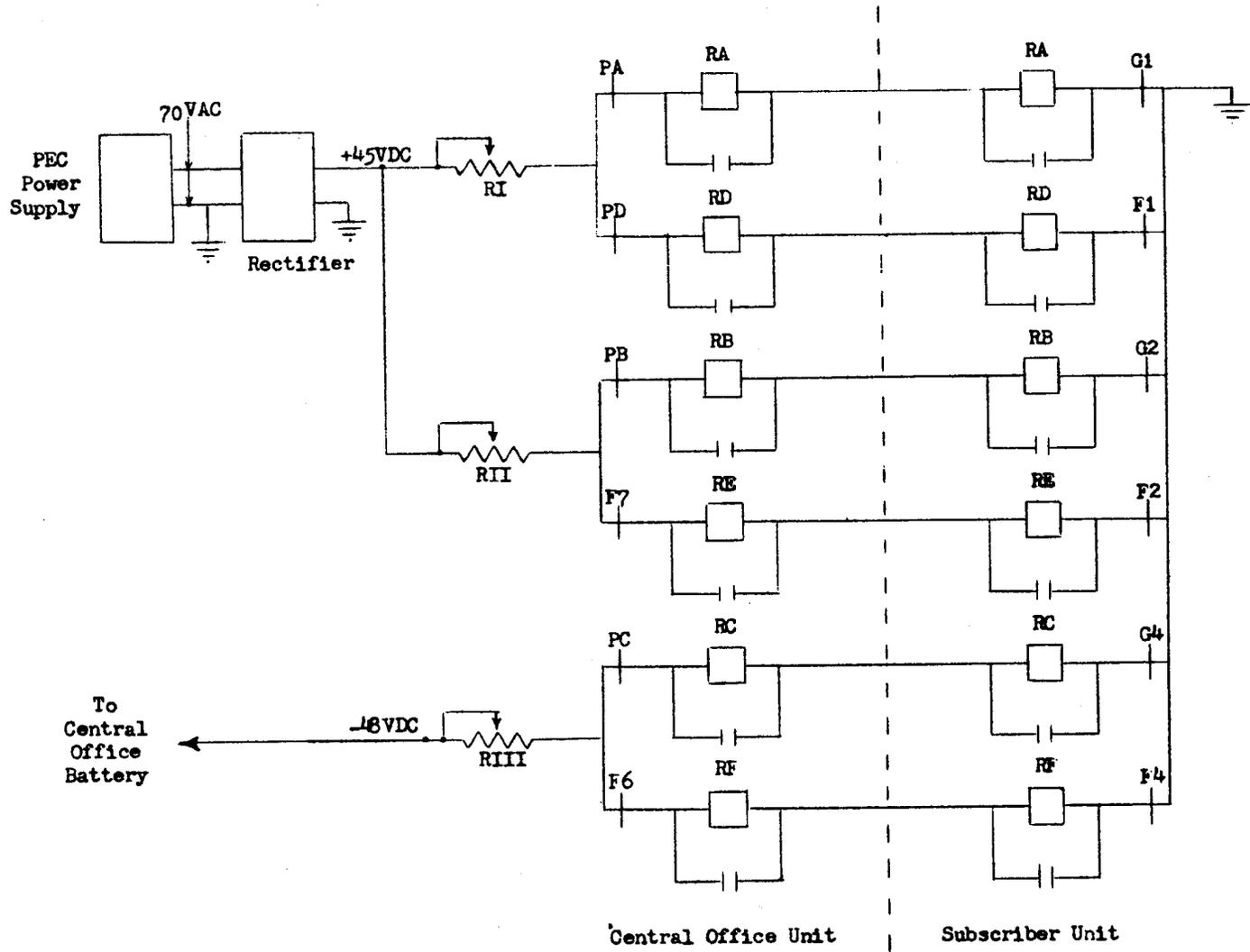


Fig. 1A

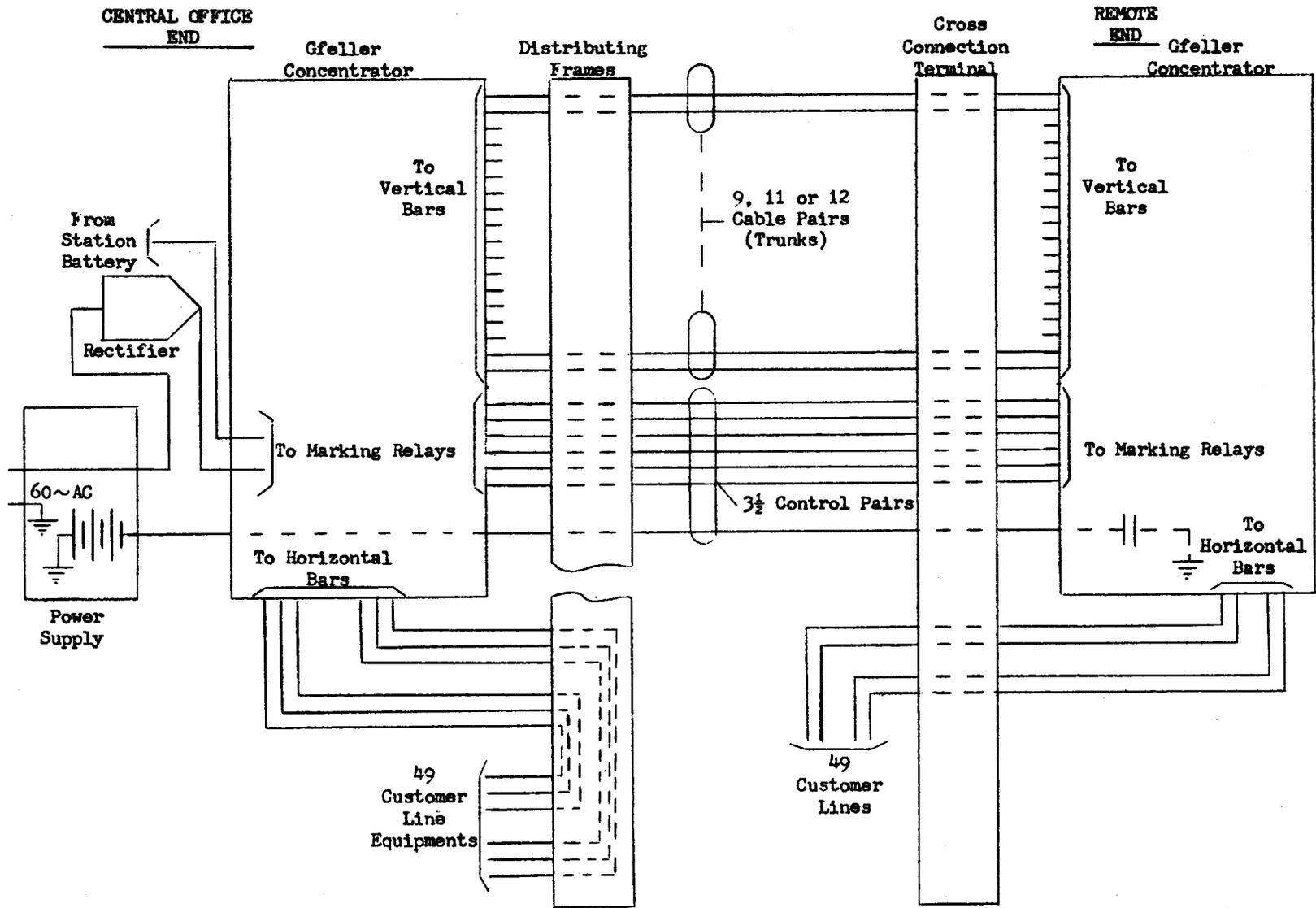
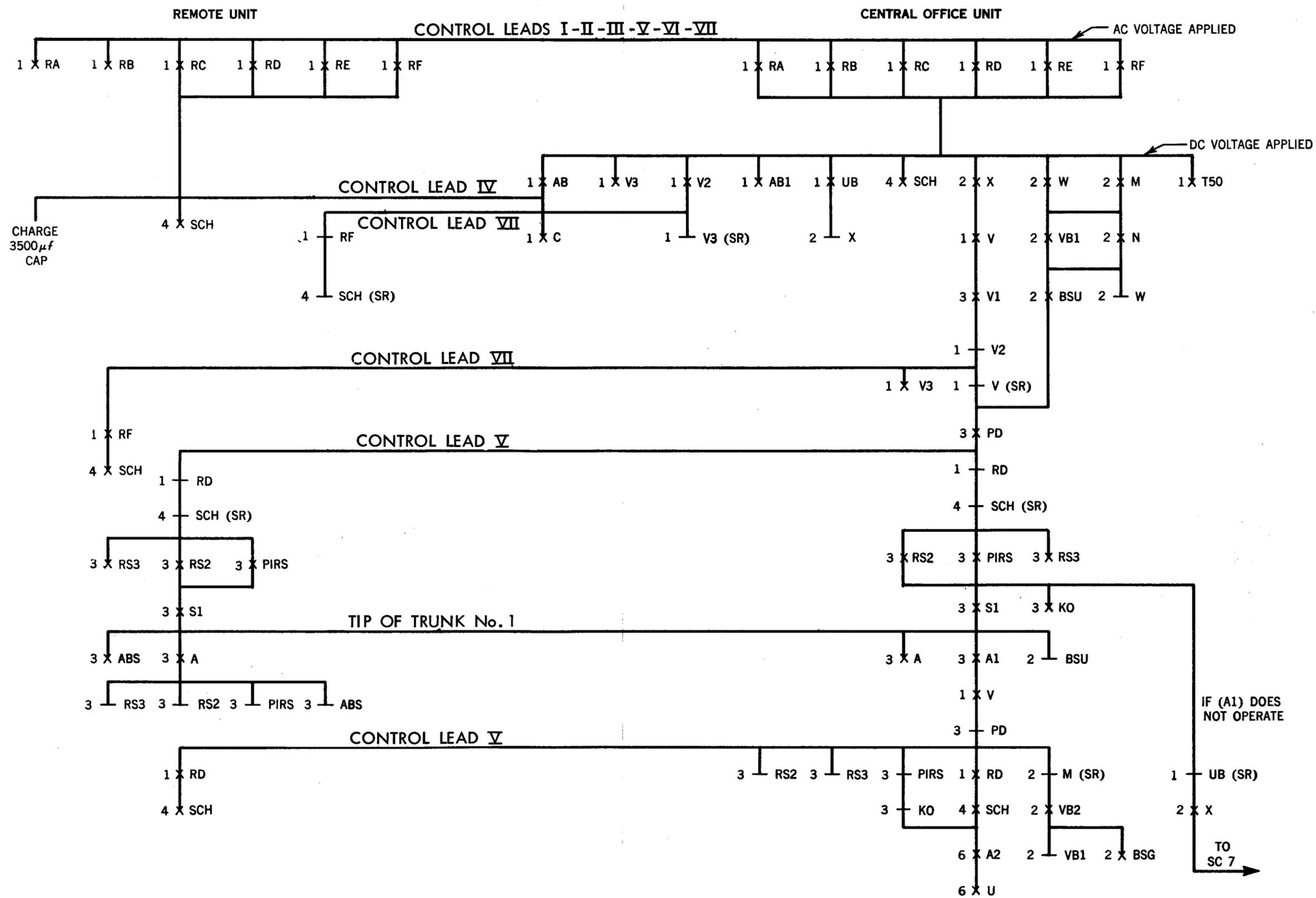
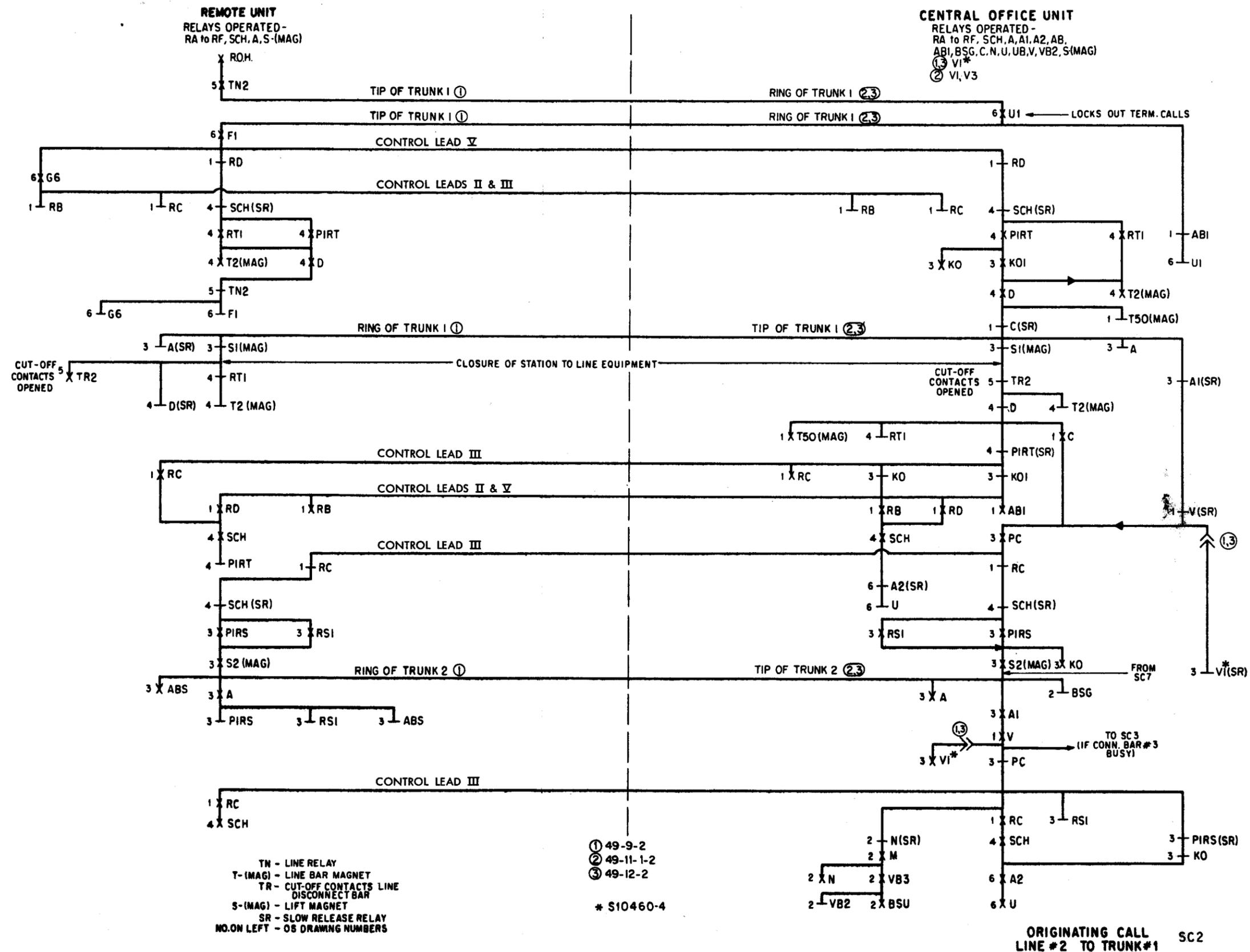


Fig. 2A  
Block Diagram of Typical Layout

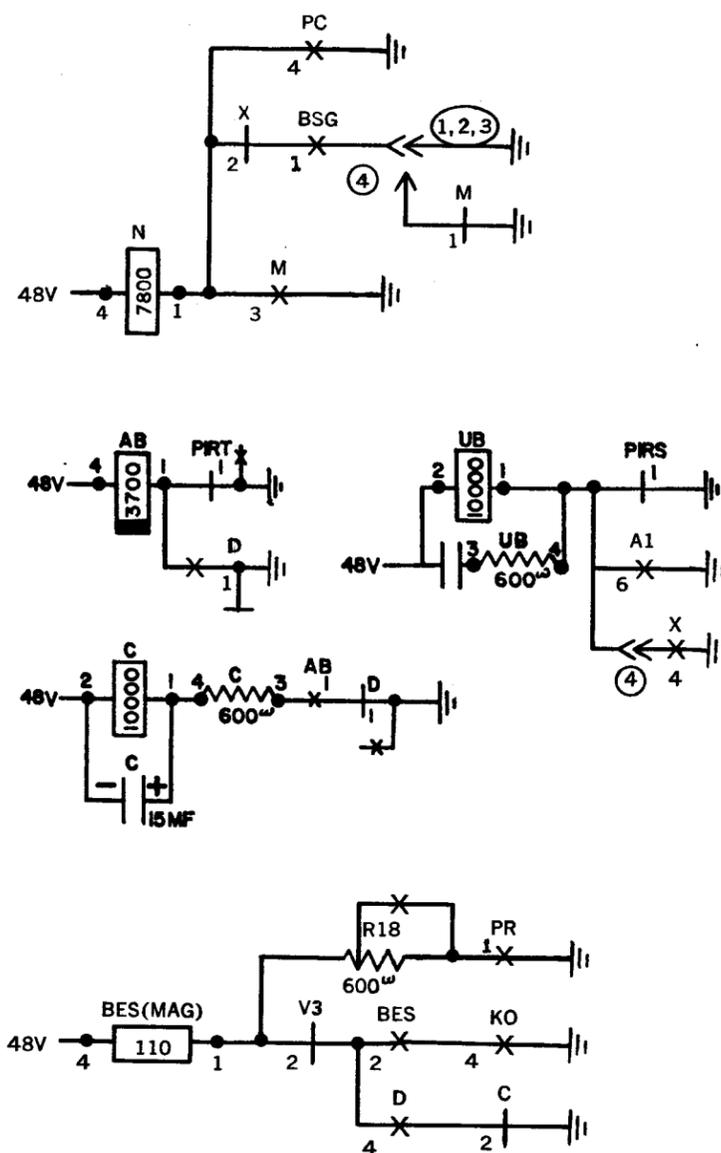
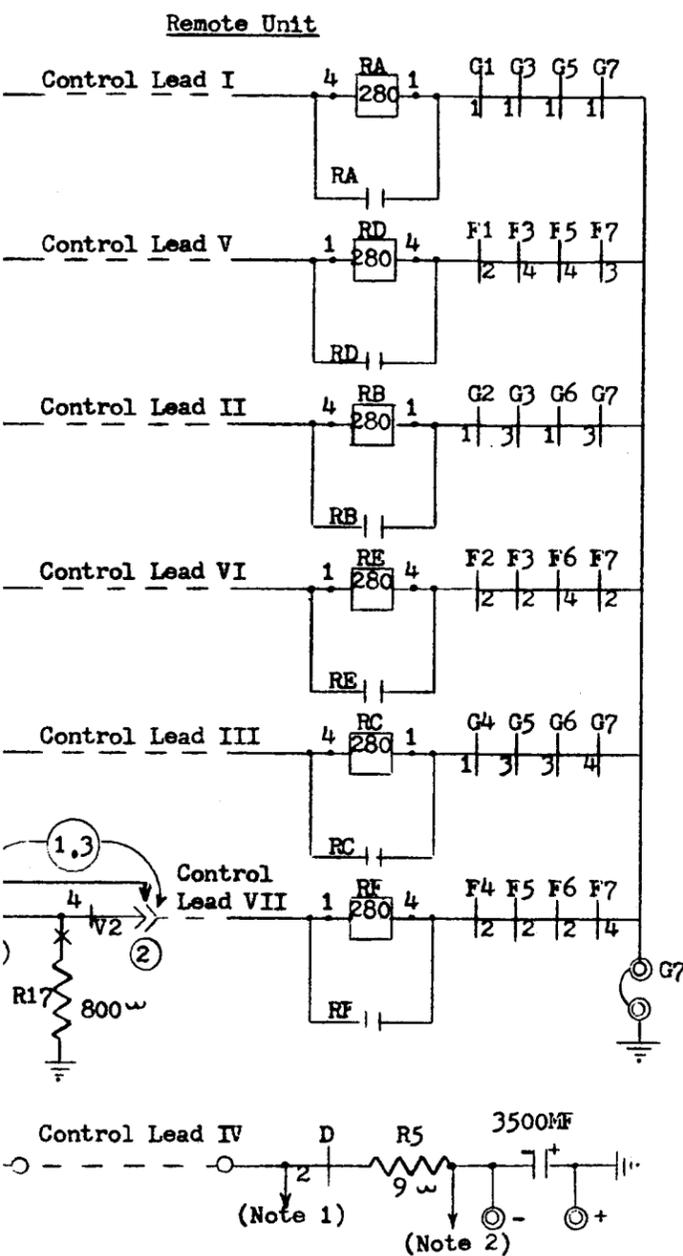




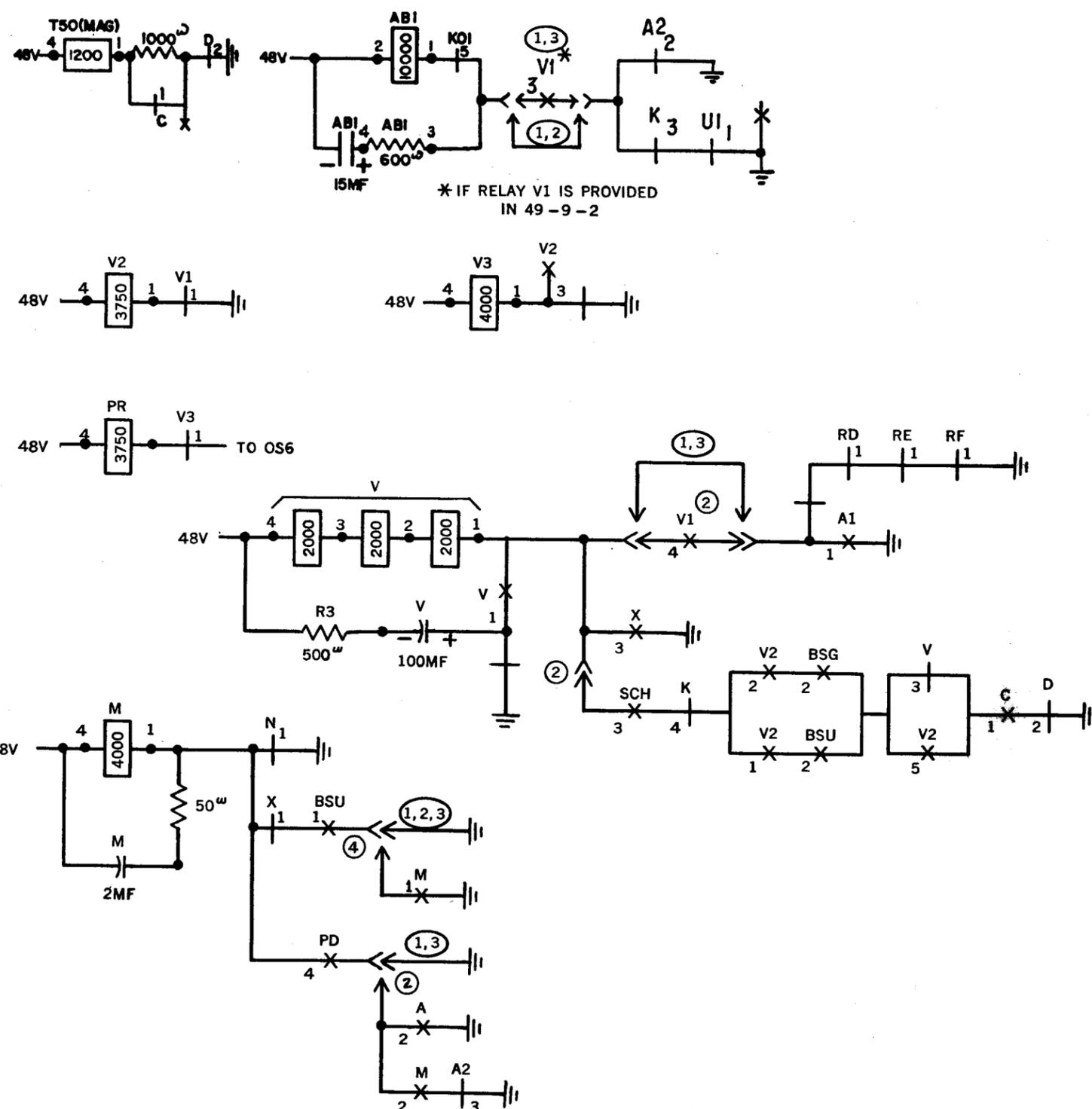
INITIAL OPERATION SC1  
(49-11+1-2)





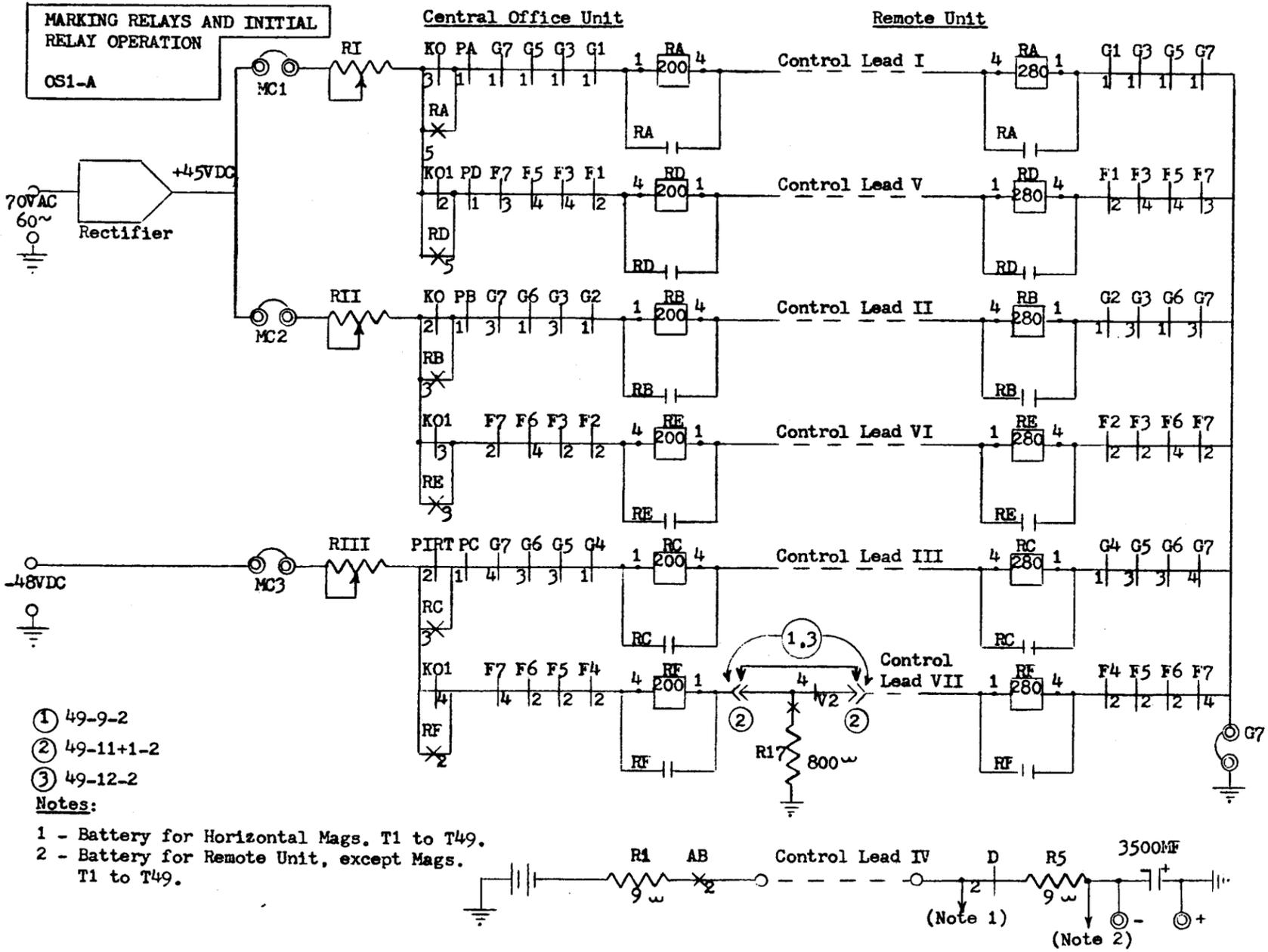


- ① 49-9-2
- ② 49-11+1-2
- ③ 49-12-2
- ④ 49-9-2 SERIAL NOS. 2 TO 4 ONLY



MARKING RELAYS AND  
INITIAL RELAY OPERATION

OS1



- ① 49-9-2
  - ② 49-11+1-2
  - ③ 49-12-2
- Notes:

1 - Battery for Horizontal Mags. T1 to T49.  
2 - Battery for Remote Unit, except Mags. T1 to T49.

