

*BJM # 8218*

**GFELLER LINE CONCENTRATORS**  
**49-9-2, 49-11 + 1-2, 49-12-2**  
**AUXILIARY AND APPLIQUE CIRCUITS**  
**DESCRIPTION**

**1. GENERAL**

**1.01** This is one of a group of sections pertaining to the Gfeller line concentrators. This section describes various changes in and additions to the concentrator circuit to adapt it to certain operating conditions.

**1.02** This section is reissued to revise Items C and I and to add Items J, K, and L. These changes cover information for the 49-11+1-2 and 49-12-2 models of the Gfeller line concentrator. The title has been changed accordingly.

**1.03** The items covered are:

**A. Sleeve Battery Supply for Unused Concentrator Line Equipment terminals (49-9-2):** This change can be applied to concentrators with serial numbers 2 through 447.

**B. Modification to Extend AC Signaling Range (49-9-2):** This modification can be made on concentrators with serial numbers 2 through 389.

**C. Modification to Convert from 48-Volt (750-Ohm DC Range) to 72-Volt (1200-Ohm DC Range) Operation (49-9-2):** This modification can be made on concentrators with serial numbers 2 through 234 and 270 through 331.

**D. Applique to Prevent Continuity Test Failures No. 1 and No. 5 Crossbar Offices (All Models).**

**E. Applique for Connecting Dial Tone Speed Register Circuit (All Models).**

**F. Fuse Protection for Winding of the A Relay in Central Office Unit (All Models).**

**G. Transfer of PA, PB, PC and PD Relay Windings from Fuse 1 to Fuse 2 (49-9-2):** This modification is applicable to concentrators with serial numbers 449 through 1164 which are arranged for 72-volt operation. This arrangement will assure a concentrator alarm if a 72-volt supply fuse in the power supply operates.

**H. Replacement of Resistors RI, RII, and RIII (49-9-2):** This modification is applicable to concentrators with serial numbers 2 through 709 and 751 through 889. It will prevent overheating of these resistors in units modified or equipped for extended AC signaling range but working on short loops.

**I. Installation of Busy Signal Applique (49-9-2 and 49-12-2):** This applique circuit is intended for use in units working out of step-by-step or community dial offices only. It will cause a busy signal to be returned on an incoming call if all concentrator trunks are busy. It can be applied to 49-9-2 concentrators with serial numbers from 448 up and to all 49-12-2 concentrators.

**J. Modification to Prevent ATB Register Operating while using Disengagement (AK) Key (Central Office Unit-All Models).**

**K. Modification to Prevent Call Transfer from Overflow Tone Trunk (BES) to Idle Trunk (49-11+1-2).**

**L. Modification to Extend Sleeve Leads of Vertical Bars for Trunk Usage Measurements (49-9-2).**

2. METHOD

A. Sleeve Battery Supply for Unused Concentrator Line Equipment Terminals (49-9-2)

2.01 This change can be applied to the central office unit of concentrators with serial numbers 2 through 447. Serial numbers 448 and above already are equipped with this battery supply.

2.02 Material:

600-ohm resistor Gfeller P2, 600-ohm, or equivalent 10-watt, wire-wound resistor with hollow core and cement coating.

6-32 screw and washer For mounting resistor.

6-32 bottoming tap For threading resistor mounting hole.

2.03 Procedure:

(a) Using the 6-32 bottoming tap, thread the spare hole in the resistor mounting strip below resistor R15.

(b) Mount the new 600-ohm resistor, using the 6-32 screw and washer. Designate the resistor R16 (to conform to the arrangement shown in schematic S10460-4, coordinates d9).

(c) Using a new wire, connect one terminal of the new resistor to the terminal of resistor R10 to which the black-white (battery loop) wire is connected. See Fig. 1.

(d) Using a new wire, connect the other terminal of the new resistor to a spare terminal in the lower half of terminal strip III. Designate this terminal R16.

(e) At the distributing frame terminal strips on which the concentrator line equipments appear:

(1) On the cable side of the strip, strap in multiple all terminals in the row adjacent to the S terminals. Designate this new row SB.

(2) By means of a spare in a cable between the terminal strips and the concentrator, connect the SB terminal multiple to terminal R16 on terminal strip III of the concentrator.

(3) On the cross-connection side of the distributing frame terminal strip, strap terminal S to SB for each unused concentrator line equipment.

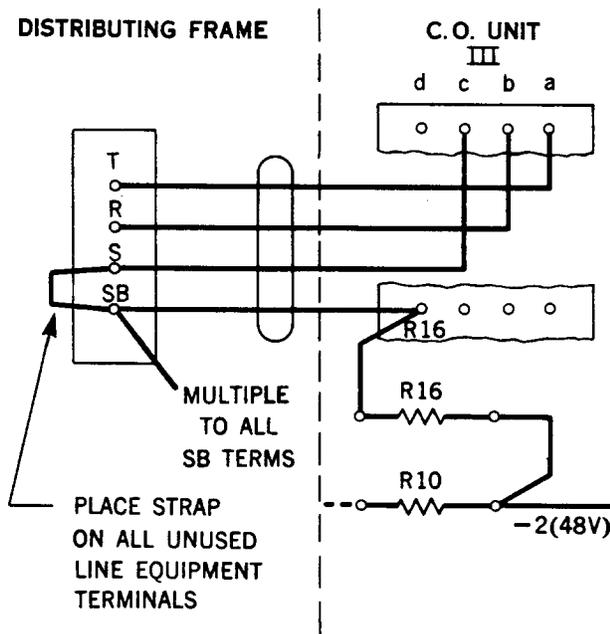


Fig. 1

B. Modification to Extend AC Signaling Range (49-9-2) — Serial No. 2 through 389

2.04 These earlier concentrators were equipped with ac relays with 1000-ohm coils shunted by 3- or 6-microfarad capacitors. Their ac signaling range, using exchange cable facilities, was about five miles. To increase the range of these concentrators to approximately 12 miles of exchange cable, proceed as follows:

2.05 On the RA through RF relays, substitute 200-ohm coils in the central office unit and 280-ohm coils in the remote unit. Replace the existing CRA through CRF capacitors in both units with 30-mfd electrolytic capacitors. Observe

polarity and wire as shown on schematics S10460-4 and S10461-4 (Section 067-201-401).

**2.06** Equip the armatures of the RA through RF relays with the proper residual discs and readjust the relays electrically. Disc dimensions and electrical requirements are shown on the circuit requirement table for each unit in Section 067-201-701.

**C. Modification to Convert from 48-Volt (750-Ohm DC Range) to 72-Volt (1200-Ohm DC Range) Operation (49-9-2)**

**2.07** This modification applies to concentrator central office units with certain serial numbers. The serial numbers are 2 through 4, wired per Option 1, and serial numbers 5 through 234 and 270 through 331, wired per Option 2 on drawing S10460-3.

*Note:* Central office units modified prior to the issuance of Issue 2 of this practice have been wired per Fig. 2 and strapped per Table A. This information has been retained to aid in restrapping units already modified but it is recommended that future units be modified as given below.

The modification consists of:

- (a) Replacing the existing 500-ohm R11 resistor with a 700-ohm, P2, resistor equipped with a slider.
- (b) Rearranging the connections to resistors R1 and R4 and the winding of the A relay so that these units conform with later serial numbered units (332 and up).

**2.08** Refer to Section 067-201-801 for ordering the 700-ohm, P2, resistor.

**2.09 Procedure:**

- (a) Remove the wires from R11, remove the resistor and replace with the 700-ohm resistor. Reconnect the wires to the replacement resistor and strap the slider to the rear terminal if required.

- (b) Remove the black-white wires from the fuse holder designated Subscr. S. splice, solder and tape them.

- (c) Connect a new wire to the fuse holder from which the black-white wires were removed and run the new wire to the middle terminal of the power connecting block. Designate the middle terminal as 72V.

- (d) Remove the two black-white wires from Resistor R4, splice together and tape.

- (e) Connect a new wire to the terminal on R4 from which the black-white wires were removed and run the new wire to the terminal of R1 that has the black-white wires attached to it.

- (f) Remove the two black-white wires from winding terminal 4 of relay A, splice together and tape.

- (g) Connect a new wire to winding terminal 4 of relay A and run the new wire to the terminal of R1 that has the black-white wires attached to it.

- (h) Refer to Section 067-201-501 or 067-201-502 for power connections.

**D. Applique to Prevent Continuity Test Failures — No. 1 and No. 5 Crossbar Offices (All models)**

**2.10** On a call being terminated to a line served by a Gfeller concentrator, connection to the line conductors usually has not been made through the concentrator at the time that the marker is making a crosspoint continuity test. This may falsely result in a continuity test failure.

**2.11** To prevent these false failures, a 0.5 microfarad capacitor in series with a 22,000-ohm resistor may be connected across the tip and ring of each circuit working through the concentrator. This simulated conductor capacitance will satisfy the marker. The applique can be connected to the concentrator line equipments or, if the concentrated lines are confined to one horizontal

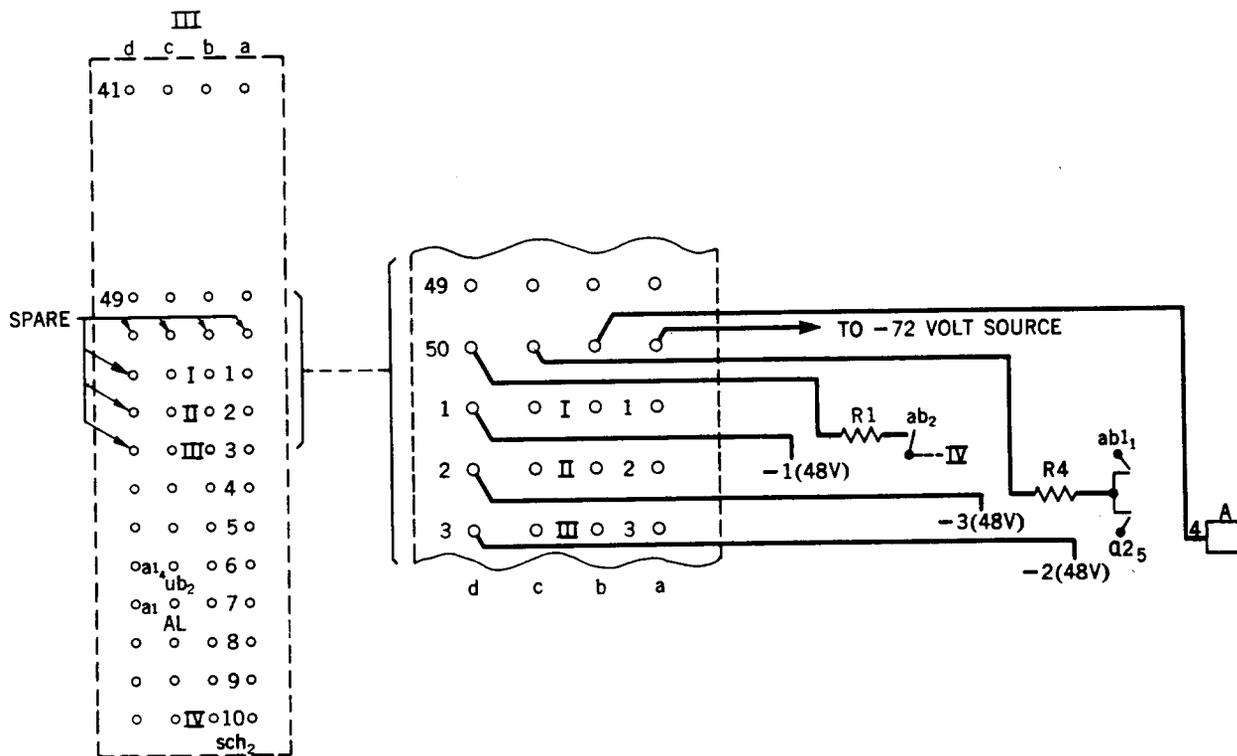


Fig. 2

TABLE A

48-Volt Operation

- Connect — 1d to 50d  
 — 2d to 50c  
 — 3d to 50b
- Strap out (Short Circuit) — R11A  
 — 150-ohms of R11  
 — At Remote unit, 14-ohms of R1

72-Volt Operation

- Connect — 50a, 50b, 50c, 50d together.
- Remove Straps — R11  
 — R11A  
 — At Remote unit, R1

through the line link primarily crosspoints will not be tested by the marker.

2.12 The components used and the manner of mounting and connecting the applique will depend on local conditions. The following arrangement is suggested:

2.13 441C capacitors, 26A terminal punchings and radio-type 22,000-ohm, 1-watt resistors may be assembled on a mounting plate as shown in Fig. 3 and wired as shown in Fig. 4. The applique circuits may be cabled (or wired with paired cross-connection wire through a locally provided ring run) to the line equipment terminal strip on the concentrator or on the distributing frame, to a separate block on the distributing frame and then cross-connected as required, or to the line links.

**Note:** The 441C consists of two capacitors in one metal enclosure. Although the capacitors are not shielded from each other, no detri-

group, to the line links serving the group. With the latter arrangement, however, continuity

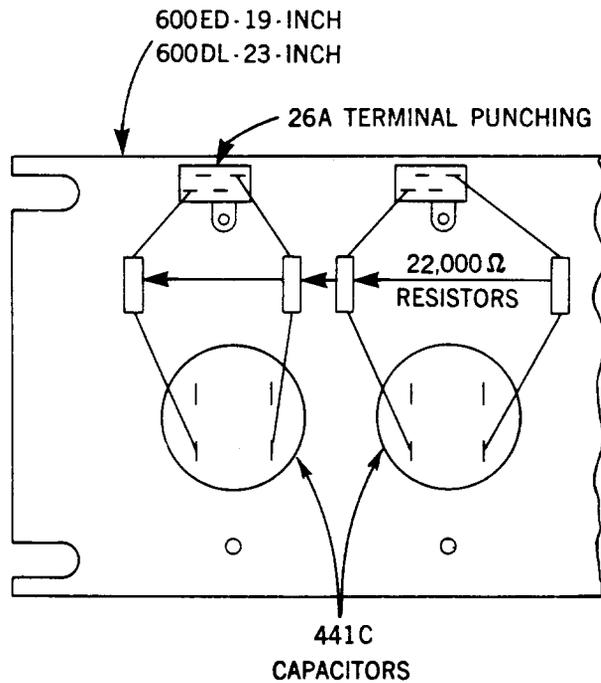


Fig. 3

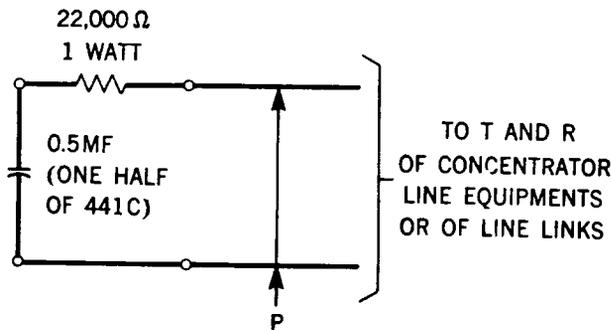


Fig. 4

mental effect on transmission will result from this particular application.

#### E. Applique for Connecting Dial Tone Speed Register Circuit (All models)

2.14 The circuit shown in Fig. 5 can be used to connect the dial tone speed register circuit to the concentrator. This applique requires:

- (a) Connection to the T, R and S leads of a spare line equipment in the concentrator and to the T or R lead of a spare central office line equipment.
- (b) Disconnection of the corresponding line relay at the remote unit.
- (c) Short circuiting of the T and R of this line at the remote unit.
- (d) Provision of an auxiliary relay (designated DTS in Fig. 5). This relay may be the same type as that used as a line-relay in the particular office and using the same requirements, or a Gfeller type (such as those with the designation BSU, BSG, or SCH) may be used.

2.15 Assembly and connection of this circuit should be engineered locally to suit the particular installation. Consideration should be given to the preference chain of the line concentrator when assigning the test line.

2.16 In operation, when the dial tone speed register circuit connects to the applique, the TN-relay for the dial tone test line in the central office unit will operate. The concentrator will function as on a typical terminating call. When the test line has been cut through to a concentrator trunk at both units, the DTS relay will operate over the loop. The DTS relay contacts extend the dial tone speed register lead either to the central office line equipment to cause a seizure of the line, or to battery through 200 ohms resistance. In the former case, speed of dial tone can be measured; in the latter, concentrator operating time can be measured.

#### F. Fuse Protection for Winding of the A Relay in Central Office Unit (All models)

2.17 If the ring-side of a concentrator trunk should become crossed with ground, or should a heat coil operate, an abnormally high current will flow through the central office unit A relay when it is connected to the trunk. This is particularly true where the customer loop is long and the compensating resistance is consequently of low value. The current most likely will not op-

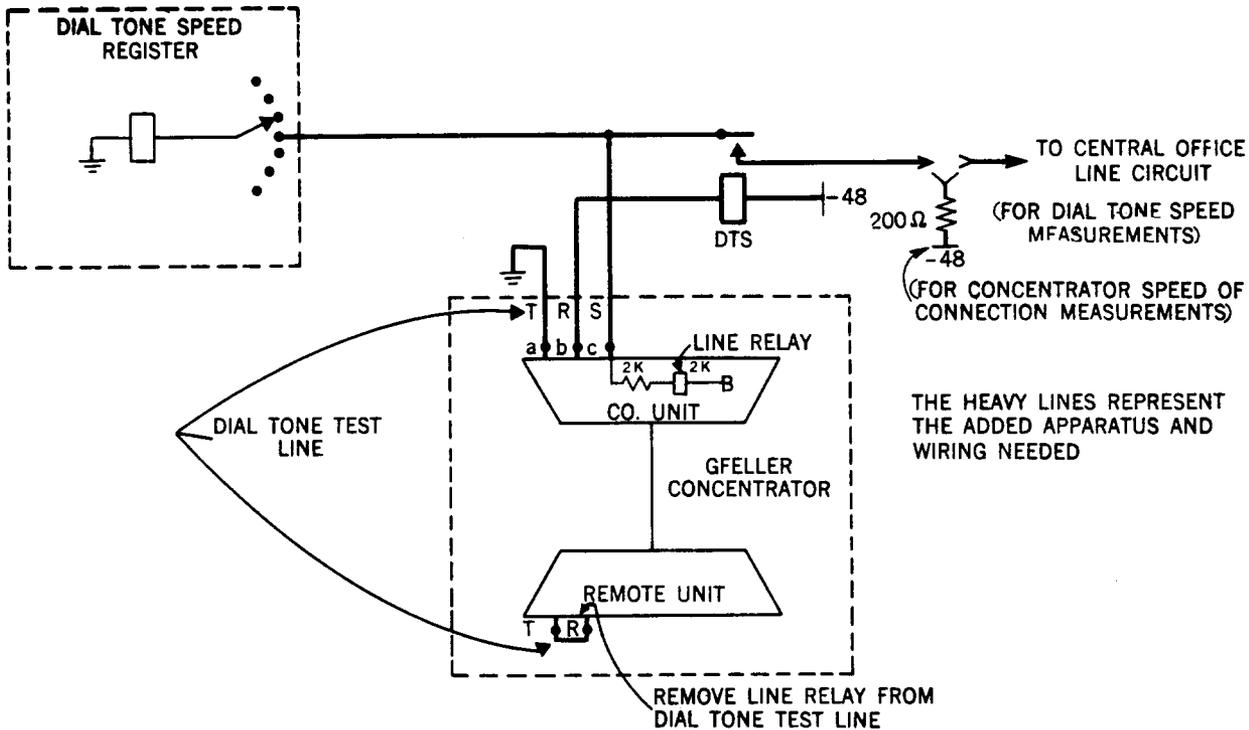


Fig. 5

erate the regular fuse, but may be sufficient to overheat the A relay winding. To prevent overheating, the winding may be protected by inserting a low capacity fuse in its operating path.

**2.18** A suggested method of doing this is to mount on 18A fuse block in the available space in the lower right corner of the fuse panel. Drill a 27/32-inch hole in that portion which will allow the fuse block when mounted to clear adjacent apparatus and mounting details. Position the fuse block in the mounting hole so that the hole for insertion of the designation pin will be to the left of the fuse cap. It will be necessary to notch the mounting hole at a point behind the designation pin hole to allow a recess for the projection on the mounting flange. Drill a 1/8-inch hole for starting the self-tapping screws in the panel at each of the screw hole locations in the flange.

**2.19** Before mounting the fuse block, connect a new wire to its central terminal and another to its B terminal. The wires should be long enough to reach the wiring side of the MC5 test jack after the fuse block is mounted.

**2.20** Mount the fuse block, using the self-tapping screws. Equip the block with a KS-14174, List 5 (yellow) designation pin and a 70E fuse (0.180 amperes, yellow bead).

**2.21** Remove the red wire from one side of the MC5 test jack. Splice this wire to one of the wires from the fuse block. Solder and tape the splice. Connect the other wire from the fuse block to the terminal on the test jack.

**2.22** An alarm lead should not be connected to the fuse block; operation of this fuse will result in a concentrator alarm.

#### G. Transfer of PA, PB, PC and PD Relay Windings from Fuse 1 to Fuse 2 (49-9-2)

**2.23** In concentrators numbered 449 through 1164 an alarm will not be received, or, if received may be retired and not reappear if the 72-volt dc supply fuse operates during certain portions of the concentrator operating cycle. To assure that an alarm will be received, the windings of the PA through PD relays may be transferred from Fuse 1, the 72-volt fuse, to Fuse 2.

**2.24** Remove the two wires from the No. 4 winding terminals of the PA relay and also the PD relay. At the PD relay, test each of the two wires for the presence of battery. Reconnect the wire which tests clear to the No. 4 winding terminal of the PD relay. At the PA relay, similarly test the two wires and reconnect the clear wire to the No. 4 winding terminal. Run a new wire from this same terminal to the No. 4 winding terminal of the V relay. The PA through PD relay windings are now supplied from Fuse 2.

**2.25** Reclose the Fuse 1 battery feed loop by splicing together, with a short length of wire, the unconnected wires at the PA and PD relays. Solder and tape the splices.

#### H. Replacement of Resistors R1, R11 and R111 (49-9-2)

**2.26** In concentrators with serial numbers 2 through 709 and 751 through 889 the R1, R11 and R111 resistors are of a lower wattage rating than the P2 type now being installed by the manufacturer. In earlier units (2 through 389) which have been modified, or in units in the range of serial numbers mentioned above manufactured with low resistance coils in the RA through RF relays, these resistors can overheat on short loops. This can be overcome by replacing them with the P2 type.

**2.27** It is important to measure the value of resistance for which the existing resistors are strapped. The new ones can then be set to the same values. The new resistors can be mounted in the same locations as the old. However, it will be necessary to cut about one inch (this should be measured for each particular installation) from the old mounting screws.

**2.28** Ordering information for the replacement 600-ohm resistors will be found in Section 067-201-801.

#### I. Installation of Busy Signal Applique (49-9-2 and 49-12-2)

**2.29** This applique, for use in units serving step-by-step and community dial offices,

applies a ground to the sleeve of all idle lines when all concentrator trunks are busy, causing a busy signal to be returned on any incoming calls. It is applicable to 49-9-2 concentrators with the serial numbers from 448 up and to all 49-12-2 concentrators. A schematic of the circuit is shown in Fig. 6.

**2.30** Mount the applique unit in the space between terminal strip III and the fuse panel. Extend the large, preformed cable to the left and behind the terminal strips. Line up the skimmers from the branch on the extreme left with the fanning strip holes for terminals 1 through 20 on terminal strip I. Similarly line up the skimmers on the other branches for terminals 21 through 40 on terminal strip II and 41 through 49 on III. Pass the skimmers through the fanning strip holes and connect them to their respective "d" terminals.

**2.31** Connect the remaining leads from the applique circuit to miscellaneous terminals on terminal strip III as follows:

- (a) Battery feed loop (lead from winding terminal 4, VO9 relay) to -2 terminal.
- (b) Ground lead (wire designated + on Fig. 6) to + terminal.
- (c) The lead (wire designated V<sub>12</sub> on Fig. 6) from number 1 winding terminal of the VO9 relay to one of the V<sub>12</sub> terminals.
- (d) Connect the other V<sub>12</sub> terminal to + terminal (ground).

Verification of each of the four leads given above will be necessary to insure each lead is attached to its proper terminal.

**2.32** The ordering information for the applique unit is as follows:

(Quantity) Applique, Tone, Busy, for Gfeller LD-9/12-2 Concentrator.

#### J. Modification to Prevent ATB Register Operating while using Disengagement (AK) Key (Central Office Unit-All Models).

**2.33** When testing the Gfeller line concentrator using the Disengagement key, battery is

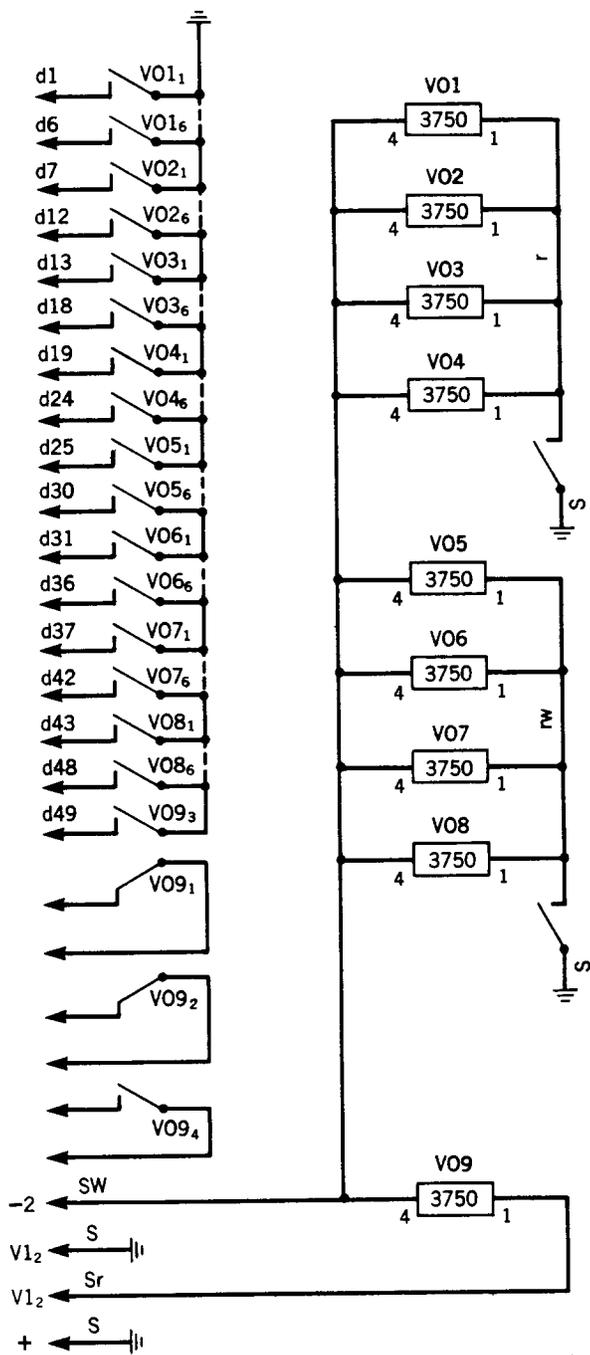


Fig. 6

2.34 To correct this condition, a strap is required to short out the break contact of the AK key as follows:

49-9-2 Serial Nos. 2 through 447 — Contact 1

All other Models and Serial Nos. — Contact 2

2.35 Remove the insulated mounting plate on which the Disengagement (AK) key is mounted by removing the four screws. Install the strap and solder across the contact given in 2.34. Replace the mounting plate.

**K. Modification to Prevent Call Transfer from Overflow Tone Trunk (BES) to Idle Trunk (49-11+1-2)**

2.36 This modification prevents the release of a terminating call connected to the overflow tone trunk (vertical BES) in the event a trunk becomes idle.

2.37 Without this modification, a call connected to the overflow tone trunk would be released in the event a trunk becomes idle and be connected to the idle trunk. The release is caused by the operation of relay V3 when a trunk becomes idle. Relay V3 operated, releases relay PR and relay PR released opens the holding ground for vertical BES. Vertical BES released closes the cutoff contacts and the terminating call is then handled as an initial attempt and is connected to the idle trunk.

2.38 This call that was originally connected to BES has had the ringing current tripped by the operation of the 313C tube associated with the BES vertical. With the release of BES and the connecting to the idle trunk, the call will not ring the called station due to the tripped ringing current.

2.39 To prevent this transfer, relay V3 contact 1 must be shorted out by using a strap. This shorted contact will hold the terminating call to the overflow tone trunk under control of the line equipment sleeve ground. This ground will hold operated relay PR which in turn provides the holding ground for vertical BES.

removed from the sleeve lead of horizontal bar 50. The removal of this battery gives the same indication as an all-trunks-busy condition. The result is that the ATB register will score each time the Disengagement key is operated.

**L. Modification to Extend Sleeve Leads of Vertical Bars for Trunk Usage Measurements (49-9-2)**

**2.40** This modification is required to enable trunk usage measurements to be made on the sleeve leads of trunks on the 49-9-2 model of the line concentrator.

**2.41** To accomplish this, it will be necessary to vacate nine terminal strip punchings on terminal strip III. On concentrators equipped with four row punching blocks, row d punchings 41 through 49 will be used and on five row punching blocks, row e punchings 41 through 49 will be used.

**2.42** To vacate the punchings, remove the resistor RC and its connecting wire from row d or e, as given above, splice together and tape.

**2.43** Connect new wires in sequence to the front contact 3 of relays VB1 through VB9. Terminate the other end of the new wires to the 9 vacated punchings in sequence and designate as VB1 through VB9 corresponding to the VB— relay to which it is attached.

**2.44** Cable the Gfeller terminal block III to the distributing frame as prescribed by local procedures.