GFELLER LINE CONCENTRATORS
49-9-2, 49-11+1-2, 49-12-2
INITIAL PREPARATION, LINE-UP, AND CUTOVER

1. GENERAL

1.01 This is one of a group of sections pertaining to the Gfeller line concentrator. This section contains various tests to be performed at the time of initial preparation, line-up, and procedures at cutover.

1.02 This section is reissued to include preparation and line-up procedures for models 49-11+1-2 and 49-12-2. Also added are cutover procedures for all models of the Gfeller line concentrator. The title has been changed accordingly. Additions and corrections have been made to bring this section up to date.

1.03 The tests covered are:

A. Manual Test of Relays and Vertical and Horizontal Bars: This test checks the mechanical condition of all relays, bars, and bar magnets.

B. Test of Resistors RI, RII, RIII, and Relays RA through RF: This test provides for adjusting resistors RI, RII, and RIII to suit particular cable conductor resistance and verifies that relays RA through RF meet electrical requirements.

C. Test of Resistors R1, R2, R5, R11, R12, R13, and R14: This test checks the resistance requirements and provides adjusting methods where required.

D. F- and G- Relay Test: This test checks the operating requirements for these relays and verifies that the proper numbered relays operate in accordance with the marking control pattern.

E. Hold Winding Test of Vertical Bar Lift Magnets: This test checks that the vertical bar lift magnets hold operated in accordance with circuit requirements.

F. Test of M and N Relays: This test checks the adjustment of these relays using a pulse checking test set.

G. Walking Circuit Test: This test checks the sequence of operation of the VB relays and their associated vertical bars.

H. Test of V Relay Release Time: This test checks the slow release time of the V relay in relation to the charged voltage maintained on the two 1750 MF capacitors in the remote unit between successive calls.

I. Test of All-Trunks-Busy Register Feature: This test checks that, when all vertical bars are engaged with service calls, a lead is grounded to the all-trunks-busy register.

J. Test of All-Trunks-Busy Applique Circuit, 49-9-2 and 49-12-2 Models in Step-by-Step Offices: This test verifies that the all-trunks-busy feature will activate the applique circuit and cause all line equipment sleeves connected to the concentrator to be grounded.

K. Test of Overflow Tone Trunk, 49-11+1-2 Model: This test checks that, when all vertical bars (trunks) are engaged with service calls, overflow tone is returned to the terminating call.

1.04 Procedures for cutover to the Gfeller line concentrator, given in this section, assume that the outside plant facilities have no spare pairs available prior to cutover.

1.05 ***Caution: When blocking any relays nonoperated, avoid dislodging the residual separator that may be installed.***

1.06 Performing tests prior to the actual installation of the units, as covered in Parts →3 and 4, may be desirable for the following reasons.

(a) The Gfeller line concentrators are most often used in locations where there are a minimum of spare cable facilities, which necessitates rearrangements of working circuits to connect the two units.

(b) When the central office and remote units are set up next to each other, access for performing the tests is convenient.

(c) This method reduces the number of tests required after installation and consequently reduces the time required for placing the concentrator in service.

1.07 As experience is gained in the testing and maintenance of the concentrator, testing of the units on a back to back basis prior to installing may no longer be required.

1.08 Figs. 2 and 3 show the terminal strip arrangement for the central office unit line concentrators covered by schematics S11460-3 and S11460-4, respectively. Fig. 4 shows the arrangement for central office units covered by schematics S11888 and S11840.

2. APPARATUS

Test A

2.01 No. 74D gauge (for measuring the air gap of horizontal and vertical bar magnets).

2.02 No. 70J gram gauge (for measuring the tension of relay and vertical bar contact springs and the pressure required to move horizontal and vertical bars).

2.03 0.10 mm. Gfeller feeler gauge (for measuring the clearance and make of the contact fingers and flag contacts of the crossbar switch).

Tests B, C, D, E, and F

2.04 Gfeller test leads, equipped with banana type plugs (for connecting test equipment to line concentrator test jacks).

Test B through F — if units are tested side by side

2.05 24 variable wire-wound resistors (10 watt) (for simulating trunk cable conductor resistance).

2.06 8 wire-wound 300 ohm resistors (10 watt) (for simulating control cable conductor resistance).

2.07 4 capacitors, 2 mf. (100 volts) (for simulating control cable conductor capacity to ground).

Tests B, C, D, E and H

2.08 KS-14510 meter, portable volt-ohm-milliammeter, or equivalent (for measuring dc and ac voltage, resistance, and dc current).

Test B

→2.09 25 ohm wire-wound resistor (10 watt).

2.10 35-type test set (used in conjunction with current flow measurements).

2.11 Testing cord, W2W cord, 6 feet long, equipped with one No. 310 plug, No. 360B tool and No. 360C tool (No. 2W17A cord), two No. 141 cord tips (for connecting the 25 ohm resistor and 35 type test set together).

Test F

2.12 Pulse checking test set, J94723A (SD-96362-01)

2.13 Testing cord, W2W cord, 6 feet long, equipped with one No. 310 plug, No. 360B tool and No. 360C tool (No. 2W17A cord), two KS-6278 connecting clips (for connecting pulse checking test set to line concentrator MA jack).

2.14 Testing cord, W3M cord, 6 feet long, equipped with one No. 310 plug, No. 360A tool, No. 360B tool, and No. 360C tool (No. 3W4A cord), two KS-6278 connecting clips (for connecting battery and ground to pulse checking test set BAT-G jack).

Tests I and J

2.15 Test receiver, No. 716C receiver attached to a W2AB cord equipped with two No. 360A tools (No. 2W21A cord), one KS-6278 connecting clip and one No. 411A (test pick) tool (for use in checking for the presence of ground).

3. PREPARATION

STEP	ACTION	VERIFICATION
Tests B through J		
1	Determine from records or by measurement the loop resistance of one of the cable pairs to be used as a trunk or for control leads. To measure the loop resistance — Strap together the tip and ring at the remote end and connect an ohmmeter across the tip and ring at the central office. Record reading and remove strap.	
2	At the central office unit — With each conductor selected in Step 1 grounded at the remote end — Using an ac voltmeter — Measure the ac potential from each conductor to ground.	Max 10 volts on each conductor.
3	Measure the dc ground potential for the conductors as arranged in Step 2 by connecting a dc voltmeter from ground to one conductor of the pair.	
4a	If a negative voltage is obtained in Step 3 — Determine the negative dc ground potential effect on the loop resistance by multiplying each negative volt obtained in Step 3 by 15 ohms. *Note:* Disregard any positive voltage.	
5	With the loop resistance obtained in Step 1 corrected for 68° nominal temperature, add any resulting product from Step 4a. This sum becomes the effective loop resistance.	
6	Determine the dc voltage requirements as follows: Loop resistance or effective loop resistance 750 ohms or less use 48-volt operation; 751 to 1200 ohms use 72-volt operation.	
Tests B through F		
→ 7b	If preliminary tests are to be made with the units located side by side prior to their being installed — Simulate the effective cable resistance of the control leads and trunk conductors by interconnecting both units using the wire-wound resistors as follows:	

STEP	ACTION	VERIFICATION
	(a) Control leads—use two 300 ohm resistors in series and one 2 uf. capacitor bridged to ground at the mid-point of the resistors.	
	(b) Trunk conductors — use the variable 10 watt resistors adjusted to one half the resistance value obtained in Step 5.	
	Tests B through J	
8c	If Tests B through J are to be made after the units are installed — Connect the control leads 1 through 4 as follows: Use first control pair for leads 1 and 4 and connect them to the tip and ring, respectively. Use second control pair for leads 2 and 3 and connect them to the tip and ring, respectively.	
9c	Connect the trunks to their respective cable pairs.	
→ 10	Connect power to the central office unit as covered in Section 067-201-501 or 067-201-502.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Manual Test of Relays and Vertical and Horizontal Bars	
→	*Note:* This test applies to both units except that all reference to bar 50 is omitted for the remote unit.	
1	Manually operate each relay in turn.	Armature moves freely. Fiber separators are positioned correctly between the springs. All contacts have — Min .005 inch follow Min .005 inch clearance when opened.
2	Manually lift each vertical bar in turn.	Vertical bar moves freely and is positioned correctly. Fiber separators of vertical bar contacts are positioned correctly between the springs. All contacts have — Min .005 inch follow Min .005 inch clearance between springs when normal.

STEP	ACTION	VERIFICATION
3	Manually move each horizontal bar to the right in turn.	Bar moves freely and is positioned correctly.
↱ 4	Using 0.10mm. Gfeller gauge — Insert feeler gauge between right side of position rod and horizontal bar 1. Lift each vertical bar in turn.	Flag contacts clear all contact fingers.
5	Repeat Step 4, applying gauge to horizontal bar 2, and continue in this manner until all horizontals have been checked.	Same as Step 4.
↳ 6	Using 0.10mm. Gfeller gauge — Insert feeler gauge between left side of position rod and horizontal bar 1.	
7	Lift vertical bar 1.	
8	Move horizontal bar 1 to its operated position.	
9	Slowly lower vertical bar 1.	Contact fingers first contact the sloping portion of the flag contacts. When flag contacts are fully engaged — Horizontal bar cutoff contacts opened.
↱ 10	Lift vertical bar 1, release horizontal bar 1, lower vertical bar 1.	
11	Repeat Steps 6 through 10 for each vertical bar using horizontal bar 1.	Same as Step 9.
12	Repeat Steps 6 through 11 applying gauge to horizontal bar 2. Continue in this manner until all horizontal bars have been checked.	Same as Step 9.
↳ 13	Using a 74D nest of gauges — Measure the air gap between the armature and pole face of each horizontal bar magnet while manually operating the horizontal bar.	Max .002 inch. *Note:* It is permissible for the armature to touch the pole face in the operated position.
14	Using a 70J gram gauge applied to the front right–hand end of each horizontal bar — Measure pressure required to move horizontal bar from its normal position.	As horizontal bar just moves from its normal position — 25 to 40 grams

STEP	ACTION	VERIFICATION
15	Using 74D nest of gauges — Measure air gap between the lift magnet 1 armature and pole face in its operated position.	.004 to .012 inch.
→ 16	Lift each remaining vertical in turn, and gauge by eye the air gap between pole face and armature by comparing with gap of No. 1.	.004 to .012 inch.
17	Manually load eight vertical bars on horizontal bar 50.	Horizontal bar 50 still touches the positioning rod.
→ 18	Manually unload all vertical bars.	
19	Using a 70J gram gauge applied at the bottom of vertical bar — Measure pressure required to lift each vertical bar from its normal position.	As vertical bar just leaves its normal position — Central office unit — Min 70 grams. Remote unit — Min 50 grams.
20	Using a 70J gram gauge — Measure the pressure of the make and break contacts associated with each vertical bar as specified.	Make contact: 17-35 grams. Break contact: 20-30 grams.

B. Test of Resistors RI, RII, RIII, and Relays RA through RF

↱ 11	At central office unit — Divide the resistance used in Step 6 by 2 to get the individual conductor resistance. Subtract this resistance from 600 to get the compensating resistance. For example: loop or effective loop resistance 950 ÷ 2 = 475 ohms conductor resistance: 600 — 475 = 125 ohms. *Note:* On model 49-9-2 with serial nos. 1 to 709 and 751 to 889, the compensating resistance must be rounded to the nearest 20 ohms due to the tapped compensating resistors RI, RII, and RIII. The resistors shall be adjusted to 120 ohms in the above example.	
12	Remove associated 70 or 80 volt ac supply fuse.	
↳ 13	With all ac power removed from unit— Using an ohmmeter for verification — Remove or add straps or adjust slider on RI as required to obtain resistance value obtained in Step 11.	

STEP	ACTION	VERIFICATION
14	Remove ohmmeter from resistor RI.	
15	Repeat Steps 13 and 14 substituting resistors RII and RIII in turn.	
16	Replace 70 or 80 volt ac supply fuse.	
↱ 17	Remove plug from test jacks MC1.	Relays RA and RD release in both units.
18	Replace plug.	Relays RA and RD operate in both units.
19	Remove plug from test jacks MC2.	Relays RB and RE release in both units.
20	Replace plug.	Relays RB and RE operate in both units.
21	Repeat Steps 19 and 20, substituting test jacks MC3.	Same as Steps 19 and 20 except that relays RC and RF release and operate.
↳ 22	Check the operate and release requirements of relays RA through RF as specified in the circuit requirement table of Section 067-201-701 using the test arrangement given in the same section.	
23	At remote unit — Repeat Step 22.	

C. Test of Resistors R1, R2, R5, R11, R12, R13, R14, and R18

11	At the central office unit — Remove all fuses.	
→ 12d	If units are powered for 48-volt dc operation — With straps wired between the rear and slide terminals of resistors R2, R5, R11, R13 and R18, if provided — Connect an ohmmeter to the front and R2, R5, R11, R13, and R18, if provided, between the front and rear terminals.	
→ 13d	Adjust slide terminal for each resistor as required.	Ohmmeter should read as follows: R2 — 50 ohms ± 2 ohms R5 — 6 ohms ± .5 ohms R11 — 350 ohms ± 10 ohms R13 — 225 ohms ± 10 ohms R18 — 450 ohms ± 15 ohms

STEP	ACTION	VERIFICATION
→ 14e	If units are powered for 72-volt dc operation — With strap removed between the rear and slide terminals of resistor R11 — Connect an ohmmeter, in turn, to resistors R2, R5, R11, R13, and R18, if provided, between the front and rear terminals.	Ohmmeter should read as follows: R2 — 50 ohms ± 2 ohms R5 — 6 ohms ± .5 ohms R11 — 700 ohms ± 20 ohms R13 — 225 ohms ± 10 ohms R18 — 450 ohms ± 15 ohms
15d	At the remote unit — If unit is powered for 48-volt dc operation — With strap wired between the rear and slide terminals of resistor R1 — Connect an ohmmeter to the front and rear terminals of resistor R1.	
16d	Adjust slide terminal as required —	Ohmmeter should read 6 ohms ± .5 ohm.
17e	If unit is powered for 72-volt dc operation — With strap removed between the rear and slide terminals of resistor R1 — Connect an ohmmeter to the front and rear terminals.	Ohmmeter should read 20 ohms ± 1 ohm.
→ 18	At the central office unit — Manually load all vertical bars (trunks) on bar 50.	
19	Replace all fuses.	Circuit functions to cause vertical bar 1 to be selected and held operated.
20	Remove plug from test jacks MC4.	
21	Connect dc milliammeter to test jacks MC4.	
22	Block operated relays C and AB1.	
→ 23	At the remote unit — Block operated any TN- relay.	
24	At central office unit — Adjust slide of resistor R12 to obtain reading in accordance with Table A.	
25	Momentarily release and then block operated relay C.	Circuit advances to select and hold operated next higher numbered vertical bar. Milliammeter should read in accordance with reading obtained in Step 24 ± 2 ma.

STEP	ACTION	VERIFICATION

TABLE A

OUTSIDE TEMPERATURE DEGREES FAHRENHEIT	CURRENT FLOW R-12	R-14
105-114	67 ma	53 ma
95-104	68 ma	54 ma
85-94	69 ma	55 ma
75-84	71 ma	56 ma
65-74	72 ma	57 ma
55-64	74 ma	58 ma
45-54	76 ma	60 ma
35-44	78 ma	61 ma
25-34	80 ma	62 ma
15-24	82 ma	64 ma

26	Repeat Step 25 until all vertical bars have been tested.	Same as Step 25.
27	Remove blocking tools and meter and replace plug in test jacks MC4.	
28	Remove plug from test jacks MC5.	
29	Connect dc milliammeter to test jacks MC5.	
30	Adjust slide of resistor R14 to obtain a reading in accordance with Table A.	
31	Momentarily operate relay F1.	Circuit functions to select and operate next higher numbered vertical bar. Milliammeter should read in accordance with reading obtained in Step 30 ± 2 ma.
32	Repeat Step 31 until all vertical bars have been tested.	Same as Step 31.
33	Remove meter and replace plug in jacks of MC5.	
34	Remove block from relays C and AB1.	

D. F- and G- Relay Test

11	At the central office unit — Remove plug from test jacks MC4.	
12	Connect dc milliammeter to test jacks MC4.	
13	Block operated relays C and AB1.	

STEP	ACTION	VERIFICATION
→ 14	At the remote unit — Hold operated relay TN1.	Milliammeter reads in accordance with R-12, Table A ± 2 ma. At the remote unit — Relays F- and G- are operated in accordance with Table B.
15	Release relay TN1.	
16	Repeat Steps 14 and 15, substituting relays TN2 through 49.	Same as Step 14.
17	At the central office unit — Hold operated relay TN1.	Milliammeter reads 70 to 75 ma. Relays F- and G- are operated in accordance with Table B.
18	Release relay TN1.	
19	Repeat Steps 17 and 18, substituting relays TN2 through 49.	Same as Step 17.
20	Remove block from relays C and AB1.	
21	Remove meter from test jacks MC4 and replace plug.	

TABLE B

TN-	G-	F-	TN-	G-	F-
1	5	1	26	6	4
2	6	1	27	7	4
3	7	1	28	8	5
4	8	2	29	1	5
5	1	2	30	2	5
6	2	2	31	3	5
7	3	2	32	4	5
8	4	2	33	5	5
9	5	2	34	6	5
10	6	2	35	7	5
11	7	2	36	8	6
12	8	3	37	1	6
13	1	3	38	2	6
14	2	3	39	3	6
15	3	3	40	4	6
16	4	3	41	5	6
17	5	3	42	6	6
18	6	3	43	7	6
19	7	3	44	8	7
20	8	4	45	1	7
21	1	4	46	2	7
22	2	4	47	3	7
23	3	4	48	4	7
24	4	4	49	5	7
25	5	4	AK	6	7

STEP	ACTION	VERIFICATION
	E. Hold Winding Test of Vertical Bar Lift Magnets	
11	At the central office unit — Connect a dc milliammeter between the MA jack and ground.	
12	Block operated relay V.	
13	Block nonoperated relay A.	
14	Manually lift vertical bar 1.	Milliammeter reads 55 to 60 ma. Vertical bar 1 remains operated.
15	Momentarily disconnect milliammeter from jack MA.	Vertical bar 1 releases.
→ 16	Repeat Steps 14 and 15, substituting odd numbered vertical bars.	Same as Steps 14 and 15, except odd numbered vertical bars are substituted.
17	Disconnect meter from jack MA.	
18	Connect milliammeter to jack MR.	
19	Manually lift vertical bar 2.	Milliammeter reads 55 to 60 ma. Vertical bar 2 remains operated.
20	Momentarily disconnect meter from jack MR.	Vertical bar 2 releases.
→ 21	Repeat Steps 19 and 20, substituting even numbered vertical bars.	Same as Steps 19 and 20 except even numbered vertical bars are substituted.
22	Disconnect meter from jack MR.	
23	Remove block from relays V and A.	
	F. Test of M and N Relays	
11	With no connections made to pulse checking test set and all keys normal — Turn CAL potentiometer fully counterclockwise.	
12	Adjust screw of break meter as required.	Meter reads 100% break.
13	Using the W3M cord — Insert plug in BAT G jack and connect tip (red conductor) to ground. (white conductor) to battery and sleeve	

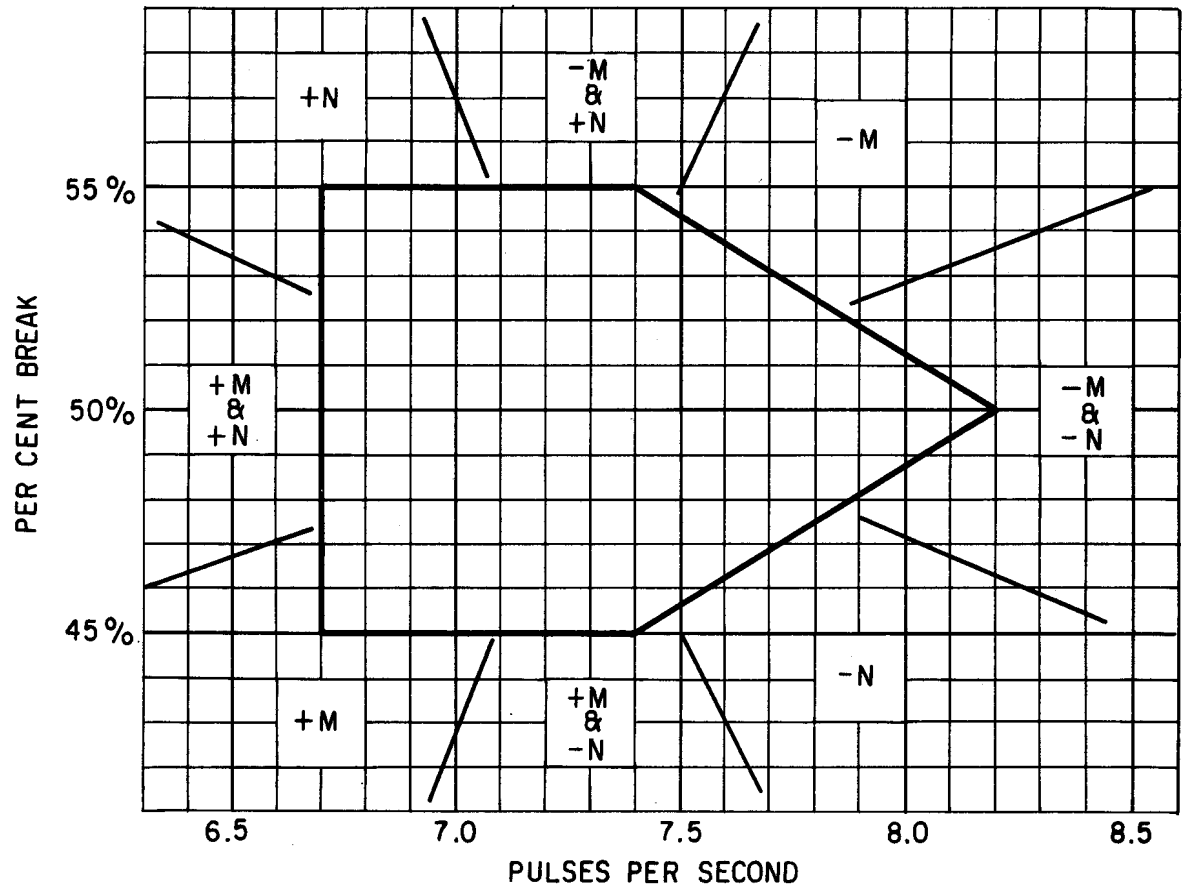
STEP	ACTION	VERIFICATION
14	Turn CAL potentiometer clockwise as required.	Meter reads 0% break.
15	At the central office unit — Using the W2W cord — Insert plug in P jack of test set and connect tip to the MA jack of line concentrator.	
16	At test set — Set scale key on 0-20 PPS.	
17	At central office unit — Hold relay D operated and then lift and release each vertical bar.	Walking circuit hunts for an idle trunk.
18	At test set — Operate PPS key.	Meter reading indicates pulses per second.
19	Release PPS key.	
20	Operate PCB key.	Meter reading indicates per cent break.
21	Release PCB key.	
22	Plot the readings obtained in Steps 18 and 20 using the two ordinates on Pulse Requirement Chart, Fig. 1.	The coordinates should intersect within the heavy lined center figure of the Pulse Requirement Chart.
→ 23d	If requirement is not met — Adjust M and/or N relay, using Gfeller LD1A open end wrench, as required and as specified on chart to move coordinates toward the center of heavy lined figure. Adjustment is made by turning tensioning screw mounted on spring pile-up. Clockwise increases tension and counter-clockwise decreases tension.	The two readings intersect within the heavy lined center figure of the Pulse Requirement Chart.

Caution: If the screw binds in its mounting spring, remove tension by slightly spreading the mounting spring using a KS-6854 screwdriver. Excessive tension may shear off the screw during the adjustment.

→ 24	Manually load all vertical bars on bar 50.	Walking circuit functions and operates a vertical bar. Walking action ceases.

STEP	ACTION	VERIFICATION

PULSE REQUIREMENTS
"M" & "N" RELAYS



\+ INCREASE SPRING TENSION
− DECREASE SPRING TENSION

Fig. 1

G. Walking Circuit Test

→ 11	At central office unit — While holding relay D operated — Momentarily lift each vertical bar.	All vertical bars unloaded. M and N relays operate and release continuously. All VB- relays and W operate and release in sequence. *Note:* In the 49-12-2 model, the W relay will not operate.

STEP	ACTION	VERIFICATION
12	Load vertical bar 1 on bar 50.	Relay BSU operates. Vertical bar 1 operates. Walking circuit hunts.
13	Load vertical bar 2 on bar 50.	Relay BSG operated. Walking circuit action ceases.
14	Momentarily operate relay D.	Vertical bar 1 releases. Vertical bar 2 operates. Walking circuit hunts.
→ 15	Repeat Steps 12 through 14, substituting for vertical bars 1 and 2 the following combinations: 2-3, 3-4, 4-5, and continuing in this manner until the last vertical bar and vertical bar 1 are tested.	Correct vertical bars operate and release. Walking circuit functions as in Steps 12 through 14.
16	Manually load all nonloaded vertical bars on bar 50.	
17	Insulate contact 2 of relay PIRS.	
→ 18	Hold operated DISENGAGEMENT (AK) key.	At central office unit — All VB- relays operate and release in sequence. No vertical bar is operated.
19	After two cycles of VB- relay sequence — Release DISENGAGEMENT (AK) key.	
20	Remove insulator from relay PIRS.	At each unit — A correspondingly numbered vertical bar is operated. Walking circuit action ceases.
21	At the central office unit— Remove plug from jacks MC5.	At the central office unit — The vertical bar operated in Step 20 releases. All vertical bars operate and release in sequence. At the remote unit — Vertical bar operated in Step 20 releases. All vertical bars operate and release in sequence.
22	After two cycles of sequence— Replace plugs in jacks MC5.	At each unit — A correspondingly numbered vertical bar is operated.
23	Load any nonloaded vertical bars on bar 50.	

STEP	ACTION	VERIFICATION
	H. Test of V Relay Release Time	
11	At the central office unit— Strap winding terminals 2, 3, and 4, of the V relay.	
→ 12	At distributing frame— At GLC connector block— Strap the sleeves of any eight horizontal bars to terminals associated with R16 battery (shown as SB terminal on Figs. 2, 3 and 4).	
13	Load eight vertical bars on the horizontal bars selected in Step 12.	
→ 14	At remote unit— Connect a dc voltmeter to jacks + and —.	
15	Hold operated DISENGAGEMENT (AK) key.	Peak voltage reaches Min 40 volts between successive vertical bar operations.
16	Release DISENGAGEMENT (AK) key.	
17d	If peak voltage requirement in Step 15 is not met— Remove strap between winding terminals 3 and 4.	
18d	Repeat Steps 13, 15, and 16.	Same as Step 15.
19e	If peak voltage requirement is not met in Step 18d— Remove strap from winding terminals 2 and 3.	
20e	Repeat Steps 13, 15, and 16.	Same as Step 15.
21	Disconnect voltmeter.	
	I. Test of All-Trunks-Busy Register Feature	
↱ 11	At the central office unit— Unload all but one vertical bar.	
12f	If units are not installed— At terminal strip III (See Fig. 3 or 4), connect a test cord between ground and punching as follows: 49-9-2 $AB1_3$ 49-11 + 1-2 $V3_3$ 49-12-2 $AB1_3$	
↳		

STEP	ACTION	VERIFICATION
13	Connect a test receiver between battery and punching as follows: 49-9-2 $V1_1$ 49-11+1-2 $V2_6$ 49-12-2 $V1_1$	
14	Connect a test cord between ground and any sleeve punching.	49-9-2 or 49-12-2 — When relay V1 releases, ground present at punching $V1_1$. 49-11 + 1-2 — When relay V2 releases, ground present at punching $V2_6$.
15	Remove test cord between ground and sleeve punching selected in Step 14.	49-9-2 or 49-12-2 — When relay V1 operates, ground absent from punching $V1_1$. 49-11 + 1-2 — When relay V2 operates, ground absent from punching $V2_6$.
16	Remove connections from terminal strip III.	
17	Manually load all vertical bars on horizontal bar 50.	

J. Test of All-Trunks-Busy Circuit, 49-9-2 and 49-12-2 Models, Step-by-Step Offices

11	With the applique circuit connected at the central office unit— Block nonoperated relay V1.	At applique circuit — Relay VO1 through 9 operates.
12	Connect test receiver to battery.	
13	At terminal strip III— Using test pick— Test for presence of ground at terminals d1 through d49.	Ground present on each terminal.
14	Remove block from relay V1.	
15	Disconnect test receiver.	

K. Test of Overflow Tone Trunk, 49-11+1-2 Model

Note: This test requires that the central office unit be installed.

11	At the central office unit— Unload all vertical bars.	Walking circuit hunts for an idle trunk.

STEP	ACTION	VERIFICATION
12	Initiate a terminating call to a concentrated line.	Vertical BES is lifted. First ring trips ringing cycle. Overflow tone is heard.
13	Disconnect test call.	Vertical BES drops.
14	Manually load vertical bar 1 to horizontal bar 50.	Walking circuit ceases hunting. Vertical 1 is preselected.

5. CUTOVER PROCEDURES

5.01 It is assumed that test and inspections were completed with the line concentrator units connected together either using simulating resistors or has been working at another location. This part gives procedures to be followed when the cable facilities have no spare pairs prior to cutover.

5.02 It is also assumed that the necessary cable pair assignments, unassigned horizontal bar sleeve leads have been strapped to the SB terminal, releases by the customers assigned to control pairs 1, 2 and trunk 1 have been obtained and cutover work is to commence.

5.03 When a release is obtained for subsequent trunk cable pair assignments, the customer's line equipment may be cross connected to his line relay while the trunk is being tested. This will minimize the outage time for each customer during cutover operations.

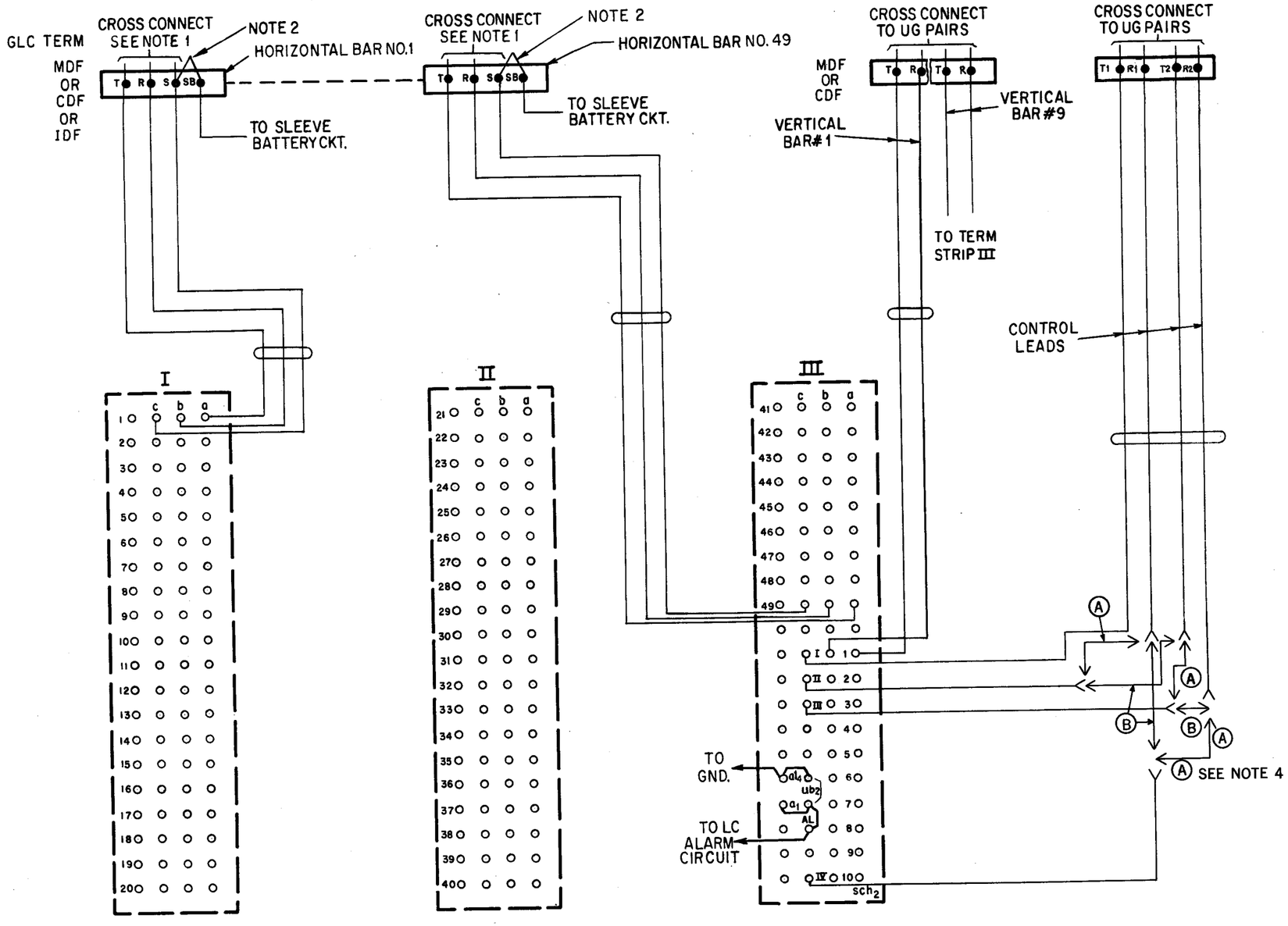
STEP	ACTION	VERIFICATION
1	At the central office unit— Remove the fuses and shorting plugs from all MC test jacks.	
2	Determine by measurement the loop resistance of the cable pairs to be used as control conductors. To measure the loop resistance — Strap together the tip and ring of each of the control pairs at the remote unit end and connect an ohmmeter across tip and ring of each pair in turn at the central office. Record reading and remove straps.	
3	At the central office unit — With each conductor selected in Step 2 grounded at the remote end — Using an ac voltmeter — Measure the ac potential from each conductor to ground.	Max 10 volts on each conductor.

STEP	ACTION	VERIFICATION
4	Measure the dc ground potential for the conductors as arranged in Step 3 by connecting a dc voltmeter from ground to one conductor of the pair.	
5a	If a negative voltage is obtained in Step 4 — Determine the negative dc ground potential effect on the loop resistance by multiplying each negative volt obtained in Step 4 by 15 ohms. *Note:* Disregard any positive voltage.	
6	With the loop resistance obtained in Step 2 corrected for 68° nominal temperature, add any resulting product from Step 5a. This sum becomes the effective loop resistance.	
7	Determine the dc voltage requirements as follows: Loop resistance or effective loop resistance 750 ohms or less use 48-volt operation; 751 to 1200 ohms use 72-volt operation.	
8	Connect the control leads 1 through 4 as follows: Use first control pair for leads 1 and 4 and connect them to the tip and ring, respectively. Use second control pair for leads 2 and 3 and connect them to the tip and ring, respectively.	
9	Connect trunk 1 to its assigned cable pair.	
10	Connect power to the central office unit as covered in Section 067-201-501 or 067-201-502.	
11	At central office unit — Divide the resistance used in Step 6 by 2 to get the individual conductor resistance. Subtract this resistance from 600 to get the compensating resistance. For example: loop or effective loop resistance 950÷2=475 ohms conductor resistance: 600 — 475=125 ohms.	

STEP	ACTION	VERIFICATION
	Note: On model 49-9-2 with serial nos. 1 to 709 and 751 to 889, the compensating resistance must be rounded to the nearest 20 ohms due to the tapped compensating resistors RI, RII, and RIII. The resistors shall be adjusted to 120 ohms in the above example.	
12	Remove associated 70 or 80 volt ac supply fuse.	
13	With all ac power removed from unit — Using an ohmmeter for verification — Remove or add straps or adjust slider on RI as required to obtain resistance value obtained in Step 11.	
14	Remove ohmmeter from resistor RI.	
15	Repeat Steps 13 and 14 substituting resistors RII and RIII in turn.	
16	Replace 70 or 80 volt ac supply fuse.	
17	Replace plug (red) in test jacks MC1.	Relays RA and RD operate in both units.
18	Replace plug (red) in test jack MC2.	Relays RB and RE operate in both units.
19	Replace plug (red) in test jacks MC3.	Relays RC and RF operate in both units.
20	Remove MC1 test jack plug and insert the 25-ohm resistor (10 watt) using the Gfeller test leads equipped with two KS-6278 connecting clips.	
21	Using a KS-14510 meter — Place selector on 3 volts ac position and read voltage drop of the 25-ohm resistor on the ***12 volt scale.*** Record reading.	Meter reads 7.5 to 9.5 volts.
22	Remove resistor and reinstall test jack plug.	
23	Repeat Steps 20, 21, and 22 substituting MC2 and MC3.	Same as Step 21.
	Note: The readings recorded in Steps 21 and 23 may be converted to milliamperes by multiplying by 10. For example: meter reading is 8.6 volts, current flow is 86 ma.	

STEP	ACTION	VERIFICATION
24	Replace all test plugs.	
25	At the central office unit — Manually unload all vertical bars except vertical bar No. 1.	
26	Perform Steps 19 through 24 and 27 through 30 of test C given in Part 4, Method, Record reading for R12 and R14.	Same as Steps given in Part 4.
27	Remove meter and replace plug in jacks of MC5.	
28	Remove block from relays C and AB1.	
29	At distributing frame — At GLC connector block — Strap the sleeves of any eight horizontal bars to terminals associated with R16 battery (shown as SB terminal on Figs. 2, 3, and 4).	
30	Load eight vertical bars on horizontal bars selected in Step 12.	
31	At remote unit — Connect a dc voltmeter to jacks + and —.	
32	Hold operated DISENGAGEMENT (AK) key.	Peak voltage reaches Min 40 volts between successive vertical bar operations.
33	Release DISENGAGEMENT (AK) key.	
34d	If peak voltage requirement in Step 32 is not met — Remove strap between winding terminals 3 and 4 on the V relay.	
35d	Repeat Steps 30, 32, and 33.	Same as Step 32.
36e	If peak voltage requirement in Step 35d is not met — Remove strap between winding terminals 2 and 3 on the V relay.	
37e	Repeat Steps 30, 32, and 33.	Same as Step 32.
38	Disconnect voltmeter.	
39	The control pairs and trunk 1 are ready to handle service calls.	

STEP	ACTION	VERIFICATION
40	Obtain release from customer using cable pair assigned for trunk 2.	
41	Cross connect trunk 2 to its assigned cable pair.	
42	Manually load vertical bar 2 on horizontal bar 50.	Vertical bar 2 operates.
43	Remove plug from test jacks MC4.	
44	Connect dc milliammeter to test jacks MC4.	
45	Block operated relays C and AB1.	
46	At the remote unit — Block operated any TN- relay.	
47	At the central office unit — Measure current flowing in MC4 test jacks.	Milliammeter should read in accordance with Step 26 (R12) ± 2 ma.
48	Remove blocking tools and milliammeter and replace plug in test jacks MC4.	
49	Remove plug from test jacks MC5.	
50	Connect dc milliammeter to test jacks MC5.	Milliammeter should read in accordance with Step 26 (R14) ± 2 ma.
51	Repeat Steps 40 through 50 substituting trunk 3 and continue until all trunks have been cutover.	



NOTES:

1. **No. 1 Crossbar Offices**

   Cross-connect T and R to line equipment terminals T and R for assigned lines. Extend sleeves S of assigned line equipments from the LDF, via cable or tie cable, to theHMDF and cross-connect to the line concentrator S terminals.

   No. 5 Crossbar Offices

   Cross-connect T, R and S to line equipment terminals T, R and LS for assigned lines.

   Panel BCO and SXS Offices

   Connect T, R, S, to T, R, S for assigned line numbers. Where GLC block is located on the MDF the line equipment S leads must be extended by tie cable from the IDF to the MDF.

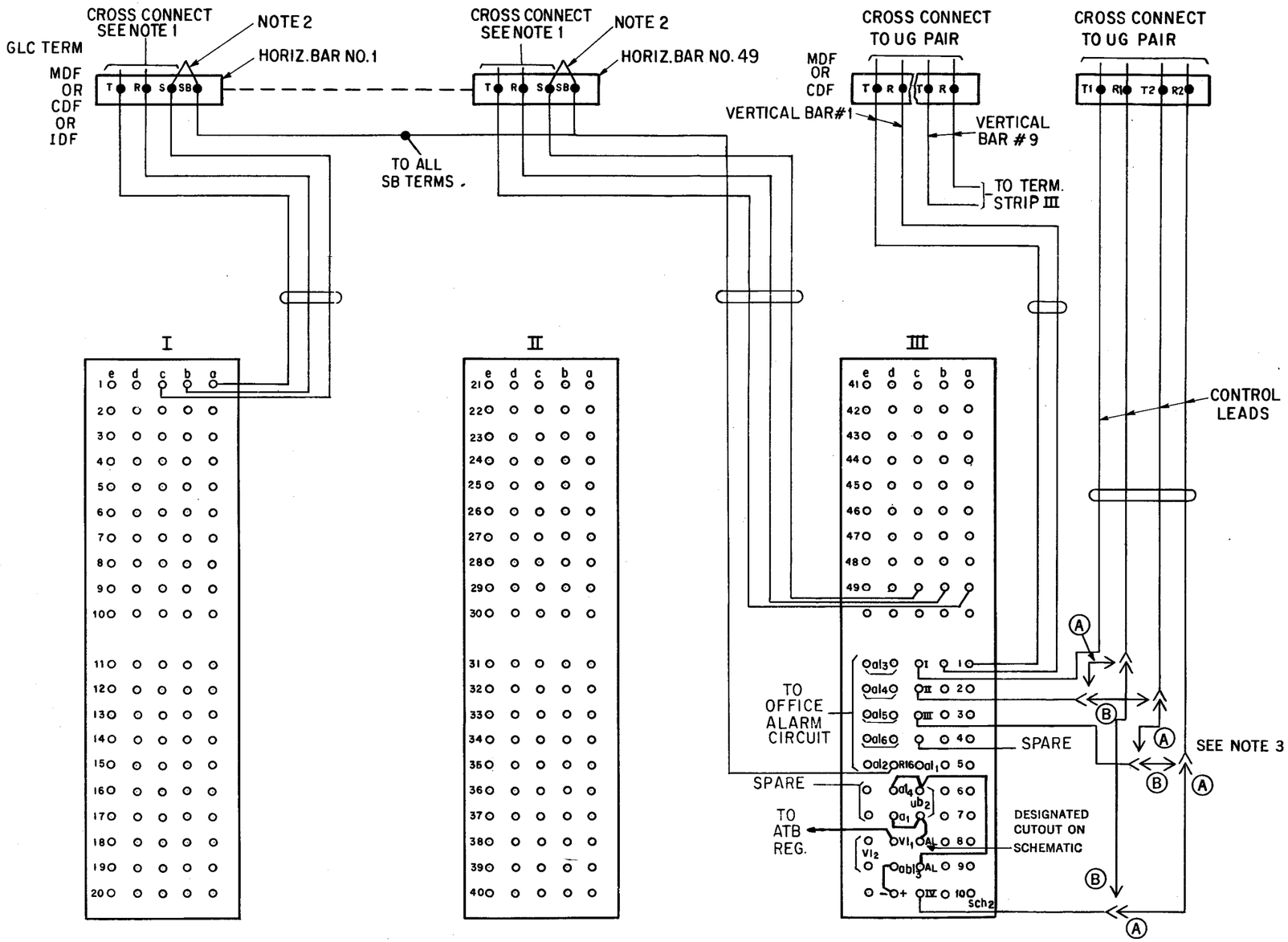
   Panel GCO

   Connect T, R, to T, R, for assigned line numbers. Connect S leads to applique circuit as covered in Section 067-201-103

2. Place strap for all unassigned horizontal bars.
3. For conversion to 72 volt operation refer to Section 067-201-103
4. (A) Cross-connect control pairs per step 8c, part 3

   (B) Cross-connect control pairs straight

Fig. 2 – Terminal Strips for Schematic No. S10460-3



NOTES:

1. **No. 1 Crossbar Offices**

   Cross-connect T and R to line equipment terminals T and R for assigned lines. Extend sleeves S of assigned line equipments from the LDF, via cable or tie cable, to theHMDF and cross-connect to the line concentrator S terminals.

   No. 5 Crossbar Offices

   Cross-connect T, R and S to line equipment terminals T, R and LS for assigned lines.

   Panel BCO and SXS Offices

   Connect T, R, S, to T, R, S for assigned line numbers. Where GLC block is located on the MDF the line equipment S leads must be extended by tie cable from the IDF to the MDF.

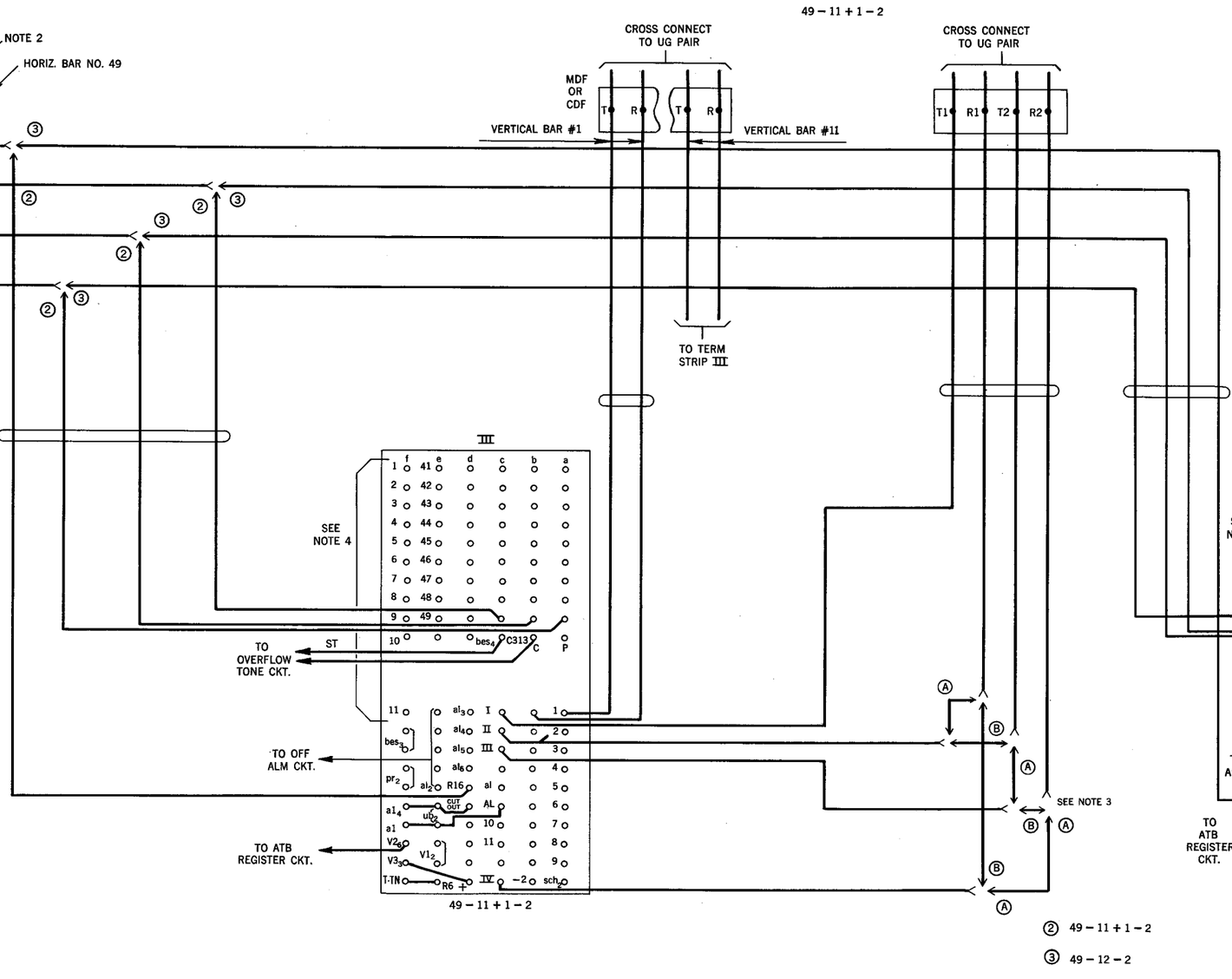
   Panel GCO

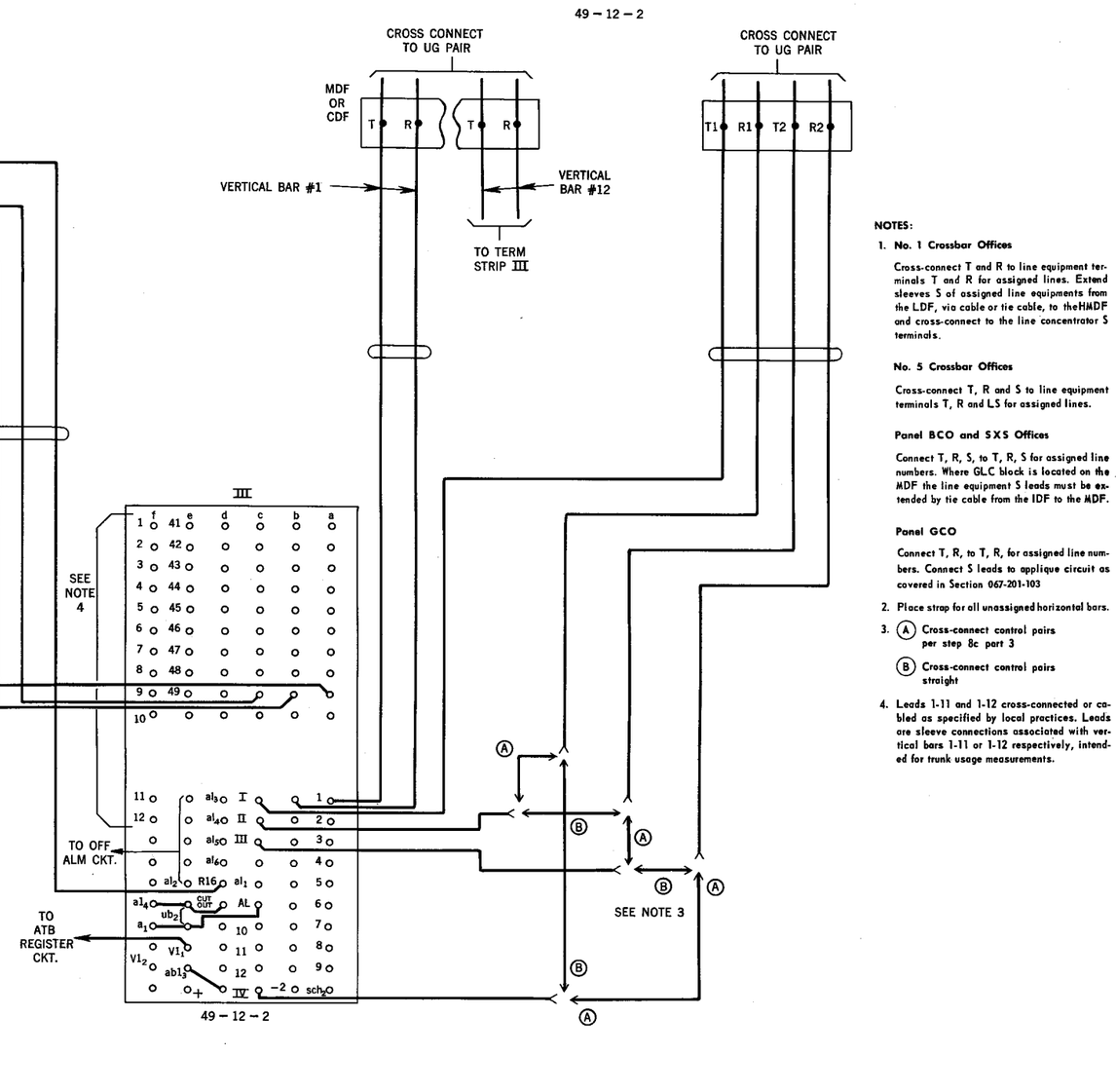
   Connect T, R, to T, R, for assigned line numbers. Connect S leads to applique circuit as covered in Section 067-201-103

2. Place strap for all unassigned horizontal bars.
3. (A) Cross-connect control pairs per step 8c part 3

   (B) Cross-connect control pairs straight

Fig. 3 — Terminal Strips for Schematic No. S10460-4





NOTES:

1. **No. 1 Crossbar Offices**

   Cross-connect T and R to line equipment terminals T and R for assigned lines. Extend sleeves S of assigned line equipments from the LDF, via cable or tie cable, to the HMDF and cross-connect to the line concentrator S terminals.

   No. 5 Crossbar Offices

   Cross-connect T, R and S to line equipment terminals T, R and LS for assigned lines.

   Panel BCO and SXS Offices

   Connect T, R, S, to T, R, S for assigned line numbers. Where GLC block is located on the MDF the line equipment S leads must be extended by tie cable from the IDF to the MDF.

   Panel GCO

   Connect T, R, to T, R, for assigned line numbers. Connect S leads to applique circuit as covered in Section 067-201-103

2. Place strap for all unassigned horizontal bars.
3. (A) Cross-connect control pairs per step 8c part 3

   (B) Cross-connect control pairs straight

4. Leads 1-11 and 1-12 cross-connected or cabled as specified by local practices. Leads are sleeve connections associated with vertical bars 1-11 or 1-12 respectively, intended for trunk usage measurements.

Fig. 4 – Terminal Strips for Schematics S11888 and S11840

49 – 11 + 1 – 2

GLC TERM

CROSS CONNECT SEE NOTE 1

NOTE 2

HORIZ. BAR NO. 1

MDF OR CDF OR IDF

T R S SB

TO ALL SB TERMS

CROSS CONNECT SEE NOTE 1

NOTE 2

HORIZ. BAR NO. 49

CROSS CONNECT TO UG PAIR

MDF OR CDF

VERTICAL BAR #1

VERTICAL BAR #11

TO TERM STRIP III

CROSS CONNECT TO UG PAIR

T1 R1 T2 R2

I

II

III

SEE NOTE 4

TO OVERFLOW TONE CKT.

ST

C313

TO OFF ALM CKT.

TO ATB REGISTER CKT.

SEE NOTE 3

49 – 11 + 1 – 2

MDF OR CDF

VERTICAL BAR #1

SEE NOTE 4

TO OFF ALM CKT.

TO ATB REGISTER CKT.

49 – 12 – 2

② 49 – 11 + 1 – 2

③ 49 – 12 – 2