

**J99395LB, PA, RA, AND SB SIGNALING UNITS
WITH EQUALIZATION OR GAIN TRANSFER
ADJUSTMENT PROCEDURES**

CONTENTS	PAGE
1. GENERAL	1
2. ADJUSTMENT PROCEDURE FOR GAIN TRANSFER UNITS (GLB AND GSB)	1
3. ADJUSTMENT PROCEDURE FOR 4-WIRE UNITS WITH EQUALIZATION	2

1. GENERAL

1.01 This section covers the manual adjustment procedures of the balance network circuits in the GLB and GSB units and the 4-wire equalizer circuits in the GPA and GRA units (see Fig. 1, 2, 3, 4, and 5). Manual adjustment of the balance network circuit is required when one or more of the following conditions exist:

- When the cable configuration is not one of the choices in the prescription tables.
- When the load is not one of the choices in the prescription tables.
- When large values of slope or gain are being used. The balance network settings become more critical as these parameters increase; so, precise adjustments and margin tests become necessary to assure stable operation.

The conditions which require adjustments to the 4-wire equalizer circuit are discussed in paragraph 3.01.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Before performing any adjustments or tests, consult Table A for explanation of the symbols that are used in Fig. 6 through 12.

2. ADJUSTMENT PROCEDURE FOR GAIN TRANSFER UNITS (GLB AND GSB)

2.01 Before any adjustments are initiated, the SF unit must be inserted into a test extender and connected through cable to its normal load in the busy state. In general, the busy state involves closing the tip and ring to dc signals at the load, with the proper ac impedance. For the telephone set, the busy state means off-hook. For 900-ohm and 600-ohm plus 2.15 μ fd, the busy state means a closed circuit at dc with the proper ac impedance.

2.02 When the build-out capacitor (BOC) switch S3 and balance network (BN) switch S5 (Fig. 2 and 3) are operated to the ON position, the red numbers are visible. When the switches are operated to the OFF position, the white numbers will be visible.

2.03 In this procedure, the KS-20501 return loss measuring set will be referred to as the RLMS and the return loss meter will be referred to as RLM.

2.04 Adjustments covered are:

A. Balance Network for Nonloaded Cable: The adjustment procedure involves initial settings and five steps as follows:

Initial Settings: TRMT to 0 (front panel and PWB), RCV to 0 (front panel and PWB), ST to 0, SR to 0, S1 to 0, S2 to NLC, S4 to BN, operate S5-346, Z to 5, R2 to 8. Connect the RLMS between LINE RCV and LINE TRMT.

NOTICE

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STEP	RLMS TEST TYPE SWITCH	MAXIMIZE RLM WITH
1	ERL	Z dial and S5-2,3
2	SRL	R1 switches (S5-4,6)
3	SRL HI	Z and R2 dials—Record
4	ERL	Z and R2 dials—Record
5	—	Set Z and R2 dials halfway between re- corded values

Note: Complete details of this procedure (step-by-step) are shown in Fig. 6 and 7.

B. Balance Network for Loaded Cable:

The adjustment procedure involves initial settings and six steps as follows:

Initial Settings: TRMT to 0 (front panel and PWB), RCV to 0 (front panel and PWB), SR to 0, ST to 0, S1 to O, S2 to LC, S4 to BN, S5 to OFF, S3 to make near-end section equal 6 kft, Z to 5. Connect the RLMS between LINE RCV and LINE TRMT.

STEP	RLMS TEST TYPE SWITCH	MAXIMIZE RLM WITH
1	ERL	Z dial and S5-2,3
2	SRL HI	BOC (S3)
3	SRL	X switches (S5-7,8,9)
4	SRL HI	Z dial—Record
5	ERL	Z dial—Record
6	—	Set Z dial halfway between recorded value

Note: Complete details of this procedure (step-by-step) are shown in Fig. 6 and 8.

2.05 The tests covered are:

A. Near-End Margin Check: This check is performed to determine if gain transfer has been achieved after the balance network and build-out capacitors (BOC, S3) have been manually adjusted (see Fig. 9).

B. Loop Margin Check: This check is performed if the G signaling unit has met the requirements of Test A (near-end margin check), has been plugged into the G bay, and the overall circuit does not function properly. (See Fig. 10.)

ADJUSTMENTS A AND B (FIG. 7 AND 8) AND TEST A (FIG. 9)

2.06 The following apparatus is needed to perform adjustments A and B and Test A:

APPARATUS:

1—Test Extender, SD-7C080-01

1—RLMS, KS-20501

2—Patch cords, P3E cord, 4 feet long, equipped with 310 plugs at each end (3P7E).

2.07 The following apparatus is needed to perform Test B (Fig. 10):

APPARATUS:

1—Test Extender, SD-7C080-01

1—RLMS, KS-20501

2—Patch cords, P2CL cord, 3 feet long, equipped with red KS-19531 plugs on one lead and an alligator clip on the other lead with 47 cord tips on the other ends of the cords. Equip the 47 cord tips with a 310 plug, connecting the red conductor to the tip.

3. ADJUSTMENT PROCEDURE FOR 4-WIRE UNITS WITH EQUALIZATION

3.01 When the GPA and GRA units are connected to a trunk in which the cable make-up is unknown or the prescription settings given on the circuit layout record (CLR) do not provide adequate frequency response of the circuit, the cable loss must be measured. Four measurements must be made in order to calculate the bandwidth (BW), height (HT), slope (SL), and nonloaded/loaded switch settings of the 4-wire equalizer circuit. These switch settings are determined when the adjustment procedures are performed per Fig. 11 and 12 of this section. It is important to have the proper cable terminating impedances selected since

loss-frequency measurements are influenced by terminating impedances. The HMLO switches must be set before performing the loss measurements in Fig. 11. The H setting (1200 ohms) is for H88 loaded cable and the M setting (600 ohms) is for nonloaded cable. In mixed loaded and nonloaded layouts, the H setting should be used when the nearest load coil is closer than 9 kft and the M setting should be used when the nearest load coil is farther than 9 kft. Before the cable loss measurements can be made, a communication link must be established either from the central office end of the trunk (GPA) or from the PBX or station end of the trunk (GRA). If the craftperson performing the adjustments is unfamiliar with making cable loss measurements with a transmission measuring set (TMS), a detailed explanation on how to make cable loss measurements with a TMS can be found in Section 103-221-100, Part 5.

3.02 Low-frequency equalization is controlled by the NL/L switch and the slope setting. With the NL/L switch in the L position, increasing the slope setting increases the low-frequency loss with respect to the 1 kHz loss. Whereas decreasing slope adds more relative gain at the low frequencies and there is almost no effect on the frequencies above 1 kHz.

3.03 When the NL/L switch is in the NL position, increasing the slope setting increases the loss of the low frequencies while more gain is added to the midband frequencies relative to the 1 kHz response. When the slope setting is decreased, gain is added to the low frequencies and loss is added to the midband frequencies relative to the 1 kHz gain. Changes to the slope setting always affect the 1 kHz gain of the unit.

3.04 High-frequency (above 1 kHz) equalization is accomplished with two controls, bandwidth (BW), and height (HT), which shape a bump centered at 3250 Hz. For large values of BW, increasing

the HT setting adds more gain at 3250 Hz and almost as much gain at the midband frequencies. When small values of BW are used, increasing the HT setting adds more gain at 3.25 kHz with almost no change in midband level.

3.05 Equalizer adjustments are determined by the difference in the 1 kHz loss and the loss at the other three frequencies. This difference is located on the bottom scale of the appropriate range chart in Fig. 12, and the setting is found on the top scale. If the difference is exactly equal to the number on the range scale, the setting to the right of the number should be used. If the difference is smaller than the lowest range value, the smallest setting on the table should be used. If the difference is greater than the largest range value, the highest setting on the table should be used.

3.06 These adjustments include the setting up and measurement of the cable loss, and operating the appropriate switches as designated in Fig. 12.

3.07 The following apparatus is needed to perform the adjustments.

APPARATUS:

- 1—Test Extender, SD-7C080-01
- 2—TMS, J94021A (one at sending end of trunk being adjusted and one at G-signaling unit being adjusted)
- 1—2P14A Cord Assembly, P2AA cord, 3 feet long with 241B plug on each end (receiving end)
- 1—3P17A Cord Assembly, P3N cord, 3 feet long with 241A plug on one end and a 310 plug on the other end (sending end).

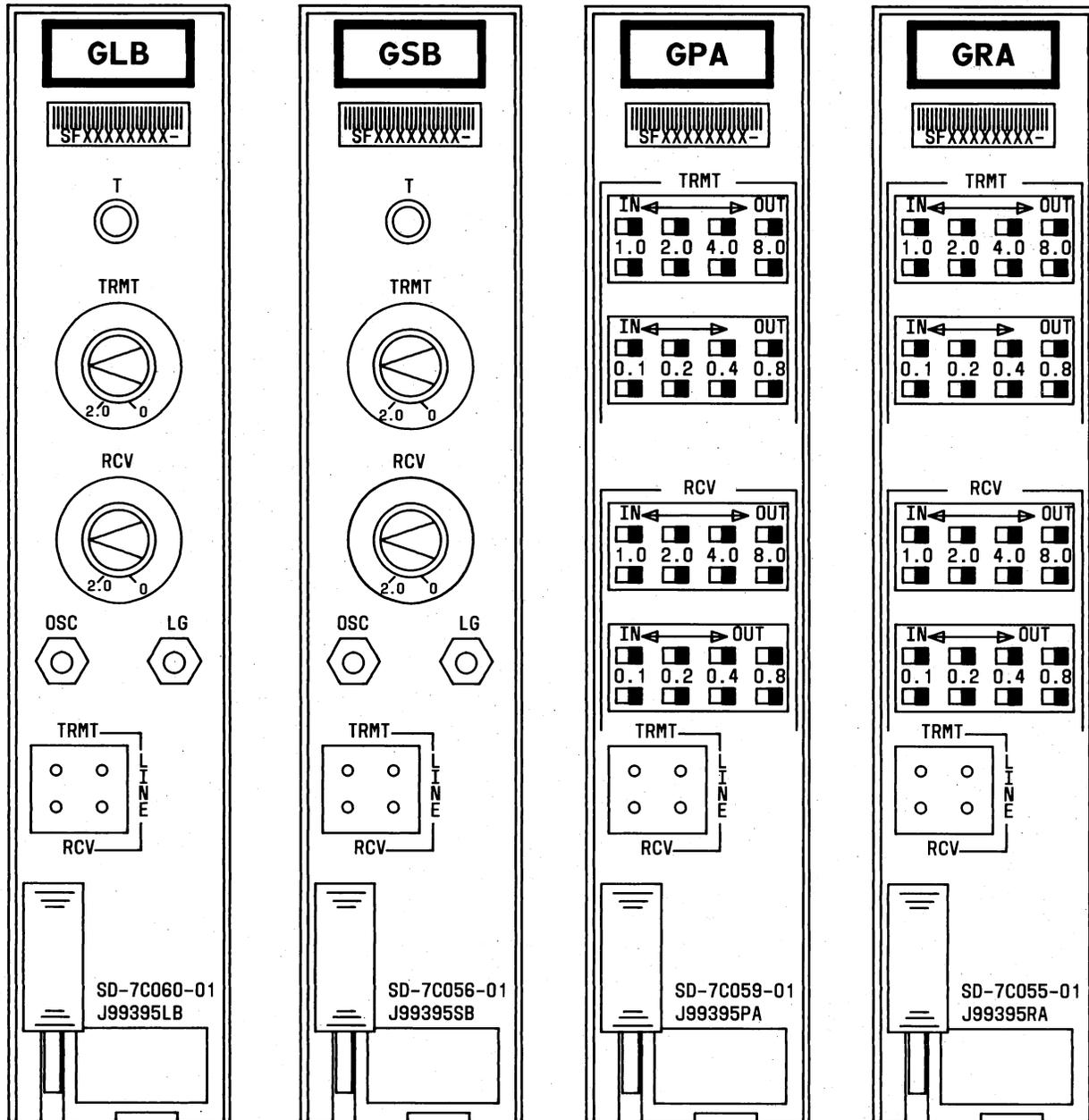


Fig. 1—GLB, GSB, GPA, and GRA Faceplates

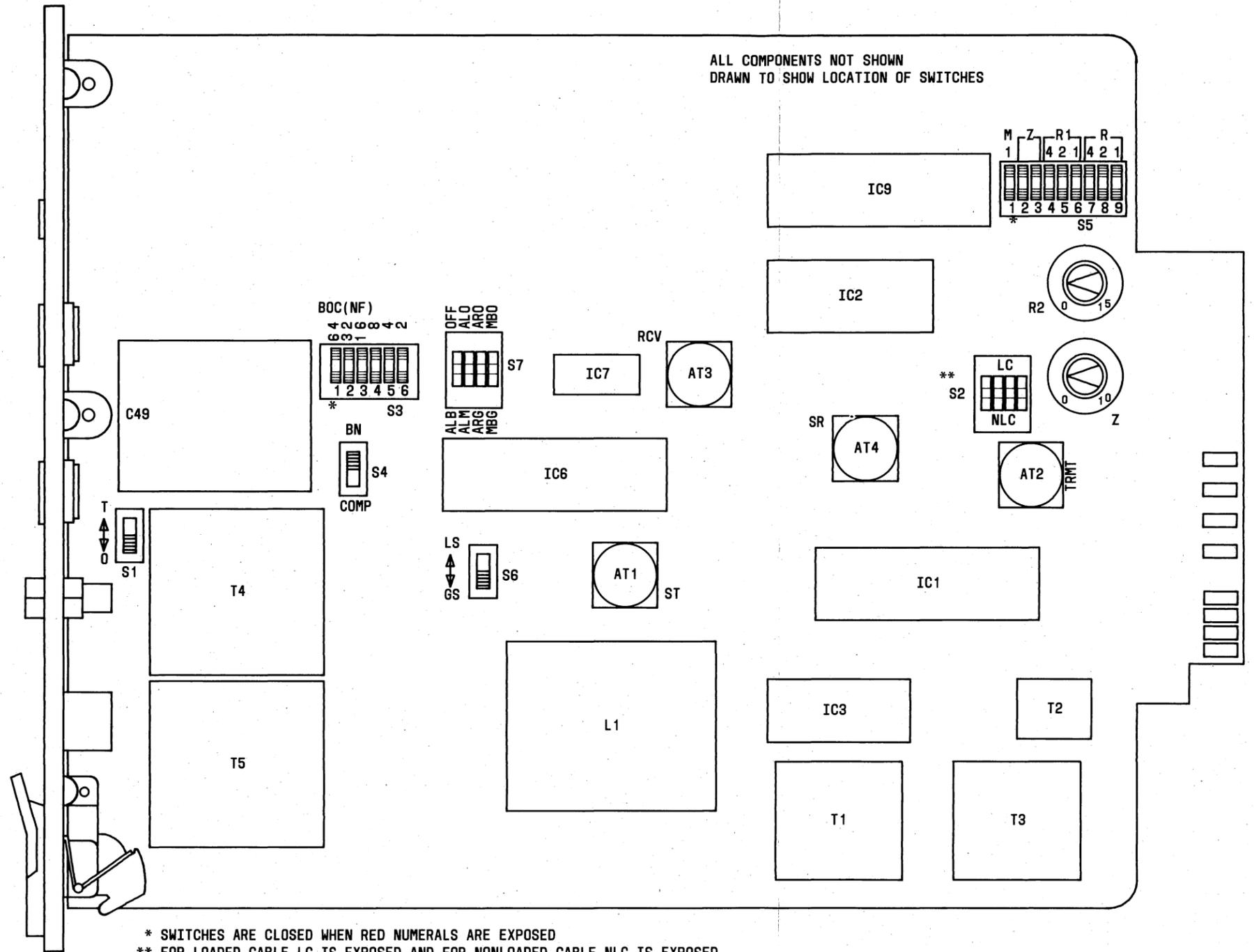


Fig. 2—Illustration of GLB Showing Location of Switches

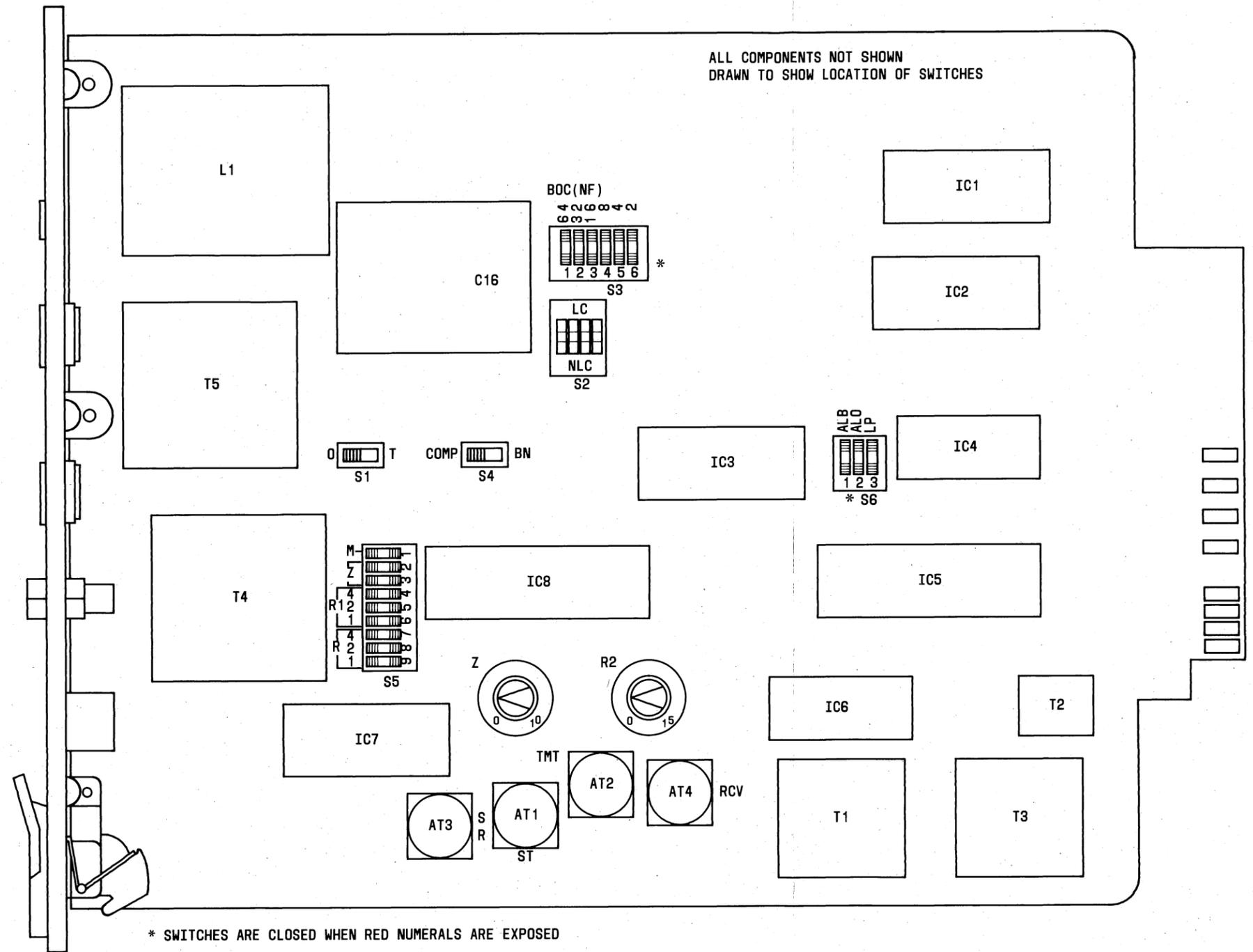


Fig. 3—Illustration of GSB Showing Location of Switches

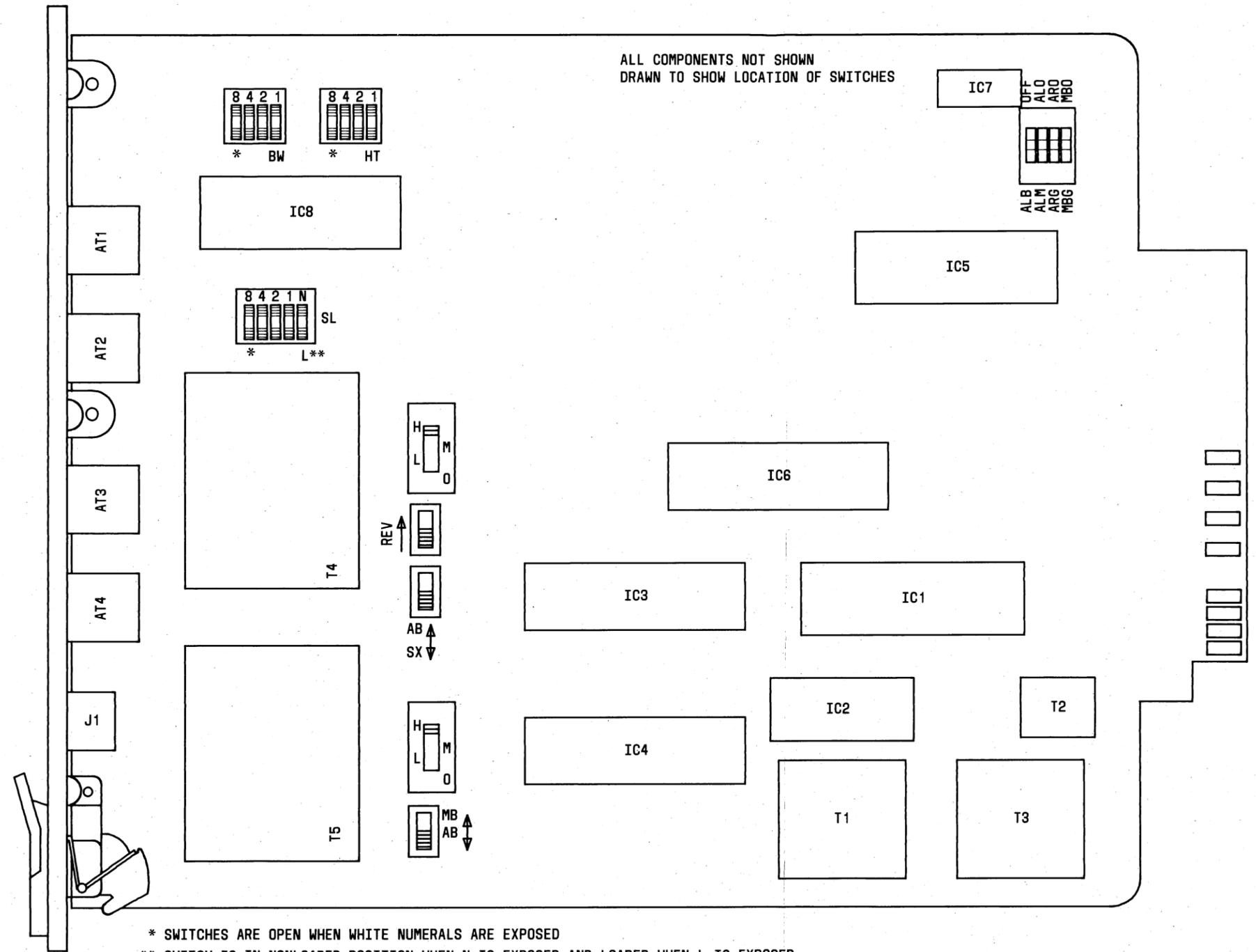


Fig. 4—Illustration of GPA Showing Location of Switches

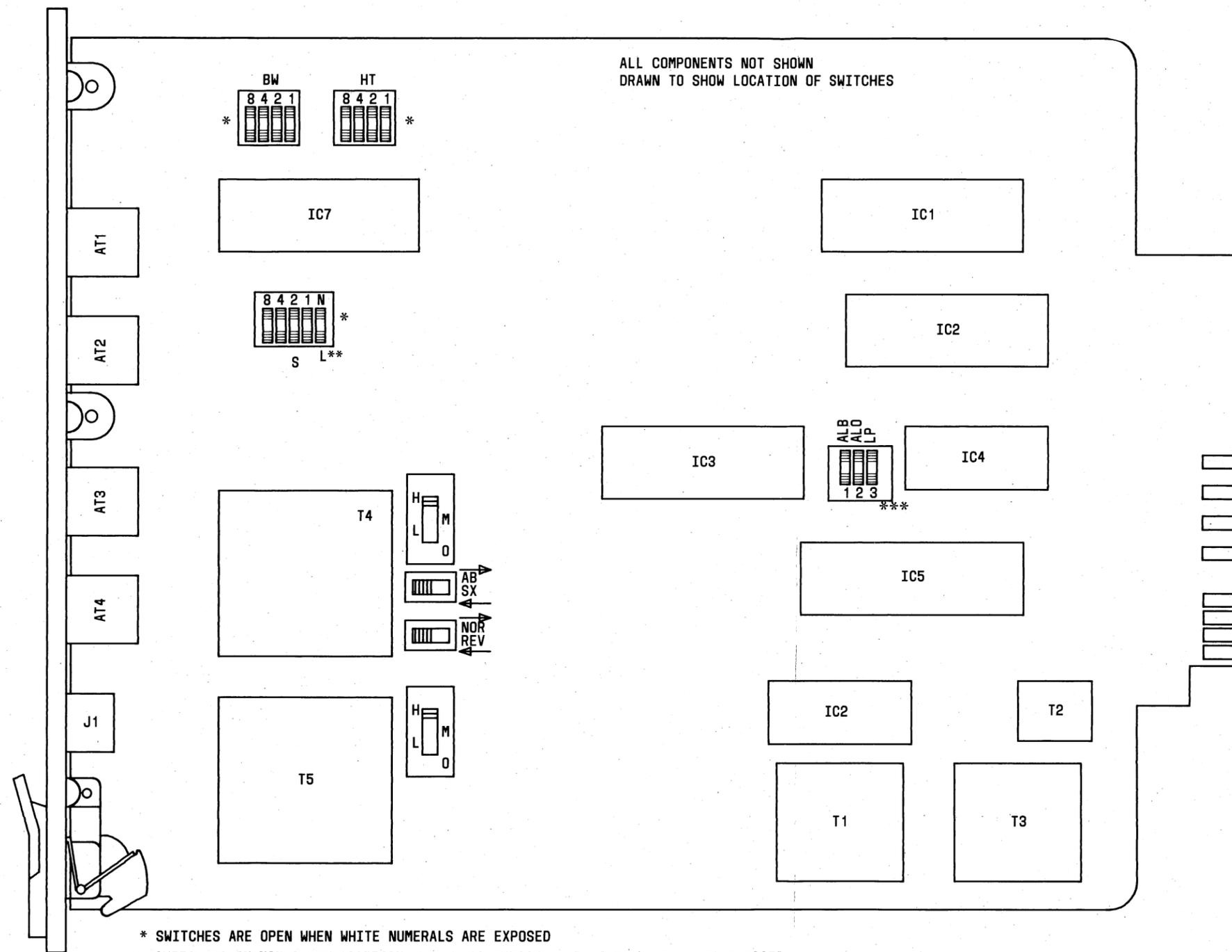
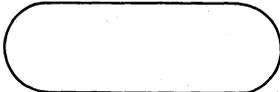
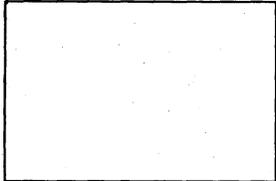
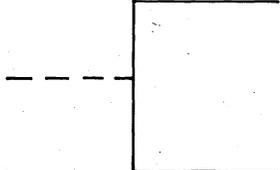
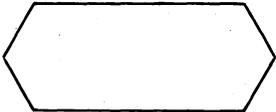
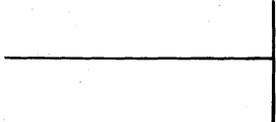
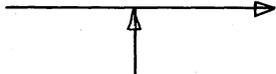


Fig. 5—Illustration of GRA Showing Location of Switches

TABLE A
FLOWCHART EXPLANATIONS

SYMBOL	EXPLANATION
	<p>Indicates the beginning of the procedure and an exit or entrance reference to pages within same procedure.</p>
	<p>Indicates an action which is performed on a manual or automatic basis.</p>
	<p>Brackets are used to reference supporting-type data.</p>
	<p>Used to represent a decision which determines which one of two paths to take.</p>
	<p>The end of procedure symbol is used to denote that the end of the emergency action condition has been completed.</p>
	<p>Used to indicate the direction of information flow.</p>
	<p>Used to indicate two processes flowing into a common sequence.</p>

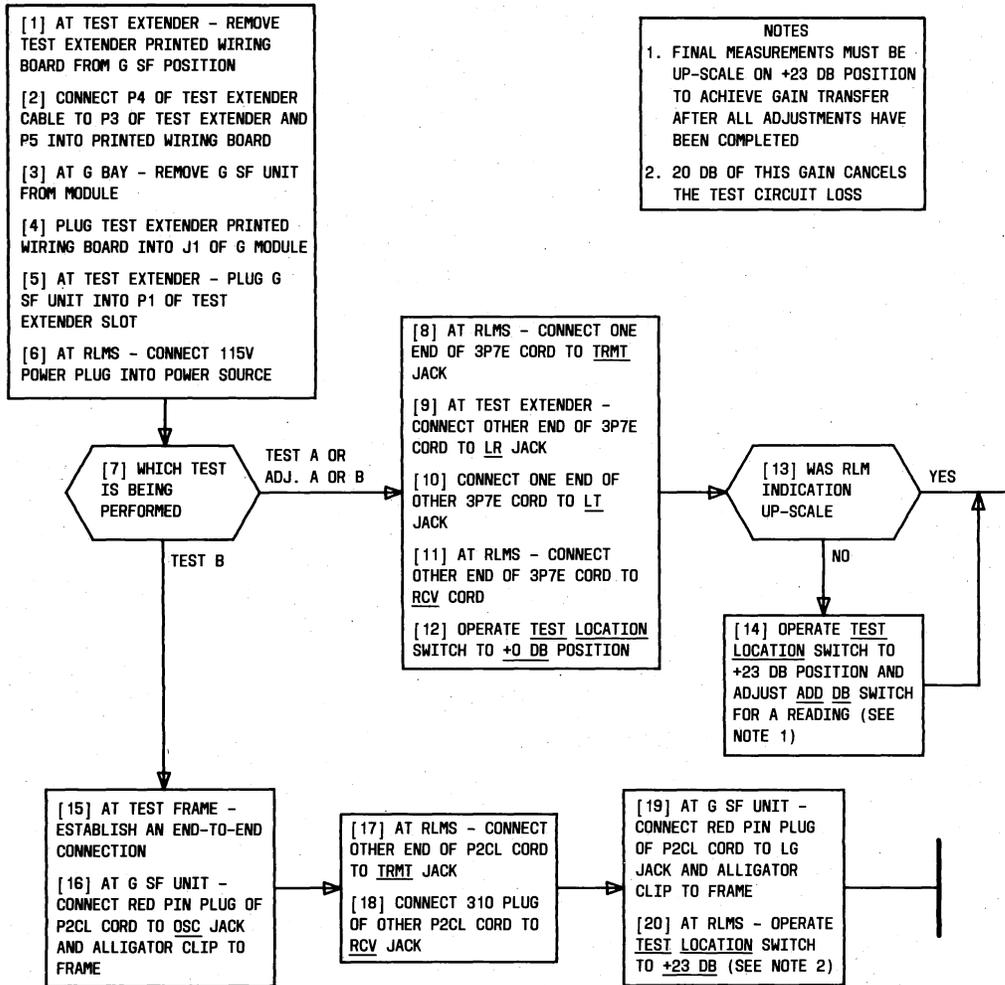
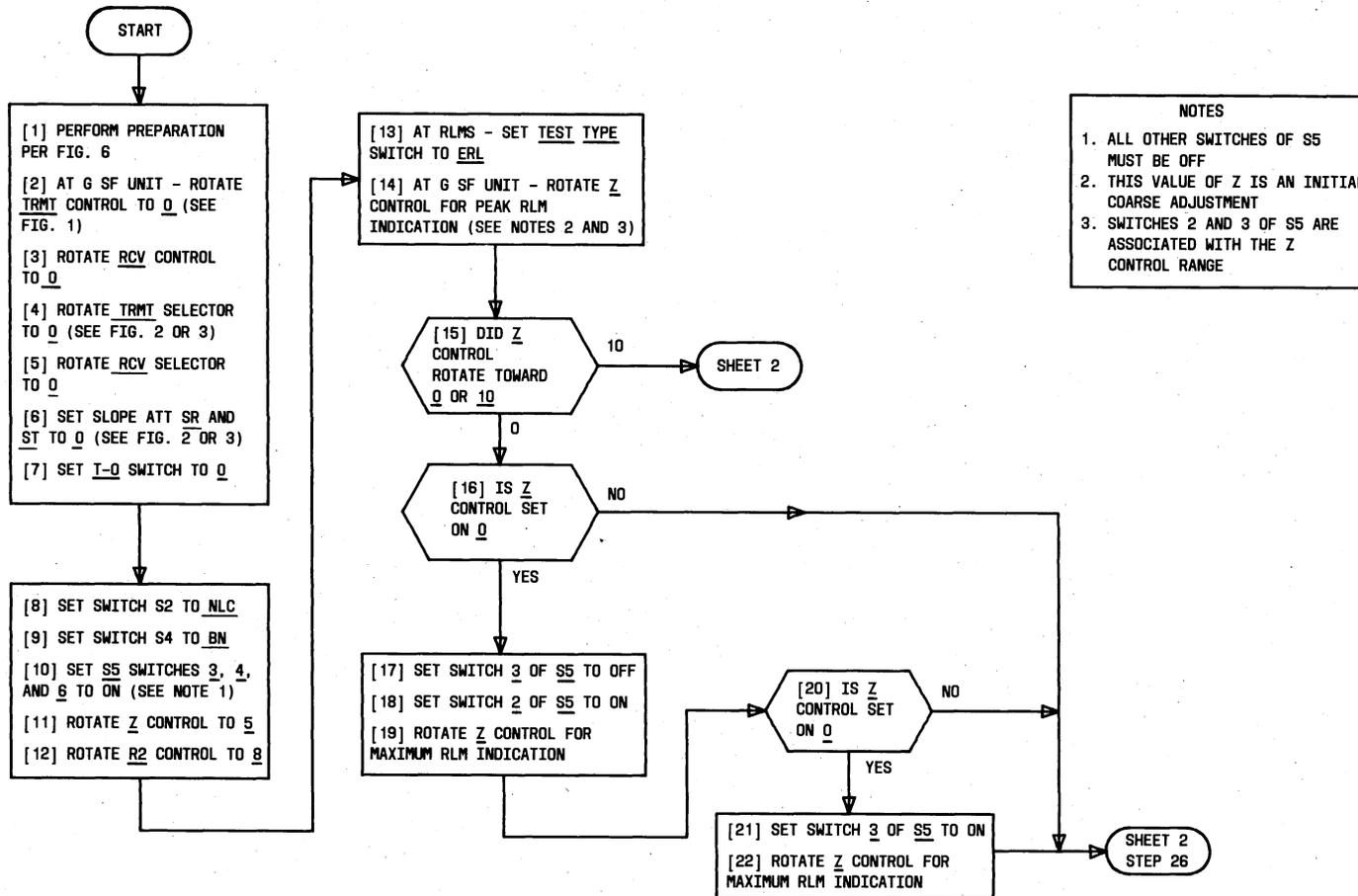


Fig. 6—Preparation for Adjustment and Tests



NOTES

1. ALL OTHER SWITCHES OF S5 MUST BE OFF
2. THIS VALUE OF Z IS AN INITIAL COARSE ADJUSTMENT
3. SWITCHES 2 AND 3 OF S5 ARE ASSOCIATED WITH THE Z CONTROL RANGE

Fig. 7—Adjustment A: Balance Network for Nonloaded Cable (Sheet 1 of 3)

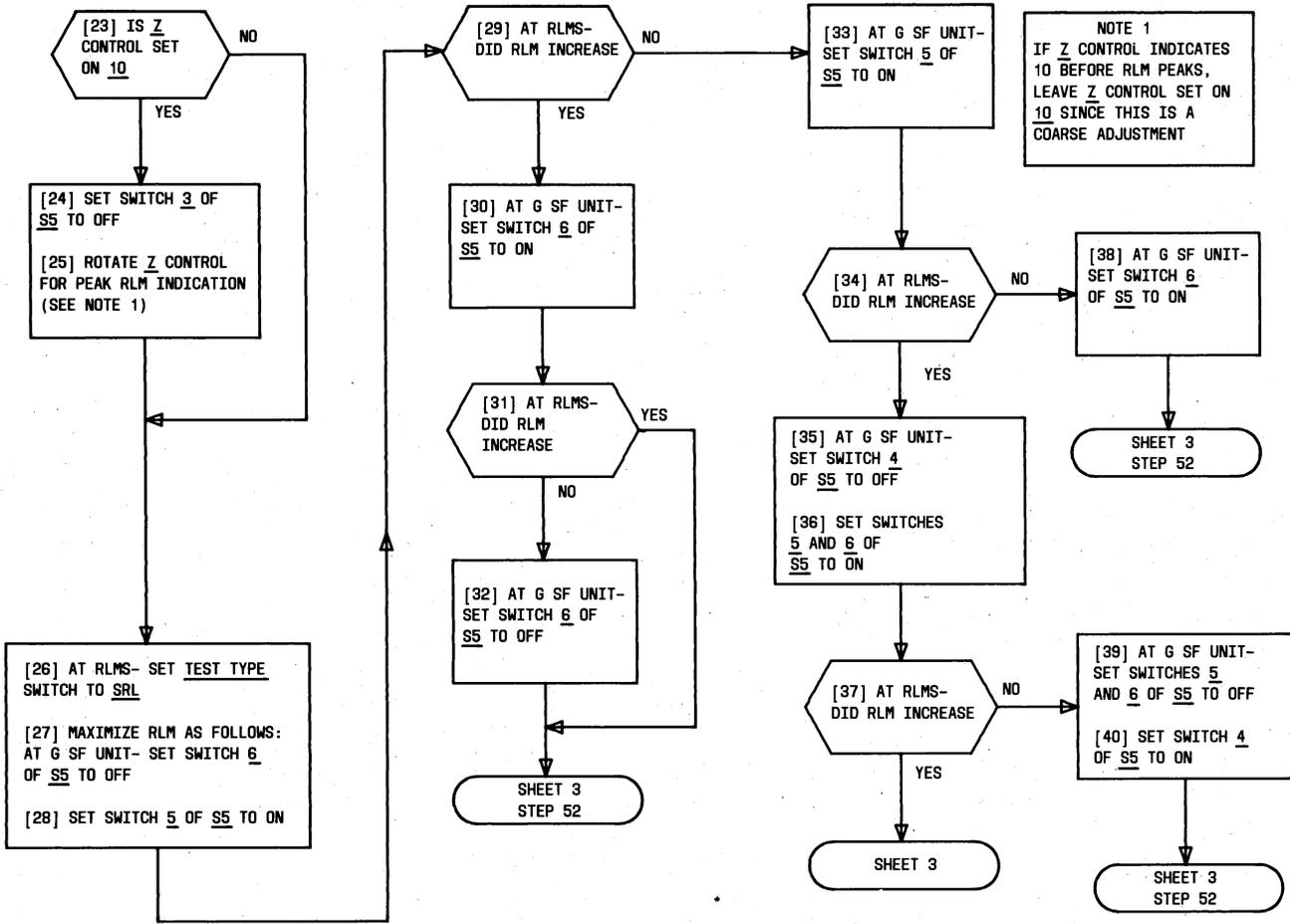


Fig. 7—Adjustment A: Balance Network for Nonloaded Cable (Sheet 2 of 3)

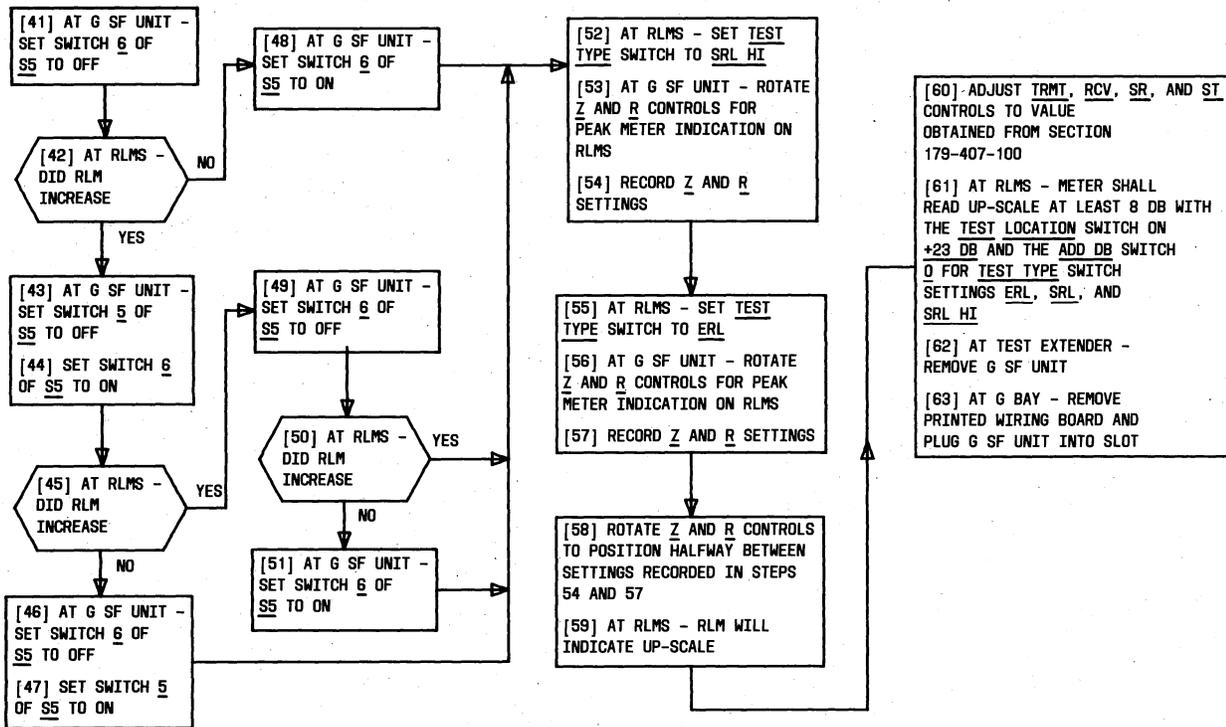


Fig. 7—Adjustment A: Balance Network for Nonloaded Cable (Sheet 3 of 3)

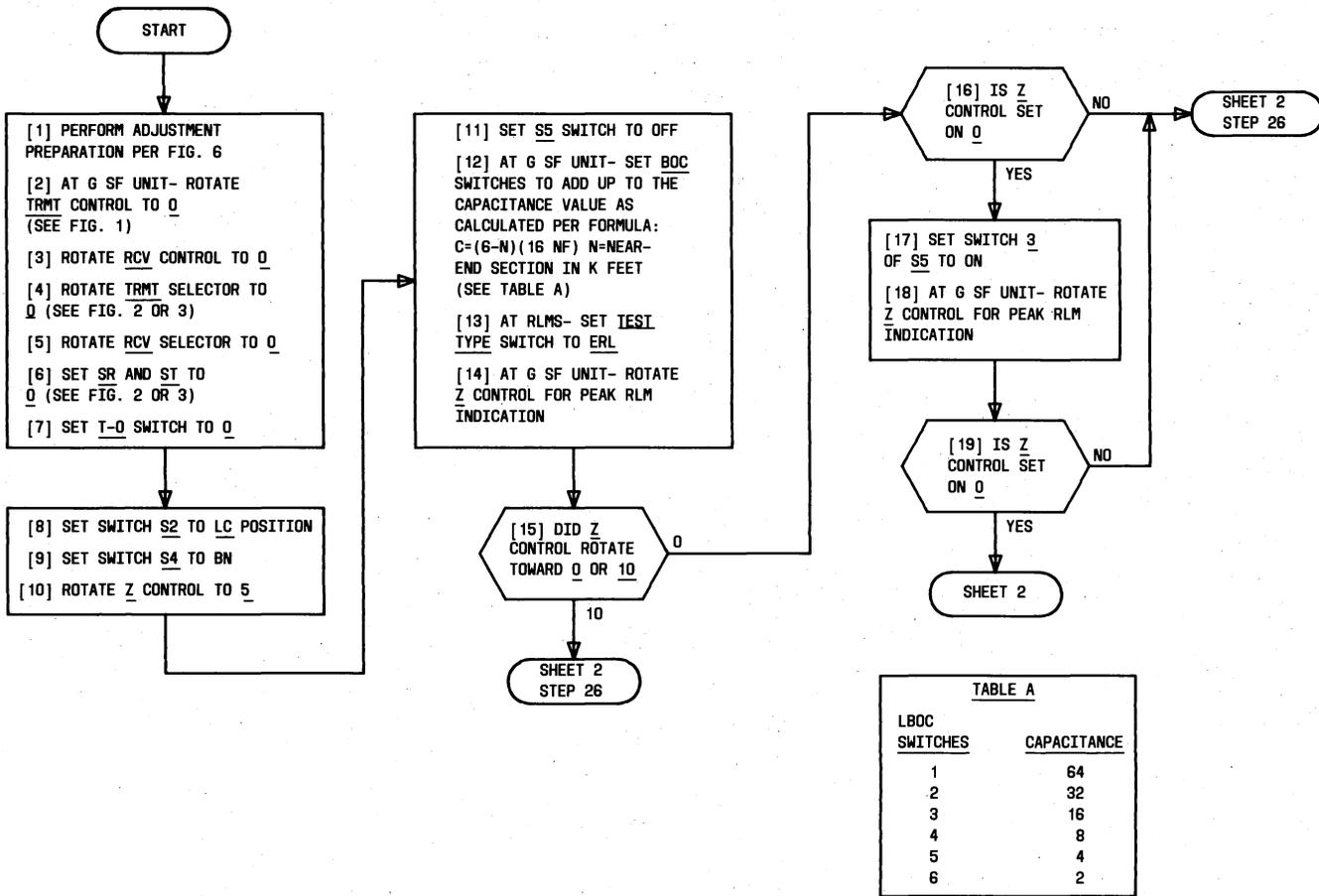


Fig. 8—Adjustment B: Balance Network for Loaded Cable (Sheet 1 of 4)

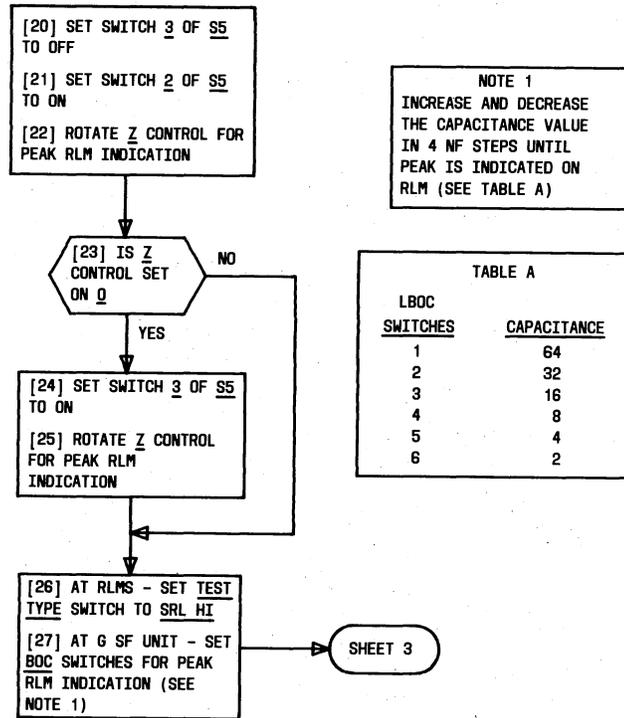


Fig. 8—Adjustment B: Balance Network for Loaded Cable (Sheet 2 of 4)

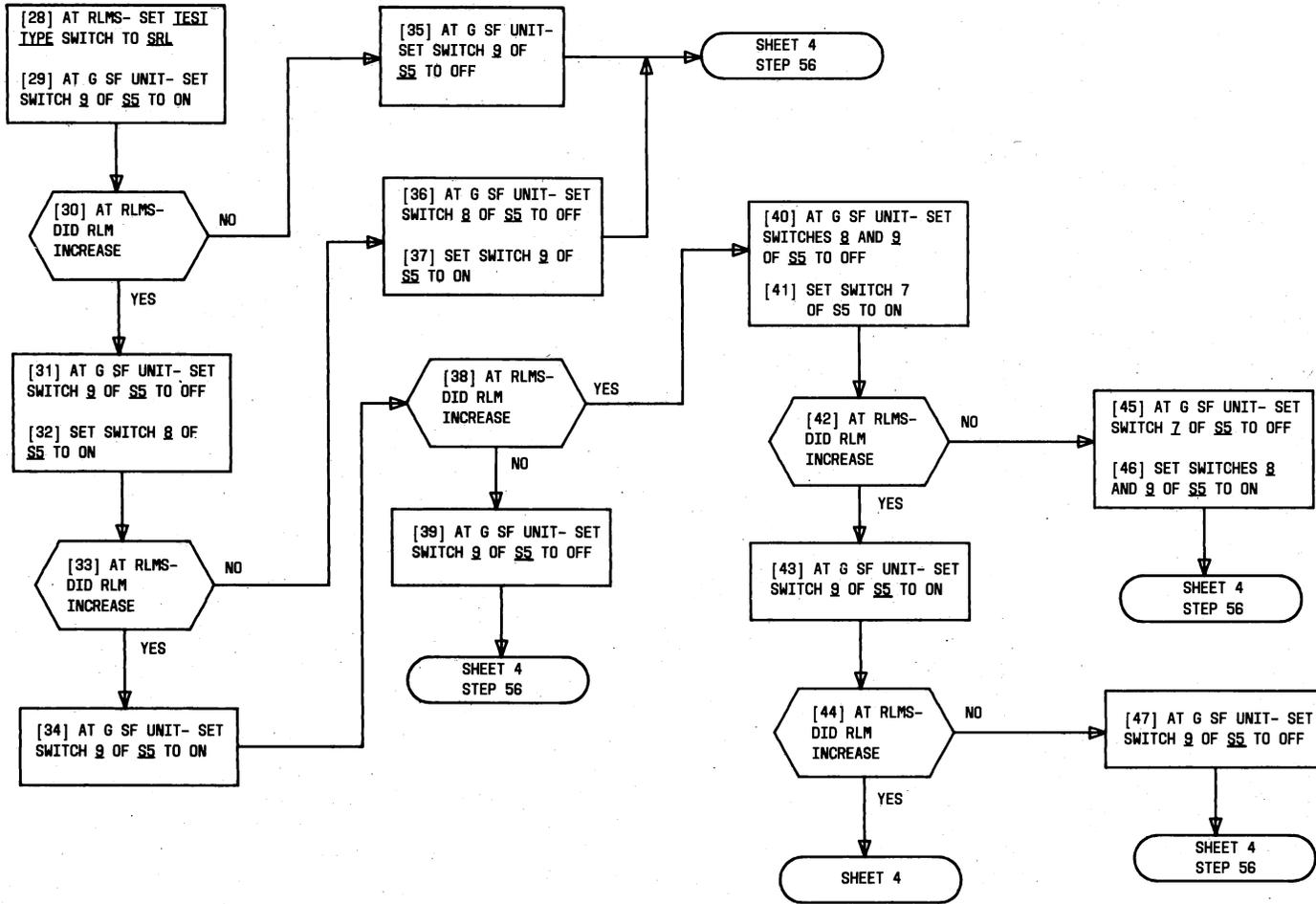


Fig. 8—Adjustment B: Balance Network for Loaded Cable (Sheet 3 of 4)

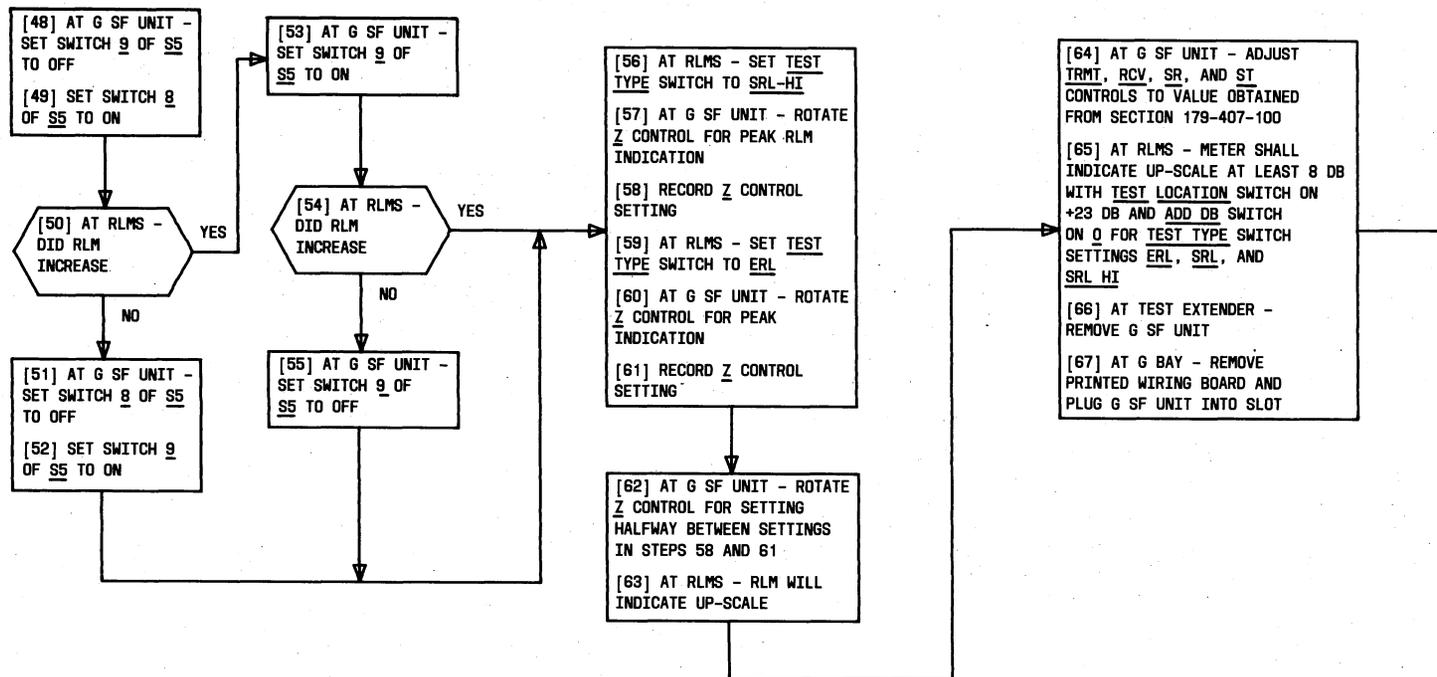


Fig. 8—Adjustment B: Balance Network for Loaded Cable (Sheet 4 of 4)

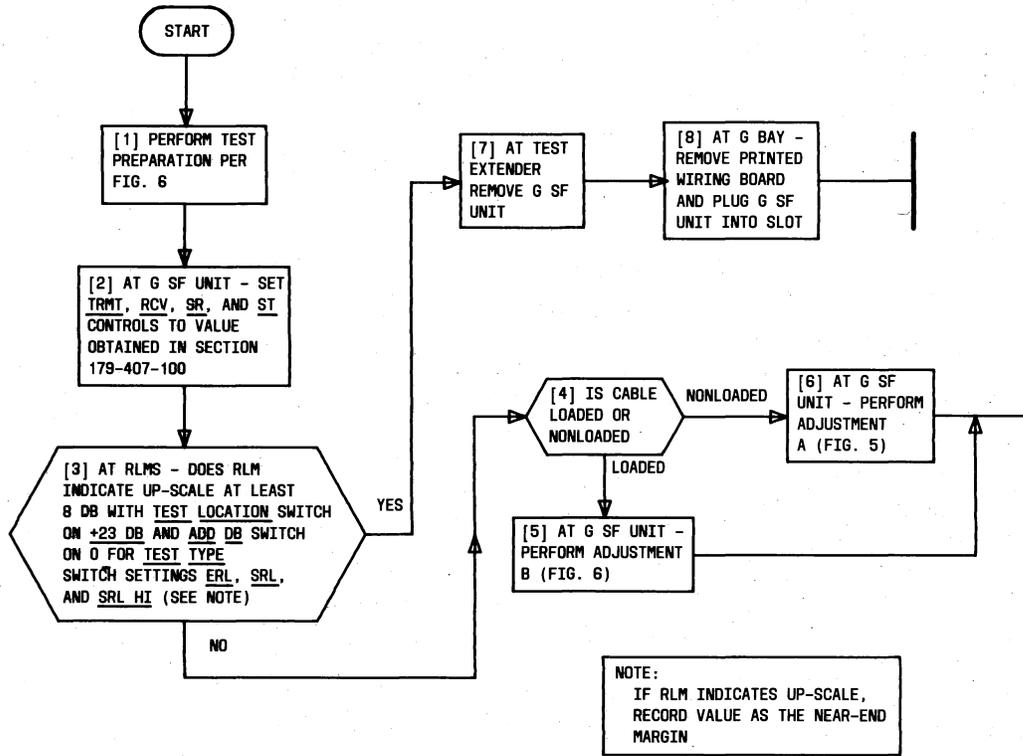


Fig. 9—Test A: Near End Margin Check

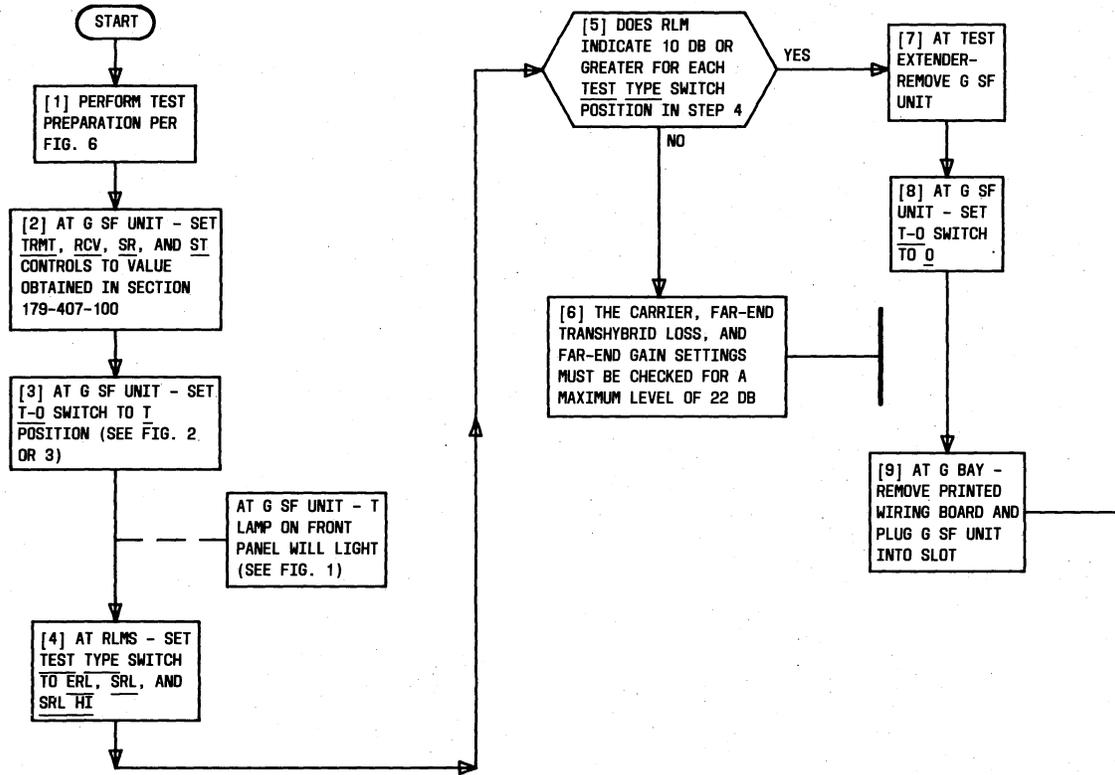


Fig. 10—Test B: Loop Margin Check

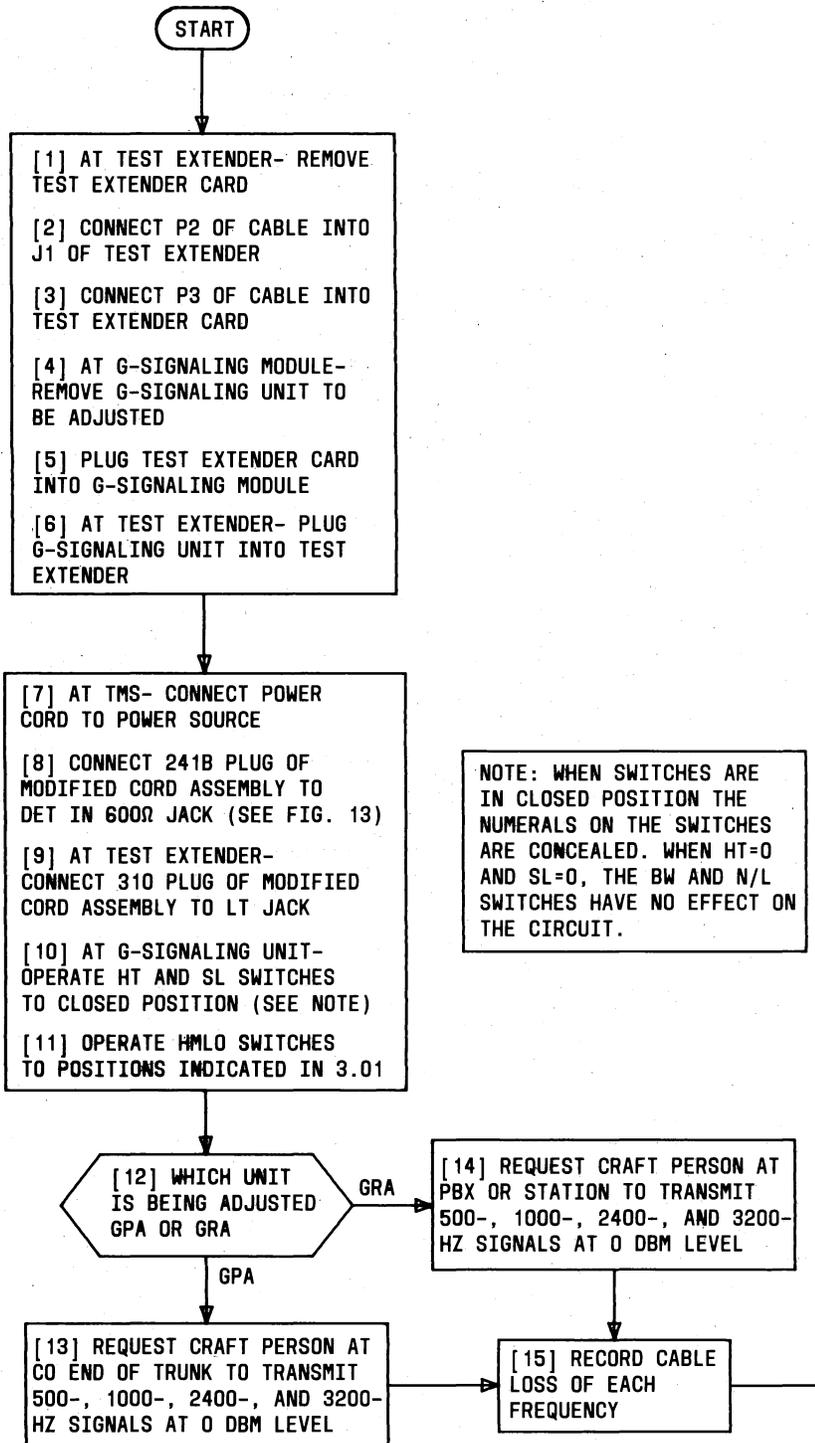
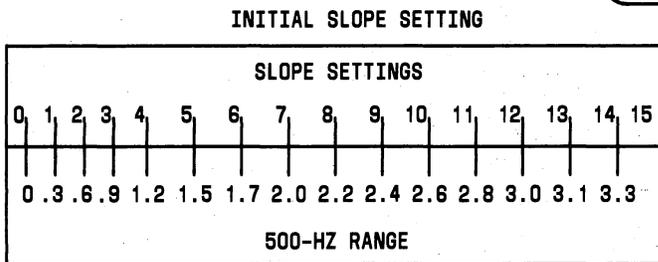
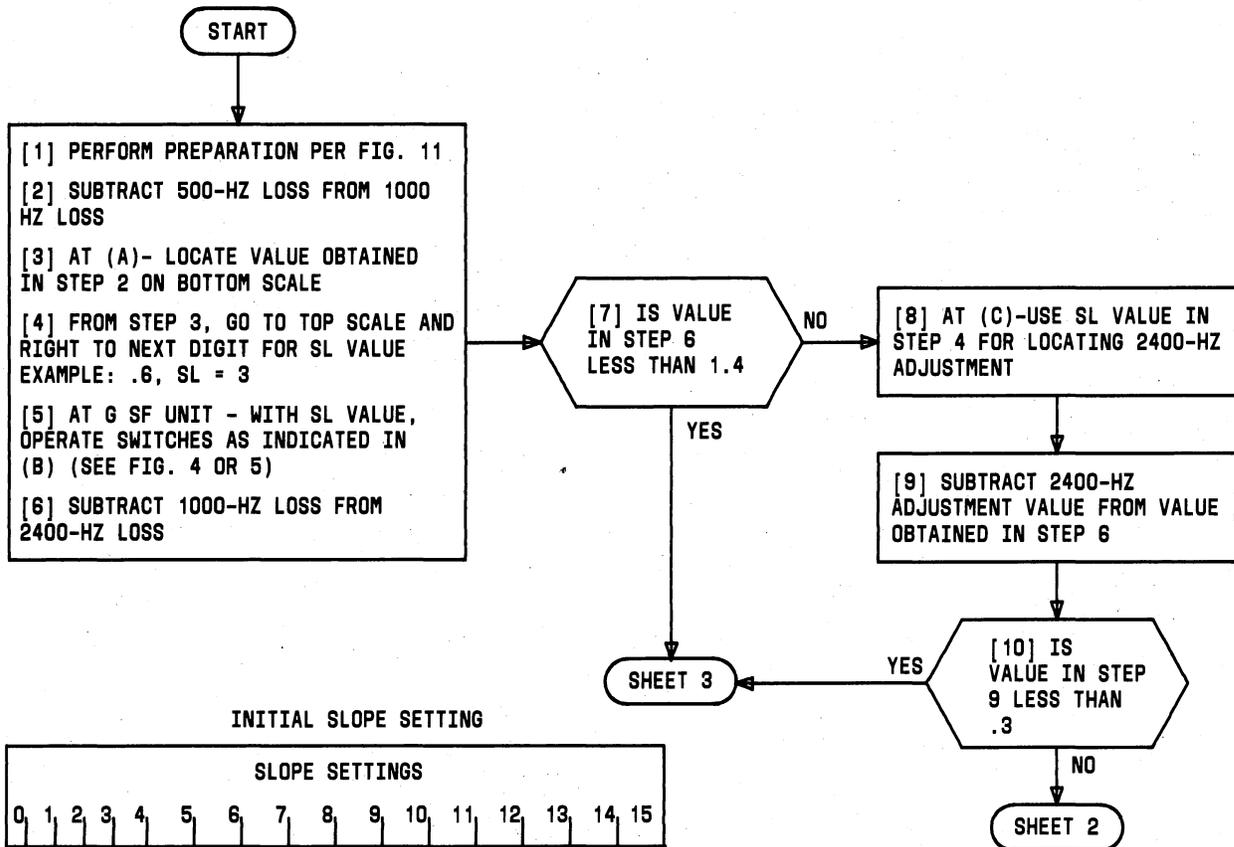


Fig. 11—Preparation for Adjustment of Equalizer



(A)

SWITCHES OPERATED

	8	4	2	1
0				
1				X
2			X	
3			X	X
4		X		
5		X		X
6		X	X	
7		X	X	X
8	X			
9	X			X
10	X		X	
11	X		X	X
12	X	X		
13	X	X		X
14	X	X	X	
15	X	X	X	X

SL
HT
OR
BW
VALUES

(B)

DETERMINING 2400-HZ ADJUSTMENT

SLOPE SETTING	2400-HZ ADJUSTMENT
0	0.0
1	0.6
2	1.2
3	1.6
4	2.0
5	2.3
6	2.6
7	2.8
8	3.0
9	3.1
10	3.3
11	3.4
12	3.5
13	3.6
14	3.6
15	3.7

(C)

Fig. 12—Adjustment C: Equalization Procedure (Sheet 1 of 4)

[11] AT G SF UNIT - SET N/L SWITCH SO N IS EXPOSED
 [12] SUBTRACT 2400-HZ LOSS FROM 3200-HZ LOSS
 [13] AT (D) - LOCATE VALUE OBTAINED IN STEP 12 ON BOTTOM SCALE
 [14] FROM STEP 13, GO TO TOP SCALE AND RIGHT TO NEXT DIGIT FOR BW VALUE
 [15] AT G SF UNIT - WITH BW VALUE, OPERATE SWITCHES AS INDICATED IN (B)

[16] AT (E) - LOCATE BW VALUE FROM STEP 14 AT SIDE OF (E) AND VALUE FROM STEP 9 AT BOTTOM OF SCALE
 [17] FROM STEP 16, GO TO TOP SCALE AND RIGHT TO NEXT DIGIT FOR HT VALUE EXAMPLE: 1.2, BW= 13, HT= 4
 [18] AT G SF UNIT - WITH HT VALUE, OPERATE SWITCHES AS INDICATED IN (B)

[19] AT TEST EXTENDER - REMOVE G SF UNIT
 [20] AT G BAY - REMOVE TEST EXTENDER PRINTED WIRING BOARD AND PLUG G SF UNIT INTO SLOT

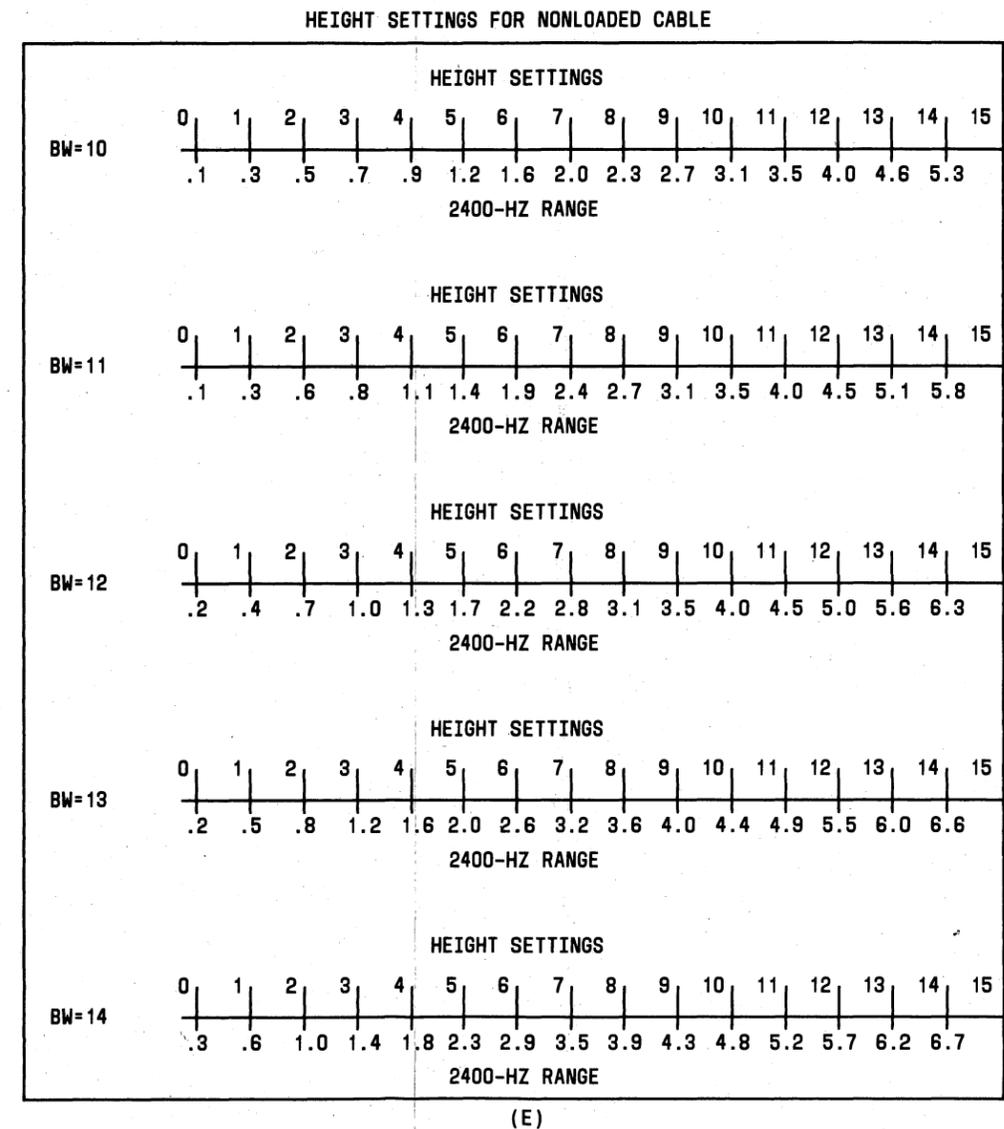
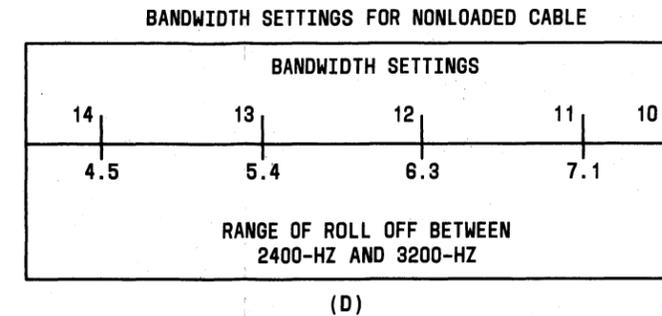


Fig. 12—Adjustment C: Equalization Procedure (Sheet 2 of 4)

[21] AT G SF UNIT - SET N/L SWITCH OF S7 SO L IS EXPOSED

[22] AT (F)- LOCATE VALUE FROM STEP 2 ON BOTTOM SCALE

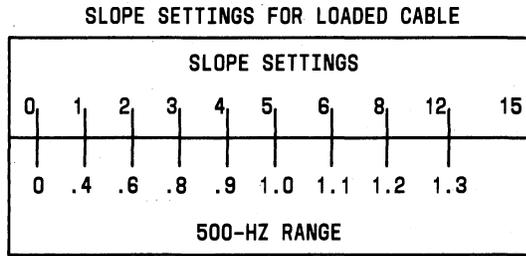
[23] FROM STEP 22, GO TO TOP SCALE AND RIGHT TO NEXT DIGIT FOR SL VALUE EXAMPLE: .6, SL = 3

[24] AT G SF UNIT - WITH SL VALUE FROM STEP 23, OPERATE SWITCHES AS INDICATED IN (B)

[25] AT (G)- USE SL VALUE IN STEP 23 FOR LOCATING 3200-HZ ADJUSTMENT

[26] SUBTRACT 1000-HZ LOSS FROM 3200-HZ LOSS

[27] SUBTRACT 3200-HZ ADJUSTMENT FROM VALUE OBTAINED IN STEP 26



(F)

2400-HZ AND 3200-HZ ADJUSTMENTS FOR LOADED CABLE FROM SLOPE SETTING (TABLE F)

SLOPE SETTING	2400-HZ ADJUSTMENT	3200-HZ ADJUSTMENT
0	0	0
1	.2	.2
2	.2	.3
3	.3	.3
4	.4	.4
5	.4	.4
6	.4	.5
8	.4	.5
12	.5	.5
15	.5	.5

(G)

[28] AT (H)- LOCATE VALUE FROM STEP 27 ON BOTTOM SCALE

[29] FROM STEP 28, GO TO TOP SCALE AND RIGHT TO NEXT DIGIT FOR HT VALUE EXAMPLE: 1.4, HT = 2

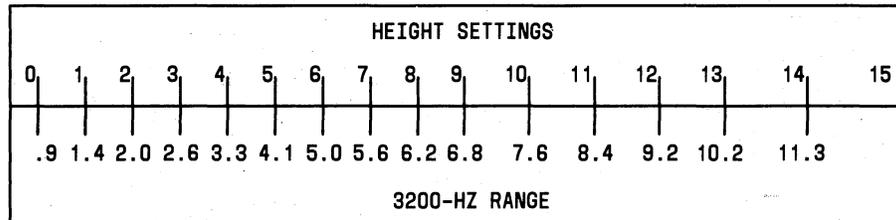
[30] AT G SF UNIT - WITH HT VALUE, OPERATE SWITCHES AS INDICATED IN (B)

[31] SUBTRACT 1000-HZ LOSS FROM 2400-HZ LOSS

[32] AT (G)- LOCATE 2400-HZ ADJUSTMENT WITH SL VALUE OF STEP 23

SHEET 4

HEIGHT SETTINGS FOR LOADED CABLE



(H)

Fig. 12—Adjustment C: Equalization Procedure (Sheet 3 of 4)

[33] SUBTRACT 2400-HZ ADJUSTMENT FROM VALUE OBTAINED IN STEP 31

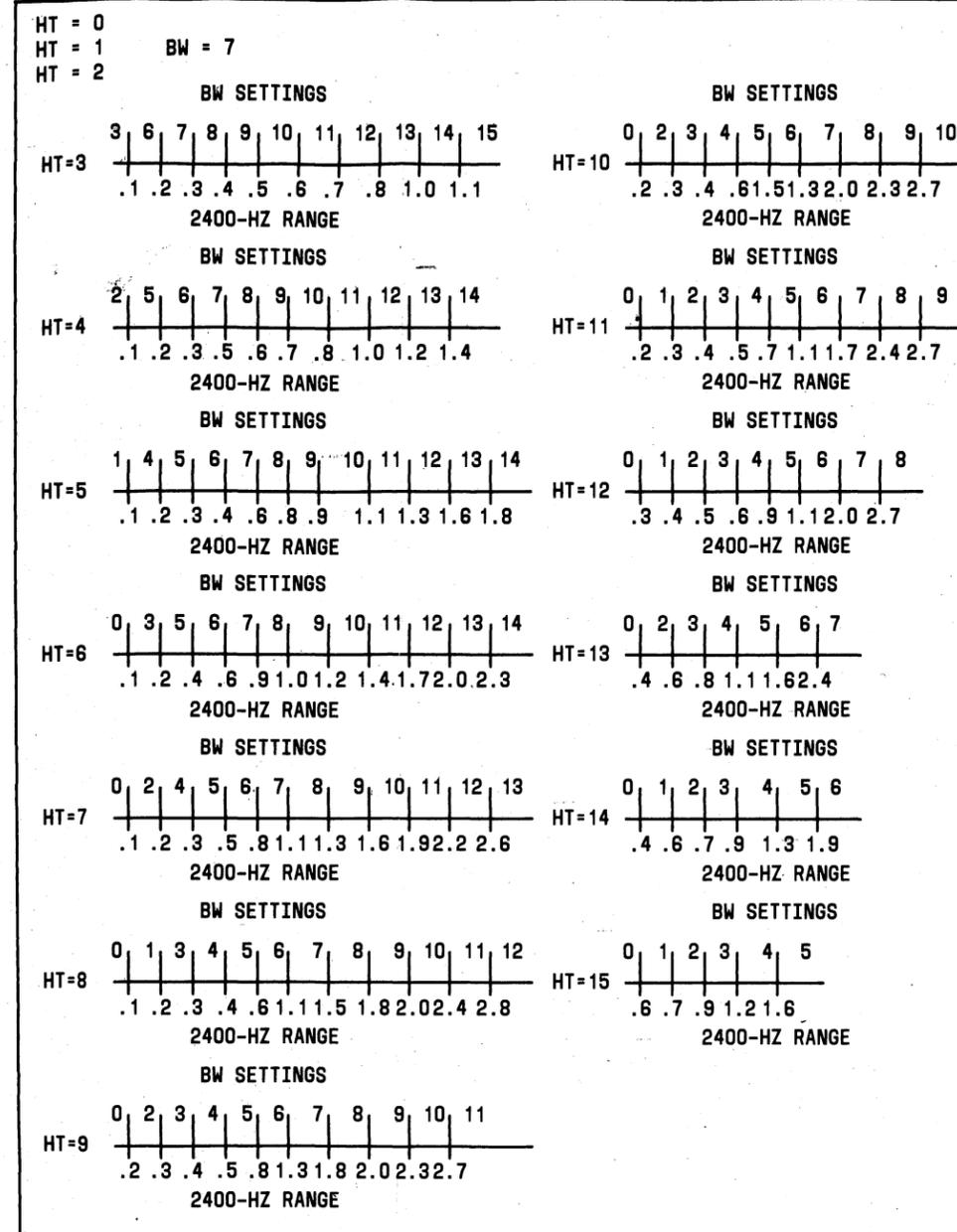
[34] AT (I)- LOCATE HT VALUE FROM STEP 29 AT SIDE OF (I) AND VALUE FROM STEP 33 AT BOTTOM OF SCALE

[35] FROM STEP 34, GO TO TOP SCALE AND RIGHT TO NEXT DIGIT FOR BW VALUE EXAMPLE: 0, HT = 3, BW = 3

[36] AT G SF UNIT - WITH BW VALUE, OPERATE SWITCHES AS INDICATED IN (B)

[37] AT TEST EXTENDER - REMOVE G SF UNIT

[38] AT G BAY - REMOVE TEST EXTENDER PRINTED WIRING BOARD AND PLUG G SF UNIT INTO SLOT



(I)

Fig. 12—Adjustment C: Equalization Procedure (Sheet 4 of 4)