METALLIC FACILITY TERMINAL

2-2 REPEATERS (J99343PA, PB, PC, PD, PE, PF, PG, PH, PJ, PK)

SD-1C359-01

INSTALLATION AND TESTING

CONTENTS PAGE

1. GENERAL

1.01 This section describes the installation and test procedures for the Metallic Facility Terminal (MFT) 2-2 repeater units. These units are:

2-2 Terminal (L)—J99343PA, PG

2-2 Terminal (NL)—J99343PB

2-2 Intermediate (L-L)—J99343PC, PH

2-2 Intermediate (NL-NL)—J99343PD

2-2 Intermediate (L-NL)—J99343PE, PJ

2-2 Intermediate (NL-L)—J99343PF, PK

1.02 This section is reissued to include information on four new 2-2 repeaters which are functional replacements for earlier models. The new repeaters use a new balancing network which may be used to balance H88 loaded high-capacitance (.083 μF/mile) or H88 loaded low-capacitance (.064 μF/mile) Metropolitan Area Trunk (MAT) cable. Manual adjustment procedures have also been changed to include procedures for MAT facilities. Due to extensive revision, arrows normally used to indicate changes are not shown.

1.03 Detailed descriptions of the units covered by this section may be found in Section 332-912-111. Prescription settings for the balancing networks and 309D equalizer may be found in Section 332-912-212.

A. 2-2 Terminal (L) Repeaters (J99343PA, PG)

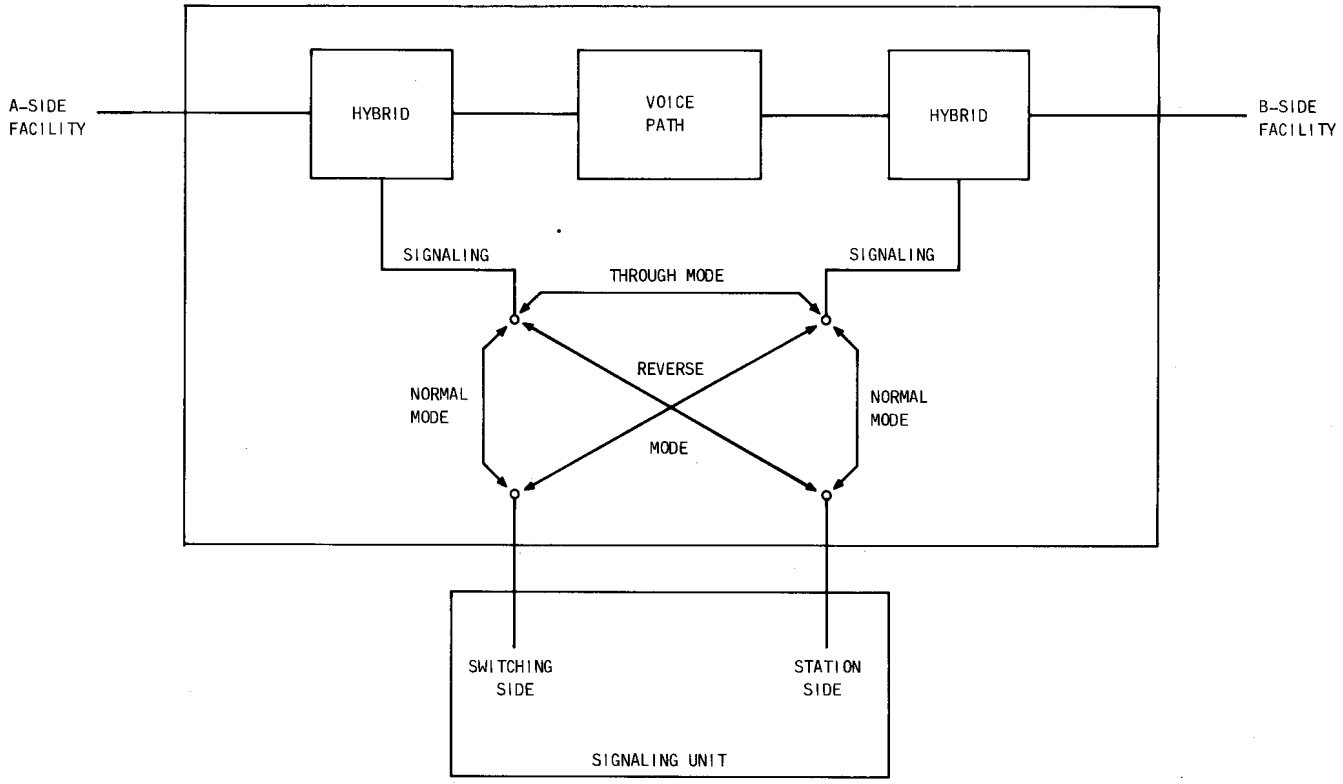
1.04 The 2-2 terminal (L) repeaters are designed to supply gain and fixed equalization between 900-ohm, 2-wire terminal equipment and 2-wire H88

loaded cable. Gain of up to 6 dB across the repeater and a small amount of fixed active equalization for loaded cable is supplied by a 309C repeater unit (hereafter referred to as an amplifier unit) for both directions of transmission.

1.05 The repeater presents a structural impedance of 900 ohms in series with 2.15 μF to both the 2-wire equipment (A-side) and the H88 loaded cable (B-side).

1.06 Hybrid balance on the A-side is accomplished by a 900-ohm + 2.15 μF compromise network. The B-side hybrid is balanced by line buildout capacitors (LBOC) across the 2-wire line and an active precision balancing network (PBN) on the network side of the hybrid. The J99343PA repeater (MD) uses a 4240A PBN to balance high-capacitance (.083 μF/mile) H88 loaded cable. It is replaced by the J99343PG repeater which uses a 4240C PBN to balance either high-capacitance cable or the low-capacitance (.064 μF/mile) MAT cable.

1.07 A & B type signaling leads with simplex (SX) inductors are available on both sides of the repeater. A slide switch labeled SX SH shorts the SX inductors to the switching side of the signaling unit when signaling applications do not require their use. Two other slide switches labeled RV and RV/T permit selection of three signaling modes; NORMAL, REVERSE, or THROUGH. In the NORMAL mode, the A-side A&B leads are connected to the switching side of a companion MFT signaling unit and the B-side A&B leads are connected to the station side. In the REVERSE mode, the connections at the signaling unit are reversed: A-side A&B leads are connected to the station side of the signaling unit and the B-side A&B leads are connected to the switching side. The THROUGH mode interconnects the A- and B-side signaling leads when a companion signaling unit is not required. Fig. 1 is a pictorial diagram of the lead connections with the switch settings required for each.



SIGNALING MODE	RV SWITCH	RV/T SWITCH
NORMAL	NOR	NOR
REVERSED	RV	RV/T
THROUGH	NOR	RV/T

Fig. 1—RV RV/T Switch Settings

1.08 A DISABLE switch permits the companion signaling unit to control the -48 volt power to the repeater. When in the DISABLE position, the power feed to the repeater is removed during idle circuit conditions. If in the NORMAL position, the power feed is continuous.

> ***Note:*** When a signaling unit is not required or the signaling unit does not include a disabler, the DISABLE switch must be in the NORMAL position.

1.09 The 2-2 terminal (L) repeater utilizes the LBOC to buildout the near end section of loaded cable to the electrical equivalent of 6000 feet. Screw switches labeled A through F allow selection of capacitance from 0 to .126 μF in .002 μF steps.

B. 2-2 Terminal (NL) Repeater (J99343PB)

1.10 The 2-2 terminal (NL) repeater is used to terminate 2-wire nonloaded cable in 900-ohm, 2-wire terminal equipment. The 2-2 terminal (NL) repeater does not require the LBOC for hybrid balance and uses a 4240B PBN to match the 2-wire nonloaded cable.

1.11 A 309D amplifier unit is used to supply gain of up to 6 dB across the repeater and active equalization for nonloaded cable. The equalizer section of the 309D is controlled by five rocker switches labeled 1, 2, 4, 8, C which allow 32 combinations for equalizer adjustment. Switches are operated when pressed toward the designation. The first setting is the C switch (0 = off; C = operated) and the second is the sum of the operated switches (1, 2, 4, 8). The C switch is a range switch which, when operated, increases the slope of the equalizer across the voiceband.

1.12 All other components of the J99343PB are identical to those used in the J99343PA repeater.

C. 2-2 Intermediate Repeaters

1.13 Since the intermediate repeaters interface cable on both sides, two PBNs are required. When loaded cable is connected to the repeater, a LBOC is also required. Table A lists the repeaters by name, J-number, amplifier unit (309C or D), and balancing networks required on the A and B sides.

1.14 The intermediate repeaters are capable of supplying gain of 12 dB across the repeater. Other features are the same as discussed for the terminal repeater units.

TABLE A

2-2 INTERMEDIATE REPEATERS

REPEATER TYPE	J-NUMBER	A-SIDE BALANCE	B-SIDE BALANCE	AMPLIFIER TYPE
2-2 Intermediate (L-L)	J99343PC(MD)	4240A LBOC	4240A LBOC	309C
	J99343PH	4240C LBOC	4240C LBOC	309C
2-2 Intermediate (NL-NL)	J99343PD	4240B	4240B	309D
2-2 Intermediate (L-NL)	J99343PE(MD)	4240A LBOC	4240B	309D
	J99343PJ	4240C LBOC	4240B	309D
2-2 Intermediate (NL-L)	J99343PF(MD)	4240B	4240A LBOC	309D
	J99343PK	4240B	4240C LBOC	309D

2. REPEATER SELECTION AND DESIGN RULES

A. Repeater Selection

2.01 Criteria for selection of the proper repeater are shown in Table B. Since the repeater code required for the circuit is dependent on whether the cable facility is loaded or nonloaded, the following rules will aid in determining the type cable when standard loading is not used in the end section.

Rule 1: If the distance from the repeater to the first load coil (near end section length) plus the length of any bridged taps in the near end section exceeds 8000 feet, or the facility does not contain any load coils, it is nonloaded.

Rule 2: If the near end section length plus the length of any bridged taps in the end section is less than 8000 feet, the facility is loaded.

Rule 3: At an intermediate location, if a facility on one side of the repeater does not contain load coils and its 1 kHz loss is less than 1 dB, the facility should be connected to the A-side of a terminal repeater (PA, PB, or PG).

B. Design Rules

2.02 The following paragraphs discuss the design of circuits which must meet trunk objectives. This is not to imply that trunk design objectives will be met, but rather the restrictions are given for cable plant which will normally lead to adequate trunk performance.

2.03 Transmission levels of 2-wire circuits are limited by two factors; crosstalk and stability. Separate objectives are given for satisfactory stability and crosstalk performance, and both requirements must be met.

2.04 For stability considerations, the maximum allowable gain across the repeaters is

2-2 Terminal 6 dB

2-2 Intermediate 12 dB (see Note).

Note: For exception to the 12 dB maximum, see 2.08, 2-2 intermediate (L-NL or NL-L) repeater.

These gains are not the maximum available with the 2-2 repeaters since both the terminal and intermediate types are capable of producing more than 12 dB of gain for most equalizer settings.

2.05 Crosstalk objectives determine the following level requirements with respect to the 0 transmission level point (TLP).

Maximum Output Level +6 dB (TLP)
Minimum Input Level -9 dB (TLP)

2.06 The levels in the previous two paragraphs are based on the assumption that the repeaters are located in the central office. The 2-2 repeaters are not recommended for installation at a customer location since hybrid balance is more difficult because of generally less well controlled cable plant. Also, the impedance of most PBXs is considered to be 600 ohms + 2.15 μF while the repeaters are 900 ohms + 2.15 μF.

TABLE B

REPEATER-TYPE SELECTION CRITERIA

A-SIDE CONNECTED TO	B-SIDE CONNECTED TO		
	LOADED CABLE		NONLOADED CABLE
	HI-CAP	MAT	
2-Wire Equipment	J99343PA, PG	J99343PG	J99343PB
Loaded Cable (HI-CAP) (MAT)	J99343PC, PH J99343PH	J99343PH J99343PH	J99343PE, PJ J99343PJ
Nonloaded Cable	J99343PF, PK	J99343PK	J99343PD

2.07 Rolloff objectives at 400 and 2800 Hz for the 2-2 repeaters are shown in Table C. It is recommended, but not required, that the rolloff at 400 and 2800 Hz for both lines and trunks be greater than the 1 kHz loss.

2.08 The following restrictions listed by repeater type will, when observed, generally guarantee meeting trunk objectives for rolloff. Since trunk objectives are more stringent than line objectives, these restrictions would also guarantee line objectives.

2-2 Terminal (L) Repeater (J99343PA, PG)

- Total 1 kHz loss of the facility should not exceed 9 dB.
- The near end section length plus the length of any bridged taps in the end section should be less than 6 kft.

Note: For endsections between 6 kft and 8 kft, line objectives may be met even though trunk objectives are exceeded.

- Total far end section length plus bridged taps should be less than 9 kft.
- Load coil spacing should be between 5.7 and 6.3 kft.

2-2 Terminal (NL) Repeater (J99343PB)

- Total 1 kHz loss of the facility should not exceed 9 dB.
- There should be no load coils in the facility

2-2 Intermediate (L-L) Repeater (J99343PC, PH)

- Total 1 kHz loss of the A-side facility should not exceed 9 dB.
- Total 1 kHz loss of the B-side facility should not exceed 9 dB.
- Total 1 kHz loss of the facilities on both sides of the repeater should not exceed 15 dB.
- The length of the near end sections, including bridged taps in the end sections, on both sides of the repeater should not exceed 6 kft.
- Load coil spacing should be between 5.7 and 6.3 kft.
- Far end section length plus bridged tap lengths on both sides of the repeater should not exceed 6 kft. (This does not guarantee trunk objectives can be met, but if exceeded the circuit will normally not meet trunk objectives. To guarantee trunk objectives both far end sections must be approximately 3 kft.)

2-2 Intermediate (NL-NL) Repeater (J99343PD)

- Total 1 kHz facility loss on each side of the repeater should not exceed 9 dB.
- Total length of cable plus length of bridged taps should not exceed 30 kft.
- There should be no load coils in either facility.

TABLE C

ROLL-OFF LIMITS FOR TRUNKS AND LINES

FREQUENCY	ROLL-OFF LIMITS FOR TRUNKS*	ROLL-OFF LIMITS FOR LINES*
400Hz	−1.0 to +3.0 dB	−1.0 to +5.0 dB
2800Hz	−1.0 to +4.5 dB	−1.0 to +7.5 dB

* Relative to 1 kHz loss

2-2 Intermediate (L-NL) Repeater (J99343PE, PJ)

and

2-2 Intermediate (NL-L) Repeater (J99343PF, PK)

- Total 1 kHz loss of the facility on either side of the repeater should be less than 9 dB.

- Total 1 kHz loss of the facilities on both sides of the repeater should not exceed 15 dB.

Exception: If the facilities match the prescription setting tables (Section 332-912-212) and no equivalences are used, the total loss should not exceed 18 dB and maximum gain should not exceed 15 dB.

- Total length of the near end section plus the length of any bridged taps in the near end section should not exceed 6 kft.

- Total length of the far end section and its bridged taps should not exceed 9 kft.

- The nonloaded facility should not contain any load coils.

- Load coil spacing for the loaded facility should be between 5.7 and 6.3 kft.

2.09 For single repeater 2-wire facilities, the equalization is on an end-to-end basis. Equalization is considered good if:

- The rolloff at 400 and 2800 Hz is each greater than 0.

- For nonloaded to nonloaded facilities (PD repeater) the 2800 Hz rolloff should be greater than 1.5 times the 400 Hz rolloff, but as close to this ratio as possible. For all other facilities, the 2800 Hz rolloff should be equal to or greater than the 400 Hz rolloff, but as close to equal as possible.

- Where design roll-off objectives can be met, use an equalizer setting with the C switch off (nonoperated). Only very long nonloaded to nonloaded cable should require operation of the C switch.

3. APPLICATION GUIDELINES

3.01 Application guidelines for the 2-2 repeaters are given in Section 332-910-180.

4. ADJUSTMENT OF LINE BUILDOUT CAPACITORS

4.01 For repeaters that interface loaded cable, the LBOC must be set prior to adjusting the PBN.

4.02 The LBOC is adjusted by tightening screw switches, labeled A through F (and G through L on the J99343PC and PH) for the value of capacitance required. The value required is determined by type cable (high- or low-capacitance) and the length of the near end section. Two formulas are given for computation of the LBOC required, one for high-capacitance (.083 μF/mile) cable and one for low-capacitance (.064 μF/mile) MAT cable.

For high-capacitance cable—C = .008 + .016(6-N)

For low-capacitance MAT cable—C = .008 + .0122(6-N)

where C is the value of capacitance, and N is the length of the near end section in kilofeet.

4.03 For convenience, the value of capacitance and screw switch settings required for end sections from 1450 to 4549 feet are listed in Table D by cable type.

5. ADJUSTMENT OF PRECISION BALANCING NETWORKS

5.01 The procedures in this section cover the manual adjustments for the 4240A, 4240B, and 4240C PBNs. When the makeup of the cable facility is known, the prescription setting tables in Section 332-912-212 may be used.

5.02 The following procedures require successive measurements of echo return loss (ERL), singing return loss (SRL), and singing return loss-high frequency (SRL-HI). The three return loss measurements are maximized by adjusting the settings of the PBN.

TABLE D

LBOC SETTINGS

END-SECTION LENGTH (FEET)	CAPACITANCE VALUE HI-CAP.	SCREWS DOWN 1st	SCREWS DOWN 2nd	CAPACITANCE VALUE MAT	SCREWS DOWN 1st	SCREWS DOWN 2nd
1450 — 1549	.080	DF	JL	.064	F	L
1550 — 1649	.078	ABCF	GHIL	.062	ABCDE	GHIJK
1650 — 1749	.076	BCF	HIL	.060	BCDE	HIJK
1750 — 1849	.076	BCF	HIL	.060	BCDE	HIJK
1850 — 1949	.074	ACF	GIL	.058	ACDE	GIJK
1950 — 2049	.072	CF	IL	.058	ACDE	GIJK
2050 — 2149	.070	ABF	GHL	.056	CDE	IJK
2150 — 2249	.068	BF	HL	.054	ABDE	GHJK
2250 — 2349	.068	BF	HL	.054	ABDE	GHJK
2350 — 2449	.066	AF	GL	.052	BDE	HJK
2450 — 2549	.064	F	L	.052	BDE	HJK
2550 — 2649	.062	ABCDE	GHIJK	.050	ADE	GJK
2650 — 2749	.060	BCDE	HIJK	.048	DE	JK
2750 — 2849	.060	BCDE	HIJK	.048	DE	JK
2850 — 2949	.058	ACDE	GIJK	.046	ABCE	GHIK
2950 — 3049	.056	CDE	IJK	.046	ABCE	GHIK
3050 — 3149	.054	ABDF	GHJK	.044	BCE	HIK
3150 — 3249	.052	BDE	HJK	.042	ACE	GIK
3250 — 3349	.052	BDE	HJK	.042	ACE	GIK
3350 — 3449	.050	ADE	GJK	.040	CE	IK
3450 — 3549	.048	DE	JK	.040	CE	IK
3550 — 3649	.046	ABCE	GHIK	.038	ABE	GHK
3650 — 3749	.044	BCE	HIK	.036	BE	HK
3750 — 3849	.044	BCE	HIK	.036	BE	HK
3850 — 3949	.042	ACE	GIK	.034	AE	GK
3950 — 4049	.040	CE	IK	.032	E	K
4050 — 4149	.038	ABE	GHK	.032	E	K
4150 — 4249	.038	ABE	GHK	.030	ABCD	GHIJ
4250 — 4349	.036	BE	HK	.030	ABCD	GHIJ
4350 — 4449	.034	AE	GK	.028	BCD	HIJ
4450 — 4549	.032	E	K	.026	ACD	GIJ

5.03 It is assumed that the type repeater has been selected by the rules given in Part 2 of this section.

5.04 The J99343TB test extender (Section 332-910-102), a return loss measuring set (RLMS) such as the KS-20501, or equivalent, and a circuit layout record (CLR) will be required for the following procedures.

5.05 The procedures in Chart 1 are for the initial setup of the test equipment and are identical for the 4240A, 4240B, or 4240C PBNs.

CHART 1

INITIAL PROCEDURES FOR ADJUSTMENT OF PRECISION BALANCE NETWORKS

STEP	PROCEDURE

1 Terminate the far end of the circuit in its nominal impedance. If the far end is a switch or PBX, a compromise network (600 or 900 ohms + 2.15 μF) should be used. If the far end terminates in a telephone set, use the off-hook telephone with loop current or a 4066H network.

2 Insert the repeater into the slot on the side of the test extender and plug the cable extender card into the mounting slot.

3 Set the repeater options as follows:

(a) 309D Equalizers—all switches off.

(b) If B-side network is to be adjusted, remove A-side LBOC (screws A through F turned out). If the A-side network is to be adjusted remove any LBOC on the B-side of the repeater.

(c) Set signaling options as specified on CLR (RV, RV/T, SX SH).

Note: When the CLR specifies the THRU signaling mode, the RV/T switch should be set to the NOR position for PBN adjustment.

(d) Set DISABLE switch to NOR position.

(e) Set both gain potentiometers to approximately mid-range. This is done to improve the sensitivity of the measurements; the gain settings are not critical.

4 Set the test extender as follows:

(a) For adjustment of B-side network

A-side	B-side
600/900 to 900	600/900 to 900
2W/4W to 2W	2W/4W to 2W
COMP NET IN/OUT TO IN	COMP NET IN/OUT TO OUT

(b) For adjustment of A-side network

A-side	B-side
600/900 to 900	600/900 to 900
2W/4W to 2W	2W/4W to 2W
COMP NET IN/OUT TO OUT	COMP NET IN/OUT TO IN

CHART 1 (Cont)

STEP	PROCEDURE
5	Set the RLMS to 900 + 2.15 μF 2-wire, and switch in the internal 900 + 2.15 μF network.
6	Connect the 900 + 2.15 μF 2-wire jack (TRMT) of the RLMS to the A-side 2W EQUIP jack on the test extender to set a B-side network or the B-side 2W EQUIP jack to set the A-side network. See Fig. 2 for test setup.
7	For adjustment of 4240A PBN for loaded cable, go to Chart 2. For adjustment of 4240B PBN for nonloaded cable, go to Chart 3. For adjustment of the 4240C PBN for loaded cable, go to Chart 4.

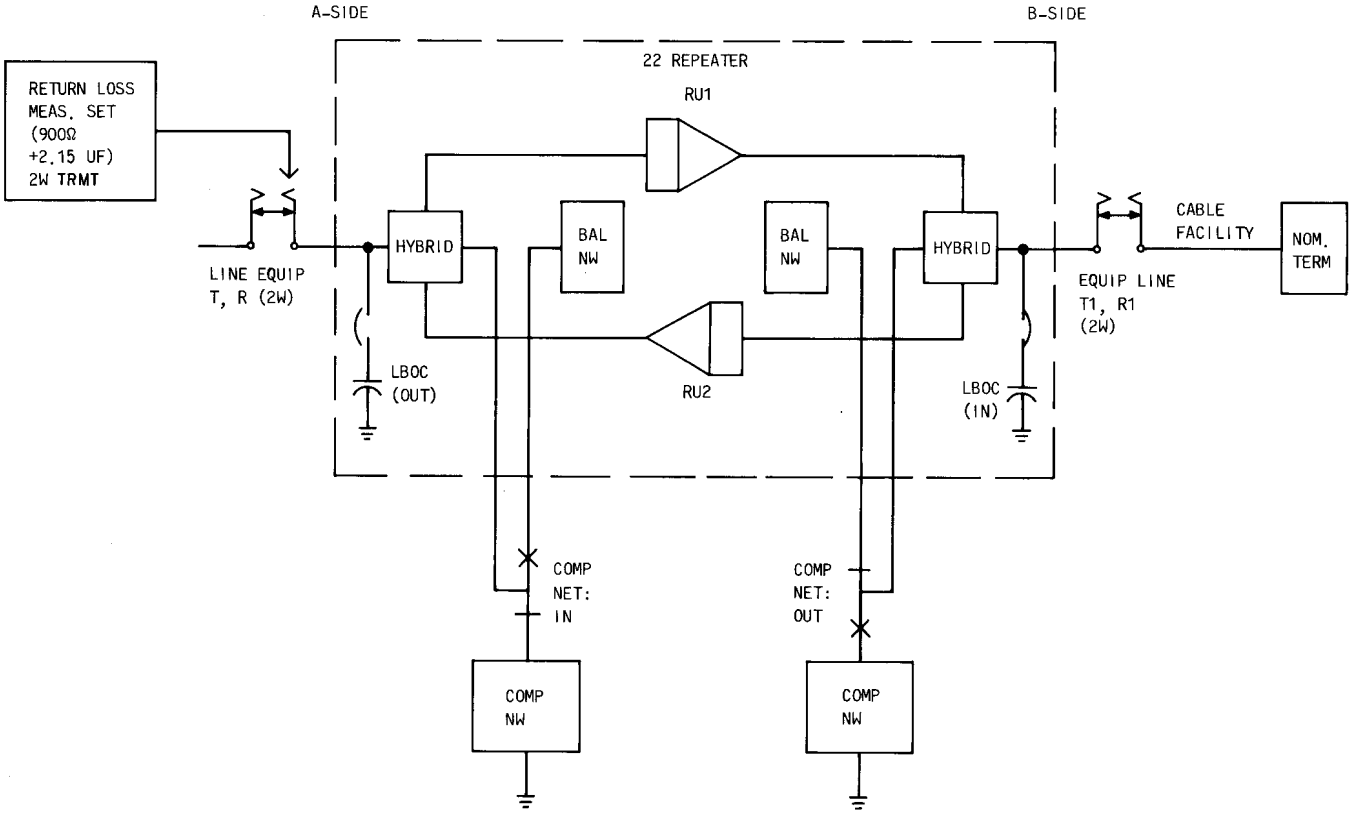


Fig. 2—Test Configuration for Determining Balance Network Settings by Measurement

5.06 The use of Chart 2 and 3 for PBN adjustment does not require any knowledge of the facility make-up. Chart 4, for adjustment of the 4240C PBN, does require knowledge of the cable type being used (high-capacitance or MAT). The procedure should not be used if the cable capacitance is unknown. The circuit designer should be consulted to determine the facility make-up.

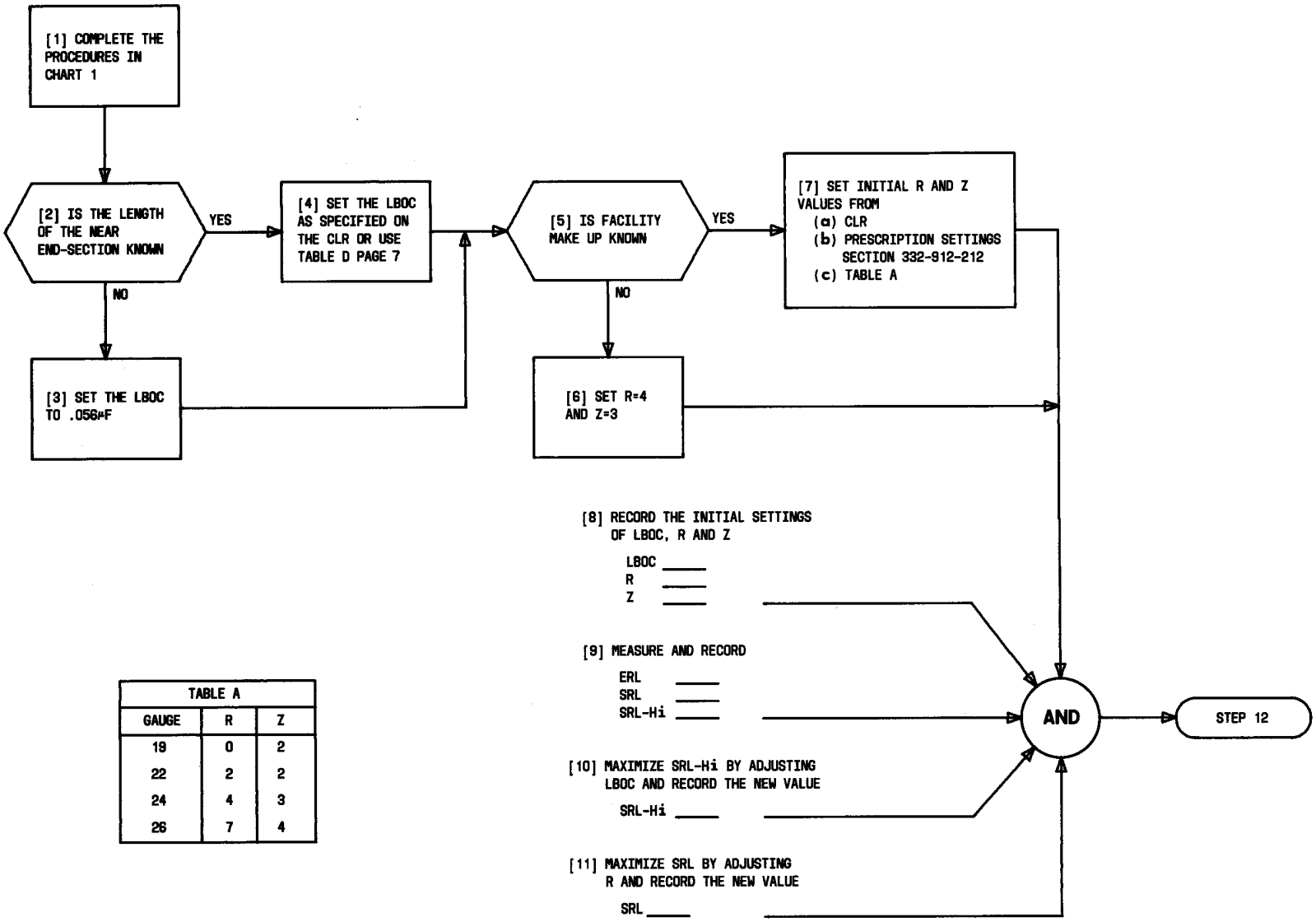


TABLE A		
GAUGE	R	Z
19	0	2
22	2	2
24	4	3
26	7	4

Chart 2—Adjustment of 4240A Precision Balance Networks

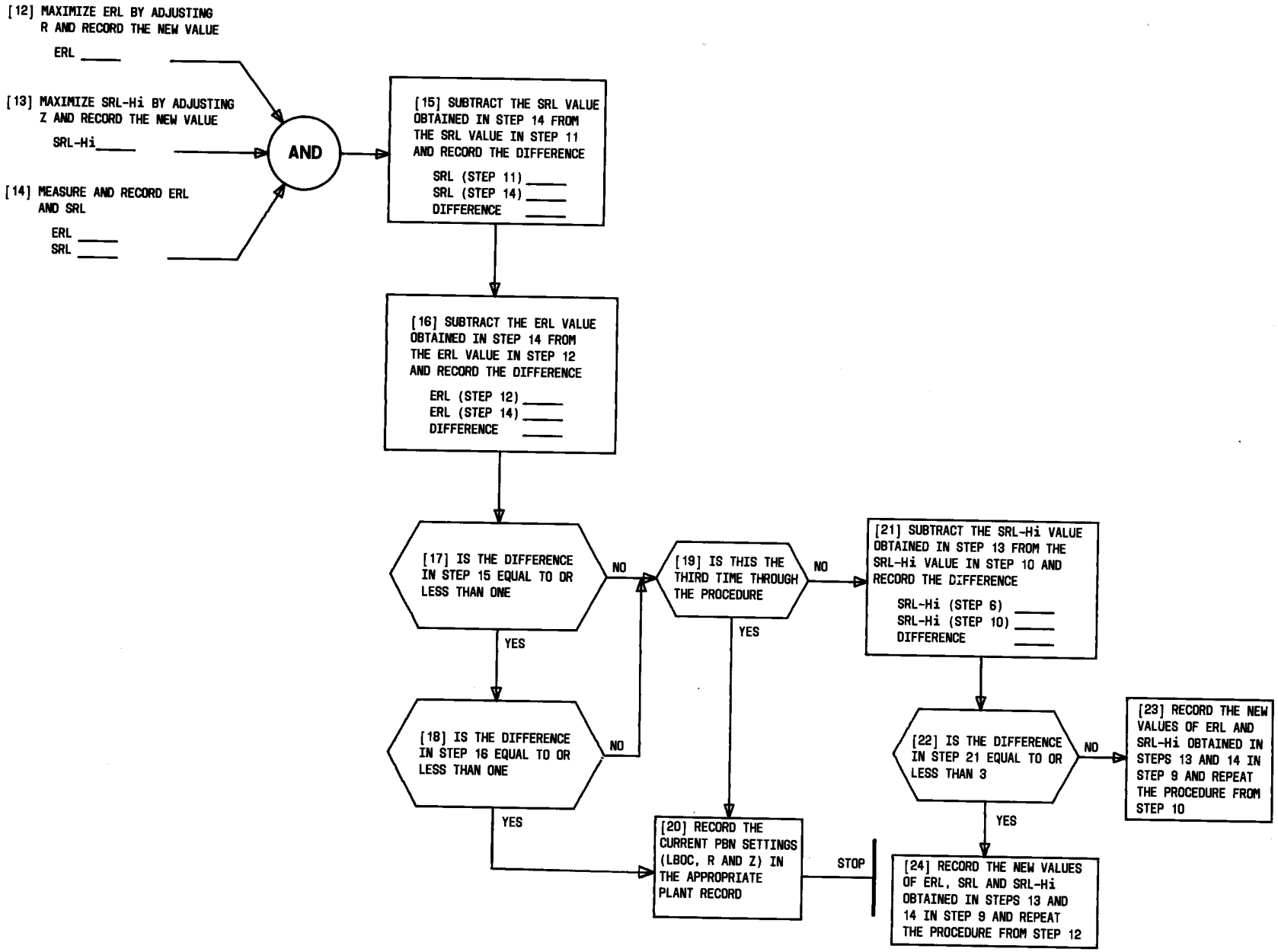


Chart 2—Adjustment of 4240A Precision Balance Networks (Cont)

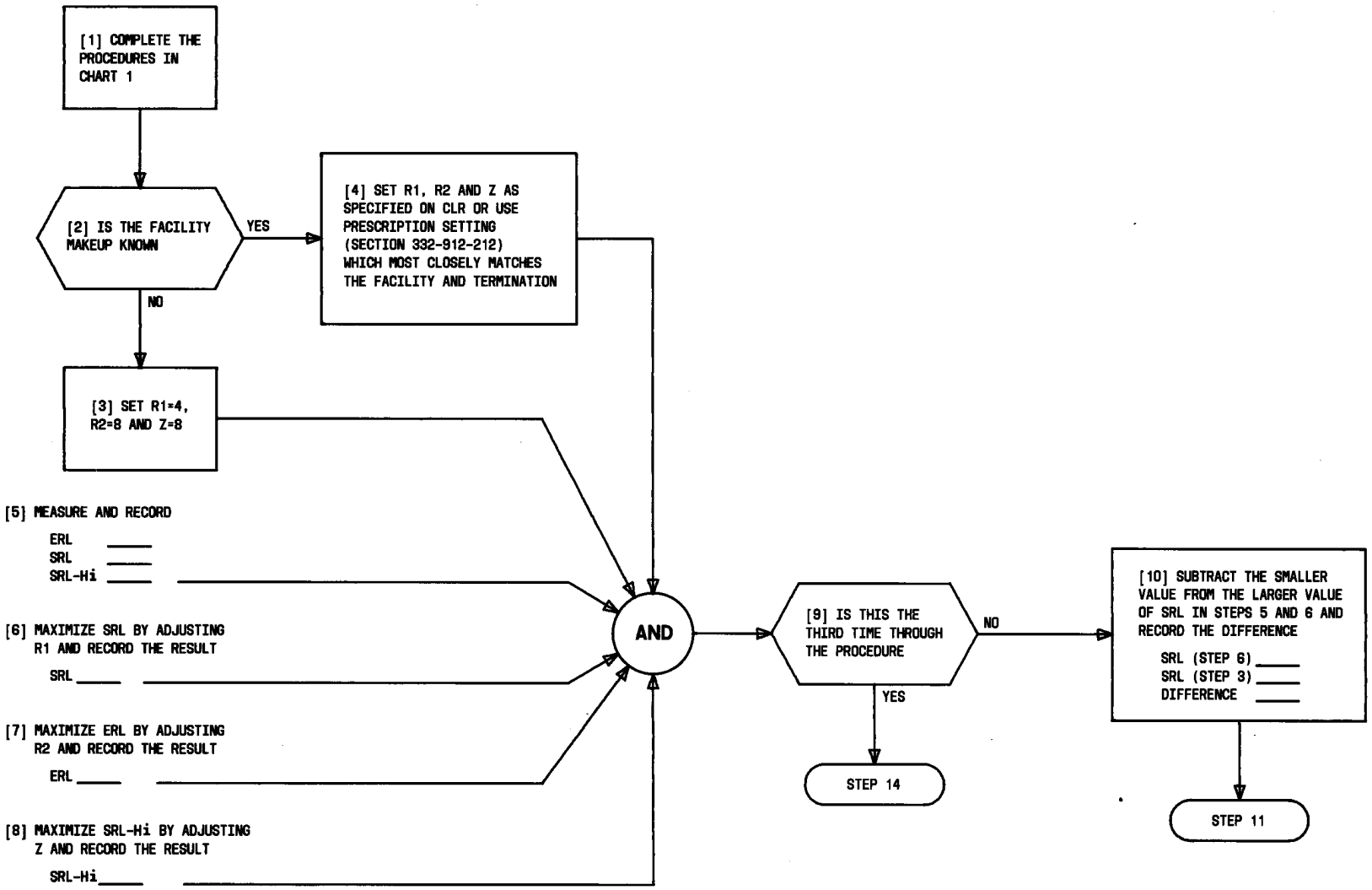


Chart 3—Adjustment of 4240B Precision Balance Networks

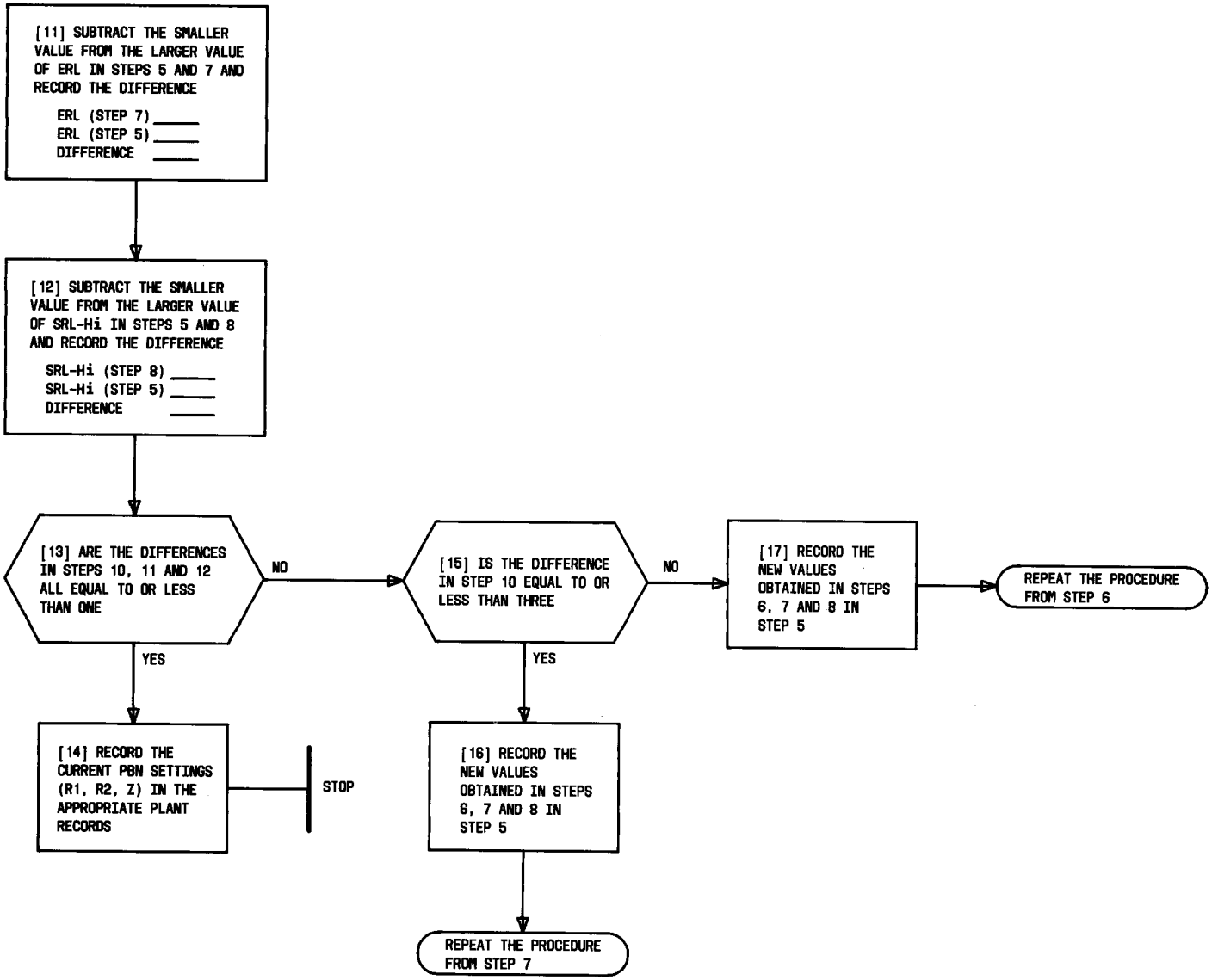


Chart 3—Adjustment of 4240B Precision Balance Networks (Cont)

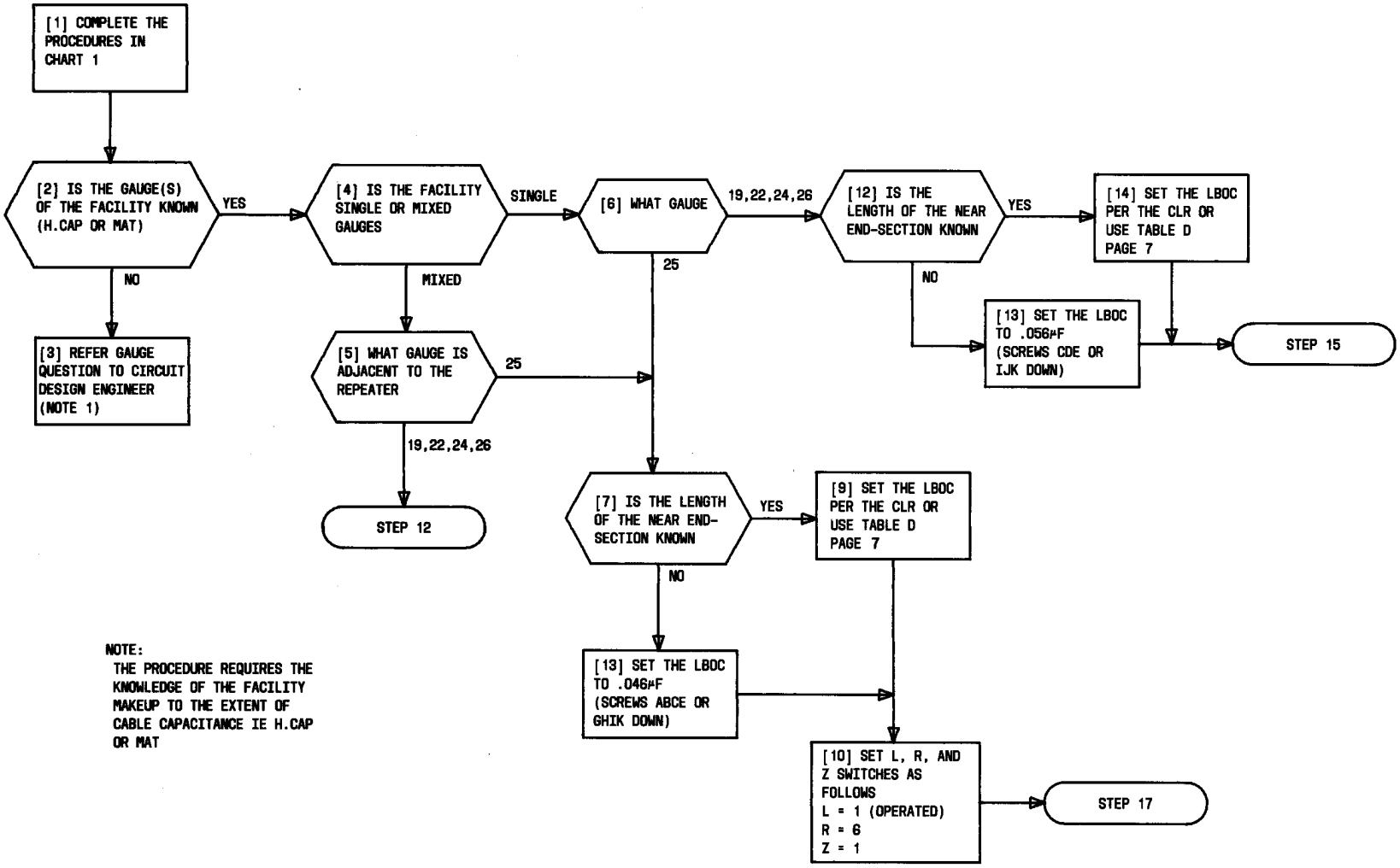


Chart 4—Adjustment of 4240C Precision Balance Networks

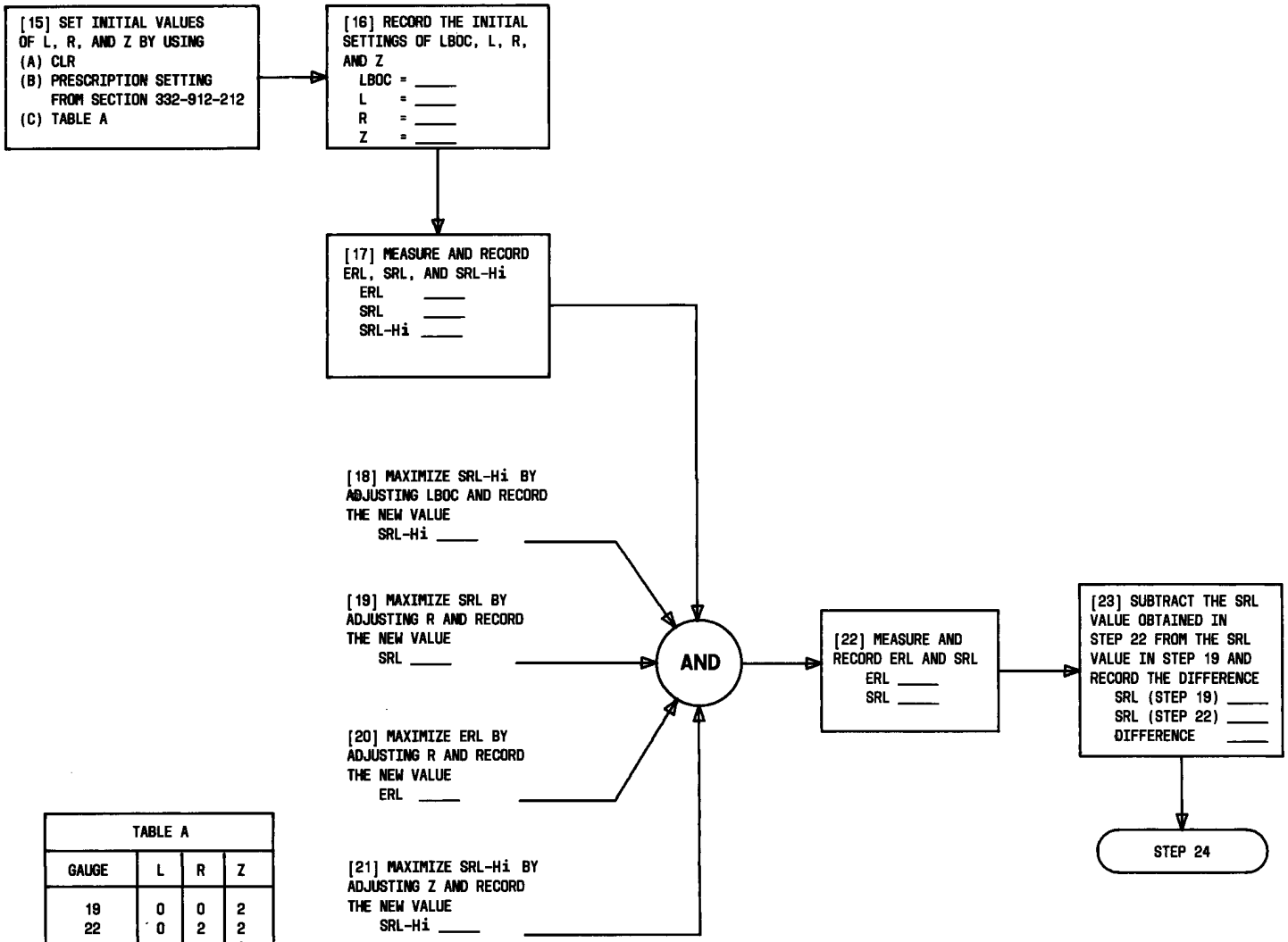


TABLE A

GAUGE	L	R	Z
19	0	0	2
22	0	2	2
24	0	4	3
26	0	7	4
UNKNOWN	0	4	3

Chart 4—Adjustment of 4240C Precision Balance Networks (Cont)

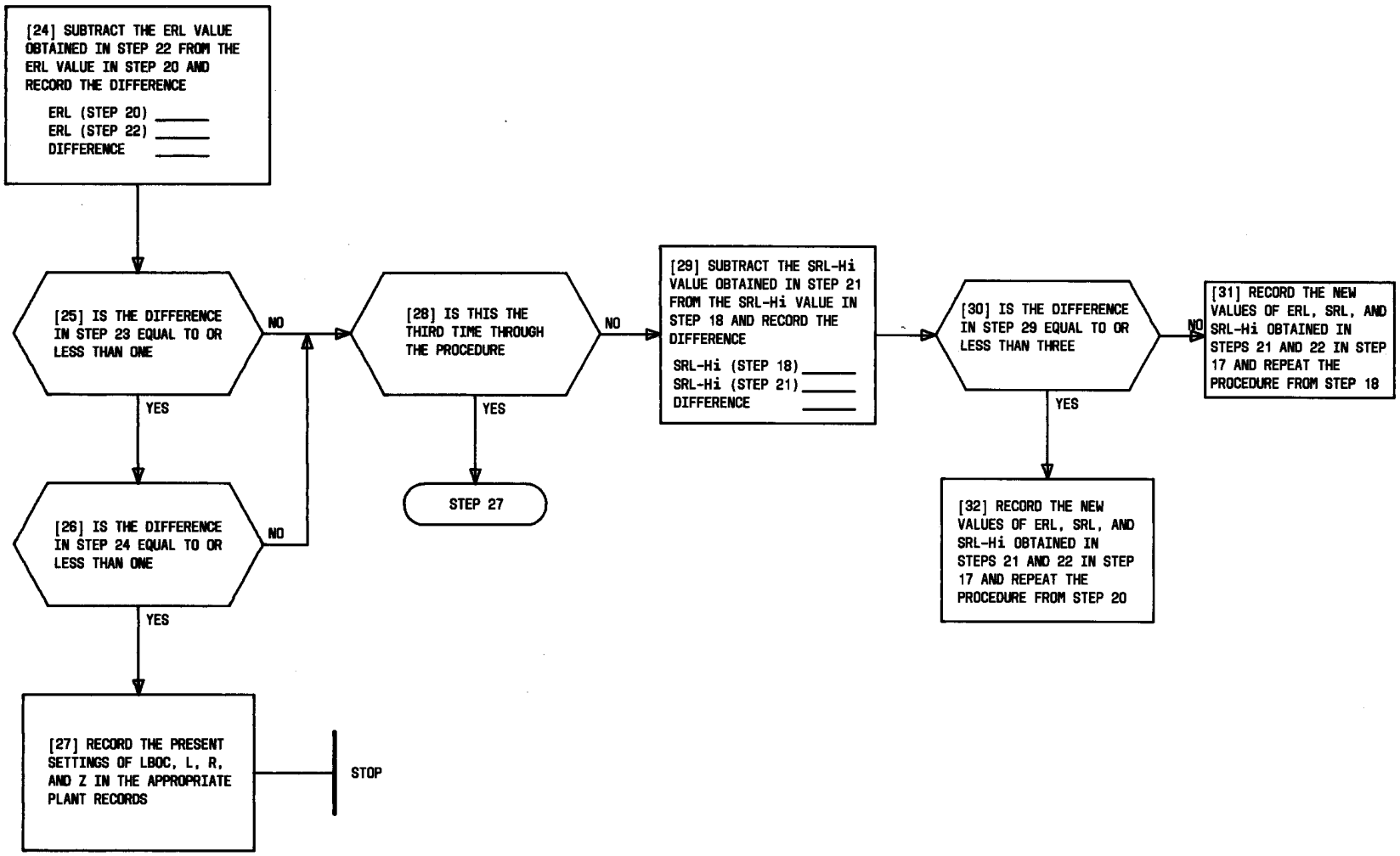


Chart 4—Adjustment of 4240C Precision Balance Networks (Cont)

6. GAIN ADJUSTMENT

6.01 Gain adjustment is controlled by a potentiometer for each direction of transmission. Amplifier RU1 supplies gain for the A to B direction, while RU2 supplies gain for the B to A direction.

6.02 Since the 309D amplifier unit used in repeaters which interface nonloaded cable also includes an active equalizer section, the total 1 kHz gain available is the sum of the potentiometer setting and the gain of the equalizer section. Repeaters which utilize the 309D must have the equalizer settings installed prior to adjusting the gain. If the equalizer settings are unknown, they may be determined using the procedures in Part 8 of this section or if the cable makeup is known, the prescription setting tables in Section 332-912-212 may be used.

6.03 The additional 1 kHz gain (or loss) for all equalizer settings is listed in Table E.

Setting Specified Gain

6.04 The procedures in Chart 5 are for setting the repeater to a specified gain and requires the following equipment:

- J99343TB test extender
- Voice frequency oscillator with adjustable output power and preferably a 900-ohm output impedance
- Transmission measuring set (detector) preferably with a 900-ohm input impedance

Note: The oscillator and detector may be a combination unit similar to the Hewlett-Packard 3550B or Northeast Electronics TTS 15B.

- Circuit layout record (CLR)
- Appropriate test cords.

The test configuration for setting a specified gain is shown in Fig. 3.

TABLE E

1 KHZ GAIN OF 309D EQUALIZER

SLOPE SETTING	EQUALIZER GAIN (dB)	SLOPE SETTING	EQUALIZER GAIN (dB)
0 0	0	C 0	−3.5
0 1	0.2	C 1	−3.3
0 2	0.5	C 2	−3.0
0 3	0.8	C 3	−2.7
0 4	1.2	C 4	−2.4
0 5	1.6	C 5	−2.0
0 6	1.9	C 6	−1.6
0 7	2.3	C 7	−1.2
0 8	2.8	C 8	−0.8
0 9	3.2	C 9	−0.4
0 10	3.6	C 10	0.0
0 11	4.0	C 11	0.4
0 12	4.4	C 12	0.8
0 13	4.7	C 13	1.2
0 14	5.1	C 14	1.6
0 15	5.5	C 15	2.0

CHART 5

REPEATER GAIN ADJUSTMENT

STEP	PROCEDURE
1	Install equalizer settings (309D repeater unit only). If equalizer settings are unknown, they may be determined using the procedures in Part 8.
2	If repeater is for loaded cable, remove LBOC (screws A through F and G through L turned out).
3	Set signaling options (RV, RV/T, SX SH) as specified by CLR.
4	Turn gain potentiometers to full counterclockwise.
5	Set the DISABLE switch to the NOR position.
6	Remove companion signaling unit if used.
7	Set test extender switches as follows:

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO IN	COMP NET IN/OUT TO IN

Note: If oscillator and TMS are 600 ohms, set the 600/900 switch on the test extender to 600 to maintain the hybrid balance.

8	Insert the test extender card into the proper slot of the mounting shelf.
9	Insert the repeater into the mounting on the side of the test extender.
10	Note the gain specified on the CLR and call it G. (If the oscillator and TMS are 600 ohm impedances, subtract 0.4 dB from the specified gain to correct for impedance mismatches).
11	Connect the oscillator output to the input of the detector. Adjust the oscillator output for an indication of -G dBm on the detector.
12a	For gain adjustment of RU1 (A to B direction), connect the oscillator output to the 2W EQUIP jack on the A-side of the test extender and the detector to the 2W EQUIP jack on the B-side of the extender.
12b	For gain adjustment of RU2 (B to A direction), connect the oscillator output to the 2W EQUIP jack on the B-side of the extender and the detector to the 2W EQUIP jack on the A-side.
13	Adjust the potentiometer associated with RU1 for A to B direction or RU2 for B to A direction for a 0 dBm indication on the detector.

CHART 5 (Cont)

STEP	PROCEDURE

Note: If the detector does not follow adjustment of the potentiometer smoothly, either the test extender has not been set to match the test equipment; the LBOC section has not been removed; or the wrong potentiometer was adjusted.

14 If both repeater units (RU1 and RU2) have been adjusted, set PBNs, LBOC and DISABLE switch as specified on CLR.

15 Remove repeater from test extender.

16 Remove cable extender card from mounting shelf.

17 Insert repeater and signaling unit (if required) into mounting shelf.

18 This completes the adjustment to a specified gain.

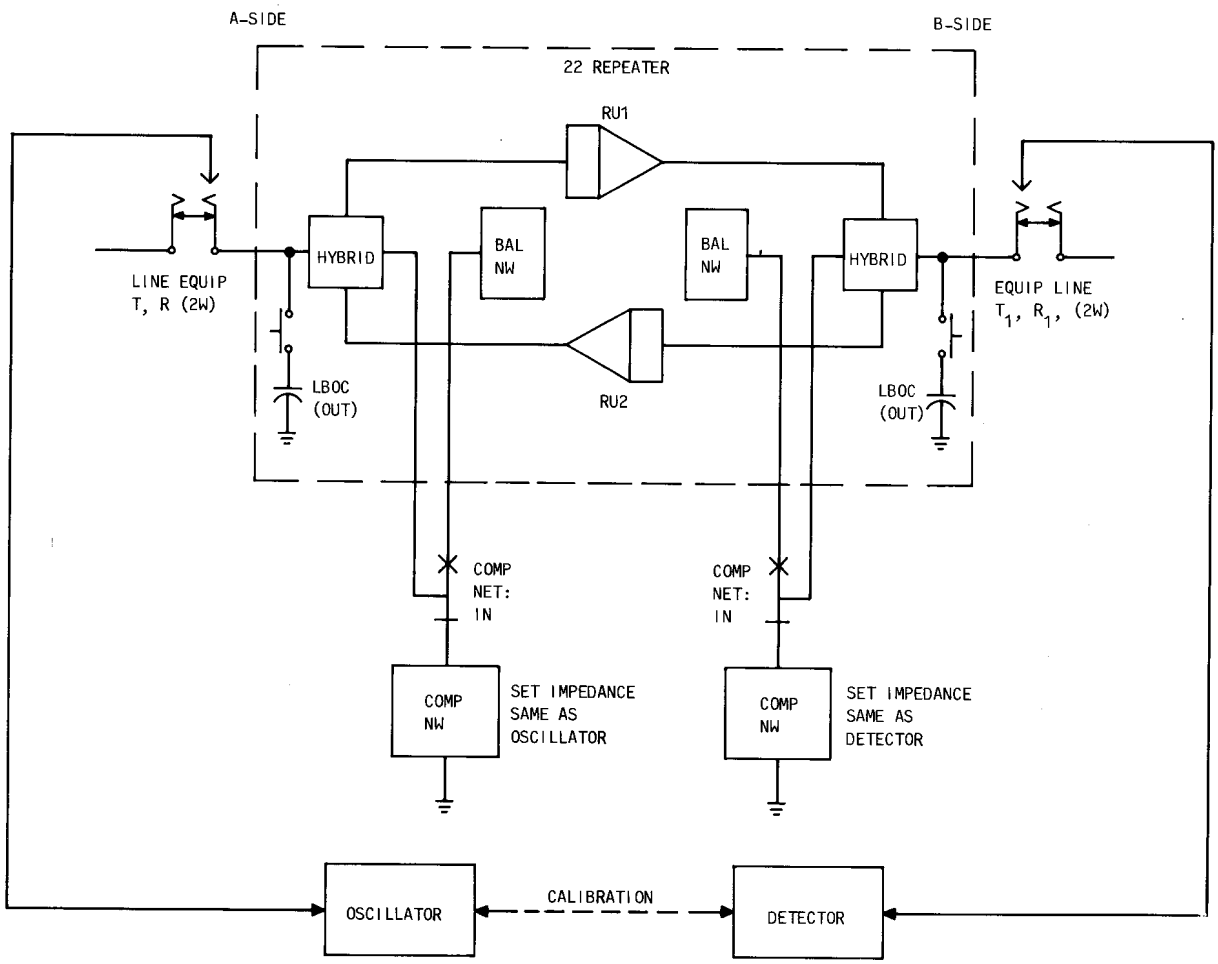


Fig. 3—Test Configuration for Setting Specified Gain

Setting Specified Output Level

6.05 The procedures for adjusting the repeaters to a specified output level differ slightly from those for a specific gain. The most important difference is that the PBN and its associated LBOC (if required) on the input side of the amplifier being adjusted must be set to their proper values. If the PBN settings are unknown, they may be determined using the procedures in Chart 2, 3, or 4.

6.06 It is also necessary to remove any LBOC settings on the output side of the amplifier being adjusted to prevent impedance mismatches which will result in inaccurate readings. The following procedures are designed to minimize the number of changes to LBOC settings.

6.07 The test configuration shown in Fig. 4 is for A-side level adjustments and Fig. 5 is for B-side adjustment.

6.08 The procedures in Chart 6 are for setting the repeater to a specified output level.

CHART 6

REPEATER LEVEL ADJUSTMENT

STEP	PROCEDURE
1	Install both equalizer settings (309D repeater units only). If equalizer settings are unknown they may be determined using the procedures in Part 8.
2	Install PBN settings on both sides of repeater (as shown on CLR or as determined in Chart 2, 3, or 4).
3	Set LBOC as follows: (a) If the LBOC is present on the output side of the amplifier being adjusted, it must be removed (screws up). (b) If the LBOC is present on the input side of the amplifier being adjusted, it must be set to its proper value as specified on CLR.
4	Install the proper signaling options (RV, RV/T, SX SH) as specified on CLR.
5	Set both gain potentiometers to fully counterclockwise.
6	Set the DISABLE switch to the NOR position.
7	Set the switches on the test extender as follows: (a) For level adjustment on A-side (output of RU2)

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO IN	COMP NET IN/OUT TO OUT

CHART 6 (Cont)

STEP	PROCEDURE

(b) For level adjustment on B-side (output of RU1)

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900 (see note)
COMP NET IN/OUT TO OUT	COMP NET IN/OUT TO IN

Note: If detector is 600 ohms, the 600/900 switch must be set to 600 to maintain hybrid balance.

8 Insert cable extender card into proper mounting slot.

9 Insert repeater into slot on side of test extender.

10 Note the output level specified on the CLR for direction of transmission being adjusted. (If detector is 600 ohm impedance, a correction factor of 0.2 dB must be subtracted from the specified level.) Call this level L.

11 Have 1 kHz tone applied to the circuit at the 0 TLP.

Note: Gain of any repeaters between the 0 TLP and the repeater being adjusted should be set to their specified values.

12 Connect the detector to the appropriate 2W EQUIP jack on the test extender (see Fig. 4 or 5).

13 Adjust the gain potentiometer for a reading of L on the detector.

14 An uneven response to changing the potentiometer setting such as a sudden increase in level for a very small change in the setting indicates poor hybrid balance. This condition will most likely be caused by:

(a) Adjusting wrong potentiometer

(b) LBOC IN on the output side of the amplifier being adjusted

(c) LBOC OUT or incorrect on the input side (see 4.02)

(d) COMP NET switches on the test extender in the wrong position

(e) Test extender impedance (600/900 switch) does not match detector impedance

(f) PBN setting does not match the cable facility (see Chart 2, 3, or 4).

CHART 6 (Cont)

STEP	PROCEDURE

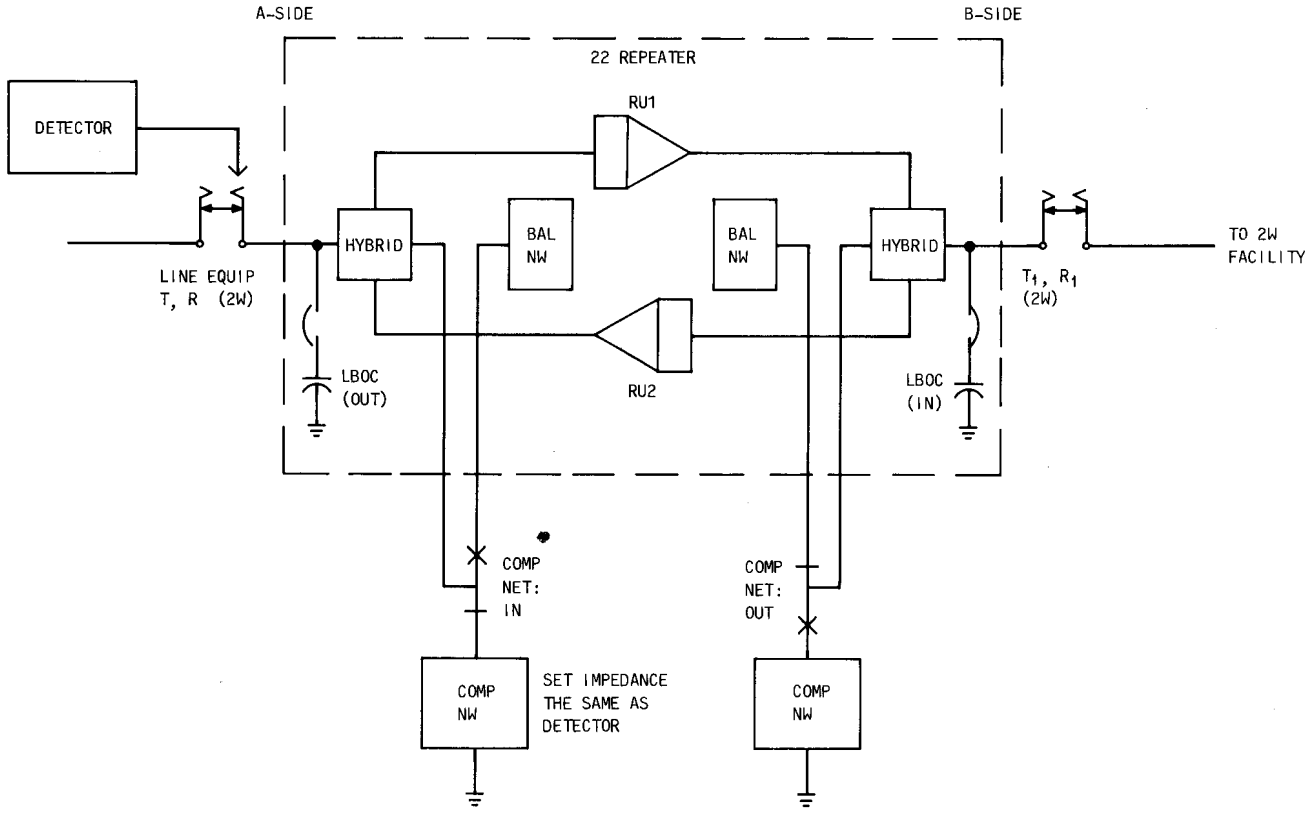


Fig. 4—Test Configuration for Setting A-Side Level

15 Set LBOC (if required) on output side of repeater to value specified on CLR.

16 If level is to be set for other direction of transmission, remove LBOC (if required) and go back to Step 7.

17 If both amplifiers have been adjusted, set the DISABLE switch to position specified on CLR.

18 Remove the repeater from the test extender.

19 Remove cable extender card from mounting shelf.

20 Insert repeater into mounting shelf. This completes the level adjustment procedures.

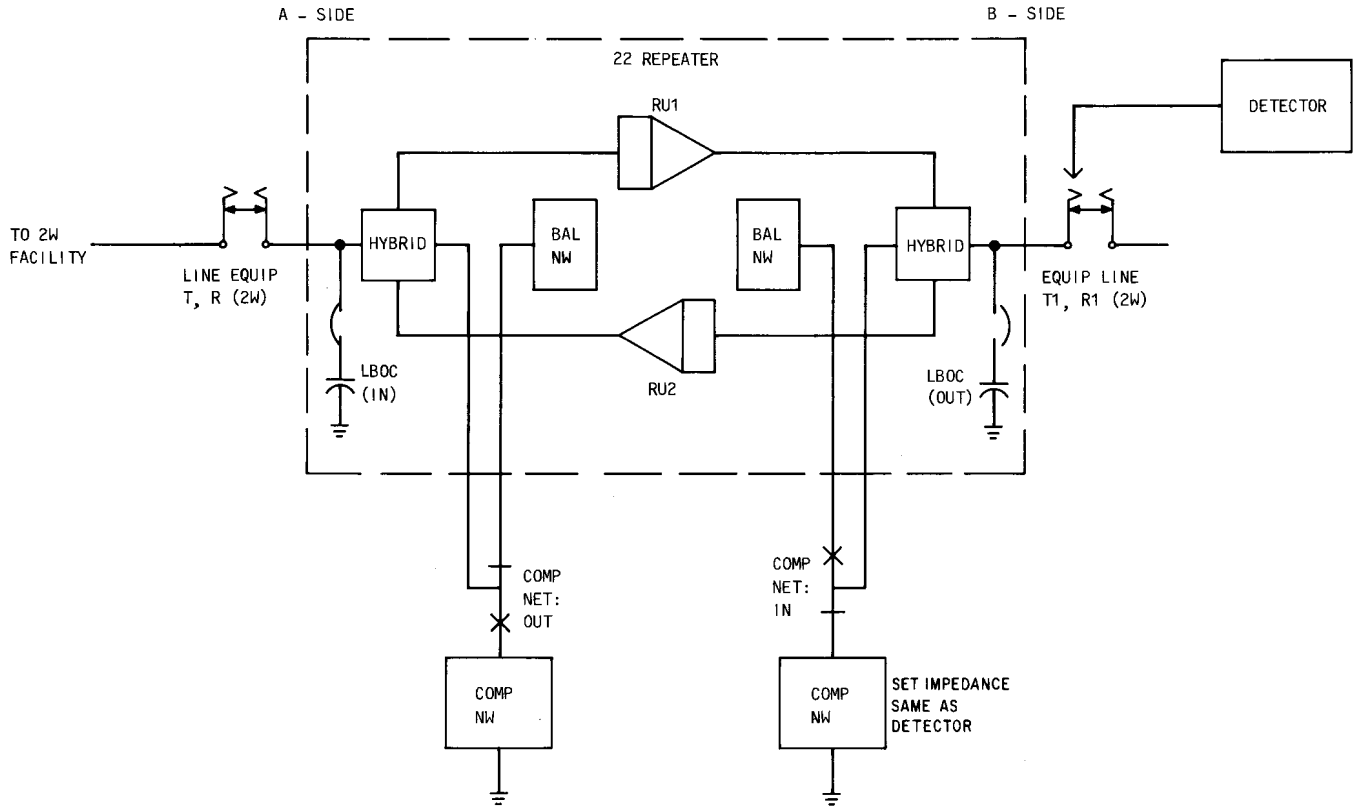


Fig. 5—Test Configuration for Setting B-side Level

7. FREQUENCY RESPONSE MEASUREMENTS

7.01 Frequency response measurements as described in Chart 7 and 8 are used to check circuit frequency response against requirements or as an input for the procedures in Part 8 for determining the 309D equalizer settings by measurement.

7.02 Two procedures are given; one for terminal repeaters (Chart 7) and one for intermediate repeaters (Chart 8).

Terminal Repeater

7.03 Test equipment required for terminal repeater frequency response tests is as follows:

Receiving Location

- J99343TB test extender
- Transmission measuring set (detector)

Transmitting Location

- Oscillator with selectable output impedance (600 or 900 ohms) and variable output frequency or at least selectable 400, 1000, and 2800 Hz.

7.04 The test configuration is shown in Fig. 6.

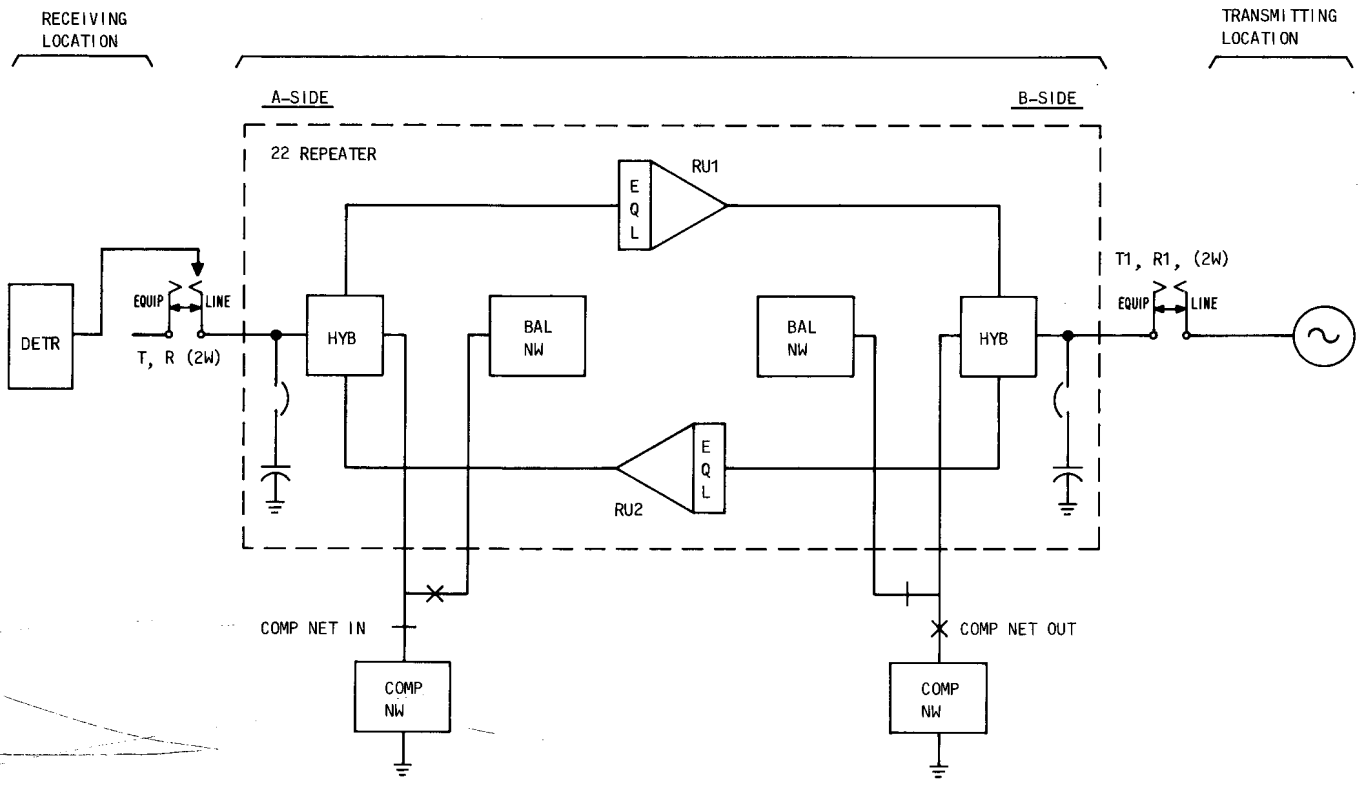


Fig. 6—Test Configuration for Terminal Repeater Frequency Response Measurements

CHART 7

TERMINAL REPEATER FREQUENCY RESPONSE MEASUREMENTS

STEP	PROCEDURE

At the Transmitting Location

1 Connect the oscillator to the line with the output 1 kHz at 0 dBm and the impedance set as follows:

LOCATION	IMPEDANCE
Central Office	900 Ohms
600-Ohm PBX	600 Ohms
900-Ohm PBX	900 Ohms
Station Set	600 Ohms

CHART 7 (Cont)

STEP	PROCEDURE
	At The Receiving Location
2	Remove the repeater from the mounting shelf and insert the cable extender card into the mounting slot.
3	Insert the repeater into the slot on the side of the test extender.
4	Set the repeater controls as follows: (a) Equalizer switches (309D only) to OFF (b) PBN to proper value (as shown on CLR or as determined in Chart 2, 3, or 4). (c) Gain potentiometers fully counterclockwise (d) LBOC (if required) to proper value (e) Signaling options (RV, RV/T, SX SH) to positions specified on CLR (f) DISABLE switch to NOR position.
5	Set switches on test extender as follows: (a) For 900-ohm detector:

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO IN	COMP NET IN/OUT TO OUT

(b) For 600-ohm detector:

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 600	600/900 to 900
COMP NET IN/OUT TO IN	COMP NET IN/OUT to OUT

6	Connect the detector to the 2W EQUIP jack on the A-side of the test extender.
7	Instruct the transmitting location to send a 1 kHz tone.
8	Measure the 1 kHz level and adjust the gain of RU2 for a suitable output level (eg, -5 dBm) and record this value.

CHART 7 (Cont)

STEP	PROCEDURE
9	Note the position of the potentiometer on RU2 and adjust the RU1 potentiometer to approximately the same position.
10	Have the transmitting location send 400 and 2800 Hz at 0 dBm and record the levels received.
11	Use the levels recorded in Steps 8 and 10 for computation of the equalizer settings as described in Chart 9.
12	After setting both equalizers to the values determined in Chart 9, remeasure the circuit at the three frequencies to verify the accuracy of the setting and to evaluate the roll-off against service objectives.
13	Adjust the gain potentiometer for RU2 to give the output level specified on the CLR. Procedures are given in Chart 6.
14	To set the gain of RU1, measure the gain of RU2 as outlined in Chart 5 (900-ohm oscillator is required). Adjust RU1 to the same value.
15	Record the final gain and equalizer settings in the appropriate plant records.
16	Set the DISABLE switch to the position specified on the CLR.
17	Remove the repeater from the test extender.
18	Remove the cable extender card from the mounting shelf.
19	Insert the repeater into the mounting shelf.
20	This completes the procedure for terminal repeater frequency response measurements.

7.05 A separate procedure is given for repeaters in an intermediate location. Fig. 7 is the test arrangement showing the three locations involved. This arrangement and the following procedure has the transmitting location on the B-side of the repeater. This arrangement is arbitrary and, if reversed, the amplifier designations (RU1, RU2) given in the procedure must also be reversed.

7.06 The following equipment, by location, will be required for frequency response tests on circuits utilizing intermediate repeaters.

Transmitting Location

- Voice frequency oscillator with selectable 600- and 900-ohm output impedances and variable frequency selection for 400, 1000, and 2800 Hz.

Receiving Location

- Transmission measuring set (detector) with 900-ohm input impedance.

Intermediate (repeater) Location

- J99343TB test extender

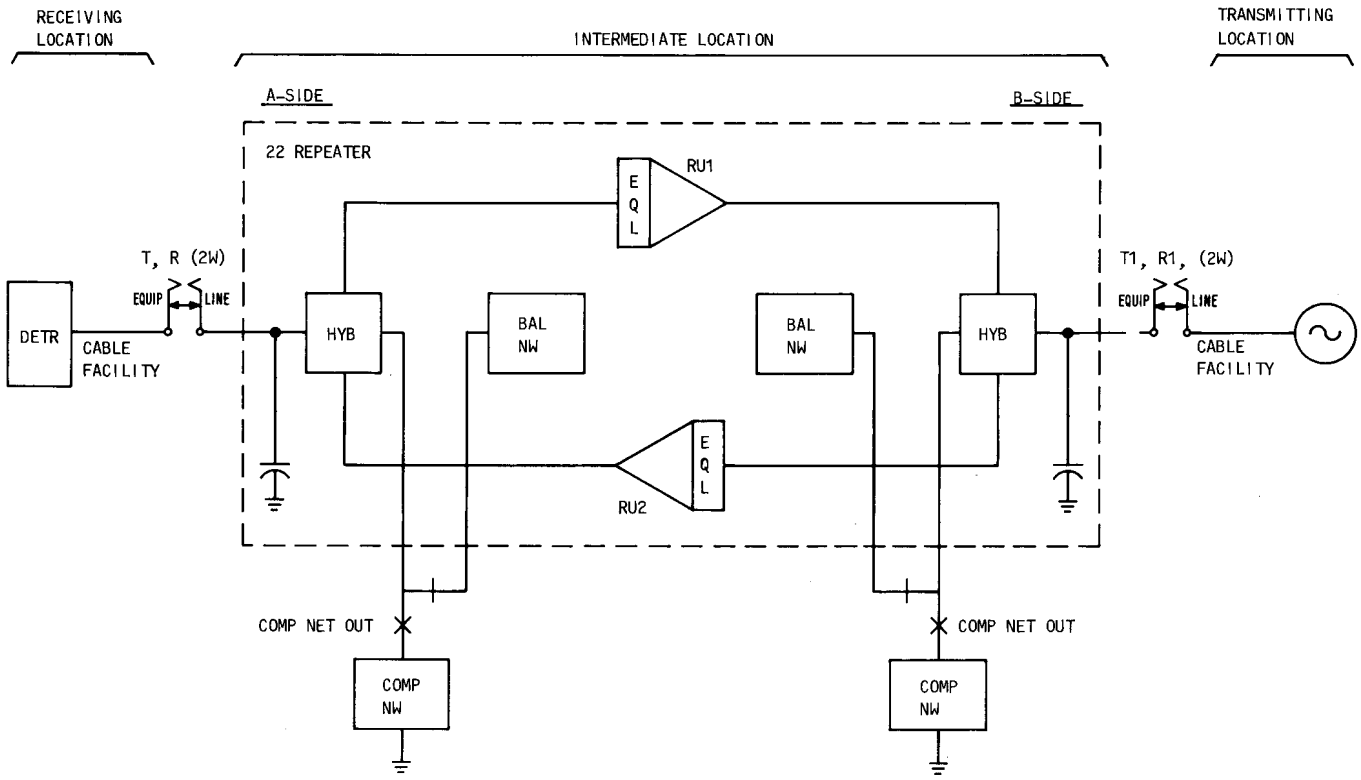


Fig. 7—Test Configuration for Intermediate Repeater Frequency Response Measurements

CHART 8

INTERMEDIATE REPEATER FREQUENCY RESPONSE MEASUREMENTS

STEP	PROCEDURE

Transmitting Location

1 Connect oscillator to line with an output of 1 kHz at 0 dBm and the oscillator impedance set as follows:

TRANSMITTING LOCATION	OSCILLATOR IMPEDANCE
Central Office	900 ohms
600-ohm PBX	600 ohms
900-ohm PBX	900 ohms
Station Set	600 ohms

Receiving Location

2 Connect the detector to the line with the input impedance determined by the table above.

CHART 8 (Cont)

STEP	PROCEDURE
	Intermediate Location
3	Remove repeater from mounting shelf.
4	Insert test extender card into mounting shelf, and plug the repeater into the test extender.
5	Set the repeater as follows: (a) Equalizer switches (309D only) to OFF. (b) Set PBNs to proper values per CLR or by measurement as in Chart 2, 3, or 4. (c) Set both gain potentiometers to minimum (fully counterclockwise). (d) LBOC (if required) to its final value. (e) Signaling options (RV, RV/T, SX SH) as specified on CLR. (f) DISABLE switch to NOR.
6	Set test extender as follows: **A-side**: 2W/4W to 2W; 600/900 to 900; COMP NET IN/OUT TO OUT **B-side**: 2W/4W to 2W; 600/900 to 900; COMP NET IN/OUT to OUT
7	Have transmitting location send 1 kHz tone at 0 dBm and adjust RU2 until receiving location receives -5 dBm.
8	Note the position of the RU2 gain potentiometer, and adjust RU1 to approximately the same value.
9	After adjusting the gain, have the transmitting location send 400 Hz to 0 dBm and record the level read at the receiving location.
10	Have the transmitting location send 2800 Hz and record the level read at the receiving location.
11	For calculation of equalizer settings, use the received levels for 400, 1000, and 2800 Hz in the procedures in Part 8.
12	After computing the equalizer settings, they should be installed in both equalizers.
13	Remeasure the circuit at 1000 Hz and readjust the gain of RU2 until the receive location receives the level specified on the CLR.

CHART 8 (Cont)

STEP	PROCEDURE
14	Readjust the gain of RU1 using procedures in Chart 6 or if oscillator and measuring sets are available at both transmitting and receiving locations, RU1 may be adjusted as in Step 13.
15	Remeasure the circuit at 400 and 2800 Hz, and compare the results to the circuit objectives.
16	Set the DISABLE switch to the position specified on the CLR.
17	Remove the repeater from the test extender.
18	Remove the cable extender card from the mounting shelf and insert the repeater.
19	Have transmitting and receiving locations remove the test equipment, and restore the circuit to the normal condition.
20	Record the equalizer and gain settings in the appropriate plant records.
21	This completes the procedure for frequency response measurements for intermediate repeaters.

8. EQUALIZER SETTINGS FROM CABLE LOSS DATA

8.01 The procedures in Chart 9 are used to obtain 309D equalizer settings by actual circuit loss measurement at 400, 1000, and 2800 Hz.

8.02 The measurements are made using the procedures in Chart 7 or 8 and may be used when the facilities do not fit the prescription setting tables in Section 332-912-212.

8.03 The differences computed in the following procedures are rounded to the nearest 0.5 dB and located in Table F. Table F also indicates whether the facility will meet trunk or line objectives.

8.04 After setting the equalizer to the values determined in the procedures, the 1 kHz gain must be readjusted to correct for the additional gain (or loss) introduced by the equalizer.

8.05 The use of Table F to find equalizer settings is straightforward. Locate the 400 Hz difference (Step 11) on the left side and read across to the column that contains the 2800 Hz difference (Step 11). The values in the block represent the equalizer settings; the first is the C switch position (0 = off, C = operated) and the second is the numerical sum of the operated switches.

9. STABILITY MARGIN TESTS

9.01 After the repeater has been installed and lined up, stability margin tests may be used as an indicator of circuit performance. The calculated margin represents a goodness value for comparison to other similar circuits.

9.02 The test setup is shown in Fig. 8.

9.03 Two types of stability tests can be made; talk state, which is made with nominal terminations on both ends of the circuit and idle state, which is made with all switching and signaling equipment in the circuit in the idle condition. The stability margin in the idle state will be lower than that in the talk state. Table G compares actual and nominal terminations for use in stability tests.

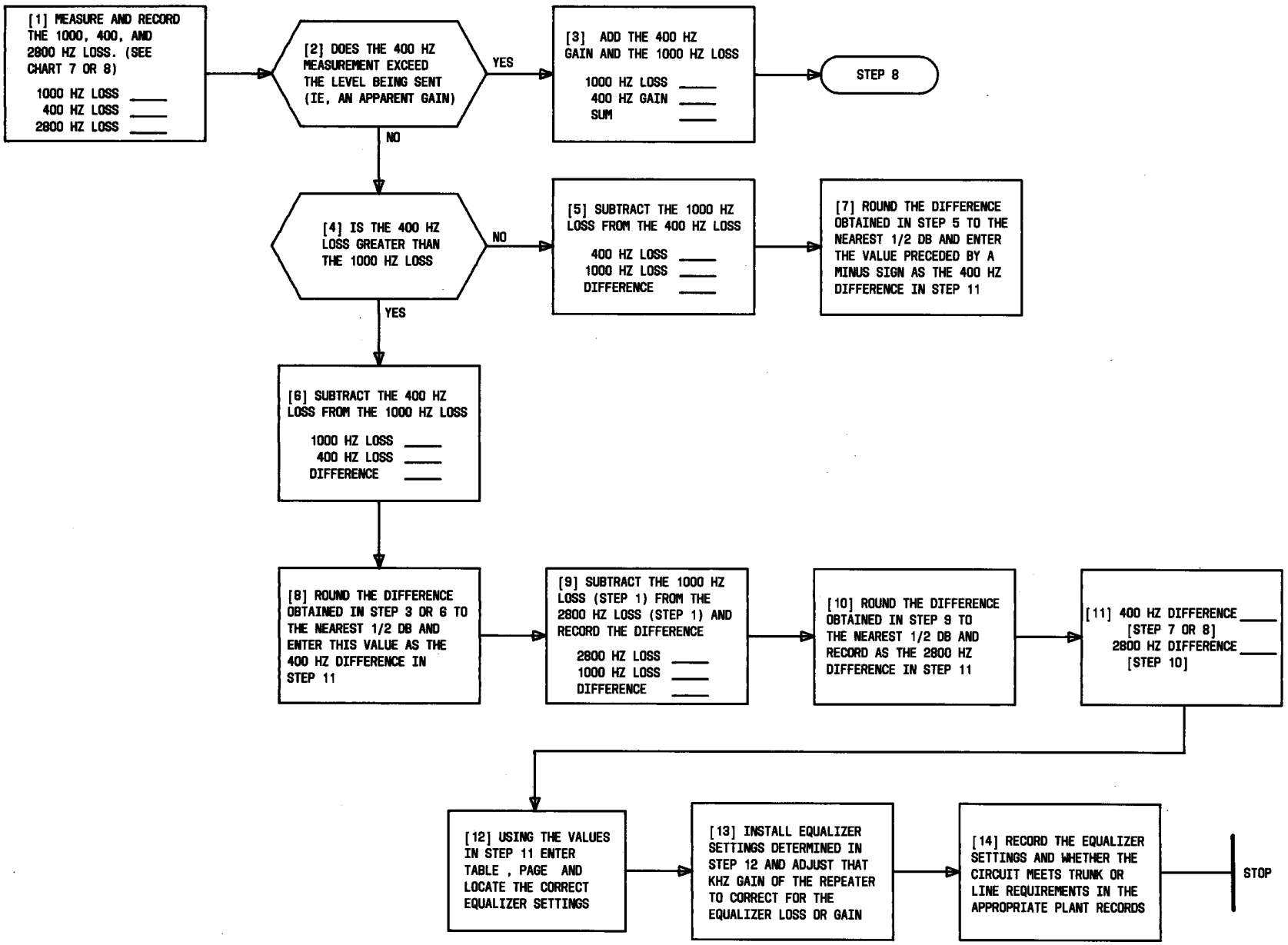


Chart 9—Obtaining 309D Equalizer Settings By Measurement

TABLE F

EQUALIZER SETTINGS FROM LOSS DATA
2800 Hz DIFFERENCE

400 Hz DIFFERENCE

	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0
−1.0	0, 0	0, 0	0, 0	0, 1	0, 1	0, 2	0, 2	0, 3	0, 3	0, 4	0, 4	0, 5	0, 6	0, 7	0, 7	0, 7	0, 7	0, 7	0, 8	0, 9	0, 9	0, 10	0, 11	0, 12	0, 13	0, 14					
− .5	0, 0	0, 0	0, 1	0, 1	0, 2	0, 2	0, 3	0, 3	0, 4	0, 4	0, 5	0, 6	0, 7	0, 7	0, 8	0, 9	0, 9	0, 9	0, 9	0, 10	0, 11	0, 11	0, 12	0, 13	0, 15	0, 15	C, 6				
0	0, 0	0, 1	0, 1	0, 2	0, 2	0, 3	0, 3	0, 4	0, 4	0, 5	0, 6	0, 7	0, 7	0, 8	0, 9	0, 10	9, 11	0, 11	0, 11	0, 11	0, 12	0, 13	0, 14	0, 15	C, 6	C, 6	C, 7	C, 7	C, 8		
.5					0, 3	0, 3	0, 4	0, 4	0, 5	0, 6	0, 7	0, 7	0, 8	0, 9	0, 10	0, 11	0, 12	0, 13	0, 13	0, 13	0, 13	0, 15	0, 15	0, 15	C, 6	C, 7	C, 8	C, 8	C, 9	C, 10	
1.0								0, 5	0, 6	0, 7	0, 7	0, 8	0, 9	0, 10	0, 11	0, 12	0, 14	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	C, 7	C, 8	C, 9	C, 10	C, 10	C, 11	C, 12
1.5								0, 6	0, 7	0, 7	0, 8	0, 9	0, 10	0, 11	0, 12	0, 14	0, 15	0, 15	0, 15	0, 15	C, 7	C, 7	0, 15	0, 15	C, 8	C, 9	C, 10	C, 11	C, 12	C, 13	C, 14
2.0								C, 1	C, 1	0, 8	0, 9	0, 10	0, 11	0, 12	0, 14	0, 15	0, 15	0, 15	0, 15	0, 15	C, 9	C, 9	C, 9	0, 15	C, 10	C, 10	C, 11	C, 12	C, 13	C, 14	C, 15
2.5								C, 1	C, 2	C, 2	0, 10	0, 11	0, 12	0, 14	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	C, 10	C, 11	C, 11	C, 11	C, 11	C, 12	C, 13	C, 14	C, 15	C, 15	C, 15
3.0											C, 3	0, 12	0, 14	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	C, 11	C, 12	C, 13	C, 13	C, 13	C, 13	C, 14	C, 15	C, 15	C, 15	C, 15
3.5												0, 14	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	0, 15	C, 12	C, 13	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15
4.0													C, 6	C, 6	C, 7	C, 8	C, 9	C, 10	C, 11	C, 12	C, 13	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15
4.5															C, 8	C, 9	C, 10	C, 11	C, 12	C, 13	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15
5.0																C, 10	C, 11	C, 12	C, 13	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15
5.5																	C, 12	C, 13	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15
6.0																		C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15	C, 15

MEET *TRUNK* REQUIREMENTS

MEET *LINE* REQUIREMENTS

9.04 The following equipment is required for stability tests:

- J99343TB test extender
- Oscillator with adjustable output power and 900-ohm output impedance
- Transmission measuring set (detector) with 900-ohm input impedance.

Note: The oscillator and detector may be contained in a single unit.

- High impedance monitoring device (1014A handset or equivalent in MON position or a high impedance meter).

9.05 It is assumed that the repeater has been adjusted to its final settings and all options are set as specified on the CLR. Stability margin tests are outlined in Chart 10.

TABLE G

COMPARISON OF ACTUAL vs NOMINAL TERMINATIONS

ACTUAL TERMINATION	NOMINAL TERMINATION
Central Office (switch)	900 ohms + 2.15 μF
600 ohm PBX (switch)	600 ohms + 2.15 μF
900 ohm PBX (switch)	900 ohms + 2.15 μF
Station Set (Telephone)	Off-hook station set with loop current or 4066H network

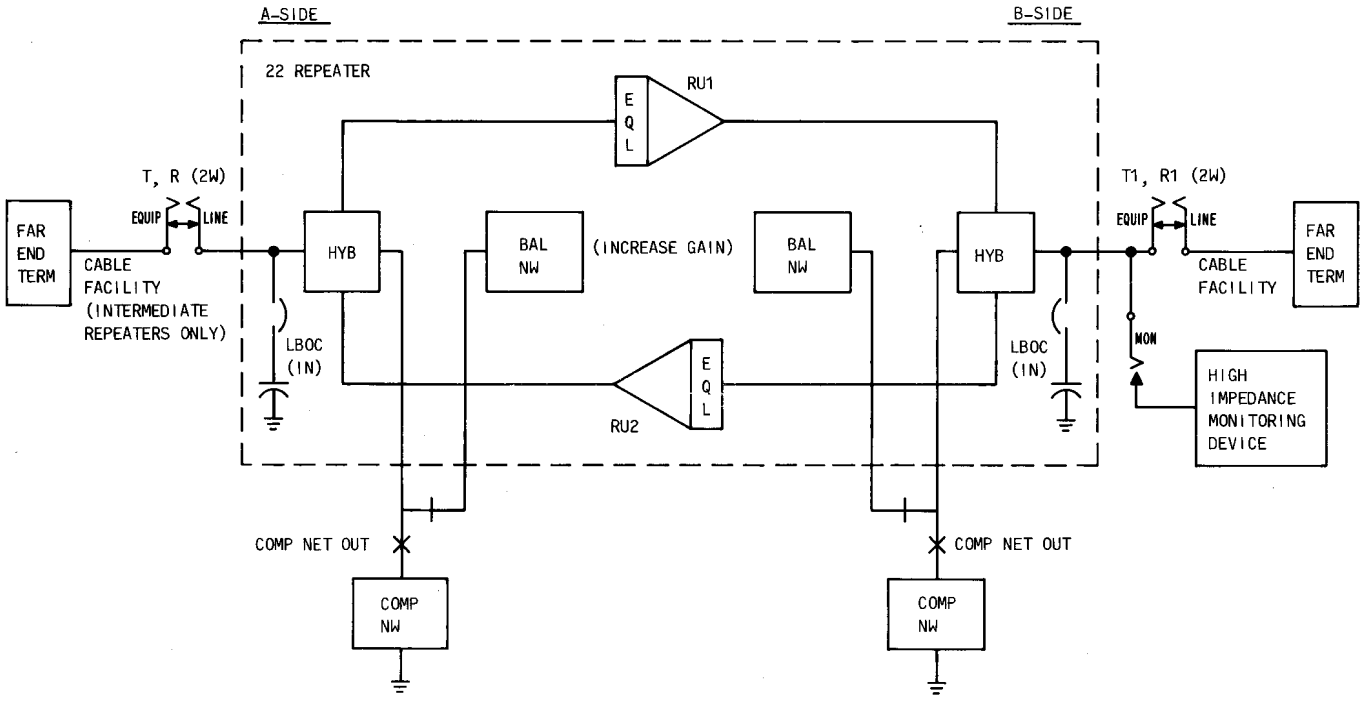


Fig. 8—In Circuit Configuration For Stability Margin Tests

CHART 10

STABILITY MARGIN TESTS

STEP	PROCEDURE

1 Insert the cable extender card into the proper mounting slot.

2 Insert the repeater into the mounting on the side of the test extender.

3 Set the DISABLE switch to NOR.

4 Record and remove any LBOC settings (turn screws out at least three turns).

5 Set the switches on the test extender as follows:

A-side	B-side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO IN	COMP NET IN/OUT TO IN

Note: If oscillator and/or detector are 600 ohms impedance, set the 600/900 switch to 600 to maintain hybrid balance.

6 Disconnect the companion MFT signaling unit if used.

7 Connect the oscillator output to the detector input and adjust the output level of the oscillator for a 0 dBm indication on the detector.

8 Disconnect the oscillator from the detector.

9 Measure the gain of RU1 by connecting the oscillator to the A-side 2W EQUIP jack on the extender and the detector to the B-side 2W EQUIP jack.

10 The level shown on the detector is the gain of RU1 in dBm (A to B direction). Record this value as G_{AB} _____.

11 Reverse the oscillator and detector connections and measure the gain of RU2 (B to A direction).

12 Record the value determined in Step 10 as G_{BA} _____.

13 Disconnect the oscillator and detector from the test extender and reconnect the MFT signaling unit.

14 Set the COMP NET IN/OUT switches on both sides of the test extender to OUT.

15 Connect the high impedance monitoring device to the monitor jack on the B-side of the extender.

CHART 10 (Cont)

STEP	PROCEDURE
16	Install the LBOC settings removed in Step 4.
17	Increase the gain of RU1 (turn the potentiometer clockwise) until either the maximum setting is reached or a tone is heard or indicated on the monitoring device.
18	If no tone is heard with RU1 at its maximum gain setting, increase the gain of RU2 until it reaches its maximum gain or a tone is heard (or indicated) on the monitoring device.
19	Decrease the gain of either RU1 or RU2 until the tone stops and then increase it slowly to the position where tone is just heard, or indicated (circuit starts to oscillate). If both potentiometers are at maximum, skip this step.
20	Remove the companion signaling unit (if used) and set the DISABLE switch to the DISABLE position. Remove the monitoring device from the test extender.
21	Add the gains determined in Steps 10 and 12 to determine the total nominal gain. G_{AB} _____ (Step 10) G_{BA} _____ (Step 12) Total nominal gain _____.
22	Record and remove the LBOC settings.
23	Set both the COMP NET IN/OUT switches on the test extender to the IN position.
24	Connect the oscillator and detector to the test extender to measure the gain of RU1.
25	Set the DISABLE switch to NOR.
26	Record the measured gain of RU1 as in Step 10. G_{AB} _____
27	Reverse the oscillator and detector connections and measure and record the gain of RU2 as in Step 12. G_{BA} _____
28	Add the gains determined in Steps 26 and 27 to find the total maximum gain. G_{AB} _____ (Step 26) G_{BA} _____ (Step 27) Total maximum gain _____

CHART 10 (Cont)

STEP	PROCEDURE
29	Subtract the total nominal gain (Step 21) from the total maximum gain (Step 28). Total maximum gain ____ Total nominal gain ____ Difference ____
30	The STABILITY MARGIN is one half the DIFFERENCE obtained in Step 29. Stability Margin = ____.
31	Adjust RU2 to the gain measured in Step 12.
32	Reverse the oscillator and detector connections and adjust the gain of RU1 to the value measured in Step 10.
33	Set the LBOCs to the values recorded in Step 4.
34	Set the DISABLE switch as specified on the CLR.
35	Remove the oscillator and detector from the test extender.
36	Remove the repeater from the test extender.
37	Remove the cable extender card from the mounting shelf.
38	Insert the repeater and signaling unit into the proper mounting slots.

10. GUIDELINES FOR EQUALIZER TOUCHUP

10.01 These touchup procedures assume the initial equalizer setting has been determined using the prescription setting tables in Section 332-912-212 and are used to improve the initial setting.

10.02 When the procedure calls for increasing or decreasing an equalizer setting, it refers to only the sum of the operated numerical switches. The position of the C switch should not be changed once it has been set except as directed by the procedure. All equalizer settings are written as two values. The first is the C switch (0 = nonoperated or off and C = operated) and the second is the sum of the numerical switches operated.

10.03 All measurements in the procedure are end-to-end as described in Part 7.

10.04 Over equalization at either high or low frequencies could cause the circuit to become unstable (sing).

10.05 The most important rule for 2-wire equalization which is referred to as the ***fundamental rule*** is:

> ***The loss at 400 Hz and at 2800 Hz should both be greater than the loss at 1000 Hz.***

10.06 The following procedure assumes all options, balancing network settings and 1 kHz levels have been set to their proper values. It is also assumed that frequency response measurements have been made and circuit requirements are ***not*** met.

> ***Note:*** The facility is considered to be properly equalized when the 2800 Hz loss is slightly more but as close as possible to the 400 Hz loss.

10.07 The procedure for equalizer touchup is in flowchart form (Chart 11), and if Step 11 is accessed twice without satisfactory results, the circuit cannot be properly equalized and should be referred to the circuit designer.

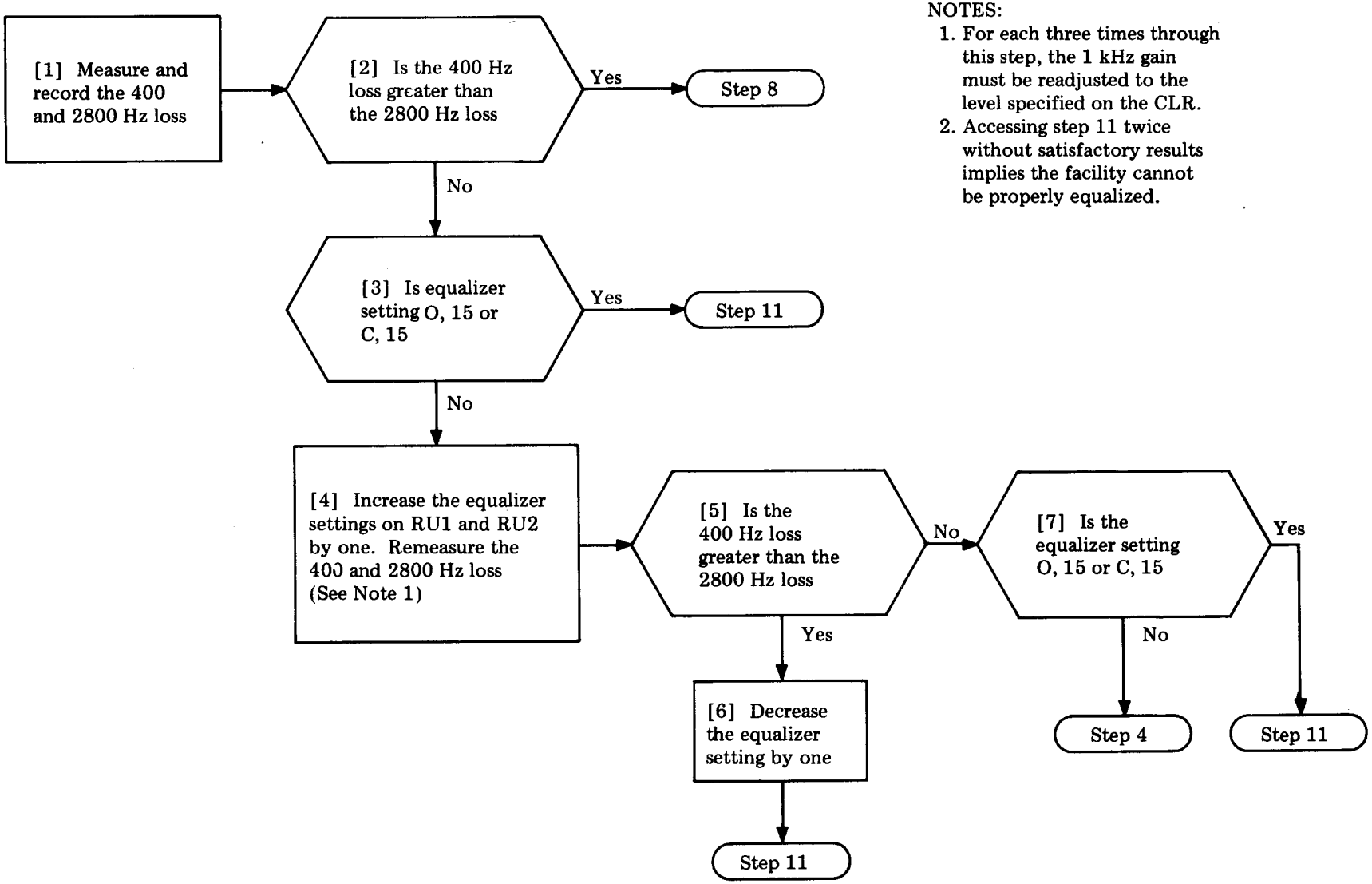
11. PROCEDURES FOR CIRCUITS REQUIRING TERMINAL BALANCE

11.01 MFT 2-2 repeaters in combination with 837- or J99380-type impedance compensators may be used for circuits with terminal balance requirements. The following paragraphs describe the applications of 2-2 terminal repeaters on circuits requiring terminal balance.

11.02 Prescription settings for the repeaters (4240-type network and 309D equalizers) and the 837- or J99380-type networks are found in Section 332-912-212. It is important to note that special tables found in Section 332-912-212 must be used for MFT/837 network configurations.

11.03 If the cable make-up does not fit the tables, ie, bridged taps, or more than two-gauges, manual adjustment procedures must be used.

11.04 Manual lineup procedures for MFT/837 network configurations on nonloaded cable are given in Chart 12.



NOTES:

1. For each three times through this step, the 1 kHz gain must be readjusted to the level specified on the CLR.
2. Accessing step 11 twice without satisfactory results implies the facility cannot be properly equalized.

Chart 11—309D Equalizer Touch-up Procedures

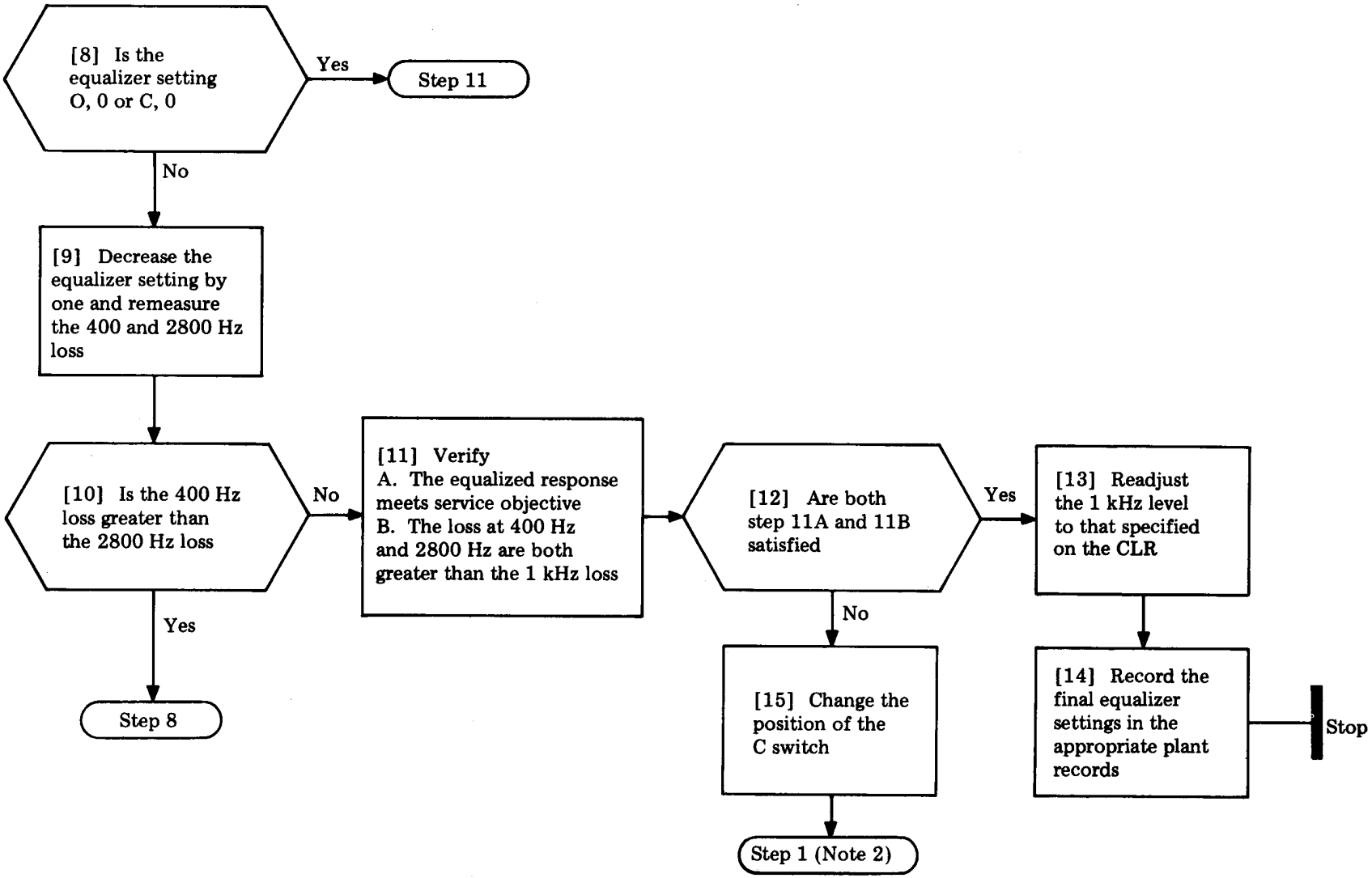


Chart 11—309D Equalizer Touch-up Procedures (Cont)

CHART 12

ADJUSTMENT OF J99343PB REPEATER AND 837D OR J99380AA NETWORK

STEP	PROCEDURE
1	If the facility does not fit the prescription setting tables, initial settings should be chosen using an equivalent gauge and length which most closely resembles the actual facility. (See Table X or Y; Section 332-912-212.)
2	Insert the 2-2 terminal (NL) repeater in the test extender.
3	Insert the cable extender card into the proper mounting slot.
4	Set the switches on the test extender as follows:

A-side	B-side
2W/4W or 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO OUT	COMP NET IN/OUT to OUT

5	Insert a 310 dummy plug into the T1R1 2W EQUIP jack on the B-side of the test extender to terminate the cable facility in 900 ohms + 2.15 μF.
6	To prevent the repeater from singing during adjustment of the 837D or J99380AA, disconnect the repeater.
7	Have the 837D or J99380AA settings optimized using the procedures in Section 332-205-500 or 311-100-551.
8	After obtaining satisfactory terminal balance on the drop side of the 837D or J99380AA: (a) Remove the 310 dummy plug from the test extender. (b) Reconnect the repeater. (c) Terminate the drop side of the 837D or J99380AA in the proper impedance (600 or 900 ohms + 2.15 μF).
9	Optimize the 4240B PBN using the procedures in Part 5 (Chart 3) of this section.
10	Determine the 309D equalizer settings using the procedures in Parts 7 and 8 (Charts 7 and 9) of this section.
11	After installing the equalizer settings, set the levels of the amplifier units using the procedures in Part 6 (Chart 6) of this section.
12	Insure that circuit requirements are met, and touch-up the 837D or J99380AA R potentiometer as required to improve the terminal balance.

11.05 The following procedure should be used for manual adjustment of the 2-2 terminal (L) repeater when used with 837A, B, E, F or G or J99380AB or AC networks.

CHART 13

ADJUSTMENT OF J99343PA, PG REPEATERS AND 837A, B, E, F, OR G OR J99380AB OR AC NETWORKS

STEP	PROCEDURE
1	Using equivalence procedures, choose the initial 4240A or 4240C network settings from Table Z, Section 332-912-212 for the facility which most nearly matches the actual facility.
2	If the end section length adjacent to the 837- or J99380-type network is known, its initial settings may be found in Sections 332-206-251 through 257.
3	If the end section length adjacent to the 837- or J99380-type network is unknown, the initial settings may be determined using the procedures in Section 332-205-500 or 311-100-552.
4	Insert the repeater into the test extender and the cable extender card into the mounting shelf.
5	Set the switches on the test extender as follows:

A-Side	B-Side
2W/4W to 2W	2W/4W to 2W
600/900 to 900	600/900 to 900
COMP NET IN/OUT TO OUT	COMP NET IN/OUT to OUT

6	Insert a 310 dummy plug into the T1R1 2W EQUIP jack on the B-side of the test extender to terminate the cable facility in 900 ohms + 2.15 μF.
7	To prevent the repeater from singing during adjustment of the 837- or J99380-type network, disconnect the repeater.
8	Optimize the 837- or J99380-type network settings using the procedures in Section 332-205-500 or 311-100-552.
9	After obtaining satisfactory terminal balance on the drop side of the 837- or J99380-type network: (a) Remove the 310 dummy plug from the test extender. (b) Reconnect the repeater. (c) Terminate the drop side of the 837- or J99380-type network in the proper impedance (600 or 900 ohms + 2.15 μF).

CHART 13 (Cont)

STEP	PROCEDURE
10	Optimize the 4240A or 4240C network using the procedures in Part 5 (Chart 2 or 3) of this section.
11	After adjusting the PBN and LBOC to their proper values, set the levels of the amplifier units using the procedures in Part 6 (Chart 6) of this section.
12	Insure that circuit requirements are met, and touch up the 837- or J99380-type network as necessary to improve the terminal balance.

12. REFERENCES

12.01 The following list of references contain additional information which may be helpful.

REFERENCE	TITLE
332-910-100	General Description of MFT
332-910-180	General Application Information for MFT
332-910-102	MFT Test Extender
332-912-111	2-2 Repeater Description
332-912-212	Prescription Settings for 2-2 Repeaters
SD-1C359-01	Metallic Facility Terminal Circuit
CD-1C359-01	Common Systems—Metallic Facility Terminal Circuit