J99343GG, L1 & L2 AND GK LOOP SIGNALING REPEATER/2-2 WIRE INTERMEDIATE REPEATER (L-NL) COMBINED FUNCTION UNIT INSTALLATION AND TESTING METALLIC FACILITY TERMINAL

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1. GENERAL

1.01 This section presents the installation testing and maintenance procedures for the MFT (metallic facility terminal) Loop Signaling Repeater (Loop Start Only)/2-2 Wire Intermediate/Terminal (Loaded-Nonloaded) Repeater ▶(J99343GG, L1 & L2) and the Loop Signaling Repeater/2-2 Wire Intermediate/Terminal Repeater (J99343GK)◀ CFUs (Combined Function Units).

1.02 This practice is being reissued to include the J99343GG, L2 and J99343GK 2-2 Wire Intermediate Repeaters (L-NL)/Loop Signaling Repeaters CFUs. Revision arrows are used to emphasize the more significant changes. The Equipment Test List is not affected. The specific reasons for reissue are listed as follows:

(a) To include the J99343GG, L2 and GK CFUs in the general information, installation, and testing parts of this practice

(b) To add Fig. 2 and 3 to illustrate the switch layout of the J99343GG, L2 and GK CFUs

(c) To delete reference to procedures as charts to comply with Standards

(d) To delete the part specifying additional references to comply with Standards.

1.03 The ▶J99343GG, L1 & L2 and GK CFUs, shown in Fig. 1, 2, and 3◀ provide gain and equalization for application between loaded (A-side) and nonloaded (B-side) facilities. These units also provide regeneration of loop start signals. With proper switch selection, they can be arranged to operate as 2-2 wire nonloaded terminal repeaters. More detailed descriptive information about these units is provided in Section 332-912-158. Prescription setting information for these units is given in Section 332-912-212 (2-2 wire repeaters).

2. INSTALLATION

A. Mounting Arrangements

2.01 The CFUs combine the functions of a transmission unit and a signaling unit on a single MFT plug-in. The CFUs can be used in either a single- or double-module MFT mounting arrangement. They can be mounted in any slot of a single-module shelf or in the transmission slot of a double-module shelf. In double-module applications, the companion signaling unit slot must be vacant. Section 332-910-101 contains additional information on MFT mounting arrangements.

Note: On early versions of some MFT double-module frames, ringing and talk battery may not be available in the transmission slot. Strap wires may need to be added from the signaling slot. Ringing should be connected from pin J2-7 (SU) to J1-30 (TU) and talk battery from pin J2-20 (SU) to pin J1-20 (TU).

B. Unit Controls

2.02 Figures 1 through 3 show the location of the individual unit controls. These controls must be set properly prior to the installation of the units. The settings are determined by circuit application and are to be supplied by the local circuit layout organization. This organization can use the following sources to provide this information:

- 332-912-158—Descriptive Section
- 332-912-212—(2-2 wire repeaters) Prescription Setting Section
- Universal Cable Circuit Analysis Program (UNICCAP)
- Standard design engineering sections (851-Division).

The manual procedures provided in this section are also used to obtain unit control settings.

2.03 The switches for a particular function are operated when pressed or depressed toward the respective designation on the switch. Part 4 of this section provides procedural information to aid in setting the various controls of the ◗J99343GG, L1 & L2 and GK◖ units.

3. APPLICATION GUIDELINES

A. Transmission Objectives

3.01 Transmission levels of 2-wire circuits are limited by two factors: crosstalk and stability. Separate objectives are given for satisfactory stability and crosstalk performance.

3.02 For stability considerations, the maximum allowable gain at 1 kHz across the ◗J99343GG, L1 & L2 and GK◖ CFUs is 12 dB in intermediate application and 6 dB in terminal applications. This gain is not the maximum available with these units since they are capable of producing more than 12 dB of gain for some equalizer and gain settings.

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

(a) Maximum output = +6 dB (TLP)

(b) Minimum Input Level = −9 dB (TLP).

3.04 The levels in the previous two paragraphs are based on the assumption that the CFUs are located in the CO (central office). The CFUs are not recommended for installation at customer locations due to repeater balance requirements which are better maintained at central offices. Also the impedance of most PBXs (considered to be 600 ohms +2.15 μF) does not match that of the J99343GG, L1 & L2 or GK CFUs (900 ohms +2.15 μF).

3.05 Roll-off objectives at 400 and 2800 Hz for the ◗J99343GG, L1 & L2 and GK◖ CFUs are shown in Table A. It is recommended, but not required, that the roll-off at 400 and 2800 Hz for both lines and trunks be greater than the 1-kHz loss.

3.06 The following facility characteristics are necessary for an MFT circuit to meet trunk requirements for roll-off. Since trunk requirements are more stringent than line requirements, the following facility characteristics will guarantee that line requirements are met also.

- When the unit is used in an intermediate application, the maximum 1-kHz facility loss on both sides of the unit is 15 dB with a maximum of 9 dB on one side.
- When the unit is used in a terminal application, the maximum 1-kHz facility loss is 9 dB.

To meet trunk objectives, the facility should also meet the following specifications:

- Central office end section length 1500 to 4500 feet.
- Customer end section length 3000 to 9000 feet including bridge tap.
- At least two loading coils with spacing 6000 ± 120 feet.

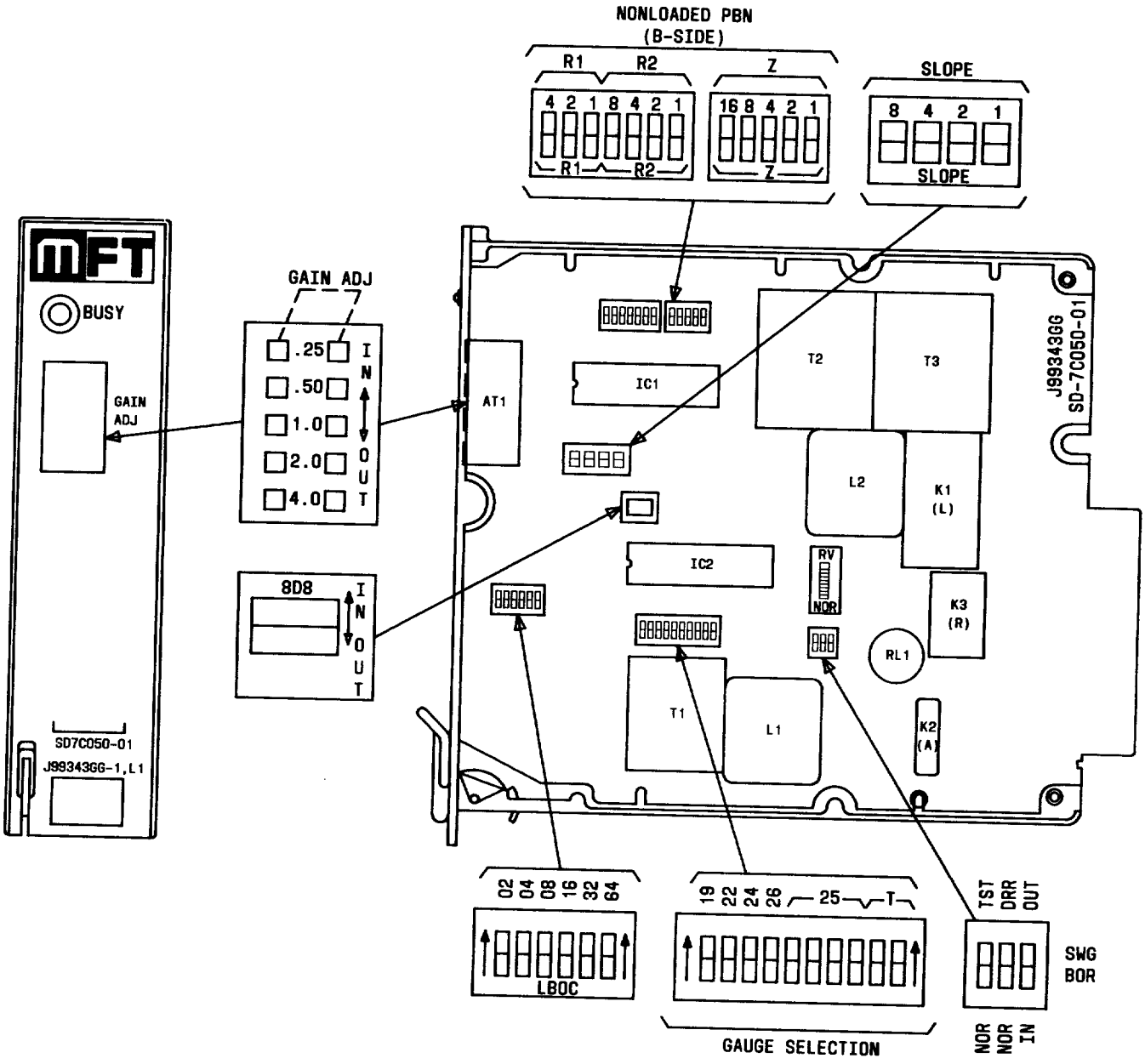


Fig. 1—J99343GG, L1 Switch Layout

- The nonloaded facility should not contain any load coils.
- The nonloaded facility should meet resistance design rules as described in Section 902-115-101.

3.07 For circuits which include a single CFU in the 2-wire facility, the equalization is on an end-to-end basis. Equalization should meet objectives outlined in paragraph 3.05.

3.08 Application guidelines for the ▶J99343GG, L1 & L2 and GK◀ CFUs are given in the descriptive Section 332-912-158.

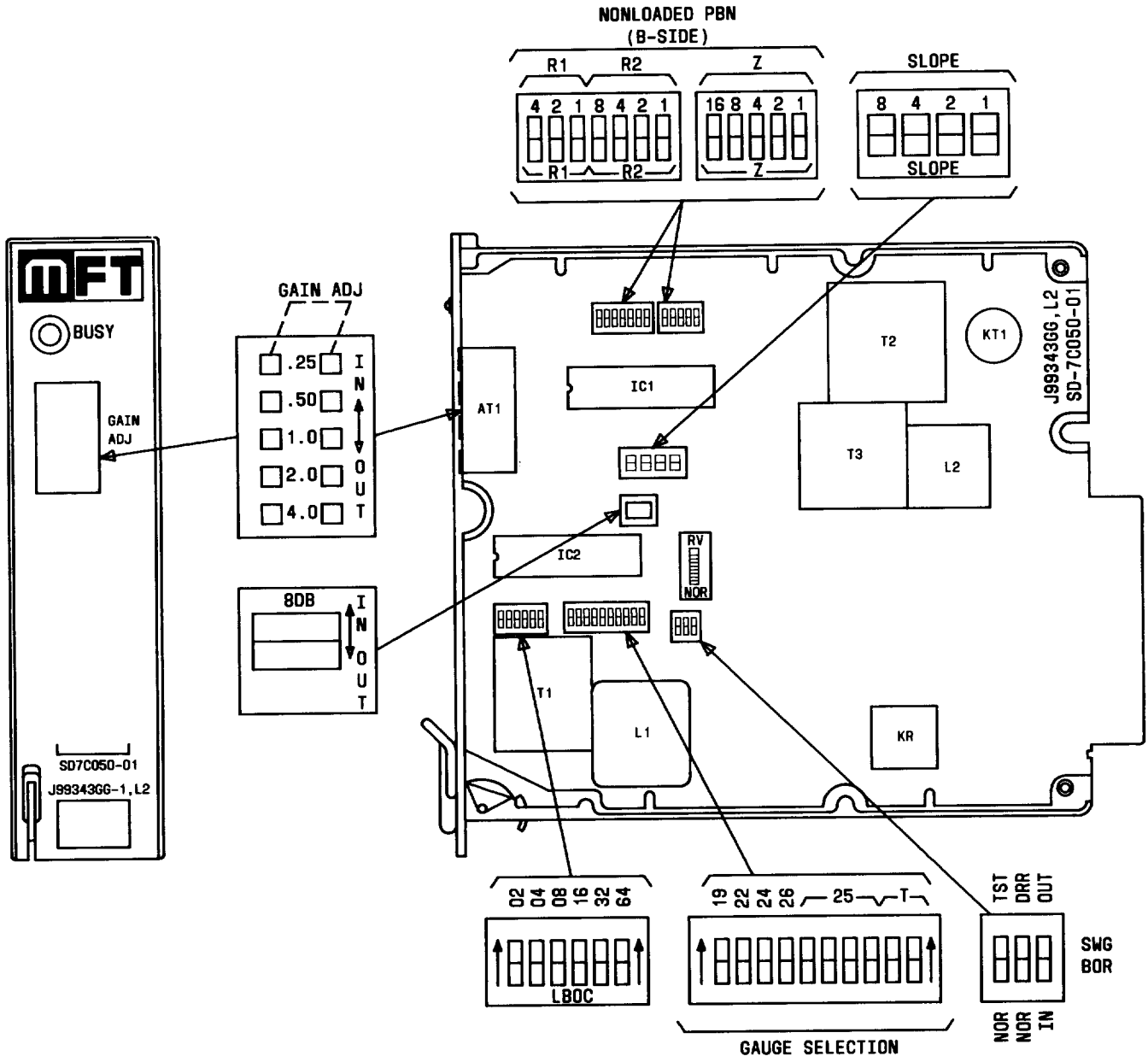
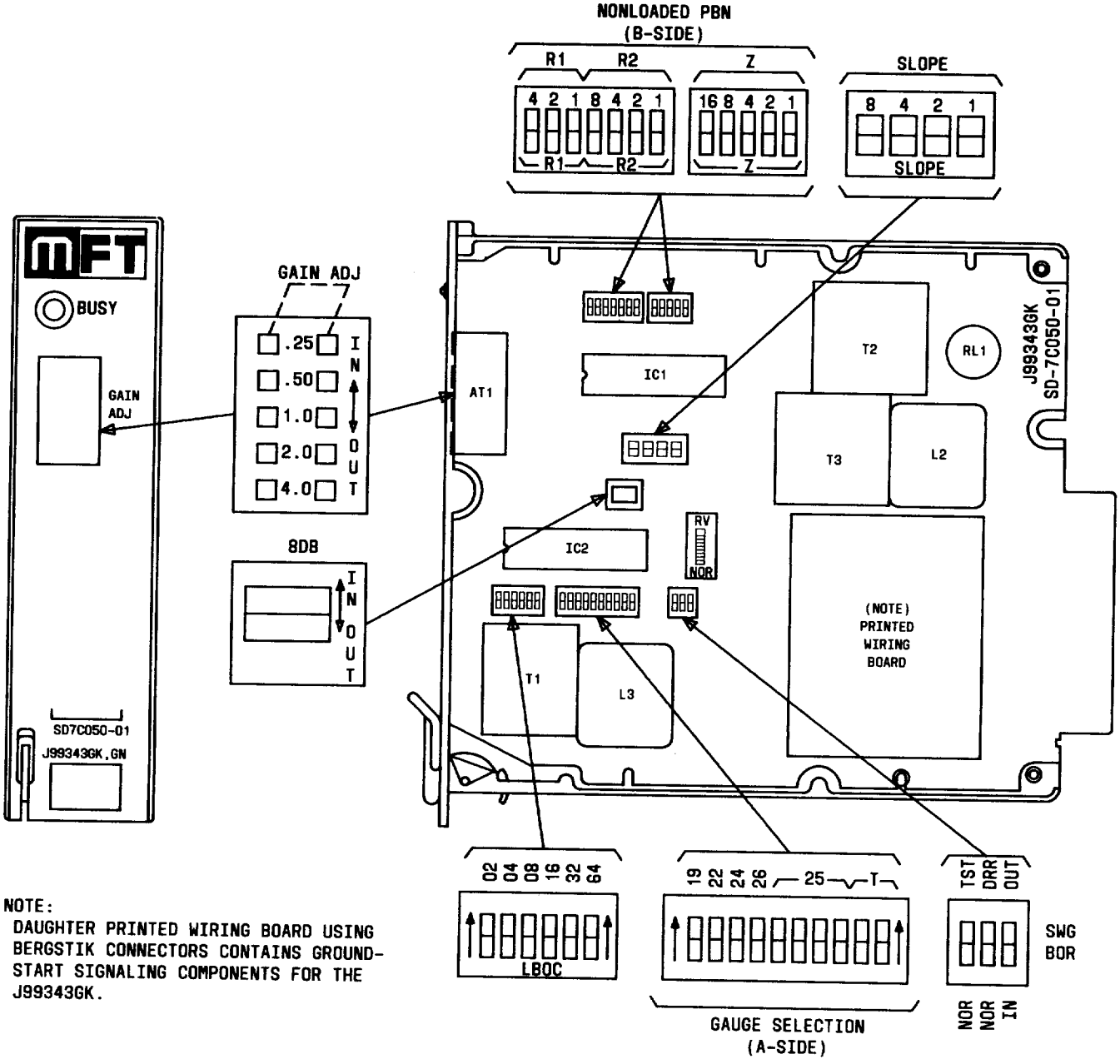


Fig. 2—J99343GG, L2 Switch Layout

B. Terminal Repeater Application

3.09 The ▶J99343GG, L1 & L2 and GK CFUs◀ are primarily intended for use as 2-2 wire intermediate (loaded to nonloaded) repeaters. However, these units also provide a switch-selectable option which allows them to operate with 900-ohm terminal equipment on the A-side. With the two T switches operated and the other GAUGE and LBOC switches nonoperated, the J99343GG, L1 & L2 and GK CFUs provide balance to 900-ohm in series with 2.15-microfarads equipment on the A-side.



NOTE:
DAUGHTER PRINTED WIRING BOARD USING BERGSTIK CONNECTORS CONTAINS GROUND-START SIGNALING COMPONENTS FOR THE J99343GK.

Fig. 3—J99343GK Switch Layout

TABLE A

ATTENUATION DISTORTION ROLL-OFF OBJECTIVES FOR VOICEGRADE SWITCHED SPECIAL SERVICES CIRCUITS

CIRCUIT	ALLOWABLE DEVIATION FROM 1000-HZ LOSS	
	MEASURED AT 400 HZ (NOTE)	MEASURED AT 2800 HZ (NOTE)
Trunks	Within 3.0 dB more loss or 1.0 dB less loss	Within 4.5 dB more loss or 1.0 dB less loss
Lines	Within 5.0 dB more loss or 1.0 dB less loss	Within 7.5 dB more loss or 1.0 dB less loss

Note: Relative to 1-kHz loss

4. TESTS AND ADJUSTMENTS—ALIGNMENT SEQUENCE

4.01 Figure 4 provides a flowchart which presents the overall process for setting up the J99343GG, L1 & L2 and GK CFUs. This flowchart should be followed when using this practice to install these units. Parts 5 through 12 of this practice supplement Fig. 4 where additional information is required to perform the individual transmission tests while Part 13 gives similar information for setting the signaling section of the CFU.

5. PROCEDURES FOR CIRCUITS REQUIRING TERMINAL BALANCE

5.01 The ▶J99343GG, L1 & L2 and GK◀ CFUs in combination with the 837, J99380 or J99343 types of impedance compensators may be used for circuits with terminal balance requirements. When used in this arrangement, the 837D, J99380AA or J99343BL settings should be optimized using the procedure in Sections 332-205-500 (837D and J99380AA) or 332-912-206 (J99343BL).

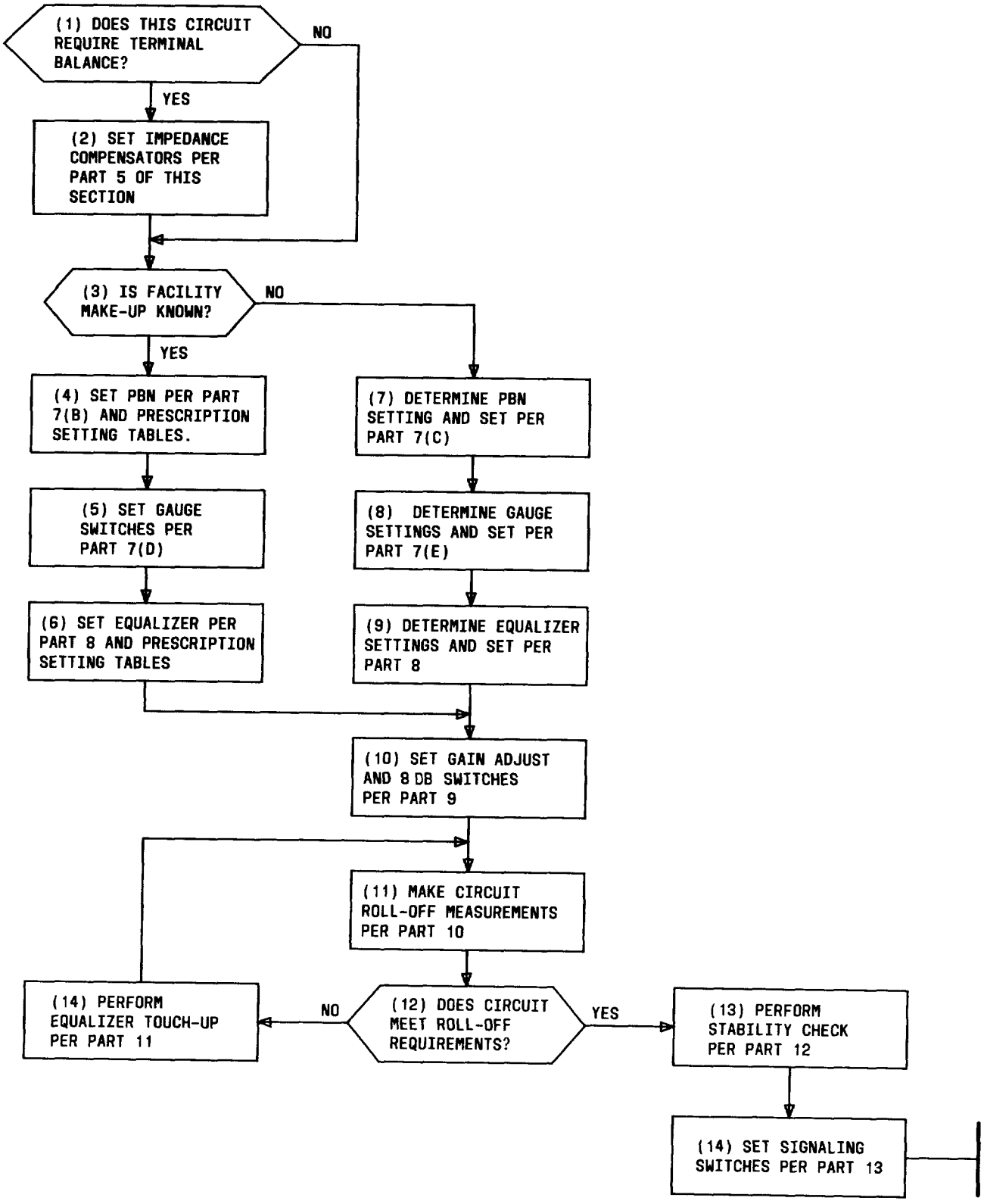


Fig. 4—Transmission Alignment Sequence Flowchart

6. ADJUSTMENT OF LBOC (LINE BUILD-OUT CAPACITORS) — A-SIDE

6.01 The ◗J99343GG, L1 & L2 and GK◖ CFUs have an LBOC on the A-side for interfacing loaded cable. The LBOC builds out the A-side H88 loaded cable end section to an electrical equivalent of 6000 feet from the unit to the first loading coil. The LBOC must be set prior to adjusting the balancing network of the canceler hybrids.

6.02 The LBOC settings of the J99343GG, L1 & L2 and GK CFUs are controlled by six miniature switches (see Fig. 1 through 3) on the printed wiring board. These switches are labeled 02, 04, 08, 16, 32, and 64. The numbers indicate the capacitance value added when the switches are operated toward their labeled designations. For example, the switch labeled 04, when operated, applies 0.004 μF of capacitance across the 2-wire facility on the A-side. The capacitance of the LBOC is additive; for example, if the switches labeled 02, 06, and 16 are operated, 0.024 μF of capacitance is added to the A-side facility.

6.03 Table B gives the LBOC settings for near-end sections from 1500 to 4500 feet.

LBOC CALCULATIONS

6.04 For end-section lengths not listed in Table B, the required capacitance value can be calculated. Two formulas are given for calculation of the capacitance value required, one for high-capacitance (0.083 μF/mile) cable and one for low-capacitance (0.064 μF/mile) MAT® trunk cable. These formulas are:

(a) High-capacitance (19, 22, 24, 26)

$$C = 0.016\ (6\text{-}N)$$

(b) Low-capacitance (MAT)

$$C = 0.002 + 0.0122\ (6\text{-}N)$$

Where: C is the capacitance in microfarads,
N is the length of the near-end section in kilofeet.

7. ADJUSTMENT OF BALANCING NETWORKS

A. General

7.01 The procedures in this section cover the adjustments for balancing networks of the ◗J99343GG, L1 & L2 and GK◖ CFUs.

7.02 The ◗J99343GG, L1 & L2 and GK◖ CFUs contain two types of balancing networks, a canceler hybrid on the A-side facing the loaded facility and a two-transformer hybrid with a PBN (precision balance network) on the B-side facing the nonloaded facility. The following paragraphs discuss the adjustment of the canceler hybrid GAUGE switches and the PBN of the transformer hybrid.

Test Equipment

7.03 In applications where the makeup of the loaded or nonloaded facility is not known, the following test equipment is required to determine the GAUGE or PBN settings:

- J99343TB test extender
- RLMS (return loss measuring set), KS-20501, List 3 or equivalent
- Office record sheet (circuit layout card, or equivalent) to record new settings
- Various termination networks.

B. PBN Setting (B-Side)

7.04 Adjustment of the PBN for the transformer hybrid on the B-side is done through the operation of 12 switches located on the printed wiring board. The switches are labeled as follows: three switches labeled R1 (designated 4,2,1); four switches labeled R2 (designated 8,4,2,1); and five switches labeled Z (designated 16,8,4,2,1 [see Fig. 1 through 3]). If the B-side facility makeup is known, the PBN setting can be determined from one of the sources given in paragraph 2.02.

C. Manual Procedures for Adjustment of Precision Balance Network

7.05 In applications where the nonloaded facility is not known or if the facility makeup is known and the circuit does not perform satisfactorily with

TABLE B

LBOC SETTINGS (NOTE)

END-SECTION LENGTH (FEET)	CAPACITANCE VALUE HI-CAP	SWITCHES OPERATED TO "ON"	CAPACITANCE VALUE MAT	SWITCHES OPERATED TO "ON"
1450 — 1549	.072	08,64	.058	02, 08, 16, 32
1550 — 1649	.070	02, 04, 64	.056	08, 16, 32
1650 — 1749	.068	04, 64	.054	02, 04, 16, 32
1750 — 1849	.068	04, 64	.054	02, 04, 16, 32
1850 — 1949	.066	02, 64	.052	04, 16, 32
1950 — 2049	.064	64	.052	04, 16, 32
2050 — 2149	.062	02, 04, 08, 16, 32	.050	02, 16, 32
2150 — 2249	.060	04, 08, 16, 32	.048	16, 32
2250 — 2349	.060	04, 08, 16, 32	.048	16, 32
2350 — 2449	.058	02, 08, 16, 32	.046	02, 04, 08, 32
2450 — 2549	.056	08, 16, 32	.046	02, 04, 08, 32
2550 — 2649	.054	02, 04, 16, 32	.044	04, 08, 32
2650 — 2749	.052	04, 16, 32	.042	02, 08, 32
2750 — 2849	.052	04, 16, 32	.042	02, 08, 32
2850 — 2949	.050	02, 16, 32	.040	08, 32
2950 — 3049	.048	16, 32	.040	08, 32
3050 — 3149	.046	02, 04, 08, 32	.038	02, 04, 32
3150 — 3249	.044	04, 08, 32	.036	04, 32
3250 — 3349	.044	04, 08, 32	.036	04, 32
3350 — 3449	.042	02, 08, 32	.034	02, 32
3450 — 3549	.040	08, 32	.034	02, 32
3550 — 3649	.038	02, 04, 32	.032	32
3650 — 3749	.036	04, 32	.030	02, 04, 08, 16
3750 — 3849	.036	04, 32	.030	02, 04, 08, 16
3850 — 3949	.034	02, 32	.028	04, 08, 16

TABLE B (Contd)

LBOC SETTINGS (NOTE)

END-SECTION LENGTH (FEET)	CAPACITANCE VALUE HI-CAP	SWITCHES OPERATED TO "ON"	CAPACITANCE VALUE MAT	SWITCHES OPERATED TO "ON"
3950 — 4049	.032	32	.026	02, 08, 16
4050 — 4149	.030	02, 04, 08, 16	.026	02, 08, 16
4150 — 4249	.030	02, 04, 08, 16	.024	08, 16
4250 — 4349	.028	04, 08, 16	.024	08, 16
4350 — 4449	.026	02, 08, 16	.022	02, 04, 16
4450 — 4549	.024	08, 16	.020	04, 16

Note: When replacing a 2-2 wire MFT repeater containing a transformer hybrid(s) interfacing loaded cable with the J99343GG, L1 & L2 and GK CFUs, the LBOC value of the replaced repeater will be reduced by 0.008 μF when LBOC settings are used with high-capacitance loaded cable and .006 μF when used with low-capacitance H88 MAT cable. For example: a 2-2 MFT repeater having an LBOC value of 0.080 with a transformer hybrid interfacing with high-capacitance loaded cable is being replaced with the J99343GG, L1, L2 or GK CFU. The new LBOC value will be 0.072 μF.

prescribed settings, optimized PBN settings can be determined by performing the following procedure and steps in Fig. 5. A typical test configuration for setting the B-side PBN is shown in Fig. 6.

STEP	PROCEDURE
1	Terminate the B-side 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 +2.16 μF) should be used. If the far end terminates in a telephone set, use a 4066H network (Section 332-852-108) to simulate the telset.
2	Insert the repeater under adjustment into the J99343TB test extender. Plug the cable extender card of the J99343TB into the appropriate shelf mounting slot.
3	Set the repeater options as follows: (a) SLOPE equalizer switches — all switches to off. (b) A-side LBOC switches — all switches to off. (c) Signaling options as specified on CLR (NOR/RV). (d) TST/NOR switch to TST position. (e) Gain switches to approximately midrange. This is done to improve the sensitivity of the measurements; the gain settings are not critical. (f) All gauge switches to off. (g) The two T-switches to on.
4	Set switches on the J99343TB test extender as follows (see Note).

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 OUT (see Note).

Note: The COMP NET IN/OUT switch on the test extender does not affect the A-side canceler circuit. Therefore, T switches on the J99343GG, L1 & L2 and GK repeaters must be operated to provide a 900-ohm compromise network to match 900-ohm test equipment. (All the other GAUGE switches must not be operated.)

STEP	PROCEDURE
5	Set the switches on the KS-20501, List 3 RLMS as follows: (a) TEST LOCATION to 900-2W (b) NETWORK to INT. ***Note:*** Section 103-106-115 provides operating information on the KS-20501, List 3 RLMS.
6	Connect the TRMT jack (2-wire) of the RLMS to the A-side 2W EQUIP jack on the J99343TB test extender to set a B-side network. See Fig. 6 for test configuration.
7	Follow steps of Fig. 5 for adjustment of the PBN.

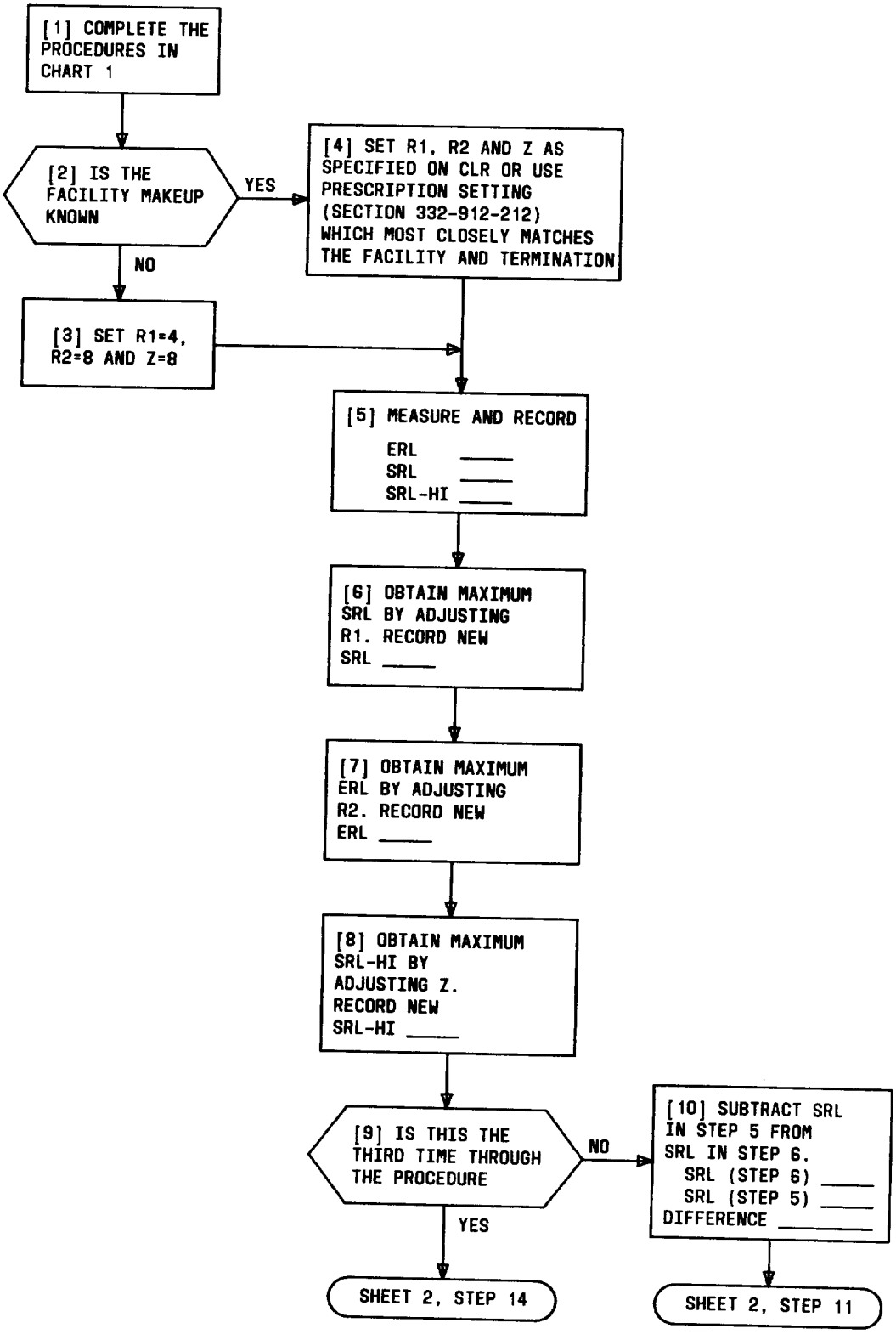


Fig. 5—Procedures for Adjustment of the B-Side PBN (Sheet 1 of 2)

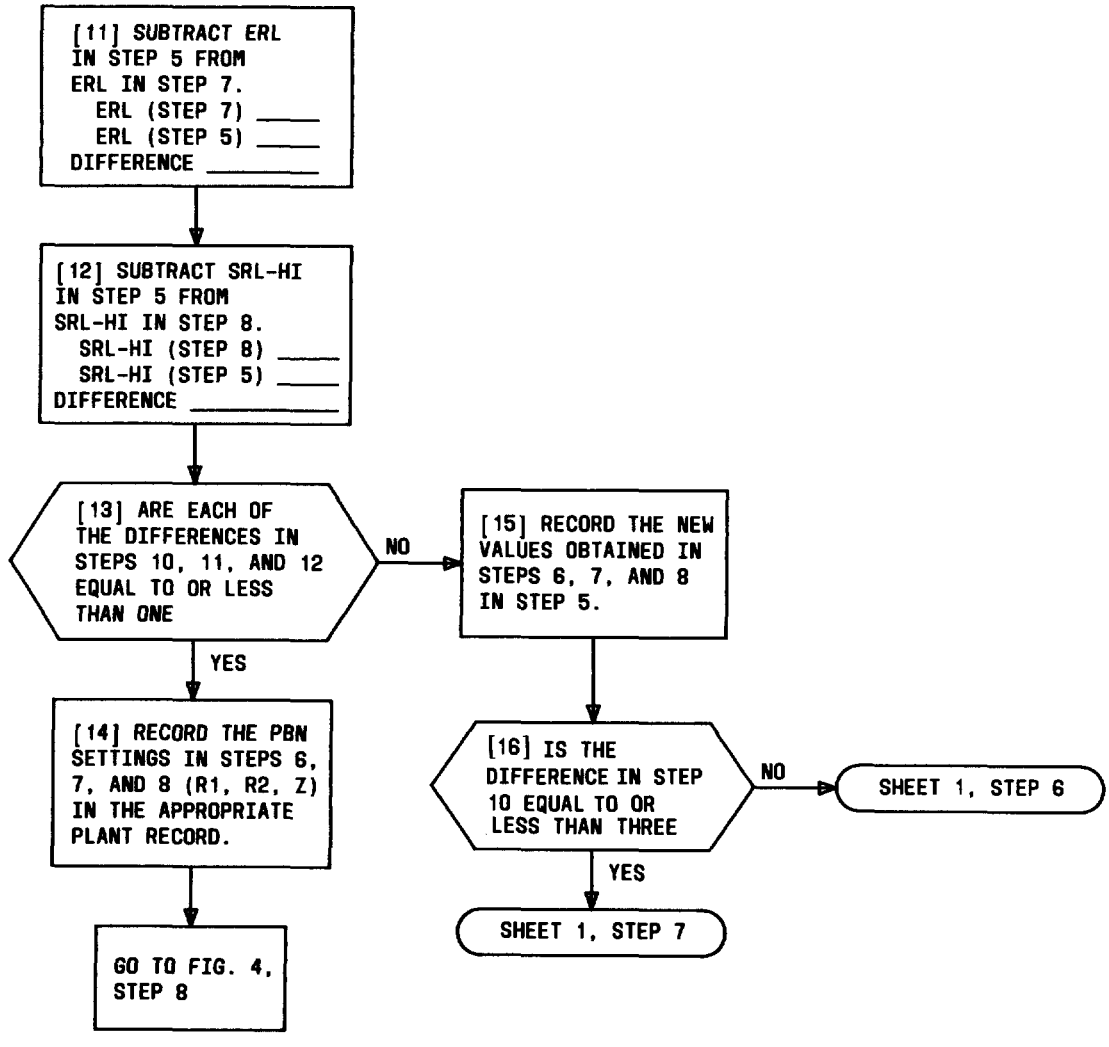
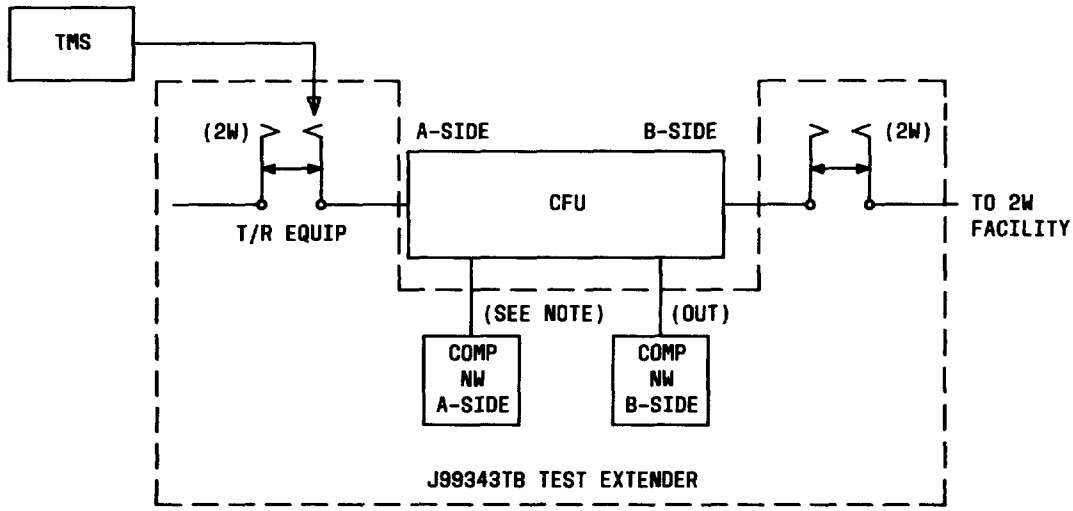


Fig. 5—Procedures for Adjustment of the B-Side PBN (Sheet 2 of 2)



NOTE:
THERE IS NO ACCESS FOR THE COMP NETWORK ON THE A-SIDE. THE "T" SWITCHES ON THE CABLE GAUGE SWITCH PAD MUST BE OPERATED TO IMPEDANCE MATCH 900Ω + 2.15 μF EQUIPMENT

Fig. 6—Typical Test Configuration for Setting B-Side PBN

D. Gauge Settings (A-Side)

7.06 Adjustment of the balancing network of the canceler hybrid on the loaded facility side (A-side) of the J99343GG L1, L2 and GK CFU is controlled by ten miniature switches located on the printed wiring board. Four of these switches are labeled 19, 22, 24, and 26; four are collectively labeled 25 and two are labeled T. The numbers correspond to the gauge of cable connected to the A-side of the CFU. Only one gauge setting should be selected for each application. To set the unit for 25-gauge MAT cable, all four switches labeled 25 must be operated toward the 25 designation. In mixed gauge applications, the GAUGE switch(es) should be set to match the predominant gauge. The predominant gauge can be determined by the following rules:

(a) If the gauge adjacent to the CFU is 2000 feet or less in length, set the GAUGE switch(es) to the gauge of the distant cable.

(b) If the adjacent gauge is 6000 feet or more, set the switch(es) to the adjacent gauge.

(c) If the adjacent gauge is between 2000 and 6000 feet, set the switch(es) to the longest gauge in the facility.

E. Manual Procedure for Adjustment of the Gauge Switches

7.07 In applications where the makeup of the A-side loaded facility is not known, or if the facility makeup is a known mixed gauge and the circuit does not perform satisfactorily, optimized GAUGE switch settings can be determined by performing the following procedure and steps in Fig. 7. A typical test configuration for setting the A-side balance network is shown in Fig. 8.

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 + 2.16 μF) should be used. If the far end terminates in a telephone set, use a 4066H network (Section 332-852-108) to simulate the telset.
2	Insert the repeater-under-adjustment into the J99343TB test extender. Plug the cable extender card of the J99343TB into the appropriate shelf mounting slot.
3	Set the repeater options as follows: (a) Slope equalizer switches—all switches to off. (b) Signaling options as specified on CLR (NOR/RV). (c) TST/NOR switch to TST position. (d) Gain switches to approximately midrange. ***Note:*** This is done to improve the sensitivity of the measurements; the gain settings are not critical. (e) T-switches to off.
4	Set switches on the J99343TB test extender as follows: **A-Side**: 600/900 to 900; 2W/4W to 2W; COMP NET IN/OUT to OUT **B-Side**: 600/900 to 900; 2W/4W to 2W; COMP NET IN/OUT to IN
5	Set the switches on KS-20501, List 3 RLMS as follows (see Note): (a) Test location to 900-2W (b) Network—INT. ***Note:*** Section 103-106-115 provides operating information on the KS-20501, List 3 RLMS.
6	Connect the TRMT jack (2-wire) of the RLMS to the B-side 2W EQUIP jack on the J99343TB test extender to set the A-side network. See Fig. 8 for test configuration.
7	Go to Fig. 7 for adjustment of the A-side GAUGE and LBOC switches.

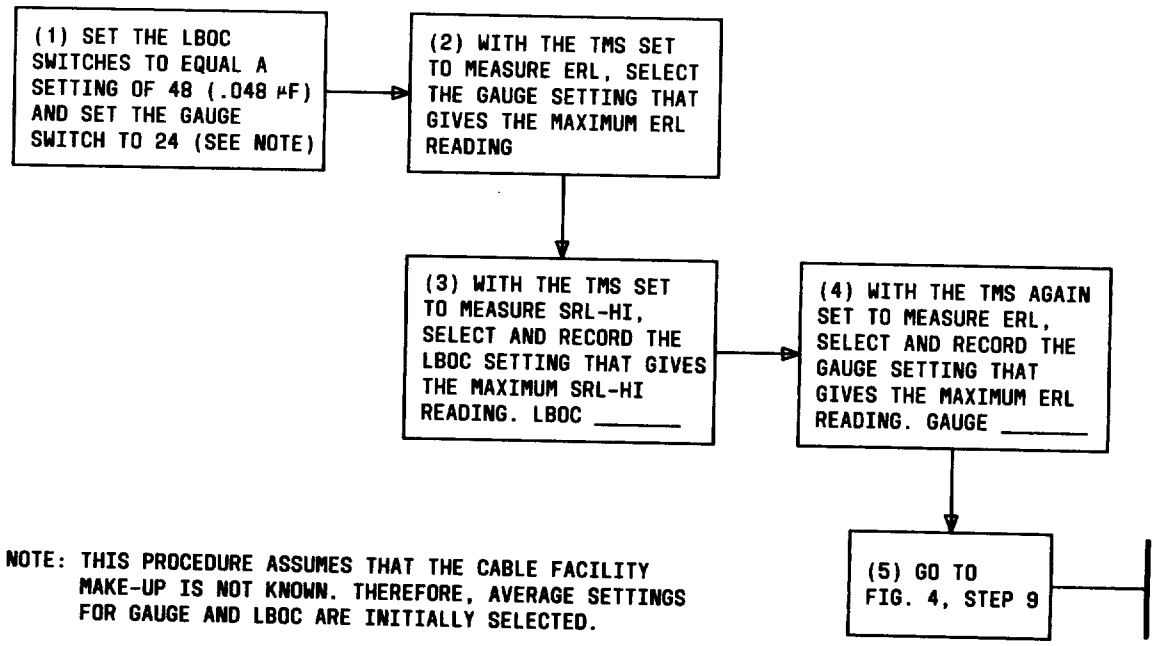


Fig. 7—Procedure for Determining Optimum Gauge and LBOC Settings When the A-Side Loaded Facility Makeup is Not Known

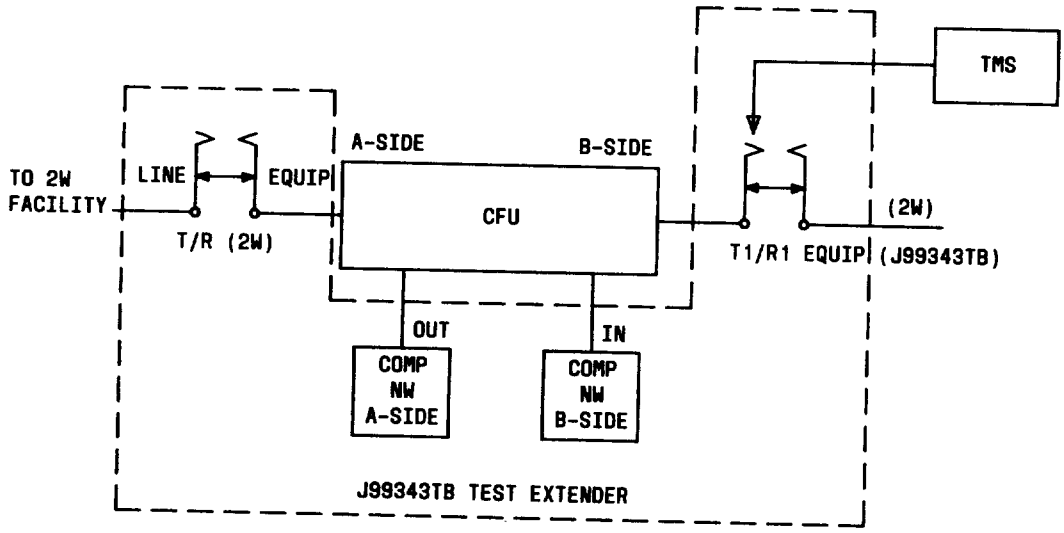


Fig. 8—Typical Test Configuration for Setting A-Side Gauge Switches

8. EQUALIZER SETTINGS FROM FREQUENCY RESPONSE MEASUREMENTS

A. General

8.01 The information and procedures in this part are provided as a manual method to determine the ◗J99343GG, L1 & L2 and GK◖ equalizer settings. These procedures are normally used when equalizer settings cannot be determined from any other source, such as the prescription setting tables (332-912-212) or any of the various mechanized provisioning systems such as TIRKS (Trunk Integrated Record Keeping System) or UNICCAP.

8.02 Cable loss information to calculate the equalizer settings is obtained from the frequency response measurement procedure. Figure 9 is a typical test configuration for obtaining the frequency response measurements and the procedure is given in Part 8B. Once the 400-, 1000-, and 2800-Hz cable loss has been determined, this information should be recorded in Step 1 of Fig. 10. The flowchart (Fig. 10) provides the procedure for determining the equalizer settings. An example of a calculation is also provided.

B. Frequency Response Measurements

8.03 Figure 9 is the typical test configuration for making frequency response measurements on the J99343GG, L1 & L2 and GK repeaters. The following equipment is required for these measurements:

(a) Transmitting location: oscillator with selectable 600- and 900-ohm output impedances and variable frequency selection for 400, 1000, and 2800 Hz

(b) Receiving location: transmission measuring set (detector) with 600- or 900-ohm input impedance

(c) Intermediate location: J99343TB test extender.

Once the levels at 400, 1000, and 2800 Hz have been obtained, they should be recorded in Step 1 of Fig. 10.

STEP	PROCEDURE
	At the Transmitting Location:
1	Connect the oscillator to the cable facility and set the oscillator impedance as follows:

TERMINATING EQUIPMENT	IMPEDANCE
Central Office	900 ohms
600-ohm PBX	600 ohms
900-ohm PBX	900 ohms
Station Set	600 ohms

	At the Receiving Location:
2	Connect the TMS (transmission measuring set) to the line with the input impedance determined by the receiving location (see list in Step 1).
	At the Intermediate Location:
3	Insert the CFU into test extender and insert test extender into the CFU shelf location slot.

STEP	PROCEDURE
4	Set the repeater-under-adjustment as follows: (a) Equalizer switches to OFF (b) PBNs to proper values per CLR or as determined in Part 7 of this section (c) All gain switches to OUT (d) LBOC to its final value (e) Signaling options (NOR/RV) as specified on CLR (f) TST/NOR switch to TST.
5	Set the J99343TB 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	Send 1-kHz tone at 0 dBm and adjust amplifier gain until receiving location receives −5 dBm.
7	Next, send 400 Hz at 0 dBm and record the level read at the receiving location.
8	Finally, send 2800 Hz at 0 dBm and record the level read at the receiving location.
9	For calculation of equalizer settings, record the received levels for 400, 1000, and 2800 Hz in Step 1 of Fig. 10.

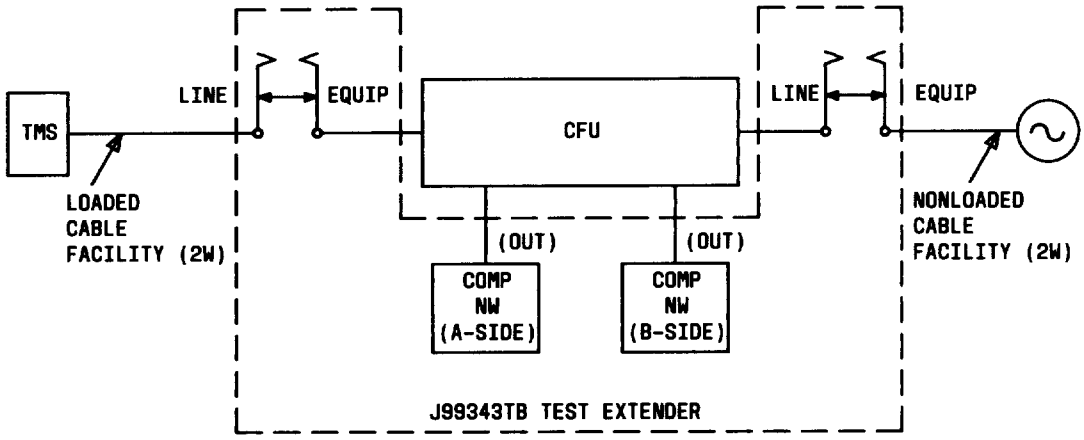


Fig. 9—Typical Test Configuration for Frequency Response Measurements

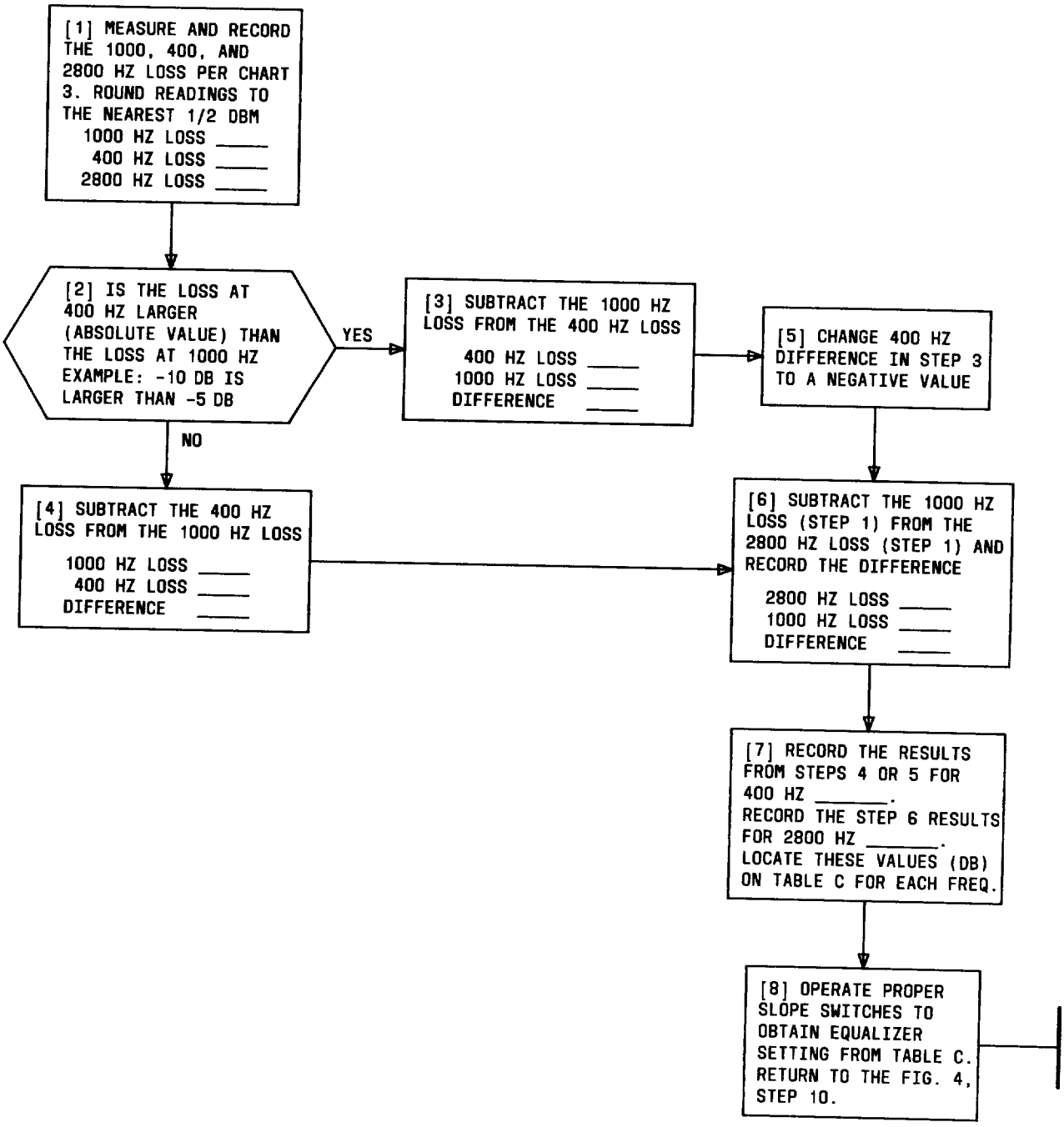


Fig. 10—Obtaining Equalizer Settings by Measurement

8.04 The following is an example of using the procedures in Fig. 10 for obtaining equalizer settings by measurement:

Example: Tests level is 0 dBm at 1 kHz.

Step 1. Measure and record the 1000-, 400-, and 2800-Hz loss from Part 8B and round off to the nearest 0.5 dB.

1000-Hz loss 5.0

400-Hz loss 3.5

2800-Hz loss 13.5

Step 2. Is the loss at 400-Hz larger (absolute value) than the loss at 1000-Hz? No, go to Step 4.

Step 4. Subtract the 400-Hz loss from the 1000-Hz loss.

1000-Hz loss 5.0

400-Hz loss 3.5

400-Hz Difference 1.5

Step 6. Subtract the 1000-Hz loss (Step 1) from the 2800-Hz loss (Step 1) and record the difference.

2800-Hz loss 13.5

1000-Hz loss 5.0

2800-Hz Difference 8.5

Step 7. 400-Hz Difference 1.5

2800-Hz Difference 8.5

Equalizer setting

from Table C = 14

Step 8. Set SLOPE switches 2, 4, and 8.

9. GAIN ADJUSTMENT

9.01 The total gain provided by the ◗J99343GG, L1 & L2 and GK◖ CFUs is the combination of the gain contribution by the amplifier and equalizer units. In order to determine the setting of the gain switches (GAIN ADJ and 8 dB), the equalizer settings must be determined (Part 8). Once the equalizer setting has been determined, Table D gives the 1-kHz gain associated with that equalizer setting. The equalizer gain should then be subtracted from the total gain to be provided by the J99343GG, L1 & L2 and GK CFUs. The difference in the total and equalizer gain is the gain to be provided by the amplifier unit.

9.02 Once the amplifier gain has been determined, the appropriate GAIN ADJ and 8-dB switches must be set. The GAIN ADJ switches, accessible through the front panel, are labeled .25, .5, 1.0, 2.0, and 4.0. These switches are additive and provide gain from 0 through 7.75 dB in 0.25 dB increments. They are also ganged to provide the same gain in each direction of transmission. The 8-dB switches, located on the component board can provide 8 dB of additional gain in each direction.

Note: For crosstalk considerations, the maximum gain provided by the CFU is 12 dB.

9.03 Once the gain setting has been determined, refer to Fig. 4, Step 11, and complete the alignment sequence.

10. ATTENUATION DISTORTION ROLL-OFF MEASUREMENT

A. General

10.01 This part provides the procedure for checking any circuit against given roll-off objectives. The J99343GG, L1 & L2 and GK CFUs can be used in various types of circuits with different roll-off objectives. These CFUs are typically used in voicegrade special service circuits. The roll-off objectives for these circuits are given in Table A (Part 3).

B. Attenuation Distortion Roll-Off Measurement

10.02 The following procedure is very similar to the frequency response measurement given in Part 8. For this reason, the test configuration given in Fig. 9 and associated test equipment (paragraph 8.03) are the same for the roll-off measurements.

TABLE C

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	1	1	2	2	3	3	4	4	5	6	7	7	7	7	7	8	9	9	10	11	12	13	14					
− .5	0	0	1	1	2	2	3	3	4	4	5	6	7	7	8	9	9	9	9	10	11	11	12	13	15	15					
0	0	1	1	2	2	3	3	4	4	5	6	7	7	8	9	10	11	11	11	11	12	13	14	15							
.5					3	3	4	4	5	6	7	7	8	9	10	11	12	13	13	13	13	15	15	15							
1.0								5	6	7	7	8	9	10	11	12	14	15	15	15	15	15	15	15							
1.5								6	7	7	8	9	10	11	12	14	15	15	15	15			15	15							
2.0										8	9	10	11	12	14	15	15	15	15	15											
2.5											10	11	12	14	15	15	15	15	15	15											
3.0												12	14	15	15	15	15	15	15	15											
3.5												14	15	15	15	15	15	15	15	15											
4.0																															
4.5																															
5.0																															
5.5																															
6.0																															

MEET ***TRUNK*** REQUIREMENTS | MEET ***LINE*** REQUIREMENTS

TABLE D

EQUALIZER GAIN AT 1 KHZ

SWITCH SETTING	EQUALIZER GAIN
0	0
1	+0.2
2	+0.5
3	+0.8
4	+1.2
5	+1.5
6	+1.9
7	+2.3
8	+2.7
9	+3.1
10	+3.6
11	+4.0
12	+4.4
13	+4.7
14	+5.1
15	+5.5

STEP	PROCEDURE

At the Transmitting Location:

1 Connect the oscillator to the cable facility and set the oscillator impedance as follows:

TERMINATING EQUIPMENT	IMPEDANCE
Central Office	900 ohms
600-ohm PBX	600 ohms
900-ohm PBX	900 ohms
Station Set	600 ohms

STEP	PROCEDURE

At the Receiving Location:

2 Connect the TMS (transmission measuring set) to the line with the input impedance determined by the receiving location (see list in Step 1).

At the Intermediate Location:

3 Insert the CFU into test extender and insert test extender into the CFU shelf location slot.

4 Set the repeater-under-test as follows:

(a) Equalizer switches to value per CLR or as determined in Part 8

(b) PBNs to proper values per CLR or as determined in Part 7

(c) GAIN ADJ and 8 dB to value on CLR or as determined in Part 9

(d) LBOC to value on CLR or as determined in Part 6

(e) Signaling options (NOR/RV) as specified on CLR

(f) TST/NOR switch on TST.

5 Set the J99343TB 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 Send a 1-kHz tone at the transmitting location and verify the receive location is receiving the specified level. If the appropriate level is not received, readjust the gain switches to obtain the correct level.

7 Next, readjust the generator at the transmitting location to the specified frequencies and levels for the roll-off requirement. If the roll-off requirements are not met, go to the equalizer touch up procedure (Part 11) of this section; otherwise, go to the stability check in Part 12.

11. GUIDELINES FOR EQUALIZER TOUCH-UP

11.01 These touch-up procedures assume that the initial equalizer settings were determined and did not meet roll-off objectives (Part 10).

11.02 When the procedure calls for increasing or decreasing the equalizer setting, it refers to the numerical sum of the operated switches.

11.03 All measurements in the procedures are end-to-end as in Part 10 and Fig. 9.

11.04 Over equalization at either high or low frequencies could cause the circuit to become unstable.

11.05 The procedures for equalizer touch-up assume that 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.

11.06 The procedure for equalizer touch-up is given in Fig. 11. If Step 11 of Fig. 11 is repeated twice without satisfactory results, the circuit cannot be properly equalized and should be referred to the proper personnel.

11.07 Figure 11 assumes the roll-off requirements are to be measured at 400 and 2800 Hz. However, if the roll-off requirements are at different frequencies they can be substituted for the 400 and 2800 Hz in Fig. 11.

12. STABILITY TESTS

A. General

12.01 The final test to be made on the J99343GG, L1 & L2 and GK CFUs and associated circuits is the stability test. This test should be performed on all new circuits. It assumes that all the other adjustments on the transmission section have been made and the circuit is ready to be turned up.

12.02 Two types of stability tests can be made; (1) talk state, which is made with nominal termination on both ends of the circuit; and (2) idle state, which is made with the associated station and switching equipment in the idle condition.

12.03 The idle state stability test is conducted for this part.

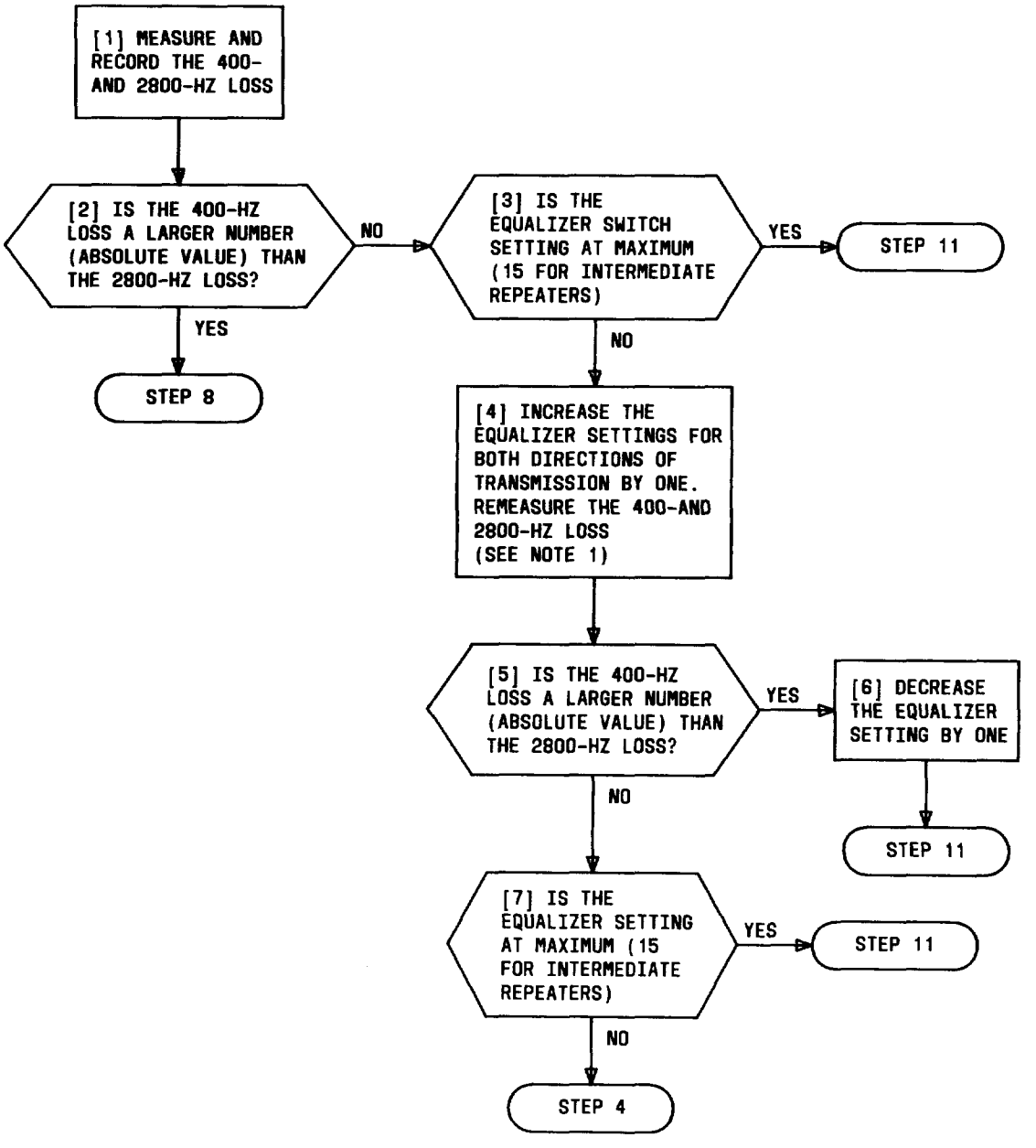
B. Idle State Stability Tests

12.04 The following equipment is required for stability tests:

(a) J99343TB test extender

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

12.05 It is assumed that the repeater-under-test has been adjusted to its final settings and all options are set as specified on the CLR. Idle state stability test procedures are given in the following procedure and an example test setup is shown in Fig. 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.

Fig. 11—Procedure for Equalizer Touch-Up (Sheet 1 of 2)

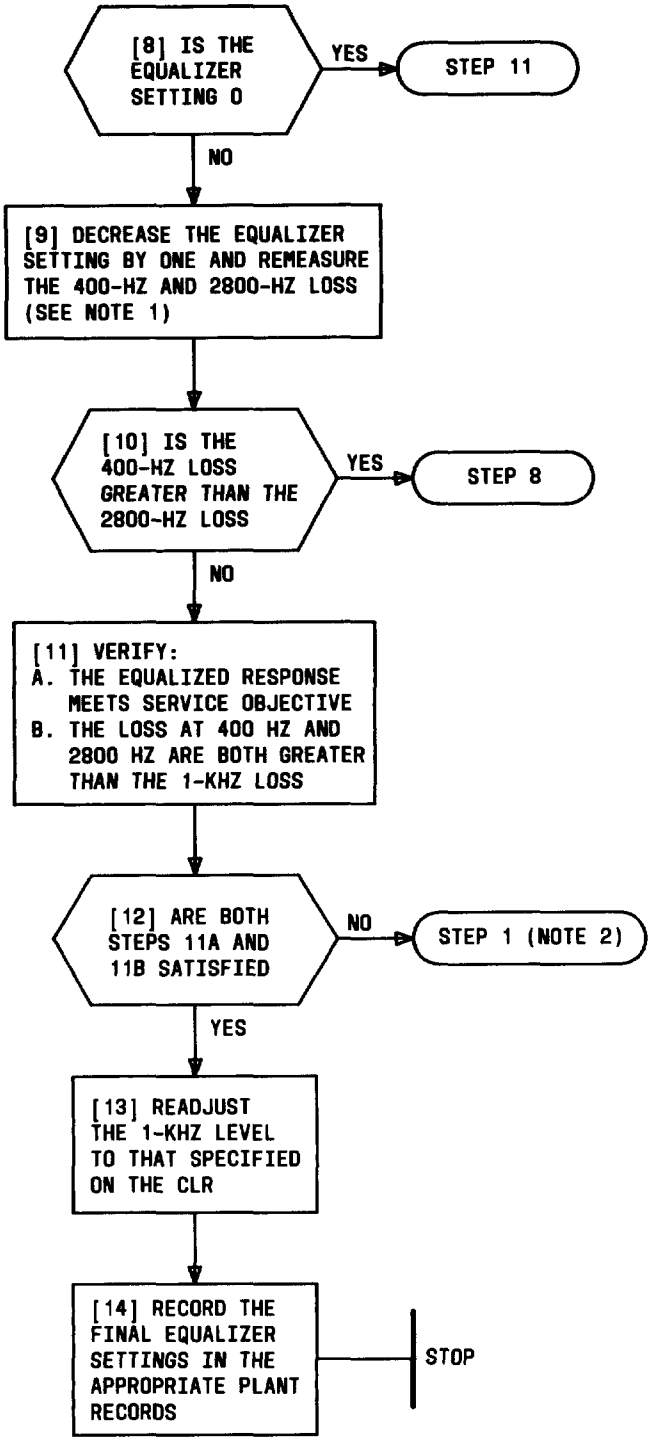


Fig. 11—Procedure for Equalizer Touch-Up (Sheet 2 of 2)

STEP	PROCEDURE

1 Remove repeater under test from its shelf location.

2 Insert repeater into test extender and connect test extender into the repeater shelf location.

3 Set the TST/NOR switch on the repeater to TST.

4 Set the switches on the J99343TB 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

5 Connect the high impedance monitoring device to the monitor jack (MON) on the B-side of the J99343TB test extender (see Fig. 12).

6 Monitor the CFU for singing using the high impedance monitoring device with the following combinations of terminations:

Note: With the monitoring device connected as shown in Fig. 12, no sound other than battery noise should be audible.

ORIGINATING END	TERMINATING END
(1) 900 (600) ohms	900 (600) ohms
(2) Open circuit	Short circuit
(3) Short circuit	Open circuit
(4) Short circuit	Short circuit

7 If the repeater sings, check the following conditions for possible troubles:

(a) Improper test connections have been installed.

(b) Insertion loss has been incorrectly measured and is less than permissible.

(c) Makeup of the facility is outside limits.

8 Disconnect test extender from shelf and remove CFU from test extender.

9 Set TST/NOR switch on CFU to NOR position.

10 Insert the CFU into its proper shelf locations.

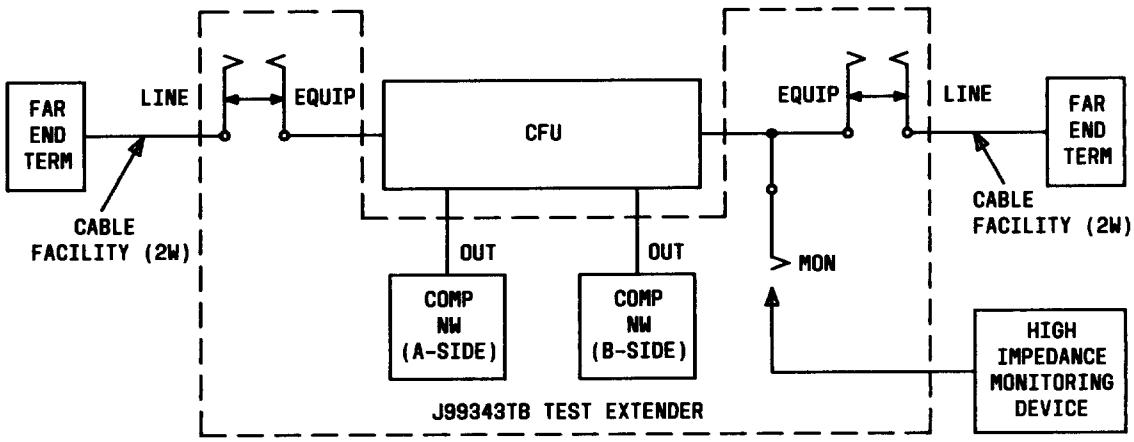


Fig. 12—Typical Circuit Configuration for Stability Margin Tests

13. SIGNALING SWITCH ADJUSTMENT AND RANGE INFORMATION

13.01 The following switches provide the signaling options for the J99343GG, L1 & L2 and GK CFUs. These switches must be properly operated before placing the unit in service. If this information is not available, Fig. 13 provides a flowchart for determining these switch settings.

13.02 ***TST:NOR:*** This switch provides a special test arrangement for the CFU. With the switch in the TST position, the repeater section can be tested independent of the signaling section. In this arrangement the repeater is continuously activated. In the NOR position the CFU transmission section is controlled by the signaling section and is activated during station off-hook.

13.03 ***NOR:RV:*** This switch is used to establish the normal or reverse signaling mode. ▶When set in the RV position, a reverse signaling mode is established. When set in the NOR position, a normal signaling mode is established.◀ This switch only affects the dc path to the signaling section.

13.04 ***NOR:DRR:*** The ringing circuitry is controlled by the NOR:DRR switch. In the NOR position, "ring-ping" signals and all distinctive ringing patterns will be reproduced. In the DRR mode, ringing patterns less than 140 ms in duration are rejected (no local ringing output). A ringing signal greater than 140 ms produces a 2-second ringing output. The DRR mode converts all distinctive ringing patterns into the 2-second ringing output and rejects ring-ping signals. Therefore, the unit can be used with other equipment that cannot pass distinctive ringing patterns.

> ***Note:*** Accurate reproduction of the distinctive ringing patterns in tandem arrangements cannot be guaranteed.

13.05 ***BOR Switch:*** To limit switching-side loop current, the BOR switch is placed in the IN position. In this position, 511 ohms is added to the internal unit resistance. In the OUT position, the resistance is removed and maximum signaling range is provided.

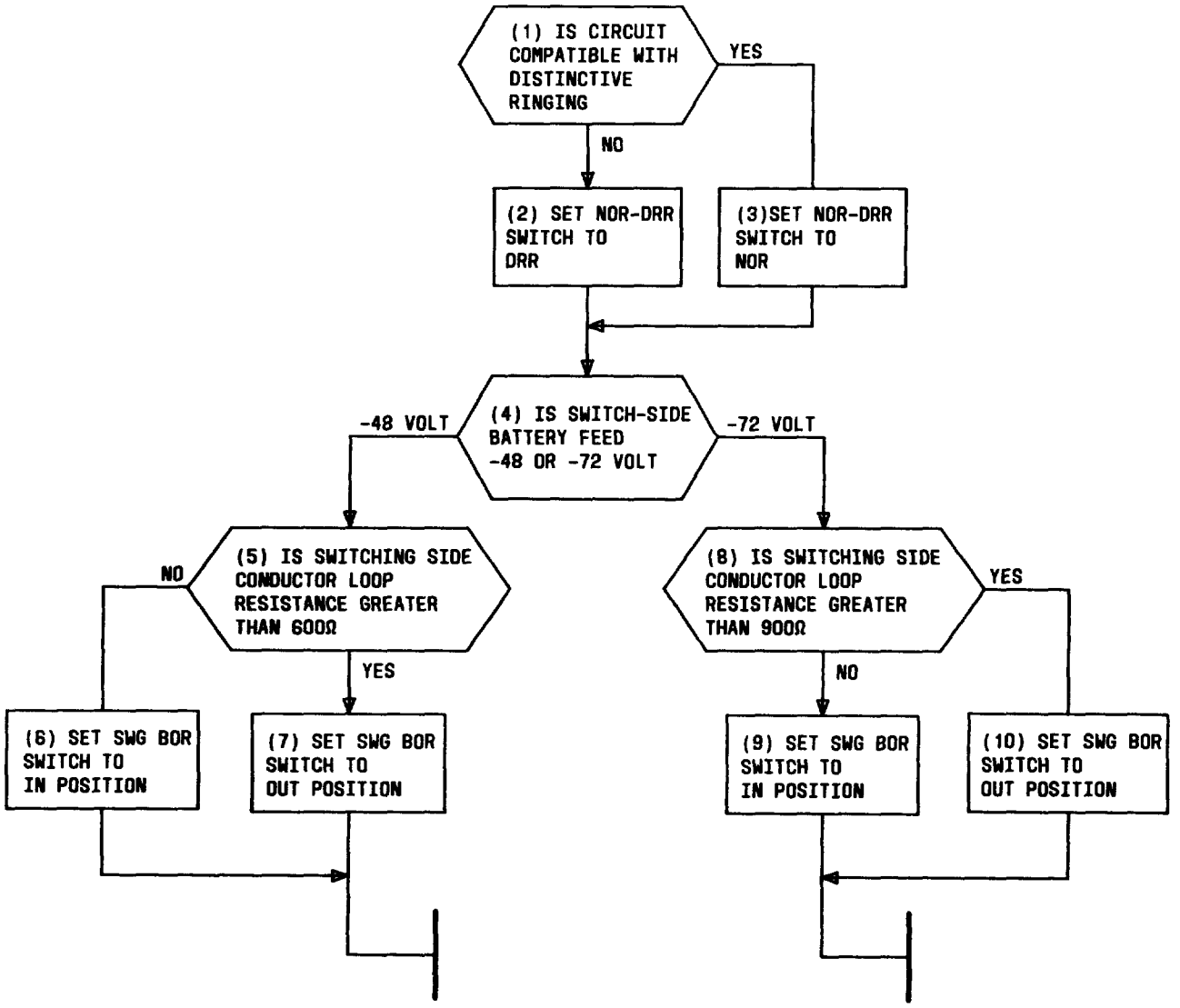


Fig. 13—Signaling Switches Flowchart

13.06 Table E lists the maximum ringing ranges and Table F lists the maximum signaling ranges.

14. MAINTENANCE

14.01 The MFT units require no routine maintenance. If a unit is determined to be faulty, it should be removed from service and replaced with a spare. The defective unit should be sent to the appropriate Service Center for repair.

TABLE E

REGENERATED RINGING RANGE FOR J99343GG, L1 & L2 AND GK (NOTE 1)

	RINGING LOAD			
	1 PBX RINGING DETECTOR (NOTE 2)	THREE C4A RINGERS (NOTE 3)	FOUR C4A RINGERS (NOTE 3)	FIVE C4A RINGERS (NOTE 3)
Maximum Resistance between CFU and Ringing Load	3600 Ohms maximum	2600 Ohms maximum	1600 Ohms maximum	1200 Ohms maximum

Note 1: Regenerated ringing ranges assume a 20-Hz ringing source of 84 to 88 volts RMS and a series 13L resistance lamp.

Note 2: Ringing ranges to a PBX are based on typical PBX relay detectors such as the circuits used in SD-5E016 and SD-1E340.

Note 3: Ringing ranges to station sets with C4A ringers assume a series 0.5 μF capacitor and a weak notch setting.

TABLE F

MAXIMUM RANGE FOR SUPERVISION AND DIAL PULSING FOR J99343GG, L1 & L2 AND GK (NOTES 1 AND 2)

TALK BATTERY	LSR RANGE (23 mA.)	TANDEM LSR RANGE (16 mA.)
−42.5	1300	2100
−48	1500	2500
−52	1700	2700
−67.5	2300	3700
−72	2600	4000
−78	2800	4300

Note 1: For loop-start circuits, the station side signaling range is limited by either the loop supervision and dial pulse range or by the regenerated ringing range.

Note 2: The supervision and dial pulse range includes the resistance of the station set or the internal resistance of a tandem repeater.