J99343PA, PG (LISTS 1 and 2) 2-2 WIRE TERMINALS (LOADED) REPEATERS

DESCRIPTION

METALLIC FACILITY TERMINAL

CONTENTS PAGE

1. GENERAL

1.01 This section provides a physical description and discusses the basic functions of the 2-2 wire, loaded cable (L) terminal repeaters. The individual units are described in detail, and transmission and/or signaling performance, typical applications, and maintenance philosophy are also discussed.

1.02 This section is reissued to provide a general update of information. Since this is an extensive revision, change arrows have been omitted.

Physical Description

1.03 The metallic facility terminal (MFT) is a standard equipment arrangement for providing various transmission and/or signaling functions that may be required by metallic facilities. The 2-2 wire terminal units described in this section are MFT plug-ins that consist of a component board held by either a die-cast aluminum or molded polycarbonate frame. The MFT unit measures 1-11/16 inches wide, 7-7/8 inches high, and 9 inches deep.

1.04 These units can be used in either a single- or a double-module mounting arrangement. They can be mounted in any slot of a single-module shelf. In double-module applications that require only voice-frequency gain, the repeater can be used without a companion signaling unit. When a unit is used alone, it is mounted in the transmission slot of a double-module shelf. Section 332-910-101 contains additional information on MFT mounting arrangements.

1.05 The 2-2 terminal repeaters (L) are J99343PA and PG, Lists 1 and 2. They are hybrid-type repeaters with signaling lead access. Gain and equalization are provided for both directions of transmission. The repeaters provide hybrid balance for the A-side terminal equipment and the B-side loaded facility.

1.06 The J99343PA and PG, Lists 1 and 2, are functionally similar. However, the switch format and physical layout of the J99343PA and PG, List 1, differs from the J99343PG, List 2, and is therefore

described separately. Section 332-912-214 provides installation and testing information and touch-up procedures for these units.

2. FUNCTIONAL DESCRIPTION, J99343PA AND J99343PG, LIST 1

2.01 The J99343PA is shown in Fig. 1 and the J99343PG, L1 is shown in Fig. 2. They provide gain and equalization on 2-wire circuits between terminal equipment and loaded facilities. Figure 3 shows a block diagram of these units.

A. Operation

Amplifier Units

2.02 Adjustable gain is provided in these repeaters by the RU1 and RU2 amplifier units. RU1 provides gain for the A-to-B direction of transmission, and RU2 for the B-to-A direction. The controls for the amplifier units are designated GAIN ADJ. The range of the amplifier unit gain is approximately 0 to 14 dB.

> ***Caution: For crosstalk considerations, the maximum gain on terminal repeaters typically is limited to 6 dB.***

Two-Transformer Hybrid (A-Side and B-Side)

2.03 The two-transformer hybrid splits the 2-wire transmission interface into a 4-wire path through the repeater. This allows gain and equalization to be provided in each direction of transmission. The transformer hybrid is matched to the terminal equipment by the compromise network and to the 2-wire facility by the precision balance network.

Compromise Networks (A-Side)

2.04 The compromise network (COMP NET) in the repeater provides hybrid balance by approximating the impedance of the 2-wire terminal equipment. The COMP NET uses 900 ohms in series with 2.15 μF in the hybrid balance circuit. There are no adjustments associated with this circuit.

Precision Balance Network (B-Side)

2.05 The precision balance network (PBN) in the repeater provides hybrid balance by matching the impedance of the 2-wire, H88 loaded facility. The PBN balances 19-, 22-, 24-, and 26-gauge facilities. The controls for this PBN are designated R and Z. (The PG, L1 also provides balance for 25-gauge MAT cable.)

Line Build-out Capacitor (B-Side)

2.06 The line build-out capacitor (LBOC) network is used on the 2-wire loaded cable interface to build out the end section to an equivalent of 6 kft. The switches that control the LBOC are designated A, B, C, D, E, F.

Signaling

2.07 The signaling leads (A and B) are derived through the transformer windings and midpoint capacitor on each side of the repeater. The SX inductors isolate the transmission path from the signaling circuit. The three basic signaling modes (normal, reverse, and through) are controlled by the NOR·RV and NOR·RV/T switches.

B. Unit Controls

2.08 In the following paragraphs, the rocker-type switches for a particular function are operated when depressed toward the respective designation. The sum of the values of the switches operated is the setting for that function. The unit controls are illustrated in Fig. 1 and 2.

GAIN ADJ

2.09 The RU1 and RU2 amplifiers are controlled by dial-type potentiometers which are designated GAIN ADJ. The controls are calibrated in a range from 0 to 14 dB. Gain is increased by rotating the dial clockwise. See Caution in paragraph 2.02.

PBN Controls

2.10 The PBN controls for the J99343PA are illustrated in Fig. 4. This figure shows the two labeling schemes for this PBN. Controls on the early production units were labeled ABC and XYZ. This has been changed to R (4, 2, 1) and Z (4, 2, 1), respectively.

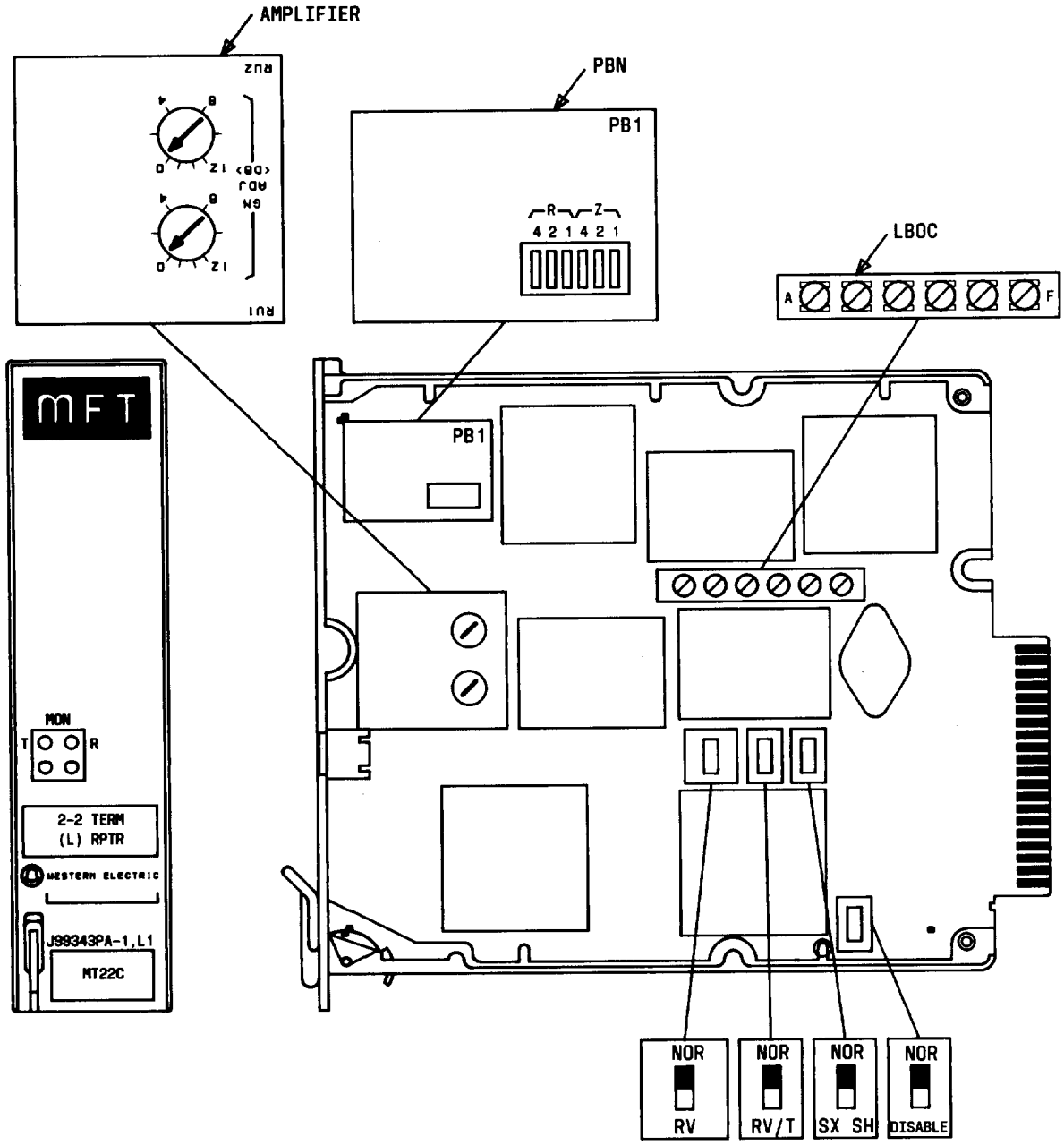


Fig. 1—J99343PA Component Layout

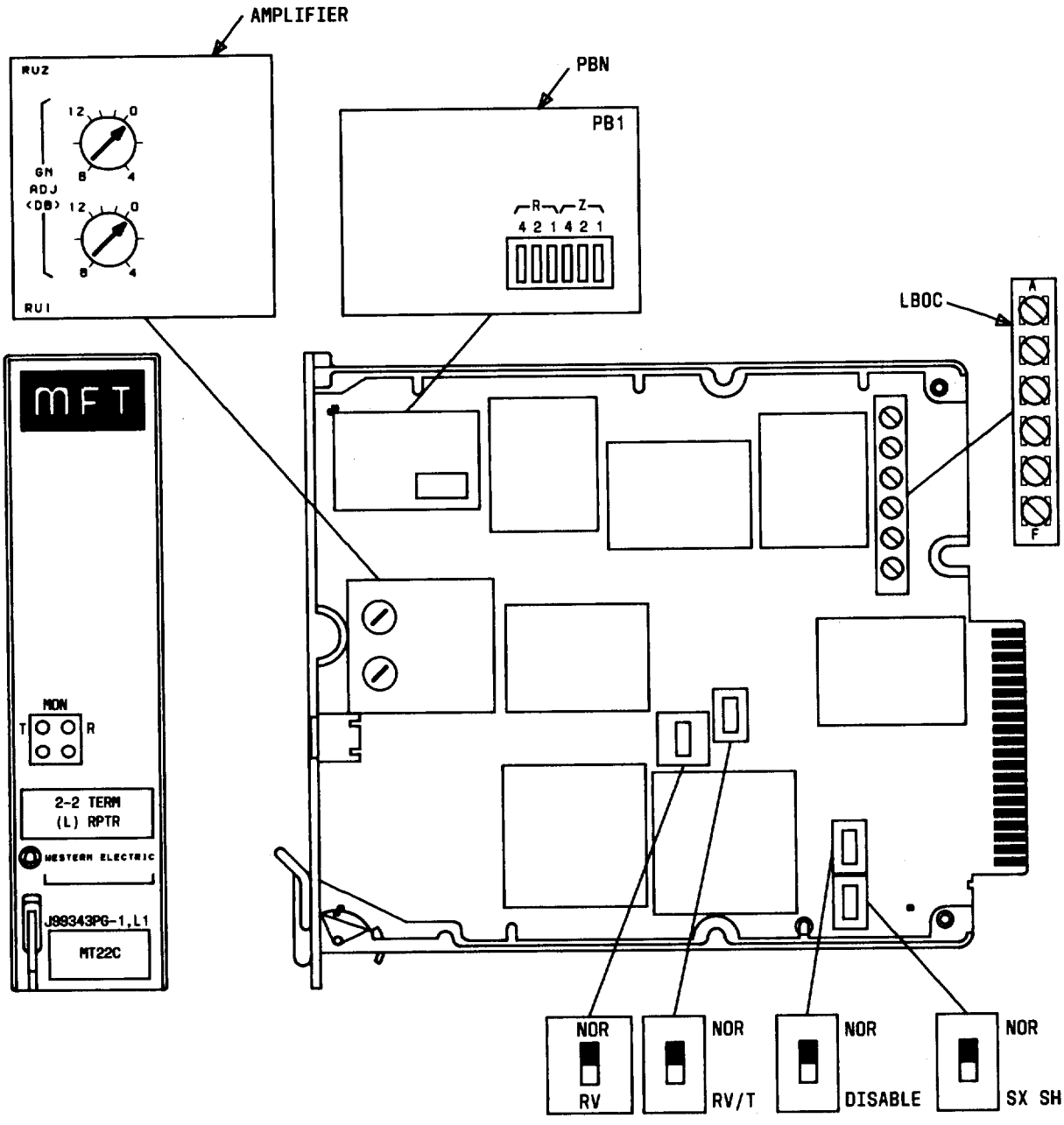


Fig. 2—J99343PG, L1 Component Layout

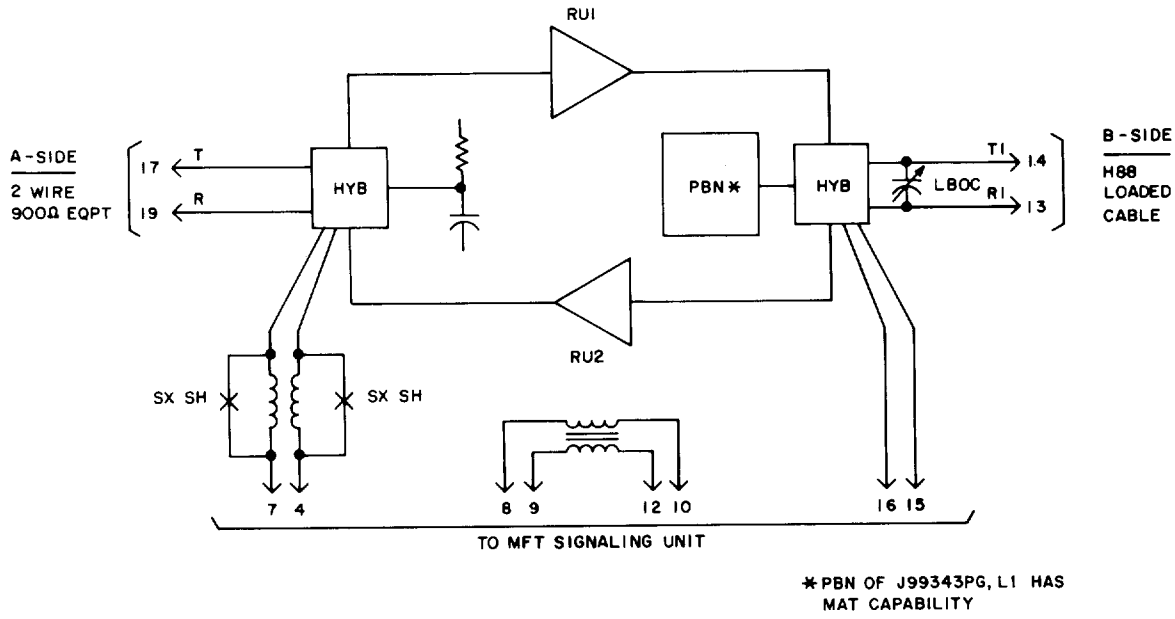


Fig. 3—J99343PA, PG L1 Block Diagram

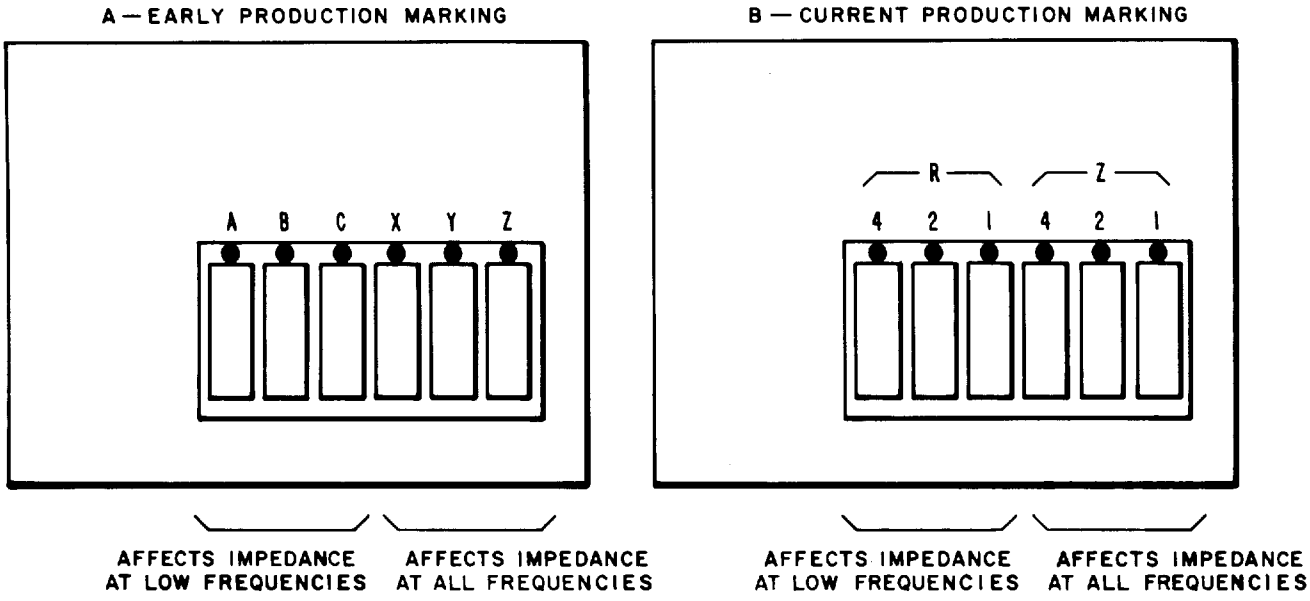


Fig. 4—Precision Balancing Network Switch Functions J99343PA

2.11 The PBN controls for the J99343PG, L1, are illustrated in Fig. 5. This figure shows three groups of controls: R (4, 2, 1), Z (4, 2, 1) and the L switch. The L switch is used when the facility is 25-gauge MAT cable.

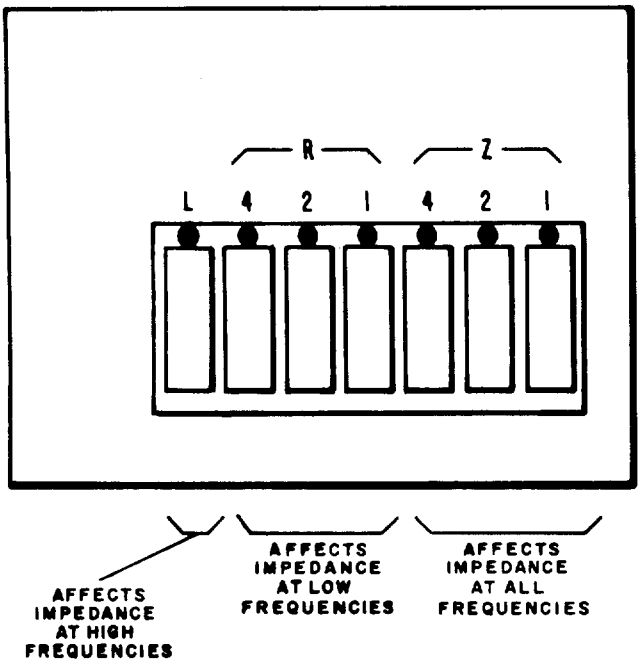


Fig. 5—Precision Balancing Network Switch Functions J99343PG, L1

LBOC Controls

2.12 The controls for the LBOC consist of a block with six screw switches labeled A through F. These switches control the selection of capacitor values from 0 to 0.126 μF in 0.002 μF increments. Capacitance is inserted when the screws are turned down (clockwise).

NOR·SX SH

2.13 This switch shorts one set of SX inductors when it is not required. (A and B signaling leads with SX inductors are available on both sides of the repeater.) The inductors are shorted when the switch is set in the SX SH position; they are not shorted in the NOR position.

> ***Note:*** If no companion SU is used, these switches should be in the NOR position.

NOR·RV and NOR·RV/T

2.14 These switches are used to establish a signaling mode of either normal, reverse, or through. Figure 6 gives the required switch positions to achieve a prescribed mode. These switches only affect the dc signaling path to the signaling unit.

> ***Note:*** If no companion signaling unit is used, these switches should be set for the through mode.

NOR·DISABLE

2.15 This switch permits any companion signaling unit, having the disable function, to control the power to the repeater. In the DISABLE position, the power input to the repeater is removed during the idle circuit condition. In the NOR position, the power is continuous.

> ***Note:*** If no companion signaling unit is used or if the signaling unit does not have the disabling function, the switch must be in the NOR position.

3. FUNCTIONAL DESCRIPTION, J99343PG, LIST 2

3.01 The J99343PG, L2, is shown in Fig. 7. It provides gain and equalization on 2-wire circuits between terminal equipment and loaded facilities. Figure 8 shows a block diagram for this unit.

A. Operation

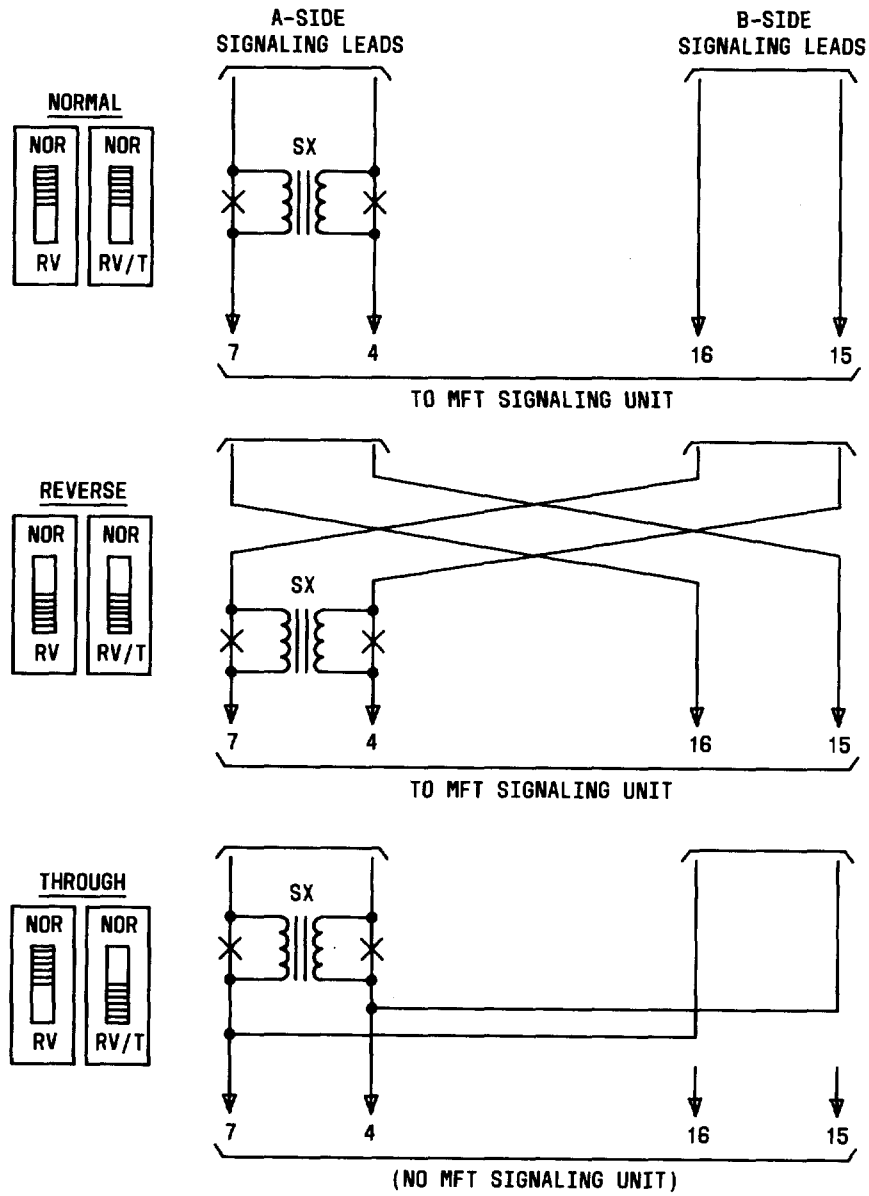
Amplifier Units

3.02 Adjustable gain and fixed equalization is provided for each direction of transmission. The controls for gain are designated GAIN ADJ. The range of the amplifier unit gain is 0 to 7.75 dB.

> ***Caution: For crosstalk considerations, the maximum gain on terminal repeaters typically is limited to 6 dB.***

Compromise Canceler Hybrid

3.03 The compromise canceler hybrid splits the 2-wire transmission interface into a 4-wire path through the repeater. This allows gain and equalization to be provided in each direction of transmission. The compromise canceler hybrid balances the 900-ohm plus 2.15 MF terminal equipment and has no associated adjustments.



NOTES:
1. THESE DIAGRAMS SHOW FUNCTIONALLY THE THREE SIGNALING CONNECTIONS. THE EXACT WIRING CONNECTIONS HAVE BEEN OMITTED FOR CLARITY.
2. THE ORIENTATIONS OF THE RV AND RV/T SWITCHES MAY VARY ON SOME CODES.

Fig. 6—Three Options of RV and RV/T Switches

Facility Canceler Hybrid

3.04 The facility canceler hybrid splits the 2-wire transmission interface into a 4-wire path through the repeater. This allows gain and equalization to be provided in each direction of transmission. The facility canceler hybrid is matched to the 2-wire facility using the GAUGE switches.

Line Build-Out Capacitor

3.05 The LBOC network is used on the 2-wire loaded cable interfaces to build out the end section to an equivalent of 6 kft. The switches that control the LBOC are designated 002, 004, 008, 016, 032, and 064.

Signaling

3.06 The signaling leads (A and B) are derived through the transformer windings and midpoint capacitor on each side of the repeater. The SX inductors isolate the transmission path from the signaling circuit. The three basic signaling modes (normal, reverse, and through) are controlled by the NOR·RV and NOR·RV/T switches.

B. Unit Controls

3.07 In the following paragraphs, the rocker-type switches for a particular function are operated when depressed toward the respective designation. The sum of the values of the switches operated is the setting for that function. The unit controls are illustrated in Fig. 7.

GAIN ADJ

3.08 Five miniature switches, designated GAIN ADJ, control the gain of the repeater. These switches, accessible through the front panel, are labeled .25, .5, 1.0, 2.0, and 4.0 (dB). The gain is adjustable from 0 to 7.75 dB in 0.25 dB increments. These gain switches are ganged to provide the same gain in both directions of transmission. See Caution in paragraph 3.02.

LBOC

3.09 The controls for the LBOC consist of a group of six rocker switches labeled 002, 004, 008, 016, 032, and 064. These switches control the selection of capacitor values from 0 to 0.126 μF in 0.002 μF increments.

GAUGE

3.10 The GAUGE switches consist of eight rocker switches. Four switches are labeled 19, 22, 24, and 26, and four are labeled 25. The numbers correspond to the cable gauge of the facility that the repeater interfaces. To set the unit to 25-gauge cable, all four switches labeled 25 must be operated toward 25. For a mixed gauge facility, the predominant gauge determines the gauge setting. Only one gauge setting may be used at a time.

NOR·SX SH

3.11 This switch shorts one set of SX inductors when it is not required. (A and B signaling leads with SX inductors are available on both sides of the repeater.) The inductors are shorted when the switch is set in the SX SH position; they are not shorted in the NOR position.

> ***Note:*** If no companion SU is used, these switches should be in the NOR position.

NOR·RV and NOR·RV/T

3.12 These switches are used to establish a signaling mode of either normal, reverse, or through. Figure 6 gives the required switch positions to achieve a prescribed mode. These switches only affect the dc signaling path to the signaling unit.

> ***Note:*** If no companion signaling unit is used, these switches should be set for the through mode.

NOR·DISABLE

3.13 This switch permits any companion signaling unit, having the disable function, to control the power to the repeater. In the DISABLE position, the power input to the repeater is removed during the idle circuit condition. In the NOR position, the power is continuous.

> ***Note:*** If no companion signaling unit is used or if the signaling unit does not have the dis-

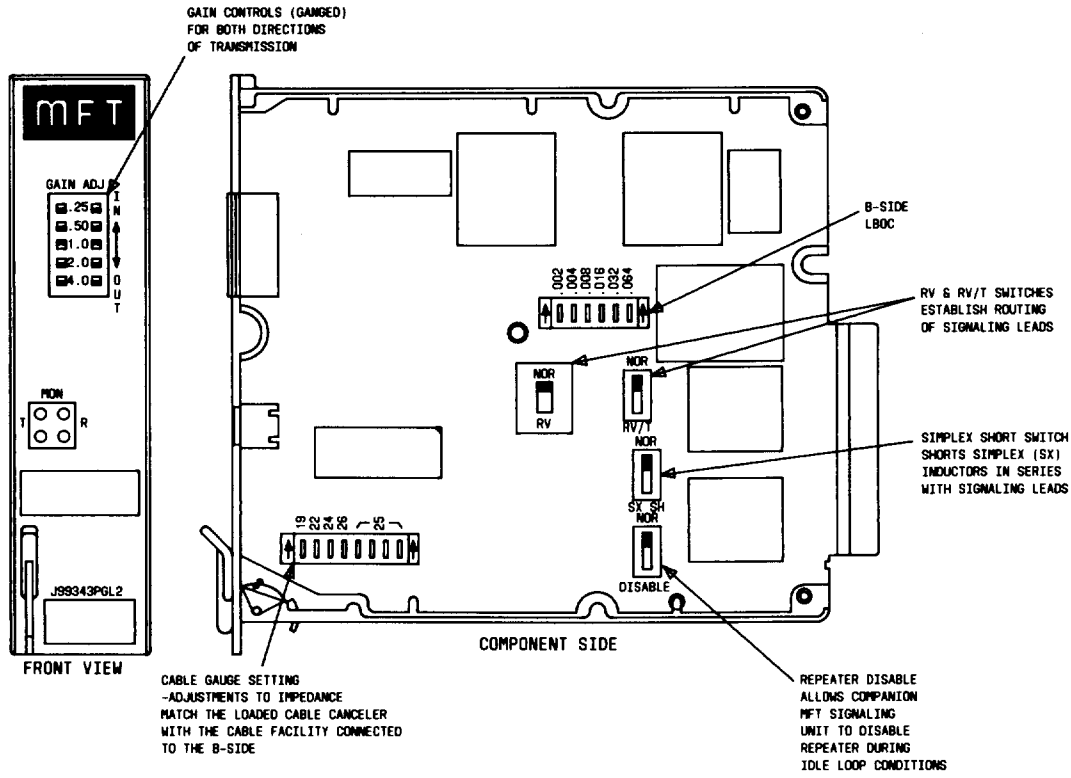


Fig. 7—J99343PG, L2 Component Layout

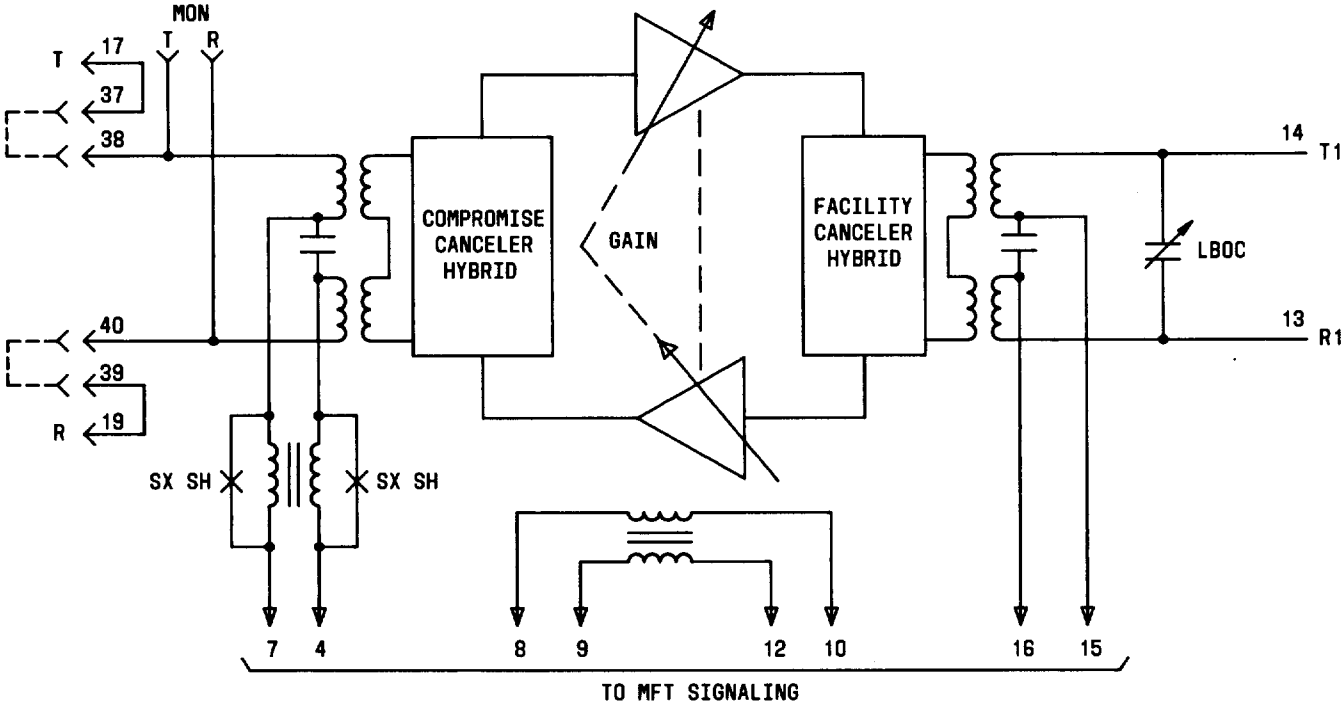


Fig. 8—J99343PG, L2 Block Diagram

abling function, the switch must be in the NOR position.

4. PERFORMANCE CHARACTERISTICS

4.01 The performance of the J99343PA and J99343PG, L1 and L2 repeaters are discussed in the following paragraphs. Table A gives a comparison of characteristics for all versions of the 2-2 terminal (L) repeaters.

A. Amplifier Frequency Response

4.02 Figure 9 gives the amplifier frequency response of the unit.

B. Envelope Delay Distortion

4.03 Figure 10 gives the envelope delay distortion for the repeater.

C. Longitudinal Balance

4.04 The longitudinal balance for these repeaters is at least 60 dB from the 60 Hz to 4000 Hz.

D. Output Power Capability

4.05 Figure 11 shows the output power capability of the 2-2 terminal (L) repeaters. The output power is determined by input power and repeater gain, as shown by the +6 dB gain line in the figure. Power limiting occurs in this unit at about 13.5 dBm.

5. APPLICATIONS

5.01 The J99343PA and the J99343PG, L1 and L2 repeaters may be used to provide gain on any 2-wire circuit between 900-ohm terminal equipment and loaded facilities. Typical applications include PBX-CO trunks and FX trunks or lines shown in Fig. 12. They also include, but are not limited to, OPS lines, WATS trunks and lines, and voicegrade private lines. Section 332-910-180 provides additional application information.

6. MAINTENANCE

6.01 MFT repeaters require no routine maintenance. If the repeater is determined to be faulty, it should be removed from service and replaced with a spare. The defective unit should be sent to the nearest Western Electric Service Center for repair.

7. REFERENCES

7.01 The following is a list of references which provide additional information concerning 2-2 wire (L) terminal repeaters.

SECTION	TITLE
332-910-100	MFT - General Description
332-910-101	Shelf, Frame, Power Panel, and Distributing Frame Arrangements - Description
332-910-180	General Application Information
332-912-212	2-2 Repeaters - Prescription Settings
332-912-214	2-2 Repeaters - Installation and Testing
CD-1C359-01	MFT Circuit - Circuit Description
SD-1C359-01	MFT Circuit - Schematic Drawing

The appropriate numerical index section should be consulted to find the current issue to the sections listed and any addendum that may have been issued. The pertinent numerical index for the sections listed here is Section 332-000-000.

TABLE A

REPEATER CHARACTERISTICS

FUNCTION		J99343PA; PG, L1	J99343PG, LIST 2
Available Repeater Gain		0 dB to +14 dB	0 dB to +7.75 dB
Equalization		Fixed	Fixed
Hybrid Balance	A-Side	Compromise Network	Compromise Canceler
	B-Side	PBN and LBOC	Facility Canceler and LBOC
Max. Output Power		+13.5 dBm	+13.5 dBm
DC Resistance		55 ohms — SX shorted 130 ohms — SX in 185 ohms — through signaling	65 ohms — SX shorted 185 ohms — SX in 250 ohms — through signaling
Current Drain		Disable: 0 ma No Signal: 29 ma Typical: 30 - 36 ma Maximum: 60 ma	Disabled: 0 ma No Signal: 32 ma Typical: 32 - 38 ma Maximum: 52 ma

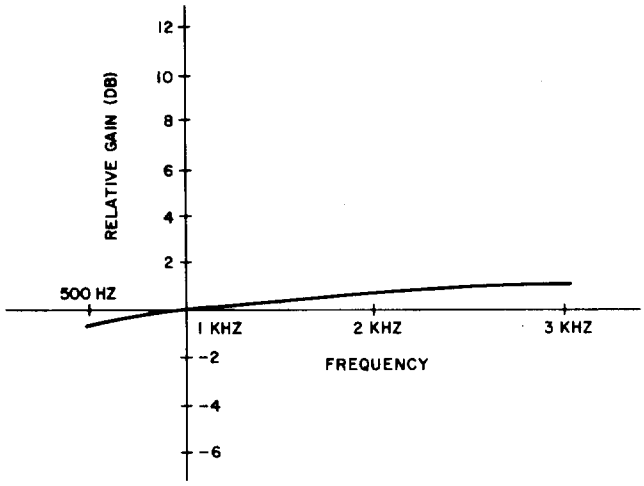


Fig. 9—Amplifier Frequency Response

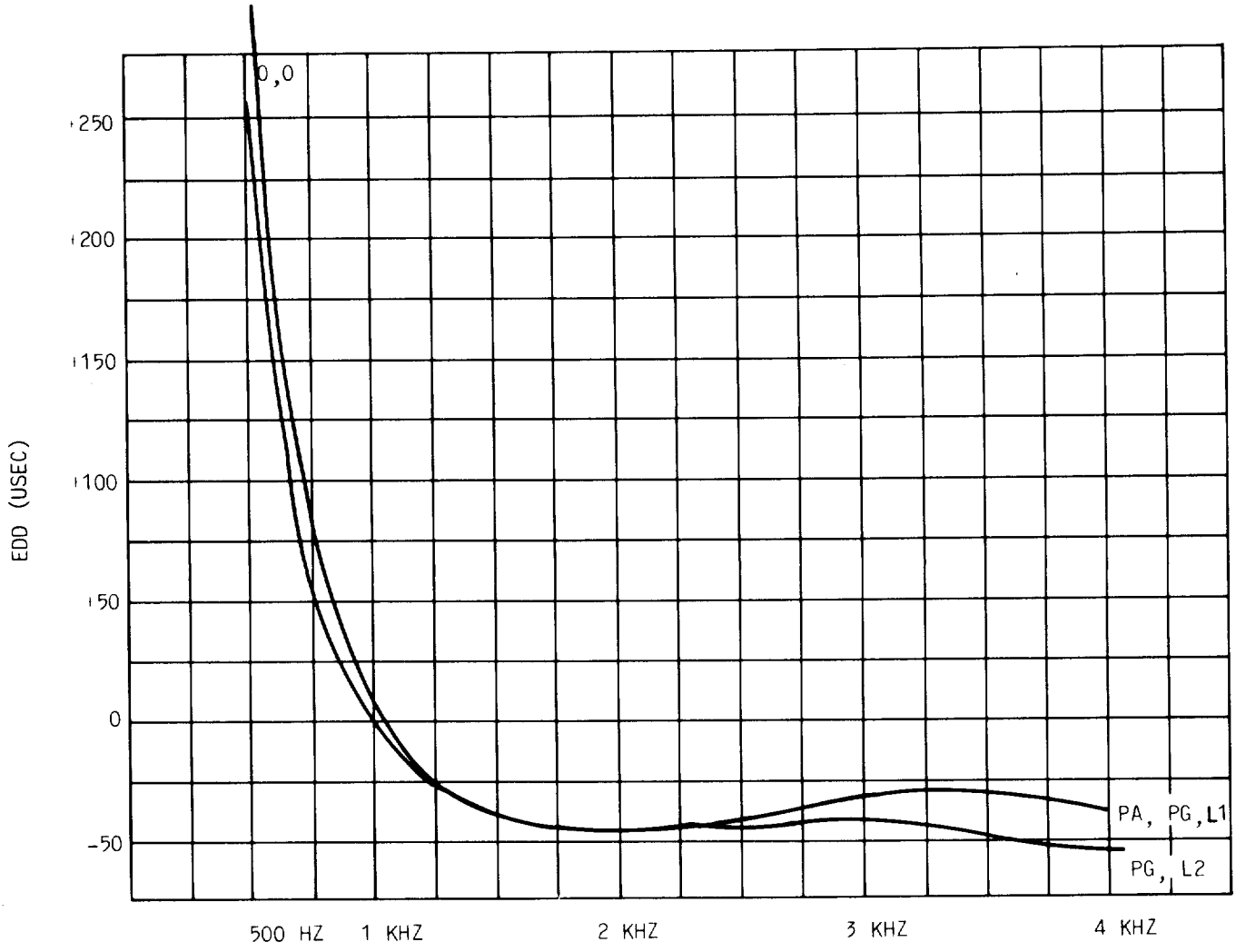


Fig. 10—Envelope Delay Distortion

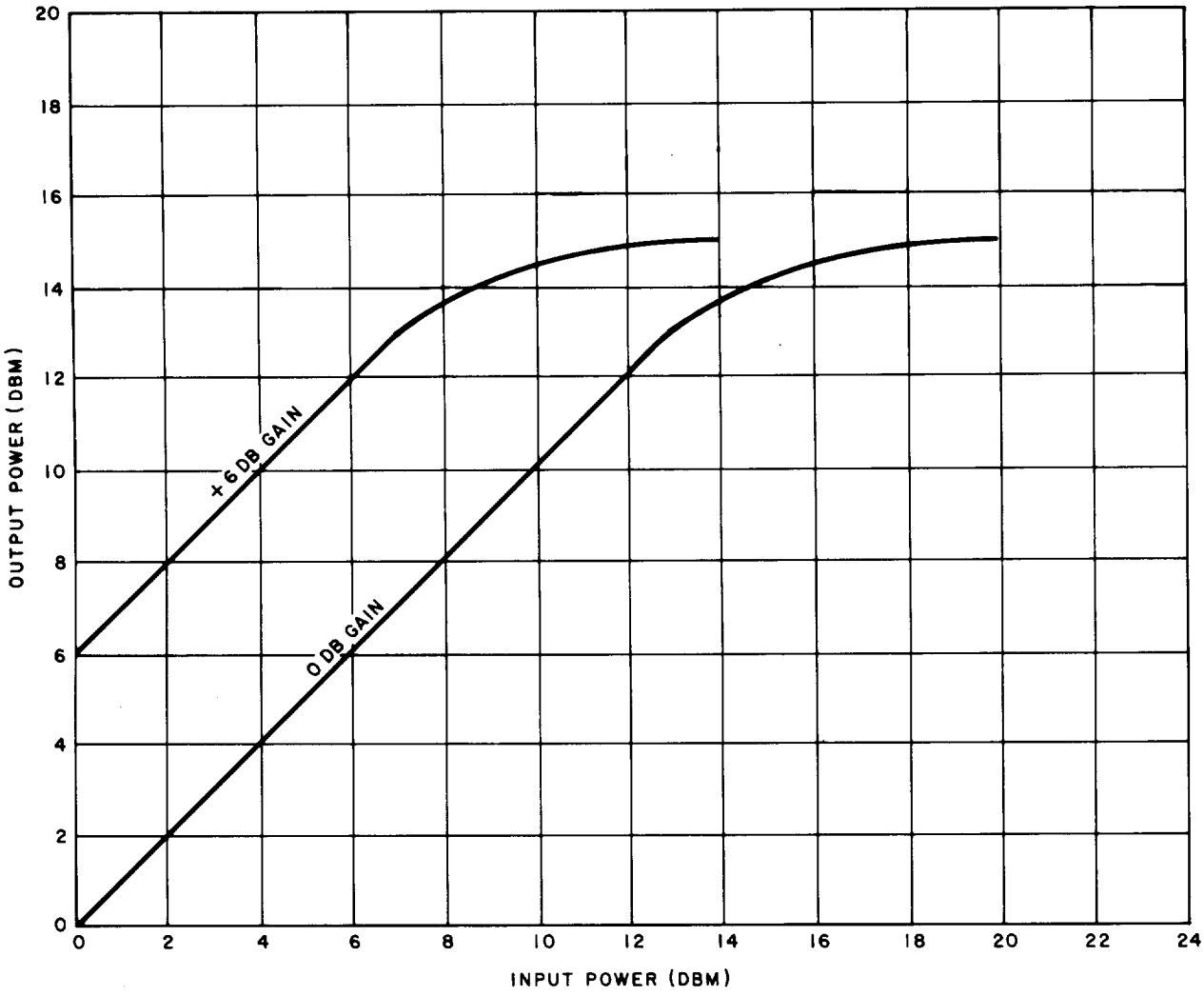
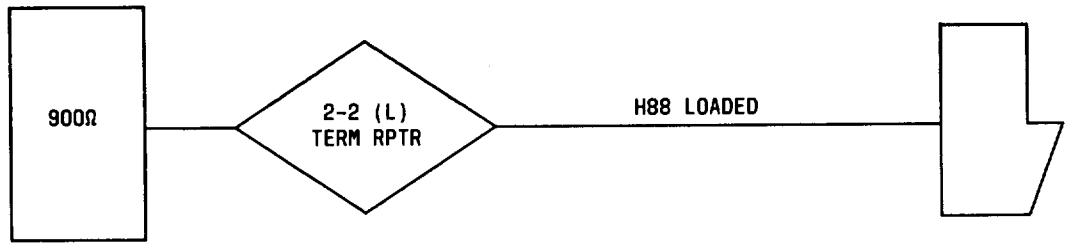
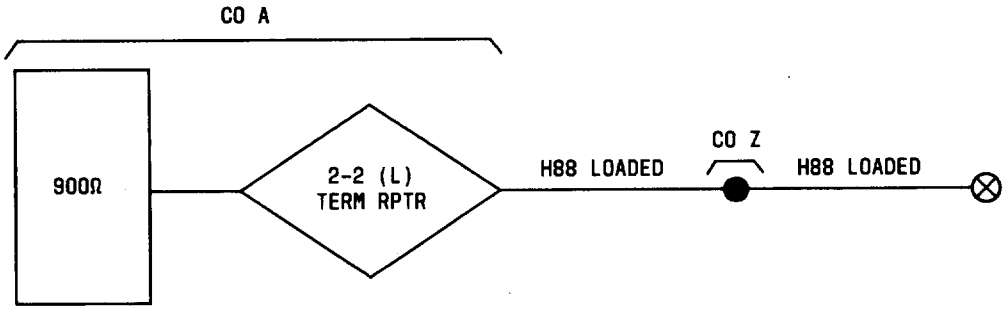


Fig. 11—Output Power Capability



PBX - CO TRUNK



FX LINE

Fig. 12—Typical Applications