

**J99343PC, PH (LISTS 1 AND 2) 2-2 WIRE INTERMEDIATE
REPEATERS (LOADED-LOADED)
DESCRIPTION
METALLIC FACILITY TERMINAL**

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1. GENERAL

1.01 This section provides a physical description and discusses the basic functions of the 2-2 wire, loaded-to-loaded cable (L-L) intermediate repeaters. The individual units are described in detail; transmission 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 intermediate units 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 or in the transmission slot of a double-module shelf. In double-module applications, the repeater may be used with or without a companion signaling unit. Section 332-910-101 contains additional information on MFT mounting arrangements.

1.05 The 2-2 intermediate repeaters (L-L) are J99343PC and PH, List 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 loaded facility and the B-side loaded facility.

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1.06 The J99343PC and PH, Lists 1 and 2, are functionally similar. However, the switch format and physical layouts of the J99343PC and PH, List 1, differ from the J99343PH, List 2, and are therefore described separately. Section 332-912-215 provides installation and testing information, and touch-up procedures for these units.

2. FUNCTIONAL DESCRIPTION—J99343PC AND J99343PH, LIST 1

2.01 The J99343PC is shown in Fig. 1 and the J99343PH, List 1 is shown in Fig. 2. They provide gain and equalization on 2-wire circuits between 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 intermediate repeaters typically is limited to 12 dB.

Two-Transformer Hybrid

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 2-wire facility by the precision balance network.

Precision Balance Network (J99343PC)

2.04 The precision balance network (PBN) in the J99343PC repeater provides hybrid balance by matching the impedance of the 2-wire, H-88 loaded facility. The PBN balances 19-, 22-, 24-, and 26-gauge facilities. The controls for this PBN are designated R and Z.

Precision Balance Network (J99343PH, List 1)

2.05 The precision balance network (PBN) in the J99343PH, List 1, provides hybrid balance by

matching the impedance of the 2-wire H-88 loaded facility. The PBN balances 19-, 22-, 24-, and 26-gauge (high capacitance) facilities and 25-gauge metropolitan area trunk (MAT low capacitance) facilities. The controls for this PBN are designated R, Z, and L.

Note: The L switch is operated when the facility is 25-gauge MAT cable.

Line Build-Out Capacitor

2.06 The line build-out capacitor (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 A, B, C, D, E, F (A-side) and G, H, I, J, K, L (B-side).

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 controls for the J99343PC PBN are illustrated in Fig. 4. This figure shows the two labeling schemes for this PBN. Controls on the early production units were labeled A B C and X Y Z. This has been changed to R (4,2,1) and Z (4,2,1), respectively. See Section 332-912-212 for prescription settings of the PBN (loaded).

2.11 The controls for the J99343PH, L1, PBN are illustrated in Fig. 5. This figure shows the

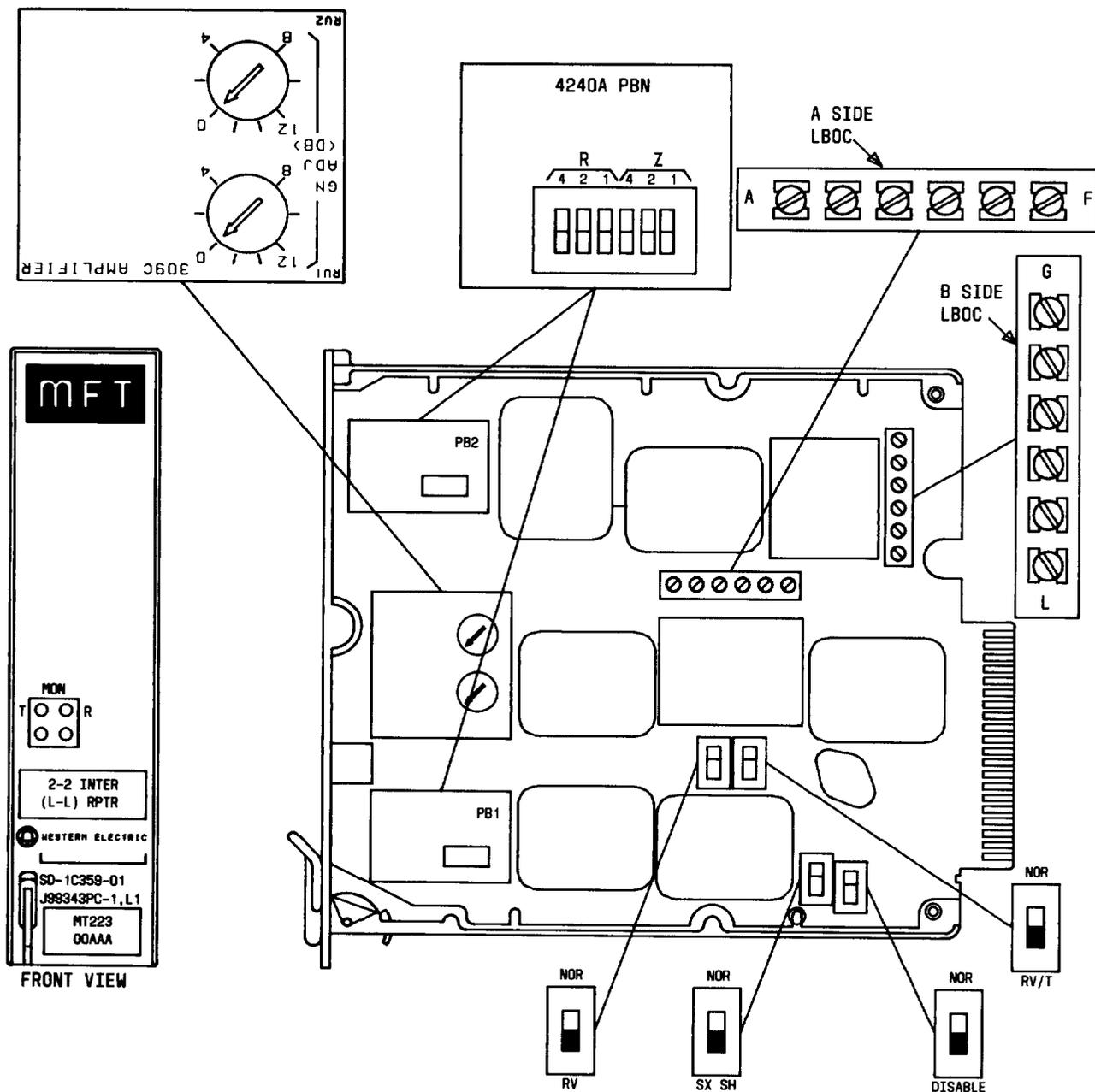


Fig. 1—2-2 Intermediate (L-L) Repeater J99343PC (MD) Component Layout

three groups of controls: R (4,2,1), Z (4,2,1), and L. The L switch is operated when the facility is 25-gauge MAT cable. See Section 332-912-212 for prescription settings of the PBN (loaded).

LBOC Controls

2.12 The controls for the LBOC consist of two blocks with twelve screw switches labeled A

through F, and G through L. 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).

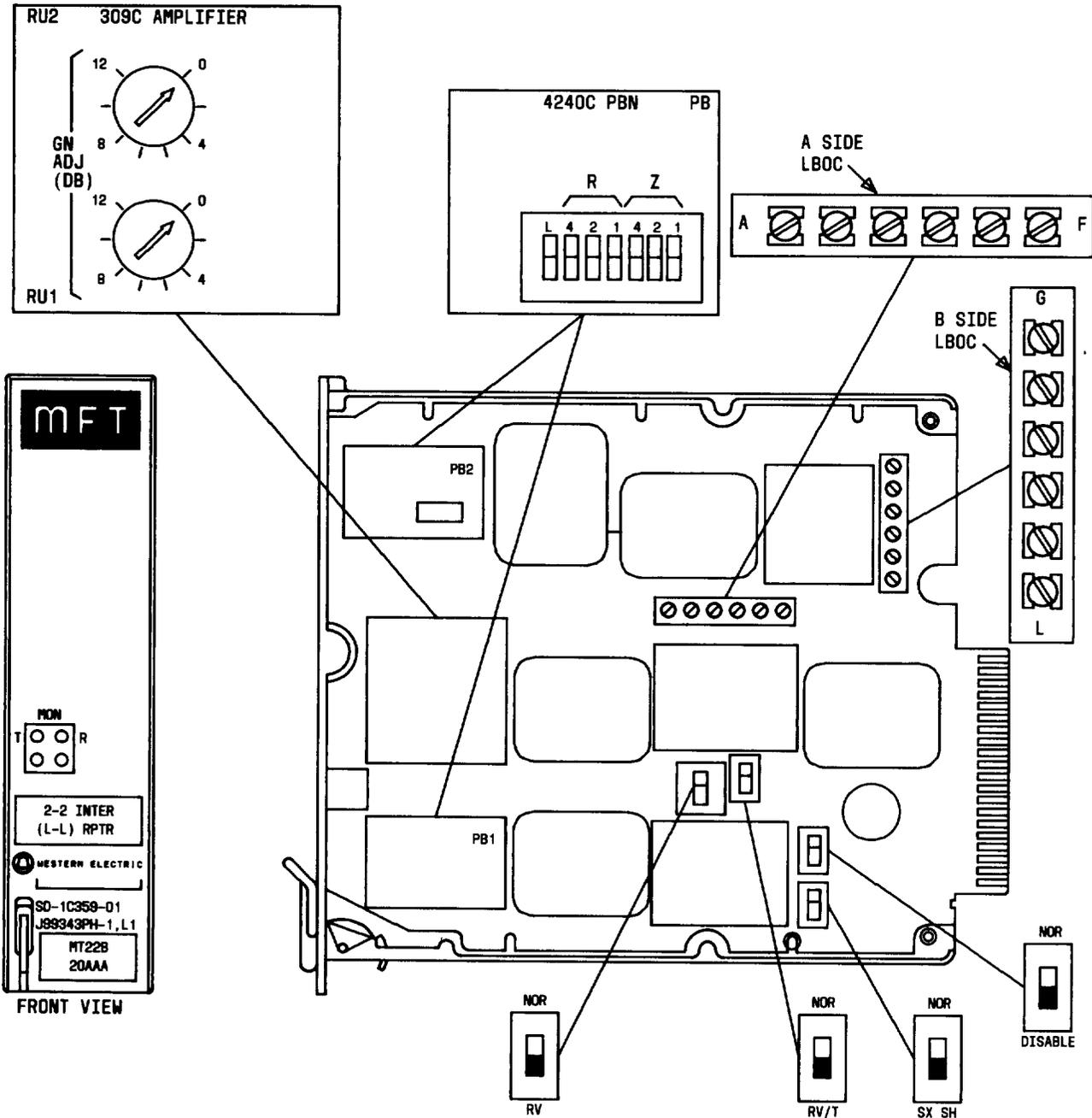


Fig. 2—2-2 Intermediate (L-L) Repeater J99343PH, L1 (MD) Component Layout

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

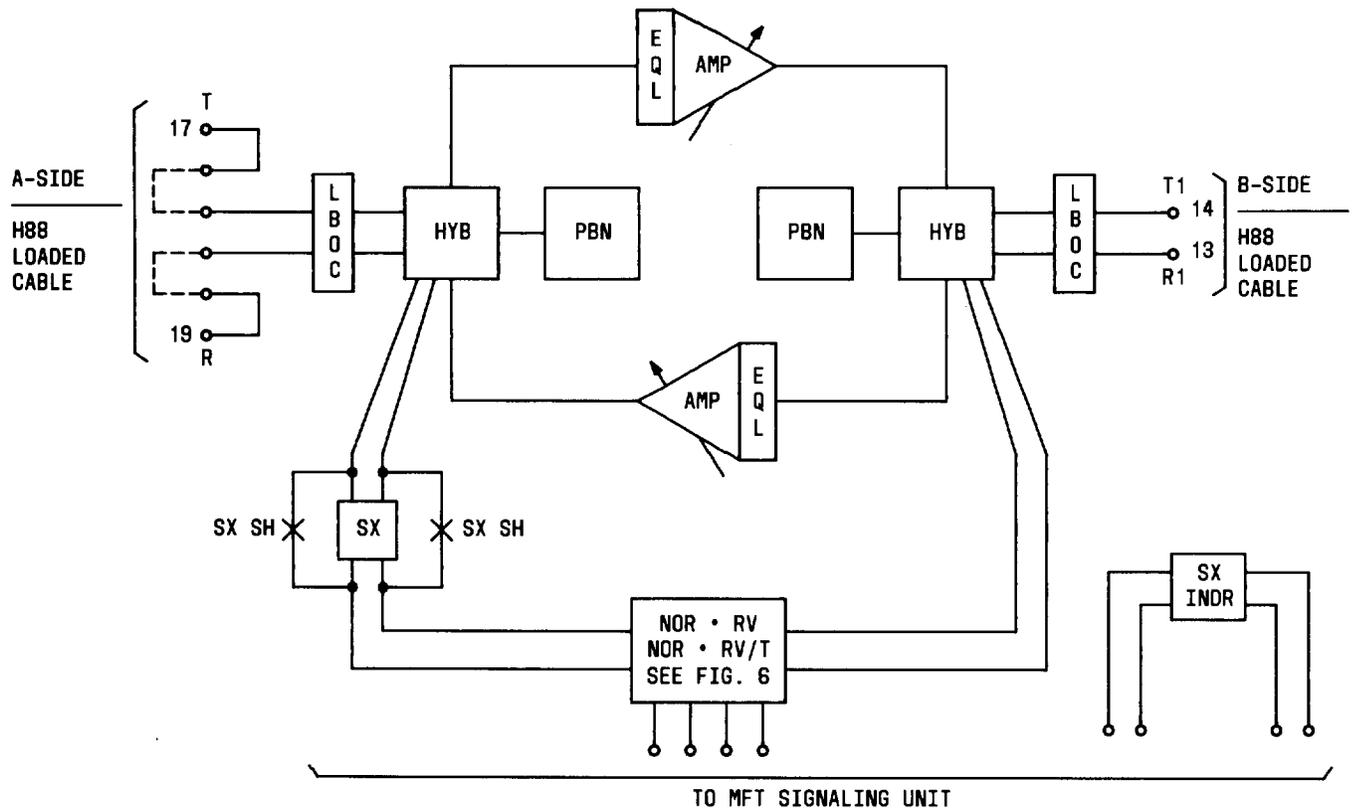


Fig. 3—Block Diagram of the 2-2 Intermediate (L-L) Repeater J99343 PC/PH, L1

to achieve a prescribed mode. These switches only affect the dc 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—J99343PH, LIST 2

3.01 The J99343PH, List 2 is shown in Fig. 7. It provides gain and equalization on 2-wire circuits between 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 and 8 dB. The range of the amplifier unit gain is 0 to 15.75 dB.

Caution: For crosstalk considerations, the maximum gain on intermediate repeaters typically is limited to 12 dB.

Facility Canceler Hybrid

3.03 The facility canceler hybrid splits the 2-wire transmission interface into a 4-wire path

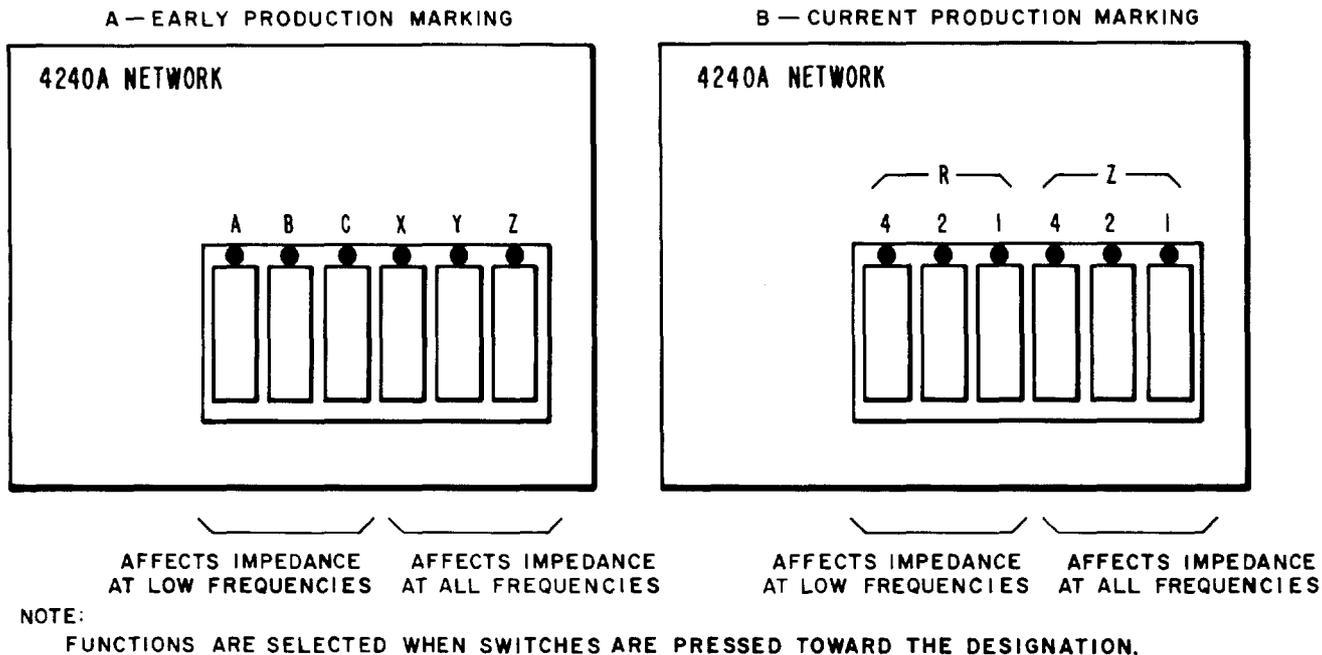


Fig. 4—Control Switches of the J99343PC PBN

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

3.04 The line build-out capacitor (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

3.05 The signaling leads (A and B) are derived through the transformer windings and mid-point 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

3.06 The rocker-type switches for a particular function, which are described in the following

paragraphs, 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 and 8DB

3.07 Five miniature switches (GAIN ADJ) and a group of four other switches (labeled 8DB) control the gain of the repeater. The GAIN ADJ switches, accessible through the front panel, are labeled .25, .5, 1.0, 2.0, and 4.0 (dB). These switches are ganged to provide the same gain in both directions of transmission. The 8DB switches, located on the component board, can provide 8 dB of additional gain in each direction (see Note). See Caution in paragraph 3.02.

Note: For proper operation, all four switches labeled 8DB must be in the same position, ie, all IN or all OUT.

GAUGE

3.08 The GAUGE switches consist of ten rocker switches. Four switches are labeled 19, 22, 24, and 26, four are labeled 25, and two are labeled T. The

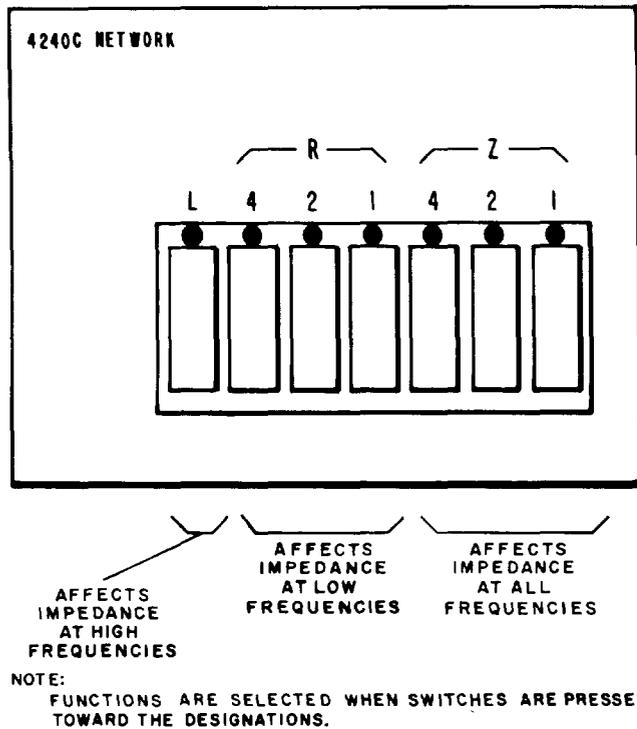


Fig. 5—Control Switches of the J99343PH, L1 PBN

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. The T switches are not operated during normal operation of the repeater.

LBOC Controls

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.

NOR·SX SH

3.10 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

3.11 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 path to the signaling unit.

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

NOR·DISABLE

3.12 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.

4. PERFORMANCE CHARACTERISTICS

4.01 The performance of the J99343PC and J99343PH, L1 and L2 repeaters are discussed in the following paragraphs. Table A gives a comparison of characteristics for all versions of the 2-2 intermediate (L-L) repeaters.

A. Amplifier Frequency Response

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

B. Envelope Delay Distortion

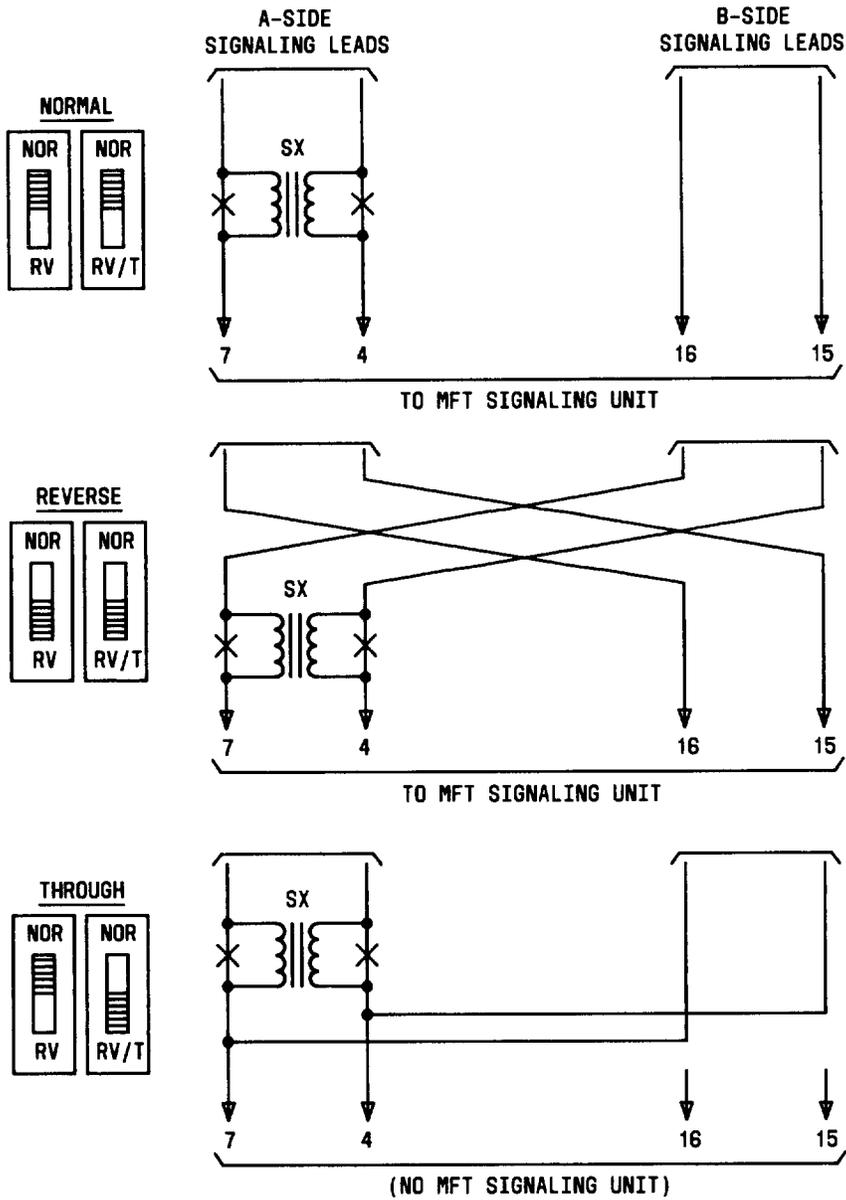
4.03 Figure 10 gives the envelope delay distortion for the repeater.

C. Longitudinal Balance

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

D. Output Power Capability

4.05 Figure 11 shows the output power capability of the 2-2 intermediate (L-L) repeaters. The



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—Signaling Options for 2-2 Intermediate (L-L) Repeaters

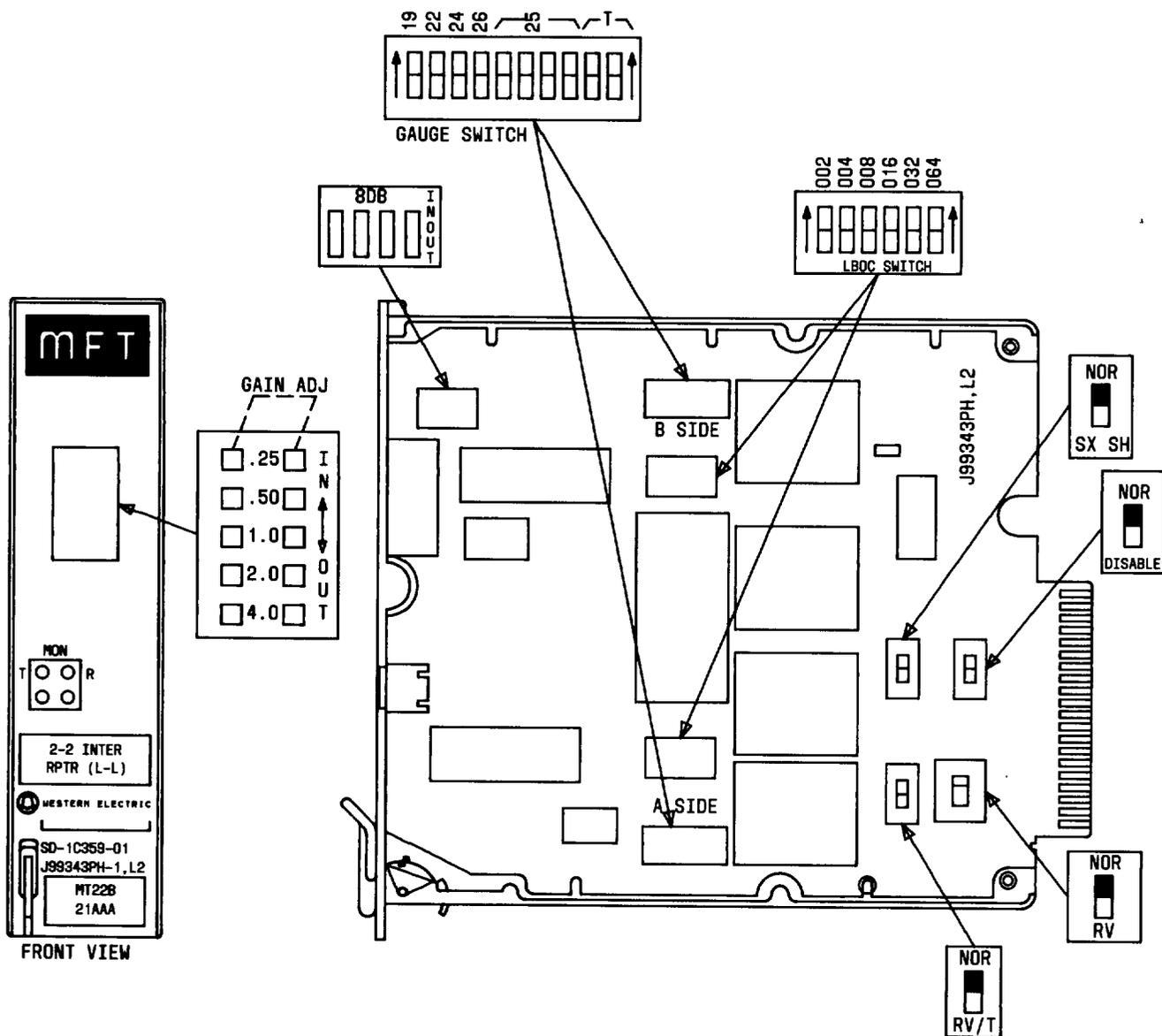


Fig. 7—2-2 Intermediate (L-L) Repeater J99343PH, L2 Component Layout

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 J99343PC and the J99343PH, L1 and L2 repeaters may be used to provide gain on any 2-wire circuit between loaded facilities. Figure 12 shows a typical application using the unit in a foreign

exchange (FX) trunk. These units also can be used on off-premises station (OPS) lines, wide area telephone service (WATS) trunks and lines, and other metallic facility special service. Section 332-910-180 provides additional 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 re-

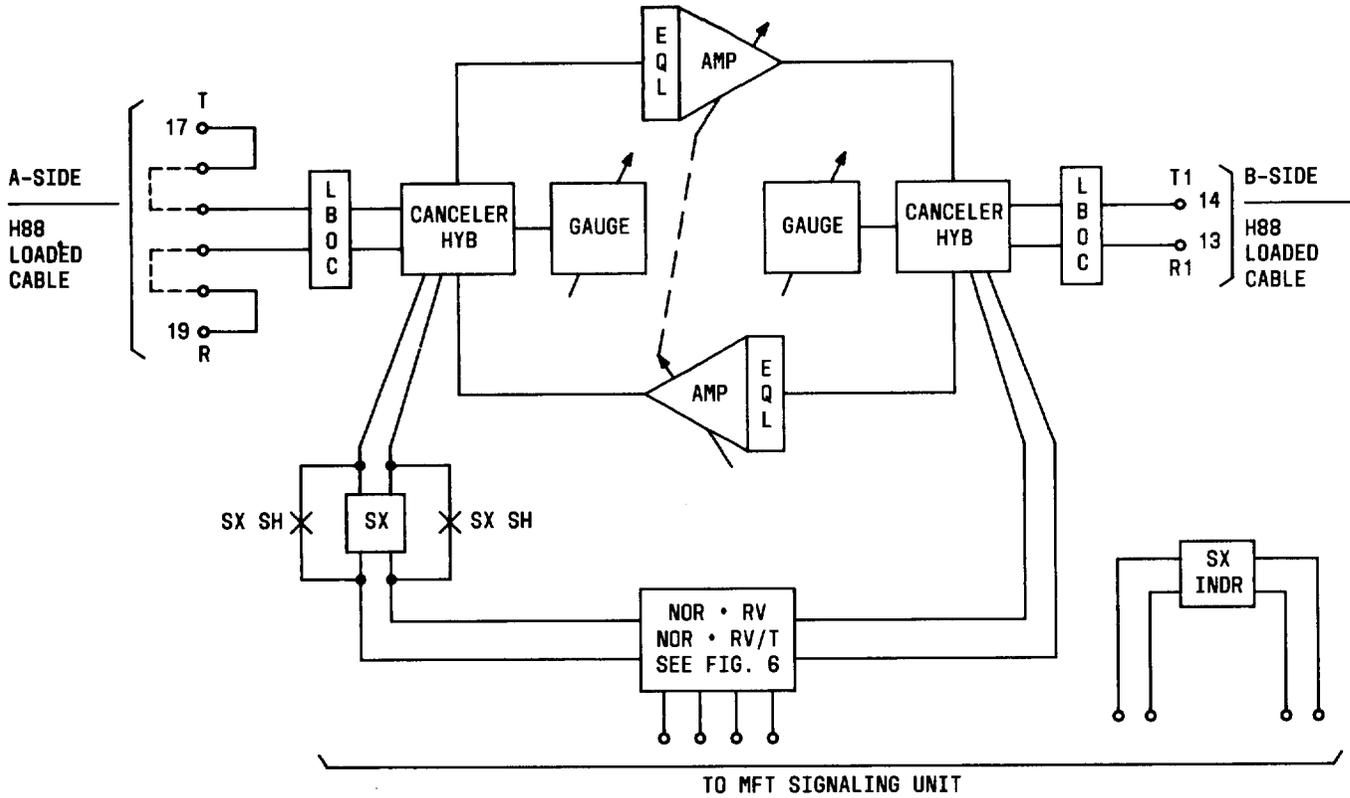


Fig. 8—Block Diagram of the 2-2 Intermediate (L-L) Repeater J99343PH, L2

placed 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 that provide additional information concerning 2-2 wire (L-L) intermediate repeaters.

REFERENCE	TITLE	REFERENCE	TITLE
332-910-100	MFT—General Description	332-912-212	2-2 Repeater—Prescription Settings
332-910-101	Shelf, Frame, Power Panel, and Distributing Frame Arrangements—Description	332-912-215	MFT 2-2 Intermediate Repeater—Installation and Testing
332-910-180	General Application Information	CD-1C359-01	Common Systems, MFT—Circuit Description
		SD-1C359-01	Common Systems, MFT—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
UNIT CHARACTERISTICS

FUNCTION		J99343PC/PH, L1	J99343PH, L2
Gain		0 dB to 14 dB	0 dB to 15.75 dB
Equalization		Fixed	Fixed
Hybrid Balance	A — Side	PBN and LBOC	Facility Canceler and LBOC
	B — Side	PBN and LBOC	Facility Canceler and LBOC
DC Resistance		55 ohms — SX shorted 130 ohms — SX in 185 ohms — through	65 ohms — SX shorted 185 ohms — SX in 250 ohms — through
Current Drain		Disabled: 0 mA No Signal: 29 mA Typical: 30-36 mA Maximum: 60 mA	Disabled: 0 mA No Signal: 36 mA Typical: 36-42 mA Maximum: 68 mA

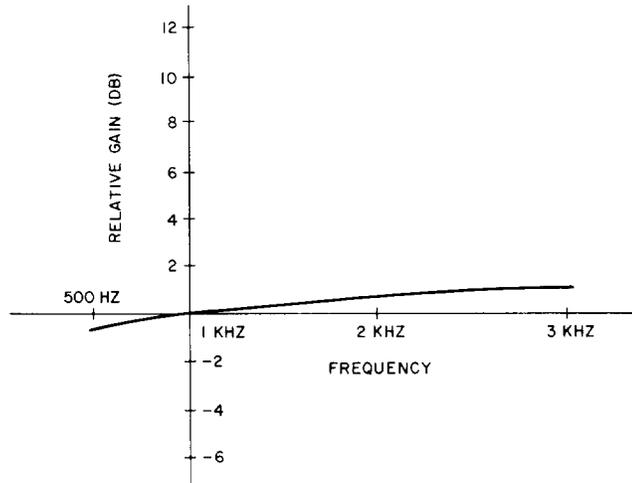


Fig. 9—Amplifier Frequency Response

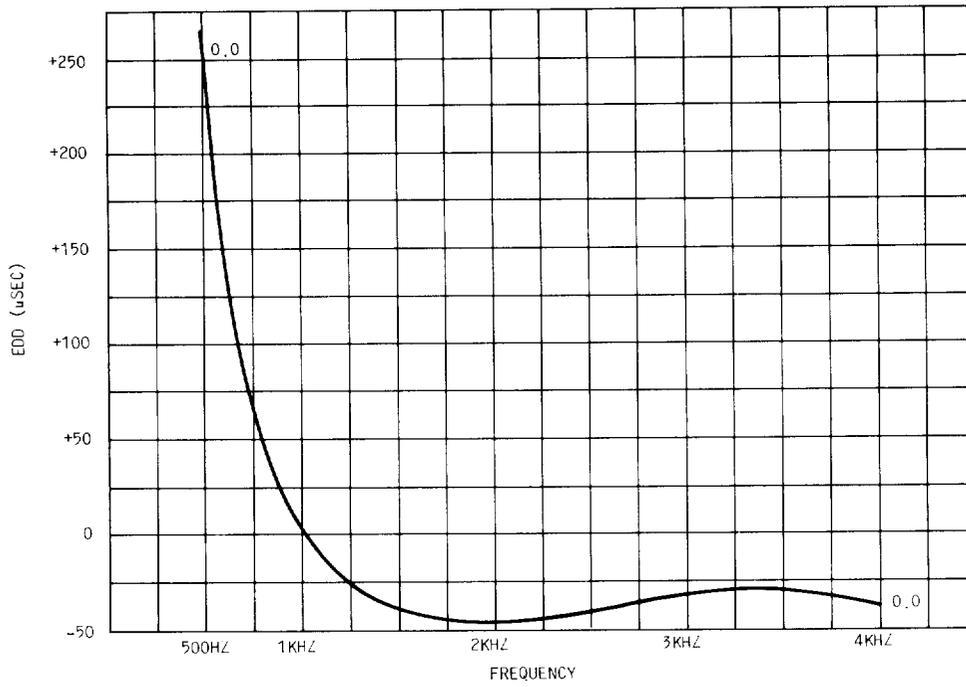


Fig. 10—Envelope Delay Distortion Curve

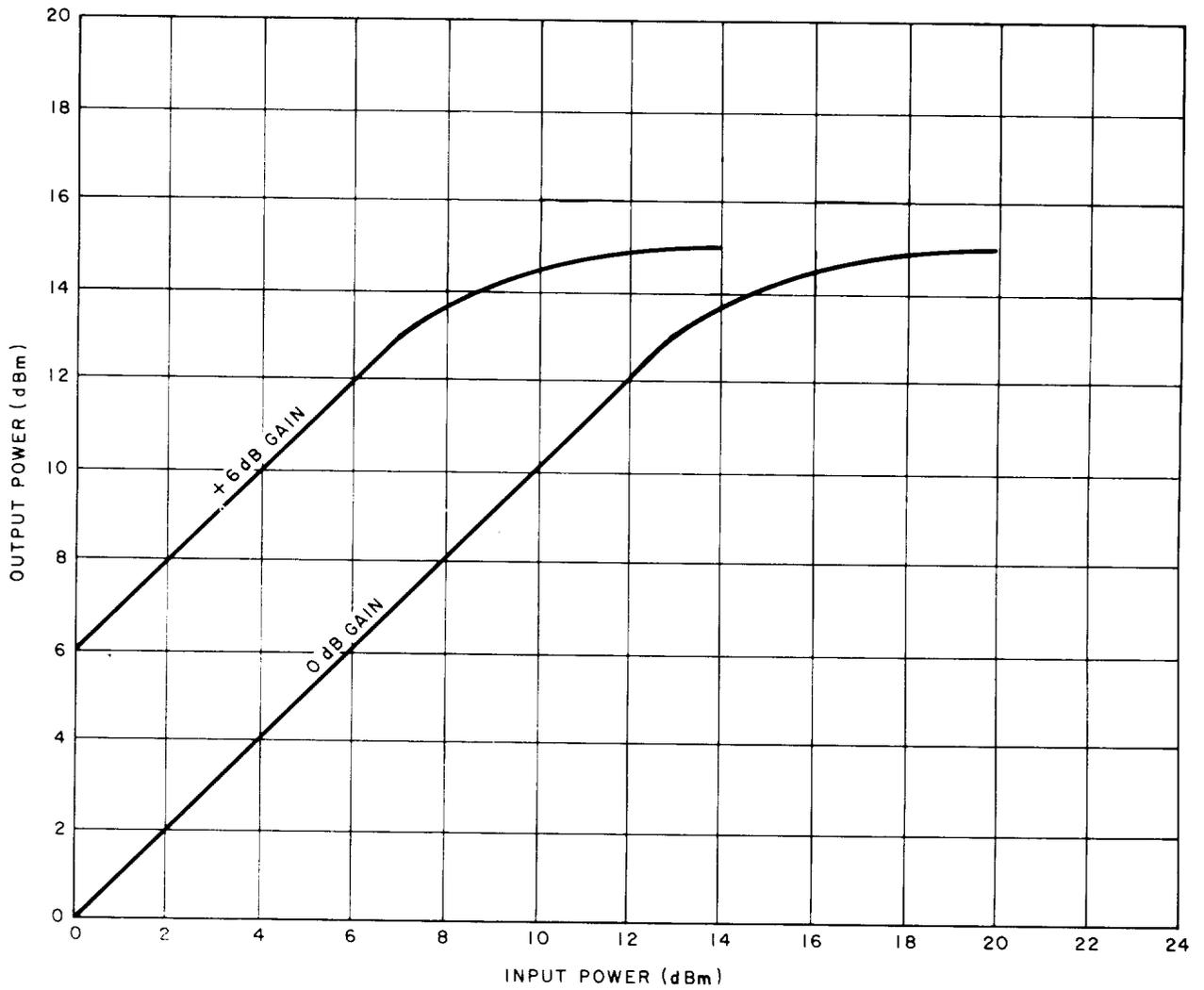


Fig. 11—Output Power Characteristic Curve

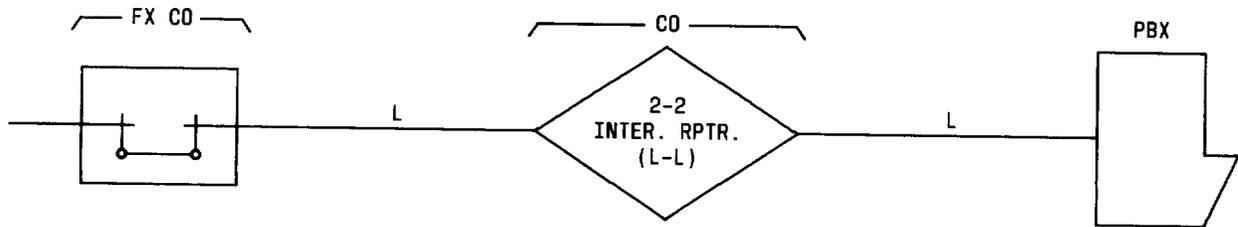


Fig. 12—Application of the 2-2 Intermediate (L-L) Repeater in an FX Trunk