

## J99343SC AND SD 4-4 WIRE INTERMEDIATE/TERMINAL REPEATERS

### DESCRIPTION

### METALLIC FACILITY TERMINAL

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Figures		1.01 This section provides a physical description and discusses the basic functions of the 4-4 repeaters, J99343SC and SD. The individual units are described in detail; and transmission performance,	
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typical applications, and maintenance philosophy are also discussed.

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

**1.03** Detailed information on the J99343SC and SD 4-4 wire repeaters can be found in Sections 332-910-100, 332-912-236, and drawings CD- and SD-7C050-01.

#### Physical Description

**1.04** 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 J99343SC and SD 4-4 wire intermediate/terminal 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.

**1.05** These units are designed for use in the transmission slot of any MFT frame. The SC unit is compatible with a companion signaling unit in a double module arrangement. The SD does not provide conventional signaling access, therefore, the unit is not compatible with a companion signaling unit. Section 332-912-101 contains additional information on MFT mounting arrangements.

## 2. FUNCTIONAL DESCRIPTION - J99343SC

### A. Operation

**2.01** The J99343SC unit is a low cost alternative of the J99343SA,L3 in terminal applications and the J99343SB,L3 in intermediate applications. The SC repeater provides gain or loss and equalization in both directions of transmission. The J99343SC is shown in Fig. 1. Figure 2 is a block diagram of the unit.

#### Amplifier Units

**2.02** **Caution:** For crosstalk considerations, the maximum gain on 4-wire repeaters typically is limited to 15 dB.

**2.03** An individual amplifier provides adjustable gain in each direction of transmission. The

control for the amplifier is designated GAIN. The range of the amplifier gain control is -20 dB to +23.5 dB with respect to the received signal level.

#### Equalizer

**2.04** The J99343SC provides only slope equalization in both directions of transmission. Equalization settings may be set per prescription settings by referring to installation and test practice 332-912-236.

#### Input and Output Transformers

**2.05** Each of the four repeater interfaces has an associated coupling transformer. These transformers provide simplex leads (SX and SX1) for the signaling unit access. Facility impedance matching is provided by the 600 or 1200 ohm INPUT and OUTPUT impedance switches.

#### Signaling

**2.06** The signaling leads (SX and SX1) are derived through the center taps of the transformer windings on each side of the repeater. The three basic signaling modes (normal, reverse, and through) are controlled by the **NOR-RV** and **NOR-RV/T** switches.

### B. Unit Controls

**2.07** The rocker-type switches for a particular function, which are described in the following paragraphs, are operated when depressed toward their 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.

**2.08** **GAIN SW:** See **Caution** in paragraph 2.02. Ten miniature switches, designated **GAIN**, control the gain of the repeater. There is a separate gain switch in each direction of transmission. These switches are labeled .1, from -20 dB to +23.5 dB in 0.1 dB increments with respect to the received signal level.

**Note:** The sum of rocker switches 1, 2, 4, and 8 should not exceed 12.

**2.09** **SLOPE:** See **Caution** in paragraph 2.02. Five rocker switches, designated **SLOPE**, control the equalization of the repeater. There is a separate slope switch in each direction of transmission.

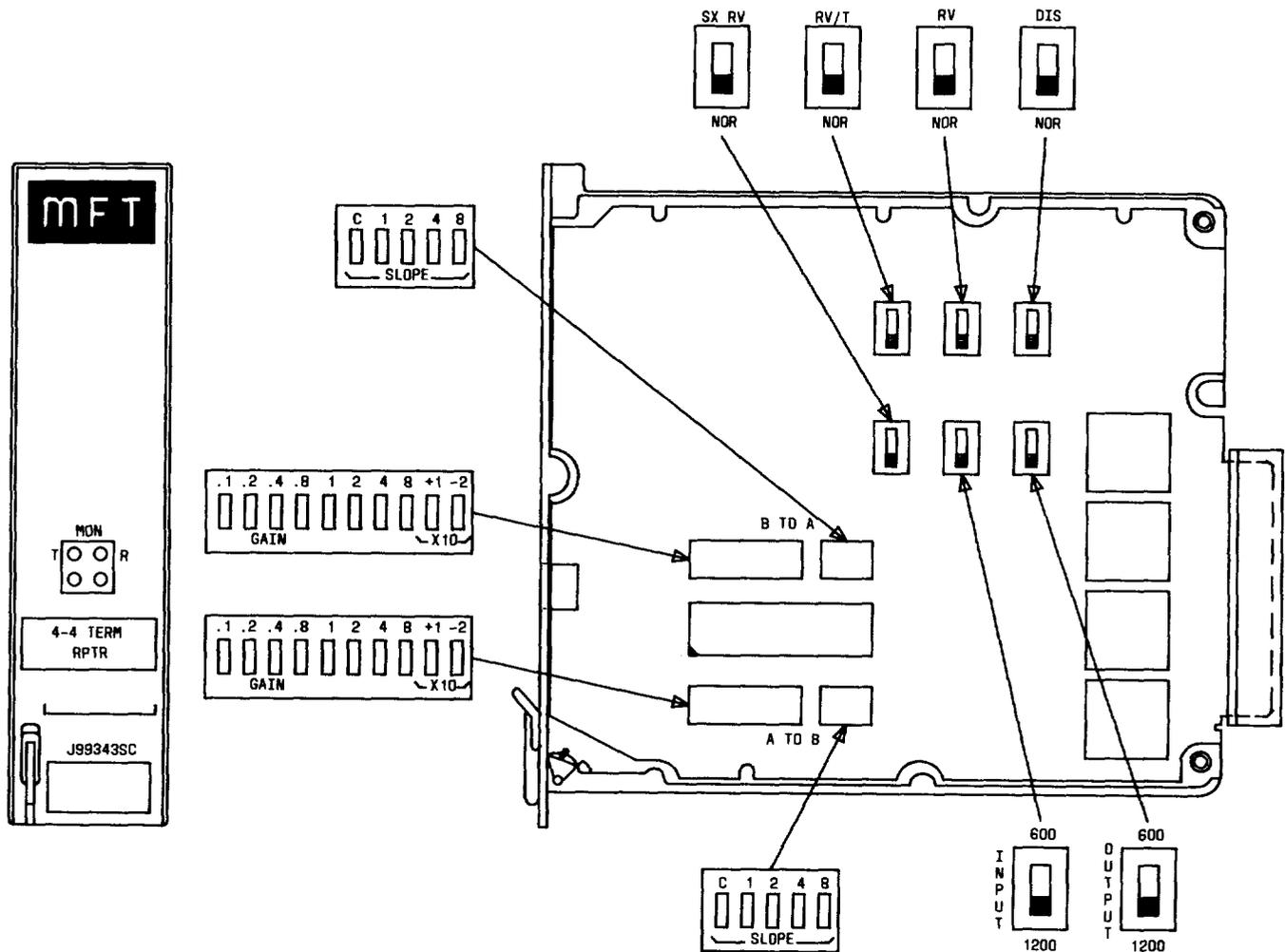


Fig. 1—4-4 Wire Transmission Unit J99343SC Component Layout

These switches are labeled C, 1, 2, 4, and 8. A separate equalizer is provided for each direction of transmission. The sum of these switches determines the equalization. The C switch acts as a range selector and when operated provides a steeper degree of equalization. See Section 332-912-212, Part A for prescription settings of the SLOPE switches.

**2.10 NOR-RV and NOR-RV/T:** These switches are used to establish a signaling mode of either normal, reverse, or through. Figure 3 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.

**2.11 NOR-SX RV:** This switch is used to reverse the simplex signaling leads (SX and SX1) on the B-side of the repeater.

**2.12 NOR-DIS:** This switch permits any companion signaling unit having the disable function to control the power to the repeater. In the **DIS** 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.

**2.13 INPUT-OUTPUT:** The input and output transformers that interface the cable facility

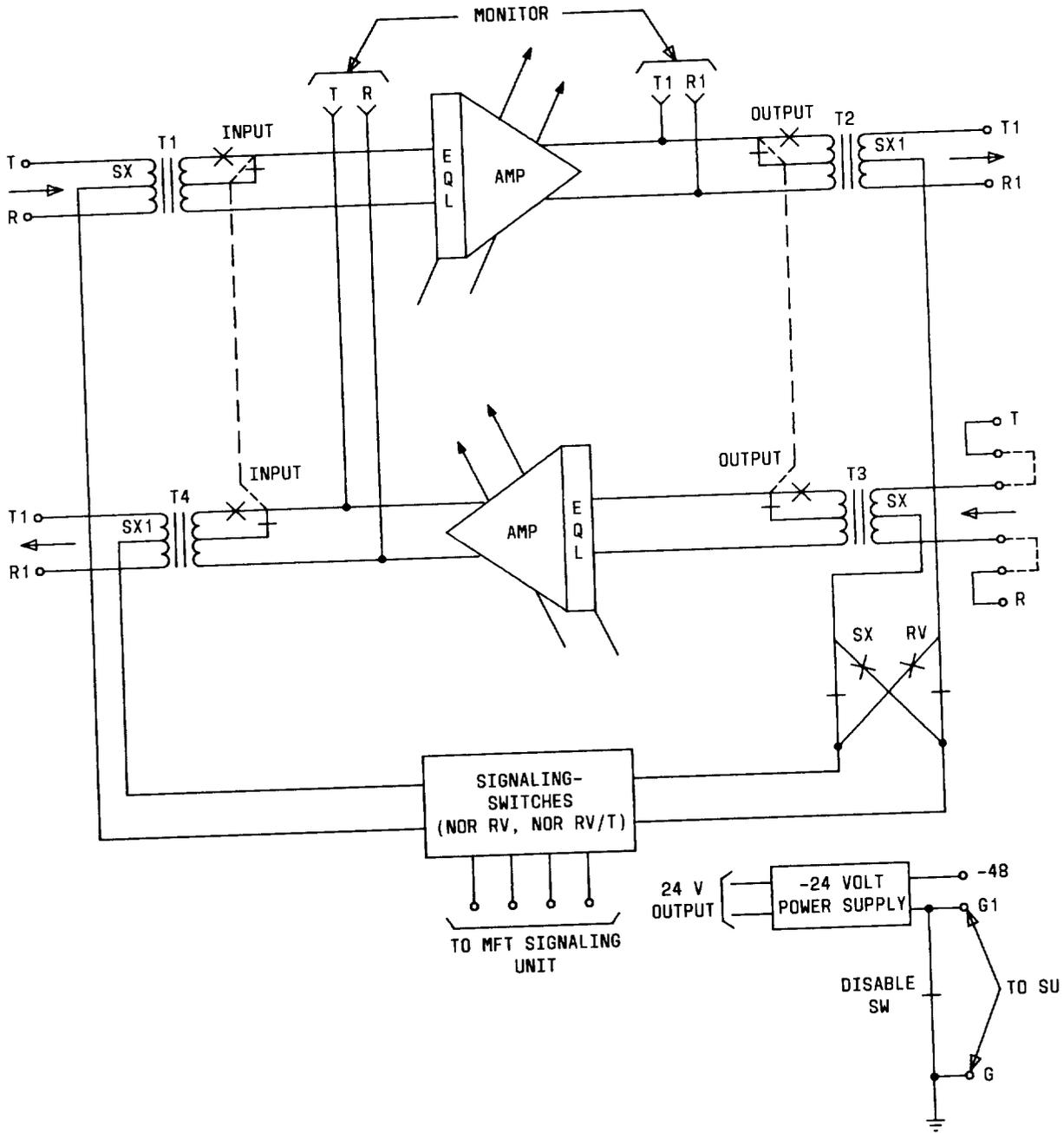
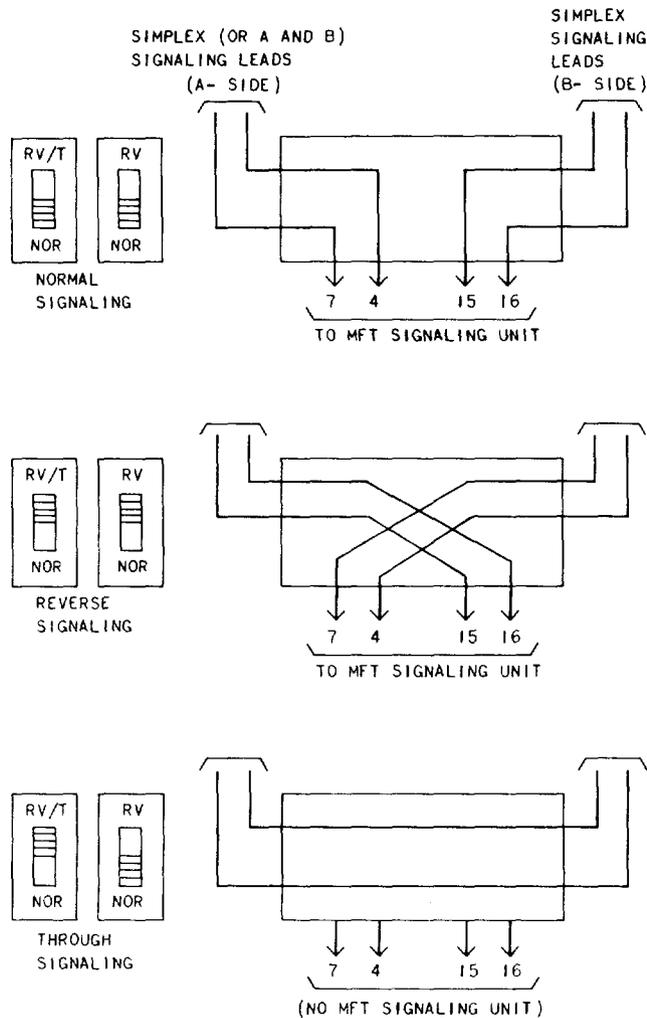


Fig. 2—Block Diagram of J99343SC Transmission Unit



## NOTE:

THESE DIAGRAMS SHOW FUNCTIONALLY THE THREE SIGNALING CONNECTIONS. THE EXACT WIRING CONNECTIONS HAVE BEEN OMITTED FOR CLARITY.

**Fig. 3—Signaling Options for the J99343SC Repeater**

are provided with a 600/1200-ohm impedance selection switch. The 1200 ohms is used for loaded cable and the 600 ohms for nonloaded cable. The impedance option switches are provided on both the A-side (INPUT) and the B-side (OUTPUT).

### 3. FUNCTIONAL DESCRIPTION - J99343SD

#### A. Operation

**3.01** The J99343SD unit supersedes the J99343BG unit for terminal and intermediate applica-

tions. The J99343SD merges the transmission circuitry of the SC unit with the capability to sink or source sealing current in either or both directions. The J99343SD is shown in Fig. 4. Figure 5 is a block diagram of the unit.

#### Amplifier Units

**3.02** *Caution: For crosstalk considerations, the maximum gain on 4-wire repeaters typically is limited to 15 dB.*

**3.03** An individual amplifier provides adjustable gain in each direction of transmission. The control for the amplifier is designated GAIN. The range of the amplifier gain control is -20 dB to +23.5 dB with respect to the received signal level.

#### Equalizer

**3.04** The J99343SD provides for only slope equalization in both directions of transmission. Equalization settings may be set per prescription settings by referring to installation and test practice 332-912-236.

#### Input and Output Transformers

**3.05** Each of the four repeater interfaces has an associated coupling transformer. These transformers provide simplex leads (SX and SX1) for the signaling unit access. Facility impedance matching is provided by the 600 or 1200 ohm INPUT and OUTPUT impedance switches.

#### Signaling

**3.06** The signaling leads (SX and SX1) are derived through the center taps of the transformer windings on each side of the repeater. The two basic signaling modes (normal and through) are controlled by the **NOR-THRU** switch.

#### Sealing Current

**3.07** *Caution: A potential problem in the use of sealing current on 4-wire circuits, as stated in paragraphs 3.08 and 3.09, should be noted. If one conductor in a pair has a higher dc resistance than the other conductor, the conductor with the lower resistance will tend to draw more current. This will cause an imbalance in tip-ring. To prevent this, take ap-*

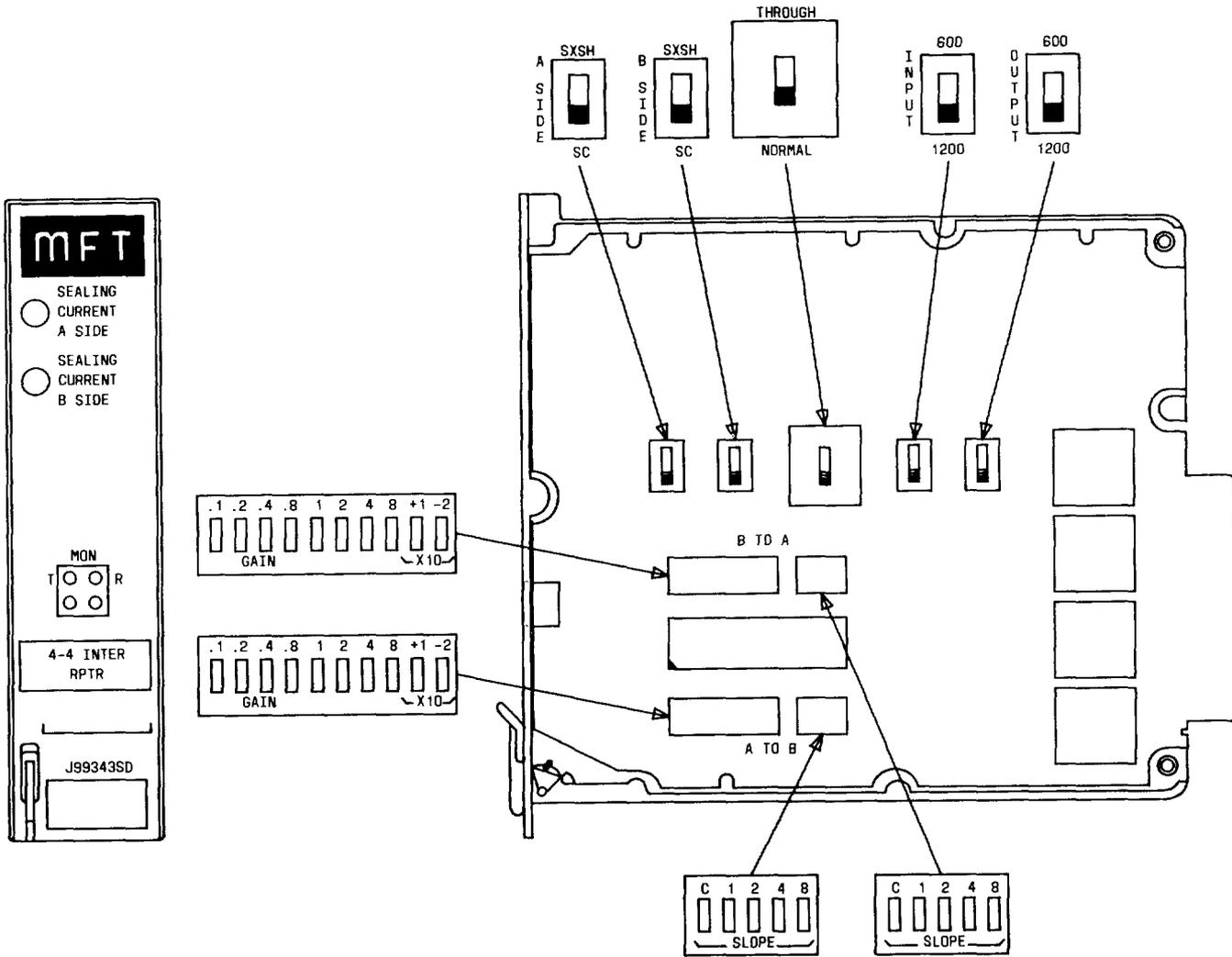


Fig. 4—4-4 Wire Transmission Unit J99343SD Component Layout

*appropriate measures to ensure that each conductor in a pair has the same dc resistance*

**3.08** See *Caution* in paragraph 3.07. The J99343SD unit provides sealing current to help prevent the buildup of high resistance film which can occur at unsoldered splices in a telephone loop. This film can degrade transmission performance of the circuit. Sealing current can be applied across the simplex leads of either the A-Side and/or B-Side line transformers.

**3.09** The SD unit will provide sealing current in excess of 10 milliamperes for simplex loop resistances of up to 3000 ohms. If the sealing current

exceeds 10 milliamperes two LEDs on the front panel, designated Sealing Current A-Side and Sealing Current B-Side, will be activated. The sealing current options are illustrated in Fig. 6. Figure 7 illustrates the sealing current versus simplex loop resistance.

**3.10** A typical example of a sealing current arrangement using the J99343SD unit is shown in Fig. 8. In order for sealing current to flow in the loop, the equipment on the distant end of the loop must have the capability of shorting the associated simplex leads.

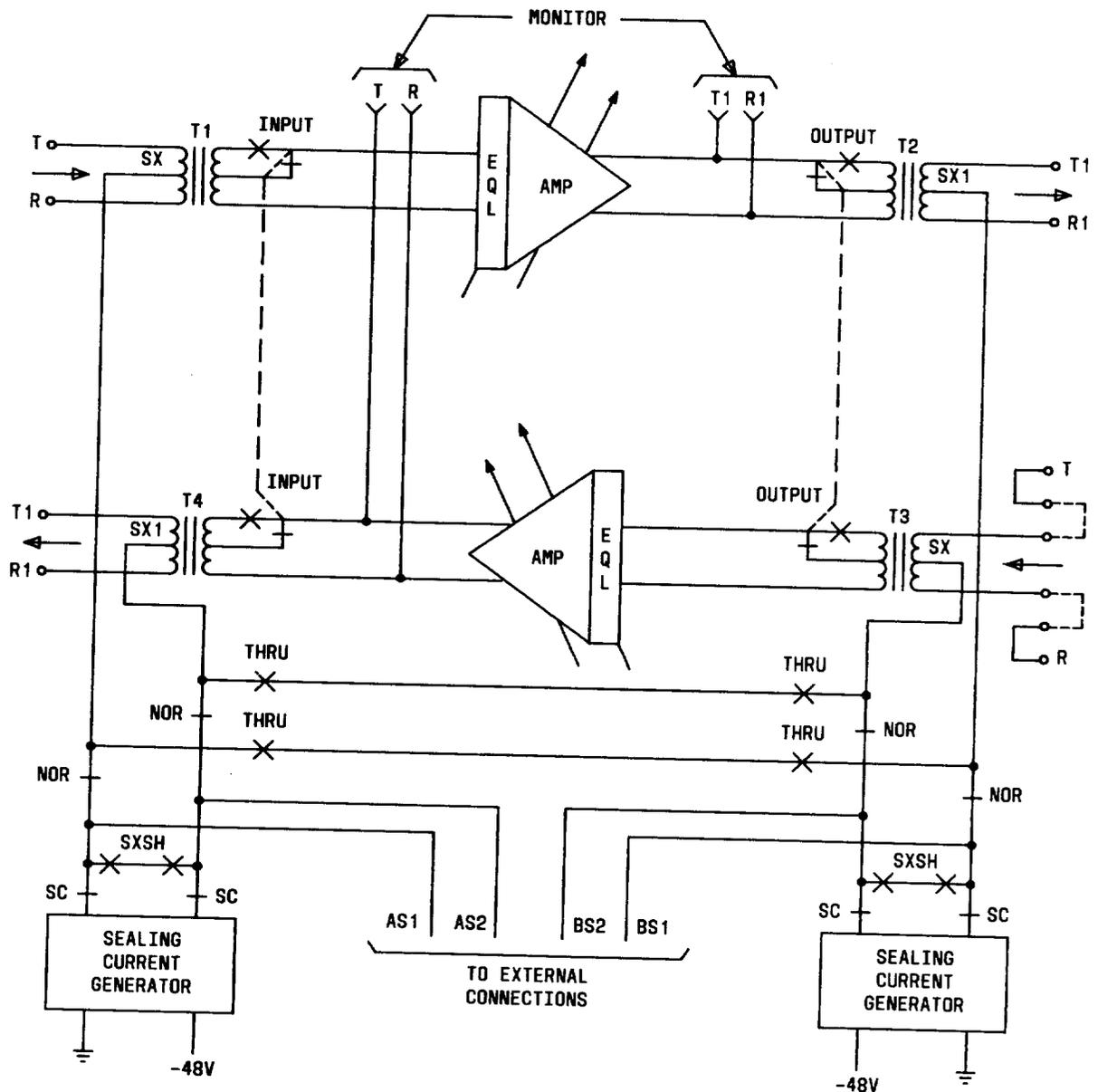


Fig. 5—Block Diagram of J99343SD Transmission Unit

## B. Unit Controls

3.11 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. 4.

3.12 **GAIN SW:** See **Caution** in paragraph 3.02. Ten miniature switches, designated **GAIN**,

control the gain of the repeater. There is a separate gain switch in each direction of transmission. These switches are labeled .1, from -20 dB to +23.5 dB in 0.1 dB increments with respect to the received signal level.

**Note:** The sum of rocker switches 1, 2, 4, and 8 should not exceed 12.

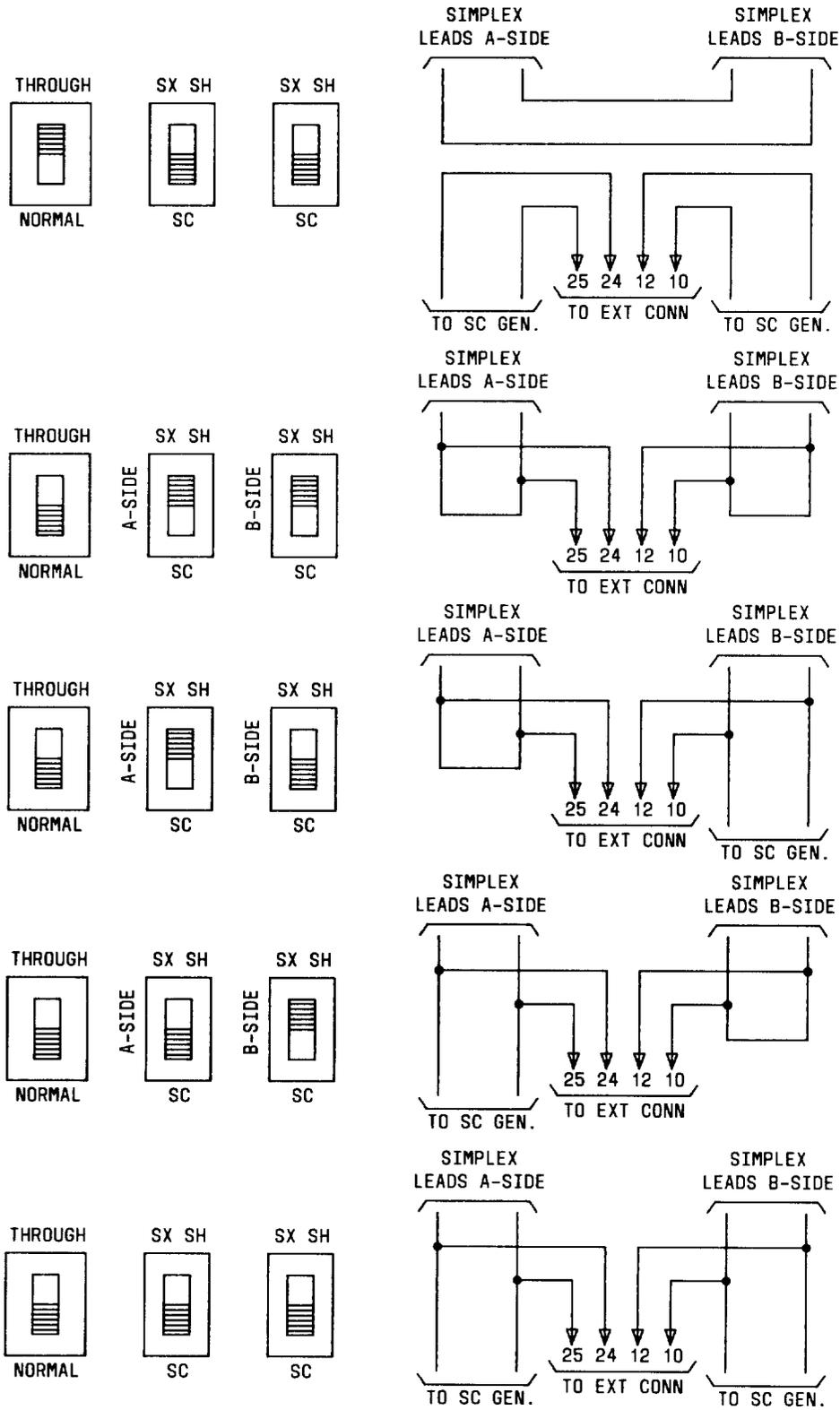


Fig. 6—J99343SD Sealing Current Options

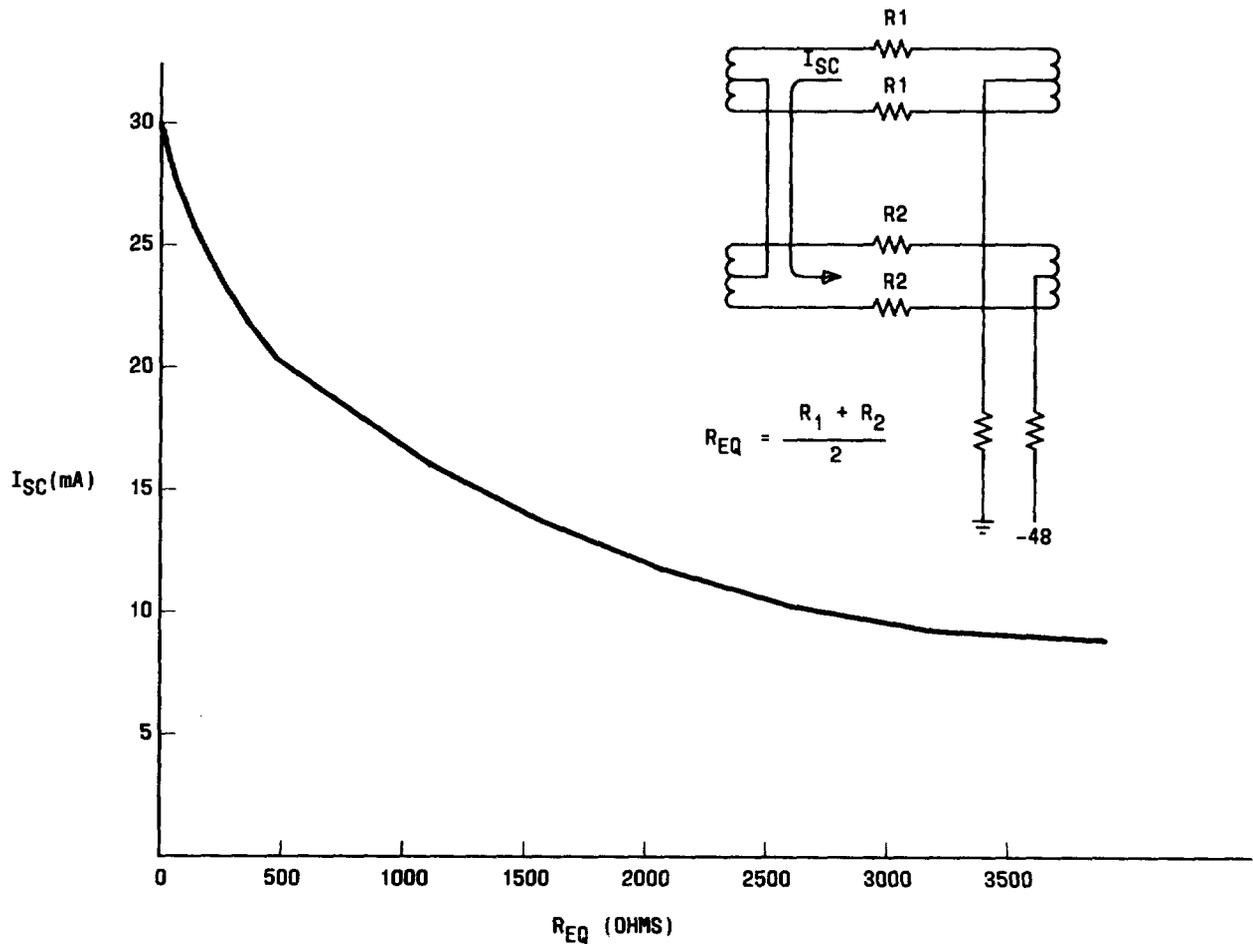


Fig. 7—Sealing Current Characteristics

**3.13 SLOPE:** See **Caution** in paragraph 3.02.

Five rocker switches, designated **SLOPE**, control the equalization of the repeater. There is a separate slope switch in each direction of transmission. These switches are labeled C, 1, 2, 4, and 8. A separate equalizer is provided for each direction of transmission. The sum of these switches determines the equalization. The C switch acts as a range selector and when operated provides a steeper degree of equalization. See Section 332-912-212, Part A for prescription settings of the **SLOPE** switches.

**3.14 NORMAL-THROUGH:**

The normal/through switch controls the routing of the simplex leads. In the **normal** mode, the simplex leads are connected to the sealing current function. In the **through** mode, the sealing current is removed from the 4-wire ports and the unit is con-

nected in the conventional through signaling mode. In the **through** mode the SC current functions are available on the external signaling leads.

**3.15 SC-SX SH:** This switch determines whether the simplex leads are connected to the sealing current generators to source current, or are shorted together to furnish a sealing current sink.

**4. PERFORMANCE CHARACTERISTICS**

**4.01** The performance of the J99343SC and SD repeaters are discussed in the following paragraphs. Table A lists the performance characteristics of these units.

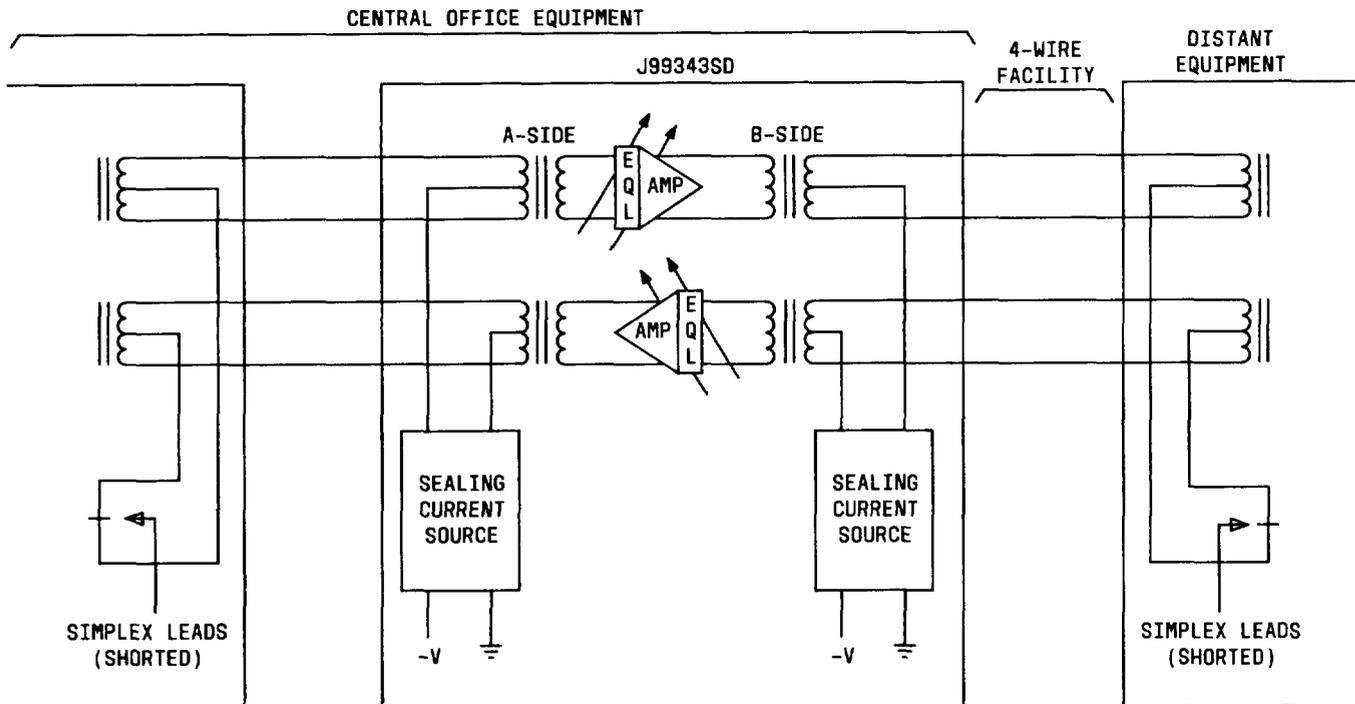


Fig. 8—Typical Applications of the J99343SD Transmission Unit With Sealing Current

TABLE A  
UNIT CHARACTERISTICS

FUNCTION	J99343SC	J99343SD
GAIN	-20 dB to +23.5 dB	-20 dB to +23.5 dB
Max. Undistorted Output Power (600 ohms)	+18 dBm	+18 dBm
Equalizer Gain	Adj. (see Fig. 9 and 10)	Adj. (see Fig. 9 and 10)
A-Side Impedance B-Side Impedance	600/1200 ohms 600/1200 ohms	600/1200 ohms 600/1200 ohms
DC Resistance (Ohms): Nor/Rev Mode Through Mode	17 34	— 34
Current Drain: Disabled Typical Maximum	0 30 50	— 50 110

### A. Amplifier/Equalizer Frequency Response

4.02 Figures 9 and 10 give the frequency response of the gain and equalizer circuits. Figure 9 provides the response curves for various equalizer settings with the C switch set for 0 (off). Figure 10 provides curves for the same equalizer settings with the C switch set for 1 (operated).

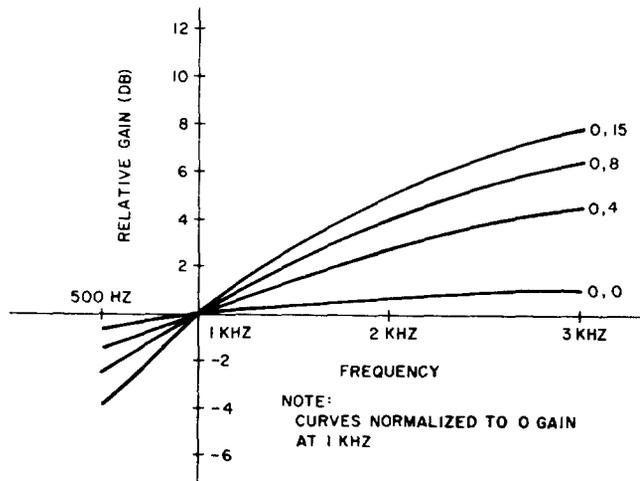


Fig. 9—Amplifier/Equalizer Frequency Response-C Switch=0 (off)

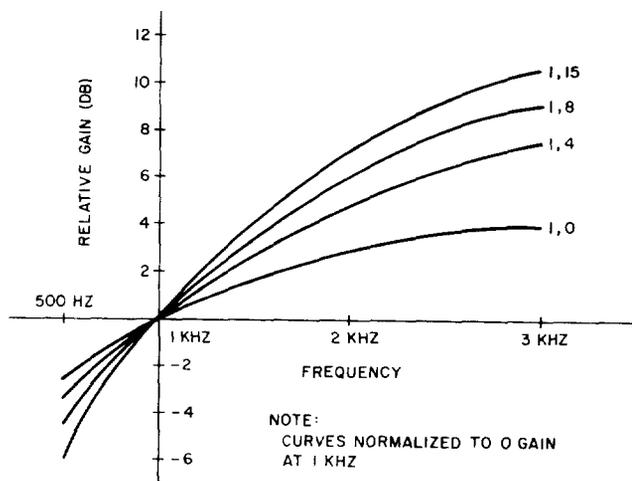


Fig. 10—Amplifier/Equalizer Frequency Response-C Switch=1 (Operated)

### B. Envelope Delay Distortion

4.03 Figures 11 and 12 give the Envelope Delay Distortion (EDD). Figure 11 provides the EDD curves for various equalizer settings with the C switch set for 0 (off). Figure 12 provides curves for the same equalizer settings with the C switch set for 1 (operated).

### C. Longitudinal Balance

4.04 The longitudinal balance for these repeaters is at least 60 dB from 200 Hz to 3000 Hz.

### D. Output Power Capability

4.05 Figure 13 shows the output power capability of the 4-4 wire intermediate/ terminal repeater. 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 18.0 dBm.

## 5. APPLICATIONS

5.01 The J99343SC and SD units are intended for use in intermediate and terminal applications requiring 4-wire transmission treatment. These applications include foreign exchange (FX) service, off-premises station (OPS) lines, wide area telephone services (WATS) trunks and lines, private business exchange (PBX) tie trunks, private line services, and multipoint bridge arrangements. Figure 14 illustrates typical applications for the 4-wire repeaters.

5.02 The J99343SC is intended as a low cost alternative to the SA,L3 and SB,L3 providing an increase in 2800 Hz roll-off is acceptable. The J99343SD is also intended to replace the SA,L3 and SB,L3 applications where sealing current is required. The SD unit is also intended to replace the J99343BG passive repeater in most applications.

## 6. MAINTENANCE

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

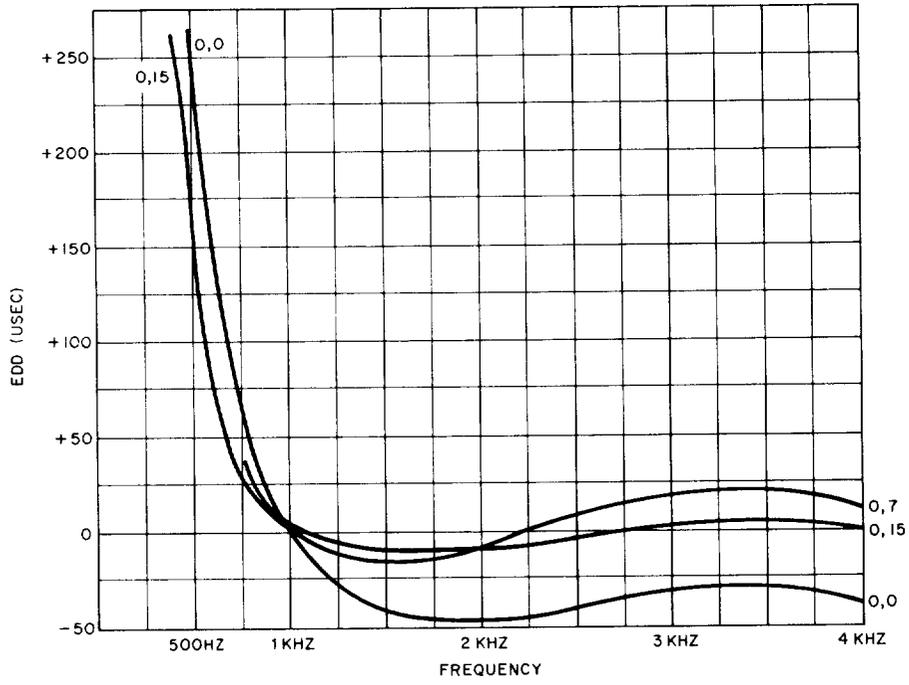


Fig. 11—Envelope Delay Distortion, C=0

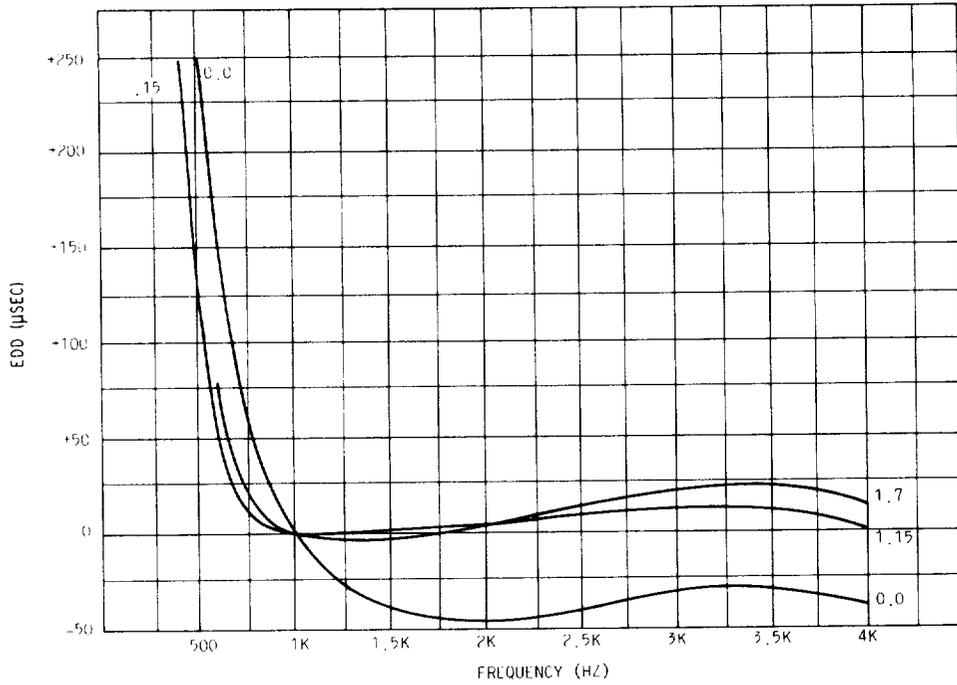


Fig. 12—Envelope Delay Distortion, C=1

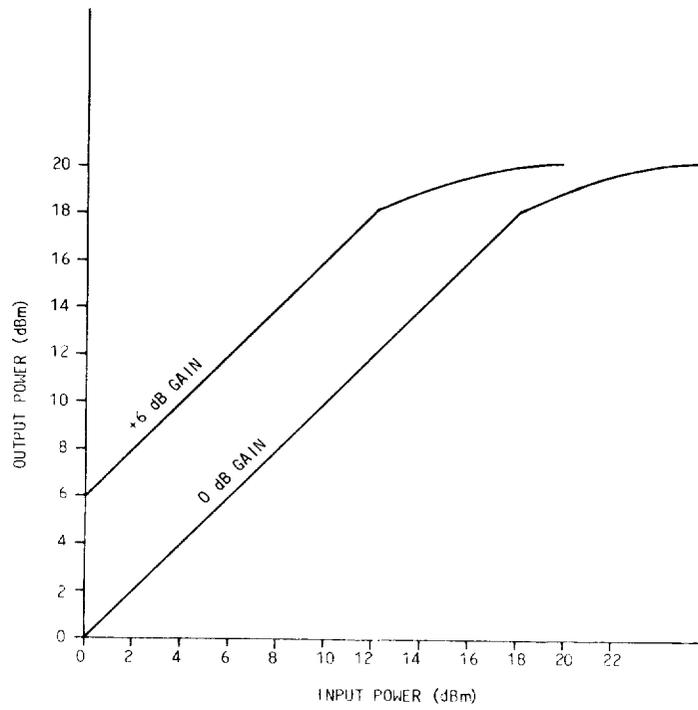


Fig. 13—Output Power Capability of the J99343SC and SD Units

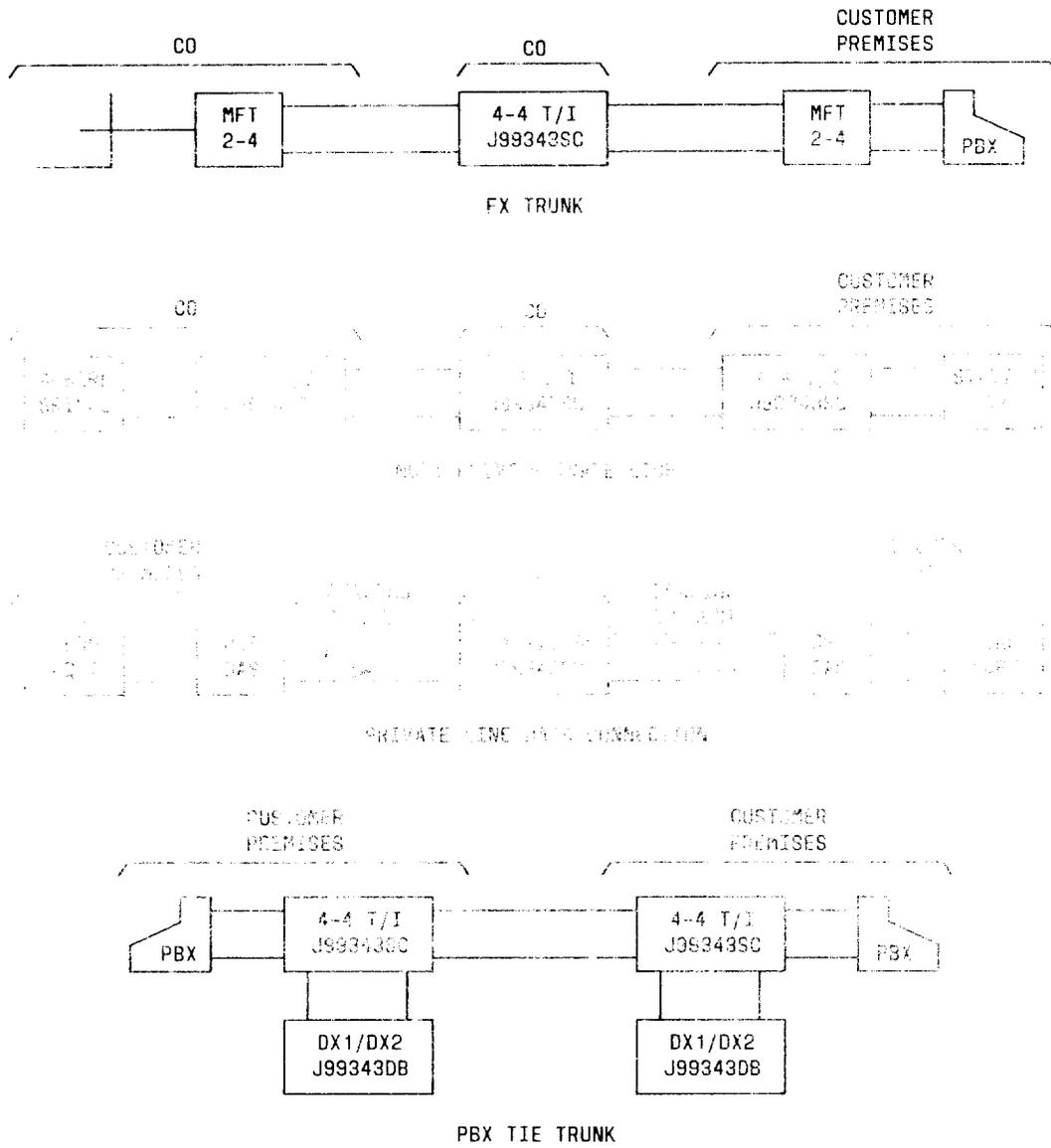


Fig. 14—Four-wire Repeater Applications