

**J99343GB, L1 AND L2, LOOP SIGNALING EXTENDER/2-2 WIRE
TERMINAL REPEATER (L) COMBINED FUNCTION UNIT**

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 Loop Signaling Extender/2-2 Wire Terminal (Loaded) Repeater (J99343GB) Combined Function Unit (CFU). The basic CFU is described in detail, and transmission and 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.

1.03 This equipment generates and uses radio frequency energy. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference in commercial and residential installations. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, the user may find the following booklet, prepared by the Federal Communications Commission, helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

Physical Description

1.04 The Metallic Facility Terminal (MFT) is a standard equipment arrangement for providing various transmission and signaling functions that may be required by metallic facilities. The Loop Signaling Extender/2-2 Wire Terminal (Loaded) Repeater CFU is an MFT plug-in that consists of a component board held by a molded polycarbonate frame. The MFT unit measures 1-11/16 inches wide, 7-7/8 inches high, and 9 inches deep.

1.05 This CFU combines the functions of a transmission unit and a signaling unit on a single plug-in. A CFU can be used in either a single- or double-module mounting arrangement. It can be mounted in any slot of a single-module shelf. When the CFU is used in the double-module arrangement, it is mounted in the transmission slot. The companion signaling unit slot must be vacant. Section 332-910-101 contains additional information on MFT mounting arrangements.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

SECTION 332-912-153

1.06 The J99343GB, L1 and L2, is the Loop Signaling Extender/2-2 Wire Terminal Repeater (L) CFU. It provides the function of the J99343CD Loop Signaling Extender (LSE) II and the J99343PG, L2 Repeater. It also provides range extension and hybrid balance for terminal equipment on the A-side and loaded facilities on the B-side.

1.07 The J99343GB, Lists 1 and 2 are functionally identical and are described together in this section. Section 332-912-253 provides installation and testing and touch-up procedures for the unit.

2. FUNCTIONAL DESCRIPTION

2.01 The J99343GB is shown in Fig. 1. It provides gain and equalization on 2-wire circuits be-

tween loaded facilities and terminal equipment. Figure 2 shows a block diagram of this unit.

A. Operation

Transmission

2.02 **Amplifier Units:** Adjustable gain and fixed equalization are 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.

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

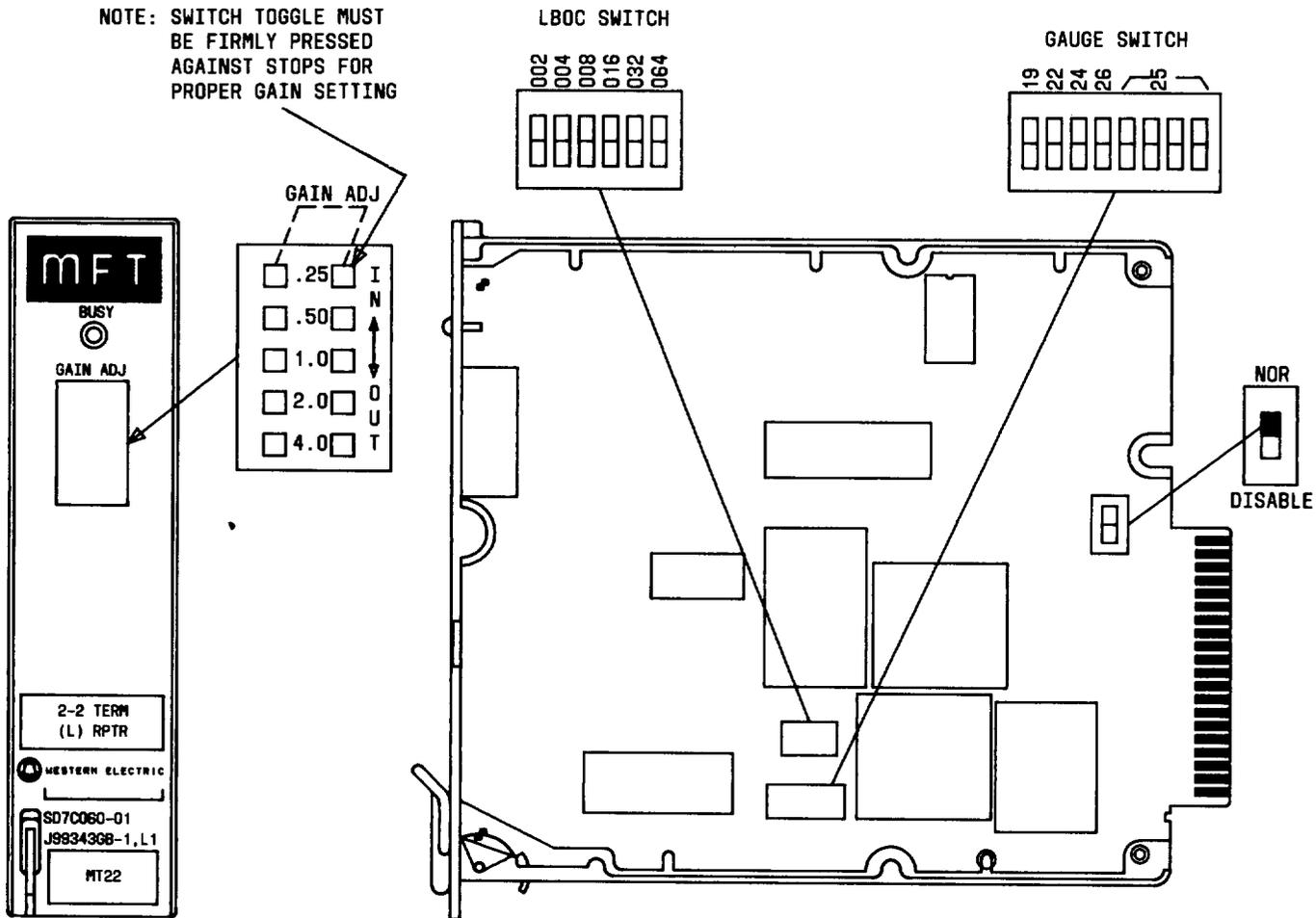


Fig. 1 — J99343GB Combined Function Unit

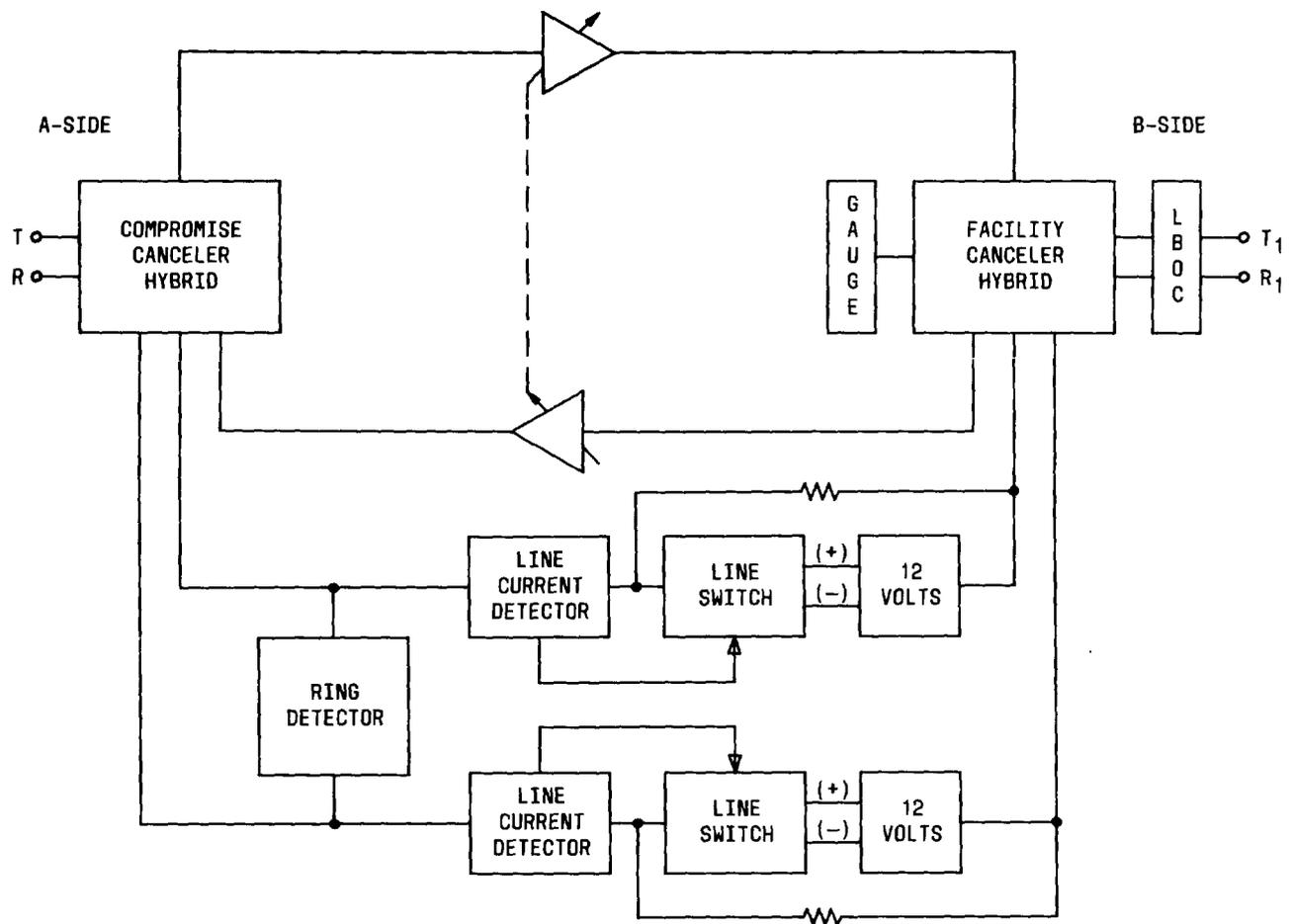


Fig. 2—Block Diagram of J99343GB CFU

2.03 Compromise Canceler Hybrid: 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 μF terminal equipment and has no associated adjustments.

2.04 Facility Canceler Hybrid: 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.

2.05 Line Build-Out Capacitor: The line build-out capacitor (LBOC) network is used on the 2-wire loaded cable interface(s) to build out the end section to an equivalent of 6 kft. The switches that control the LBOC are designated 02, 04, 08, 16, 32, and 64.

Signaling

2.06 The signaling section of the unit provides signaling range extension by:

- Boosting all dc signaling voltages for signaling range extension by maintaining a floating dc potential of up to 12 volts, which can be inserted in series with each of the tip and ring conductors.
- Sensing the loop current direction and maintaining the polarities of the floating boost voltages so that they always aid the CO battery.

The five principal parts of the LSE portion of the J99343GB CFU as shown in Fig. 2 are as follows:

- (a) Line current detector circuits
- (b) 12-volt supplies and current regulator
- (c) Line switch control circuit

- (d) Ringing detector circuit
- (e) Repeater disable circuit.

Line Current Detector Circuits

2.07 The LSE uses optical isolators as loop current detectors and switches. These devices allow complete isolation between tip and ring conductors, the control circuitry, and power sources.

2.08 Line current detectors (optical isolators) are located in both the tip and ring circuits to detect ground-start or loop-start currents. A current of 5 mA or more of either polarity in the tip or ring circuits will operate the appropriate line current detector(s). Operation of a line current detector enables the 12-volt power supplies and the appropriate line switches to supply boost voltage of the correct polarity (aiding) to the tip and ring circuits.

12-Volt Supplies

2.09 The 12-volt dc supplies for boost voltages are derived from a dc-to-dc converter source which is powered by -48 volt battery. The current regulation of the supplies is such that if the loop current increases for any reason (eg, a decrease in loop resistance) the boost voltage decreases. This tends to prevent excessive loop currents and helps stabilize the circuit from the effects of external influences.

2.10 The magnitude of the boost voltage is controlled by a line current regulation circuit in the dc-to-dc converter. The regulation circuit is biased so that the full boost voltage (12 volts) is in series with each of the tip and ring circuits until the

loop current reaches 40 mA; at this point the regulation circuit begins to reduce the boost voltage. All boost functions cease when the loop current reaches 65 mA and the LSE portion of the J99343GB CFU is effectively out of the circuit.

2.11 One of the floating dc supplies is in series with the tip and the other in series with the ring. This arrangement helps maintain longitudinal balance and assures a boost voltage for either tip or ring ground-start operation. The polarity to be used is controlled by the line switch control circuit which operates the appropriate line switch.

2.12 Line Switch Control Circuit: The line switch control circuit, when enabled by the line current detectors, turns on the appropriate line switches to boost the loop current. Included in the line switch control circuit is a delay circuit which will prevent the LSE portion from following battery reversals of less than 20 ms.

2.13 Ringing Detector Circuit: When ringing is detected on the A side, the line switches are prevented from operating in the reverse direction. During a ringing cycle, the boost voltage is applied only in the normal direction. The dc component of the superimposed ringing signal is boosted, assuring sufficient ring-trip current during the ringing interval. The ringing characteristics of the LSE as used with various ringing signal sources are shown in Table A.

Disable Circuit

2.14 The LSE features a repeater disable function. A slide switch labeled NOR/DISABLE, mounted on the component board, selects the mode of

TABLE A
RINGING CHARACTERISTICS OF J99343GB CFU
LOOP SIGNALING EXTENDER SECTION

BRIDGED RINGING	RING TRIP BOOST DURING RINGING	RING TRIP BOOST DURING SILENT INTERVAL
-48 Volt Superimposed On Ring	Yes	Yes
On Tip	No	Yes
-48 Volt Superimposed Ringing Ring to Gnd	Yes	Yes
Ringing Tip to Gnd	No	Yes

operation. When the NOR/DISABLE switch is set in the DISABLE position, power (-48 Vdc) is supplied to energize the repeater section of the GB CFU only when loop current flows. During idle or open circuit conditions, no power is supplied to operate the repeater section.

2.15 When the NOR/DISABLE switch is operated to the NOR position, power is supplied to the repeater portion at all times, regardless of the circuit condition.

B. Unit Controls

2.16 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. 1.

Transmission

2.17 GAIN ADJ: 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 Note in paragraph 2.02.

2.18 LBOC: The controls for the LBOC consist of a group of six rocker switches labeled 02, 04, 08, 16, 32, and 64. These switches control the selection of capacitor values from 0 to 0.126 μ F in 0.002 μ F increments.

2.19 GAUGE: 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.

Signaling

2.20 NOR-DISABLE: This switch provides a special test arrangement for the CFU. With the switch in the NOR position, the repeater section

can be tested independently of the signaling section. In this arrangement the repeater is continuously activated. In the DISABLE position, the CFU operates in the normal manner.

3. PERFORMANCE CHARACTERISTICS

3.01 The performance of the J99343GB CFU is discussed in the following paragraphs. Table B gives a summary of the characteristics of the CFU.

A. Amplifier Frequency Response

3.02 Figure 3 gives the amplifier response of the unit.

B. Envelope Delay Distortion

3.03 Figure 4 gives the envelope delay distortion for the repeater.

C. Longitudinal Balance

3.04 The longitudinal balance for these repeaters is at least 58 dB from 200 to 3000 Hz.

D. Output Power Capability

3.05 Figure 5 shows the output power capability of the J99343GB CFU. 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.

4. APPLICATION

4.01 The J99343GB CFU units may be used to provide gain on any 2-wire circuit between 900 Ω terminal equipment and loaded facilities. Figure 6 shows a typical application using the unit in a foreign exchange 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 services. Section 332-910-180 provides additional information.

5. MAINTENANCE

5.01 The 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.

TABLE B
UNIT CHARACTERISTICS

FUNCTION	J99343 GB
Gain	0 to 7.75 db
Equalization	Fixed
Hybrid Balance A-Side B-Side	Compromise Canceler Facility Canceler, LBOC
Current Drain Idle Typical Max.	Circuit Battery (Terminal 11) 10 mA 80 mA 110 mA

6. REFERENCES

6.01 The following references provide additional information concerning 2-2 wire (L) terminal repeaters.

SECTION	TITLE
332-910-100	MFT—Description
332-910-101	Shelf, Frame, Power Panel, and Distributing Frame Arrangements, Description
332-910-180	MFT—General Application Information

SECTION	TITLE
332-912-212	2-Wire Repeaters—Prescription Settings
332-912-253	J99343GB—Installation and Testing

DRAWING

CD-7C050-01	Common Systems, MFT, Circuit Description
SD-7C050-01	Common Systems, MFT, Schematic Drawing

The appropriate numerical index section should be consulted to find the current issue of 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.

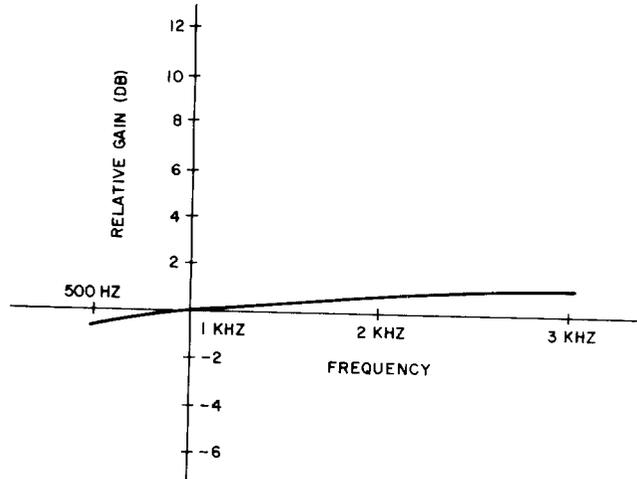


Fig. 3—Amplifier Frequency Response of J99343GB

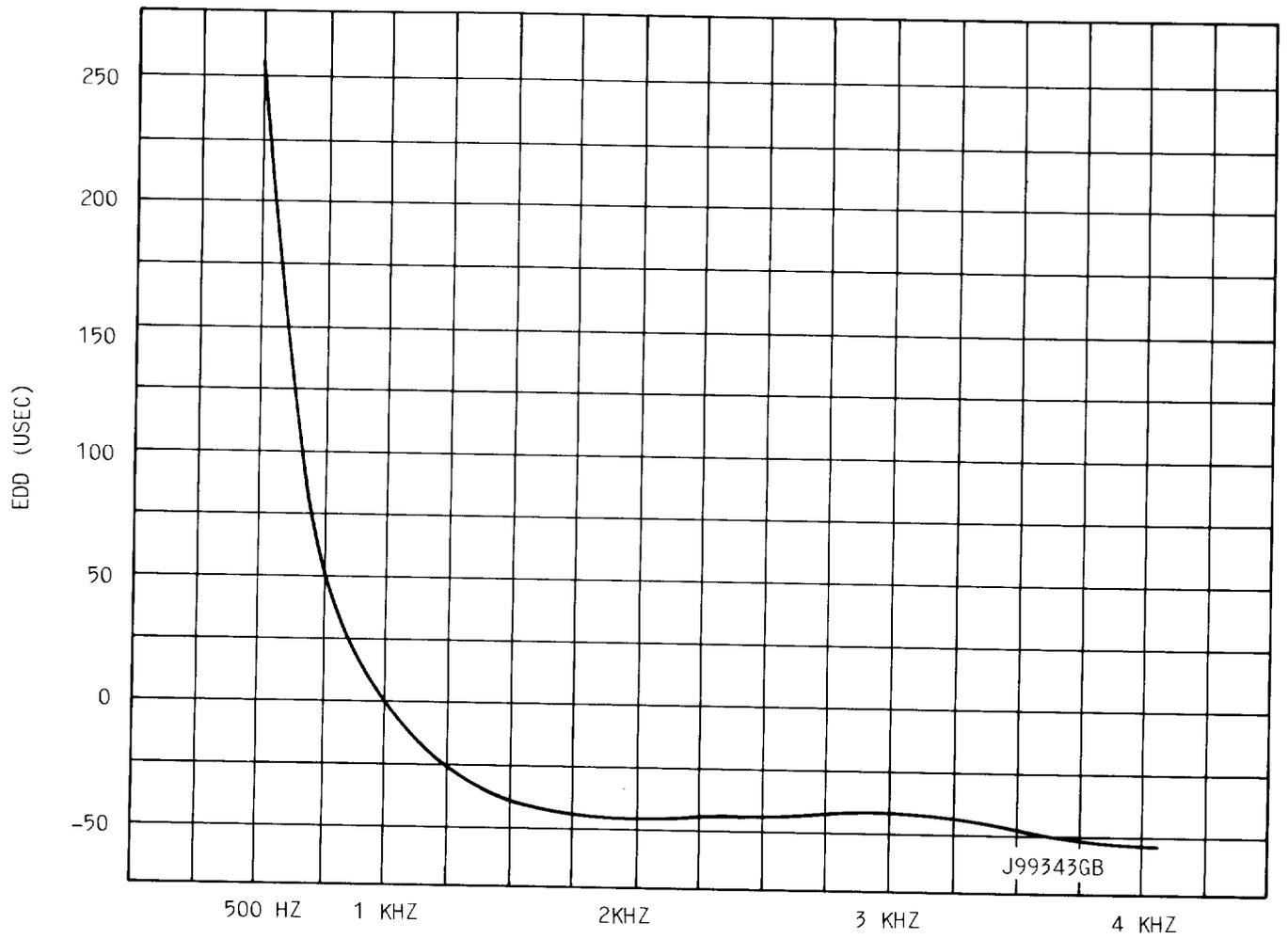


Fig. 4—J99343GB Envelope Delay Distortion

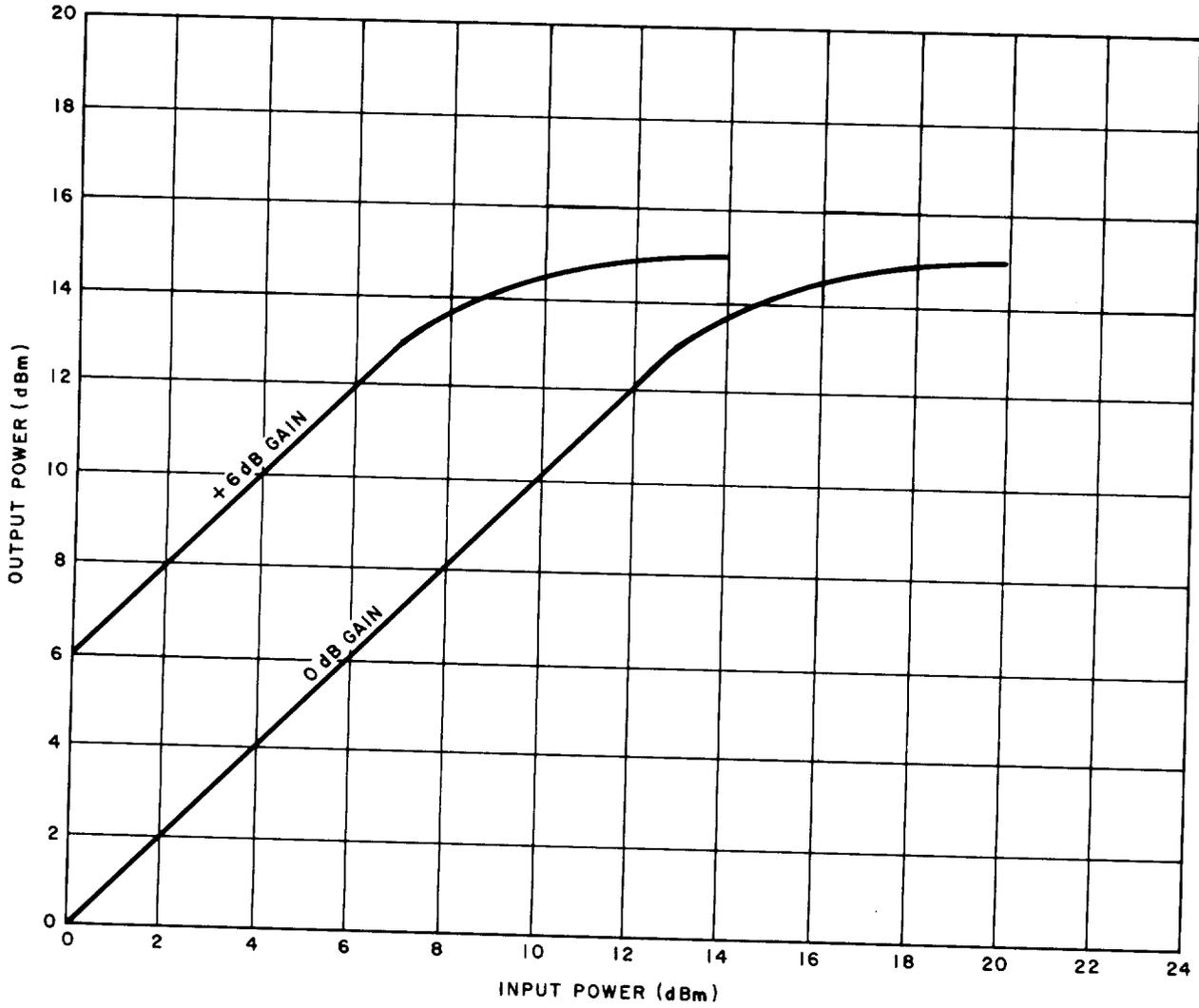


Fig. 5—Output Power Capability of the J99343GB CFU

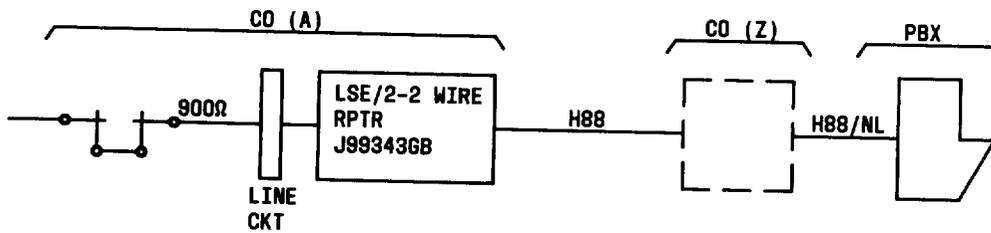


Fig. 6—Typical FX Trunk Application of the J99343GB CFU