J99343GF (L1&L2) AND GJ 2-2 WIRE INTERMEDIATE REPEATERS (L-L)/LOOP SIGNALING REPEATERS COMBINED FUNCTION UNITS

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 intermediate repeaters (L-L)/loop signaling repeaters (LSR) combined function units (CFU). In addition, transmission, signaling performance, typical applications, and maintenance philosophy are also discussed.

1.02 This section is being reissued to include the

J99343GF L2 and J99343GJ 2-2 wire intermediate repeaters (L-L)/LSRs CFUs. Revision arrows are used to emphasize significant changes. The Equipment Test List is not affected. The specific reasons for reissue are listed as follows:

(a) To include the J99343GF L2 and GJ CFUs in the general information of Part 1.

(b) To add a new part (Part 3) to describe the J99343GF L2 2-2 wire intermediate repeater (L-L)/LSR CFU.

(c) To add a new part (Part 4) to describe the J99343GJ 2-2 wire intermediate repeater (L-L)/LSR [ground start (GS)] CFU.

(d) To add component layouts and block diagrams of the J99343GF L2 and GJ CFUs (Fig. 2, 3, 4 and 5).

(e) To include the J99343GF L2 and GJ CFUs in performance characteristic descriptions (Part 5).

(f) To update Table A to include the J99343GF L2 and GJ CFUs.

(g) To include the J99343GF L2 and GJ CFUs in application descriptions (Part 6).

(h) To delete the part identifying additional documentation references.

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 repeater (L-L)/LSR 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.

1.04 The combined function unit which combines the functions of a transmission unit and a signaling unit on a single plug-in 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 left 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 wire 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).

1.05 The ▶J99343GF (L1 & L2)◀ 2-2 wire intermediate repeater/loop signaling repeater [loop start only (LSD)] CFU provides the functions of the J99343AK loop signaling (LSO) unit and the J99343PH, List 2 2-2 wire intermediate repeater (L-L). These CFUs provide regeneration of loop-start signals (including distinctive ringing) and hybrid balance for the loaded facility on the A- and B-sides.

▶1.06 The J99343GJ 2-2 wire intermediate repeater/loop signaling repeater (GS) CFU provides the functions of the J99343AJ loop signaling (GS) unit and the J99343PH List 2 2-2 wire intermediate repeater (L-L). This CFU provides regeneration of ground-start signals and hybrid balance for the loaded facility on the A- and B-sides.◀

1.07 Section 332-912-257 provides installation, testing, and touch-up procedures for the CFUs in this section.

2. FUNCTIONAL DESCRIPTION—J99343GF, LIST 1

2.01 The J99343GF, List 1 is shown in Fig. 1. It provides gain, equalization, and regenerative loop-start dc range extension between 2-wire H88 loaded facilities or between terminal equipment and an H88 loaded facility. Figure 2 shows a block diagram of this unit.

A. Operation

Transmission

2.02 ***Amplifier Units:*** Adjustable gain and fixed equalization is provided for each direction of transmission. The controls for gain are designated GAIN ADJ and 8DB. The range of the amplifier unit gain is 0 to 15.75 dB.

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

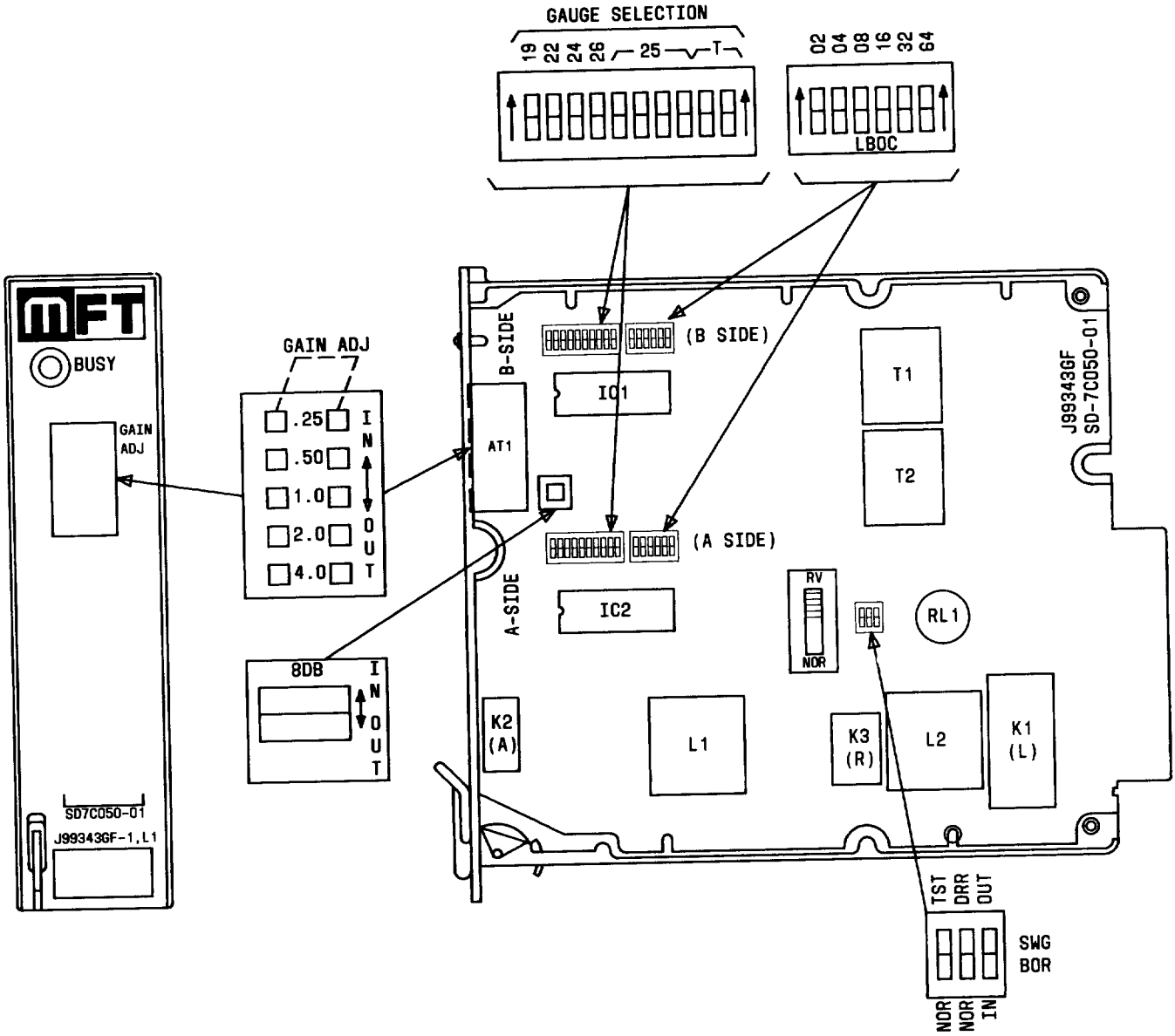


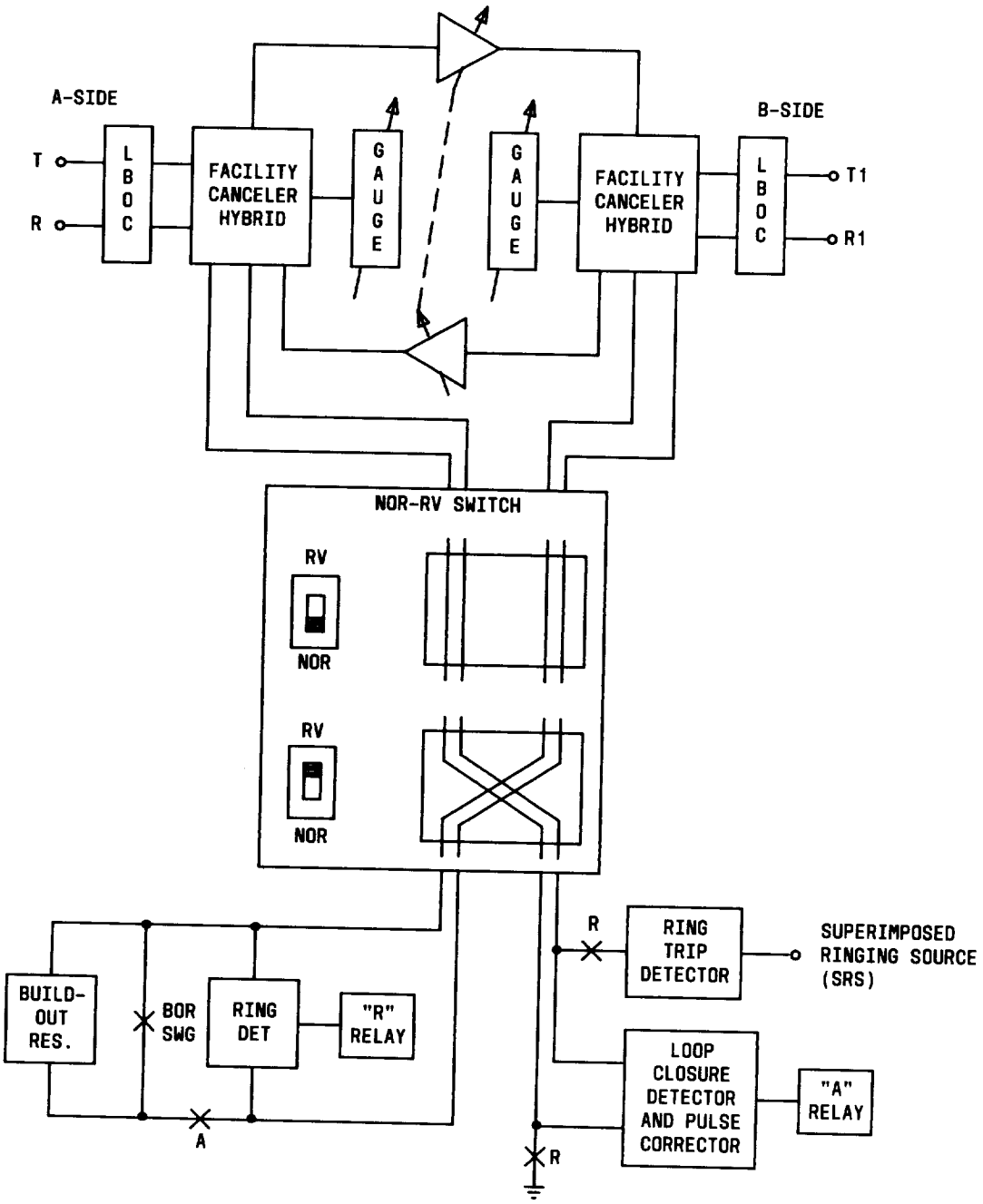
Fig. 1—J99343GF L1—Component Layout

2.03 ***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.

2.04 ***Line Build-Out Capacitor:*** 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 02, 04, 08, 16, 32, and 64.

Signaling

2.05 The signaling section of this unit provides regeneration of loop-start signals including distinctive ringing. Additional functions of the signaling section include loop-closure signaling, dial



◆Fig. 2—Block Diagram of the J99343GF (L1&L2) CFUs◆

pulse correction, ringing signaling (two modes), and ring-trip during silent and ringing intervals.

2.06 ***Loop-Closure Detector and Pulse Correction:*** The loop-closure detector detects switch-hook signals and dial pulses from the station-side equipment and transmits these signals to the pulse corrector. The pulse corrector transmits the corrected dial pulse signals toward the A-side switching equipment. The loop-closure detector also provides current limiting.

2.07 ***Ringing Circuitry:*** The ringing circuitry detects ringing signals on the A-side of the unit and connects a local ringing source to the station-side (B-side) loop. The ringing circuitry operates in two modes, the normal mode and the distinctive ringing reject mode. The selection of the modes is controlled by the NOR·DRR switch.

2.08 ***Ring-Trip Detector:*** The ring-trip detector detects station off-hook signals during the ringing interval and causes a loop-closure to be transmitted toward the switching equipment. The ring-trip signal also causes the local ringing to be removed from the station loop. During the silent interval, the station off-hook signals are detected by the loop-closure detector causing the ringing circuitry to be tripped.

2.09 ***Switch-Side Build-Out Resistor:*** A selectable build-out resistor (BOR) is provided in the switching-side circuitry to limit the loop current on short loops. The selectable switch is designated SWG BOR (IN/OUT).

B. Unit Controls

2.10 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.

2.11 ***GAIN ADJ and 8DB:*** 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 in paragraph 2.02.

2.12 ***GAUGE:*** 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 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.

2.13 The T switches are included with the gauge switch group. They provide a compromise balance to accommodate the applications where the switching-side facility is 900-ohms impedance. None of the associated GAUGE or LBOC switches should be operated for this application. This CFU can be used as a 2-wire terminal repeater (L)/LSR (LSO) unit by operating the T switches (see Section 332-912-257).

2.14 ***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 μF in 0.002 μF increments.

Signaling

2.15 ***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 independently 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 busy conditions.

2.16 ***NOR·RV:*** This switch is used to establish the normal or reverse signaling mode. Figure 2 gives the required switch positions to achieve a prescribed mode. This switch only affects the dc path to the signaling section.

2.17 ***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 out-

put. 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.

2.18 ***SWG BOR:*** To limit switching-side loop current on short facilities, the SWG 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.

3. FUNCTIONAL DESCRIPTION—J99343GF, LIST 2

3.01 The J99343GF L2 CFU, shown in Fig. 3, is a cost reduced version of the J99343GF L1 CFU. It provides gain, equalization, and regenerative dc loop-start range extension between 2-wire H88 loaded facilities or between terminal equipment and an H88 loaded facility. Figure 2 shows a block diagram of this unit.

A. Operation

Transmission

3.02 ***Amplifier Units:*** Adjustable gain and fixed equalization is provided for each direction of transmission. The controls for gain are designated GAIN ADJ and 8DB. The range of the amplifier unit gain is 0 to 15.75 dB.

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

3.03 ***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.

3.04 ***Line Build-Out Capacitor:*** 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 02, 04, 08, 16, 32, and 64.

Signaling

3.05 The signaling section of this unit provides regeneration of loop-start signals including distinctive ringing. Additional functions of the signaling section include loop-closure signaling, dial pulse correction, ringing signaling (two modes), and ring-trip during silent and ringing intervals.

3.06 ***Loop-Closure Detector and Pulse Correction:*** The loop-closure detector detects switch-hook signals and dial pulses from the station-side equipment and transmits these signals to the pulse corrector. The pulse corrector transmits the corrected dial pulse signals toward the A-side switching equipment. The loop-closure detector also provides current limiting.

3.07 ***Ringing Circuitry:*** The ringing circuitry detects ringing signals on the A-side of the unit and connects a local ringing source to the station-side (B-side) loop. The ringing circuitry operates in two modes, the normal mode and the distinctive ringing reject mode. The selection of the modes is controlled by the NOR·DRR switch.

3.08 ***Ring-Trip Detector:*** The ring-trip detector detects station off-hook signals during the ringing interval and causes a loop-closure to be transmitted toward the switching equipment. The ring-trip signal also causes the local ringing to be removed from the station loop. During the silent interval, the station off-hook signals are detected by the loop-closure detector causing the ringing circuitry to be tripped.

3.09 ***Switch-Side Build-Out Resistor:*** A selectable build-out resistor (BOR) is provided in the switching-side circuitry to limit the loop current on short loops. The control switch for the BOR is designated SWG BOR (IN/OUT).

B. Unit Controls

3.10 The rocker-type switches for a particular function, which are described in the following paragraphs, are operated (on) when depressed toward respective designations. The sum of the values of the switches operated is the setting for that function. The unit controls are illustrated in Fig. 3.

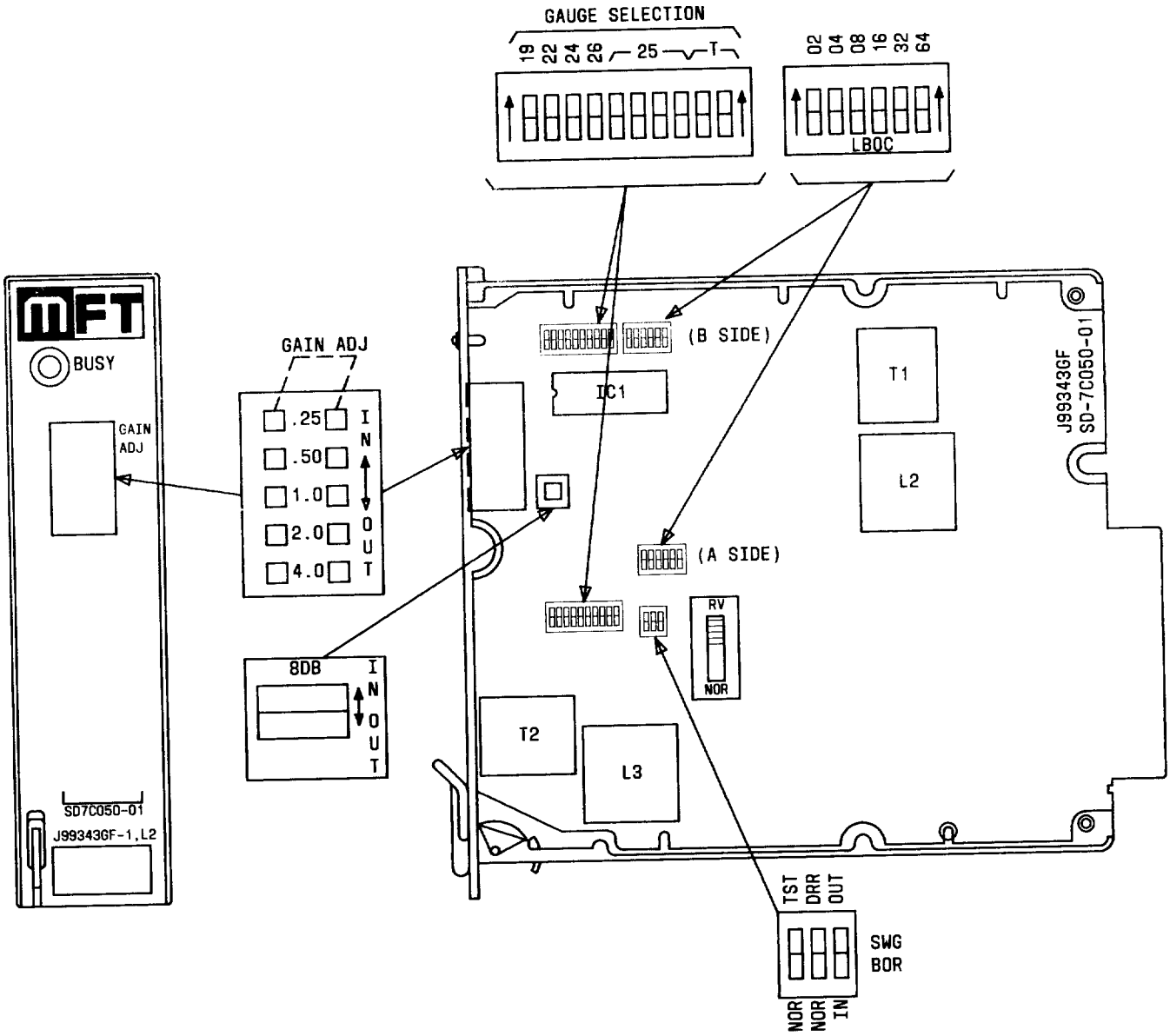


Fig. 3—J99343GF, L2—Component Layout

Transmission

3.11 ***GAIN ADJ and 8DB:*** 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 in paragraph 3.02.

3.12 ***GAUGE:*** 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 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 facili-

ty, the predominant gauge determines the gauge setting. Only one gauge setting may be used at a time.

3.13 The T switches are included with the gauge switch group. They provide a compromise balance to accommodate the applications where the switching-side facility is 900-ohms impedance. None of the associated GAUGE or LBOC switches should be operated for this application. This CFU can be used as a 2-wire terminal repeater (L)/LSR (LSO) unit by operating the T-switches (see Section 332-912-257).

3.14 ***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 μF in 0.002 μF increments.

Signaling

3.15 ***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 independently 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 busy conditions.

3.16 ***NOR·RV:*** This switch is used to establish the normal or reverse signaling mode. Figure 2 gives the required switch positions to achieve a prescribed mode. This switch only affects the dc path to the signaling section.

3.17 ***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.

3.18 ***SWG BOR:*** To limit switching-side loop current on short facilities, the SWG 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.

4. FUNCTIONAL DESCRIPTION—J99343GJ

4.01 The J99343GJ CFU is shown in Fig. 4. It provides gain, equalization, and regenerative ground-start range extension between 2-wire H88 loaded facilities or between terminal equipment and an H88 loaded facility. Figure 5 shows a block diagram of this unit.

A. Operation

Transmission

4.02 ***Amplifier Units:*** Adjustable gain and fixed equalization is provided for each direction of transmission. The controls for gain are designated GAIN ADJ and 8DB. The range of the amplifier unit gain is 0 to 15.75 dB.

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

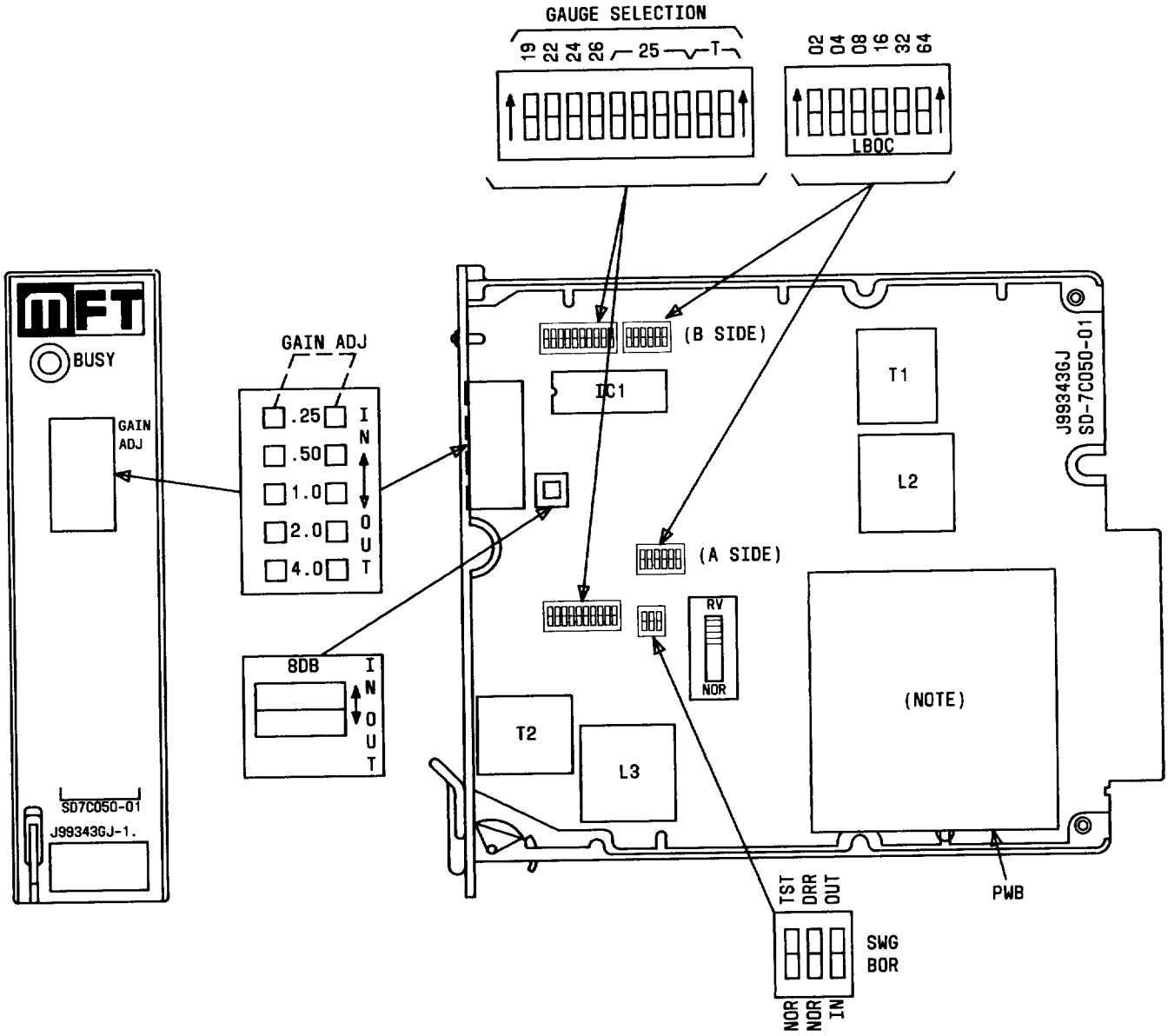
4.03 ***Facility Canceler Hybrid:*** The facility canceler hybrid splits the 2-wire transmission interface into a 4-wire path through the repeater. This allows gain and equalization to be provided in each direction of transmission. The facility canceler hybrid is matched to the 2-wire facility using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

4.04 ***Line Build-Out Capacitor:*** 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 02, 04, 08, 16, 32, and 64.

Signaling

4.05 The signaling section of this unit provides regeneration of ringing signals including distinctive ringing. Additional functions of the signaling section include loop closure detection and regeneration for ground-start operation, dial pulse correction, and ring-trip during silent and ringing intervals.

4.06 ***Loop-Closure Detector and Pulse Correction:*** The loop-closure detector detects



NOTE: DAUGHTER PRINTED WIRING BOARD USING BERGSTIK CONNECTORS CONTAINS GROUND START SIGNALING COMPONENTS OF THE J99343GJ CFU.

Fig. 4—J99343GJ CFU—Component Layout

switch-hook signals and dial pulses from the station-side equipment and transmits these signals to the pulse corrector. The pulse corrector transmits the corrected dial pulse signals toward the A-side switching equipment. The loop-closure detector also provides current limiting.

4.07 ***Ringing Circuitry:*** The ringing circuitry detects ringing signals on the A-side of the unit and connects a local ringing source to the station-side (B-side) loop. The ringing circuitry operates in two modes, the normal mode and the distinctive ringing reject mode. The selection of the modes is controlled by the NOR·DRR switch.

4.08 ***Ring-Trip Detector:*** The ring-trip detector detects station off-hook signals during the ringing interval and causes a loop-closure to be transmitted toward the switching equipment. The ring-trip signal also causes the local ringing to be removed from the station loop. During the silent interval, the station off-hook signals are detected by the loop-closure detector causing the ringing circuitry to be tripped.

4.09 ***Switch-Side Build-Out Resistor:*** A selectable build-out resistor (BOR) is provided in the switching-side circuitry to limit the loop current on short loops. The selectable switch is designated SWG BOR (IN/OUT).

4.10 ***Tip-Ground (TG) Detector—Switching Side:*** The TG detector monitors the tip conductor for ground-start (GS) signals from the CO equipment. Once the GS signal is detected, it will be regenerated toward the customer equipment (PBX).

4.11 ***Loop-Current Detector—Switching Side:*** Once a call is in progress, the loop-current detector monitors the switching-side loop for a forward disconnect signal (loss of loop current) from the CO equipment. This signal indicates the call is being terminated from the CO direction. The detector, in turn, causes the station-side loop to be open which signals the customer equipment that the call is terminated.

4.12 ***Ring-Ground (RG) Detector—Station Side:*** The RG detector monitors the ring conductor for GS signals from the customer equipment. Once the GS signal is detected, it will be regenerated toward the CO equipment.

B. Unit Controls

4.13 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.

Transmission

4.14 ***GAIN ADJ and 8DB:*** 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 in paragraph 4.02.

4.15 ***GAUGE:*** 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 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.

4.16 The T switches are included with the gauge switches. They provide a compromise balance to accommodate the applications where the switching-side facility is 900-ohms impedance. None of the associated GAUGE or LBOC switches should be operated for this application. This CFU can be used as a 2-wire terminal repeater (L)/LSR (LSO) unit by operating the T-switches (see Section 332-912-257).

4.17 ***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 μF in 0.002 μF increments.

Signaling

4.18 ***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 independently of the signaling section. In this ar-

rangement the repeater is continuously activated. In the NOR position the CFU transmission section is controlled by the signaling section and is activated during station busy conditions.

4.19 ***NOR·RV:*** This switch is used to establish the normal or reverse signaling mode. Figure 5 gives the required switch positions to achieve a prescribed mode. This switch only affects the dc path to the signaling section.

4.20 ***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.

4.21 ***SWG BOR:*** To limit switching-side loop current on short facilities, the SWG 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.◀

5. PERFORMANCE CHARACTERISTICS

5.01 The transmission performance of the ▶J99343GF (L1&L2) and GJ CFUs are discussed in the following paragraphs. Signaling performance for these CFUs may be found in Section 332-911-101.◀ Table A gives a summary of characteristics for these CFUs.

A. Amplifier Frequency Response

5.02 Figure 6 gives the amplifier frequency response of these CFUs.

B. Envelope Delay Distortion

5.03 Figure 7 gives the envelope delay distortion for these CFUs.

C. Longitudinal Balance

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

D. Output Power Capability

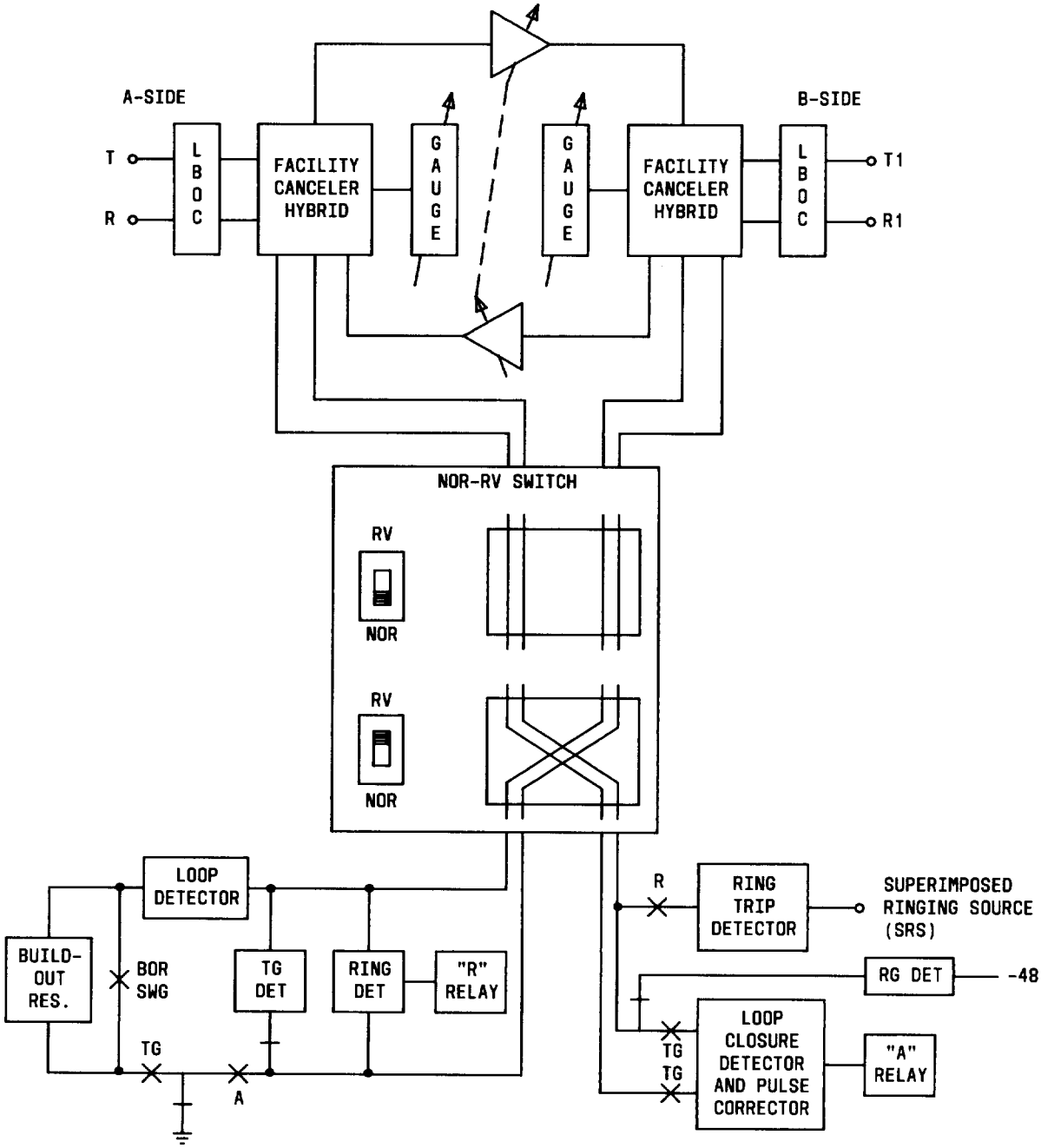
5.05 Figure 8 shows the output power capability of the ▶J99343GF (L1&L2) and GJ CFUs.◀ The output power is determined by input power and repeater gain, as shown by the +6 dB gain line in the figure. Power limiting occurs in this unit at about 13.5 dBm.

6. APPLICATIONS

6.01 ▶The J99343GF (L1&L2) and GJ CFUs◀ may be used to provide gain and range extension on any 2-wire circuit between loaded (A-side) and loaded (B-side) facilities. Figure 9 shows a typical application using these CFUs with a foreign exchange (FX) line. These units also can be used on off-premises station (OPS) lines, wide area telephone service (WATS) lines, and other metallic facility special services. Additional application information can be found in Section 332-910-180.

7. MAINTENANCE

7.01 The MFT units require no routine maintenance. If the 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 nearest Western Electric Service Center for repair.



♦Fig. 5—Block Diagram of J99343GJ CFU♦

TABLE A

UNIT CHARACTERISTICS

FUNCTIONS		J99343GF (L1 & 12) AND GJ	
Gain		0 dB to 15.75 dB	
Equalization		Fixed	
Hybrid Balance	A-Side	Facility Canceler and LBOC	
	B-Side	Facility Canceler and LBOC	
DC Resistance		185 Ohms (BOR OUT) 696 Ohms (BOR IN)	
		-48 CIRCUIT BATT.	TALK BATT.
Current Drain (mA)	Idle	30	0
	Typical	70	35
	Maximum	110	80

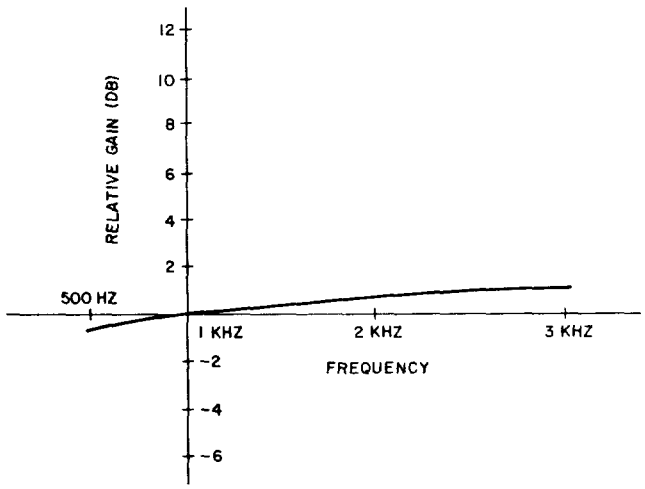


Fig. 6—Amplifier Frequency Response

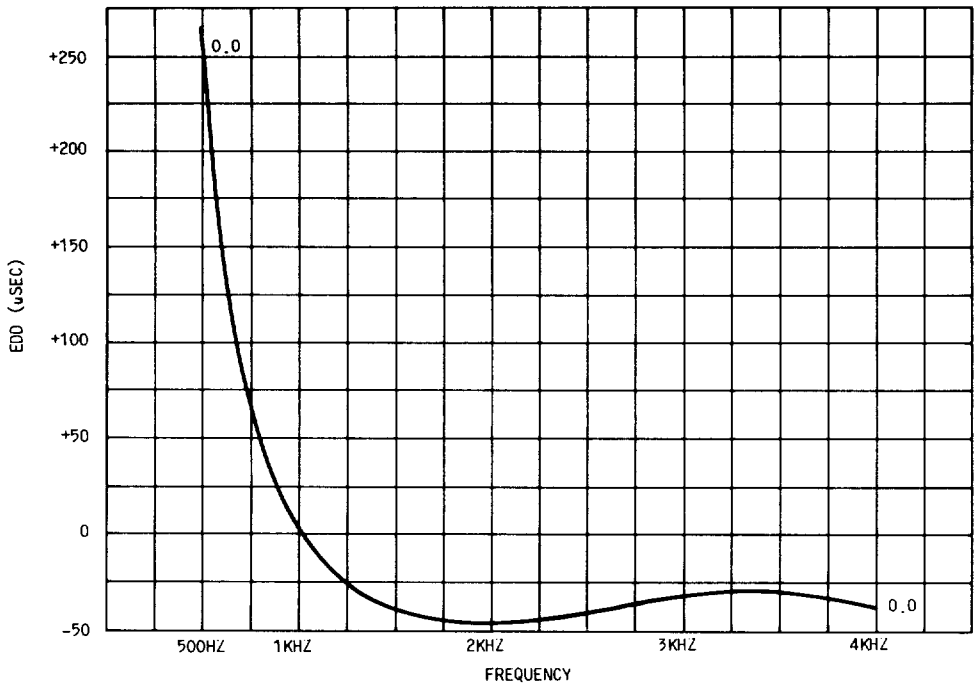


Fig. 7—Envelope Delay Distortion Curve

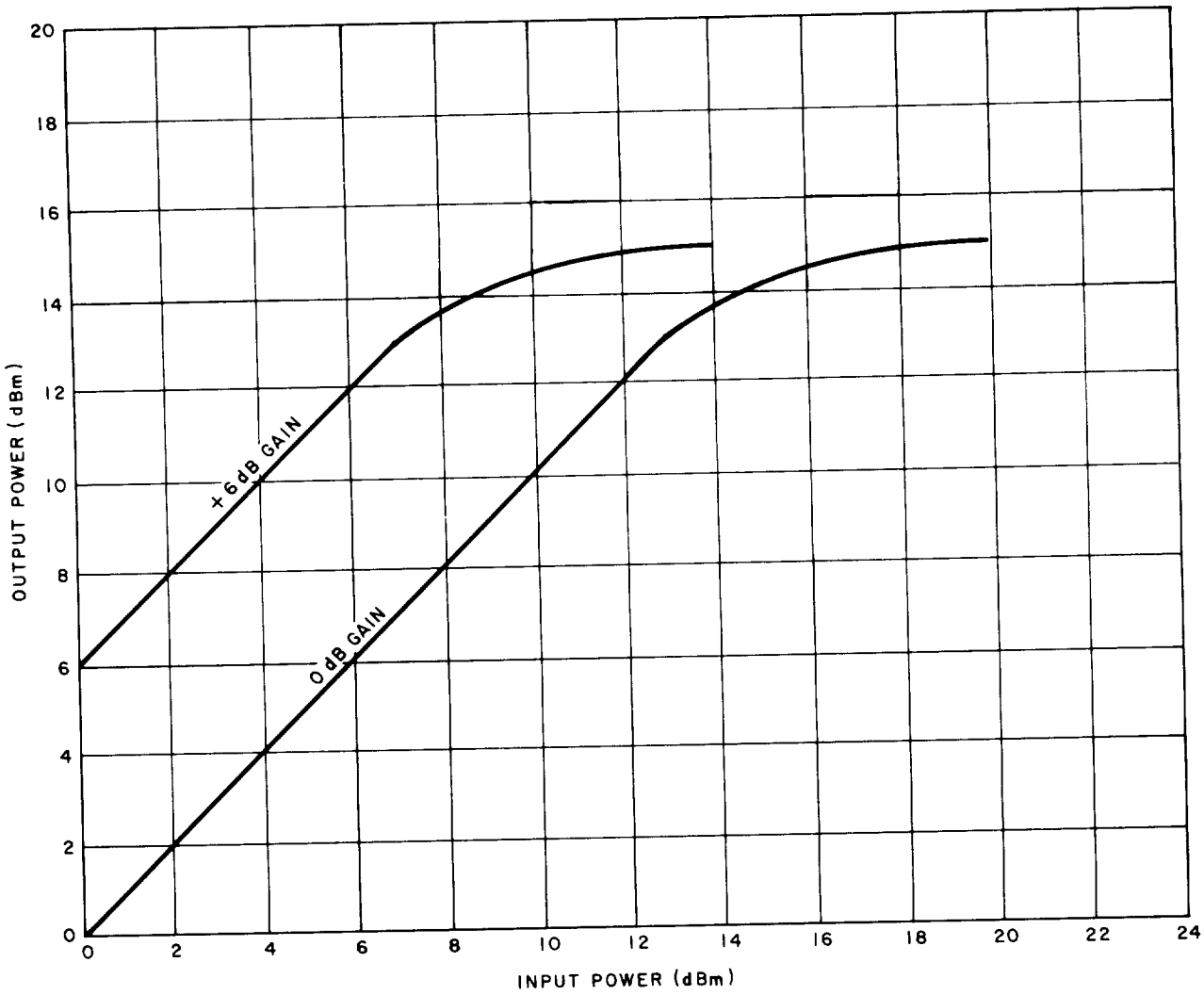


Fig. 8—Output Power Characteristic Curve

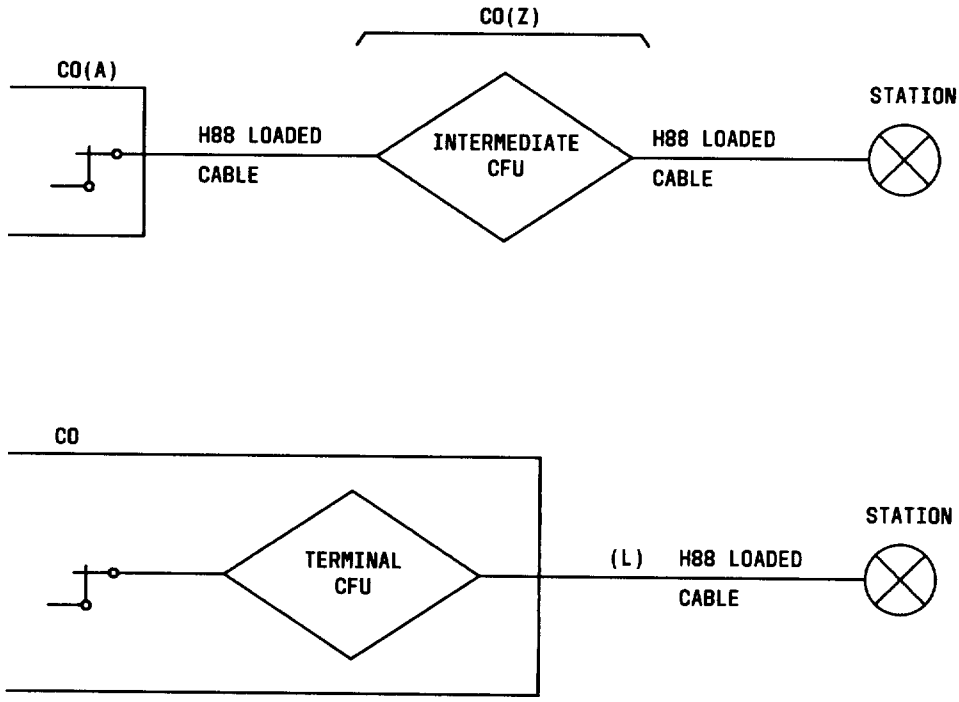


Fig. 9—Foreign Exchange Line Using J99343GF (L1&L2) and GJ CFUs