

**METALLIC FACILITY TERMINAL
LOOP-START AND GROUND-START TO DX OR E&M
SIGNALING CONVERTERS (J99343FA, FB, FC, AND FD)
INSTALLATION AND TESTING**

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A. General	4	1. GENERAL	
B. Midpoint Capacitor (MPC) Switch	4	1.01 The metallic facility terminal (MFT) is composed of shelving arrangements which accept transmission and signaling plug-in units that are electrically compatible with the MFT. These units are a standard size which fit the MFT shelving slots. This section describes the installation and testing procedures for the J99343FA, FB, FC, and FD loop-start and ground-start to duplex or E&M MFT signaling units.	
C. DX/E&M and ML1 & ML2 Switches, DX Mode	4	1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.	
D. Balance Switches	6	1.03 The J99343FA, FB, FC, and FD signaling units provide all the features and options of a number of older dial long line (DLL) signaling circuits. Although similar in function, the new units incorporate modern circuit designs and	
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components for improved reliability and performance when used with the MFT transmission units. Options may be selected by switches instead of wire straps.

1.04 Additional detailed information and complete schematic diagrams of the J99343FA, FB, FC, and FD are contained in CP34 through CP37, respectively, of SD-1C359-01. The J99343FA,L2 is contained in CP49 of SD-1C359-01.

2. CHARACTERISTICS OF THE LOOP-START AND GROUND-START TO DUPLEX OR E&M SIGNALING UNITS—J99343FA, FB, FC, AND FD

A. General

2.01 The FA, FB, FC, and FD series of signaling units provide signal range extension and conversion for loop-start or ground-start applications. The FA (central office [CO] or PBX end) and FB (station end) units are companion units used for loop-start lines, while the FC (CO end) and FD (PBX end) units are companion units used for ground-start trunks. Range information may be found in Table A. Additional descriptive information may be found in Section 332-911-105.

Note: Although the J99343FA, FB/FC and FD are companion units, the units are compatible (individually) with other applications, such as with older DLL systems (see cross-reference list of Section 332-912-105).

B. J99343FA Signaling Unit

2.02 The FA unit is a loop-start to duplex or E&M converter (LS-DX/EM). It serves as the "switch end" signaling unit in conjunction with the FB unit at the "station end." Features of the FA unit include:

- (1) Selectable E&M or duplex output
- (2) Pulse correction—58 percent break
- (3) 20- to 30-Hz ringing detection
- (4) M-Lead polarity reversal for carrier applications.

2.03 The FA,L1A is a modified version of the FA,L1 unit which provides the additional capability of detecting short ringing signals (ie, distinctive ringing), such as those produced by the CSS-201 PBX. The FA,L2 offers a new ringing

detector design. This new design provides the capability of detecting distinctive ringing with increased reliability and immunity to longitudinal noise. It functionally replaces the FA,L1 and L1A, which will be rated manufacture discontinued.

2.04 Table B lists input and output signals of the J99343FA signaling unit for all circuit conditions when operating in the E&M mode.

C. J99343FB Signaling Unit

2.05 The FB unit is a duplex or E&M to loop-start converter (DX/EM-LS). It serves as the "station end" signaling unit when used in conjunction with the FA. Features of the FB unit include:

- (1) Selectable E&M or duplex detection
- (2) Regenerative ringing
- (3) Ring tripping detection
- (4) Inversion of the E-lead for use with carrier.

2.06 Table B lists input and output signals of the J99343FB signaling unit for all circuit conditions when operating in the E&M signaling mode.

D. J99343FC Signaling Unit

2.07 The FC unit is a ground-start to duplex or E&M converter (GS-DX/EM). It serves as the "switch end" signaling unit in conjunction with an FD unit at the "station end." Features of the FC unit include:

- (1) Selectable E&M or duplex output
- (2) Pulse correction—58 percent break
- (3) 20- to 30-Hz ringing detection
- (4) Reverse battery detector (toll diversion).

2.08 Table C lists input and output signals of the J99343FC signaling unit for all circuit conditions when operating in the E&M signaling mode.

TABLE A

MAXIMUM SIGNALING RANGES (OHMS) J99343FA, FB, FC, AND FD (NOTE)

A. Station Side of J99343FB and FD Converters:		
1. Supervision and Dial Pulsing*		
a. -48V @ 16 m Adc		2770
@ 23 m Adc		1825
b. -72V @ 16 m Adc		4270
@ 23 m Adc		2870
2. 86V rms 20-Hz Ringing Range With 50V rms Across:		
a. 2 Ringers — Stiff Notch		2880
b. 3 Ringers — Stiff Notch		1820
3. Ring Trip Range With a -48V dc Trip Supply		4400
B. Switching Side of J99343FA and FC Converters:		
1. Total Resistance to be subtracted from the CO Supervisory Range:		
	<u>J99343FA</u>	<u>J99343FC</u>
a. Build Out resistors OUT	0	165
b. BOR IN	511	511
c. Toll Diversion Detector IN	N/A	65
2. Ground-Start Detection Range	Greater than 3650	
3. Ringing Dectector Range With an 86V rms 20 Hz or 125V rms 30 Hz Input	Greater than 3650	
C. DX Signal Detection Range on Metallic Facilities of Gauges From 19 to 26, Loaded or Nonloaded, All Units		5000
D. E Lead Signal Detection Range, All Units		200

Note: The range values listed are the maximum range external to the signaling converter and do not take into account the reduction in range which is caused by resistance in the companion transmission unit. To determine the exact range of a signaling converter when used with a specific MFT transmission unit, refer to the appropriate LSR range information.

*These range values are for the nominal supply voltage indicated. Variations in the supply voltage will result in a corresponding variation in range.

E. J99343FD Signaling Unit

2.09 The FD unit is a duplex or E&M to ground-start converter (DX/EM-GS). It serves as the "station end" signaling unit when used in conjunction with the FC. Features of the FD unit include:

- (1) Selectable E&M or duplex detection

(2) Regenerative ringing

(3) Ring tripping

(4) Battery reversal (toll diversion).

2.10 Table C lists input and output signals of the J99343FD signaling unit when operating in the E&M mode.

TABLE B

LOOP-START – E&M AND LOOPED E&M SIGNALING LEAD STATES (NOTE 1)

	LEADS	E&M TYPE	CO IDLE	CO RINGING	LEADS	E&M TYPE	STA ON-HOOK	STA OFF-HOOK	STA DIAL PULSING
	OUTPUTS				INPUTS (NOTE 2)				
J99343FA (CO END)	M*	I	GRD	BATT	E	I	OC	GRD	OC/GRD PULSES
	M/SB	II	OC	C	E/SG	II	OC	C	C/OC PULSES
	INPUTS (NOTE 2)				OUTPUTS				
J99343FB (STA END)	E*	I	OC	GRD	M	I	GRD	BATT	BATT/GRD PULSES
	E/SG	II	OC	C	M/SB	II	OC	C	C/OC PULSES

Note 1:

BATT — Battery

GRD — Ground

OC — Open Circuit: Type I — Referenced to ground

Type II — Between E and SG leads and between M and SB leads

C — Closure between E and SG leads and between M and SB leads in Type II interfaces.

Note 2: The input signals originate in (external) connecting circuits. The signaling states indicated are received by the E lead of the converter.

* An option switch on the J99343FA allows the GRD/BATT signaling states of the M lead to be interchanged. An option switch on the J99343FB allows the OC/GRD signaling states of the E lead to be interchanged. The signaling states shown in the table are with the option switches set in the NOR position.

3. SWITCH FUNCTIONS AND SETTINGS**A. General**

3.01 Switch settings in the following paragraphs apply to the FA, FB, FC, and FD except where noted otherwise.

B. Midpoint Capacitor (MPC) Switch

3.02 The MPC switch allows insertion of a 4- μ F capacitor across the input of the DX detector.

The MPC switch should be down for all 4-wire applications and for any 2-wire applications when there is 2 μ F or less midpoint capacitance in the associated transmission unit.

C. DX/E&M and ML1 & ML2 Switches, DX Mode

3.03 For DX mode, the DX/E&M switch should be set in the DX position. The ML1 & ML2 switches should be down.

TABLE C

GROUND-START – E&M AND LOOPED E&M SIGNALING LEAD STATES (NOTE 1)

	LEADS	E&M TYPE	CO IDLE	CO TIP GRD (GS SEIZURE)	CO RINGING (AT END OF CYCLE)	CO BATT REV (TOLL DIVERSION)	LEADS	E&M TYPE	PBX ON-HOOK	PBX RING GRD (GS SEIZURE)	PBX DIAL PULSING
	OUTPUTS						INPUTS (NOTE 2)				
J99343FC (CO END)	M	I	GRD	BATT	BATT/ GRD PULSE	BATT/ GRD PULSE	E	I	OC	GRD	OC/ GRD PULSES
	M/SB	II	OC	C	C/OC PULSE	C/OC PULSE	E/SG	II	OC	C	C/OC PULSES
	INPUTS (NOTE 2)						OUTPUTS				
J99343FD (PBX END)	E	I	OC	GRD	GRD/ OC PULSE	GRD/ OC PULSE	M	I	GRD	BATT	BATT/ GRD PULSES
	E/SG	II	OC	C	C/OC PULSE	C/OC PULSE	M/SB	II	OC	C	C/OC PULSES

Note 1:

BATT – Battery

GRD – Ground

OC – Open Circuit: Type I – Referenced to ground

Type II – Between E and SG leads and between M and SB leads

C – Closure between E and SG leads and between M and SB leads in type II interfaces.

Note 2: The input signals originate in (external) connecting circuits. The signaling states indicated are received by the E lead of the converter.

D. Balance Switches

3.04 To obtain a balancing resistance equal to the loop resistance, the R BAL screw switches are set as follows:

R BAL SWITCH DESIG SETTING	OHMS ADDED TO BALANCING RESISTANCE
2K UP	2000
2K UP	2000
1K UP	1000
500 UP	500
250 UP	250

3.05 To obtain the desired balancing capacitance, the C BAL screw switches are set as follows:

C BAL SWITCH DESIG SETTING	μ F ADDED TO BALANCE CAPACITANCE
1 DOWN	1
2 DOWN	2
4 DOWN	4

E. DX/E&M and ML1 & ML2 Switches, E&M Mode

3.06 For E&M mode, DX1 E&M selector switch should be set in the E&M position and all capacitor screw switches (MPC, 1, 2 and 4) should be turned up and all resistor switches (2K, 2K, 1K, 500 and 250) should be turned down. To provide a Type I (with E&M leads) E&M interface, screw switches ML1 & ML2 should be turned down, and to provide a Type II (looped E&M with E, M, SB, and SG leads) interface, screw switches ML1 & ML2 should be turned up.

F. BOR Switch (J99343FA and FC)

3.07 The build-out resistor switch (BOR) adds 511 ohms to the switching side circuit resistance and should be set as follows:

BOR Switch	Conductor Loop Resistance Switching Side (Ohms)
UP	Less than 600
DOWN	Greater than 600

G. M-Reversing Switch (J99343FA)

3.08 The M-lead reversing switch (MRV) should be set to NOR to have the M lead grounded when the circuit is idle or in the talk state and should be set to REV to have the M lead at battery potential when the circuit is idle or in the talk state. The REV position is used in conjunction with certain carrier systems to reverse the phasing of battery/ground connections on the M-relay contacts.

H. E-Reversing Switch (J99343FB)

3.09 The E-lead reversing switch (ERV) should be set to NOR to have the E lead open when the circuit is idle and to REV to have the E lead grounded when the circuit is idle. The REV position is used in conjunction with certain carrier systems to invert the facility input signals.

I. Toll Diversion Option Switch (J99343FC)

3.10 The toll diversion options screw (TS) switch should be up to allow the converter to pass toll diversion signals. It should be down to inhibit the toll diversion feature.

J. Toll Diversion Option Switch (J99343FD)

3.11 The toll diversion option screw (TS) switch should be down to allow the converter to pass toll diversion signals. It should be up to inhibit the toll diversion feature.

4. APPLICATIONS

4.01 The J99343FA and FB signaling units are intended for use on long special services circuits such as off-premises extensions, wide area telecommunication service lines, and 1-way PBX-CO trunks. They operate loop-start and are switch-selectable for either E&M or DX signaling modes.

4.02 The J99343FC and FD signaling units are companion signaling converter units intended for providing signaling range extension on 2-way PBX-CO ground-start trunks and FX trunks. The PBX-CO trunks can include toll diversion. Both units contain switches for operation in either E&M or DX signaling modes.

4.03 Typical circuit applications for these converters are shown in Fig. 1. The diagram in Fig. 1A shows the signaling lead interfaces between the transmission and signaling units when used with metallic facilities. Figure 1B shows the signaling connections required between the transmission unit, signaling unit, and carrier signaling circuit.

of the defective unit with a good spare unit. Location of the defective unit may be determined by end to end tests (see subpart B). The defective unit should be returned to the nearest Western Electric Service Center for repair.

Note: It is assumed signaling options and/or settings have been adjusted per circuit requirements before testing.

5. MAINTENANCE AND TESTS

A. Maintenance

5.01 When there is a malfunction in a signaling circuit(s) due to a defective signaling unit, the signaling quality is maintained by replacement

B. Tests

5.02 When a circuit contains several signaling links, an end to end test may not locate a

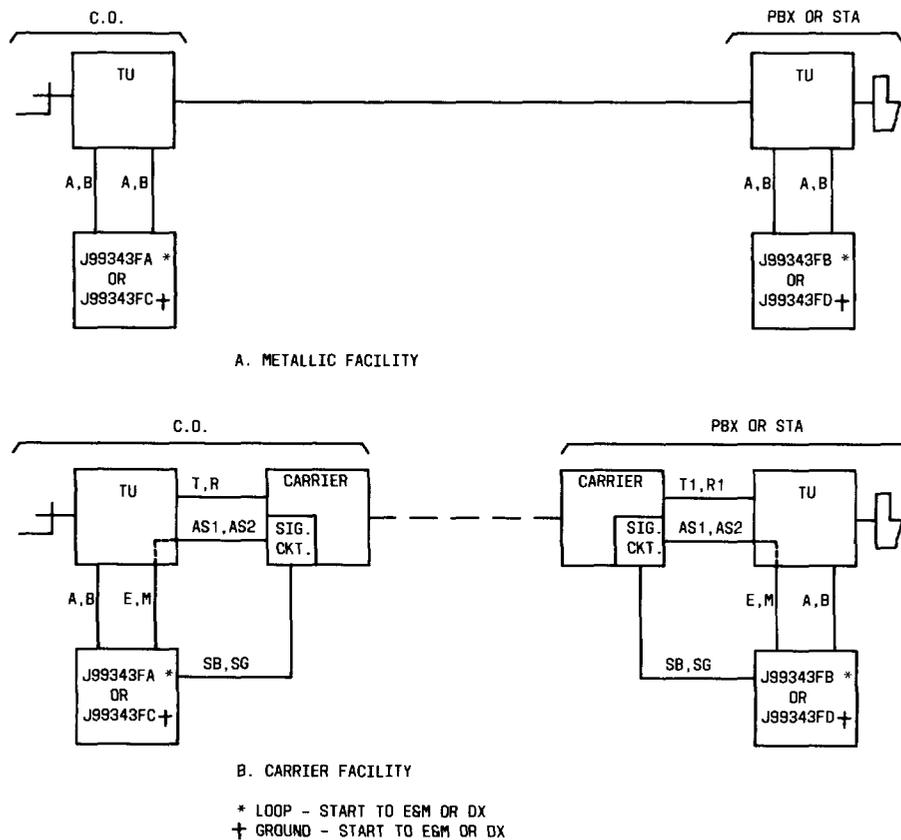


Fig. 1—Metallic and Carrier Applications of the J99343FA, FB, FC, FD Signaling Converters

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defective signaling unit. Further tests may be conducted to sectionalize the trouble.

5.03 The J99343FA, FB, FC, and FD MFT signaling units cannot be field tested individually. They must be tested through the companion MFT transmission unit which requires the use of the J99343TB test extender (Section 332-910-102). The test extender, which is designed to allow adjustment and testing of MFT transmission units, provides jack access to the AS1, AS2, and A&B or SX signaling leads which pass through the transmission unit (TU). Opens and closures of the loop or pulses of the signaling units may be checked with the appropriate test equipment using the test jacks provided by the test extender. Figure 1 shows the lead designations for various types of switching offices.

Caution: *To prevent service interruptions, working circuits should be turned down before removing a transmission unit for tests.*

Note: Only units designed to work in the transmission unit slot of MFT bays should be plugged into the test extender mounting, ie, the J99343FA FB, FC, and FD unit lead arrangements are not compatible with the TU lead arrangement and no attempt should be made to plug these units directly into the test extender.

5.04 In the event an MFT repeater is suspected of causing a malfunction, test procedures of the following sections should be consulted:

2-2 wire terminal repeaters—Section 332-912-214

2-2 wire intermediate repeaters—Section 332-912-215

4-2 or 2-4 wire intermediate repeaters—Section 332-912-221

4-4 wire repeaters—Section 332-912-234

2-4 wire terminal repeaters—Section 332-912-235

6. REFERENCES

6.01 The following references contain additional information which may be helpful.

REFERENCE	TITLE
332-910-100	General Description of MFT
332-910-102	MFT Test Extender Description and Operation
332-910-180	General Application Information for MFT
CD-1C359-01	Common Systems—Metallic Facility Terminal Circuit
SD-1C485-02	Common Systems Test Extender for Use With Metallic Facility Terminal
SD-1C359-01	Metallic Facility Terminal Circuit