J99343CA, CB, CC, CD, AND CE LOOP SIGNALING EXTENDER
INSTALLATION AND TEST
METALLIC FACILITY TERMINAL

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Tables

1. GENERAL

1.01 The Metallic Facility Terminal (MFT) is a standardized grouping of modular equipment which supplies the various forms of transmission and/or signaling functions. The loop signaling extenders (LSEs) are part of the MFT family of signaling equipment.

1.02 This section is being reissued to include the J99343CE LSE unit and to delete Addendum 332-911-202, Issue 2, dated June 1981. This addendum was issued in compliance with FCC ruling concerning possible radio frequency radiation from equipment. Revision arrows are used to emphasize significant changes. Equipment Test Lists are not affected.

1.03 Detailed information on the LSE units can be found in Section 332-911-102 and drawings CD- and SD-7C050-01.

1.04 Loop signaling extenders (LSE) J99343CA, CB, CC, CD, and ▶CE◀ are battery boost range extension devices and operate by placing two −12 volt power supplies in series with the −48 volt central office battery. One power supply is inserted in the tip conductor and one in the ring conductor of the circuit to provide an effective −72 volt dc signaling and talk battery operation. Voiceband frequencies and 20-Hz ringing currents are passed with negligible effect. (Ringing ranges are determined by the ringing source with little effect due to the LSEs.)

2. CHARACTERISTICS OF LOOP SIGNALING EXTENDERS

A. General

2.01 There are four types of LSE units included in the MFT family of signaling units:

(a) The J99343CA and CC LSE provide battery boost range extension of ground-start or loop-start signals. The J99343CC also provides SMAS compatibility.

(b) The J99343CB, LSE/TD, provides the features of the J99343CA and CC and, in addition, is capable of providing boost for toll diversion signals, including "winks".

(c) The J99343CD, LSE II, provides all the features of the J99343CA, CB, and CC units which have been rated MD.

♦(d) The J99343CE LSE unit supersedes all the LSE units which have been MD, including the CD unit. The CE unit features reduced dial pulse distortion and low insertion loss in both idle and busy states.♦

2.02 The J99343CA,CB, CC, CD, and♦CE♦ LSEs are the only MFT signaling units which may be used in the transmission unit slot of an MFT shelf. When signaling range extension and voice frequency gain are both required, an MFT repeater would be installed in the transmission unit slot and the appropriate LSE unit in the signaling unit slot. If only signaling range extension is required, the LSE unit would be installed in the transmission unit slot.

B. LSE—J99343CA and CC

2.03 The LSE units (J99343CA and CC) have been rated MD and are replaced by the ♦J99343CE♦

2.04 The main difference between the J99343CA and the J99343CC units is that the J99343CC unit is compatible with MFT frames equipped with SMAS capability while the J99343CA LSE is not SMAS compatible. Both LSE units are equipped with an A- and B-side reversing switch for determining the orientation of the LSE in the circuit as described in paragraph 3.01. Both units are also covered by a class A change that has been made to equip all of the LSE units with an SM/DM switch described in paragraph 3.02.

C. LSE/TD—J99343CB

2.05 The J99343CB LSE/TD has been rated MD and has been replaced with the ♦J99343CE♦.

2.06 The main difference between the LSE/TD and the LSE (CA and CC) is the ability of the LSE/TD to respond more quickly to toll diversion battery reversals. The LSE/TD has a lower average power consumption than the J99343CA and CC units. The LSE/TD is compatible with SMAS.

Note: The LSE/TD should not be required to pass dial pulses while in the reverse battery mode.

2.07 Similar to J99343CA and CC, the LSE/TD is equipped with an A- and B-side reversal switch and the SM/DM switch described in paragraphs 3.01 and 3.02.

D. LSE II—J99343CD

2.08 The J99343CD LSE II ♦has been rated MD and has been replaced with the J99343CE♦.

2.09 The LSE II is functionally similar to the previous LSE units, however, its operational characteristics and efficiency have been improved. The LSE II, which uses optical isolators as current detectors and switches, allows complete isolation between the tip and ring conductors, the control circuitry, and the power sources. This results in better longitudinal balance and immunity to extraneous voltages than in the previous LSE units.

2.10 The LSE II, when used with a companion MFT repeater, supplies a repeater disabler function which enables the repeater when loop current is flowing. When no loop current flows, ie, during idle or open circuit conditions, the repeater is disabled. This decreases power consumption and prohibits repeater singing during idle circuit conditions.

E. ♦LSE—J99343CE

2.11 The J99343CE LSE unit supersedes the J99343CA, CB, CC, and CD LSE which are rated MD.

2.12 The J99343CE unit features reduced dial pulse distortion, and low insertion loss. The CE unit

performs all the functions necessary for non-regenerative range extension of DC signals in both loop-start and ground-start, and with steady-state and wink reverse-battery signaling.

2.13 The J99343CE unit also provides loop current regulation to prevent excessive current flow on shorter facilities. The CE unit may be used with an external load greater than 600 ohms.

2.14 The J99343CE unit may be used in any slot of any MFT mounting arrangement. When the unit is used in the signaling unit slot of a double module bay, a companion transmission unit must be used in the transmission unit slot. When the CE unit is used with a companion MFT repeater, a repeater enable circuit function is supplied. The repeater enable circuit decreases power consumption and prohibits repeater singing during idle circuit conditions.

2.15 The J99343CE unit provides signaling range extension by maintaining the dc signaling voltage at a level of 12 volts which can be inserted in series with the tip and ring conductors. The CE unit also senses the loop current direction and maintains the polarity of the boost voltages so they always aid the CO battery to approximately 3000 ohms. The CE unit does not extend the 20 Hz ringing ranges. Refer to Section 332-911-102 for characteristics, limitations, and capabilities.◀

3. SWITCH FUNCTIONS AND SETTINGS

A. A- and B-Side Reversing Switch (J99343CA, CB, and CC)

3.01 An A- and B-side reversing switch on the LSE (J99343CA, CB, and CC) assists in establishing the proper orientation of the unit in a circuit. The −48 volt talk battery source must enter the A side of the LSE which contains the line current sensing circuit. When the switch is in the NOR position, the sensing circuit is connected to the A side of the LSE; the REV position places the sensing circuit in the B side. When the LSE is used with a transmission unit which contains a signaling lead reversal switch, the LSE switch should be set in the NORMAL position and the switch in the transmission unit used for directional control.

B. Single Module/Double Module Switch (J99343CA, CB, CC, and CD)

3.02 The LSE II, J99343CD, was designed with a switch to adapt the unit for use in either single module or double module arrangements. This switch, designated SM/DM, has been added to the J99343CA, CB, and CC units as a class A change. The SM/DM switch is to be operated to the SM position when used in single module mounting arrangements and to the DM position when used in double mounting arrangements.

C. Test or Normal Operation Switch (J99343CD)

3.03 To provide a way to bypass the J99343CD LSE II during transmission testing, option V on CPS-33 of SD-1C359-01 has been added. Option V provides a TEST/NOR switch on the front panel which, when put in the TEST position, will bypass the LSE II completely and permit transmission measurements without the LSE. Also, as part of option V, a BUSY indicator lamp is on the front panel to provide a visible indication of the busy/idle status of the circuit. Applications involving the TEST/NOR switch are discussed in paragraphs 4.11 and 4.12.

D. Line Current Detector Sensitivity Switch (J99343CD)

3.04 Line current detectors (optical isolators) are located in both the tip and ring circuits to detect both ground start and loop currents. The threshold current required to activate the line current detectors is determined by the setting of switch S1, which is set according to type of office the LSE interfaces with. Line circuits which operate on 24 volts require that switch S1 be in the "out" position. In this position a conductor current of 3 mA or more of either polarity will operate the appropriate line current detector(s). Office arrangements other than 24V line circuits require that S1 be in the "in" position. In this position, a conductor current of 5 mA or more of either polarity will operate the appropriate line current detector(s). Operation of a line current detector enables the appropriate line switch controls to supply boost voltage of the correct polarity (aiding) to the tip and ring circuits.

E. ▶Transmission Unit Slot/Signaling Unit Slot Switch (J99343CE)

3.05 When the CE unit is used in the transmission slot of any shelf, the TU SLOT/SU SLOT switch must be operated to the TU SLOT position. If the unit is used in the signaling slot of a double-module bay, the TU SLOT/SU SLOT switch must be operated to the SU SLOT position and a companion unit must be mounted in the transmission slot.◀

4. APPLICATIONS

4.01 The most common applications for the LSE (J99343CA, CB, CC, CD, and ▶CE◀) will be found on special service access lines and trunks, such as foreign exchange services (FX), off-premises station (OPS), off-premises extension (OPX), long distance terminal services (LD), wide area telecommunications services (WATS), and PBX-CO trunks.

4.02 Certain considerations must be observed when using the LSE (J99343CA, CB, CC, CD, and ▶CE◀) because the LSE only boosts the effective signaling battery. For example, the LSE does not provide signal regeneration. If signal regeneration is required, use of a loop signaling repeater (LSR) should be considered.

4.03 When a circuit is being designed using LSEs, the following limitations must be considered:

(a) LSE units should not be used in tandem or on circuits that are switched in tandem with other equipment supplying −72 volts.

(b) LSE units should not be used in circuits with high longitudinal 60-Hz induction.

(c) LSE units should not be used in circuits with positive superimposed ring-trip battery.

(d) LSE units should ***not*** be used in circuits equipped with ringing supplies with positive superimposed dc voltages.

(e) On the J99343CA, CB, and CC LSE units, the −48 volt battery on the ring conductor must be applied to the current sensing circuit on the switch (A) side.

(f) LSE units should not be used between an E6 repeater line build-out unit and nonloaded cable. When the 832A (dummy) unit is used, the LSE may be used between the 832A and nonloaded cable.

4.04 Tandem connection of LSEs is not permitted because of the possibility of creating hazardous line voltage levels. Also the LSE cannot be connected in the station side loop of an LSR arranged for 72-volt operation. The LSE should not be used with ringing supplies which have a positive DC tripping component (ringing supply should be standard 86 volts, 20 Hz with −48 vdc component).

4.05 Since the LSE (J99343CA, CB, CC, CD, and ▶CE◀) supplies battery boost in both the tip and ring conductors, range extension is also supplied for normal ground-start signals. However, the LSE is not intended for nonspecial service ground-start operation such as coin lines.

4.06 When the LSE is used with a companion MFT 2-2 repeater or 2-wire transmission unit, the SX inductors in the signaling access leads in the repeater should be shorted. When used with other MFT transmission units, the SX inductors should not be shorted.

4.07 Table A lists the maximum ranges for supervision and dial pulsing through an LSE.

4.08 The ▶J99343CE◀ may be used in place of any of the earlier model LSEs (J99343CA, CB, CC, and CD) in applications where ring trip boost (B- to A-side signaling direction) is not required. Since ringing is assumed to originate on the A side, the BS1 and BS2 leads (B side) are the only external connections to the signaling path. Thus, the boost voltage polarity is preset.

4.09 If B- to A-side signal boost is required in an J99343CD LSE II or ▶CE◀ application, refer to Section 332-911-102 for steps that may be taken.

4.10 The ▶J99343CD LSE II or CE units◀ cannot be used on the line side of a 770 PBX with 300 series features (call transfer and conferencing). The low current, which often results during conference arrangements with this PBX, prevents proper operation of the ▶J99343CD and CE units.◀

4.11 When making transmission measurements on a dry circuit containing a J99343CD, LSE II in the transmission unit slot, the J99343CD, LSE II will be in the idle condition. While idle the J99343CD, LSE II will present a 1-kHz loss of about 10 dB (in the operated condition, the LSE II presents a loss of 0.2 dB). ▶The J99343CE unit has low insertion loss in both the idle and busy state.◀ To bypass this loss the TEST/NOR switch (J99343CD) in paragraph 3.03 has been provided as an option. If the TEST/NOR switch is not provided in the J99343CA, CB, and CC units, these units may be bypassed by one of the methods listed below:

(a) Remove the LSE II from the circuit, insert the MFT test extender, and patch the 2W T/R LINE jack to the 2W T1/R1 LINE jack.

(b) Replace the LSE II with a 2-wire transmission bypass unit and patch the MON T and T1 jacks and the R and R1 jacks together.

(c) Bypass LSE II by shorting T to T1 leads (pin 38 to 14) and R to R1 leads (pin 40 to 13) on the connector at the rear of the MFT frame or at the distributing frame.

4.12 When the required signaling extension can be obtained by −72 volt operation, use of the LSE (599A2CA, CB, CC, CD, and 3CS4) is recommended over use of the loop signaling repeaters (LSRs) due to cost considerations.

5. MAINTENANCE

5.01 There is no routine maintenance required for LSE plug-in units.

5.02 If an LSE unit is determined to be faulty, it is removed and replaced by a spare. The defective unit should then be returned to the Western Electric Service Center for repair.

TABLE A

LSE MAXIMUM RANGE IN OHMS FOR SUPERVISION AND DIAL PULSE (NOTE 1)

	WHEN USED WITH COMPANION TRANSMISSION UNIT	WHEN USED ALONG
Switch-to-Switch through LSE	*RANGE = $\frac{190}{I\dagger}$ − (1830 + CO BATT. RES. + PBX RES.)	*RANGE = $\frac{100}{I\dagger}$ − (1560 + CO BATT. RES. + PBX RES.)
Switch-to-Switch through LSE	*RANGE = $\frac{100}{I\dagger}$ − (1860 + CO BATT. RES. + STA. RES.)	*RANGE = $\frac{100}{I\dagger}$ − (1560 + CO BATT. RES. + STA. RES.)
LSR-to-LSR through LSE	RANGE = 3000	RANGE = 3300
LSR-to-Station Through LSE	RANGE = 2200 − STA. RES.	RANGE = 2500 − STA. RES.
Switch-to-Switch through LSE II	*Range = $\frac{72}{I\dagger}$ − (CO BATT. RES. + TC RES. + PBX RES.)	*Range = $\frac{72}{I\dagger}$ − (CO BATT. RES. + PBX RES.)
Switch-to-Switch through LSE II	*Range = $\frac{72}{I\dagger}$ − (CO BATT. RES. + RES. + STA. RES.)	*Range = $\frac{72}{I\dagger}$ − (CO BATT. RES. + STA. RES.)
LSR-to-LSR through LSE II	Range = 3000	Range = 3300
LSE-to-Station through LSE II	Range = 2200 − STA. RES.	Range = 2500 − STA. RES.

Note 1: Since the LSE is not a terminating device, the range data in this chart represents the range between terminal equipment. The LSE can be connected into the circuit at any intermediate point. MFT TU Resistance may be obtained from SD-1C350-01 Information Notes.

* Equations applicable only for −48 volts standard battery supply.

† I = the required ring trip current for the CO and/or talk current in amperes. Range = Loop conductor resistance in ohms.