

J99343AJ AND J99343AK LOOP SIGNALING REPEATERS

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 J99343AJ loop signaling repeater (LSR) and the J99343AK loop signaling repeater (loop-start only) (LSR [LSO]). The individual signaling units are described in detail. Performance, typical applications, and maintenance philosophy are also discussed.

1.02 When this section is reissued, the reasons for reissue will be presented in this paragraph.

1.03 The Metallic Facility Terminal (MFT) is a standard equipment arrangement for providing various signaling and/or transmission functions that may be required on metallic facilities. The LSR

signaling units are MFT plug-in units that consist 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 These LSR units extend the loop signaling range between the central office and the customer's location, or between a PBX and a station location. The LSRs are used in the signaling unit slot of double-module MFT shelf arrangements. An MFT repeater, or passive transmission unit, is required in the companion transmission unit slot of the MFT shelf. Section 332-910-101 contains additional information on MFT mounting arrangements.

1.05 The J99343AJ LSR is designed to perform all the functions required for loop-start and ground-start operation. This unit may be used as a replacement for any of the existing MFT LSRs. Installation and testing information for this unit is provided in Section 332-911-207.

1.06 The J99343AK LSR (LSO) is designed to perform all of the functions required for loop-start operation. This unit is intended as a replacement for the J99343AD LSR (LSO). Installation and testing information for this unit is provided in Section 332-911-207.

2. FUNCTIONAL DESCRIPTION **J99343AJ**

A. Operation

2.01 The J99343AJ LSR is shown in Fig. 1. This unit provides regeneration of all signals required for loop-start and ground-start operation. Figure 2 is a block diagram of the unit. The following paragraphs contain a description of the J99343AJ LSR functions.

2.02 *Loop-Start or Ground-Start Operation:*
Loop-start or ground-start operation may be

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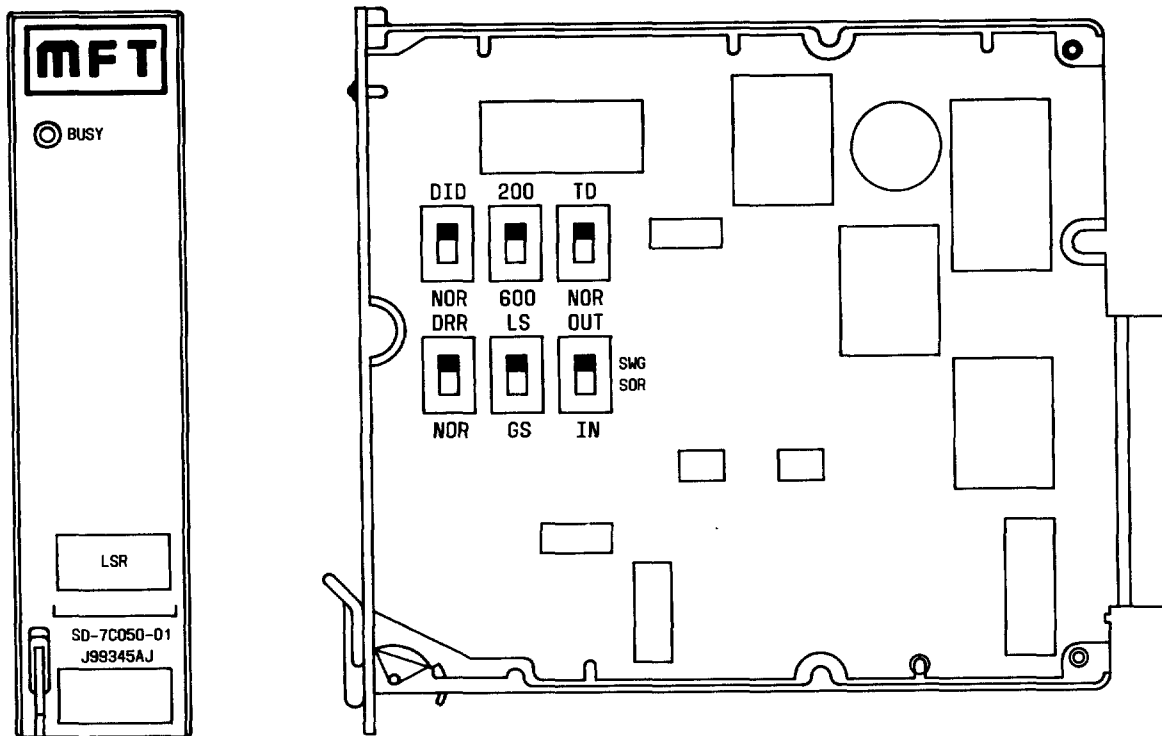


Fig. 1 — J99343AJ LSR

selected as required by circuit application. The mode of operation is selected by placing the LS-GS switch in the desired position.

2.03 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 logic circuitry. The logic circuitry includes a pulse corrector which transmits corrected dial pulsing signals toward the A-side switching equipment. The loop closure detector also provides current limiting.

2.04 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.

2.05 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 which causes the ringing circuitry to be tripped.

2.06 Open Switching Interval Protection: To prevent circuit switch transitions from being interpreted as disconnect signals, open switching interval protection is provided. The duration of the open interval protection (200 ms or 600 ms) is selected by the setting of the 200-600 switch.

2.07 Forward Disconnect: The J99343AJ LSR will forward disconnect in the loop-start as well as the ground-start mode of operation. Switching side open intervals longer than the selected 200 or 600 ms of open switching interval protection are interpreted as forward disconnect signals. Upon detection of a forward disconnect signal, the tip conductor will be opened toward the station. If the J99343AJ LSR is in the ground-start mode, the adjacent PBX trunk circuit will be released and the LSR will return to the idle ground-start state. If the J99343AJ LSR is in the loop-start mode, the station loop will be opened

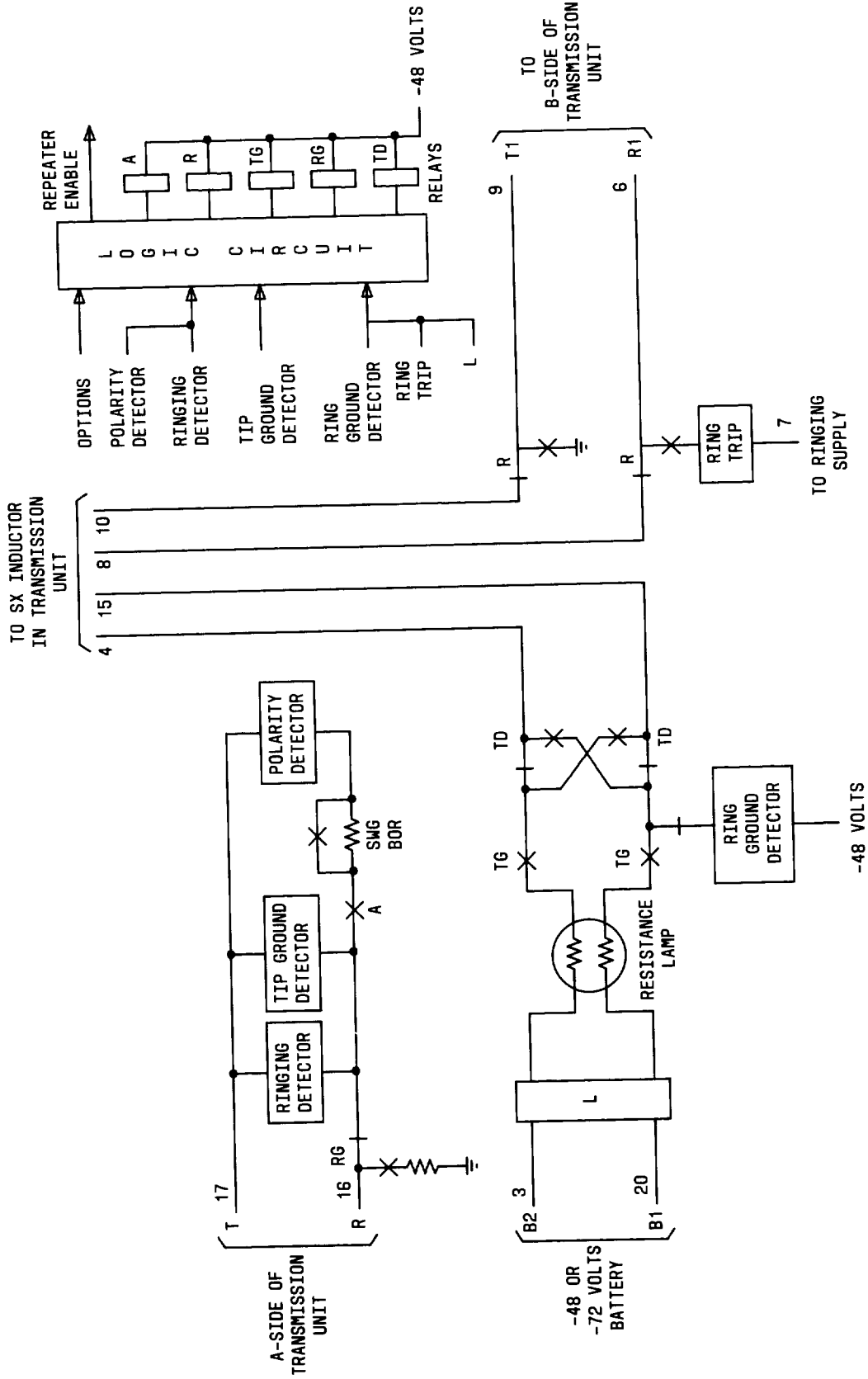


Fig. 2—Block Diagram of J99343AJ LSR

for 850 ms. After this 850 ms interval, the LSR will return to the idle loop-start state.

2.08 Battery Reversals: The J99343AJ LSR unit will detect reverse battery signaling such as toll diversion signals and repeat it on the station side of the unit. This feature is controlled by the NOR·TD switch.

2.09 Direct Inward Dialing: The J99343AJ LSR may be used on direct inward dialing circuits when the NOR·DID switch is in the DID position. In these applications, the companion transmission unit must be set in the reverse signaling mode to allow address information to be transmitted from the central office (CO) to the PBX. The J99343AJ LSR may be used with loop and battery-ground outpulsing as well as with either immediate-start, delay-dial, or wink-start dial pulse supervision. The NOR position is used for circuit applications not requiring direct inward dialing compatibility.

2.10 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

2.11 The J99343AJ LSR unit controls are described briefly in the following paragraphs and are illustrated in Fig. 1.

2.12 LS·GS: The unit's mode of operation is determined by the setting of the LS·GS switch. The LS position is used for loop-start operation while the GS position is used for ground-start operation.

2.13 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 170 ms in duration are rejected (no local ringing output). A ringing signal greater than 170 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 equipment that cannot pass distinctive ringing patterns.

Note: Accurate reproduction of distinctive ringing patterns in tandem LSR arrangements cannot be guaranteed.

2.14 200·600: The duration of the open switching interval protection is selected by setting this switch. In the 200 position, 200 ms of open interval protection is provided. The 200 ms option should be selected if the switching equipment is a step-by-step CO. The 200 ms option is also recommended for some of the signaling units in a tandem LSR arrangement. It is recommended that 600 ms of open interval protection be selected for the LSR nearest the switching equipment. The remaining units in the tandem arrangement should select 200 ms of protection. For most other applications, 600 ms of open interval protection is recommended.

2.15 NOR·TD: This switch controls the regeneration of battery reversal signals for switching equipment (eg, toll diversion). In the TD position, all battery reversals greater than 50 ms received from the switching equipment will be regenerated and transmitted toward the station. In the NOR position, battery reversals are blocked and not passed to the station equipment.

2.16 NOR·DID: This switch provides optional compatibility with direct inward dialing. A nominal station seizure delay of 150 ms is provided when the switch is in the NOR position. A 50 ms station seizure delay is provided when the switch is in the DID position for compatibility with delay dial and immediate start supervision used on direct inward dial circuits.

2.17 SWG BOR (IN·OUT): The switching side build-out resistor (BOR) is provided to limit the switching side loop current on short loops. The BOR is inserted in the A-side circuitry when the SWG BOR switch is in the IN position and removed from the circuit when the SWG BOR switch is in the OUT position.

3. FUNCTIONAL DESCRIPTION - J99343AK

A. Operation

3.01 The J99343AK LSR (LSO) is shown in Fig. 3. This unit provides regeneration of signals required for loop-start operation. Figure 4 is a block diagram of the unit. The following paragraphs contain a description of these functions.

Note: If forward disconnect feature is required on a loop start only circuit, the J99343AJ LSR should be used. The J99343AK LSR (LSO) does not provide a forward disconnect feature.

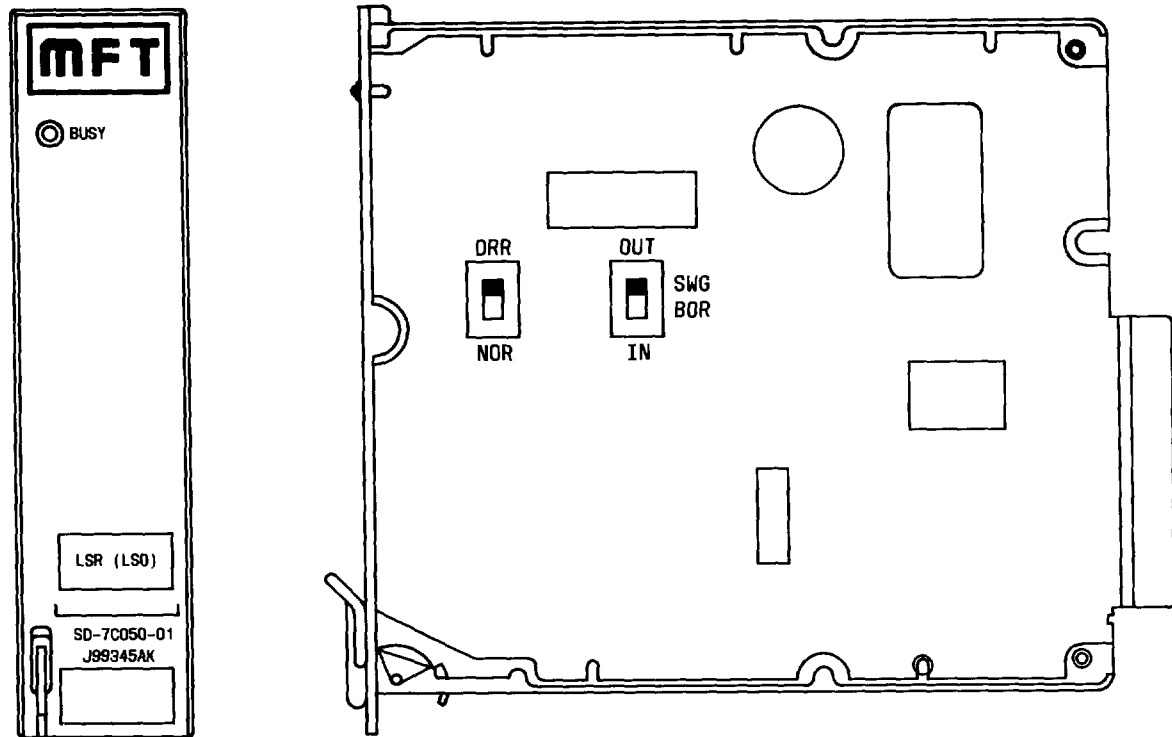


Fig. 3—J99343AK LSR (LSO)

3.02 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 logic circuitry. The logic circuitry includes a pulse corrector which transmits corrected dial pulse signals toward the A-side switching equipment. The loop closure detector also provides current limiting.

3.03 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.

3.04 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.

3.05 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 designed SWG BOR (IN·OUT).

B. Unit Controls

3.06 The J99343AK LSR (LSO) unit controls are described briefly in the following paragraphs and are illustrated in Fig. 3.

3.07 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 170 ms in duration are rejected (no local ringing output). A ringing signal greater than the 170 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

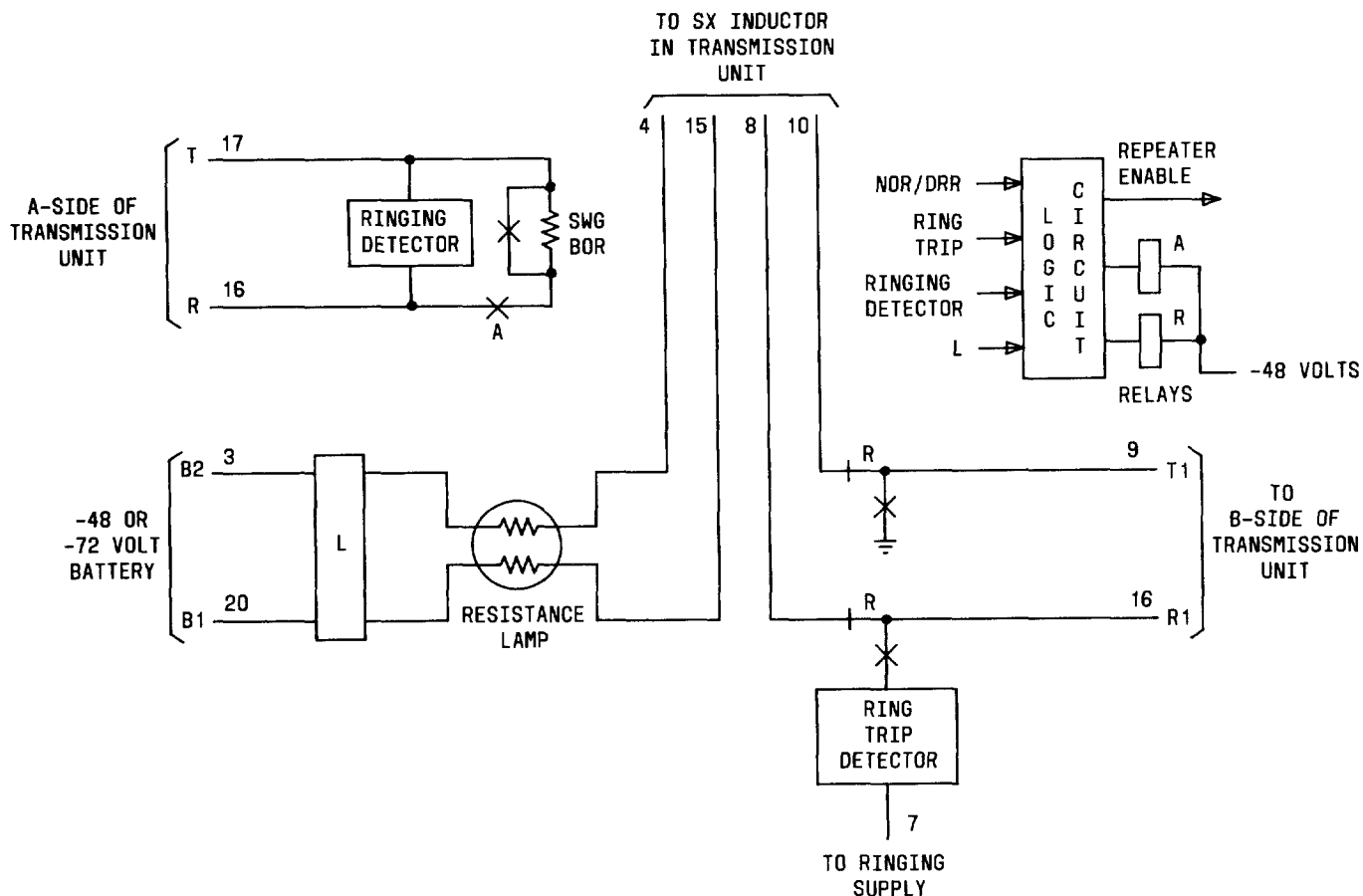


Fig. 4—Block Diagram of J99343AK

used with equipment that cannot pass distinctive ringing patterns.

Note: Accurate reproduction of distinctive ringing patterns in tandem LSR arrangements cannot be guaranteed.

3.08 SWG BOR (IN-OUT): The switching side build-out resistor (BOR) is provided to limit the switching side loop current on short loops. The BOR is inserted in the A-side circuitry when the SWG BOR switch is in the IN position and removed from the circuit when the SWG BOR switch is in the OUT position.

4. PERFORMANCE CHARACTERISTICS

4.01 The performance characteristics of the J99343AJ and AK LSRs are presented in the following tables. Table A contains a listing of the

operating characteristics of the units. Information on the internal resistance of these LSRs is provided in Table B for determining the signaling range between a switching machine and a LSR. The station side supervision and dial pulsing range is given in Table C. The regenerated ringing range from the station side of the LSR to station equipment is given in Table D.

5. APPLICATION

5.01 The J99343AJ and AK loop-signaling repeaters are intended for use with a companion transmission unit on special service lines and trunks requiring signaling range extension. These applications include Off-Premise-Station lines, Wide Area Telecommunications Service (WATS) Foreign Exchange service, PBX-CO trunks, Long Distance

TABLE A
OPERATING CHARACTERISTICS OF THE J99343AJ AND J99343AK
LOOP SIGNALING REPEATERS

CHARACTERISTIC		PERFORMANCE	
Dial pulse correction	Pulsing rate (station)	7.5 to 12 PPS	
	Percent break (source)	42% to 80%	
	Percent break (output)	58% to 64%	
External leakage requirements (tip-to-ring, tip-to-ground, ring-to-ground)*	Switching side	Maximum of office limit or 30k ohms	
	Station side (-48 volt talk-battery)	10k ohms minimum	
	Station side (-72 volt talk-battery)	15k ohms minimum	
Permissible longitudinal ac potential†	Switching side	50-Volts RMS at 60 Hz	
	Station side	10-Volts RMS at 60-Hz (10 mA RMS per conductor)	
Supervision and ringing delays	Tip ground seizure††	100 ms nominal	
	Ring ground seizure††	50 ms nominal	
	Station seizure	150 ms nominal	
	Station seizure (DID mode)††	50 ms nominal	
	Station disconnect	150 ms nominal	
	Ringing seizure (NOR mode)	100 ms nominal	
	Ringing seizure (DRR mode)	170 ms nominal	
Current—drain J99343AJ	Idle State Busy state¶ Maximum	-48 VOLT CKT BATT (Pin 11)	TALK BATT (Pin 20)§
		40 mA	0 mA
		60 mA	35 mA
		80 mA	110 mA
Current drain—J99343AK	Idle state Busy state¶ Maximum	-48 VOLT CKT BATT (Pin 11)	TALK BATT (Pin 20)§
		30 mA	0 mA
		40 mA	35 mA
		50 mA	110 mA

* The external leakage requirements include the leakage characteristics of both the cable and the terminating equipment.

† Longitudinal ac potential on the switching side is measured between the LSR tip or ring conductor and ground (open circuit to ground). On the station side, the longitudinal ac induction shall be measured with the LSR removed and the tip and ring conductors connected together to a 500 ohm resistor to ground.

†† These characteristics apply to J99343AJ only.

§ The current on pin 20 is equal to the station loop current.

¶ A nominal busy state is assumed with 25 milliamperes of switching side loop current and 35 milliamperes of station loop current.

TABLE B

SIGNALING RANGE BETWEEN SWITCHING MACHINE AND LSR

LOOP SUPERVISION AND DIAL PULSE RANGE	
The loop supervision and dial pulse range between the switching machine and the LSR is equal to the limit of the CO, or PBX, minus the combined internal resistance of the LSR and its companion transmission unit. These internal resistance values are as follows:	
Maximum Internal Resistance* of MFT Transmission Unit	185 ohms
Maximum Internal Resistance of J99343AJ LSR (SWG BOR OUT)	125 ohms
Maximum Internal Resistance of J999343AK LSR (LSO) (SWG BOR OUT)	0 ohms
SWITCHING MACHINE RING GROUND SUPERVISION RANGE	
The ring ground supervision range between the switch and the J99343AJ LSR is equal to the CO, or PBX, limit minus the combined internal resistance on the ring conductor of the LSR and its companion transmission unit. These internal resistance values are as follows:	
Maximum Internal Resistance on Ring Conductor of MFT Transmission Unit	93 ohms
Maximum Internal Resistance Applied on Ring Conductor by J999343AJ LSR	347 ohms

* The maximum internal dc resistance of MFT transmission units is 185 ohms. For more detailed information, see information notes 305 in SD-1C359-01, Issue 40A.

trunks, and Direct-Inward-Dialing trunks. The repeaters are **not** intended for use with sleeve lead control, coin service, multi-party service, or with Automatic-Identification-of-Outward Dialing.

5.02 The loop-signaling repeaters may be used singly or in tandem depending on the range requirements of the circuit. In tandem arrangements, satisfactory signaling performance is assured through the use of a constant percent break dial pulse corrector and complete ringing regeneration. However, regeneration of ring pings and distinctive ringing patterns is not guaranteed in tandem arrangements. Typical applications of the J99343AJ and AK LSRs are shown in Fig. 5.

6. MAINTENANCE

6.01 The J99343AJ and AK LSRs require no routine maintenance. If the LSR 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.

7. REFERENCES

7.01 The following references provide additional information concerning MFT loop signaling repeaters.

SECTION	TITLE
332-910-100	MFT - General Description
332-910-101	Shelf, Frame, Power Panel, and Distributing Frame Arrangements - Description
332-910-180	General Application Information
332-911-207	J99343AJ and AK - Installation and Testing

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.

7.02 The following references also provide additional information concerning MFT loop signaling repeaters.

DRAWING	TITLE	DRAWING	TITLE
			Description
SD-1C359-01	Common Systems, MFT - Schematic Drawing	SD-7C050-01	Common Systems, MFT - Circuit Packs - Schematic Drawing
CD-1C359-01	Common Systems, MFT - Circuit	CD-7C050-01	Common Systems, MFT - Circuit Packs - Circuit Description

TABLE C

STATION-SIDE SUPERVISION AND DIAL PULSE RANGE
(NOTE 1)

TALK BATTERY	LSR RANGE 23 MA MIN LOOP CURRENT (NOTE 2)	TANDEM LSR RANGE 16 MA MIN LOOP CURRENT (NOTE 2)
-42.5	1300 ohms	2100 ohms
-48	1500 ohms	2500 ohms
-52	1700 ohms	2700 ohms
-67.5	2300 ohms	3700 ohms
-72	2600 ohms	4000 ohms
-78	2800 ohms	4300 ohms

Note 1: For loop-start circuits, the station side signaling range is limited by either the loop supervision and dial pulse range or by the regenerated ringing range. In ground-start applications, the station side signaling range may be limited by the station equipment tip ground supervision range. The maximum internal resistance applied on the tip conductor through a companion transmission unit by the J99343AJ LSR during a tip ground seizure is 300 ohms.

Note 2: The supervision and dial pulse range includes the resistance of the station set or the internal resistance of a tandem repeater, and assumes an internal resistance of 185 ohms for the companion transmission unit.

TABLE D

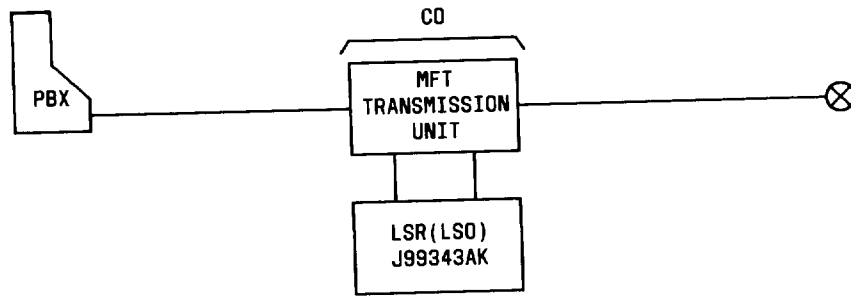
REGENERATED RINGING RANGE (NOTE 1)

	RINGING LOAD			
	1 PBX RINGING DETECTOR (NOTE 2)	THREE C4A RINGERS (NOTE 3)	FOUR C4A RINGERS (NOTE 3)	FIVE C4A RINGERS (NOTE 3)
Maximum resistance between LSR and ringing load	3600 ohms maximum	2600 ohms maximum	1600 ohms maximum	1200 ohms maximum

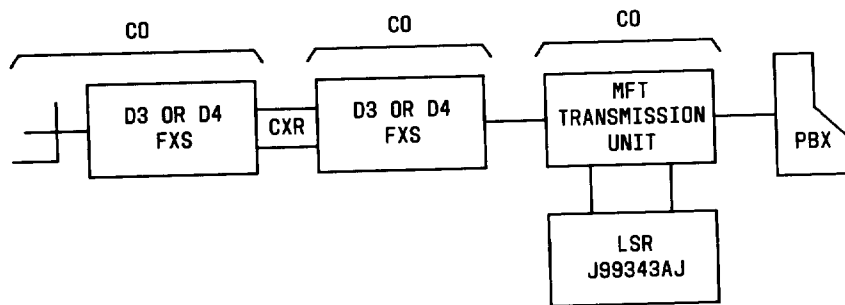
Note 1: Regenerated ringing ranges assume a 20Hz ringing source of 84 to 88 volts RMS and a series 13L resistance lamp.

Note 2: Ringing ranges to a PBX are based on typical PBX relay detectors such as the circuits used in SD-5E016 and SD-1E340.

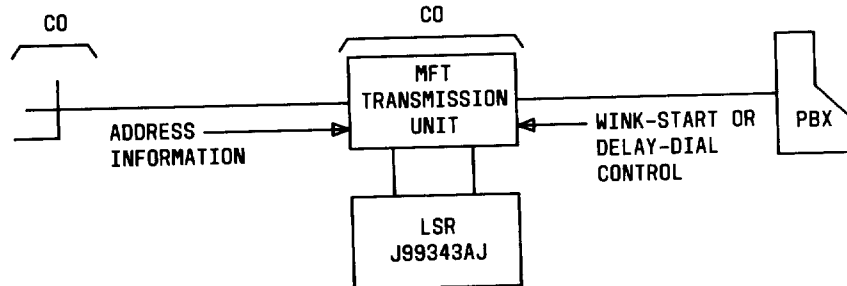
Note 3: Ringing ranges to station sets with C4A ringers assume a series 0.5 UF capacitor and a weak notch setting.



OPS LINE WITH J99343AK



FX TRUNK WITH CARRIER LINK



DID TRUNK WITH J99343AJ

Fig. 5—Typical Applications of the J99343AJ and AK LSRs