

METALLIC FACILITY TERMINAL
LOOP-START ONLY/2-WIRE TRANSMISSION UNIT (J99343GA)

SD-7C050-01

DESCRIPTION

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1. GENERAL

1.01 The Metallic Facility Terminal (MFT) is a standard grouping of modular equipment which includes transmission and/or signaling functions required with metallic (wire) facilities. The Loop-Start Only/2-Wire transmission unit (LSO/2-Wire) is a plug-in unit of the MFT family which contains circuitry for performing both transmission and signaling functions within the same unit.

1.02 When this section is reissued, the reason for reissue will be given in this paragraph.

1.03 The standard MFT equipment format normally requires separate transmission and signaling unit plug-in modules to provide both transmission and signaling treatment for voice-frequency facilities which require both (eg, gain and signaling range extension). Section 332-910-180 contains a brief description and general applications information for MFT equipment.

1.04 The LSO/2-Wire combines the functions of the MFT passive 2-wire transmission unit

(J99343BC) and the signaling functions of the Loop Signaling Repeater, Loop-Start Only (J99343AD) in a single unit. In addition, it will faithfully reproduce the distinctive ringing of the DIMENSION® PBX and can also be set to provide a ringing output pattern that is compatible with certain signaling conversion units such as carrier and other dial long lines units which are incompatible with distinctive ringing. Sections 332-912-101 and 332-911-101 contain complete descriptions of the J99343BC and J99343AD, respectively.

1.05 The distinctive ringing feature of the DIMENSION PBX includes the origination and transmission of short bursts of 20-Hz ringing. These ringing bursts are of shorter duration than standard CO ringing patterns and will either be distorted or not reproduced at all by other MFT regenerative signaling units (eg, the Loop Signaling Repeaters). The LSO/2-Wire can be set to accurately regenerate all distinctive ringing patterns when a single LSO/2-Wire is used on a circuit.

1.06 On circuits which require a second LSO/2-Wire to meet end-to-end signaling objectives, the 100 msec "ring ping" burst which is generated by the DIMENSION equipment may not be transmitted. This condition can occur if the phase relationship of the 20-Hz generators at the PBX and the first LSO/2-Wire results in a ringing input to the second LSO/2-Wire which is less than 50 msec duration. Telephone ringer bias springs should be set in the weak notch in all tandem installations.

1.07 The LSO/2-Wire is normally used in one of the single module mounting arrangements because of the greater circuit density which is possible (single module shelves can accommodate 12 circuits, double module shelves, 6 circuits). Its use in a frame necessitates that 20-Hz ringing

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current be available. Although a ringing supply is not included in many standard coded frames from the factory, installer frame options for 20-Hz ringing are available and must be added to the frame before use of the LSO/2-Wire. Part 4 contains additional information relating to the required options for all series of MFT frames.

1.08 Maintenance of all MFT plug-in units is by substitution. LSO/2-Wire units which are thought to be defective should be replaced with a unit from stock which is known to be operable. The defective unit should be returned to the Western Electric Service Center for repair.

1.09 Additional information relating to the LSO/2-Wire can be found in SD-7C050-01, CD-7C050-01 (CPS1), and Section 332-912-252 (Installation and Testing).

2. EQUIPMENT DESCRIPTION

2.01 A photograph of the LSO/2-Wire is shown in Fig. 1. The unit is made up of circuit components mounted on a printed circuit board. The circuit board, which has a built-in connector along one edge, is attached to a die-cast frame. The assembly is approximately 1-11/16" (4.3 cm) wide by 7-7/8" (20 cm) high by 9" (23 cm) deep.

2.02 There are four slide switches mounted on the unit circuit board:

DESIGNATION	FUNCTION
A-Side Z	Selects 600 or 900 ohms for A-side (switching) impedance
B-Side Z	Selects 600 or 900 ohms for B-side (station) impedance
SWG BOR	Inserts (IN) or shunts (OUT) a 511-ohm Build-Out Resistor (BOR) in A-side (switching) to limit loop current on short loops
NOR/SPEC	Selects loop-start normal (LSN) or loop-start special (LSS) mode for special ringing interface junctions

The LSO/2-Wire must be removed from its shelf or frame mounting position for access to the switches.

3. CIRCUIT DESCRIPTION

A. Transmission Functions

3.01 The transmission portion of the LSO/2-Wire consists of a 2-wire voice-frequency coupling transformer for passing voice-frequency energy between the A-side and B-side of the unit. The transformer is tapped on both sides for 600- or 900-ohm operation and may be used in any setting arrangement (600:600, 600:900, 900:600, or 900:900). Impedance selections are made by slide switches on the component board. A block diagram of the LSO/2-Wire is shown in Fig. 2.

3.02 Signaling access to the circuit is obtained through split windings in both sides of the coupling transformer. Midpoint capacitors separate the split windings. Signaling leads on both the switching and station sides are connected to the signaling circuitry through simplex inductors. (The inductors are in series with the signaling circuits at all times and cannot be shorted.) Battery and low-frequency signaling are isolated from the voice path to assure satisfactory transmission characteristics for all line conditions.

3.03 See Table A for transmission characteristics of the LSO/2-Wire.

B. Signaling Functions

3.04 The signaling circuits in the LSO/2-Wire are similar to the Loop Signaling Repeater/Loop-Start Only. The LSO/2-Wire:

- Detects 20-Hz ringing from the A-side (switching) and applies a local 20-Hz ringing source toward the B-side (station).
- Regenerates dial pulses and dc signals received from the B-side (station) toward the A-side (switching). The dial pulses are corrected and repeated at a constant 58% break.

3.05 The LSO/2-Wire can be set to operate in either the LSN or LSS mode. The mode is selected by a slide switch on a small circuit board attached to the main component board.

3.06 The LSN mode is used to faithfully reproduce the distinctive ringing patterns of the DIMENSION PBX and can be used in the general

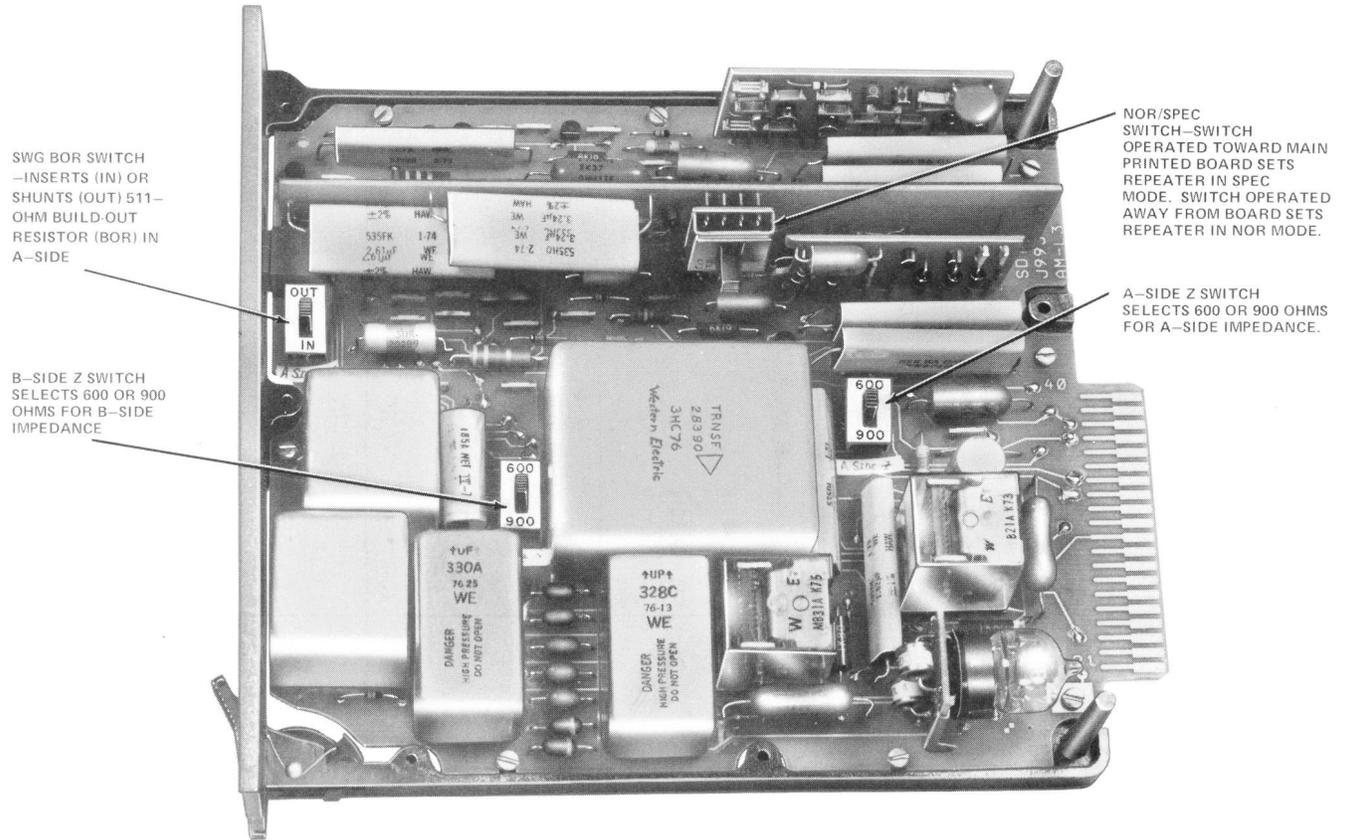


Fig. 1—Loop-Start Only/2-Wire Transmission Unit, J99343GA (MTC 2100AAA)

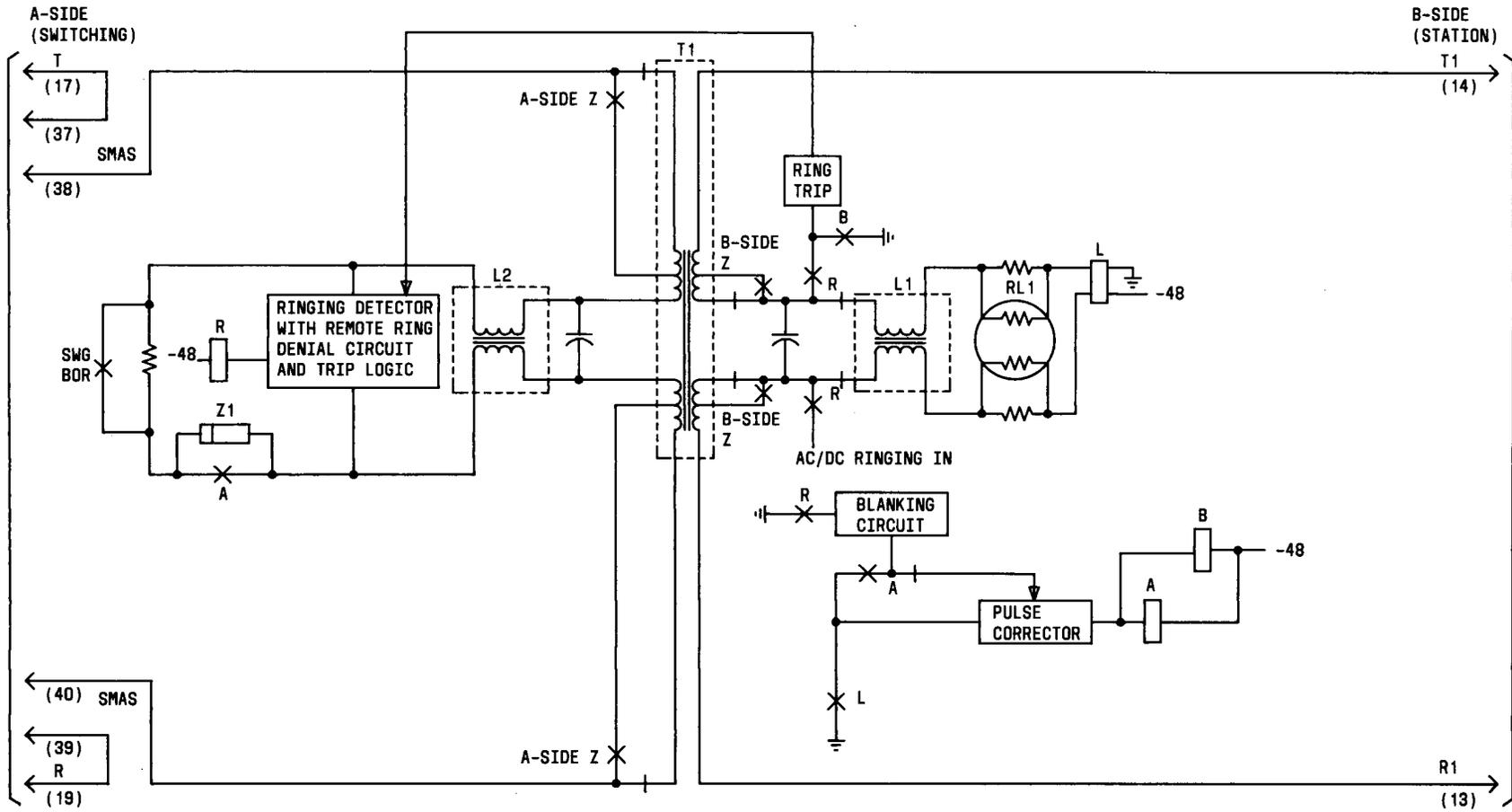


Fig. 2—LSO/2-Wire Block Diagram

TABLE A
TRANSMISSION CHARACTERISTICS OF THE LSO/2-WIRE

NOMINAL LOSS THROUGH UNIT			
A-SIDE (SWITCHING)		B-SIDE (STATION)	LOSS @ 1 KHz
900		900	.4 dB
600		600	.4 dB
A-SIDE ERL (B-SIDE TERMINATED AS SHOWN)			
A	B	B-SIDE TERM	ERL
900	900	900Ω +2.15μF	25 dB
600	600	600Ω +2.15μF	20 dB
600	900	900Ω +2.15μF	25 dB
900	600	600Ω +2.15μF	20 dB
DC RESISTANCE			
A-SIDE (SWITCHING)		B-SIDE (STATION)	
BOR IN — 666Ω		385Ω @ 16 mA	
BOR OUT — 155Ω		415Ω @ 23 mA	
		660Ω @ 36 mA	

* A-Side resistance is measured between connector terminals 38 and 40 with terminals 3 and 4 of the "A" relay shorted.

† B-Side resistance is measured between connector terminals 14 and 13 with terminals 20 and 18 shorted.

application. The LSS mode should be used when the LSO/2-Wire interfaces a carrier system or other signaling conversion units which are incompatible with distinctive ringing patterns.

3.07 If a regenerative signaling unit which will faithfully reproduce distinctive ringing is required at an intermediate location, the Loop Signaling Repeater/Distinctive Ringing (LSR/DR) (J99343AH) should be used in lieu of the LSO/2-Wire. A facility which requires signaling treatment at an intermediate location will also normally require transmission treatment (gain). The LSR/DR signaling unit must be used with a companion MFT transmission unit in a double module mounting arrangement. The transmission unit can be one of the MFT repeaters if gain is required or one of the passive

transmission units which supplies only signaling lead access for the signaling unit. Section 332-911-101 contains a description of the LSR/DR.

3.08 When operating in the LSN mode, the unit detects ringing from the switching side and applies identical ringing patterns toward the station. All ringing patterns are accurately regenerated so that the distinctive ringing characteristic of the DIMENSION PBX is perceived at the station exactly as originated. See Fig. 3 for a diagram of the distinctive ringing patterns of the DIMENSION PBX and the ringing as regenerated by the LSO/2-Wire when set to operate in the LSN mode.

3.09 The LSS mode modifies the distinctive ringing output of the DIMENSION PBX and

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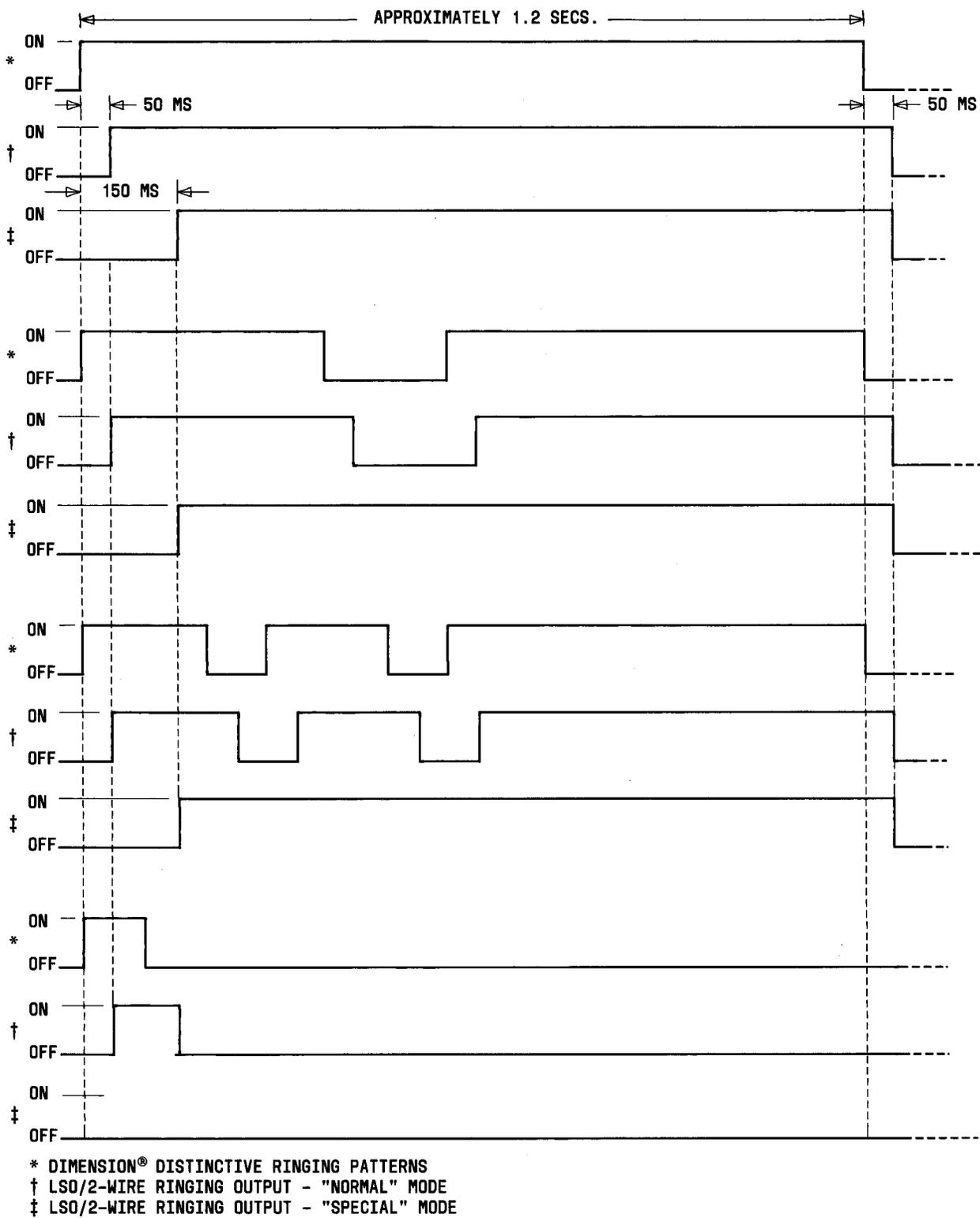


Fig. 3—Distinctive Ringing Patterns (20 Hz ON and OFF) of the DIMENSION® PBX and Corresponding Outputs of the LSO/2-Wire

effectively removes the distinctive ringing feature of the PBX. When set to operate in this mode, the LSO/2-Wire has signaling characteristics similar to the Loop Signaling Repeaters operating Loop-Start. The short-duration ringing bursts such as those generated by the DIMENSION PBX are "stretched" so they will be reliably propagated over a complex transmission facility which contains other signaling conversions (eg, carrier, DLLs). Fig. 3 also shows the ringing outputs of the LSO/2-Wire when set to operate LSS. Note that the 100-msec ring-ping is not passed in this mode.

3.10 See Table B for range information applicable to the LSO/2-Wire.

4. APPLICATIONS

4.01 The LSO/2-Wire is used to provide signaling range extension over long PBX off-premises station lines. It is compatible with the special ringing modes ("Distinctive Ringing") of the DIMENSION PBX and is normally located at customer premises near the PBX. Fig. 4 shows a typical PBX-OPS circuit employing the LSO/2-Wire for signaling range extension.

4.02 Many MFT single and double module shelves and frames are not factory equipped and

wired for the distribution of 20-Hz ringing current. The addition of a ringing distribution panel and appropriate wire strapping is installer options on the SD-1C359-01 (J99343) and SD-7C018-01 (J99378) series of frames. The SD-7C018-01 (J99386) series of connectorized frames are factory equipped and wired with ringing to each backplane assembly. Early manufactured units were wired with ringing to signaling unit positions only; later manufactured units have straps to both signaling and transmission unit positions. See Table C for equipment and wiring options for all series of MFT frames.

4.03 Installer options on MFT frames for a Customer Premise Facility Terminal (CPFT) include appropriate wire strappings which will provide 20-Hz ringing and talk battery requirements to the transmission unit positions on the J99380E* shelf assembly. The J99380F* and J99380G* shelf assemblies of a CPFT (which include the J99380J, Power Distribution and Feature Panel) are factory equipped and wired with 20-Hz ringing and talk battery to meet the LSO/2-Wire requirements. No installation options to cover signaling are available for the CPFT J99380A* shelf assembly.

*SD-7C010-01 (CPFT)/Section 801-026-171.

TABLE B

LSO/2-WIRE MAXIMUM RINGING AND SIGNALING RANGES

RINGING RANGE TO STATION WITH
C4A RINGERS AND 0.5μF SERIES CAPACITOR¹

NUMBER OF C4A RINGERS	STIFF NOTCH BIAS SPRING SETTING (50V RMS AT RINGER) ²	WEAK NOTCH BIAS SPRING SETTING (43V RMS AT RINGER) ²
1	5220 OHMS MAX	6540 OHMS MAX
2	2880 OHMS MAX	4050 OHMS MAX
3	1820 OHMS MAX	2650 OHMS MAX

MAXIMUM RANGE FOR SUPERVISION AND DIAL PULSING
(MAXIMUM CONDUCTOR LOOP RESISTANCE IN OHMS)

TALK BATTERY	RANGE BASED ON LOW/NOMINAL BATTERY VOLTAGE	RANGE BETWEEN PBX AND LSO/2-WIRE ³	RANGE BETWEEN TWO LSO/2-WIRES BASED ON 16 mA LOOP CURRENT ⁴	RANGE BETWEEN LSO/2-WIRE & STATION BASED ON 23 mA LOOP CURRENT	RANGE BETWEEN LSO/2-WIRE & STATION BASED ON 36 mA LOOP CURRENT
-24V (-22.5V TO -26V)	Low	The lesser of: 1. PBX limit minus 155 ohms 2. 1250 ohms minus PBX batt. feed res.			
	Nominal	The lesser of: 1. PBX limit minus 155 ohms 2. 1470 ohms minus PBX batt. feed res.			
-48V (-42.5V TO -52V)	Low	The lesser of: 1. PBX limit minus 155 ohms 2. 2500 ohms minus PBX batt. feed res.	2115 ohms maximum	1430 ohms minus station res.	520 ohms minus station res.
	Nominal	The lesser of: 1. PBX limit minus 155 ohms 2. 2845 ohms minus PBX batt. feed res.	2460 ohms maximum	1670 ohms minus station res.	670 ohms minus station res.
-72V (-67.5V TO -78V)	Low	The lesser of: 1. PBX limit minus 155 ohms 2. 4064 ohms minus PBX batt. feed res.	3675 ohms maximum	2520 ohms minus station res.	1215 ohms minus station res.
	Nominal	The lesser of: 1. PBX limit minus 155 ohms 2. 4345 ohms minus PBX batt. feed res.	3960 ohms maximum	2715 ohms minus station res.	1340 ohms minus station res.

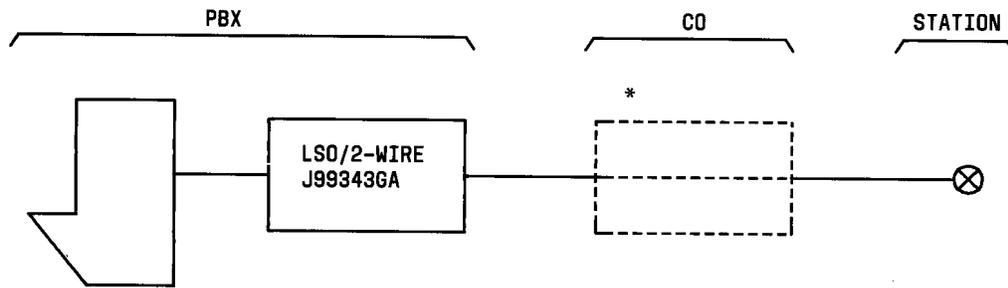
TABLE B (Contd)

Note 1: Regenerated ringing ranges given in these tables assume a ringing supply of 84-86 volts rms 20 Hz and a series 13L resistance lamp. Ringing trip range and ringing detection range both exceed 3650 ohms and are not considered as limiting factors in circuit design.

Note 2: 50 volts ac rms is the average voltage required to operate a C4A ringer with bias spring set in the stiff notch. 40 volts ac rms is the minimum voltage required to operate a C4A ringer with the bias spring set in the weak notch. To insure adequate operating margin in most circuit designs, the maximum ranges listed for 50-volt operation are recommended as design limits. When operating at the extremes of these ranges, ringers may have to be selected or set in the weak bias spring notch to obtain satisfactory operation.

Note 3: The PBX limit referred to in this table is the maximum external circuit resistance limit specified for the PBX.

Note 4: "RING-PING" may not be reproduced with tandem units. Telephone ringer bias spring should be set in weak notch in tandem installations.



* 2-2 REPEATER IF VF GAIN IS REQUIRED

Fig. 4—Typical Off-Premises Station Application of the LSO/2-Wire

TABLE C

FRAME OPTIONS REQUIRED FOR LSO/2-WIRE USE¹

FRAME SERIES	SINGLE MODULE	DOUBLE MODULE
J99343 () NON-SMAS	ZW ² , ZV	ZW ² , ZV
J99378 () SMAS	K ² , ZD	K, ZD
J99386 () CONNECTORIZED	K ²	K

Notes: 1. Options ZW and K — Strapping to provide for 20-Hz ringing supply. (See options in SD-1C359 and SD-7C018.)

Options ZV and ZD—Ringing Distribution Panel [ED-7C171-()] (See options in SD-1C359 and SD-7C018.)

2. Included with all late production units; installer option on others.