

# RINGDOWN AND PRIVATE LINE AUTOMATIC RINGDOWN CHANNEL UNITS

## DESCRIPTION

### D4 CHANNEL BANK

### DIGITAL TRANSMISSION SYSTEMS

	CONTENTS	PAGE
1.	<b>GENERAL</b> . . . . .	1
2.	<b>CIRCUIT DESCRIPTION</b> . . . . .	1
	<b>A. Signaling and Supervision RD and PLAR</b> . . . . .	1
	<b>B. Ringing Modes (Ringdown)</b> . . . . .	2
	<b>C. Transmitting Operation</b> . . . . .	2
	<b>D. Receiving Operation</b> . . . . .	2
3.	<b>CIRCUIT OPTIONS</b> . . . . .	3
4.	<b>REFERENCES</b> . . . . .	3

#### 1. GENERAL

**1.01** This section describes the D4 2-wire and 4-wire ringdown/private line automatic ringdown (RD/PLAR) channel units. These special service channel units combine the RD and PLAR functions that were separate in the D3 channel units. The D4 channel units are compatible with the D3 RD and PLAR channel units.

**1.02** Whenever this section is reissued the reason for reissue will be given in this paragraph.

**1.03** Both the 2-wire and 4-wire units provide a nonswitched private line service. Each unit contains options that can be set to determine the mode of operation, either RD or PLAR. The PLAR mode is applicable only to 2-point lines. The RD mode is intended for multipoint bridged private lines and includes features to allow any station to select any

other station out of a group of 15 on the same bridge. Table A lists these units with their schematic (SD) and circuit description (CD) numbers. Figures 1 and 2 show a pictorial view of the component side of each unit.

#### 2. CIRCUIT DESCRIPTION

##### A. Signaling and Supervision RD and PLAR

**2.01** Signaling is accomplished in the RD application by pushing a button at the calling station which generates ringing current to the calling channel unit. Signaling is accomplished in the PLAR application by an off-hook condition (loop closure) at the calling station. Options to convert the channel unit to RD or PLAR type signaling are contained on both the 2-wire and 4-wire units. Both the 2-wire and 4-wire units, when optioned in the PLAR mode, provide -48 volt talk battery to the metallic facility. The 2-wire unit, optioned in the PLAR mode, also offers the option of -72 volt talk battery.

**2.02** Supervision during RD operations for both 2-wire and 4-wire circuits is provided by a properly conditioned (via microswitches) microcomputer contained in each channel unit. The calling RD optioned channel unit identifies the 20-Hz ringing bursts and passes the appropriate signaling logic to the D4 common circuits. The called RD optioned channel unit converts the signaling logic from the D4 common circuits into a ringing signal toward the called station depending on the ringing mode selected (via switches) in each channel unit. During ringing, the called station channel unit produces dc pulse which is sent to the calling station channel unit until the calling station answers and a talking path is established. For bidirectional signaling around a bridge, the channel units receive -48 volt dc pulses on the "S" leads and convert to signaling logic for the

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D4 common circuits. The bridge provides the means for connecting three or more stations together. Figure 3 illustrates a typical multipoint RD 4-station bridge circuit.

**2.03 Supervision during PLAR operations for both 2-wire and 4-wire units** is also provided by a properly conditioned microcomputer contained in each channel unit. An off-hook condition (loop closure) at either station will cause the calling station PLAR optioned channel unit to convert the loop closure signal into appropriate signaling logic for the D4 common circuits. The called station PLAR optioned channel unit converts the signaling logic from the D4 common circuits into a repeated ringing signal toward the called station. The called station rings with 2 seconds on and 4 seconds off. The called station channel unit produces a 440- and 480-Hz ringback tone which is sent to the calling station channel unit until the called station answers and a talking path is established. Figure 4 illustrates typical 2-point PLAR circuits.

#### B. Ringing Modes (Ringdown)

**2.05** The 2-wire and 4-wire ringdown units have four different switch-selectable signaling modes available to satisfy the need for selective and nonselective ringing. They are as follows:

(1) **Code Select:** In this mode any combination of 15 station switches may be selected to designate the ringing code to which a specific station will respond. The calling station sends ringing bursts to the transmitting channel unit (the same number of bursts as the code assigned to the desired station). The transmitting channel unit converts these bursts to the appropriate signaling required by the D4 common equipment, and the receiving channel units compare the received code to their assigned code. When the codes match, the receiving channel unit sends a single 2-second burst of ringing toward the associated called station.

(2) **No Code:** This mode is a nonselective type of ringing mode that causes all receiving stations to ring simultaneously. Each receiving channel unit in a multipoint bridge circuit responds to the release of the ringing button at a calling station with a single 2-second 20-Hz ringing burst to its station loop or a 2-second -48 volt dc pulse to the "S" leads.

(3) **Repeat Input Timing (2-Second Limit):** The repeat input timing mode with 2-second

limit is a nonselective ringing mode with a morse code type of signaling. The ringing button at the calling station is pushed as many times as the code being generated. All receiving station channel units respond to the pushbutton signals of the calling station with a 2-second limit on each pulse. This causes all receiving stations to ring simultaneously with a 2-second ring duration for every signal from the calling station.

(4) **Repeat Input Timing (No Limit):** The repeat input timing mode is identical to the input timing mode of (3) above except no time limit is invoked by the receiving station channel unit; therefore, ringing time will vary depending on how long the calling station ringing button is depressed. This mode is the preferred mode for bridge signaling which connects two carrier systems together.

#### C. Transmitting Operation

**2.06** The transmit circuit of the 2-wire RD/PLAR channel unit has a hybrid circuit to convert from 2-wire to 4-wire transmission for bidirectional processing of voice circuits. The transmitting signal is amplified, level adjusted, and filtered. Following the filter, the signal is sampled by a gate that is controlled by the channel unit logic circuits. It is then passed to the D4 common equipment.

**2.07** The transmit circuit of the 4-wire RD/PLAR has a balanced input transformer equipped with switched impedances of 150, 600, or 1200 ohms and an equalizer with 15 dB of 1 kHz insertion gain. The transmitting signal is equalized, amplified, level adjusted, and filtered. After being filtered, the signal is sampled by a gate and sent to the D4 common equipment.

#### D. Receiving Operation

**2.08** The 2-wire and 4-wire RD/PLAR receive circuits are similar. Each unit reconstructs the voice frequency (VF) waveform from the gated PAM sample in the receive active filter at +4 dB TLP. The output of the receive filter is attenuated and amplified to meet levels needed on the VF cable. The received VF signal is put on the cable through a hybrid in 2-wire units or a balanced transformer with switched impedances of 150, 600, or 1200 ohms in 4-wire units.

**3. CIRCUIT OPTIONS**

**3.01** Options for the 2-wire and 4-wire RD/PLAR units are shown on Fig. 1 and 2, respectively. Table B lists and defines the 2-wire RD/PLAR options and Table C lists and defines the 4-wire RD/PLAR options. Options necessary for a specific circuit will be listed on the circuit layout record card (CLRC) or work order record details (WORD) document for that circuit.

**4. REFERENCES**

**4.01** The following is a list of sections associated with the RD/PLAR channel units:

**SECTION****TITLE**

365-170-000

D4 Channel Bank—Task Oriented Practices (TOP)

365-170-101

D4 Channel Bank Channel Unit Description — Digital Transmission Systems

855-351-105

D4 Channel Bank Channel Units Application Engineering — Carrier Engineering.

**TABLE A****D4 2-/4-WIRE RD/PLAR CHANNEL UNITS**

<b>EQUIPMENT</b>	<b>EQUIPMENT CODE</b>	<b>SD/CD NUMBER</b>
2RD/PLAR	J98726SN	7C035
4RD/PLAR	J98726SP	7C036

**TABLE B**  
**2-WIRE RD/PLAR OPTIONS**

OPTION	FUNCTION															
M (1, 2)	Two switches (1 and 2) of S6 (M) are set as follows for one of four ringing modes: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">SWITCH 1 COLOR</th> <th style="text-align: center;">SWITCH 2 COLOR</th> <th style="text-align: center;">RINGING MODE</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">White</td> <td style="text-align: center;">White</td> <td style="text-align: center;">Code select</td> </tr> <tr> <td style="text-align: center;">Red</td> <td style="text-align: center;">White</td> <td style="text-align: center;">No code</td> </tr> <tr> <td style="text-align: center;">Red</td> <td style="text-align: center;">Red</td> <td style="text-align: center;">Repeat input timing (no limit)</td> </tr> <tr> <td style="text-align: center;">White</td> <td style="text-align: center;">Red</td> <td style="text-align: center;">Repeat input timing (2-second limit)</td> </tr> </tbody> </table>	SWITCH 1 COLOR	SWITCH 2 COLOR	RINGING MODE	White	White	Code select	Red	White	No code	Red	Red	Repeat input timing (no limit)	White	Red	Repeat input timing (2-second limit)
SWITCH 1 COLOR	SWITCH 2 COLOR	RINGING MODE														
White	White	Code select														
Red	White	No code														
Red	Red	Repeat input timing (no limit)														
White	Red	Repeat input timing (2-second limit)														
S7, S8	These switches select a code for the code select ringing mode. Codes 1 through 15 are selected by switches 1 through 7 on S7 and by 8 through 15 on S8, respectively.															
AC, DC J2	White area of J2 is exposed when 20 Hz ringing is used in RD or PLAR applications. Black area of J2 is exposed when dc ringing is used in RD applications.															
PLAR/RD J3, J4, J8, J9	White area of J3, J4, J8, and J9 is exposed for RD applications. Black area of J3, J4, J8, and J9 is exposed for PLAR applications.															
F, J6	White area of J6 is exposed for 48-volt battery and black area is exposed for 72-volt battery.															
S, J2	White area of J2 is exposed for nonlooped dc signaling.															
TRMT, AT1	Transmit attenuator provides 0 to 16.5 dB of attenuation in steps of 0.1 dB.															
RCV, AT2	Receive attenuator provides 0 to 16.5 dB of attenuation in steps of 0.1 dB.															

**TABLE C**  
**4-WIRE RD/PLAR OPTIONS**

OPTION	FUNCTION															
M (1, 2)	<p>Two switches (1 and 2) of S6 (M) are set as follows for one of four ringing modes:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; border-bottom: 1px solid black;">SWITCH 1 COLOR</th> <th style="text-align: center; border-bottom: 1px solid black;">SWITCH 2 COLOR</th> <th style="text-align: center; border-bottom: 1px solid black;">RINGING MODE</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">White</td> <td style="text-align: center;">White</td> <td style="text-align: center;">Code select</td> </tr> <tr> <td style="text-align: center;">Red</td> <td style="text-align: center;">White</td> <td style="text-align: center;">No code</td> </tr> <tr> <td style="text-align: center;">Red</td> <td style="text-align: center;">Red</td> <td style="text-align: center;">Repeat input timing (no limit)</td> </tr> <tr> <td style="text-align: center;">White</td> <td style="text-align: center;">Red</td> <td style="text-align: center;">Repeat input timing (2-second limit)</td> </tr> </tbody> </table>	SWITCH 1 COLOR	SWITCH 2 COLOR	RINGING MODE	White	White	Code select	Red	White	No code	Red	Red	Repeat input timing (no limit)	White	Red	Repeat input timing (2-second limit)
SWITCH 1 COLOR	SWITCH 2 COLOR	RINGING MODE														
White	White	Code select														
Red	White	No code														
Red	Red	Repeat input timing (no limit)														
White	Red	Repeat input timing (2-second limit)														
S7, S8	These switches select a code for the code select ringing mode. Codes 1 through 15 are selected by switches 1 through 7 on S7 and by 8 through 15 on S8, respectively.															
AC, DC J2	White area of J2 is exposed when 20 Hz ringing is used in RD or PLAR applications. Black area of J2 is exposed when dc ringing is used in RD applications.															
PLAR/RD J3, J4, J8	White area of J3, J4, and J8 is exposed for RD applications. Black area of J3, J4, and J8 is exposed for PLAR applications.															
-7 dB, J5	White area of J5 is exposed for PLAR applications and black area is exposed for RD applications.															
S, J2	White area of J2 is exposed for nonlooped dc signaling.															
TRMT, AT1	Transmit attenuator provides 0 to 16.5 dB of attenuation in steps of 0.1 dB.															
RCV, AT2	Receive attenuator provides 0 to 16.5 dB of attenuation in steps of 0.1 dB.															
L/N, S2	Part of switch S2 is used to make an overall slope adjustment to the equalizer frequency response. L is selected for loaded cable and N is selected for nonloaded cable.															
SL, S2	Four binary weighted switches of S2 are used to adjust the slope of the equalizer frequency response in 15 steps for loaded and nonloaded cable.															
HT, S4	Four binary weighted switches of S4 are used to adjust the amplitude response of the equalizer (height of 3250 Hz bump) from 0 to 11 dB in 15 steps.															
BW, S3	Four binary weighted switches of S3 are used to adjust the bandwidth response of the equalizer (bandwidth of 3250 Hz bump) from approximately 200 Hz to 3.4 kHz in 15 steps.															
TRMT, S1 RCV, S5	These switches allow selection of 150-, 600-, or 1200-ohm impedance to the transmit and receive sides of the metallic facility. The open position disconnects the metallic facility.															

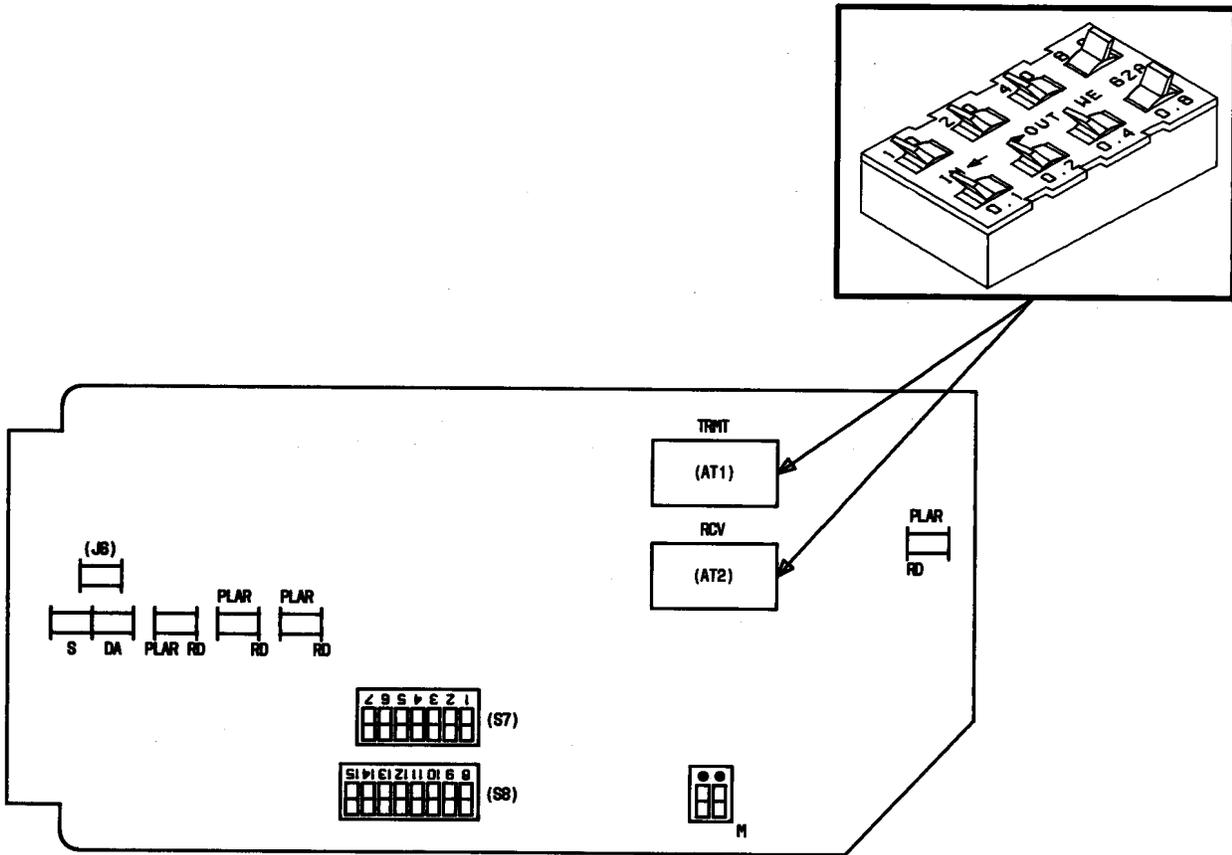


Fig. 1—2-Wire RD/PLAR Channel Unit

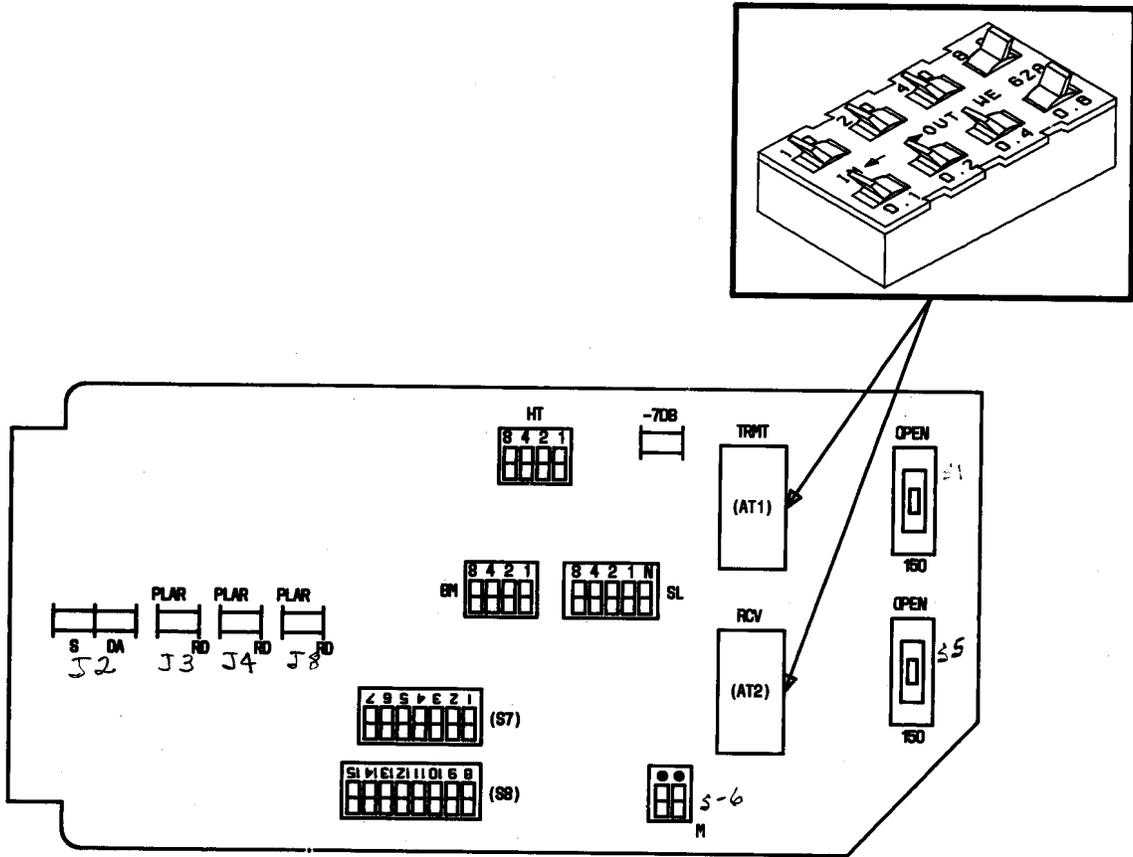


Fig. 2—4-Wire RD/PLAR Channel Unit

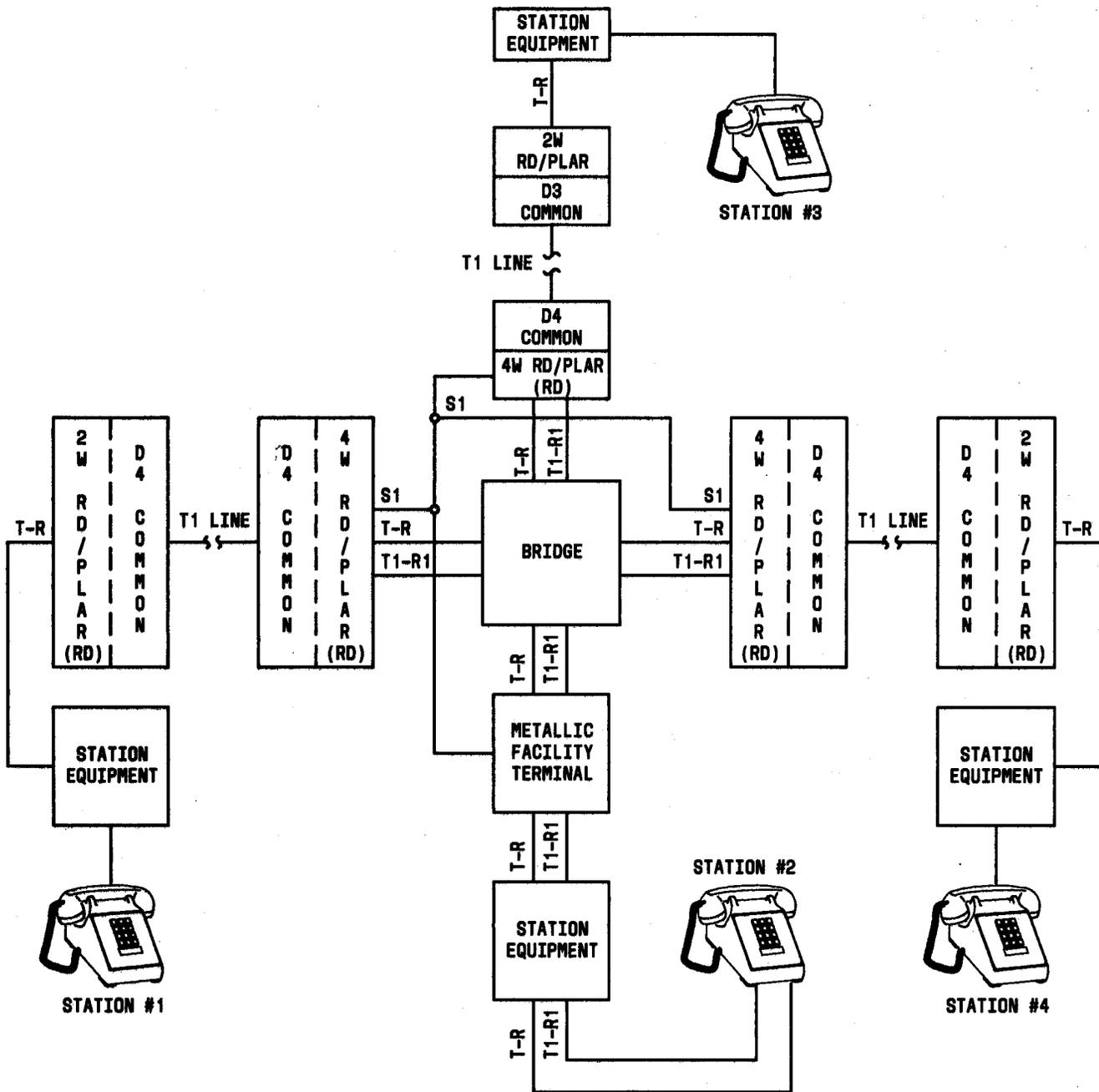
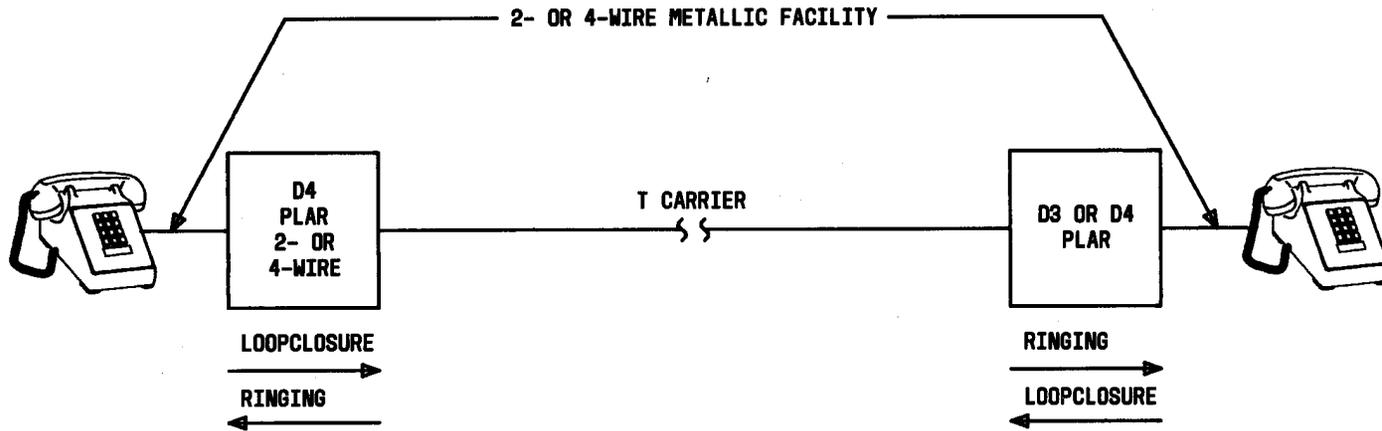
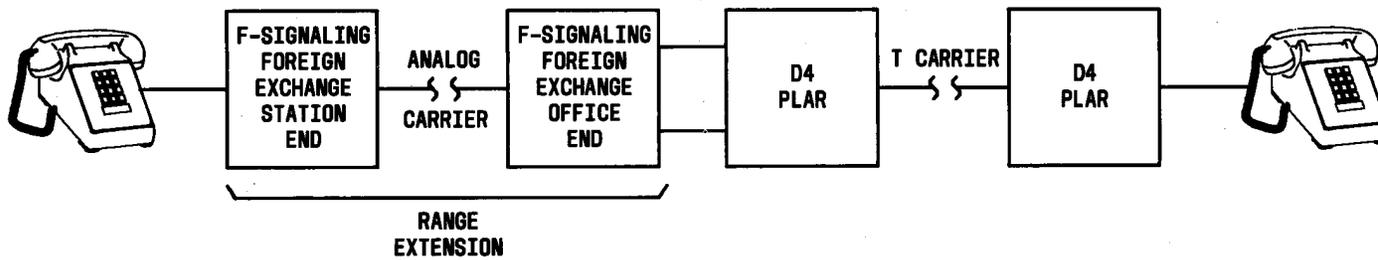


Fig. 3—Typical Multipoint Ringdown 4-Station Bridge Circuit



A. SINGLE T CARRIER LINK



B. ANALOG AND DIGITAL CARRIER LINKS IN TANDEM

Fig. 4—Typical 2-Point RD/PLAR Circuits