DIAL PULSE CHANNEL UNITS

DESCRIPTION

D4 CHANNEL BANK

DIGITAL TRANSMISSION SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This section provides a description of both 2-wire and 4-wire dial pulse D4 channel units. Table A identifies each unit described in the section and shows the J-code and SD/CD number. Fig. 1 is a typical example of a 2-wire channel unit and Fig. 2 shows the 4-wire loop-simplex channel unit. These message channel units provide interface between dial pulse or multifrequency pulse circuits and either originating or terminating equipment. The interface is provided between the trunk circuit, selector or rotary-out-trunk switches, and the D4 common circuits on the line side.

1.02 This section is reissued to add the 600 ohm dial pulse terminating (DPT) channel unit to Table A.

1.03 This section provides a functional description of the channel unit at a block diagram level. The transmission paths and signaling circuits that characterize the units are described in this section. Circuit elements that are common to all D4 channel units (active filters, pulse amplitude modulation gates, and channel unit logic functions) are only mentioned in this section and described in more detail in the general channel unit descriptive Section 365-170-101. Voice frequency level, circuit and signaling options, and attenuator settings are given on the circuit layout record card (CLRC). The procedures for making the settings and adjustments are covered in Section 365-170-000 (TOP).

2. CHANNEL UNITS DESCRIPTION

A. Applications

2.01 These dial pulse channel units are used in D4 applications to provide an interface between the common circuits on the line side and either a trunk or other specific circuits.

2.02 ***2-Wire Dial Pulse Units (DPO and DPT):*** The DPO and DPT interface between the respective originating and terminating trunk circuits on the office side and the D4 common circuits on the line side. Through that interface the channel units provide the following:

(1) Forward and reverse signaling and supervision

(2) A means to disconnect a call, make circuit busy, and release terminating equipment during a carrier failure

(3) Splitting access to the VF transmission path at the 4-wire, common-level points for testing purposes.

2.03 ***3-Wire Sleeve Dial Pulse Unit Originating (SDPO):*** The SDPO provides an inter-

face between a step-by-step selector or a rotary-out-trunk switch on the office side and D4 common equipment on the line side. This interface eliminates the need for an outgoing repeater on the office side. The channel unit also is used to provide the following:

(1) Forward and reverse signaling and supervision

(2) Splitting access to the VF transmission path at the 4-wire, common-level points for testing purposes

(3) A means of winking and grounding the sleeve lead to release the calling subscriber and to busy the circuit.

2.04 ***2-Wire Dial Pulse Multifrequency Originating (DPMO):*** The DPMO provides an interface between dial pulse or multifrequency pulse originating circuit on the office side and D4 common circuits on the line side. The most important feature is an option with multifrequency (MF) only which can be used to cure relay pumping problems when the terminal end is E&M. This unit is also used to provide the following:

(1) Forward and reverse signaling and supervision

(2) A means to properly terminate a call during a carrier failure

(3) Splitting access to the VF transmission path at the 4-wire, common level point for testing purposes.

2.05 ***4-Wire Loop-Simplex Originating (4LSXO):*** The 4LSXO is similar to the DPO except that it interfaces between the circuit and the office side of D4 common with additional options. Important features of the 4LSXO channel units are:

(1) Transmission circuits are 4-wire with more range of levels than 4 E&M

(2) It can be managed for signaling on simplex of transformer to 4-wire trunk circuit or on separate leads

(3) Signaling is identical with DPO except as described in (2).

It also has an option to accept either a dial pulsing (DP) or multifrequency (MF). The MF mode provides additional delay which overcomes some transient problems. Figure 3 illustrates an application of 4LSXO with TSPS trunks to 4 ESS via D4 and DT/DIF. It obviates a signal converter needed with 4 E&M.

B. Transmission Paths

2.06 The transmission of channel units DPO, DPT, SDPO, and DPMO is basically the same. The transmitting and receiving logic of each unit follows the identical steps to perform its functions. Figure 4 is a typical block diagram which is applicable to each of these four channel units. The 4LSXO is illustrated in Fig. 5.

2.07 Voice frequency signals enter the 2-wire dial pulse units from a 2-wire 900-ohm balanced trunk. The hybrid circuit converts the signals to an unbalanced 4-wire 600-ohm transmission with a loss of 4.0 dB between the 2- and 4-wire ports. After amplification the signal is attenuated by an adjustable attenuator to provide from 0 to 6.3 dB attenuation and to obtain -8.5 dB TLP. The TST jack on the faceplate provides access to the signal to verify desired −8.5 TLP transmitting and +4.0 dB TLP receiving. Then the signal is transmitted to the filter which suppresses all unwanted signals above and below the VF band. The filter output is sampled by a junction field effect transistor (JFET) gate and passed to the common circuit as a pulse amplitude modulation (PAM) signal. Conversely, the receiving filter accepts PAM samples from the common equipment. A JFET gate passes the PAM sample to the filter under the control of the channel unit logic circuits. The filter output is the reconstructed and attenuated VF waveform transmitted for application to the trunk circuits via the hybrid.

2.08 The 4LSXO transmission path enters via T1 transformer at an impedance of 600 ohms. The amplified signal is attenuated from 0 to 25 dB by selectable attenuators 1 and 2 to adjust the input signal between +8.0 and −17.5 dB to a −8.5 dB TLP. A test jack is provided on the faceplate to verify the signal level. The VF signal is then filtered and sampled to generate the PAM signal to be transmitted to the D4 common equipment. The 4LSXO receive circuit reconstructs the VF waveform from the gated PAM in the filter at +4.0 dB. The output of the filter can be accessed at a test jack and is passed on to attenuators 1 and 2 which provide attenuation adequate to produce a signal output level between +8.5

and −17.0 dB TLP. This signal is passed to the trunk via T2 transformer in the receive path.

C. Signaling And Supervision

2.09 The signaling and supervision for the dial pulse channel units are different for each unit. Table B lists the signaling states used for proper trunk supervision for the channel units. Two states in each direction, the open and closed loop and the normal and reverse battery signaling, are applied to the channel units.

2.10 Trunk processing functions for each of the dial pulse channel units are under control of the common circuits which normally supply −48 volts to the relay driver. A carrier failure removes the voltage and reapplies it as appropriate.

3. CIRCUIT OPTION

Signaling and Supervision

3.01 The circuit options for the dial pulse channel unit signaling are given in Table C.

Attenuation and Gain and Loss Parameters

3.02 The parameters of insertion gain and loss, attenuator range, and input-output levels are shown in Table D.

4. REFERENCES

4.01 The following is a list of sections associated with the dial pulse D4 channel units DPO, DPT, SDPO, DPMO, and 4LSXO.

SECTION	TITLE
179-100-311	D4 Channel Bank—Signaling Compatibility
365-010-105	D-Type Channel Bank—Channel Unit Compatibility
365-170-000	D4 Channel Bank—TOP
365-170-101	D4 Channel Bank—General Channel Unit Description

TABLE A
DIAL PULSE CHANNEL UNITS

J98726()	SD/CD	CHANNEL UNIT TYPE	FACEPLATE MARKINGS
BA	3C322-0()	2-Wire Dial Pulse Originating	DPO
BB	3C323-0()	2-Wire Dial Pulse Terminating	DPT
BH	3C330-0()	3-Wire Sleeve Dial Pulse Originating	SDPO
BM	3C333-0()	2-Wire Dial Pulse Multifrequency Originating	DPMO
BY	3C392-0()	4-Wire Loop Simplex Originating	4LSXO
CH	3C323-0()	2-Wire Dial Pulse Terminating	DPT-6

TABLE B
SIGNALING STATES FOR DIAL PULSE CHANNEL UNITS

DESCRIPTION OF SIGNALING STATES		CHANNEL UNITS				
		DPO	DPT	SDPO	DPMO	4LSXO
Open and closed loop	TRMT	√		√	√	√
	RCV		√			
Normal and reverse battery	TRMT		√			
	RCV	√		√	√	√

TABLE C
MESSAGE CHANNEL UNIT OPTIONS

CHANNEL UNIT MARKING	OPTION	FUNCTION
DPO (Orange Dot) J98726BA SD3C322-0__	SD	Forces off-hook (reverse battery) supervision 2 seconds after trunk processing is initiated to make channel appear busy during carrier failure.
	1G	Provides a ground on the 1 lead (make-busy lead) when trunk processing is initiated. After a 2.5 second delay, the ground disappears for 100 milliseconds and then reappears for the duration of the carrier failure. This option is normally selected for all electromechanical switching machines except No. 5 crossbar.
	S and 1G	Selecting both of these options provides proper conditioning for an outgoing trunk circuit of a step-by-step machine. The sleeve lead from the switch is connected to make-busy lead 1, while the sleeve connection from the trunk circuit is to lead 2. During normal system operation, the channel unit provides a closed circuit between leads 1 and 2, and the trunk circuit and switch interact in the usual way. When trunk processing begins, the channel unit applies a ground to the switch sleeve lead through lead 1 and disconnects lead 2 to isolate the trunk circuit. The 100-millisecond open on lead 1, which occurs after a 2-5-second delay, disconnects any customer who may have been connected to that trunk at the originating end.
	L	Used with No. 5 crossbar switching machine to provide for closure between make-busy leads 1 and 2 during trunk processing. The closure opens for 100 milliseconds after an initial 2.5-second delay, then remains closed until the circuit is cleared.
	NBOC 2,4,8, 16,32,64	Refer to Sections 365-170-101 and 365-170-000 (TOP).
DPT (Blue Dot) J98726BB SD3C323-0__	NBOC 2,4,8, 16,32,64	Refer to Sections 365-170-101 and 365-170-000 (TOP).
SDPO (Purple Dot) J98726BH SD3C330-0__	Z (Strap)	Provides this strap when the unit is used in a 35-E97 dial office. It provides –48 volts to the sleeve lead when the channel is idle. The strap is not provided on units as shipped.
	NBOC 2,4,8, 16,32,64	See paragraphs 4.04 through 4.06.

TABLE C (Contd)
MESSAGE CHANNEL UNIT OPTIONS

CHANNEL UNIT MARKING	OPTION	FUNCTION
DPMO (Red Dot) J98726BM SD3C333-0__	SD	Forces off-hook (reverse battery) supervision 2 seconds after trunk processing is initiated to make channel appear busy during carrier failure.
	1G	Provides a ground on the 1 lead (make-busy lead) when trunk processing is initiated. (After a 2.5 second delay, the ground disappears for 100 milliseconds and then reappears for the duration of the carrier failure.) This option is normally selected for all electro-mechanical switching machines except No. 5 crossbar.
	MF/DP	Selected to correspond to the type of signaling employed in the trunk (multifrequency or dial pulsing). The DP position provides low dial pulse distortion, while the MF position provides protection against relay pumping, especially when the terminating end is PAM.
	NBOC 2,4,8, 16,32,64	Refer to Sections 365-170-101 and 365-170-000 (TOP).
4LSXO (Gray) J98726BY SD3C392-0_	SD	When selected, trunk processing (during a carrier failure alarm) will provide an on-hook, releasing the attached customer, followed 2.5 seconds later by an off-hook, making the channel appear busy.
	SX	Selected as a pair to provide loop signaling on a simplex basis over the four transmission wires.
	LP	Selected as a pair to provide loop signaling over a separate pair of leads.
	MF/DP	Same as DPMO.

TABLE D
CHANNEL UNIT ATTENUATION, GAIN, AND LOSS PARAMETERS

CHANNEL UNIT	TRANSMIT PATH (T & R TO TST JACK −8.5 dB TLP POINT)				RECEIVE PATH [TST JACK +4.0 dB TLP POINT TO T1 & R1 OR T & R (2W)]			
	G_T INSERTION GAIN (+) OR LOSS (−) dB	ATTENUATOR RANGE (dB)	INPUT LEVEL AT T & R (dB) (SEE NOTE)		G_R INSERTION GAIN (+) OR LOSS (−) dB	ATTENUATOR RANGE (dB)	OUTPUT LEVEL AT T1 & R1 (dB) (SEE NOTE)	
			MIN	MAX			MIN	MAX
MESSAGE								
DPO	−4.0	0-6.3	−4.5	+1.8	−4.0	0-6.3	−6.3	0
DPT	−4.0	0-6.3	−4.5	+1.8	−4.0	0-6.3	−6.3	0
SDPO	−4.0	0-6.3	−4.5	+1.8	−4.0	0-6.3	−6.3	0
DPMO	−4.0	0-6.3	−4.5	+1.8	−4.0	0-6.3	−6.3	0
4LSXO	+9.0	0-25.5	−17.5	+8.0	+4.5	0-25.5	−17.0	+8.5

Note: Special service channel unit input and output levels are recommended values. In some cases, attenuator ranges cover a wider distribution of levels. It is recommended that circuit levels be constrained within the input and output levels specified in the table.

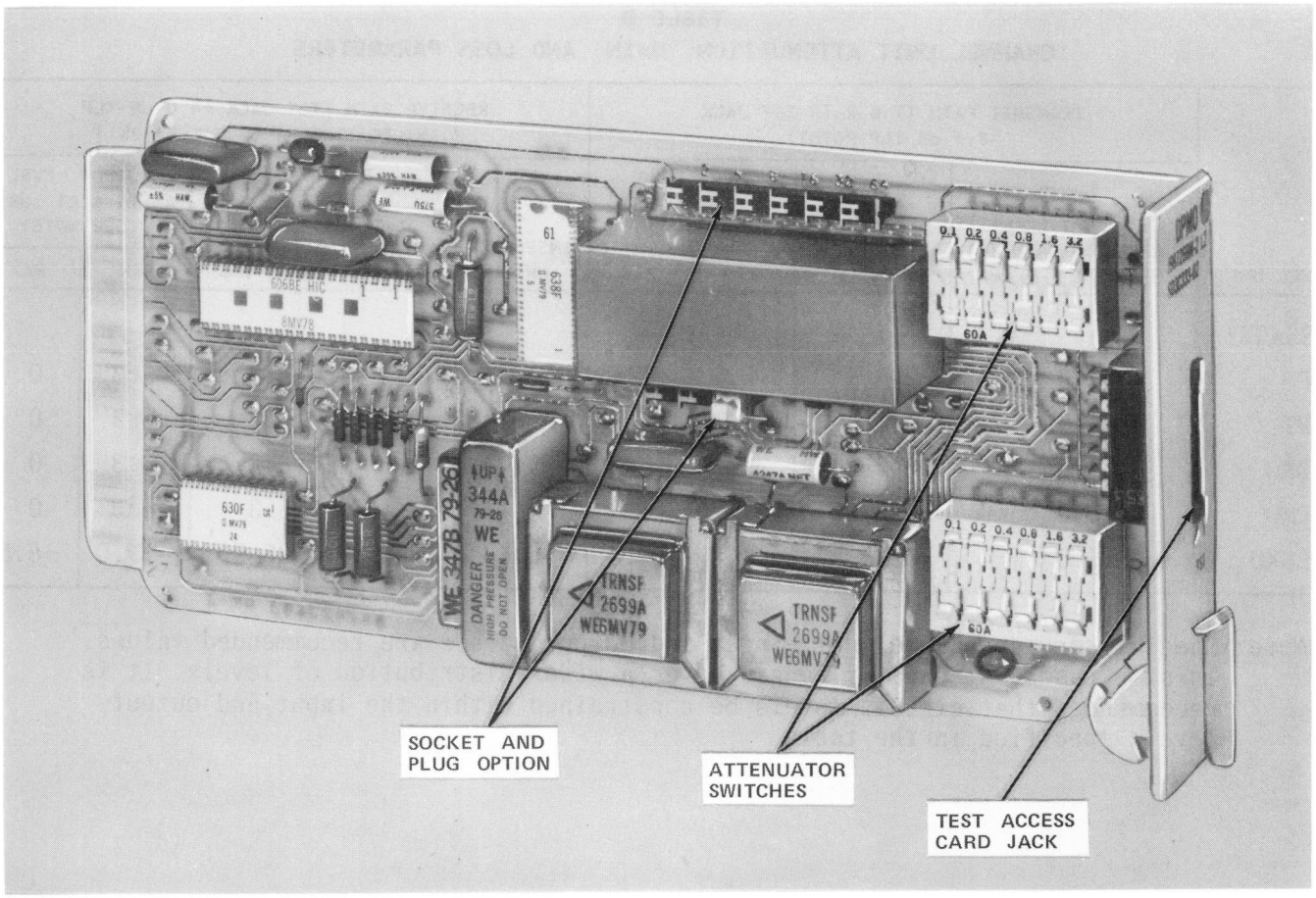

Fig. 1—Typical 2-Wire Dial Pulse D4 Channel Unit

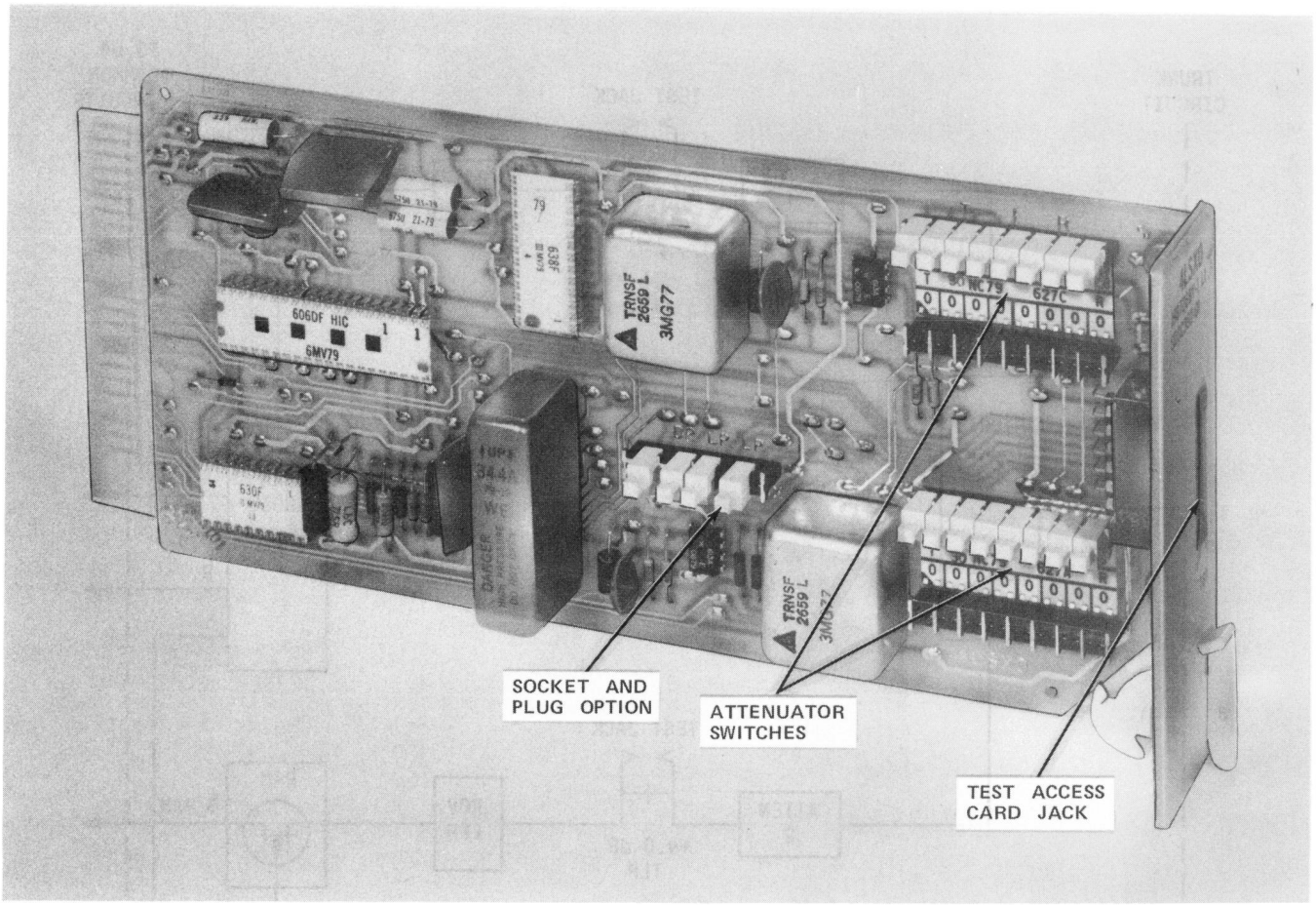

Fig. 2—Typical 4-Wire Dial Pulse D4 Channel Unit

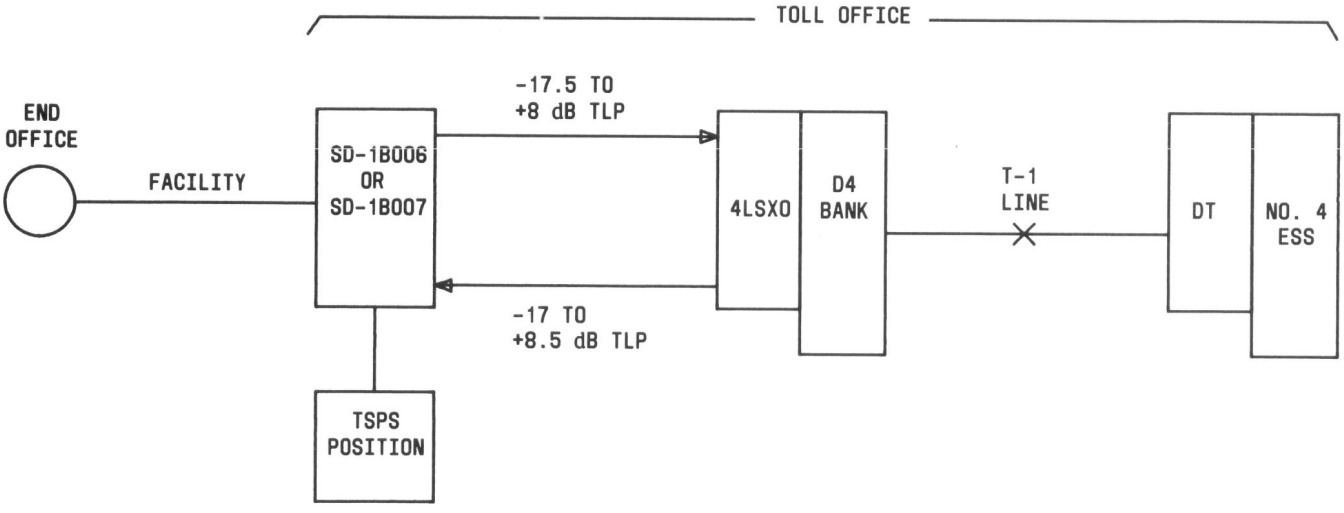

Fig. 3—4-Wire Loop Simplex Originate

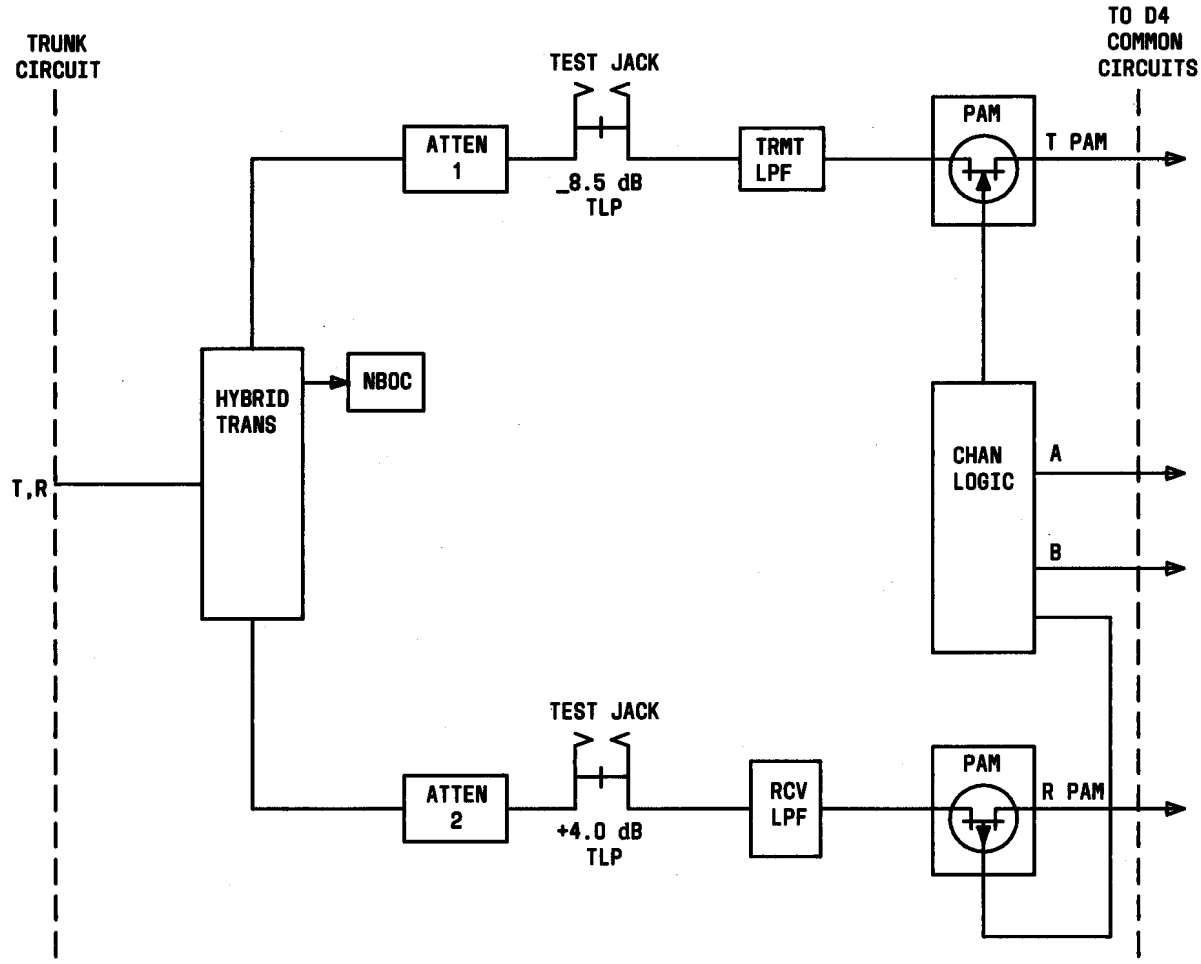

Fig. 4—Transmission Paths Dial Pulse Channel Units

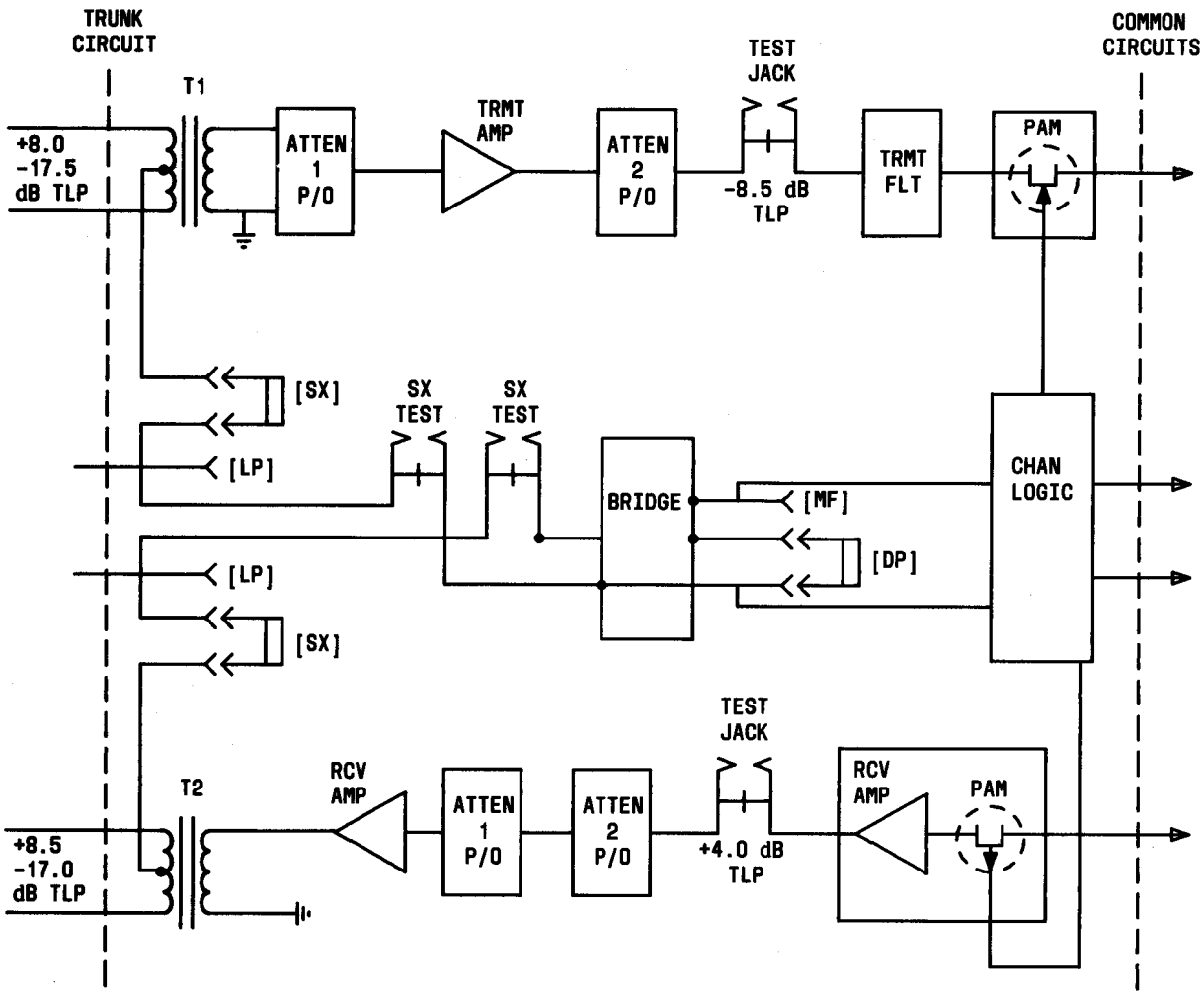

Fig. 5—Transmission Paths 4LSXO Channel Unit