DIGITAL TRANSMISSION SYSTEMS
D3 CHANNEL BANK
CHANNEL OPTION AND PAD SELECTION

CONTENTS PAGE

1. GENERAL

1.01 This section contains instructions for the application of screw-down options and for the adjustment of attenuators on the D3 channel units.

1.02 This section is reissued to include information on D3 special service channel units and on channel units which are compatible with No. 4 ESS. Since this issue is a general revision, arrows have been omitted. The option information is now presented tabularly instead of descriptively. Issue 2 of Section 365-150-101 will contain a description of options. This reissue does not affect the Equipment Test List.

1.03 Examples of special services are foreign exchange trunks, PBX lines and trunks, tandem channels, and transmission only circuits. The special service units, which with the exception of the foreign exchange units are new, provide these services.

1.04 The screw-down options are located inside the channel units (see Fig. 1) and on the faceplates of some special service units. An option is selected by turning the appropriate screw(s) in a clockwise direction to contact firmly two terminals with the underside of the screwhead. The screws for options not selected should not be removed but turned counterclockwise (up) sufficiently (about three complete turns) to avoid making contact with either terminal. When selecting some options, the channel unit must be out of the D3 bank or inserted in a channel unit extender (ED-3C424).

1.05 Office loss compensation and trunk loss adjustment are accomplished with variable attenuators in the channel units (see Fig. 1). High and low frequency equalization controls are also provided on certain 4-wire special service units. These adjustments are made according to the office records or prescription settings based on the type and length of loop cabling for special units. After the channel unit adjustments and D3 channel bank tests have been performed, the overall expected measured loss (EML) on the office records should be met. As a precaution, drop tests may be required before the overall EML, but many times drop tests are only used for troubleshooting if the EML is not met.

1.06 Nameplates have a surface suitable for marking with pencil or ballpoint pen. Pencil notations may be erased and updated. Space has been provided for entering attenuator and screw-down option settings.

2. SCREW-DOWN OPTIONS

A. Trunk and Signaling Options

2.01 Table A is a listing of the D3 channel units and the channel unit options with their respective applications.

2.02 Presently, there are three E&M trunk circuit arrangements, designated Type I, II, or III. To accommodate these, signaling between the trunk circuit and the D3 channel unit is over two or four

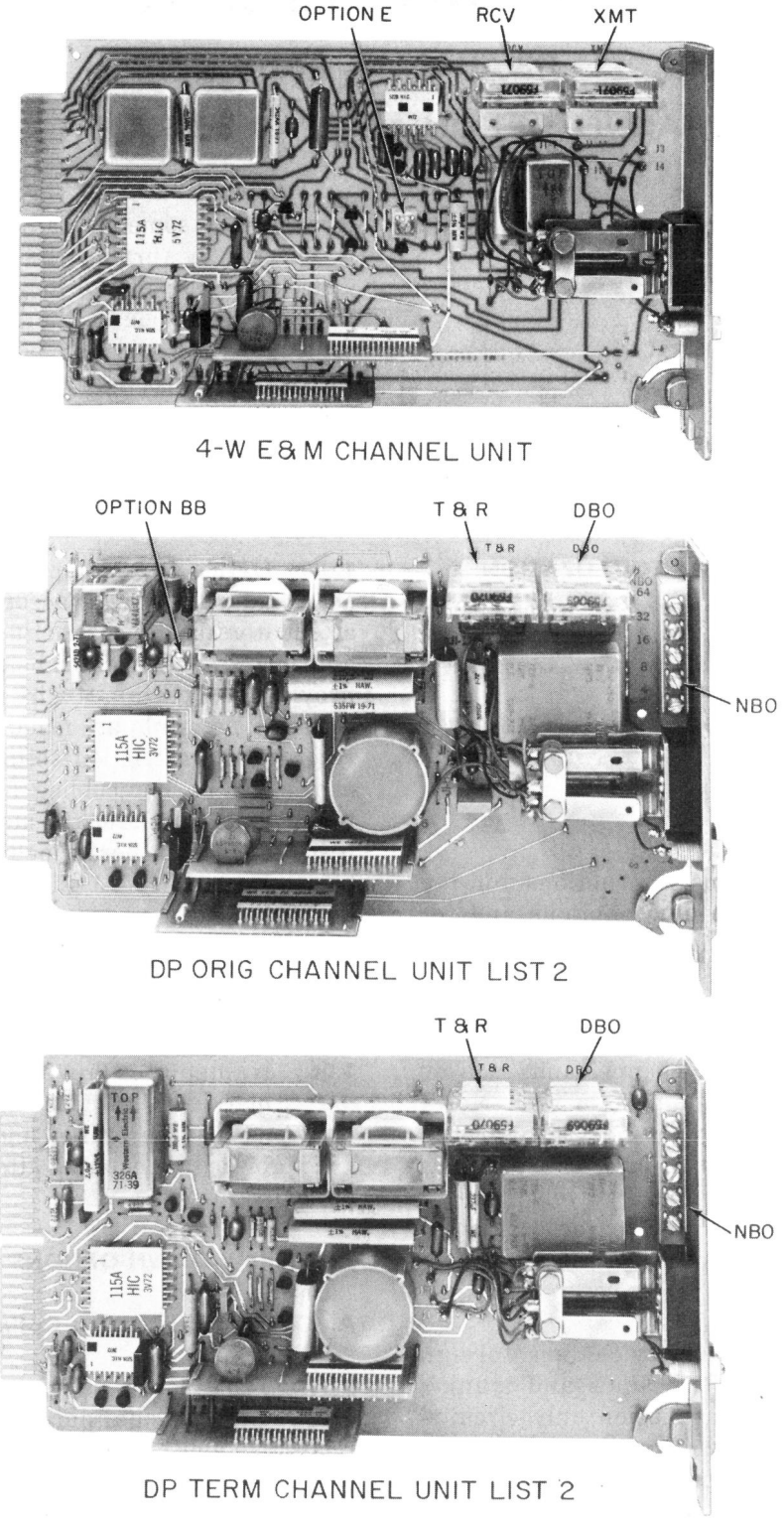


Fig. 1—Screw-Down Option and Attenuator Locations

TABLE A

CHANNEL UNIT	SD OR CD	OPTION	APPLICATION
J98718BA Dial Pulse Originating (DP ORIG)	3C122-01	BB	Provides busy indication (after time delay) during a carrier failure
	-02	CN	Tighten for compromise network; loosen if external precision network used.
J98718BB Dial Pulse Terminating (DP TERM)	3C123-01	S	Used when by-link incoming trunk circuits are involved.
	-02	DD	Used when off-hook signaling must be blocked during idle periods.
		WD	Used when DD is not used.
		CN	Tighten for compromise network; loosen if external precision network used.
J98718BC 4-Wire E&M	3C124-01, -02	E	Used for Type I and III E-lead signaling; the option makes ground available for connection to E lead. Option up for Type II.
J98718BD Foreign Exchange Station End (FX SUB)	3C125-01	BB	Used for grounded tip lead (busy) during carrier failure.
		X Strap	Prevents prematurely tripping the ringing, but restricts external resistance to 1000 ohms.
		V Strap	Removes 1000 ohm restriction.
		600 or 900	One used to provide optimum transhybrid loss.
	-02	D1 or D2	D1 used if far bank is D1D and D2 used if far bank is D2.
J98718BE Foreign Exchange Office End (FX OFF)	3C126-01	LX1 and LX2	Both used to increase loop current and maintain balance.
	-02	D1 or D2	D1 used if far bank is D1D and D2 used if far bank is D2.
J98718BJ 2-Wire E&M	3C127-01	E	Used for Type I and III E-lead signaling; the option allows ground to be applied to the E lead. Option up for Type II.

TABLE A (Cont)

CHANNEL UNIT	SD OR CD	OPTION	APPLICATION
J98718BJ 2-Wire (Cont) E&M	3C127-01	CN	Tighten for compromise network; loosen if external precision network used.
		X	Used when 1-μf capacitor is needed across A and B leads or for X-BAR which has no A and B leads.
		Y	Used when trunk circuits contain 4-μf capacitor for the A and B leads.
J98718BF Revertive Pulse Originating (RP ORIG)	3C128-01		
J98718BG Revertive Pulse Terminating (RP TERM)	3C129-01	XB	Used for proper operation when unit is connected to incoming registers with U-type GR relays. Do not use SB in panel offices.
J98718BH Sleeve Dial Pulse Originating (SD ORIG)	3C130-01	W Strap	Required in a 35 E97 dial office.
J98718BK Special Access Station End (Mfr. Disc.)	3C131-01		
J98718BL Special Access Office End (Mfr. Disc.)	3C132-01		
J98718SB 4-Wire FX SUB	3C217-01	BB	Grounds tip lead (busy indication) during a carrier failure. This occurs after time delay.
		RX	Increases ringing current on loops with over 600 ohms.
J98718SD 2-Wire 900-ohm Duplex (DX)	3C219-01	BB	Provides busy indication (after time delay) during carrier failure.
J98718SE 4-Wire 600-ohm DX	3C220-01	BB	Provides busy indication (after time delay) during carrier failure.
J98718SF 4-Wire, 600-ohm Tandem	3C221-01	S or T	Provides correct logic to represent signaling conditions: S for "0" on T1 line or T for "1" on T1 line when there is an open on EX lead.

TABLE A (Cont)

CHANNEL UNIT	SD OR CD	OPTION	APPLICATION
		W and V	These enable secondary signaling circuit.
		Y or Z	Provides required signaling receiver operation: Y grounds E lead with "0" on T1 line and Z grounds E lead with "1" on T1 line.
		R	Provides primary signaling information on both primary and secondary signaling circuits.
		E	Used with Type I and III E-lead signaling. Option up for Type II.
J98718SH 4-Wire 600-ohm T0	3C223-01		
J98718SJ 2-Wire, 900-ohm T0	3C224-01		
J98718SK Pulse Link Repeater (PLR)	3C225-01	BB	Provides busy indication (after time delay) during carrier failure.
		Y and Z	Both used with Type I and III E-lead signaling. Options up for Type II.
J98718SQ 4-Wire, 600-ohm T0 with Equalization	3C230-01		

leads. For Type I, the original E&M arrangement, signaling is over the E&M leads. For Type II, signaling from the trunk circuit is over the MA and MB leads and signaling from the channel unit is over the EA and EB leads. Type II is called a fully looped arrangement because the channel unit supplies battery (MB lead) to the trunk circuit which supplies ground (EB lead) to the channel unit. Type III also uses four leads (E, M, SB, and SG) but in a partially looped arrangement. Signaling is over the E&M leads but the channel unit supplies battery and ground (SB and SG leads) to the trunk circuit. Type I is primarily used with electromechanical switches and Types II and III with electronic switching systems.

B. Network Build-Out Capacitance Options (NBOC)

2.03 These options, provided on all 2-wire channel units, are used to match the capacitance of the office cabling, thereby reducing echo. All of the channel units associated with any one office should have the same NBOC value as the office NBOC value. The NBOC value is selected as part of through and/or terminal balance testing and may be obtained from the office balance record.

Note: When NBOC options are selected incorrectly, trouble may be introduced into the circuit.

2.04 The method of determining the average office wiring capacitance is described in sections of the 660 division, which are concerned with through and terminal balance.

2.05 Each NBOC option screw (Fig. 2) is associated with a capacitor whose value is represented by a numeral located near the screw. For example, if option 4 is selected, a .004-μF capacitor is inserted in parallel with the compromise network R6 and C9. If additional options are selected, capacitors with values corresponding to the numerals selected are also inserted in the circuit in parallel. The NBOC options on various units are as follows:

NBOC OPTION	CAPACITOR VALUE
2	0.002μF
4	0.004μF
8	0.008μF
16	0.016μF
32	0.032μF
64	0.064μF

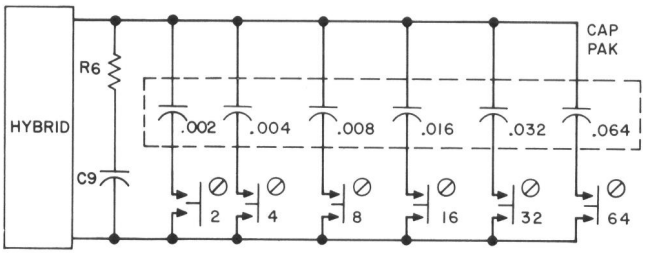


Fig. 2—Network Build-Out Capacitance (NBOC)

3. CHANNEL UNIT LOSS AND EQUALIZATION

3.01 The variable attenuators and related controls are used to produce the required loss and equalization in the channel units. In the transmit path the attenuators are set to obtain the −7.5 TLP at the XMT jack, and in the receive path the attenuators are set to produce the required TLP at the office switch or at the PBX. High and low frequency controls are provided on certain special D3 channel units to maintain a nearly flat input to the channel.

A. Regular Channel Units

DP ORIG, DP TERM, RP ORIG, RP TERM, and 2W E&M Units

3.02 ***The DBO slide attenuator*** (Fig. 3) provides from 0 to 1.5 dB of loss in 0.1-dB steps in both the transmit and receive paths simultaneously. Loss is introduced by exposing digits to the right of the slide switches so that their sum equals the total loss required. Loss is removed when the black mark to the left side of the slide switch is exposed. The DBO attenuator is adjusted to build out the office loss to 1.5 dB; that is, the loss of the office cabling plus that of the DBO attenuator equals 1.5 db. See Fig. 4 for the transmission diagram.

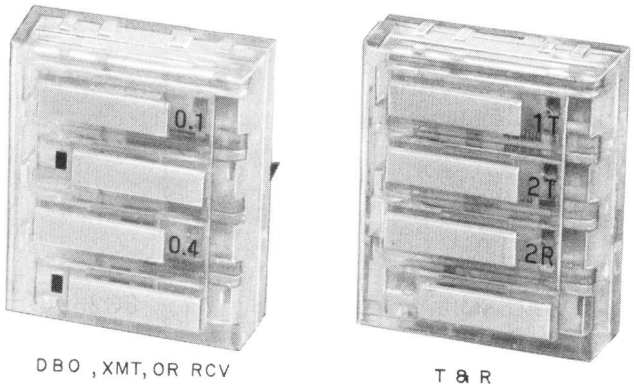


Fig. 3—Slide Attenuators

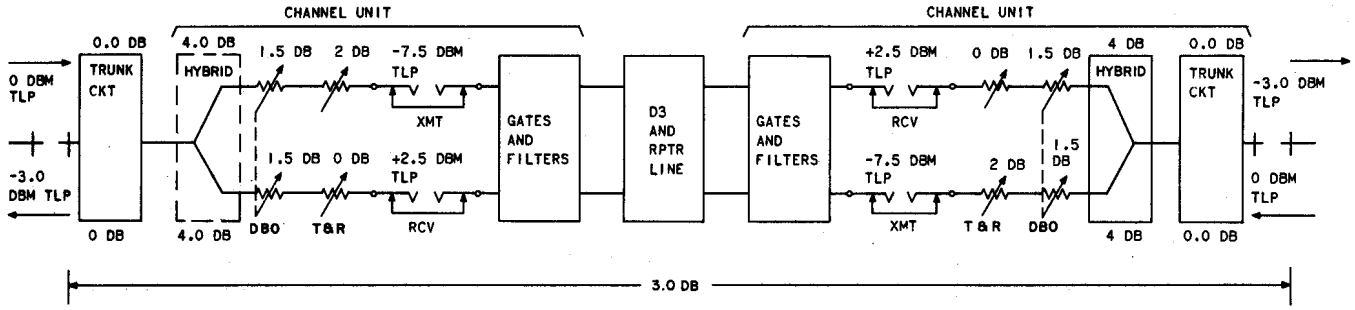
3.03 ***The T&R slide attenuator*** has four sections (Fig. 3), three or four of which are used, depending on the equipment code. The 50B attenuator provides 0 to 3 dB of loss, adjustable in 1-dB steps, in the transmit path and only 0 or 2 dB in the receive path. Only the section with the 2R designation introduces loss in the receive path; the other section is not fuctional. The 50D provides 0 to 3dB of loss in the receive path as well as in the transmit path. This 3-dB loss capability in the receive path is required in channel units at a TP0 office connected to a TP3 office at the far end. These TP numbers are central office designations; TP0 for an end office, TP2 for an

analog toll office and TP3 for a digital toll office (No. 4 ESS). The following table gives the prescription settings for dial pulse, revertive pulse and 2-wire E&M units. For example, the T&R setting in a TP0 office (near end) connected to another TP0 office (far end) is 2T and no loss in the receive path. This setting is shown at both ends in Fig. 4 which represents a 3-dB, non-toll, direct trunk.

FAR OFFICE	NEAR OFFICE	
	TP0	TP2
TP0	2T	—
TP2	2T,2R	2R
TP3	2T,2R,1R	1R

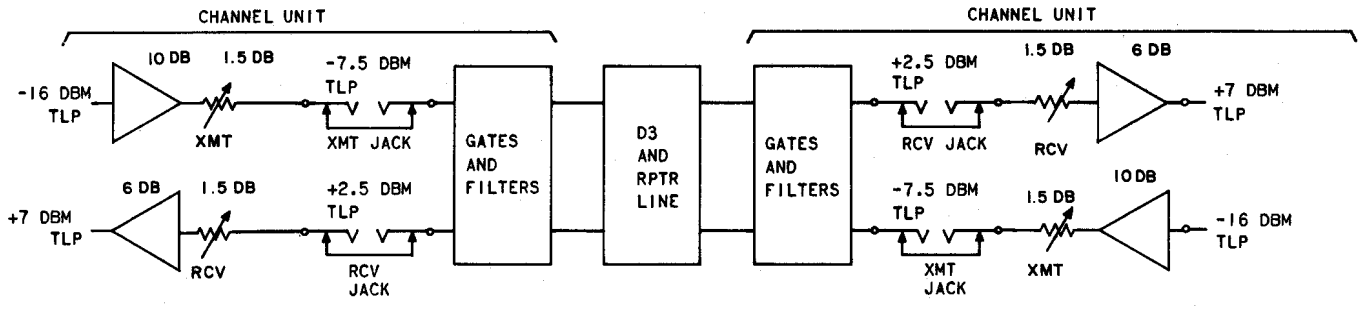
4-Wire E&M Unit

3.04 ***The XMT and RCV attenuators*** provide 0 to 1.5 dB of loss in 0.1-dB steps in the transmit and receive paths, respectively. These attenuators are used to build out the office loss to a constant of 1.5 dB in both paths of transmission. The XMT and RCV attenuators are provided to allow independent buildout to handle the possible office loss difference between the transmit office cable pair and the receive office cable pair. With this arrangement correct levels (−7.5 TLP and +2.5 TLP) can be maintained at the channel unit test jacks, and standard levels (−16 TLP and +7 TLP) can be maintained over the 4-wire circuit. See Fig. 5.



NOTES:
1. OFFICE BUILDOUT SHOWN = 1.5 DB WHICH IS THE CASE WHEN OFFICE CABLING LOSS = 0 DB.
2. BOTH OFFICES ARE TPO.

Fig. 4—2W Level and Trunk Setting Adjustment



NOTE:
OFFICE CABLE LOSS = 0 DB WHICH REQUIRES BOTH XMT AND RCV ATTENUATORS TO BE SET AT 1.5 DB.

Fig. 5—4W Level and Office Loss Adjustment

B. Special Channel Units

Equalization Controls—4-Wire FXS, 4-Wire DX, and 4-Wire TO With Equalization (ETO)

3.05 For special services, loaded cables must be used for customer loops or PBX tie trunks greater than 12 kilofeet in length. In this case, the loop switch on the circuit board must be set to the 1200 position and the equalization controls (calibrated in thousands of ohms) must be set per Table B, C, D, or E, as applicable. These tables are for 19-, 22-, 24-, and 26-gauge, H88 (H = 6000 ft, 88 = 88 mH) loaded cables. When the ***HF screw*** is down, the high frequency compensating network and ***RHF control*** are included in the transmit path. When the ***LF screw is up, the low frequency compensating network (capacitor options C.25, C.5, C1 and C2) and RLF control*** are in the transmit path. The loop switch must be set to the 150 position for equalization on nonloaded cables even though it produces an impedance mismatch. The 600 position is provided for lab tests only.

2- and 4-Wire DX Units

3.06 The calibrated ***RLP control*** and the two capacitance ***options A and B*** on the 2- and 4-wire DX unit are used to balance the customer loop for proper signaling. Option A (1 μF) is for cable lengths between 30 and 90 kilofeet, and options A and B (2 μF) are for 90 kilofeet lengths or greater.

Loss Controls—2-Wire FX SUB and FX OFF Units

3.07 As with regular units, these contain ***DBO and T&R slide attenuators*** (Fig. 3). The DBO attenuator (0 to 1.5 dB, 0.1-dB steps) is used to build out the office loss to 1.5 dB and the T&R (0 to 3 dB, transmit and 0 or 2 dB, receive) is used to set the trunk loss. These units are used in TP0 offices which normally require a T&R setting of 2T and no loss in the receive path. However, to compensate for a long VF extension connected to the FXS unit, all or part of the 2 dB normally in the transmit path can be removed. To provide equal losses in both directions, the resulting T&R setting must be duplicated at the FXO end. The DBO must always be set at the FXO end to provide adequate drop build-out to handle a milliwatt test line connection. Refer to Fig. 6 for a representative channel arrangement and to the SD/CD for further information including the D3 to D1D application.

4-Wire DX, FXS, and ETO Units

3.08 These two units contain a 0 to 15 dB slide attenuator in both the transmit and receive path. The 0 to 15 dB attenuator allows coarse adjustment in 1-dB steps. The 4-wire DX and ETO units also contain a 0- to 1.5-dB slide attenuator in both paths to allow final adjustment in 0.1-dB steps. The 4-wire FXS unit has a 0 to 2 dB calibrated potentiometer in both paths for final adjustments. See Fig. 6 for a representative channel arrangement.

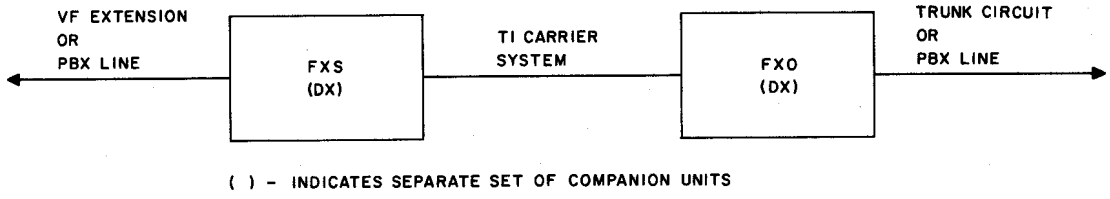


Fig. 6—Special Service Trunk

TABLE B

PRESCRIPTION SETTINGS FOR 19H88 CABLE

CABLE LENGTH (KFT) CABLE LENGTH (MI)		12 2.3	42 8.0	60 11.4	78 14.8	96 18.2	108 20.5	114 21.6	152 28.4
HI-FREQ COMPENSATION	HF	O	X	X	X	X	X	X	
	RHF	O	600	400	300	250	200	100	
LO-FREQ COMPENSATION	C.25	X	O	O	O	O	O	O	
	C.5	O	O	O	O	O	O	O	
	C1	X	X	X	X	X	X	X	
	C2	X	X	X	X	X	X	X	
	LF	O	O	O	O	O	O	O	
	RLF	3000	3000	3000	3000	3000	3000	3000	
DX BALANCE	A	O	O	O	X	X	X	X	
	B	O	O	O	O	X	X	X	
	RLP	200	450	600	700	900	975	1100	
EQUALIZER LOSS (DB) AT 1 KHZ		0	1.7	2.0	2.3	2.5	3.0	3.0	

Notes:

Maximum allowed cable length = 152 kft.

O indicates screw up.

X indicates screw down.

When loop falls within the given length limits or equals high limit, use settings below that range; ie, for 78 KF use setting for range 60—78 kft.

TABLE C

PRESCRIPTION SETTINGS FOR 22H88 CABLE

CABLE LENGTH (KFT) CABLE LENGTH (MI)		12 2.3	18 3.4	24 4.5	60 11.4	90 17.0	108 20.5
HI-FREQ COMPENSATION	HF	X	X	X	X	X	
	RHF	1900	900	800	500	300	
LO-FREQ COMPENSATION	C.25	O	O	O	O	O	
	C.5	O	O	O	O	O	
	C1	O	O	O	O	X	
	C2	O	O	X	O	O	
	LF	X	X	O	O	O	
	RLF	0	0	2000	1500	1000	
DX BALANCE	A	O	O	O	X	X	
	B	O	O	O	O	O	
	RLP	200	350	700	1250	1600	
EQUALIZER LOSS (DB) AT 1 KHZ		1.0	1.5	1.5	1.8	3.0	

Notes:

Maximum allowed cable length - 90 kft.

O indicates screw up.

X indicates screw down.

When loop falls within the given length limits or equals high limit, use settings below that range; ie, for 60 KF use setting for range 24—60 kft.

TABLE D

PRESCRIPTION SETTINGS FOR 24H88 CABLE

CABLE LENGTH (KFT) CABLE LENGTH (MI)		12 2.3	18 3.4	30 5.7	42 8.0	60 11.4	72 13.6
HI-FREQ COMPENSATION	HF RHF	X 1300	X 1300	X 750	X 500	X 400	
LO-FREQ COMPENSATION	C.25 C.5 C1 C2 LF RLF	O O X O O 600	O O X O O 1500	X X O O O 700	O X O O O 1400	X O O O O 3000	
DX BALANCE	A B RLP	O O 200	O O 650	O O 950	O O 1350	X O 1750	
EQUALIZER LOSS (DB) AT 1 KHZ		1.2	1.2	1.6	1.8	2.0	

Notes:

Maximum allowed cable length = 60 kft.

O indicates screw up.

X indicates screw down.

When loop falls within the given length limits or equals high limit, use settings below that range; ie, for 42 KF use setting for range 30—42 kft.

TABLE E

PRESCRIPTION SETTINGS FOR 26H88 CABLE

CABLE LENGTH (KFT) CABLE LENGTH (MI)		12 2.3	18 3.4	24 4.5	30 5.7	36 6.8	43 8.0
HI-FREQ COMPENSATION	HF	O	X	X	X	X	X
	RHF		1800	1100	1400	1500	750
LO-FREQ COMPENSATION	C.25	O	X	X	X	O	O
	C.5	O	O	O	O	O	O
	C1	O	O	O	O	O	O
	C2	O	O	O	O	O	O
	LF	O	O	O	O	O	O
	RLF	O	400	800	1600	2600	3000
DX BALANCE	A	O	O	O	O	O	O
	B	O	O	O	O	O	O
	RLP	250	600	900	1100	1400	1600
EQUALIZER LOSS (DB) AT 1 KHZ		0	1.0	1.3	1.1	1.1	1.6

Notes:

Maximum allowed cable length = 43 kft.

O indicates screw up.

X indicates screw down.

When loop falls within the given length limit or equals high limit, use settings below that range; ie, for 30 KF use setting for range 24—30 kft.

2-Wire DX Unit

3.09 As with regular units, this DX unit contains a ***DBO and T&R slide attenuator (Fig. 3).*** The DBO attenuator (0 to 1.5 dB, 0.1-dB steps) is used to build out the office loss to 1.5 dB and the T&R (0 to 3 dB, 1-dB steps) is used to set the trunk loss. These units are used in TP0 offices which require a T&R setting of 2T and no loss in the receive path.

2- and 4-Wire TO Units

3.10 Both the 2- and 4-wire transmission only units have a 0 to 15-dB slide attenuator (1-dB steps) and a 0- to 1.5-dB slide attenuator (0.1-dB steps) in the transmit and receive paths.

Tandem and PLR Units

3.11 The tandem unit has only one loss control which is ***designated DBO*** and is located in the transmit path. The PLR unit has three loss controls. Two are the ***XMT and RCV controls*** which are 0- to 1.5-dB (0.1-dB steps) slide attenuators. The other is a 0- to 15-dB (1-dB steps) slide attenuator connected to the XMT attenuator in the transmit path. See Fig. 7 for a representative channel arrangement.

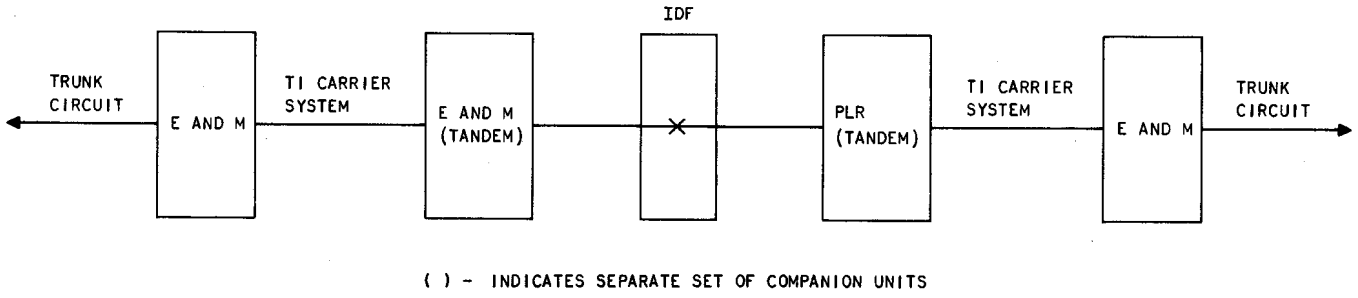


Fig. 7—Channel Interconnections