BPT61 4-4 WIRE DATA INTERFACE UNIT
DESCRIPTION AND INSTALLATION
"OMNIPORT* " NETWORK CHANNEL TERMINATING EQUIPMENT

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1. GENERAL

1.01 This practice provides description, application, and installation information for the OMNIPORT NCTE (Network Channel Terminating Equipment) BPT61 4-4 Wire DIU (data interface unit). A general description of OMNIPORT NCTE is given in AT&T Practice 332-620-100.

1.02 When this practice is reissued, the reason(s) for reissue will be listed in this paragraph.

1.03 The BPT61 DIU is part of the OMNIPORT NCTE family of customer premises equipment (both mountings and circuit packs) for voice-frequency special services, maintenance, and analog data services.

Printed in U.S.A.

2. UNIT DESCRIPTION

2.01 The BPT61 is a 4-4 wire terminal repeater with maintenance loopback for use on private line analog data circuits. It provides −20 to +26.5 dB of gain in 0.1-dB steps in both directions of transmission. This unit also provides 0 to 7 dB of 2804-Hz post-equalization in 1-dB steps in the receive (from the network) direction.

2.02 This unit can be mounted in any OMNIPORT NCTE mounting, or 400-type equivalent, that supplies −48 or ±12 volts dc power to the unit.

A. Unit Specifications

2.03 The BPT61 unit specifications are summarized in Table A. Figure 1 is a block diagram of the unit and Fig. 2 shows the unit controls and faceplate. Table B is a listing of the unit leads and their functions.

B. Unit Impedance

2.04 This unit provides a 600-ohm impedance to the customer equipment and a switch selectable 150-, 600-, or 1200-ohm impedance to the network facility. The 600- and 1200-ohm impedances are used to match nonloaded and loaded cable, respectively. The 150-ohm impedance is used to provide mismatch equalization on nonloaded cable.

C. Maintenance Feature

2.05 The maintenance feature is remotely activated by applying a 2713-Hz tone to the unit for at least 2 seconds. When the tone is removed, the unit disconnects the customer equipment from the circuit and provides a loopback connection to the network facility. A switch selectable 8- or 16-dB gain is inserted in the loopback path to provide standard signal levels to the transmit (to the network) path. A BUSY indicator on the unit faceplate will light while the maintenance feature is activated. The maintenance feature can be remotely deactivated by applying a 2713-Hz tone to the unit for at least 1 second or by allowing the feature to automatically time out after 20 minutes.

2.06 The maintenance feature can be locally activated by connecting the MLB (manual loopback) lead (pin 39) to the MLBG (manual loopback return) lead (pin 37). The unit will remain in the loopback mode as long as the MLB and MLBG leads are connected together.

2.07 A contact opening is provided between the SI and SIR leads (formerly designated TEK5 and TEK6, respectively) when the maintenance feature is activated as a "maintenance busy" indication to the customer equipment. The SIR lead has two output appearances, one on pin 19 and another on pin 21.

D. Sealing Current

2.08 A sealing current option is provided on this unit. This option connects the SXR and SXT leads together to provide a return path for sealing current applied at the far end of the circuit. If the maintenance feature is activated while the sealing current option is selected, the sealing current path will be opened to indicate the unit is in the maintenance mode.

E. Monitor Jacks

2.09 Two 310-type monitor jacks, TRANS MON and REC MON, are located on the BPT61 faceplate. These jacks provide test access to the customer side of the unit.

F. Identification Leads

2.10 This unit contains two identification leads (ID1 and ID2) for use by the telephone company. These leads are available for insertion of a component on the printed wiring board to allow positive identification of a particular unit.

G. Unit Controls

2.11 ***BUSY:*** This indicator on the unit faceplate will light when the maintenance loopback feature is in use.

2.12 ***48·12:*** This switch is set according to the power arrangement provided at the mounting. Set the switch in the 48 position if −48 volts dc is supplied to the unit or in the 12 position if ±12 volts dc is supplied.

2.13 ***150·600·1200:*** This switch selects the network side output impedance. Set the switch in the 600 position to match nonloaded cable or in the 1200 position to match loaded cable. Set the switch in the 150 position to provide mismatch equalization.

2.14 *SC:* This option provides a sealing current return path when the switch is in the ON position.

2.15 *8·16:* This switch selects the amount of gain provided in the loopback path. Set the switch in the 8 or 16 position to provide 8 or 16 dB of loopback gain.

2.16 ***TRANS GAIN and REC GAIN:*** The TRANS GAIN and REC GAIN switches (.1, .2, .4, .8, 1, 2, 4, 8, 10, and −20) control −20 to +26.5 dB of gain in 0.1-dB steps in the transmit and receive directions, respectively. Set the switches so the sum of the switches in the ON position equals the desired gain or loss.

> ***Note:*** The −20 switch provides 20 dB of loss. For example, if 8 dB of loss is required, set the −20, 10, and 2 switches in the ON position.

2.17 ***REC EQ:*** These switches (labeled 1, 2, and 4) control 0 to 7 dB of post-equalization in 1-dB steps in the receive (from the network) direction. Set the switches so the sum of the switches set toward the numbers equals the desired equalization.

H. Equalization

2.18 The BPT61 provides 0 to 7 dB of slope equalization in 1-dB steps in the receive (from the network) direction. For ease of equalizer adjustment, the EQ switch markings indicate the amount of 2804-Hz equalization supplied when the switches are set toward the numbers. For example, if 3 dB of 2804-Hz equalization is required, set switches 1 and 2 toward the numbers on the printed wiring board. Equalizer performance is shown in Table C and by the frequency response curves in Fig. 3.

2.19 The gain and equalizer settings are independent of each other. As shown in Fig. 3, the equalizer setting has little effect on the unit gain at 1 kHz while providing additional gain at 2800 Hz and introducing loss at 400 Hz.

2.20 When the 150-ohm output impedance option is used to provide mismatch equalization, the unit gain should be set using the unknown facility procedure of paragraphs 4.07 and 4.08 (disregard Steps 8, 9, and 10 of the procedure that adjust the active equalizer).

I. Attenuation Distortion

2.21 This unit provides 0 to 7 dB of active post-equalization in the receive direction and a flat frequency response in the transmit direction. Equalizer performance information for the receive channel is provided in Table C and Fig. 3. Attenuation distortion values for the transmit channel are provided in Table D.

3. APPLICATION

3.01 The BPT61 is a 4-4 wire terminal repeater for use on 4-wire private line analog data circuits. This unit can be used as a replacement for 829-type data auxiliary sets and the BPT60 DIU. This unit can also be used as a 4-4 wire terminal repeater for voice-frequency special services applications. A typical application of the unit is shown in Fig. 4.

4. INSTALLATION

4.01 The BPT61 can be installed in any OMNIPORT NCTE mounting, or 400-type equivalent, that supplies −48 or ±12 volts dc power to the unit. Installation involves setting the unit controls and inserting the circuit pack in its mounting slot.

4.02 Set the unit controls as required for proper circuit operation as discussed in paragraphs 2.12 through 2.17. For convenience, the GAIN and EQ switch markings show the amount of gain and equalization supplied when the switches are set toward the numbers. The following paragraphs provide information on setting the GAIN and EQ switches.

A. Gain and Equalization

4.03 The gain and equalization to be provided can be determined by two methods. One method is used when the facility length and gauge are known. The other method is used when the facility length and gauge are not known, if 150-ohm mismatch equalization is provided, or if the circuit fails to meet transmission requirements using the known facility method.

Known Facility

4.04 When the length and gauge of the facility are known, gain and equalization values can be obtained from the WORD (Work Order Record and

Details) document, the CLR (circuit layout record) card, or by using the gain and equalization factors in Table E.

4.05 The necessary gain can be calculated by multiplying the length of cable, in miles or kilofeet, by the appropriate gain factor. For mixed-gauge cables, the sum of the values calculated for each gauge will equal the required gain.

4.06 The equalization required for nonloaded cable can be calculated by multiplying the length of cable, in kilofeet, by the equalization factor (0.25). If values between two available switch settings are obtained, use the lower value setting.

> ***Example:*** Fifteen (15) kft of nonloaded cable has a calculated equalization value of 3.75 dB (15 kft × 0.25 = 3.75 dB). An EQ switch setting of 3 should be used (i.e., switches 1 and 2 set toward the numbers).

Unknown Facility

4.07 The following procedure is for use when the length and gauge of the facility are not known, if 150-ohm mismatch equalization is provided, or if transmission requirements are not met using the known facility procedure. Test equipment required for the following procedure includes a 43A test extender, or equivalent, a 600-ohm oscillator, and a 600-ohm detector. Equipment connections for this procedure are shown in Fig. 5.

> ***Note 1:*** This procedure can be performed without a test extender by using the TRANS MON and REC MON jacks on the unit faceplate if the customer equipment is not connected to the circuit.

> ***Note 2:*** If 150-ohm mismatch equalization is provided, disregard Steps 8, 9, and 10 that adjust the active equalizer.

4.08 Set the GAIN and EQ switches as follows:

(1) Insert unit into test extender and insert test extender into mounting shelf.

(2) Connect 600-ohm oscillator to customer-side T/R jack. Adjust oscillator to provide a 1004-Hz, 0-dBm signal.

(3) Connect detector at far end of facility to measure 1004-Hz signal.

(4) Adjust TRANS GAIN switches to provide desired signal level at far end.

(5) Connect oscillator at far end of facility. Adjust oscillator to provide a 1004-Hz, 0-dBm signal.

(6) Connect detector at customer-side T1/R1 jack to measure 1004-Hz signal.

(7) Adjust REC GAIN switches to provide desired signal level at the detector.

(8) Adjust oscillator at far end of facility to provide a 2804-Hz, 0-dBm signal.

(9) Adjust detector at customer-side T1/R1 jack to measure 2804-Hz signal.

(10) Adjust EQ switches to provide a 2804-Hz level equal to, or slightly less than, 1004-Hz level set in Step 7.

(11) Remove test equipment and remove unit from test extender.

(12) Insert unit into mounting shelf.

5. MAINTENANCE

5.01 This unit requires no routine maintenance. If a unit is faulty, replace it with a spare and send the defective unit to the nearest AT&T Service Center for repair.

TABLE A

BPT61 UNIT SPECIFICATIONS

GENERAL	
CLEI CODE	NCDI020AXX
DIMENSIONS (H, W, D)	5.60 × 1.45 × 5.90 Inches
WEIGHT	9.6 Ounces
TEMPERATURE	
Operating	0° to 50° Celsius
Storage	−40° to 66° Celsius
HUMIDITY	5 to 95 Percent Relative
POWER INPUT REQUIREMENTS	
VOLTAGE	
Nominal	±12 V dc or −48 V dc (PWB fused)
Range	±12 V dc ±5 Percent or −42.5 to −56.0 V dc
CURRENT DRAIN	
Typical	40 mA
Typical With Maintenance Feature Activated	50 mA
TRANSMISSION	
INTERFACE	4W-4W
IMPEDANCE	
Customer Side	600 Ohms
Network Side	600/1200 Ohms (for nonloaded and loaded cable) 150 Ohms (for mismatch equalization of nonloaded cable)
GAIN/ATTENUATION	
Transmit	−20.0 to +26.5 dB (switch selectable in 0.1-dB steps)
Receive	−20.0 to +26.5 dB (switch selectable in 0.1-dB steps)
EQUALIZATION	
Receive (Post)	0- to 7-dB Slope (switch selectable in 1-dB steps)
RETURN LOSS	
Customer Side	
ERL	Greater Than 26 dB
SRL	Greater Than 17 dB
Network Side	
ERL	Greater Than 31 dB
SRL	Greater Than 32 dB (150, 600, or 1200 Ohms)
LONGITUDINAL BALANCE (200 to 3000 Hz)	
Customer Side	Greater Than 55 dB
Network Side	Greater Than 60 dB

TABLE A (Contd)

BPT61 UNIT SPECIFICATIONS

TRANSMISSION (Contd)	
IDLE CHANNEL NOISE	Less Than 5 dBrnC
ENVELOPE DELAY DISTORTION	Less Than 100 μSec (200 to 4000 Hz Referenced to 1 kHz)
PEAK-TO-AVERAGE RATIO (PAR)	98 or Greater
MAXIMUM SIGNAL LEVELS Input Output	Transmit / Receive +12 dBm / +12 dBm +12 dBm / +18 dBm
CROSSTALK (200-3400 Hz)	Greater Than 90 dB (between adjacent circuit packs) Greater Than 75 dB (between transmit and receive paths)
MAINTENANCE	
TYPE	20-Minute Transmission Loopback With +8 or +16 dB of Gain
TONE DETECTOR	2713 ±7 Hz Tone, −30 dBm to 0 dBm (10 dB or greater signal-to-noise ratio)
REMOTE ACTIVATION	Activates After Removal of a 2-Second or Longer 2713 ±7 Hz Tone
REMOTE DEACTIVATION	Deactivates After Receiving 2713 ±7 Hz Tone for 1 Second or Will Time Out After 20 Minutes
LOCAL ACTIVATION	Activates After Removal of a 2-Second or Longer Connection Between MLB and MLBG Leads (Pins 39 and 37)
LOCAL DEACTIVATION	Deactivates after a 1-Second Connection Between MLB and MLBG Leads or Will Time Out After 20 Minutes
CUSTOMER BUSY	SI and SIR Leads (formerly designated TEK5 and TEK6) Are Open

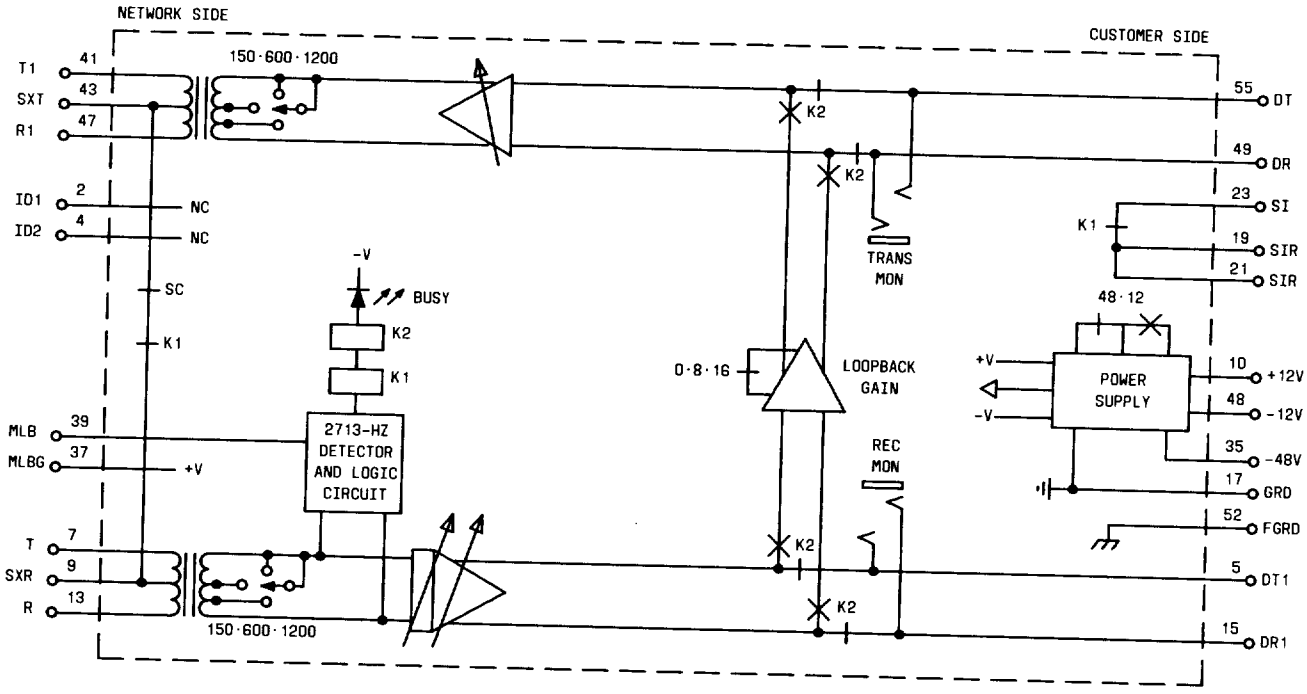

Fig. 1—Block Diagram of BPT61

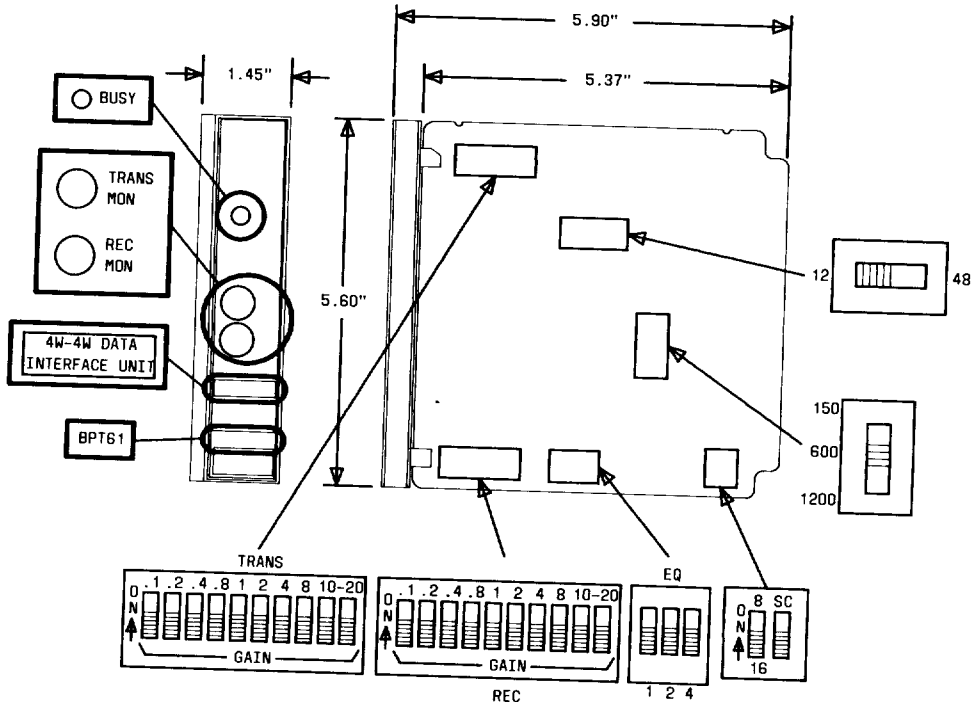

Fig. 2—BPT61 Unit Controls and Faceplate

TABLE B

BPT61 LEAD DESIGNATIONS AND FUNCTIONS

LEAD NO.	LEAD DESIG	FUNCTION
NETWORK LEADS		
41	T1	(Tip 1) Transmit Output Toward Network
47	R1	(Ring 1) Transmit Output Toward Network
43	SXT	Transmit Simplex Lead (Network Side)
7	T	(Tip) Receive Input From Network
13	R	(Ring) Receive Input From Network
9	SXR	Receive Simplex Lead (Network Side)
CUSTOMER LEADS		
55	DT	(Data Tip) Transmitted Data Input From Customer
49	DR	(Data Ring) Transmitted Data Input From Customer
5	DT1	(Data Tip 1) Received Data Output Toward Customer
15	DR1	(Data Ring 1) Received Data Output Toward Customer
23	SI	Status Indicator Toward Customer (Formerly Designated TEK5)
19,21	SIR	Status Indicator Return Toward Customer (Formerly Designated TEK6)
POWER LEADS		
10	+12V	+12 V Battery Supply
48	−12V	−12 V Battery Supply
17	GRD	±12 V and −48 V Battery Supply Ground
35	−48V	−48 V Battery Supply
52	FGRD	Frame Ground
MISCELLANEOUS LEADS		
39	MLB	Manual Loopback
37	MLBG	Manual Loopback Return
2	ID1	Identification Lead 1
4	ID2	Identification Lead 2

TABLE C

BPT61 EQUALIZER GAIN CONTRIBUTION IN dB

EQ SWITCH SETTING	FREQUENCY (HZ)					
	200	400	1000	2000	2800	4000
0	−2.3	−0.7	0.0	0.1	0.1	0.0
1	−2.6	−1.0	−0.2	0.6	1.0	0.9
2	−3.0	−1.4	−0.3	1.1	2.0	1.8
3	−3.5	−1.8	−0.5	1.7	3.0	2.7
4	−3.9	−2.2	−0.5	2.3	3.8	3.5
5	−4.6	−2.8	−0.5	3.2	4.9	4.6
6	−5.5	−3.5	−0.3	4.1	6.0	5.7
7	−6.8	−4.4	0.0	5.2	7.3	7.0

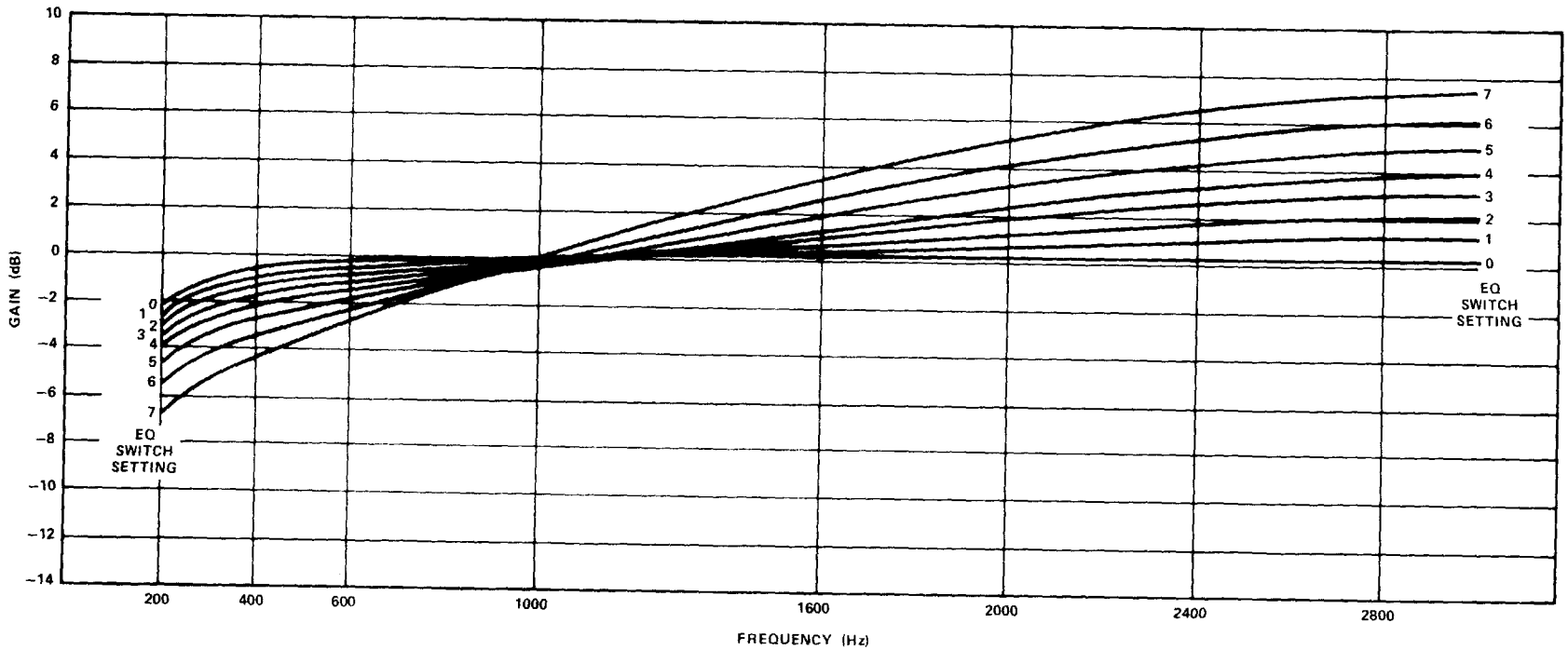

Fig. 3—Equalizer Performance Curves

TABLE D

TYPICAL BPT61 ATTENUATION DISTORTION
(CHANNEL GAIN RELATIVE TO 0 dB AT 1000 Hz)

CHANNEL	FREQUENCY						
	200	300	400	1000	2000	2800	4000
Transmit	−0.3	−0.2	−0.1	0.0	0.1	0.1	0.1

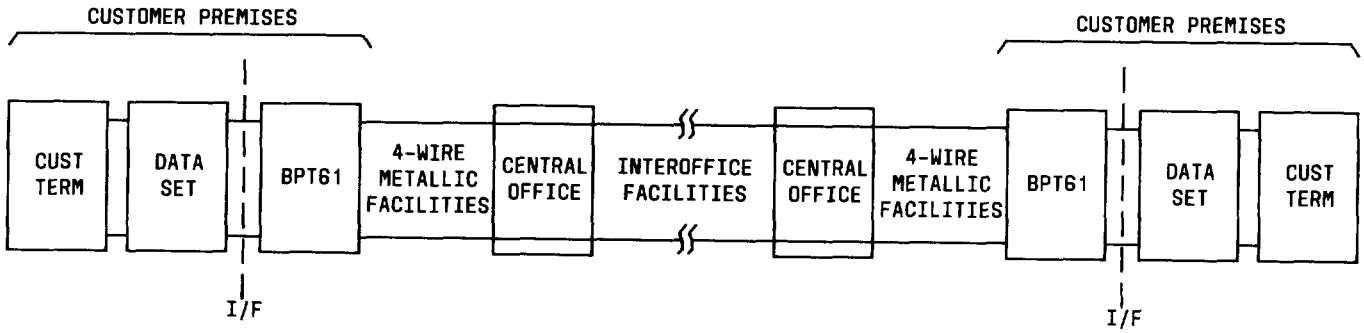

Fig. 4—Typical Application of BPT61

TABLE E

GAIN AND EQUALIZATION FACTORS

CABLE TYPE	1-KHZ GAIN REQUIRED PER KFT	1-KHZ GAIN REQUIRED PER MILE	EQUALIZATION REQUIRED PER KFT (NOTE)
H88 LOADED CABLE			
22 Gauge	0.15 dB	0.8 dB	0.0 dB
24 Gauge	0.23 dB	1.2 dB	0.0 dB
26 Gauge	0.34 dB	1.8 dB	0.0 dB
D66 LOADED CABLE			
22 Gauge	0.15 dB	0.8 dB	0.0 dB
24 Gauge	0.23 dB	1.2 dB	0.0 dB
NONLOADED CABLE			
22 Gauge	0.34 dB	1.8 dB	0.25 dB
24 Gauge	0.44 dB	2.3 dB	0.25 dB
26 Gauge	0.54 dB	2.9 dB	0.25 dB

Note: For equalizer settings, see paragraph 4.06.

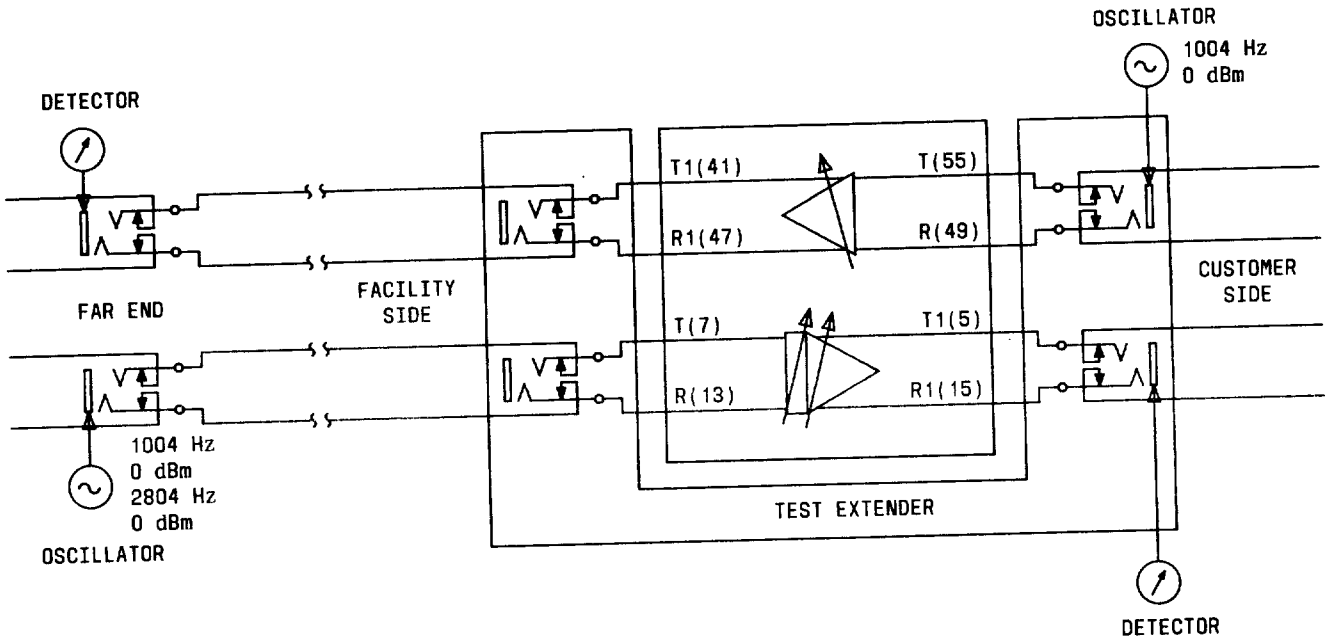

Fig. 5—Gain and Equalizer Adjusting Arrangement