PG-FLEX 24 CHANNEL CENTRAL OFFICE TERMINAL LINE UNIT

Model	List Number	Part Number	CLEI Code
FLL-712	3A	150-1312-31	VACHDFLCAA

FLL 712
LINE UNIT

LIST 3A

PWR ○

LOOP 1 — SYNC ○
MARGIN ○

LOOP 2 — SYNC ○
MARGIN ○

TEST ○

FAULT ○

RS 232
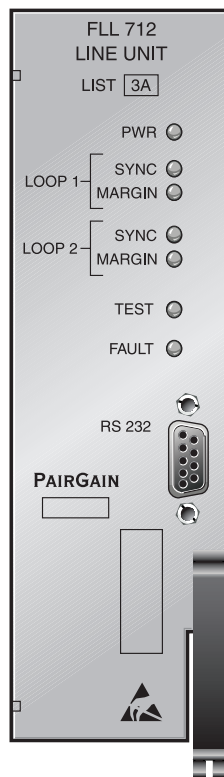
PAIRGAIN

PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING PLANT SERIES TECHNICAL PRACTICE
SECTION 363-712-131-01

Revision History of this practice.
Revision 01—February 24, 1998
A) Initial Release

PAIRGAIN
THE COPPEROPTICS COMPANY

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USING THIS TECHNICAL PRACTICE

Two types of messages, identified by icons, appear in the text:

A note informs you of special circumstances.

Cautions indicate the possibility of damage to equipment or the possibility of personal injury.

A. PRODUCT OVERVIEW

1. Description and Features

1.1   The PairGain® PG-Flex™ FLL-712 List 3A Central Office Terminal (COT) line unit is located at the Central Office (CO) end of the PG-Flex subscriber carrier system, and transports up to 24 DS0 subscriber channels between a COT and a Remote Terminal (RT). The FLL-712 resides in a PairGain COT 19- or 23-inch shelf. Each system in the shelf requires one FLL-712 COT line unit. The FLL-712 provides access through its Craft port to provision a PG-Flex system using an ASCII terminal. However, installing an FAU-728 List 2 or an FPI-729 unit in the shelf disables the Craft port on the FLL-712 line unit. The FPI-729 unit then provides access through its Craft port to provision the PG-Flex system through an ASCII terminal.

The FLL-712 COT line unit uses PairGain's High-bit-rate Digital Subscriber Line (HDSL) 2B1Q technology to provide the equivalent of 1.544 Mbps digital transmission rates, plus signaling over two copper pairs. The HDSL line can include unterminated bridge taps. The technology is implemented:

- without using repeaters

- without loop conditioning

- without pair selection

The FLL-712 supports the use of PG-Flex doublers to extend the range of a PG-Flex subscriber carrier system to 24 kft (7.3 km) of 24 AWG or 18 kft (5.4 km) of 26 AWG loops. Two doublers can triple the range to 36 kft (10.9 km) of 24 AWG or to 27 kft (8.2 km) of 26 AWG loops.

1.2   The FLL-712 COT line unit:

- supports 24 subscriber channels in the CO

- supports PG-Flex doublers in systems transporting POTS and ISDN circuits

- supports 4Tel compatible Loop Test Systems

- is compatible with Mechanized Loop Testing (MLT) and the Pair Gain Test Controller (PGTC) when an FP1-729 List 1 PGTC Interface Unit is installed in the shelf

- supports ISDN channel units

- supports loop start/ground start channel units

2. Front Panel

Figure 1 shows the FLL-712 line unit front panel. Table 1 lists the indicators and indicator states for the FLL-712 front panel LEDs.
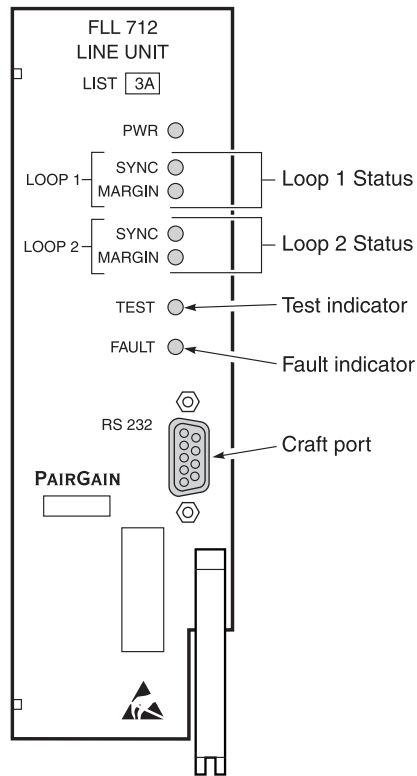
Figure 1 . *FLL-712 List 3A Front Panel*

Table 1. *FLL-712 Front Panel LEDs*

LED	LED State	Indicates
PWR	Solid Green	Power applied and line feed operating normal.
	Flashing Green	Power applied to the RT and testing for overloads.
	OFF	Not receiving power. COT line unit fuse may be blown.
LOOP 1 SYNC	Solid Green	HDSL line 1 is in sync between the COT and RT.
	Flashing Green	HDSL line 1 is attempting to sync with remote unit.
	OFF	HDSL line 1 does not detect an active remote unit.
LOOP 1 MARGIN	Solid Yellow	HDSL line 1 is below preset margin threshold.
	OFF	HDSL line 1 margin is above the preset margin threshold.
LOOP 2 SYNC	Solid Green	HDSL line 2 is in sync between the COT and RT.
	Flashing Green	HDSL line 2 is attempting to sync with remote unit.
	OFF	HDSL line 2 does not detect an active remote unit.
LOOP 2 MARGIN	Solid Yellow	HDSL line 2 is below preset margin threshold.
	OFF	HDSL line 2 margin is above the margin threshold.
TEST	Flashing Yellow	Test in progress.
	OFF	No tests active in system.
FAULT	Solid Red	System alarm/fault detected.
	OFF	No faults are detected in system.

3. Specifications

Electrical Characteristics

COT Power Supply Input Voltage............... -40 to -72 Vdc

COT Power Supply Input Power .... 145 Watts (maximum)

COT Power Supply Input Protection .... Fuse (3A GMT)

COT Power Supply Output Voltage .... ± 130 Vdc (maximum)

COT Power Supply Output Power.............. 100 Watts (maximum)

Environmental

Operating Elevation .... -200 ft to 13,000 ft (-60 m to 4,000 m)

Operating Temperature & Humidity .... -40° F to +150° F (-40° C to +65° C)
                                             5% to 95% (non-condensing)

Physical

Dimensions

     Height:...   6.7 in.   (17.2 cm)

     Width:..   2.0 in.   (5.1 cm)

     Depth:...   10.5 in.   (26.7 cm)

Weight.. 2.0 lb.   (0.9 kg)

# B. FUNCTIONAL DESCRIPTION

4. Applications

4.1　　　　**Overview.** PG-Flex is a small-capacity, universal subscriber carrier system supporting up to 24 DS0 channels including both Plain Old Telephone Service (POTS) and Integrated Services Digital Network (ISDN) services. The system is based on HDSL transmission technology. Remote power is supplied from the Central Office (CO).

A PG-Flex system is comprised of one line unit and one (or more) channel units at both the CO and the RT (Figure 2). Line units and channel units can be hot-swapped without affecting other systems in the same shelf. The POTS channel units use a Pulse Code Modulation (PCM) encoding scheme that allows high speed modem and group 3 facsimile operation on all channels.

The CO-side of a PG-Flex system mounts into a COT shelf and supports up to four systems. An alarm unit or Pair Gain Test Controller (PGTC) interface unit (common to all systems installed in the shelf) provides an interface for maintenance alarm relays and metallic access to the remote subscriber lines.

The remote side of a PG-Flex systems mounts into an FRE-765 RT enclosure. The RT enclosure supports one system, which includes one line unit and up to three channel units. The channel units must be the same type of card as the channel units installed at the CO.

PG-Flex uses HDSL transmission technology over two unconditioned copper pairs. Power is supplied from the CO to the RT over the HDSL transmission lines. The maximum distance from the CO to the RT is 12.3 kft (3.7 km) using 24 AWG cable (0.5 mm).
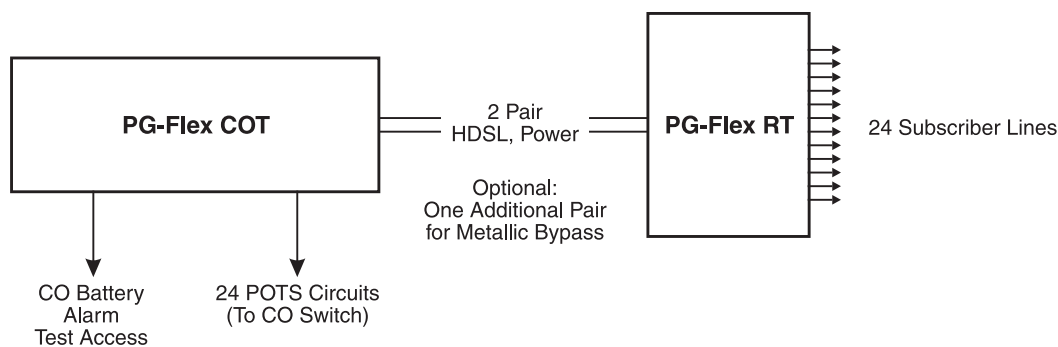
Figure 2. *Typical PG-Flex Configuration*

4.2　　　　**HDSL Transmission.** PG-Flex uses HDSL transmission technology between the COT and RT. This technology provides up to 24 DS0s, plus signaling, over two copper pairs without using repeaters, loop conditioning, or pair selection. Adaptive equalization, scrambling, and a four-level 2B1Q line coding scheme increase range and minimize crosstalk.

The line interface is a two-pair, 784-kbps full-duplex 2B1Q transmission format. The dual HDSL lines provide 24 channels at 64-kbps, with signaling and an operations channel for management control. The signal characteristics on the carrier pairs comply with TR-NWT-001210, Generic Requirements for High-bit-rate Digital Subscriber Line (HDSL) Systems.

Table 2 shows the maximum distance between the COT and the RT for various gauge wire. Because of HDSL transmission technology, the HDSL lines require no special conditioning and may include unterminated bridge taps, but cannot include load coils.

Table 2. PG-Flex Distances

Wire Gauge		Loop Length		DC Resistance
		12/24 Channel System		
26 AWG	(0.4 mm)	9.0 kft	(2.8 km)	750 Ω
24 AWG	(0.5 mm)	12.3 kft	(3.8 km)	638 Ω
22 AWG	(0.6 mm)	16.1 kft	(5.0 km)	521 Ω
19 AWG	(0.9 mm)	22.8 kft	(7.0 km)	367 Ω

Do not share metallic bypass pairs between PG-Flex systems and between PG-Flex and other Digital Loop Carrier (DLC) systems.

4.3   **Subscriber Drop Testing.** For subscriber drop testing from the Central Office, PG-Flex is able to select and connect any subscriber drop to a metallic bypass pair at the RT. PG-Flex extends this connection back to the COT where it is switched to the test jack on the FAU-728 or FPI-729 units or to the corresponding subscriber line on the COT channel card.

Metallic access is performed by momentarily placing +116 Vdc (from the CO) on the subscriber's Tip lead. (The Ring lead should be between GND and the Tip value.) With POTS, Ground Start/Loop Start, and ISDN channel cards, the selected subscriber drop (assuming a working metallic bypass pair) connects to the corresponding COT subscriber line.

The metallic connection drops when -116 Vdc is momentarily applied to the subscriber's COT Tip lead.

Metallic access may also be activated through an ASCII terminal connected to the RS-232 Maintenance port located on the front of the FLL-712 line unit or through the FAU-728 List 2 or FPI-729 units.

5. Operational Capabilities

5.1   The FLL-712 COT line unit provides the following functions for each 24-channel system in a single COT shelf:

- system power supply

- HDSL line transceivers and simplex RT power

- front-panel status indicators

- RS-232 Maintenance Interface (DCE)

- switched access to the metallic bypass pair

- MLT/PGTC loop test system compatibility

- 4Tel loop test system compatibility

5.2   Figure 3 shows a block diagram of the FLL-712. The power supply converts CO battery into voltages necessary to power the PG-Flex electronics including ±130 Vdc. During power-up, the system checks the HDSL lines for hazardous voltages or other line faults that may effect the system. If a fault condition is detected, the system stops the power-up sequence and the LED indicators on the front panel indicate a line fault problem.
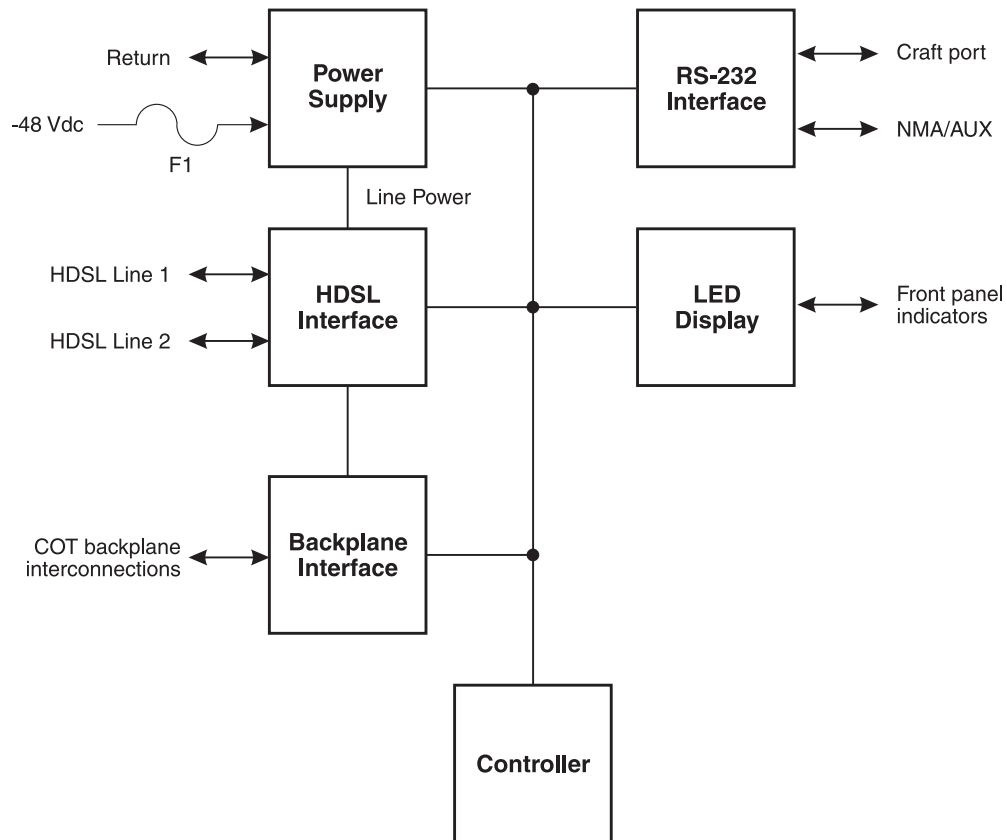
Figure 3. FLL-712 COT Line Unit Block Diagram

6. Terminal Management

6.1   The terminal management function allows a technician to manage the entire PG-Flex system using
an ASCII terminal (or modem with a null modem cable) connected to the Craft port. With this
function, you can:

- view system status

- set configuration parameters

- set metallic access connection to the subscriber circuit

- monitor system performance

- obtain an inventory report

6.2   **Connecting FLL-712 to a Terminal or Modem.** Figure 4 shows the pinouts for connecting the
FLL-712 Craft port to an ASCII terminal.

> **The FLL-712 line unit will not automatically log off when a terminal is unplugged
> from the craft maintenance port unless the DTR signal is connected between
> the terminal and the Craft port. Technicians must manually log off the line unit
> before unplugging from the port. Otherwise, the line unit remains logged in,
> and the terminal session will still be in the same place.**
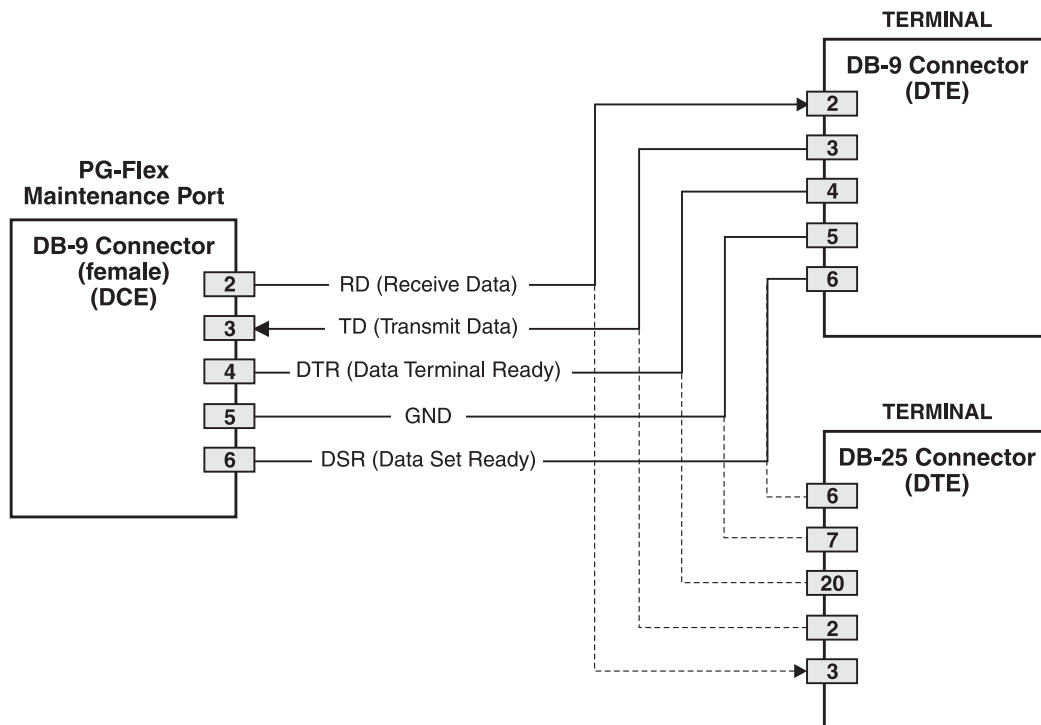
Figure 4. *Connecting FLL-712 to an ASCII Terminal*

Figure 5 shows the pinouts for connecting the FLL-712 to a modem using a null-modem cable. Using Data Carrier Detect (DCD) from the modem ensures that the FLL-712 line unit logs off if the carrier signal disappears.

When configuring a modem, ensure that either the DIP switches or the software configuration is set OFF for Carrier Detect (CD) override. This causes the modem to send CD signal when it connects with another modem and to drop CD when it disconnects. Otherwise, if set ON, the FLL-712 connection functions correctly but does not log out when disconnected.

It is recommended that Data Terminal Ready (DTR) override be OFF. This allows a modem call to terminate correctly when the FLL-712 drops DSR (which is null-modemed to DTR input on the modem).

FLL-712   **MODEM**

DB-9 Connector   **DB-9 Connector**
(DCE)   Not Connected ———————— 6   **(DTE)**
                    6 ————————————————————— 4
                    4 ◄————————— DCD ————————— 1
                    3 ◄———————————————————————— 2
                    2 ————————————————————————— 3
                    5 ——————————— GND ————————— 5
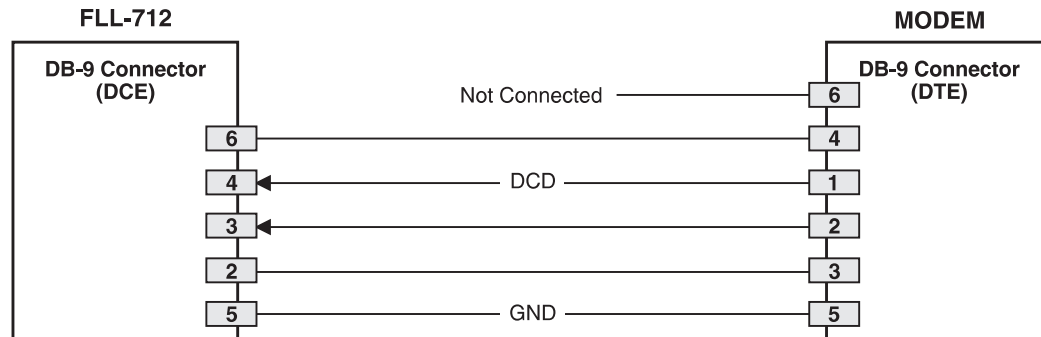
Figure 5. *Connecting the FLL-712 to a Modem*

The connection is set up as:

- DCE with 8 data bits

- 1 stop bit

- no parity

- 1200 to 9600 baud (9600 baud recommended)

The protocol requires DTR active from the terminal to prevent automatic log off.

6.3   Menus and Display Structure. Figure 6 shows the menu structure of the terminal management system.
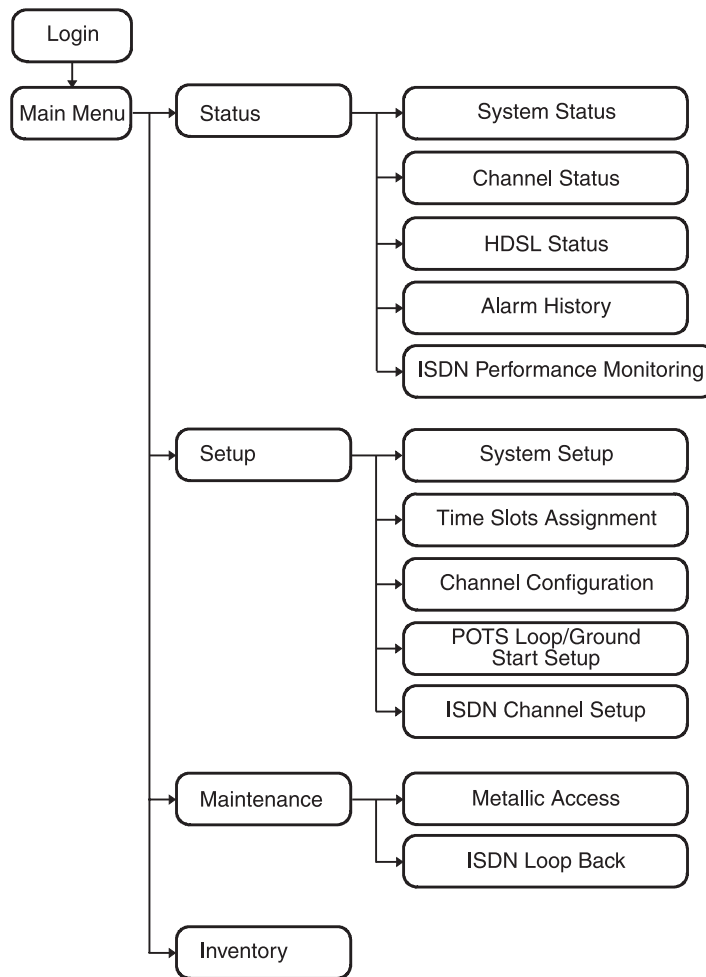
Figure 6. *Terminal Menu and Display Structure*

6.4   **Power-Up and Connection Screen.** The Power-Up and Connection screen display once the
                 ASCII terminal has been connected to the FLL-712 line unit:

```
     [COT] READY
```
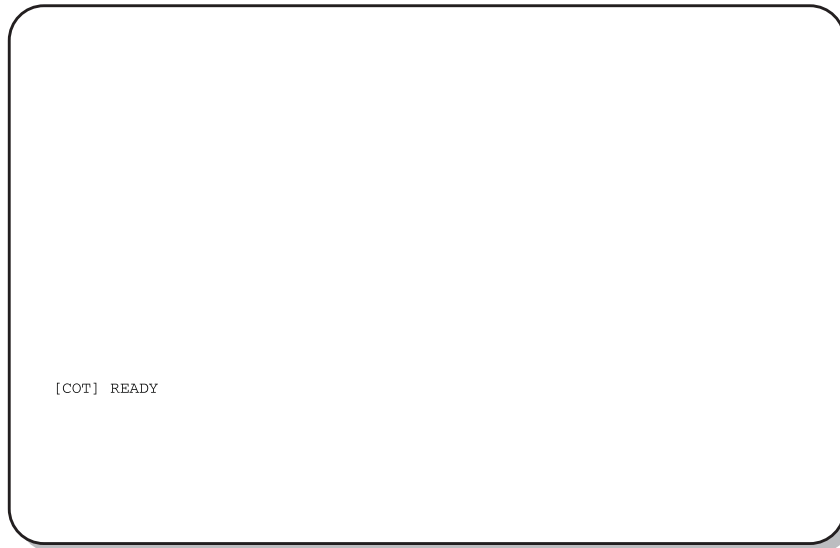
6.5   **Log On Screen.** The FLL-712 line unit displays a log on screen when it detects user input from
                 the Craft port (while idle).

1   Press the <Spacebar> rapidly several times to start the autobaud feature (autobaud supports
         transmission rates of 1,200, 2,400, 4,800 and 9,600 bps only). This input causes the
         log on screen to display:

```
     11-FEB-98      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL      01:22:54
                          SYSTEM ID: 24 Channel PG-Flex System      SYSTEM: 2




     [COT] LOGIN PASSWORD>
```
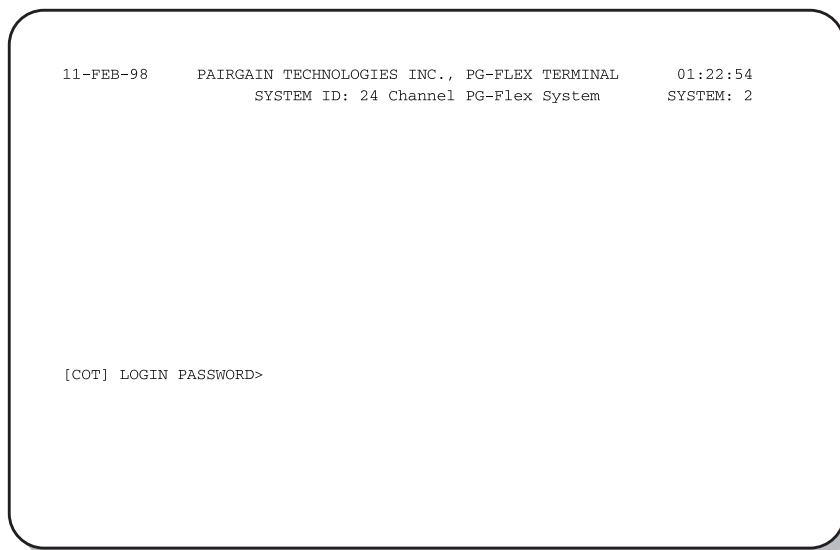
2   Enter your password. For security reasons, the password input is echoed with "*" characters.

**If you do not have your logon password, contact the Customer Service
Engineering group (see Technical Support) for access using a Master
Password.**

6.6   **System Time Set Screen.** The System Time screen appears the first time you log on, or after the power has been turned off. Enter the new system time in hours (HH), minutes (:MM), and seconds ([:SS]):

```
   11-FEB-98           PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                           SYSTEM ID: 24 Channel PG-Flex System           SYSTEM: 1

                                       SYSTEM TIME
   -----------------------------------------------------------------------------




       System Time has NOT been initialized!!


          [COT] ENTER NEW SYSTEM TIME (HH:MM[:SS]):
```

This screen will not appear the next time you log on unless the power has been turned off.

6.7   **Main Menu.** From the Main Menu, you access other menus where you can configure a PG-Flex system, initiate or view test procedures, and view status information. The Main Menu is displayed after a successful log on:

```
   11-FEB-98           PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                           SYSTEM ID: 24 Channel PG-Flex System           SYSTEM: 1
       CURRENT STATUS: OK                                     LOGGED IN: COT
       ALARMING TERMINAL: NONE
                                                               CHREV: SPAN 1

                                       MAIN MENU
   -----------------------------------------------------------------------------

                                   A) STATUS
                                   B) SETUP
                                   C) MAINTENANCE
                                   D) INVENTORY
                                      Q)uit


          [COT] ENTER COMMAND>
```

Table 3 describes the Main Menu options (A through D).

Table 3. *Main Menu Options*

Main Menu Option	Function

A) Status	Select the Status option (A) from the Main Menu to display:
	
	• System Status to show the equipment installed in the system and the current status (in alarm or not) of the equipment.
	
	• Channel Status to show the current status of all channels in the system. Each channel has a status condition. Status conditions vary for the different types of channel cards. Examples of status are:
	
	    IDLE: channel is not off-hook or ringing
	    RING: channel is ringing
	    BUSY: channel is off-hook
	    OPEN: no connection to CO switch
	    TEST: in test mode
	    TREQ: 116 Vdc test request
	    SERR: PCM bus frame sync error
	    FIDL: forced idle
	    TDSB: time slots disabled
	    RBAT: reverse battery
	    ****: unknown
	
	• HDSL Status to show the status of the HDSL span. You can view either a 24-hour or 7-day performance history.
	
	• Alarm History to display the status history of COT, RT, and span alarms.
	
	• ISDN Performance Monitoring Menu to show PM error count and PM threshold for a specific ISDN card and channel.

B) Setup	Select the Setup option (B) from the Main Menu to view the current setup or to set or change the following configurable items: • System Setup • Time Slots Assignment (view only) • Channel Configuration • POTS Loop/Ground Start Setup • ISDN Channel Setup
C) Maintenance	Select the Maintenance option (C) from the Main Menu for setting up a metallic access connection to a subscriber circuit or performing an ISDN loop back test for a PG-Flex system. Metallic Access includes: COT bridging, COT looking in, COT looking out, RT looking out, RT looking in, RT bridging, and subscriber bypass.
D) Inventory	Select the Inventory option (D) from the Main Menu to view manufacturing information and version information for all the units in the system (except the FAU/FPI unit). At the CO line unit terminal or the RT line unit terminal, the command displays all units in the system.

C. INSTALLATION AND TEST

7. Unpacking

7.1   Upon receipt of the equipment, proceed as follows:

   1 Unpack each container and visually inspect it for signs of damage. If the equipment has been
          damaged in transit, immediately report the extent of damage to the transportation company and
          to PairGain. Order replacement equipment if necessary.

   2 Check the contents versus the packing list to ensure complete and accurate shipment. If the
          shipment is short or irregular, contact PairGain as described in Section 11. If you must store the
          equipment for a prolonged period, store the equipment in its original container.

8. Installation

**Observe normal electrostatic discharge precautions when handling electronic
equipment. Do not hold electronic plugs by their edge. Do not touch
components or circuitry.**

**An FPI-729 List 1 PGTC Interface Unit or an FAU-728 List 2 Alarm Unit must be
installed at all times when ISDN channel units are installed. These units
provide the composite clock reference source for the ISDN channel units and
are required for normal operation of the ISDN channel units. Removing the FPI-
729 List 1 or FAU-728 List 2 during an ISDN call terminates the call.**

8.1   Install a FLL-712 COT line unit and verify operation as follows:

   1 Insert the FLL-712 COT line unit into the COT shelf and verify:

   •   all LEDs on the Line Card turn on for about one-half second, then turn off

   •   PWR and FAULT LEDs turn on

   •   after ten seconds, the COT starts its power management routine and the PWR LED flashes

**If line powering fails, wait one minute before attempting to reinsert the FLL-712.
If line powering succeeds, HDSL communications begins synchronizing and
LOOP 1 SYNC and LOOP 2 SYNC flash.**

   2 Verify the following front panel indications after the system powers up and establishes HDSL
          synchronized communications, and when no calls are in progress:

   •   POWER is on

   •   LOOP 1 SYNC is on

   •   LOOP 1 MARGIN is off

   •   LOOP 2 SYNC is on

   •   LOOP 2 MARGIN is off

   •   TEST is off

   •   FAULT is off

> **3**   Measure the following voltages on the COT shelf backplane:
>
> - -130 Vdc (±10%) between the HDSL_T1 pin and chassis ground
>
> - 0 Vdc to +130 Vdc between the HDSL_T2 pin and chassis ground

9. Provisioning

9.1   **Configure System Settings.** Perform system setup, if not previously accomplished.

> **1**   Type <B> then press <Enter> at the Main Menu. The Setup Menu is displayed:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1
   CURRENT STATUS: OK                                          LOGGED IN: COT
   ALARMING TERMINAL: NONE
                                                          CHREV: SPAN 1


                              SETUP MENU
  ----------------------------------------------------------------------------
                         A) SYSTEM SETUP
                         B) TIME SLOTS ASSIGNMENT
                         C) CHANNEL CONFIGURATION
                         D) POTS LOOP/GROUND START SETUP
                         E) ISDN CHANNEL SETUP


                   CTRL-X) Main Menu    e(X)it


        [COT] ENTER COMMAND> A
```

2   Type <A> then press <Enter>. The System Settings menu is displayed:

```
  11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                           SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1


                                 SYSTEM SETTINGS
     --------------------------------------------------------------------------------
       A) SYSTEM DATE:    .   .   .   .   .   05-DEC-97
       B) SYSTEM TIME:    .   .   .   .   .   00:01:08
       C) SYSTEM ID: .    .   .   .   .   .   24 Channel PG-Flex System
       D) SET PASSWORD    .   .   .   .   .
       E) AUTO LOGOUT TIME (min.):    .   .   5         (DISABLED,5,30,60)
       F) METERED TONE FREQUENCY (kHz):   .   DISABLED   (DISABLED,12,16)
       G) RING FREQUENCY (Hz):    .   .   .            20        (20,25,30)
       H) HDSL ES ALARM THRESHOLD:    .   .   17        (DISABLED,17,170)
       I) HDSL MARGIN THRESHOLD: .    .   .   6         (0-15,0=DISABLED)
       J) ALARM ON HDSL THRESHOLD:    .   .   ENABLED   (DISABLED,ENABLED)
       K) LOCAL LOOP LENGTH:    .    .   .   .          LONG      (SHORT,LONG)
       L) ALARM ON CONFIGURATION:    .   .   ENABLED   (DISABLED,ENABLED)
       M) ALARM ON INSUFFICIENT TIMESLOT:   ENABLED    (DISABLED,ENABLED)
       N) ALARM ON ISDN PM THRESHOLD:       ENABLED    (DISABLED,ENABLED)


                          CTRL-X) Main Menu     e(X)it


          [COT] ENTER CHOICE> A
```

3   Type a letter (A through N) and press <Enter> to select a parameter to change. Refer to Table 4 for system settings menu options.

You get a separate screen for the parameter selected. It prompts you to input the change.

4   Type <Ctrl+X> to return to the Main Menu.

Table 4. *System Settings Menu Options*

Parameter	Default Value	Description
A) System Date	01-JAN-00	The System Date is set for each PG-Flex system individually and displays as dd-mmm-yy. It increments automatically each midnight, as long as the COLU and RTLU are installed in the shelf and CO battery is connected to the COLU. If the COLU or the RTLU is removed from a powered shelf, then reinserted, the date will be the same as it was when the COLU or RTLU was pulled out of the shelf or when its power was removed. It then continues to increment to successive dates each midnight, as indicated by the System Time. All years which are evenly divisible by 4 (including the default year "00") are considered leap years. In such years, the date increments from 28-FEB-yy to 29-FEB-yy (where "yy" represents the last two digits of the year, such as 00, 04, 08, etc.). This product meets or exceeds the current technical quality requirements for Year 2000 compliance and properly processes dates up to, and beyond, December 31, 1999.
B) System Time	00:00:00 at power on	The System Time must be set for each PG-Flex system individually and displays as hh:mm:ss. System Time is lost (default back to 00:00:00) whenever power is removed from the system shelf or the COLU or RTLU module is removed and reinserted.
C) System ID	(all spaces)	The System ID is supplied to indicate the physical location of the PG-Flex system (CO or RT terminal). Each PG-Flex system should have a unique System ID. The default for System ID is "blank" (all spaces). This can be left blank or set to any desired name of 24 or fewer characters (including spaces). This name can be any mixture of alphanumeric characters (including upper case, lower case, numerals, punctuation, etc.). If System ID is set to "shelf 25 system A", this ID appears at the top of each screen when accessing this system. This parameter is stored in the CO line unit NVRAM and therefore does not change when power is cycled or cards are removed and reinserted. If the CO line unit is replaced, it is necessary to reenter the appropriate system ID.
D) Set Password	(all spaces)	If there is an FPI card present in the system, you will be connected to the system through the connector on the FPI card front panel and will be prompted for a password only on initial log on to the FPI card, before accessing a specific system in the shelf. You will not be asked for an additional password when accessing a system. However if there is no FPI card, you will connect to each system individually through its front panel connector and will be prompted for the individual system Password. The Password default is <ENTER>. The password can be 10 or fewer characters (including spaces), or any mixture of alphanumeric characters (including upper case, lower case, numerals, and punctuation marks). This parameter is stored in the CO line unit card NVRAM and therefore will not change when power is cycled or cards are removed and reinserted.

Table 4. *System Settings Menu Options (continued)*

Parameter	Default Value	Description
⚠	**All of the parameters discussed in the remainder of this table are stored in the CO line unit card NVRAM and therefore will not normally change when power is cycled or cards are removed and reinserted.**	
E) Auto Logout Time	DISABLED	After logging on to a system, you are automatically logged out after a time determined by the Auto Logout Time parameter: • DISABLED: The user is never automatically logged out. (Note: If the user leaves the system without logging out, and if Auto Logout Time is "DISABLED", the next person who accesses the system can do so without logging on and does not need a password). • 5: Automatically logs out after 5 minutes. • 30: Automatically logs out after 30 minutes. • 60: Automatically logs out after 60 minutes.
F) Metered Tone Frequency	12	Metered tones are used for out-of-band signaling with coin telephones, typically in international markets. A special channel card is required to support this function.
G) Ring Frequency	20	Determines the frequency of the ringing voltage on the subscriber line. The values can be set to one of the following parameters: • 20: The ring generator is set to 20 Hz. • 25: The ring generator is set to 25 Hz. • 30: The ring generator is set to 30 Hz.
H) HDSL ES Alarm Threshold	DISABLED	Sets the number of Error Seconds required before a minor alarm is generated (dependent on the setting of the Alarm on HDSL Threshold parameter). The count of Error Seconds is reset to zero when the reset function is used on the HDSL Performance History status screen. The values can be set to one of the following parameters: • DISABLED: No minor alarm is generated, regardless of the number of error seconds. • 17: A minor alarm is generated after 17 error seconds. • 170: A minor alarm is generated after 170 error seconds.

Table 4. *System Settings Menu Options (continued)*

Parameter	Default Value	Description
I) HDSL Margin Threshold	4	Sets the HDSL margin threshold. If the HDSL margin attains a value equal to or less than the setting for this parameter, a minor alarm is generated (dependent on the setting of the Alarm on HDSL Threshold parameter). A default setting of 4 indicates that a minor alarm will occur when the HDSL margin is # 4 dB. The HDSL Margin Threshold can be set between 1 dB and 15 dB.
J) Alarm on HDSL Threshold	DISABLED	Controls whether a minor alarm is generated if the HDSL ES Alarm Threshold or HDSL Margin Threshold is exceeded. The values can be set to one of the following parameters: • DISABLED: A minor alarm does not occur when the HDSL ES Alarm Threshold and/or HDSL Margin Threshold is exceeded. • ENABLED: A minor alarm occurs when the HDSL ES Alarm Threshold and/or HDSL Margin Threshold is exceeded.
K) Local Loop Length	Long	The length of subscriber loop supported by PG-Flex is determined by this parameter and affects all subscriber loops within a single PG-Flex system. The length of the loop affects the total power required by the PG-Flex system; the shorter the loop, the less the power required. For the majority of applications, the power saved is relatively insignificant and the default value ("LONG") should be selected. The values can be set to one of the following parameters: • LONG: The PG-Flex system can support subscriber loops with a line resistance of 530 Ω or less. • SHORT: The PG-Flex system can support subscriber loops with a line resistance of 400 Ω or less.

Table 4. *System Settings Menu Options (continued)*

Parameter	Default Value	Description
L) Alarm on Configuration	DISABLED	Each channel card in a PG-Flex system must have a corresponding channel card type at the opposite node. A mismatch condition results when a card does not have the correct corresponding card at the other end due to channel unit removal, type mixing, or failure. Note if a mismatch condition exists, between the CO and RT, replace the corresponding channel with a matching channel unit. The values can be set to one of the following parameters: • DISABLED: A minor alarm does not occur if there is a mismatch of channel units. • ENABLED A minor alarm occurs if there is a mismatch of channel units.
M) Alarm on Insufficient Time Slot	DISABLED	This parameter determines whether a minor alarm is generated if more circuits have been enabled than there are time slots available. This could occur when enabling ISDN circuits without first disabling a sufficient number of POTS circuits to ensure that there are enough time slots available to support the ISDN circuits. The values can be set to one of the following parameters: • DISABLED: A minor alarm does not occur if more circuits have been enabled than there are available time slots. • ENABLED: A minor alarm occurs if more circuits have been enabled than there are available time slots.
N) Alarm on ISDN PM Threshold	DISABLED	This parameter determines whether a minor alarm occurs if any of the PM thresholds are exceeded. The values can be set to one of the following parameters: • DISABLED: A minor alarm does not occur if any of the ISDN PM thresholds are exceeded. • ENABLED: A minor alarm occurs if any of the ISDN PM thresholds are exceeded.

9.2　　　　**Configure an ISDN Channel Unit.** To configure and view the status of an ISDN Channel unit, follow the instructions in paragraphs 9.2.1 through 9.2.5.

9.2.1　　　Set up the ISDN module, starting from the Setup Menu:

1　　Type <E> then press <Enter> to view the ISDN Channel Setup selection menu:

```
   11-FEB-98            PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:08
                            SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1
                                      ISDN CHANNEL SETUP
       ------------------------------------------------------------------------------



                            Press ESCAPE to return to previous menu






     Enter Card and Channel To Setup (CARD,CHANNEL): 2,3
```

> If there are no ISDN cards present in your PG-Flex system, the display will indicate that there are no ISDN cards installed, and not allow you to continue to the ISDN Channel Setup menu.

2　　Type the card number followed by a comma, then type the channel number and press <Enter> for the ISDN module you want to configure. The ISDN Channel Setup menu is displayed:

```
   11-FEB-98            PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:08
                            SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1

                                      ISDN CHANNEL SETUP
   --------------------------------------------------------------------------------
       CARD: 2          CHANNEL: 3
   --------------------------------------------------------------------------------
       A) PM Mode  .   .   .   .        Interim Path   (Interim Path, Segmented)
       B) eoc Mode  .   .   .  . .      Normal         (Normal, Transparent)
       C) B1<->B2 Swap  .   .   .       Normal         (Normal, Swap)
       D) Sealing Current  .   .        On             (Off, On)
       E) Zero Byte Substitution  .     Off            (Off, Enabled)


                         S) SELECT NEW CARD AND CHANNEL
                            CTRL-X) Main Menu     e(X)it


        [COT] ENTER CHOICE> A
```

3   From the ISDN Channel Setup menu type a letter (A through E) and press <Enter> to choose a setup parameter. Select one of the two options available for each parameter (Table 5):

The options in Table 5 listed in bold type are the default settings

Table 5. ISDN Channel Unit Configuration Options

Parameter	Description	Options	
A) PM Mode	Performance monitoring of the ISDN channels is done considering the channel as one path (Interim Path) or several separate sections (Segmented).	**Interim**	Performance monitoring is done considering the channel as one path and collects the end-to-end error rate for the entire transport path.
		Segmented	Performance monitoring is done considering the channel as separate sections, and collects error rates for each DSL loop individually
B) eoc mode	This parameter determines how ISDN eoc messages are handled by the PG-Flex system.	**Normal**	ISDN eoc messages are decoded and re-transmitted within the PG-Flex system.
		Transparent	ISDN eoc messages are not decoded and are passed through the PG-Flex system transparently.
C) B1<->B2 Swap	This parameter determines whether the B channels are swapped between the PG-Flex CO ISDN "U" interface and the RT ISDN "U" interface. The "D" signaling channel is unaffected by this parameter.	**Normal**	ISDN channel "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B1" and "B2" at the RT ISDN "U" interface.
		Swap	ISDN channel "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B2" and "B1" at the RT ISDN "U" interface.
D) Sealing Current	This parameter determines whether sealing current is applied to the ISDN subscriber loop.	**Off**	No sealing current is applied to the ISDN subscriber loop.
		On	A constant current of approximately 5 ma. flowing in the ISDN subscriber loop at all times.
E) Zero Byte Substitution	This parameter determines how ISDN eoc messages are handled by the PG-Flex system.	**Off**	The PG-Flex system passes all data through without any special encoding.
		On	The PG-Flex system will use a ZBS code to prevent long string of zeros in the data.

4   From the ISDN Channel Setup menu type <S> and press <Enter> to select a new ISDN channel unit and channel to configure.

Type the channel unit number followed by a comma, then type the channel for the new ISDN channel unit. That is, type "2, 3" for ISDN card number 2 on channel 3.

9.2.2   Configure channels, starting at the Setup Menu (refer to Table 6 for channel configuration options):

> **There are 24 time slots available. Enable is the default for the channels.**
> **Disable channels only when the time slots are required by another channel unit.**
>
> **For channel configuration, ON means the channel is enabled with a time slot.**
> **OFF means the channel is enabled but does not have a time slot assigned.**

1   Type <C> then press <Enter> to access the Channel Configuration menu:

```
11-FEB-98         PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                          SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1


                                 CHANNEL CONFIGURATION
--------------------------------------------------------------------------------
          CU1       CU2       CU3
          CU1       CU2       CU3
Channel   COT      (POTS8)   (POTS8)   (ISDN4)
          RT       (POTS8)   (POTS8)   (ISDN4)   (---)
--------------------------------------------------------------------------------
1                   ON        ON        ON
2                   ON        ON        OFF
3                   ON        ON        DISABLED
4                   ON        ON        DISABLED
5                   ON        ON        -
6                   ON        ON        -
7                   ON        ON        -
8                   ON        ON        -

                          2 Time-Slots Available
                     D)isable Channel     E)nable Channel
                          CTRL-X) Main Menu    e(X)it

          [COT] ENTER COMMAND> D
```

3   Type <D> to disable a channel or type <E> to enable a channel and then press <Enter>.

         You get a prompt to enter the card and channel number.

4   At the prompt for the system to be configured, enter the card number followed by a comma, and
         then enter the channel number and press <Enter>, (that is, type "1,1" for card 1 on channel 1).

Table 6. *Channel Configuration Options*

Parameter	Default Value	Function
Channel Configuration	ENABLED	Each channel is individually enabled or disabled through the COLU. This configuration is stored in both the COLU and the COCU. If any one card (COLU, RTLU, COCU, or RTCU) is removed, replaced, or reinserted, the Channel Configuration will automatically be preseved. The values can be set to one of the following parameters: • DISABLED: The selected channel is disabled. • ENABLED: The selected channel is enabled.

9.2.3   Enable alarms, if required by local practice (start at the Setup Menu):

1   Enable/disable the Alarm On ISDN PM Threshold Cross:

    a   Type <A> then press <Enter> to display the System Settings menu.

    b   Type <N> then press <Enter> to display the Alarm On ISDN PM Threshold Cross menu:

```
 11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                         SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1

                         ALARM ON ISDN PM THRESHOLD CROSS
 --------------------------------------------------------------------------------


                              CURRENTLY: DISABLED




 [COT] ENABLE THE ALARM ON ISDN THRESHOLD CROSSING [Y/N]:

```

    c   Type <Y> then press <Enter> to enable the alarm, or type <N> then press <Enter> to disable the alarm.

9.2.4   View time slot assignments, starting at the Setup Menu. Type <B> then press <Enter> to display the Time Slot Assignment menu:

```
  11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                           SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1


                             TIME SLOTS ASSIGNMENT
  ----------------------------------------------------------------------------
  TIME        CHANNEL    TIME        CHANNEL    TIME        CHANNEL    TIME        CHANNEL
  SLOT        ASSIGNMENT SLOT        ASSIGNMENT SLOT        ASSIGNMENT SLOT        ASSIGNMENT
  ----------------------------------------------------------------------------
   1:         CU1 CH1     7:         CU1 CH7    13:         CU2 CH5    19:         CU3 CH1
   2:         CU1 CH2     8:         CU1 CH8    14:         CU2 CH6    20:         CU3 CH2
   3:         CU1 CH3     9:         CU2 CH1    15:         CU2 CH7    21:         CU3 CH2
   4:         CU1 CH4    10:         CU2 CH2    16:         CU2 CH8    22:         CU3 CH2
   5:         CU1 CH5    11:         CU2 CH3    17:         CU3 CH1    23:         ----
   6:         CU1 CH6    12:         CU2 CH4    18:         CU3 CH1    24:         ----
  ----------------------------------------------------------------------------



                         CTRL-X) Main Menu    e(X)it


          [COT] ENTER COMMAND> X
```

These values are automatically generated. However, when you cycle power to the system or hot plug a new channel unit, these values can change.

9.2.5   Access the ISDN Performance Monitoring Menu, starting from the Status Menu.

    1   Type <E> then press <Enter> to display the ISDN Performance Monitoring Menu:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                       SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1

                          ISDN PERFORMANCE MONITORING MENU
-------------------------------------------------------------------------------


                    Press ESCAPE to return to previous menu







        Enter Card and Channel (CARD,CHANNEL): 2,3
```

**If there are no ISDN cards present in your PG-Flex system, the display will
indicate that there are no ISDN cards installed, and not allow you to continue to
the ISDN Channel Setup menu.**

    2   Type the channel unit number followed by a comma, then type the channel for the new ISDN
channel unit. That is, type "2, 3" for ISDN card number 2 on channel 3.

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                       SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1

                          ISDN PERFORMANCE MONITORING MENU
-------------------------------------------------------------------------------
      INTERIM SEGMENTED ENABLED            CARD: 2          CHANNEL: 3
-------------------------------------------------------------------------------
                          A) SELECT NEW CARD AND CHANNEL
                          B) PM ERROR COUNT
                          C) PM THRESHOLD/ALERT INFO

                             CTRL-X) Main Menu    e(X)it



         [COT] ENTER COMMAND> B
```

    3   Type a letter (B or C) and press <Enter> to view status for the channel unit and channel
you selected.

    4   Type <A> then press <Enter> to select a new ISDN channel unit and channel.

9.3   **Configure Loop Start/Ground Start Channel Units.** To configure and test a loop start/ground start channel unit, follow the instructions in paragraphs 9.3.1 through 9.3.4.

> 📝 **Some screens can be different when channel units are installed in a 19-inch or 23-inch shelf. A 19-inch shelf has two systems where each has from one to six channel units. A 23-inch shelf has four systems where each has from one to three channel units. The example screens, where appropriate, show only a 23-inch shelf with three channel units.**

9.3.1   Set up the channels for loop start or ground start:

1   From the Main Menu, type <B> then press <Enter> to display the Setup Menu:

```
    11-FEB-98           PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                            SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1

        CURRENT STATUS: OK                                         LOGGED IN: COT
        ALARMING TERMINAL: NONE
                                                            CHREV: SPAN 1


                                    SETUP MENU
    -----------------------------------------------------------------------
                             A)  SYSTEM SETUP
                             B)  TIME SLOTS ASSIGNMENT
                             C)  CHANNEL CONFIGURATION
                             D)  POTS LOOP/GROUND START SETUP
                             E)  ISDN CHANNEL SETUP

                          CTRL-X) Main Menu    e(X)it

            [COT] ENTER COMMAND> D
```

2   Type <D> then press <Enter> to display the Pots Ground/Loop Start Configuration Menu:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System             SYSTEM: 1
                        POTS GROUND/LOOP START CONFIGURATION
--------------------------------------------------------------------------------
                    CU1        CU2        CU3
Channel    COT     (POTS8)    (POTS8)    (ISDN4)
           RT      (POTS8)    (POTS8)    (ISDN4)    (---)
--------------------------------------------------------------------------------
1                  LOOP       GND        N/A
2                  LOOP       GND        N/A
3                  LOOP       GND        N/A
4                  LOOP       GND        N/A
5                  LOOP       GND        -
6                  LOOP       GND        -
7                  LOOP       GND        -
8                  LOOP       GND        -


                        L) Change to Loop Start
                        G) Change to Ground Start
                        CTRL-X) Main Menu     e(X)it


        [COT] ENTER COMMAND>L
```

3   Type <L> then press <Enter> to change the channel to loop start, or type <G> then press <Enter> to change the channel to ground start. You get a prompt to enter the card and channel numbers.

4   At the prompt, type the card number followed by a comma, and then type the channel number for the channel unit and channel you want to disable/enable then press <Enter> (that is, type "1,1" for card 1 on channel 1).

9.3.2   Configure loop start/ground start channel unit channels, starting at the Setup Menu (refer to Table 6 on page 23 for channel configuration options).

> **There are 24 time slots available. Enable is the default for the channels.**
> **Disable channels only when the time slots are required by another channel unit.**

1   Type <C> then press <Enter> to display the Channel Configuration menu:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES., PG-FLEX TERMINAL            00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System           SYSTEM: 1
                               CHANNEL CONFIGURATION
--------------------------------------------------------------------------------
                   CU1        CU2        CU3
Channel    COT     (POTS8)    (POTS8)    (ISDN4)
           RT      (POTS8)    (POTS8)    (ISDN4)    (---)
--------------------------------------------------------------------------------
1                  ON         ON         ON
2                  ON         ON         ON
3                  ON         ON         DISABLED
4                  ON         ON         DISABLED
5                  ON         ON         -
6                  ON         ON         -
7                  ON         ON         -
8                  ON         ON         -

                        2 Time-Slots Available
                   D)isable Channel      E)nable Channel
                      CTRL-X) Main Menu     e(X)it

           [COT] ENTER COMMAND> D
```

2   Type <D> (disable) or <E> (enable) then press <Enter>. You get a prompt to enter the card and channel numbers.

3   At the prompt, type the card number followed by a comma, and then type the channel number for the channel unit and channel you want to disable/enable then press <Enter> (that is, type "1,1" to disable/enable card 1 on channel 1).

9.3.3 View time slot assignments for the loop start/ground start channel unit, starting at the Setup Menu.
Type <B> then press <Enter> to display the Time Slots Assignment menu:

```
11-FEB-98         PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                         SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1


                              TIME SLOTS ASSIGNMENT
     ------------------------------------------------------------------------------
     TIME       CHANNEL    TIME      CHANNEL    TIME      CHANNEL    TIME      CHANNEL
     SLOT       ASSIGNMENT SLOT      ASSIGNMENT SLOT      ASSIGNMENT SLOT      ASSIGNMENT
     ------------------------------------------------------------------------------
       1:        CU1 CH1     7:       CU1 CH7     13:      CU2 CH5     19:      CU3 CH1
       2:        CU1 CH2     8:       CU1 CH8     14:      CU2 CH6     20:      CU3 CH2
       3:        CU1 CH3     9:       CU2 CH1     15:      CU2 CH7     21:      CU3 CH2
       4:        CU1 CH4    10:       CU2 CH2     16:      CU2 CH8     22:      CU3 CH2
       5:        CU1 CH5    11:       CU2 CH3     17:      CU3 CH1     23:      ----
       6:        CU1 CH6    12:       CU2 CH4     18:      CU3 CH1     24:      ----
     ------------------------------------------------------------------------------


                          CTRL-X) Main Menu     e(X)it



            [COT] ENTER COMMAND> X
```

> These values are automatically generated. However, when you cycle power to
> the system or hot plug a new channel unit, these values can change.

9.3.4 Test the loop start and ground start channels:

1 Verify that front panel ACTIVE indicators are OFF and FAULT indicator is off.

2 Test circuits for loop start.

3 Test circuit for ground start.

9.4   **View Doubler Status.** Paragraphs 9.4.1 through 9.4.2 provide steps for viewing the status of a doubler unit(s).

9.4.1   View status for the doubler unit(s) through the HDSL Status menu.

1   Starting at the Main Menu, type <A> then press <Enter> to display the Status Menu:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL
00:01:08
                          SYSTEM ID: 24 Channel PG-Flex System        SYSTEM: 1

   CURRENT STATUS: OK                                        LOGGED IN: COT
   ALARMING TERMINAL: NONE
                                                        CHREV: SPAN 1


                               STATUS MENU
 ----------------------------------------------------------------------------


                       A) SYSTEM STATUS
                       B) CHANNEL STATUS
                       C) HDSL STATUS
                       D) ALARM HISTORY
                       E) ISDN PERFORMANCE MONITORING


                         CTRL-X) Main Menu     e(X)it


        [COT] ENTER COMMAND> c
```

2   Type <C> then press <Enter> to display the HDSL Status menu:

```
 11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System           SYSTEM: 1

                                    HDSL STATUS
 -------------------------------------------------------------------------------
   ALARMS: NONE
 -------------------------------------------------------------------------------
                      COT HDSL-1   COT HDSL-2    DB1 HDSL-1    DB1 HDSL-2
                       mn/cr/mx     mn/cr/mx      mn/cr/mx      mn/cr/mx
        MARGIN (db):   19/20/21     19/20/21      21/21/22      21/21/22
        PULSE ATTN (db):    0           0             0             0
        PPM OFFSET (ppm):   0           0            -5            -5
        24 HOUR ES:         7           4             0             0
        24 HOUR UAS:        0           0             0             0
 -------------------------------------------------------------------------------
          LAST CLEARED: DEC 05, 00:13
 -------------------------------------------------------------------------------

                      A) 24-HOUR PERFORMANCE HISTORY
                      B) 7-DAY PERFORMANCE HISTORY
                 CTRL-X) Main Menu   R)eset   e(X)it   (S)pan

  [COT] ENTER COMMAND> r   DO YOU WISH TO RESET THE PERFORMANCE HISTORY? [Y/N] y
```

3   Type a letter (Table 7) at the prompt to accomplish one of the following:

Table 7. ISDN Channel Unit Configuration Options

Type this letter	To get this response
A	Shows a 24 hour performance history.
B	Shows a 7-day performance history.
CTRL-X	Exits the current screen and returns to the Main Menu.
R	Resets minimum and maximum margins, 24-Hour ES, 24-Hour UAS, and 24-Hour Performance History. A prompt has you type Y to confirm the reset or type N to cancel the reset.
X	Exits this screen and returns to Status Menu.
S	Shows doubler spans not seen on the current screen. The first screen shows the span from the COT to the doubler and the second screen shows the span from the doubler to the RT. Another screen appears when using two doublers.

9.4.2 View status for the doubler unit(s) through the alarm history menu by completing the following.

1 Type <D> then press <Enter> at the Main Menu. The System Alarm History menu displays:

```
   11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                          SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1

                                  SYSTEM ALARM HISTORY
       ---------------------------------------------------------------------------
     LAST CLEARED:  ----
       ---------------------------------------------------------------------------

                          A) COT SHELF ALARM HISTORY
                          B) RT SHELF ALARM HISTORY
                          C) SPAN ALARM HISTORY


                    CTRL-X) Main Menu    R)eset    e(X)it


            [COT] ENTER COMMAND> c
```

2 Type <C> then press <Enter> at the Main Menu. The Alarm History menu displays:

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1

                              SPAN-1 ALARM HISTORY
      --------------------------------------------------------------------------
        Type          First           Last             Status    Current   Count
        ------        --------------  --------------   ----------  -------   -----

        HDSL1 UAS     DEC 24, 00:00   DEC 24, 00:00    ENABLED     NONE        1
        HDSL2 UAS     DEC 24, 00:00   DEC 24, 00:00    ENABLED     NONE        1




                       CTRL-X) Main Menu    e(X)it    (S)pan >
```

3 Type <S> then press <Enter> to get the additional screens for the doubler spans.

The following Alarm History menu (Span 2) is only available when a doubler is present in the circuit.

```
11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1

                              SPAN-2 ALARM HISTORY
      --------------------------------------------------------------------------
        Type          First           Last             Status    Current   Count
        ------        --------------  --------------   ----------  -------   -----
        HDSL2 UAS     DEC 24, 00:00   DEC 24, 00:00    ENABLED     NONE        1






                       CTRL-X) Main Menu     e(X)it    (S)pan >
```

9.5 **Maintenance.** The following paragraphs provide procedures for testing a PG-Flex system. Paragraph 9.5.1 describes the steps for testing a circuit using the metallic access options, and paragraph 9.5.2 describes the steps to initiate an ISDN loopback test.

Type <C> then press <Enter> from the Main Menu to access the Maintenance Menu:

```
11-FEB-98           PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1
    CURRENT STATUS: OK                                            LOGGED IN: COT
    ALARMING TERMINAL: NONE
                                                          CHREV: SPAN 1

                               MAINTENANCE MENU
    --------------------------------------------------------------------------

                             A) METALLIC ACCESS
                             B) ISDN LOOP BACK

                        CTRL-X) Main Menu    e(X)it


        [COT] ENTER COMMAND> a
```

9.5.1 **Metallic Access.** A metallic access connection to a subscriber circuit can be setup using the metallic access options:

1 From the Maintenance Menu, type <A> then press <Enter>. The Metallic Access Menu displays:

```
11-FEB-98           PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1
    CURRENT STATUS: OK                                            LOGGED IN: COT
    ALARMING TERMINAL: NONE
                                                          CHREV: SPAN 1
                               METALLIC ACCESS MENU
    --------------------------------------------------------------------------
                             A) COT - BRIDGING
                             B) COT - LOOKING IN
                             C) COT - LOOKING OUT
                             D) RT  - LOOKING OUT
                             E) RT  - LOOKING IN
                             F) RT  - BRIDGING
                             G) SUBSCRIBER BYPASS

                             R)emove access

                        CTRL-X) Main Menu    e(X)it


        [COT] ENTER COMMAND> a
```

Table 8 defines the functions of the metallic access menu parameter selections.

Table 8. Metallic Access Menu Options

Type Letter	Parameter	Function
A	COT - Bridging	Provides the ability to monitor a subscriber circuit connection between the switch and the specified CO channel unit Tip/Ring pair.
B	COT - Looking In	Provides the ability to verify the connection between the switch and the specified channel unit Tip/Ring pair. The channel under test is disconnected from the switch for this function. The technician will be able to verify connectivity of the channel under test back to the switch.
C	COT - Looking Out	Provides the ability to stimulate the subscriber connection through the CO channel unit. The switch is disconnected from PG-Flex for this function.
D	RT - Looking In	Provides the ability to monitor the subscriber circuit at the RT channel unit Tip/Ring pair with the subscriber terminal equipment disconnected.
E	RT - Looking Out	Provides the ability to verify the channel the subscriber drop off with the RT channel unit disconnected.
F	RT - Bridging	Provides the ability to monitor the connection between the RT channel unit and the subscriber terminal equipment.
G	Subscriber Bypass	Provides a metallic connection from the switch to the subscriber's terminal equipment for the selected channel, bypassing the PG-Flex carrier transport. This is the only access connection that can be maintained after the technician logs off the maintenance port.

3   From the Metallic Access Menu, type a letter (A through G) then press <Enter>. The Metallic Access selection menu displays:

```
 11-FEB-98          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:08
                         SYSTEM ID: 24 Channel PG-Flex System           SYSTEM: 1

    CURRENT STATUS: OK                                         LOGGED IN: COT
    ALARMING TERMINAL: NONE
                                                            CHREV: SPAN 1

                              METALLIC ACCESS MENU
 ------------------------------------------------------------------------------
                     Press ESCAPE to return to previous menu




       Enter Card and Channel To Be Accessed/Bypassed (CARD,CHANNEL): 2,1
```

9.5.1.1 To test a subscriber drop:

a Select the card and channel for the subscriber circuit being tested. (Metallic access to the selected circuit is provided at the test jack on the FPI-729 or FAU-728 front panels.)

b Use a VOM, Butt-in, or other test equipment to test the subscriber circuit.

c At the prompt for the system to be accessed, enter the card number followed by a comma, and then enter the channel number.

```
11-FEB-98         PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL       00:01:08
                        SYSTEM ID: 24 Channel PG-Flex System          SYSTEM: 1
   CURRENT STATUS: OK                                         LOGGED IN: COT
   ALARMING TERMINAL: NONE
                                                         CHREV: SPAN 1


                        METALLIC ACCESS MENU
   -----------------------------------------------------------------------------


                A) COT - BRIDGING    (ENABLED ON CU1/CH2)
                B) COT - LOOKING IN
                C) COT - LOOKING OUT
                D) RT  - LOOKING OUT
                E) RT  - LOOKING IN
                F) RT  - BRIDGING
                G) SUBSCRIBER BYPASS

                R)emove access

                      CTL-X) Main Menu    e(X)it

        [COT] ENTER COMMAND>
```

9.5.1.2 To release a subscriber drop, select <R> then press <Enter>.

9.5.2   **ISDN Loopback Menu.** Initiate an ISDN loop back test starting at the Maintenance Menu. Type <B> then press <Enter>. The ISDN Loopback Menu displays:

```
   11-FEB-98              PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:08
                               SYSTEM ID: 24 Channel PG-Flex System            SYSTEM: 1
                                        ISDN LOOPBACK MENU
   -------------------------------------------------------------------------------
   COT LOOPBACK MAP      CARD:1
   -------------------------------------------------------------------------------
   LOOPBACK              CH1             CH2             CH3             CH4
   -------------------------------------------------------------------------------
   B1 DSL               normal          normal          normal          normal
   B2 DSL               normal          normal          normal          normal
   2B+D DSL             normal          normal          normal          normal
   B1 DC                normal          normal          normal          normal
   B2 DC                normal          normal          normal          normal
   2B+D DC              normal          normal          normal          normal

                        P)revious Card  or  N)ext Card
                        S)witch between COT or RT Loopback
                        C)hange Loopback Mode

                              CTRL-X) Main Menu     e(X)it

            [COT] ENTER COMMAND> s
```

9.5.2.1   To initiate a loop back on an ISDN line:

a   Select ISDN Loopback from the Maintenance Menu.

b   Select <C> from the ISDN Loopback Menu.

c   Select the card and channel to be tested.

d   Select the Loopback type desired. In most instances, a loopback of the B1 or B2 channels towards the office (DSL) or customer (DC) is sufficient to verify operation of the ISDN circuit.

9.5.2.2   To release Loopback on an ISDN line:

a   Select "Change Loopback Mode" from the ISDN Loopback Menu.

b   Select the card and channel of the ISDN card to be released from the loopback test.

c   Select "Set Normal" from the loopback mode menu.

10. Troubleshooting

10.1   Table 9 provides troubleshooting procedures based on indications displayed by the FLL-712 front panel indicators.

Table 9. *FLL-712 COT Line Unit Troubleshooting*

Indication	Problem	Action
POWER LED off	1 The COT Shelf is no longer receiving CO battery.	Verify that the fuse on the CO fuse panel is good. Verify wiring between the COT shelf and the CO fuse panel, and from the panel to the CO battery.
	2 The COT line unit fuse F1 has blown.	Replace the fuse.
LOOP 1 (2) SYNC LED flashing or off	1 The HDSL line is attempting to synchronize with the remote terminal line unit or cannot detect the HDSL signal from the remote terminal line unit. This is usually an indication that there is a problem with the HDSL circuit between the COT and RT (assuming the FAULT LED is *off*).	Verify the HDSL circuits are terminated properly and with the correct orientation. Measure the loop resistance of each HDSL circuit (shorting the pair at the far end). The loop resistance must be less than that shown in Table 2.
	2 The COLU and RTLU are incompatible. That is, one is a T1 version and the other is an E1 version	Replace the incompatible line unit
LOOP 1 (2) MARGIN LED on	The HDSL line margin level is below a preset level.	Check the preset Margin Alarm level in the Setup Menu.
FAULT LED on	Faulty FLL-712 COT line unit or faulty FRL-742 RT line unit	Check that none of the HDSL pairs are shorted to ground. Check for continuity from COT to RT on all HDSL lines. Replace the COT line unit, if the RT line unit is confirmed good. Otherwise, replace the RT line unit.

D. TECHNICAL SUPPORT

11. Technical Support

11.1   PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contacting PairGain
             Customer Service Engineering group at:

    Telephone: (800) 638-0031 or (714) 832-9922

    Fax: (714) 832-9924

11.2   During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday - Friday, excluding
             holidays), technical assistance calls are normally answered directly by a Customer Service Engineer.
             At other times, a request for technical assistance is handled by an on-duty Customer Service
             Engineer through a callback process. This process normally results in a callback within 30 minutes
             of initiating the request.

11.3   In addition, PairGain maintains a computer bulletin board system for obtaining current information
             on PairGain products, product troubleshooting tips and aids, accessing helpful utilities, and for
             posting requests or questions. This system is available 24-hours-a-day by calling (714) 730-3299.
             Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

E. CERTIFICATION AND WARRANTY

12. Certification

12.1   **FCC Compliance.** The FLL-712 List 3A COT line unit complies with the limits for Class A digital devices pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operating this equipment in a residential area can cause harmful interference in which case the user will be required to correct any interference at his own expense.

12.2   For information on cabling, proper connections, grounding and line power, refer to the appropriate instruction manual for the unit being installed.

12.3   All external wiring must follow the provisions in the current edition of the National Electrical Code.

13. Warranty

13.1   PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 5 years from the date of original shipment, given proper customer installation and regular maintenance. PairGain will repair or replace any unit without cost during this period if the unit is found to be defective for any reason other than abuse or improper use or installation.

13.2   Only an authorized PairGain representative can perform repairs. If the unit fails, replace it with another unit and immediately report failure to PairGain. Any repairs or modifications made to the unit by unauthorized field personnel will void the warranty.

13.3   If a unit needs repair, call PairGain for a Return Material Authorization (RMA) number and return the defective unit, freight prepaid, along with a brief description of the problem, to:

> PairGain Repair Center
> 14352 Franklin Avenue
> Tustin, CA 92780-7013
>
> FAX: (714) 730-2961
> Phone: (714) 730-2800 or (800) 370-7670

13.4   PairGain will continue to repair faulty modules beyond the warranty program for a nominal charge. Contact your PairGain sales representative for details and pricing.

F. ABBREVIATIONS AND GLOSSARY

14. Abbreviations

CO	Central Office
COT	Central Office Terminal
LU	Line Unit
MLT	Mechanized Loop Testing
PBX	Private Branch Exchange
PCM	Pulse Code Modulation
PGTC	Pair Gain Test Controller
POTS	Plain Old Telephone Service
RMA	Return Material Authorization
RT	Remote Terminal

15. Glossary

Margins	Indicates the excess signal to noise ratio, at either the COT or RT, relative to a 10^{-7} Bit Error Rate. *cr* is the current margin, *mn* is the minimum margin since last cleared, *mx* is the maximum value since cleared, and N/A means Not Available. The normal range of a typical margin is from 22 to 6 dB.
Pulse Attenuation	Indicates the attenuation of the 2B1Q pulse from the distant end. PG-Flex operates with pulse attenuations in excess of 30 dB. This value is related to the cable pair's 196-kHz loss. The pulse attenuation is a more direct indication of the loop attenuation to the 2B1Q signal than the 196-kHz loss. The normal range of pulse attenuation is from 1 to 32 dB.
PPM	Indicates the relative offset of the crystal oscillator in the RT line unit from the COT line unit's crystal oscillator. Any value between -64 and +64 is adequate. Values outside this range indicate out of tolerance components or excessive temperature drift of critical components.
HDSL 24 Hour ES	The number of 1-second intervals that contained at least one CRC error. This value is a running total of errored seconds (ES) for the last 24 Hours.
HDSL 24 Hour UAS	The number of seconds (unavailable seconds) the HDSL loop was out of synchronization.

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DNV

DNV Certification, Inc.
Certificated Firm

PAIRGAIN
THE COPPEROPTICS COMPANY