# PG-FLEX 32 CHANNEL
# REMOTE TERMINAL LINE UNIT

| Model | List Number | Part Number |
|---|---|---|
| FRL-746 | 3A | 150-1346-31 |


**PAIRGAIN TECHNOLOGIES, INC.**
**ENGINEERING SERVICES TECHNICAL PRACTICE**
**SECTION 363-746-131-01**

**Revision History of This Practice**
Revision 01—May 19, 1998
A) Initial Release

PAIRGAIN

## USING THIS TECHNICAL PRACTICE

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

**Notes contain information about special circumstances.**

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

# TABLE OF CONTENTS

# PRODUCT OVERVIEW

This section provides a product description, and defines the features and specifications of a PairGain® PG-Flex™ FRL-746 List 3A Remote Terminal (RT) line unit.

## Description and Features

The FRL-746 List 3A RT line unit is the remote end of the PG-Flex subscriber carrier system, and resides in a PairGain FRE-765 RT enclosure. The FRL-746 carries up to 32 subscriber channels between a Central Office Terminal (COT) and an RT. The FRL-746 line unit provides access through its front panel RS-232 interface (Craft port) to view system options, monitor performance, and view system status using an ASCII terminal.

The FRL-746 List 3A uses PairGain's High-bit-rate Digital Subscriber Line (HDSL) 2B1Q (2 binary 1 quaternary line code) technology to provide the equivalent of 2.048 Mbps digital transmission rate, plus signaling, over two copper wire pairs. The HDSL can include unterminated bridge taps, and is used:

- without using repeaters
- without loop conditioning
- without pair selection

The FRL-746 List 3A supports PG-Flex doublers (FDU-452) to extend the range of a PG-Flex subscriber carrier system to 21.4 kft (6.6 km) with 24 AWG loops, or 16.2 kft (5.0 km) with 26 AWG loops. Two doublers can triple the range to 32.1 kft (9.9 km) with 24 AWG loops, or to 24.3 kft (7.5 km) with 26 AWG loops.

The FRL-746 List 3A supports:

- 32 subscriber channels
- PG-Flex doublers (FDU-452) in systems transporting POTS and ISDN circuits
- 4Tel compatible Loop Test Systems
- Mechanical Loop Testing (MLT) and Pair Gain Test Controller (PGTC) when an FPI-729 List 1 PGTC interface is installed in the COT shelf
- ISDN channel units
- loop start and ground start channel units

## Front Panel

Figure 1 shows the FRL-746 List 3A line unit front panel. Table 1 on page 3 lists the indicators and modes for the front panel LEDs.

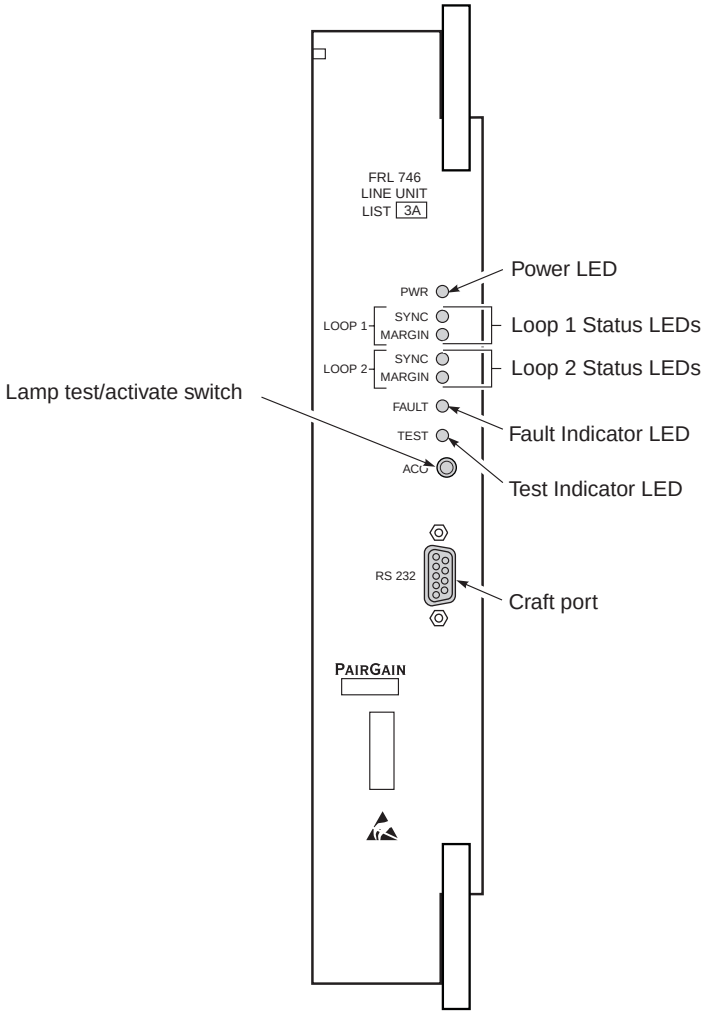


***Figure 1.*** *FRL-746 List 3A Front Panel*

***Table 1.*** *FRL-746 List 3A Front Panel LEDs*

| LED | Mode | Indicates |
|---|---|---|
| PWR | Solid Green | Power applied and line feed operating normal. |
| | OFF | Not receiving power from Central Office Line Unit (COLU) or normal operation after two minutes. |
| 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 between COT and RT. |
| | OFF | HDSL line 1 does not detect an active CO Line 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 between COT and RT. |
| | OFF | HDSL line 2 does not detect an active CO Line Unit. |
| LOOP 2 MARGIN | Solid Yellow | HDSL line 2 is below preset margin threshold. |
| | OFF | HDSL line 2 margin is above the preset margin threshold. |
| TEST | Blinking Yellow | A subscriber test connection has been established. |
| | OFF | No tests active in system. |
| FAULT | Solid Red | Fault in the system. |
| | OFF | No faults are detected in system. |

# Specifications

## Electrical Characteristics

| | |
|---|---|
| RT Power Supply Input Voltage | +100 Vdc to +130 Vdc (Line 1)<br>–100 Vdc to –130 Vdc (Line 2) |
| RT Power Supply Input Power | Less than 45 Watts |

## Environmental

| | |
|---|---|
| Operating Elevation | –200 ft. to 13,000 ft. (–60 m to 4000 m) |
| Operating Temperature & Humidity | –40° F to +150° F (–40° C to +65° C)<br>5% to 95% (non-condensing) |

## Physical

| | |
|---|---|
| Dimensions | |
| Height: | 12.00 in. (30.5 cm) |
| Width: | 2.25 in. (5.7 cm) |
| Depth: | 4.50 in. (11.4 cm) |
| Weight | 1.4 lb. (0.6 kg) |

# FUNCTIONAL DESCRIPTION

This section provides an overview of a PG-Flex system, how HDSL technology provides 32 DS0 channels, and how a subscriber drop is connected to a metallic bypass pair.

## Overview

PG-Flex is a small-capacity, universal subscriber carrier system supporting up to 32 DS0 channels including Plain Old Telephone Service (POTS), Ground Start/Loop Start, and Integrated Services Digital Network (ISDN) services–Dataphone Digital Service (DDS) is not currently supported.

A PG-Flex system is comprised of one line unit and one (or more) channel units at both the CO and the RT (see Figure 2). The POTS channel units use a Pulse Coded 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 two 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 RT side of a PG-Flex system mounts into an FRE-765 RT enclosure and supports one system, which includes one line unit and up to four channel units. The RT line unit includes the HDSL transceivers(s) and converts the line power from the COT into the voltages required by the remote terminal electronics. The channel units must be the same type of card as the channel units installed at the CO.

Power is supplied from the CO to the RT over the HDSL transmission lines. The maximum distance from the CO to the RT is 10.7 kft (3.3 km) using 24 AWG (0.5 mm) cable. (Refer to “HDSL Transmission” on page 5 for more information.)

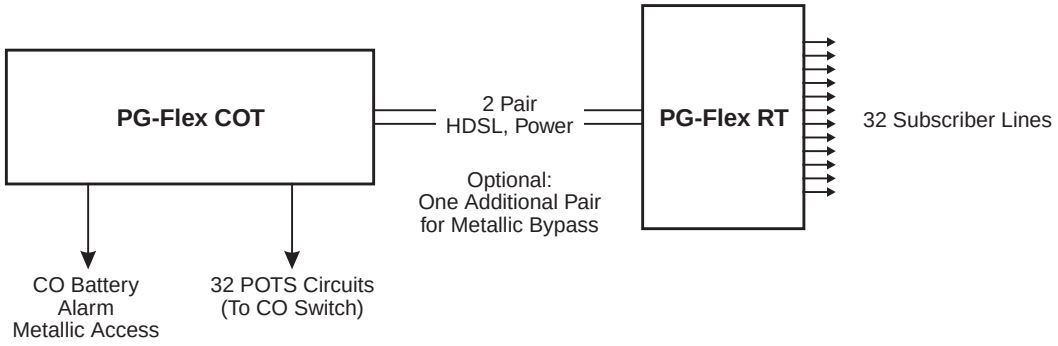


***Figure 2.*** *Typical PG-Flex Configuration*

## HDSL Transmission

PG-Flex uses HDSL transmission technology between the COT and RT. This technology provides up to 32 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. Because of HDSL transmission technology, the lines require no special conditioning and may include unterminated bridge taps, but cannot include load coils.

The line interface is a two-pair, 1110-kbps full-duplex 2B1Q transmission format. The dual HDSLs provide 32 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*.

The distance limitation for HDSL transmission is based on a maximum signal attenuation of 35 dB. Since signal attenuation decreases as cable size increases, the larger the gauge (19 AWG vs. 26 AWG), the greater the distance between the FRL-746 List 3A COT shelf and the RT enclosure. Table 2 identifies these distances (at a cable temperature of 68°F):

***Table 2.*** *PG-Flex 16 and 32 Channel HDSL Distances**

| Wire Gauge | Loop Length | DC Resistance |
|---|---|---|
| 26 AWG (0.4 mm) | 8.1 kft (2.5 km) | 686 Ω |
| 24 AWG (0.5 mm) | 10.7 kft (3.3 km) | 569 Ω |
| 22 AWG (0.6 mm) | 13.7 kft (4.2 km) | 457 Ω |
| 19 AWG (0.9 mm) | 19.4 kft (5.9 km) | 322 Ω |

* Loops over 570 Ω will not provide full loop current and ring voltage with all 32 channels off-hook simultaneously.

## Subscriber Drop Testing

For subscriber drop testing from the CO, PG-Flex is able to select and connect any subscriber drop to a metallic bypass test pair at the RT. PG-Flex extends this connection back to the COT where it switches onto the test access bus or to the corresponding subscriber line on the COT channel card.

Metallic access is performed from the subscriber's COT. Refer to the FLL-716 technical practice for more information.

## Operational Capabilities

Figure 3 shows a block diagram of the FRL-746 List 3A RT line unit. The power is supplied from the COT line unit (FLL-716 List 3A) to power the remote terminal. 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 (see Figure 1 on page 3).

The FRL-746 List 3A provides the following functions for each 32-channel system in a single RT enclosure:

- system power supply
- HDSL line transceivers
- front panel status indicators
- RS-232 Craft Maintenance Port Interface (DCE)
- line and drop test circuits

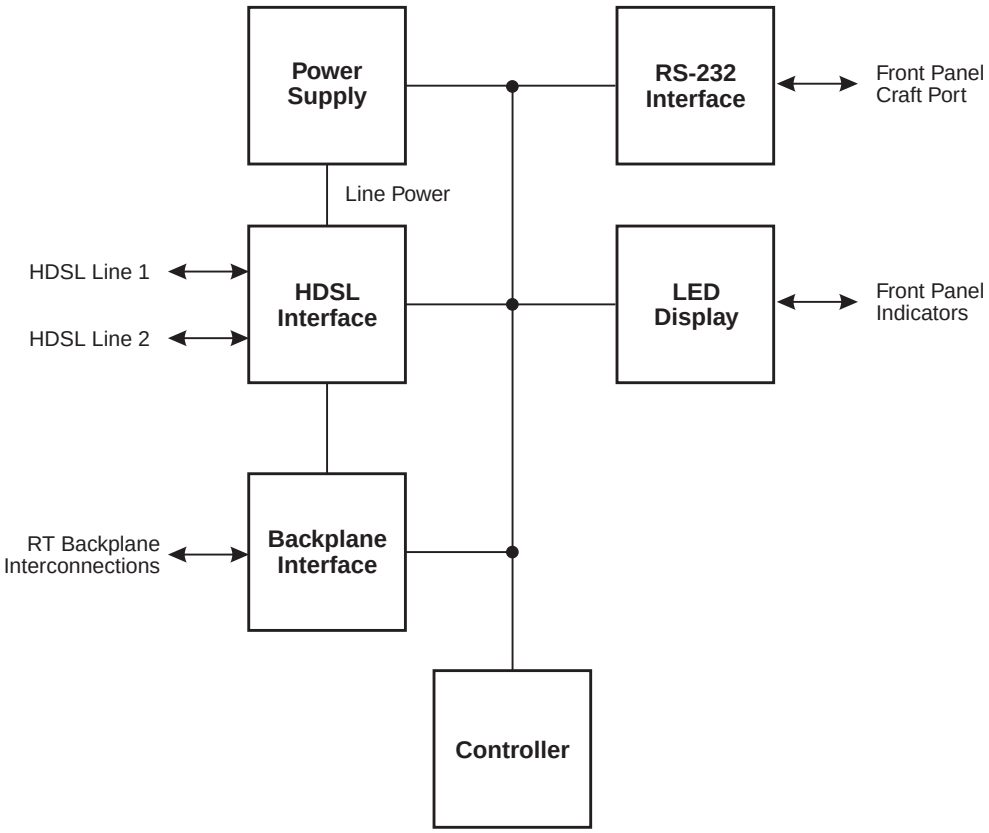


***Figure 3.*** *FRL-746 List 3A Block Diagram*

# Terminal Management

The terminal management function at the RT allows the technician to view information about the PG-Flex system using an ASCII terminal (or modem with a null modem cable) connected to the Craft port. With this function, the technician can access a series of menus to do the following:

- view system status
- view system options
- monitor performance
- obtain an inventory report

## Connecting to a Terminal

Figure 4 shows the pinouts for connecting the FRL-746 List 3A RS-232 (DB-9) Craft port to an ASCII terminal.

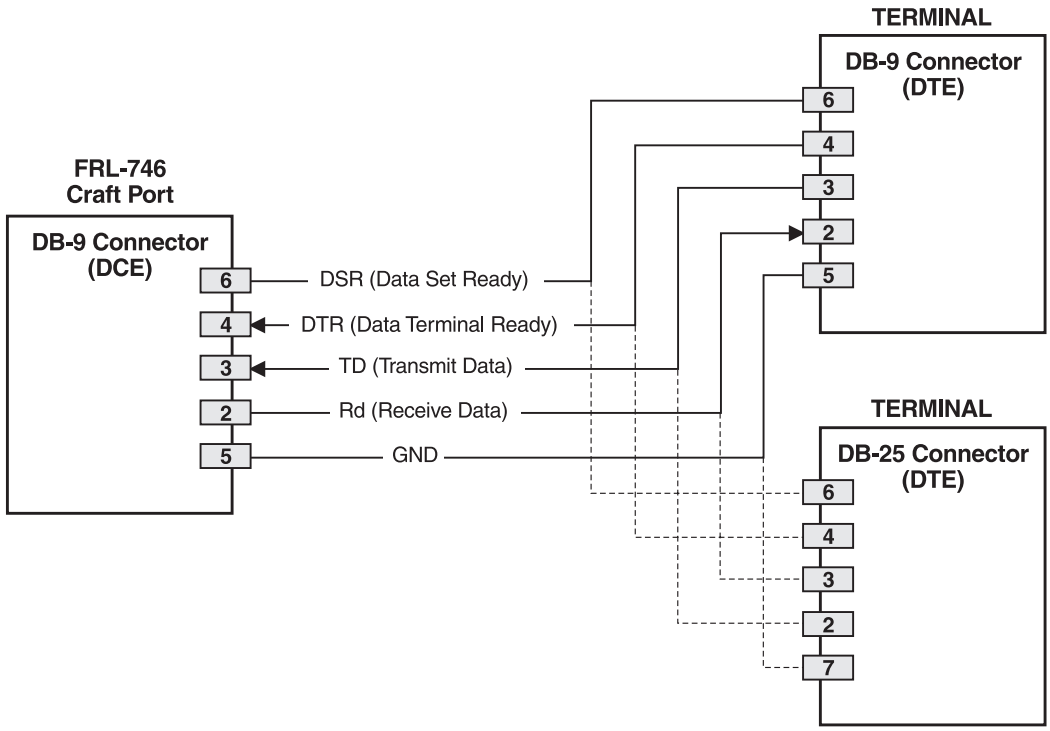


***Figure 4.*** *Connecting the FRL-746 List 3A to an ASCII Terminal*

## Connecting to a Modem

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 a CD signal when it connects with another modem and to drop CD when it disconnects. Otherwise, if set ON, the FRL-746 List 3A connection will function properly but will not log out properly when disconnected. Using Data Carrier Detect (DCD) from the modem ensures that the FRL-746 List 3A logs off if the carrier signal disappears. Figure 5 shows the pinouts for connecting the FRL-746 List 3A to a modem using a null-modem cable.

It is recommended that Data Terminal Ready (DTR) override be OFF. This allows a modem call to terminate properly when the FRL-746 List 3A drops Data Set Ready (DSR); which is null-modemed to a DTR input on the modem.

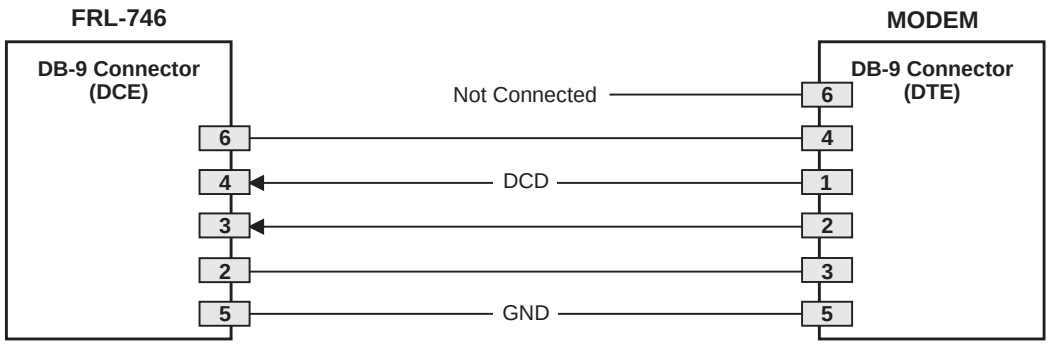


***Figure 5.*** *Connecting the FRL-746 List 3A to a Modem*

The connection is set up as:

- Baud Rate: 1200 to 9600 baud (9600 baud recommended)
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: None

The protocol requires that Data Terminal Ready (DTR) is active from the terminal to prevent automatic log off.

## Menus and Display Structure

Figure 6 shows the menu structure which is accessed through the Craft port on the FRL-746 List 3A RT line unit.

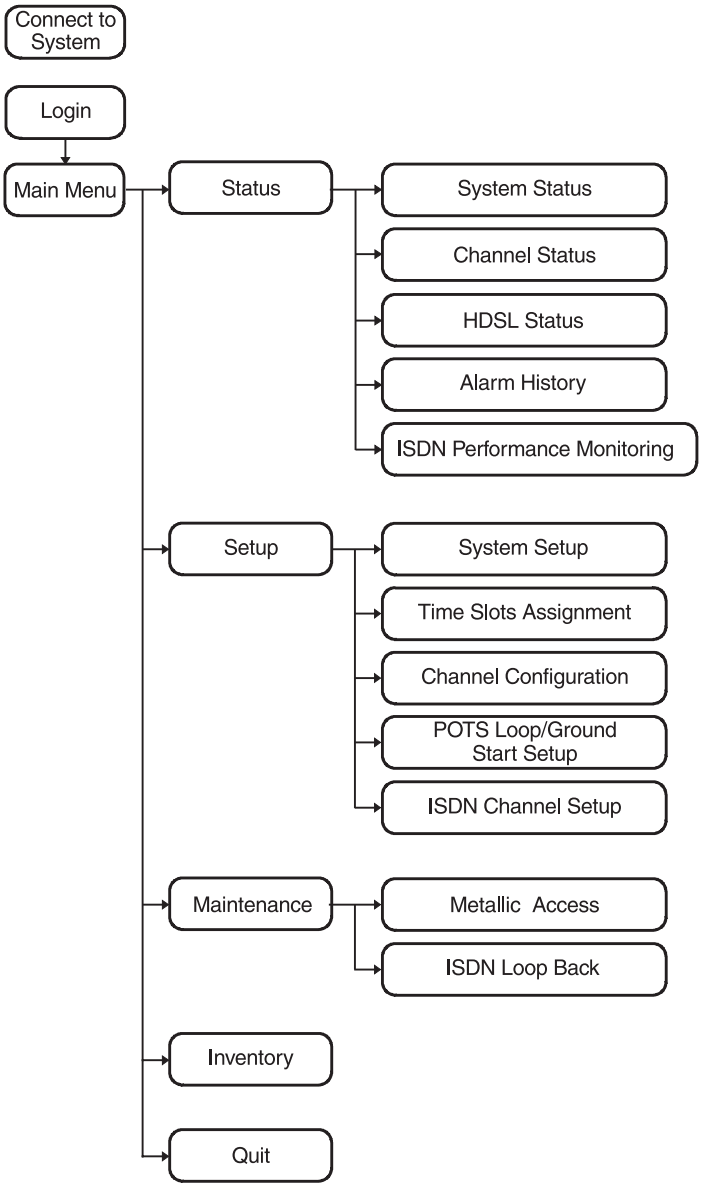


***Figure 6.*** *Terminal Menu and Display Structure*

## Navigating Through the Menus

Access the menus by typing the letter (A through D) from the Main Menu then pressing ENTER. The menu structure requires that you press enter each time you select an option or setting to continue. Table 3 describes keys you can use from the ASCII terminal keyboard to navigate through the menus.

***Table 3.*** *Key Functions*

| Key | Function |
|---|---|
| Q | Log out from the Main Menu |
| ENTER | Executes commands or selects a menu |
| ESC | Returns to the previous menu |
| CTRL + X | Returns to the Main Menu |

## Selecting an Option

From the ASCII terminal select an option as follows:

**1** Type the letter of your selection, then press ENTER. The screen prompts you for specific information.

**2** Type the information, following the instructions on the screen, then press ENTER.

**3** Type CTRL + X to return to the Main Menu.

# INSTALLATION AND TEST

The section provides procedures for unpacking, installing, and monitoring a FRL-746 List 3A RT line unit.

## Unpacking

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 "Product Support" on page 34. If you must store the equipment for a prolonged period, store the equipment in its original container.

## Installation

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

**The following procedure assumes that a FLL-716 line unit is installed in the CO side of the PG-Flex system.**

Install FRL-746 and verify operation as follows:

1. Insert the FRL-746 into the RT enclosure and verify:
   - all LEDs turn on for about one second
   - PWR and FAULT LEDs remain on
   - after about 30 seconds, SYNC LEDs for Line 1 and Line 2 begin to flash (both COT and RT)
   - within 35 seconds, SYNC LEDs for Line 1 and Line 2 turn on
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

# Monitoring a PG-Flex System

The terminal management function at the remote terminal enables you to monitor the entire PG-Flex system from an ASCII terminal connected to the Craft port. (Refer to "Terminal Management" on page 7 for connection procedures and protocols.)

## Power-up and Connection Screen

Connect an ASCII terminal to the FRL-756 Craft port. The Power-Up and Connection screen displays (assuming the terminal is set for 9600 baud):

```
[RT] Ready
```

## Log On Screen

The FRL-746 List 3A 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. The log on screen displays:

```
12-MAY-98   PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        00:01:06
                SYSTEM ID: PG-Flex 32 Channel System          SYSTEM: 2

[RT] LOGIN PASSWORD>
```

**2** Type your password. The password input is echoed back to your terminal screen with "*" characters.

3 Press **ENTER**.

**If you do not have your login password, contact the PairGain Customer Service Engineering group (see "Product Support" on page 34) for access using a Master Password.**

## Main Menu

From the Main Menu, other menus can be accessed to view system configuration, view metallic access connections, and view status information for a PG-Flex system. The Main Menu displays after a successful log on:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

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


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

                                A) STATUS

                                B) SETUP

                                C) MAINTENANCE

                                D) INVENTORY

                                    Q)uit


     [RT] ENTER COMMAND> B
```

Type a letter (**A** through **D**) then press **ENTER** to access the desired Main Menu option (see Table 4 on page 14 for a description of the Main Menu functions).

Type **Q** then press **ENTER** to log out.

***Table 4.*** *Main Menu Options*

| Type Letter | Parameter | Function |
|---|---|---|
| A | Status | Select the Status option from the Main Menu to display:<br>• System Status to show the equipment installed in the system and the current status (in alarm or not) of the equipment.<br>• Channel Status to show the current status of all channels in the system. Status conditions vary for the different types of channel cards. Examples of status are:<br>IDLE: channel is not off-hook or ringing<br>RING: channel is ringing<br>BUSY: channel is off-hook<br>OPEN: no connection to CO switch<br>TEST: in test mode<br>TREQ: 116 volts test request<br>SERR: PCM bus frame sync error<br>FIDL: forced idle<br>TDSB: time slots disabled<br>RBAT: reverse battery<br>****: unknown<br>NSYN: ISDN line is not synchronized with the CO switch<br>SYN: ISDN line is synchronized with the CO switch<br>• HDSL Status to show the status of the HDSL span. You can view either the 24-hour or 7-day performance history.<br>• Alarm History to show the status of system alarm conditions. Examples of alarm conditions are:<br>• COT Shelf Alarm History<br>• RT Shelf Alarm History<br>• Span Alarm History<br>• ISDN Performance Monitoring to show the following conditions:<br>PM Error Count<br>PM Threshold/Alert Info |
| B | Setup | Select the Setup option from the Main Menu to view the current setup and to set or change the following configurable items:<br>• System Setup<br>• Time Slots Assignment (view only)<br>• Channel Configuration<br>• POTS Loop/Ground Start Setup<br>• 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 from the Main Menu to view manufacturing information and version information for all the units in the system (except the FAU or FPI units). At the CO Line Unit terminal or the RT Line Unit terminal, the command displays all units in the system. |

## View System Settings

View the System Settings starting at the Main Menu.

**1** At the Main Menu, type **B** and press **ENTER**. The Setup Menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2


                                  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



     [RT] ENTER COMMAND> A
```

**2** Type a letter (**A** through **E**) then press **ENTER** to access the desired Setup Menu options (refer to Table 5 on page 16 for system settings menu definitions).

**3** Type **CTRL** + **X** to return to the Main Menu, or type **X** to go back to the previous menu.

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                               SYSTEM SETTINGS
--------------------------------------------------------------------------------
  SYSTEM DATE: .   .   .   .   .   24-MAR-98
  SYSTEM TIME: .   .   .   .   .   01:07:36
  SYSTEM ID:   .   .   .   .   .  32 Channel PG-Flex System
  AUTO LOGOUT TIME (min.): .   .   30          (DISABLED,5,30,60)
  METERED TONE FREQUENCY (kHz):    12          (DISABLED,12,16)
  RING FREQUENCY (Hz): .   .   .   30          (20,25,30)
  HDSL ES ALARM THRESHOLD: .   .   DISABLED    (DISABLED,17,170)
  HDSL MARGIN THRESHOLD:   .   .   4           (0-15,0=DISABLED)
  ALARM ON HDSL THRESHOLD: .   .   DISABLED    (DISABLED,ENABLED)
  LOCAL LOOP LENGTH:   .   .   .   SHORT       (SHORT,LONG)
  ALARM ON CONFIGURATION:  .   .   ENABLED     (DISABLED,ENABLED)
  ALARM ON INSUFFICIENT TIMESLOT:  ENABLED     (DISABLED,ENABLED)
  ALARM ON ISDN PM THRESHOLD:  .   ENABLED     (DISABLED,ENABLED)


                         CTRL-X) Main Menu    e(X)it

     [RT] ENTER CHOICE> X
```

**4** Type **CTRL** + **X** to return to the Main Menu, or type **X** to go back to the previous menu.

***Table 5.*** *System Settings Menu Options*

| Parameter | Default Value | Description |
|---|---|---|
| System Date | 01-JAN-00 | The System Date is set for each PG-Flex system individually and displays as dd-mm-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.).<br>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. |
| 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. |
| 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. |
| 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. |
| 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:<br>• DISABLED: The user is never automatically logged out.<br>• 5: The user is automatically logged out after 5 minutes.<br>• 30: The user is automatically logged out after 30 minutes.<br>• 60: The user is automatically logged out after 60 minutes. |
| 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.<br>• DISABLED: No tones are recognized.<br>• 12: Recognizes 12 kHz as the signal frequency.<br>• 16: Recognizes 16 kHz as the signal frequency. |

***Table 5.*** *System Settings Menu Options (Cont.)*

| Parameter | Default Value | Description |
|---|---|---|
| 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:<br>• 20: The ring generator is set to 20 Hz.<br>• 25: The ring generator is set to 25 Hz.<br>• 30: The ring generator is set to 30 Hz. |
| 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:<br>• DISABLED: No minor alarm is generated, regardless of the number of error seconds.<br>• 17: A minor alarm is generated after 17 error seconds.<br>• 170: A minor alarm is generated after 170 error seconds. |
| HDSL Margin Threshold | 4 | This parameter 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).<br>A default setting of 4 indicates that a minor alarm occurs when the HDSL margin is ≤ 4 dB.<br>The HDSL Margin Threshold can be set between 0 dB and 15 dB (0 dB = Disabled). |
| Alarm on HDSL Threshold | DISABLED | This parameter 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:<br>• DISABLED: A minor alarm does not occur when the HDSL ES Alarm Threshold and HDSL Margin Threshold is exceeded.<br>• ENABLED: A minor alarm occurs when the HDSL ES Alarm Threshold and HDSL Margin Threshold is exceeded. |
| 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:<br>• LONG: The PG-Flex system can support subscriber loops with a line resistance of 530 Ω or less.<br>• SHORT: The PG-Flex system can support subscriber loops with a line resistance of 400 Ω or less. |
| 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:<br>• DISABLED: A minor alarm does not occur if there is a mismatch of channel units.<br>• ENABLED: A minor alarm occurs if there is a mismatch of channel units. |

***Table 5.*** *System Settings Menu Options (Cont.)*

| Parameter | Default Value | Description |
|---|---|---|
| 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:<br>• DISABLED: A minor alarm does not occur if more circuits have been enabled than there are available time slots.<br>• ENABLED: A minor alarm occurs if more circuits have been enabled than there are available time slots. |
| 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 the following parameters:<br>• DISABLED: A minor alarm does not occur if any of the ISDN PM thresholds are exceeded.<br>• ENABLED: A minor alarm occurs if any of the ISDN PM thresholds are exceeded. |

## View ISDN Channel Setup

**When there are no ISDN cards present in the PG-Flex system, the display indicates this, and will not allow you to continue to the ISDN Channel Setup menu.**

**1** At the Setup Menu, type **E** then press **ENTER**. The ISDN Channel Setup menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                                ISDN CHANNEL SETUP
--------------------------------------------------------------------------------

                     Press ESCAPE to return to previous menu









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

**2** From the ISDN Channel Setup selection menu, type the card number followed by a comma, and then type the channel numbers and press **ENTER** for the ISDN module you want to view. The ISDN Channel Setup menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

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

                         S)ELECT NEW CARD AND CHANNEL

                         CTRL-X) Main Menu    e(X)it









     [RT] ENTER CHOICE>
```

From the ISDN Channel Setup menu you can view the parameters for the ISDN channel unit. Table 6 describes the ISDN channel unit configuration options.

***Table 6.*** *ISDN Channel Unit Configuration Options*

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

* Options shown in bold are factory default settings.

**3** From the ISDN Channel Setup Menu, type **S** then press **ENTER** to select a new ISDN channel unit and channel to view. 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.

### View the ISDN Channel Configuration.

**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** At the Setup Menu, type **C** then press **ENTER**. The Channel Configuration menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                                 CHANNEL CONFIGURATION
-------------------------------------------------------------------------------
                         CU1        CU2        CU3        CU4
   Channel   COT      (POTS8)    (POTS8)    (POTS8)    (ISDN4)
             RT       (POTS8)    (POTS8)    (POTS8)    (ISDN4)
-------------------------------------------------------------------------------
     1                  ON         ON         ON         ON
     2                  ON         ON         ON        OFF
     3                  ON         ON      DISABLED   DISABLED
     4                  ON         ON      DISABLED   DISABLED
     5                  ON         ON      DISABLED      -
     6                  ON         ON      DISABLED      -
     7                  ON         ON      DISABLED      -
     8                  ON         ON      DISABLED      -

                              2 Time slots Available

                         D)isable Channel   E)nable Channel
                            CTRL-X) Main Menu    e(X)it

      [RT] ENTER COMMAND>
```

**2** Type **X** then press **ENTER** to go back one screen.

## View ISDN Time Slots Assignment

At the Setup Menu, type **B** then press **ENTER**. The Time Slots Assignment menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL        01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                              TIME SLOTS ASSIGNMENT
-------------------------------------------------------------------------------
 TIME    CHANNEL     TIME    CHANNEL     TIME    CHANNEL     TIME    CHANNEL
 SLOT  ASSIGNMENT    SLOT  ASSIGNMENT    SLOT  ASSIGNMENT    SLOT  ASSIGNMENT
-------------------------------------------------------------------------------
   1:   CU1  CH1       9:   CU2  CH1      17:   CU3  CH1      25:   CU4  CH1
   2:   CU1  CH2      10:   CU2  CH2      18:   CU3  CH2      26:   CU4  CH1
   3:   CU1  CH3      11:   CU2  CH3      19:   CU3  CH3      27:   CU4  CH1
   4:   CU1  CH4      12:   CU2  CH4      20:   CU3  CH4      28:   CU4  CH2
   5:   CU1  CH5      13:   CU2  CH5      21:   CU3  CH5      29:   CU4  CH2
   6:   CU1  CH6      14:   CU2  CH6      22:   CU3  CH6      30:   CU4  CH2
   7:   CU1  CH7      15:   CU2  CH7      23:   CU3  CH7      31:     ----
   8:   CU1  CH8      16:   CU2  CH8      24:   CU3  CH8      32:     ----
-------------------------------------------------------------------------------

                          CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

**Timeslots are automatically generated. However, when power is cycled to the system or hot plug a new channel unit, these values may change.**

**Since PG-Flex is a universal carrier system, the specific time slot assigned to a channel is irrelevant—this screen is provided for diagnostic purposes only.**

## ISDN Performance Monitoring

Access these menus for performance monitoring of the ISDN channel units, starting from the Status Menu.

**1** At the Status Menu, type **E** then press **ENTER**. The ISDN Performance Monitoring Menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

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

                    Press ESCAPE to return to previous menu









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

**2** Type the ISDN channel unit number and the channel number then press **ENTER**. The ISDN Performance Monitoring Menu for the selected card and channel is displayed:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                        ISDN PERFORMANCE MONITORING MENU
--------------------------------------------------------------------------------
    INTERIM PATH 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









     [RT] ENTER COMMAND>
```

**3** Type a letter (**B** or **C**) then 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.

## View Loop Start and Ground Start Channel Units

**1** At the Setup Menu, type **D** then press **ENTER**, The POTS Ground/Loop Start Configuration menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                        POTS GROUND/LOOP START CONFIGURATION
--------------------------------------------------------------------------------
                   CU1       CU2       CU3       CU4
   Channel COT  (POTG8)   (POTG8)   (POTS8)   (ISDN4)
             RT  (POTG8)   (POTG8)   (POTS8)   (ISNN4)
--------------------------------------------------------------------------------
          1         GND       LOOP      LOOP      N/A
          2         LOOP      GND       LOOP      N/A
          3         LOOP      LOOP      LOOP      N/A
          4         LOOP      LOOP      LOOP      N/A
          5         LOOP      LOOP      LOOP
          6         LOOP      LOOP      LOOP
          7         LOOP      LOOP      LOOP
          8         LOOP      LOOP      LOOP

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


   [RT] ENTER COMMAND>
```

**2** Type **X** then press **ENTER** to go back one screen.

**There are 32 time slots available. Enable is the default for the channels. Channels are disabled from the CO side 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.**

## View Channel Unit Time Slot Assignments

At the Setup Menu, type **B** then press **ENTER**. The Time Slots Assignment menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                              TIME SLOTS ASSIGNMENT
--------------------------------------------------------------------------------
 TIME    CHANNEL     TIME    CHANNEL     TIME    CHANNEL     TIME    CHANNEL
 SLOT  ASSIGNMENT    SLOT  ASSIGNMENT    SLOT  ASSIGNMENT    SLOT  ASSIGNMENT
--------------------------------------------------------------------------------
   1:   CU1  CH1       9:   CU2  CH1      17:   CU3  CH1      25:   CU4  CH1
   2:   CU1  CH2      10:   CU2  CH2      18:   CU3  CH2      26:   CU4  CH1
   3:   CU1  CH3      11:   CU2  CH3      19:   CU3  CH3      27:   CU4  CH1
   4:   CU1  CH4      12:   CU2  CH4      20:   CU3  CH4      28:   CU4  CH2
   5:   CU1  CH5      13:   CU2  CH5      21:   CU3  CH5      29:   CU4  CH2
   6:   CU1  CH6      14:   CU2  CH6      22:   CU3  CH6      30:   CU4  CH2
   7:   CU1  CH7      15:   CU2  CH7      23:   CU3  CH7      31:     ----
   8:   CU1  CH8      16:   CU2  CH8      24:   CU3  CH8      32:     ----
--------------------------------------------------------------------------------


                          CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

**These assignments are automatically generated. However, when power is cycled to the system or hot plug a new channel unit, these assignments can change.**

## View Doubler Status

View status for the doubler unit(s) through the HDSL Status menu. At the Status Menu, type **C** then press **ENTER**. The HDSL Status menu displays:

```
 12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                       SYSTEM ID: 32 Channel PG-Flex System           SYSTEM: 2
HDSL STATUS
 ------------------------------------------------------------------------------
    ALARMS: NONE
 ------------------------------------------------------------------------------
                         COT HDSL-1   COT HDSL-2    RT HDSL-1    RT HDSL-2
                          mn/cr/mx     mn/cr/mx     mn/cr/mx     mn/cr/mx
      MARGIN (db):       21/22/23     21/22/23     21/22/24     21/22/23
      PULSE ATTN (db):          1            1            1            1
      PPM OFFSET (ppm):         0            0           27           27
      24 HOUR ES:               0            1            2            2
      24 HOUR UAS:             57           55            2            0
 ------------------------------------------------------------------------------
           LAST CLEARED: NONE
 ------------------------------------------------------------------------------

                          A) 24-HOUR PERFORMANCE HISTORY
                          B) 7-DAY PERFORMANCE HISTORY


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

      [COT] ENTER COMMAND> a
```

Type a letter at the prompt to accomplish one of the following:

| Type this letter | To get this response |
|---|---|
| **A** | Shows a performance history for 24 hours. |
| **B** | Shows a performance history for seven days. |
| **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. |

## Viewing Span Alarm History

View status for the doubler unit(s) through the System Alarm History menu by completing the following.

**1** At the Status Menu, type **D** then press **ENTER**. The System Alarm History menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                              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** At the System Alarm History menu, type **C** then press **ENTER**. The Span 1 Alarm History displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                              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









     e(X)it  (S)pan > s
```

**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.**

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                              SPAN-2 ALARM HISTORY
--------------------------------------------------------------------------------

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









     e(X)it  (S)pan > s
```

## View Maintenance Tests

From the Maintenance Menu you can view a metallic access connection to a subscriber circuit or view an ISDN loop back test for a PG-Flex system.

From the Main Menu, type **C** then press **ENTER**. The Maintenance Menu is displayed:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System           SYSTEM: 2

   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
```

### Viewing Metallic Access Tests

From the Maintenance Menu, type **A** then press **ENTER**. The Metallic Access Menu is displayed (refer to Table 7 on page 30 for the Metallic Access Menu options):

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System           SYSTEM: 2

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


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

                             COT - BRIDGING
                             COT - LOOKING IN
                             COT - LOOKING OUT
                             RT  - LOOKING OUT
                             RT  - LOOKING IN
                             RT  - BRIDGING
                             SUBSCRIBER BYPASS


                            CTRL-X) Main Menu    e(X)it

     [RT] ENTER COMMAND> a
```

***Table 7.*** *Metallic Access Menu Options*

| Parameter | Function |
|---|---|
| COT - Bridging | Provides the ability to monitor a subscriber circuit connection between the switch and the specified CO channel unit. |
| COT - Looking In | Provides the ability to verify the connection between the switch and the specified channel unit. The channel under test is disconnected from the switch for this function. |
| COT - Looking Out | Provides the ability to verify the subscriber connection through the CO channel unit. The switch is disconnected from PG-Flex for this function. |
| RT - Looking Out | Provides the ability to verify the subscriber circuit connection between the RT channel unit and the subscriber terminal equipment. |
| RT - Looking In | Provides the ability to connect a terminal equipment to the specified channel through the bypass pair. This provides the ability to verify the channel connection through PG-Flex but excludes the subscriber loop and subscriber's terminal equipment. |
| RT - Bridging | Provides the ability to monitor a subscriber circuit connection between the specified RT channel unit and the subscriber terminal equipment through the bypass pair. |
| Subscriber Bypass | Provides a metallic connection from the switch to the subscriber's terminal equipment utilizing the bypass pair. This connection bypasses the PG-Flex CO and RT channel units. |

## View ISDN Loopback Tests

ISDN loopbacks can be initiated as:

- inband loopback codes from the maintenance center upon the ISDN D-channel.
- or as a central office technician command though the ISDN Loopback Menu.

At the Maintenance Menu, type **B** then press **ENTER**. The ISDN Loop Back Menu is displayed:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                               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

     [RT] ENTER COMMAND> s
```

## Inventory

The inventory menu displays manufacturing and version information for all units in a PG-Flex system, except for the FPI unit. To access the inventory menu, do the following:

At the Main Menu, type **C** then press **ENTER**. The Inventory menu displays:

```
12-MAY-98        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:07:32
                      SYSTEM ID: 32 Channel PG-Flex System          SYSTEM: 2

                                   INVENTORY
-------------------------------------------------------------------------------
 LOC  SLOT    MODEL   LIST  ISSUE     TYPE      S/W     P1 TAG     CLEI CODE
-------------------------------------------------------------------------------
 COT  LU1    FLL-716 ****  ****     32-CH E1    3.6   **********   **********
 COT  CU1    FLC-706    1     1       ISDN4     1.3   0123456789   @ABCDEFGHI
 COT  CU2    FLC-703    3     1       POTS8     1.3   3486001292
 COT  CU3    FLC-703    3     1       POTS8     1.3   abcdefghij   abcdefghij
 RT   LU      *****  ****  ****     *********  3.5   **********   **********
 RT   CU1    FRC-756    1     1       ISDN4     1.3   0123456789   @ABCDEFGHI
 RT   CU2     *****  ****  ****       POTS8     1.4   **********   **********
 RT   CU3    FRC-753    2     1       POTS8     1.4   0307000570   VARHCGGCAA
 RT   CU4     *****  ****  ****       POTS8     1.4   **********   **********

                          CTRL-X) Main Menu    e(X)it


     [COT] ENTER COMMAND>
```

***Table 8.*** *Inventory Menu Definitions*

| Parameter | Definition |
|---|---|
| LOC | Indicates whether the card is in the COT shelf or in the RT enclosure |
| SLOT | Indicates which slot the card is located |
| MODEL | Indicates the card model |
| LIST | Indicates the card list number |
| ISSUE | Indicates the card issue number |
| TYPE | Indicates the type of card (E1, T1, POTS, ISDN) |
| S/W | Indicates the software version of the installed card |
| P1 TAG | A character ASCII string up to 10 characters providing a manufacturing serial number |
| CLEI CODE | Indicates the card CLEI code |

## Troubleshooting

Table 9 provides troubleshooting procedures based on indications displayed by the front panel indicators of FRL-746 List 3A.

***Table 9.*** *FRL-746 Troubleshooting*

| Indication | Problem | Action |
|---|---|---|
| POWER LED off | 1 This is the normal condition of the RT LEDs after the time-out period. | Press the ACO button on the RT line unit to enable the LEDs on the RT line unit. |
| | 2 One or both HDSL lines are not connected between the COT and RT. Verify the connections at the RT and COT. | Measure for 130 Vdc to 250 Vdc between HDSL-T1 and HDSL-T2 on the RT enclosure backplane.<br>On the COT shelf backplane, measure –65 Vdc to –130 Vdc, (±10% between HDSL_T1 and chassis ground and +65 Vdc to +120 Vdc between HDSL_T2 and chassis ground. |
| | 3 COT Line Unit fuse F1 has blown. | Replace the fuse. |
| | 4 RT Line Unit power supply failed. | Replace RT Line Unit. |
| | 5 COT HDSL power supply failed. | Replace COT Line Unit. |
| LOOP 1 (2) SYNC LED flashing or off | The HDSL line is attempting to synchronize with the CO unit or cannot detect the HDSL signal from the CO 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).<br>COLU and RTLU incompatible (i.e., one is a T1 version and the other is an E1 version. | Verify the HDSL circuits are terminated properly and with the correct orientation.<br>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 1 on page 3. |
| LOOP 1 (2) MARGIN LED on | The HDSL line margin level is below a preset level. | See the previous discussion on the SYNC LED flashing or off. |
| FAULT LED on | Faulty FRL-746 List 3A. | Replace the RT Line Unit. |

# PRODUCT SUPPORT

This section contains product support and warranty information.

## Technical Support

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

During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday through 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.

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) 730-2800. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

## Warranty

PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 60 months from the date of original shipment, given correct 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 incorrect use or installation.

Do not try to repair the unit. If it fails, replace it with another unit and return the faulty unit to PairGain for repair. Any modifications of the unit by anyone other than an authorized PairGain representative voids the warranty.

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 Technologies, Inc.
14352 Franklin Avenue
Tustin, CA 92780
ATTN: Repair and Return Dept.
(800) 638-0031

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

## FCC Compliance

This 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, can cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Refer to the installation section of the appropriate instruction manual for the unit you are installing to get information on:

- Cabling
- Correct connections
- Grounding

## Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by PairGain Technologies, Inc. may void the user's authority to operate the equipment.

All wiring external to the products should follow the provisions of the current edition of the National Electrical Code

## ABBREVIATIONS

| | |
|---|---|
| **AWG** | American Wire Gauge |
| **CD** | Carrier Detect |
| **CO** | Central Office |
| **COT** | Central Office Terminal |
| **DCD** | Data Carrier Detect |
| **DIP** | Dual In-Line Package |
| **DS0** | Digital Service, Level 0 |
| **DTR** | Data Terminal Ready |
| **HDSL** | High-bit-rate Digital Subscriber Line |
| **ISDN** | Integrated Services Digital Network |
| **LU** | Line Unit |
| **MLT** | Mechanized Loop Testing |
| **NVRAM** | Non-Volatile Random Access Memory |
| **PBX** | Private Branch Exchange |
| **PCM** | Pulse Code Modulation |
| **PGTC** | PairGain Test Controller |
| **POTS** | Plain Old Telephone Service |
| **RMA** | Return Material Authorization |
| **RT** | Remote Terminal |

# 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. This value is related to the cable pair's 272-kHz loss. The pulse attenuation is a more direct indication of the loop attenuation to the 2B1Q signal than the 272-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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