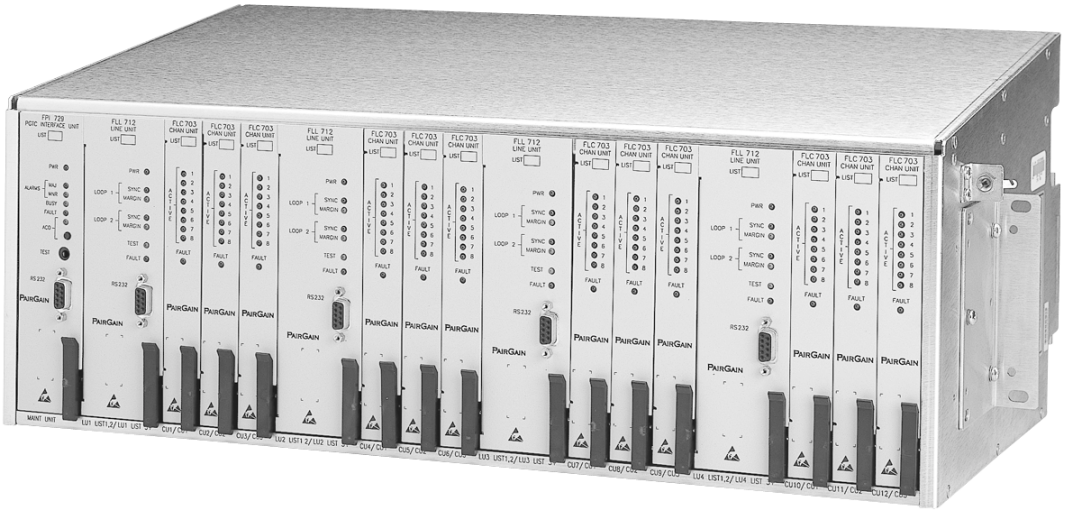
PG-Flex 24 Channel Subscriber Carrier System Provisioning Manual



PairGain Technologies, Inc.
Engineering Plant Series Technical Manual
Section 363-125-100-01

Revision History of this manual
Revision 01—March 18, 1998
A) Initial Release

PAIRGAIN
THE COPPEROPTICS COMPANY

PG-Flex 24 Channel Subscriber Carrier System Provisioning Manual
Section Number 363-125-100-01
Revision 01
March 1998

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, 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 this instruction manual, may cause harmful interference to radio communication.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1 Reorient or relocate the receiving antenna.

2 Increase the separation between the equipment and receiver.

3 Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

4 Consult the dealer or an experienced radio/TV technician for help.

Using This Manual

This manual was written to assist field service engineers and technicians in provisioning a 24 channel PG-Flex subscriber carrier system. It contains descriptions of the PG-Flex equipment, terminal management access, and the required settings to provision a complete PG-Flex 24 channel system. The document is divided into the following sections:

- *PG-Flex System Overview* contains a general description of the PG-Flex architecture, and briefly describes the central office and remote terminal equipment.
- *Installing PG-Flex System Hardware* provides procedures for installation and powering-up a PG-Flex system.
- *Terminal Management* explains how to interface with your PG-Flex system through the craft maintenance port, defines screen menus and display structure, and provides navigation instructions through these menus.
- *Provisioning Your System* provides procedures on how to configure your PG-Flex system, and defines the available settings for each option.
- *Performance Monitoring* provides procedures for viewing PG-Flex system status information.
- *Troubleshooting* provides procedures to troubleshoot a PG-Flex system using standard test equipment, using test access methods, and by using the indications displayed on the front panel LEDs of line units, channel units, alarm units, and FPI cards.
- *Screen Menus and Definitions* provides a sequential list of all available screen menus on a PG-Flex system.

Conventions and Icons

Two message conventions with 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.

CONTENTS

PG-FLEX SYSTEM OVERVIEW

This section contains a general overview of the PG-Flex 24 channel universal subscriber carrier system, and provides descriptions of the Central Office (CO) and Remote Terminal (RT) equipment.

Introduction

PG-Flex is a small-capacity, universal subscriber carrier system supporting up to 24 channels on two pair of existing copper wires. A PG-Flex system is comprised of one line unit and one (or more) channel units at both the Central Office and the Remote Terminals (Figure 1). The Central Office Terminal (COT) line unit takes the CO battery and converts it to the voltages necessary to operate the COT line units and channel units, and supplies power to the RT equipment.

The CO-side of a PG-Flex system mounts into either a 19- or a 23-inch COT shelf. The 19-inch shelf supports up to two systems, while the 23-inch shelf supports up to four systems. An alarm unit or Pair Gain Test Controller (PGTC) interface unit (common to all systems installed in a shelf) provides an interface for maintenance alarm relays and metallic access to the remote subscriber lines. The plain old telephone service (POTS) channel units use a pulse code modulation (PCM) encoding scheme that allows high speed modem and group 3 facsimile operation on all channels. Each channel unit can provide four (4) or eight (8) channels depending on the service offered. Services offered are:

- POTS Loop Start
- POTS Ground Start
- Integrated Services Digital Network (ISDN)

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

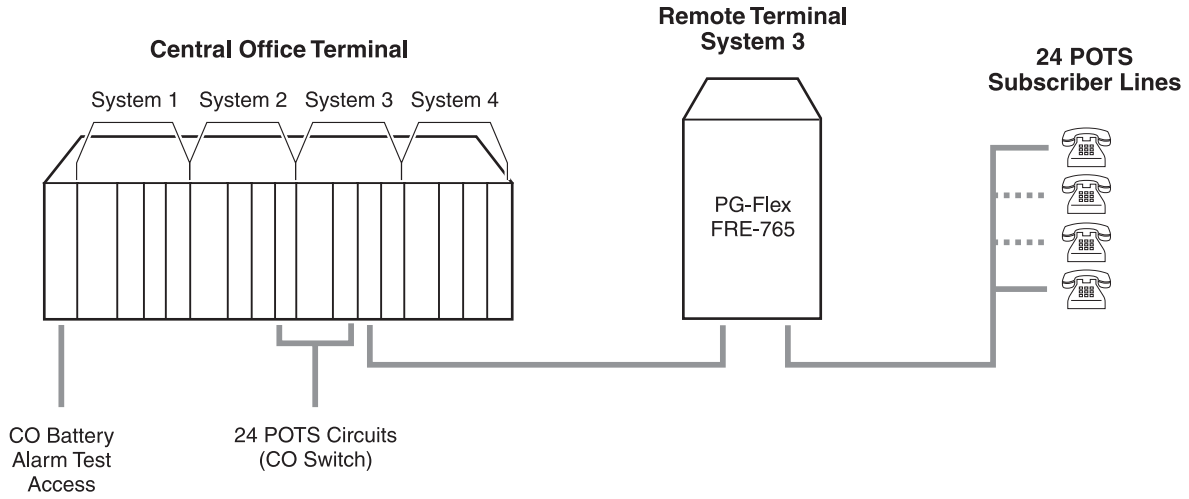


Figure 1. *Typical PG-Flex Configuration (23" Shelf shown)*

Central Office Terminal Equipment

The COT comprises the following equipment:

- COT Shelf
- Alarm Unit or FPI Interface
- Line Unit(s)
- Channel Unit(s)

COT Shelves

COT shelves provide standard mounting configurations for PG-Flex systems and support both 19-inch and 23-inch equipment frames. The 19-inch shelf may be equipped with a maximum of two systems and the 23-inch shelf may be equipped with a maximum of four systems. Line, channel, and alarm units are installed from the front of the shelf; interconnections are located on the passive backplane at the rear of the shelf. A Plexiglass™ cover is installed on the rear of the shelf to prevent damage to wire-wrap terminations and to protect the technician from high voltages.

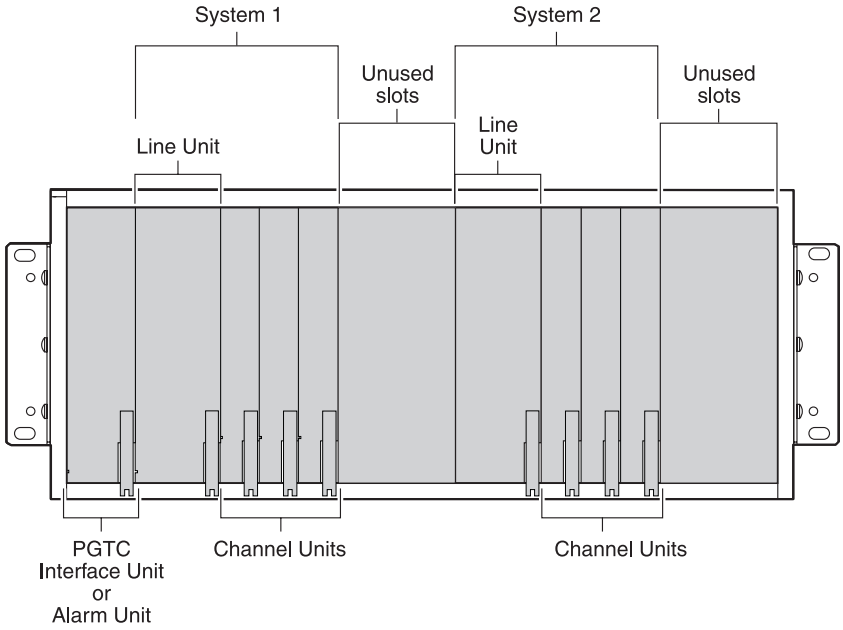


Figure 2. *Two 24 Channel PG-Flex Systems (19" Shelf)*

The 19-inch COT Shelf (Figure 2), when fully populated, accommodates two complete systems. Each system requires one COT line unit and up to three channel units.

The 23-inch COT Shelf (Figure 3), when fully populated, accommodates four complete systems. Each system requires one COT line unit and up to three channel units.

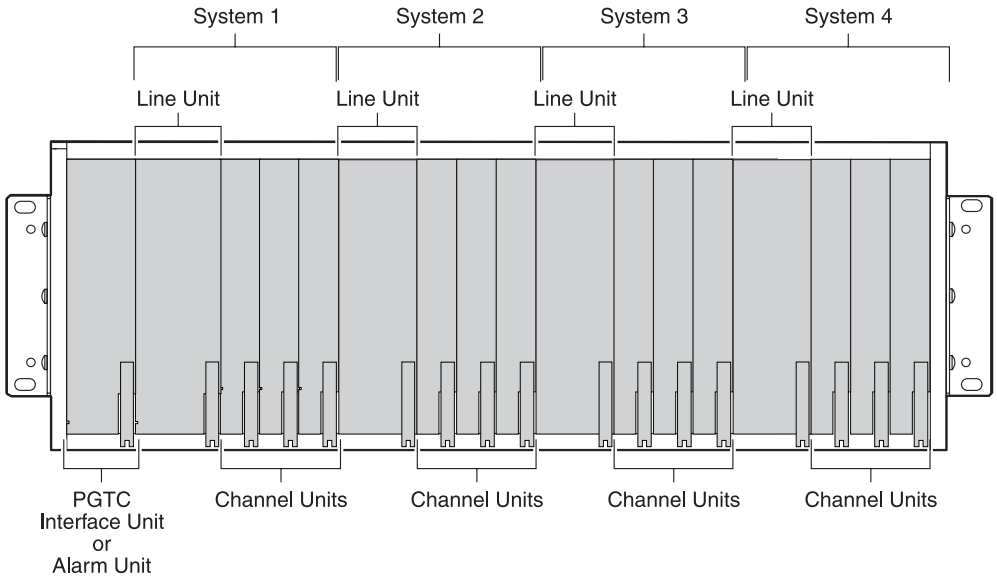


Figure 3. *Four 24-Channel PG-Flex Systems (23" Shelf)*

Alarm Unit

PG-Flex supports two types of Alarm units, the FAU-728 List 1 and the FAU-728 List 2. Both Alarm units provide PG-Flex Shelf interface to the CO Audio and Visual Alarms, and provide at least one test jack for line breakout functions (Looking-In, Looking-Out, Bridging). Neither Alarm Card supports the Pair Gain Test Controller (PGTC) test function.

FAU-728 List 1

The FAU-728 List 1 interfaces with the Central Office alarms and provides unique test jacks for up to four installed COT line units within a single PG-Flex COT shelf. The FAU-728 does not operate unless powered by a COT line unit in any slot position in an FCS-718 (19" shelf) or in the System 1 or 2 positions in an FCS-719 (23" shelf).

FAU-728 List 2

The FAU-728 List 2 Alarm Unit provides one test jack which is shared by all the COT line units installed in the PG-Flex shelf. Additionally, the Alarm Unit serves as a Craft Port Multiplexer for all COT line units installed in the shelf. Upon detection of the List 2 Alarm Unit, the Craft Maintenance Port connectors on the individual line units are disabled and communications are routed to the backplane.

The FAU-728 List 2 Alarm Unit can be used in situations where digital data service cards (ISDN, DDS) are used in the shelf but the PGTC function is not required. The List 2 Alarm Card provides an 8 kHz sync signal to all COT line units installed in the COT Shelf. The 8 kHz sync signal is derived from the Central Office supplied Composite Clock. The Alarm Unit reports a loss of the Composite Clock signal. The severity of the failure is user definable (Major, Minor, disabled).

The FAU-728 List 2 is powered from the CO battery independently of the COT line units.

PGTC Interface Unit

The FPI-729 List 1 Pair Gain Test Controller (PGTC) Interface Unit provides a common interface between the PGTC and the PG-Flex system under test. The FPI provides the translation facilities necessary to satisfy the discrete line communications to and from the PGTC, and the serial message protocol to and from the COT line unit in test.

The FPI-729 also provides Craft Port Multiplexer capabilities; a multiplexed test jack for subscriber line access; and handles the CO supplied Composite Clock for digital service cards.

The PGTC Interface Card is used in situations where digital data service cards (ISDN, DDS) are used in the shelf and the PGTC function is required. The FPI-729 is used to provide an 8 kHz sync signal to all COT line units installed in the COT Shelf. The 8 kHz sync signal is derived from the Central Office supplied Composite Clock. The Alarm Unit reports a loss of the Composite Clock signal. The severity of the failure is user definable (Major, Minor, Disabled).

COT Line Unit

A PG-Flex system is comprised of one line unit and one or more channel units at both the CO and remote terminals. The COT line unit takes the CO battery and converts it to the voltages necessary to operate the COT line unit and channel units, as well as for powering the remote terminal. The line unit also includes the high-bit digital-rate subscriber line (HDSL) transceivers and common control.

COT Channel Units

PG-Flex channel units interface between subscriber services and the system's internal PCM bus. All channel units include status indicators for each circuit supported on the channel unit and may be "hot plugged" without affecting system operation. A number of different channel units are available based on the service required.

COT POTS Channel Units

COT POTS channel units provide the analog-to-digital interface between PG-Flex's internal PCM bus and the CO switch. LEDs display the status of each subscriber channel, and indicate channel unit fault conditions. Channel units provide a metallic connection to the metallic bypass pair for subscriber drop testing. On hook transmission is provided to support CLASS services.

The 8-channel POTS units for PG-Flex support eight analog interfaces at both the CO and RT locations. Three channel units are required for a 24-channel system. The channel units provide the following features:

- converts analog signals to 64 kbps (μ-Law or A-Law) PCM digital format
- detects ringing voltage
- detects 12 kHz and 16 kHz meter tones
- detects forward disconnect
- detects subscriber drop metallic access signal
- provides loop closure
- provides on-hook transmission to support CLASS services

A status LED associated with each line indicates whether the line is off-hook, idle, ringing, or being tested. A common fault LED indicates that a general fault has been detected on the unit and that the unit should be replaced.

Metallic access relays provide a metallic connection to "look-in," "look-out," and "bridge" on each line circuit. Metallic access points appear on the COT Alarm or PGTC Interface Units. Metallic access connections to a specific line circuit are made through the maintenance terminal or by the CO switch applying the appropriate voltages on the subscriber line.

ISDN Channel Units

ISDN is a networking standard that provides end-to-end, simultaneous handling of digitized voice and data traffic on the same link. The ISDN Basic Rate Interface (BRI) channel unit provides an interface to North American Integrated Services Digital Network (ISDN) basic access services (see Figure 4). Each ISDN channel unit for PG-Flex supports four "U" interfaces with provisionable sealing current and performance monitoring on each channel. Line termination (LT) in the CO occurs at the ISDN switch. The channel unit provides the line unit termination at the RT, and the subscriber site has the Network Termination (NT1).

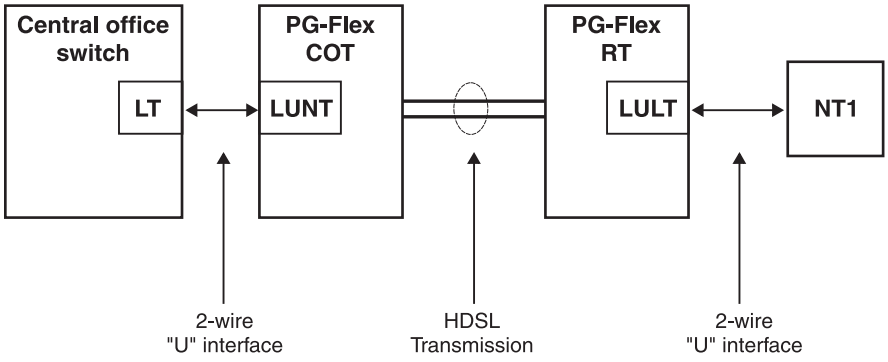


Figure 4. *Typical ISDN Arrangement*

The main features of the ISDN channel unit are:

- four ISDN U-interfaces
- mechanized loop testing (MLT) compatible and metallic test access
- dc resistive test signatures
- mp/pp eoc slave mode in 3DS0 format
- segmented path performance monitoring
- interim path performance monitoring
- software provisioning
- loopbacks
- Pair Gain Test Controller (PGTC) compatible
- sealing current (RT)

Remote Terminal Equipment

The RT Enclosure (Figure 5) is comprised of the following equipment:

- RT enclosure
- line unit
- channel unit(s)

RT Enclosure

One RT Enclosure is required for each PG-Flex system, and provides mounting for one common line unit and up to three (3) channel units, supporting up to 24 channels. The enclosures provide termination points for subscriber circuits, power, and metallic bypass pair. AMP Quiet Front™ or RayChem terminations, with internal gas tube protectors, are provided on the backplane for High bit-rate Digital Subscriber Line (HDSL) and Bypass connections. Optionally, add AMP Quiet Front termination or RayChem terminations for auxiliary power pairs when used with a PG-Flex doubler. The enclosure can be pole or wall mounted and is environmentally sealed for outside plant installation.

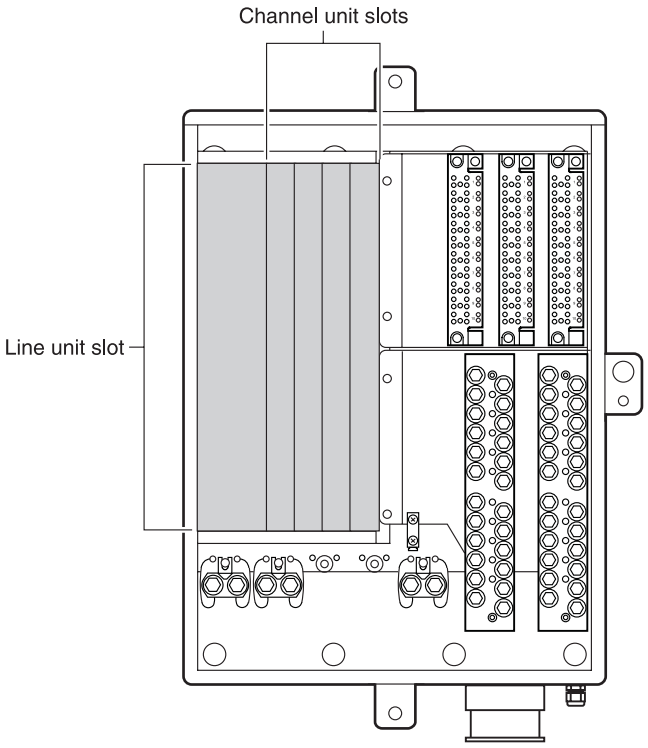


Figure 5. *Remote Terminal Enclosure*

RT Line Units

The RT line unit includes the HDSL transceivers and converts the line power from the COT into the voltages required by the remote terminal electronics. Regardless of the number of channels being transported by PG-Flex, two copper pairs are required between the CO and the RT to support the HDSL transport and provide power to the RT. As shown in Figure 6, both pairs are used for simplexing the power between the COT and RT.

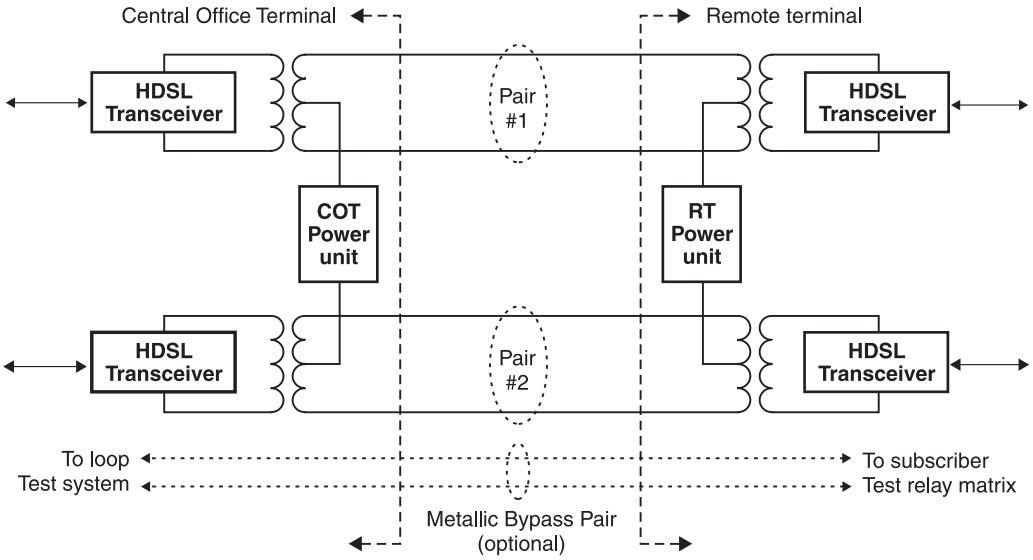


Figure 6. *Connections Between the COT and RT*

For subscriber drop testing, a third copper pair is required between the COT and RT to provide a metallic path between the selected subscriber pair and the Central Office test equipment.

RT Channel Units

Channel units provide the interface between subscriber services (POTS, ISDN) and the PG-Flex system's internal pulse code modulation (PCM) bus. The RT channel units must be installed in the same relative slot positions as the channel units on the CO-end of a PG-Flex system.

The RT channel units provide the following features:

- 64 kbps A-Law PCM encoding
- applies ringing voltage
- generates forward disconnect
- generates metering tones (12 kHz, 16 kHz)
- detects an off-hook or ring-tip condition
- connects a subscriber loop to a metallic test pair
- protects against secondary surges

A status LED is associated with each line to indicate whether the line is off-hook, idle, ringing, or being tested. A common fault LED indicates a general fault has been detected on the unit (Figure 7). Metallic test access connections to a specific line circuit are made through the Craft port or by the CO switch applying the appropriate voltages on the subscriber line.

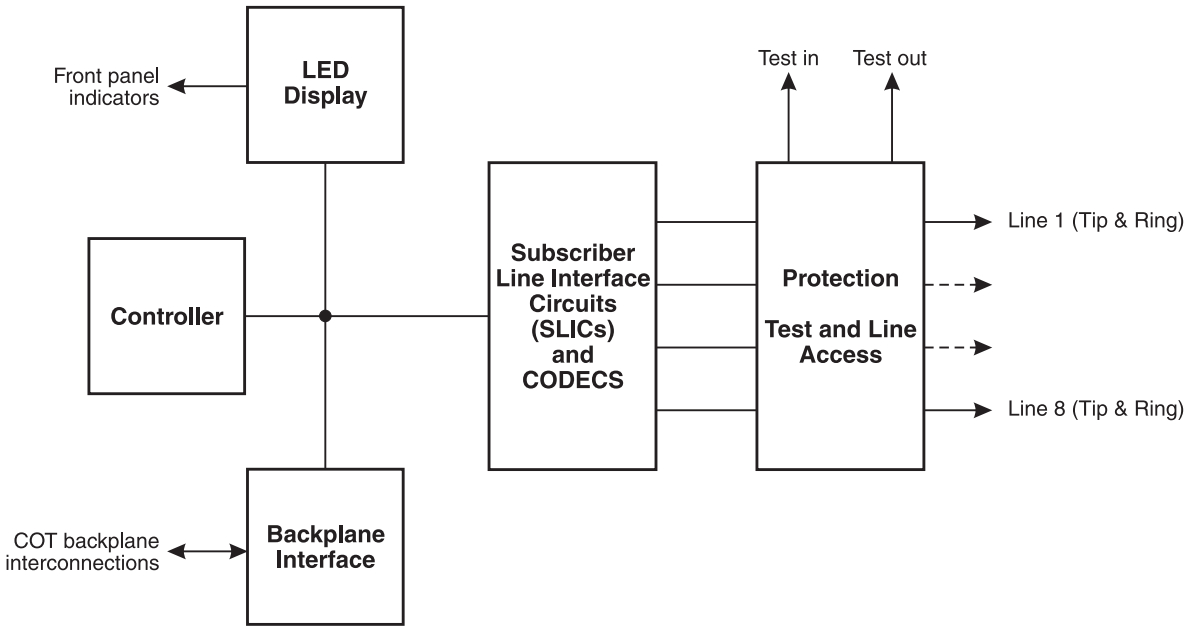


Figure 7. *RT Channel Unit Block Diagram*

Subscriber Drop Testing

The ability to test a subscriber drop is an essential element in the overall outside plant maintenance strategy. PG-Flex supports this function using a dc (metallic) test pair between the remote terminal and central office terminal. Using standard metallic access techniques and equipment, the telephone company can access a specific subscriber drop and have a metallic test path back to the central office equipment.

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

The most common method of subscriber drop metallic access is through the central office channel unit of the selected subscriber. Momentary placement and removal of +116 Vdc on the tip conductor is recognized by PG-Flex as a metallic access request. PG-Flex provides the metallic test path (Figure 8) while the termination of the test pair is dependent on whether a Pair Gain Test Controller (PGTC) Interface Unit is installed. When -116 Vdc is momentarily placed then removed from the tip conductor, PG-Flex restores all connections back to normal.

Metallic access can also be activated through an ASCII terminal connected to the Craft maintenance port located on the front of the COT line unit.

Channel Unit Signatures

To ensure that the test system can identify a carrier channel unit, all channel units incorporate the appropriate three-terminal dc signature resistances (Table 1) and conform to Bellcore's TR-NWT-000057.

Table 1. *COT Channel Unit Signatures*

Termination	FLC-701, List 2 FLC-703, List 3	All Other COT POTS Channel Units
Tip-Ring	(open)	475 kΩ, 1%
Tip-Ground	162 kΩ, 1%	332 kΩ, 1%
Ring-Ground	162 kΩ, 1%	(open)

Metallic Bypass Pair

As shown in Figure 8, a third pair may be used between the remote terminal and central office terminal to provide a metallic test path from the central office test equipment to a selected subscriber drop.

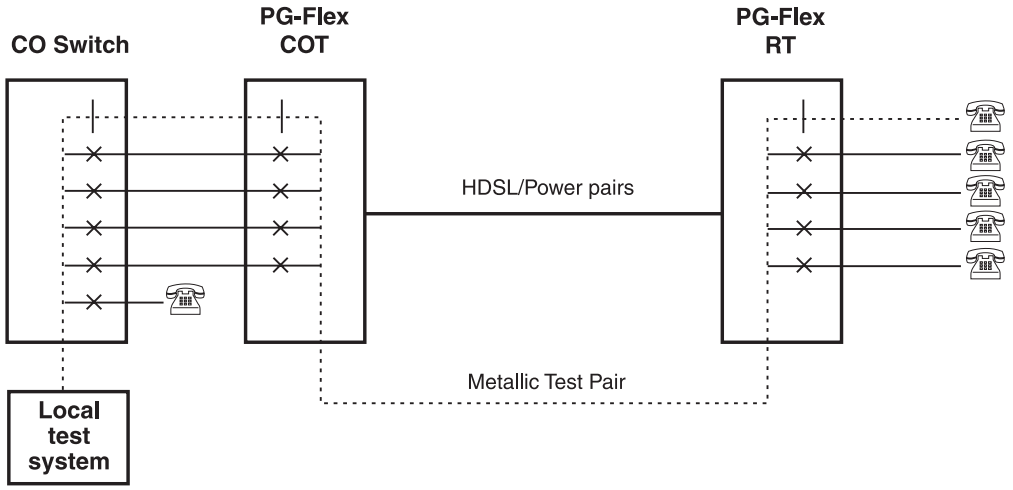


Figure 8. *Metallic Test Access Through COT Channel Unit*

When testing subscriber drops through the metallic bypass pair, the length and quality of the bypass pair must be taken into consideration when analyzing the measurement results.

Only one subscriber circuit in a PG-Flex shelf can be accessed at a time when an FPI-729 List 1 or an FAU-728 List 2 is installed.

If an FAU-728 List 1 is installed, one subscriber circuit in each PG-Flex system can be accessed simultaneously.

Craft Port Access

Using an ASCII terminal connected to the Craft port, the technician can access a specific subscriber drop. Instead of connecting the metallic bypass pair back to the local test system through the CO switch, the metallic connection appears on the PGTC interface or alarm unit test jack. As shown in Figure 9, this method of metallic access does not require a local test system and provides the technician with a means to perform metallic testing of the subscriber drop without traveling to the remote location.

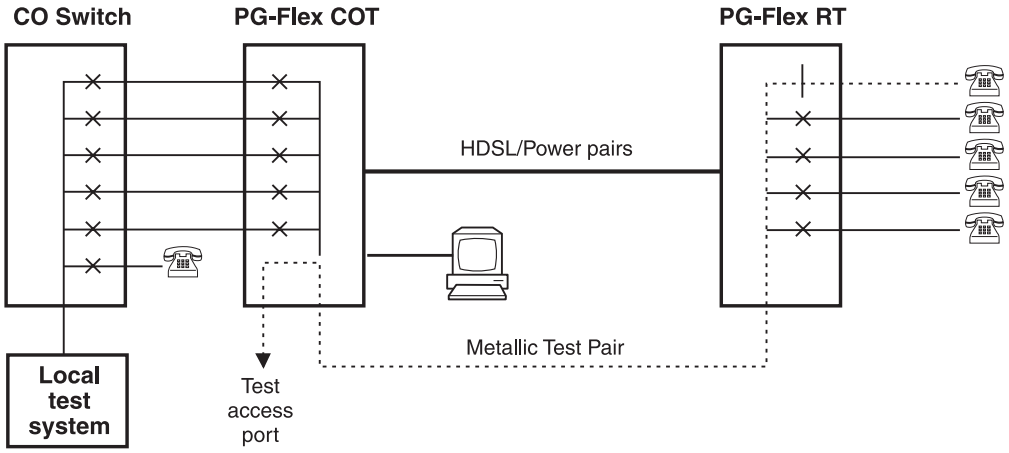


Figure 9. *Metallic Test Access Using the Craft Port*

Alarms

PG-Flex generates major and minor alarms in compliance with TR-NWT-000057 “Functional Criteria for Digital Loop Carrier Systems,” *13.4.3 Alarm Classification.*

Major Alarm

Major Alarms are generated based on a loss of 24 or more customer service loops as a group; 24 individual losses are not classified as a Major Alarm.

Major Alarms occurring within the PG-Flex system are propagated up to the COT line unit. The Fault LED illuminates at the respective line unit nodes and also at the COT FAU/FPI indicating a Major Alarm condition. Upon detection of a major alarm condition, PG-Flex operates the major alarm audible and visual relays, as well as, the shelf ID relay.

Minor Alarm

Minor Alarms are generated based on a loss of 2 to 23 customer service lines or to indicate non-service affecting failures.

Minor Alarms occurring within the PG-Flex system are propagated up to the COT line unit. The Fault LED illuminates at the respective line unit nodes and also at the COT FAU/FPI indicating a minor alarm condition. Upon detection of a minor alarm condition, PG-Flex operates the minor alarm audible and visual relays, as well as the shelf ID relay.

Information Alarm

Information Alarms are non-service affecting events. They are generally tied to the HDSL Performance Monitoring function or when a change in PG-Flex physical configuration has been detected. Some alarms can be elevated to Minor Alarms at the discretion of the customer.

Information Alarms cause the FAULT LED to be illuminated at the line unit at which the fault occurs but do not trigger the customer’s alarm relay interface unless it has been promoted to a Minor Alarm by the customer.

Faults

A fault on any unit shall be an indication of an abnormal condition that affects the functionality or performance of the unit itself or any units under its control. That is, a fault on an RT channel unit shall be indicated on the channel unit itself, propagated to the upstream RT line unit, and reported as a fault against the RT channel unit.

There are situations when the unit is incapable of propagating any information about the fault upstream (that is, losing communications with an upstream unit). The respective line unit shall then determine that such a condition exists and indicate a fault condition against the lower level unit. In this example, a major alarm would also be generated.

Propagation of the fault condition up to and including the COT line unit is the responsibility of the respective RT line unit. The exception to this would be the HDSL Faults which are normally passed to the COT line unit with the normal HDSL performance monitoring information.

A fault may cause the following alarms: Major, Minor, Information Alarms, or none, depending on how the system is configured.

The line unit detecting a Major, Minor, or Information Alarm logs the fault in its local fault history database. The database is accessible from either the CO or RT line unit node in the system. As a minimum, the database for each fault includes:

- fault type
- date and time of the first occurrence since the database was last cleared or from power on
- date and time of the most recent occurrence
- current alarm status
- number of occurrences

The minimum logging rate is at a once a second rate.

INSTALLING PG-FLEX SYSTEM HARDWARE

This section provides procedures for the installation and turn-up of a PG-Flex 24 channel universal subscriber carrier system. The following product and installation procedures are described in this section:

- PG-Flex product list—page 18
- line unit compatibility—page 20
- guidelines to preprovisioning HDSL lines—page 25
- remote terminal equipment installation—page 26
- central office terminal equipment installation—page 37

For procedures and information not contained in this section, refer to the appropriate technical practice for specific details and specifications.

PG-Flex System Compatibility Overview

The following section is divided into two topics:

- "PG-Flex Product List" on page 18, is an inventory of PG-Flex line units, channel units and support cards.
- "Line Unit Compatibility" on page 20, defines the COT and RT line unit combinations that work together, and describes the options that each combination supports.

PG-Flex Product List

Table 2 provides an inventory of the PG-Flex products, including: line units, channel cards, support cards, COT shelves, and RT enclosures.

Table 2. *PG-Flex Product List*

Part No.	Model No.	List	Description
Central Office Terminal (COT) Line Units			
150-1312-01*	FLL-712	1	24-Channel COT Line Unit (POTS)
150-1312-02*	FLL-712	2	24-Channel COT Line Unit (POTS, PGTC)
150-1312-21*	FLL-712	2A	24-Channel COT Line Unit (POTS, PGTC)
150-1312-03	FLL-712	3	24-Channel COT Line Unit (POTS, LS/GS, ISDN, PGTC)
150-1312-31	FLL-712	3A	24-Channel COT Line Unit (POTS, LS/GS, ISDN, Doubler, PGTC)
Remote Terminal (RT) Line Units			
150-1342-01*	FRL-742	1	24-Channel RT Line Unit (POTS)
150-1342-11*	FRL-742	1A	24-Channel RT Line Unit (POTS)
150-1342-02*	FRL-742	2	24-Channel RT Line Unit (POTS, PGTC)
150-1342-03	FRL-742	3	24-Channel RT Line Unit (POTS, LS/GS, ISDN, PGTC)
150-1342-31	FRL-742	3A	24-Channel RT Line Unit (POTS, LS/GS, ISDN, Doubler, PGTC)
Central Office Terminal POTS Cards			
150-1301-01*	FLC-701	1	4-Channel POTS COCU (µ-Law)
150-1301-02	FLC-701	2	4-Channel POTS COCU (µ-Law)
150-1303-01*	FLC-703	1	8-Channel POTS COCU (µ-Law)
150-1303-02*	FLC-703	2	8-Channel POTS COCU (µ-Law)
150-1303-03	FLC-703	3	8-Channel POTS COCU (µ-Law, PGTC)
150-1303-04	FLC-703	4	8-Channel POTS COCU (µ-Law, PGTC, LS/GS)
Central Office Terminal Digital Service Cards			
150-1306-01	FLC-706	1	4-Channel ISDN COCU (PGTC)
Remote Terminal POTS Cards			
150-1351-01	FRC-751	1	4-Channel POTS COCU (µ-Law)
150-1353-01*	FRC-753	1	8-Channel POTS COCU (µ-Law)
150-1353-02	FRC-753	2	8-Channel POTS COCU (µ-Law, PGTC)
150-1353-04	FRC-753	4	8-Channel POTS COCU (µ-Law, PGTC, LS/GS)
Remote Terminal Digital Service Cards			
150-1356-01	FRC-756	1	4-Channel ISDN COCU (PGTC)
Central Office Terminal Common Cards			
150-1328-01	FAU-728	1	Alarm Unit
150-1328-02	FAU-728	2	Alarm Unit (Composite Clock)
150-1329-02	FPI-729	1	PGTC Interface Unit (Composite Clock)

Table 2. *PG-Flex Product List (Continued)*

Part No.	Model No.	List	Description
PG-Flex Doublers			
150-1387-01	FDU-437	1	24-Channel Mini Doubler
150-1387-02	FDU-439	2	24 Channel Mini Doubler
150-1387-04	FDU-451	4	24-Channel Doubler
PG-Flex COT Shelves			
150-1318-01*	FCS-718	1	19" COT Shelf (Amphenol)
150-1318-02*	FCS-718	2	19" COT Shelf (Wire-Wrap, Split Power, Straight)
150-1318-22	FCS-718	2B	19" COT Shelf (Wire-Wrap, Split Power, Baffle)
150-1318-04*	FCS-718	4	19" COT Shelf (Amphenol, Straight, Adapter)
150-1318-41*	FCS-718	4A	19" COT Shelf (Amphenol, Split Power, Straight)
150-1318-42	FCS-718	4B	19" COT Shelf (Amphenol, Split Power, Baffle)
150-1319-01*	FCS-719	1	23" COT Shelf (Amphenol)
150-1319-02*	FCS-719	2	23" COT Shelf (Wire-Wrap, Split Power, Straight)
150-1319-22	FCS-719	2B	23" COT Shelf (Wire-Wrap, Split Power, Baffle)
150-1319-04*	FCS-719	4	23" COT Shelf (Amphenol, Straight, Adapter)
150-1319-41*	FCS-719	4A	23" COT Shelf (Amphenol, Split Power, Straight)
150-1319-42	FCS-719	4B	23" COT Shelf (Amphenol, Split Power, Baffle)
PG-Flex RT Enclosures			
150-1365-02*	FRE-765	2	24-Channel RT Enclosure (Amphenol)
150-1365-21*	FRE-765	2A	24-Channel RT Enclosure (Prot. Strips, IDT)
150-1365-22*	FRE-765	2B	24-Channel RT Enclosure (25’ 25 pr. PVC Cable Stub)
150-1365-24*	FRE-765	2D	24-Channel RT Enclosure (Prot. Strips, 25’ 6/25-pr. Non-Filled Cable Stubs)
150-1365-25*	FRE-765	2E	24-Channel RT Enclosure (Prot. Strips, 25’ 6/25-pr. Gel-Filled Cable Stubs)
150-1365-04	FRE-765	4	24-Channel RT Enclosure (Amphenol)
150-1365-41	FRE-765	4A	24-Channel RT Enclosure (Prot. Strips, IDT)
150-1365-42	FRE-765	4B	24-Channel RT Enclosure (25’ 25 pr. PVC Cable Stub)
150-1365-44	FRE-765	4D	24-Channel RT Enclosure (Prot. Strips, 25’ 6/25-pr. Non-Filled Cable Stubs)
150-1365-45	FRE-765	4E	24-Channel RT Enclosure (Prot. Strips, 25’ 6/25-pr. Gel-Filled Cable Stubs)
150-1365-46	FRE-765	4F	24-Channel RT Enclosure (Prot. Strips, 1’ 25-pr. PVC Cable with Male Amphenol)
150-1365-47	FRE-765	4G	24-Channel RT Enclosure (Prot. Strips, 12’ 25-pr. PVC Cable with Male Amphenol)

* Discontinued

Line Unit Compatibility

PG-Flex system configurations are based on equipment currently in production. As a rule, channel cards, including those no longer in production, can be mixed with 4-Channel POTS and 8-Channel POTS to provide Loop Start POTS service. (Refer to Table 3.)

When working with a mixed line unit system composition, the system performs correctly when the line unit list numbers are correctly matched. (Refer to Table 4 on page 21 through Table 8 on page 24 to determine which COT and RT line unit combinations work together.)

When a single Craft port interface per shelf is desired, there are two options; the FPI-729 and the FAU-728 List 2. The FPI-729 is used where PGTC functions are required, and the FAU-728 List 2 is used where PGTC functions are not needed.

Table 3. *Service Options and Compatibility*

Service	go to
Loop Start POTS-Only service	Table 4 on page 21
Loop Start POTS-Only service with PGTC testability	Table 5 on page 23
Loop Start and/or Ground Start POTS-Only service	Table 6 on page 23
Loop Start and/or Ground Start POTS service with PGTC testability	Table 7 on page 24
ISDN Service with or without Loop Start and/or Ground Start POTS service with PGTC testability	Table 8 on page 24

Table 4. *PG-Flex Line Unit Compatibility Matrix —Loop Start POTS-Only Service*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	RT	CO	RT	Channel	LS	LS/GS	ISDN		4Tel	PGTC	CC	Mux	
FLL-712 List 1	FRL-742 List 1	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X				RT Looking-In and RT Bridging line access functions are not supported.
FLL-712 List 1	FRL-742 List 2	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X				RT Looking-In and RT Bridging line access functions are not supported.
FLL-712 List 1	FRL-742 List 3	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X				RT Looking-In and RT Bridging line access functions are not supported.
FLL-712 List 2	FRL-742 List 1	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X				RT Looking-In and RT Bridging line access functions are not supported. Configuration fault/alarm, time slot allocation fault are not supported on the RT line unit menus.
FLL-712 List 2	FRL-742 List 2	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X			X	Supports configuration faults/alarms and timeslot (DS0) allocation faults.
FLL-712 List 2	FRL-742 List 3	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X			X	Supports configuration faults/alarms and timeslot (DS0) allocation faults.

Table 4. *PG-Flex Line Unit Compatibility Matrix —Loop Start POTS-Only Service (Continued)*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	**RT**	**CO**	**RT**	**Channel**	**LS**	**LS/GS**	**ISDN**		**4Tel**	**PGTC**	**CC**	**Mux**	
FLL-712 List 3	FRL-742 List 1	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X			X	RT Looking-In and RT Bridging line access functions are not supported. Configuration fault/alarm, time slot allocation fault are not supported on the RT line unit menus. -48 Vdc “wetting” voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test.
FLL-712 List 3	FRL-742 List 2	FLC-701 List 2 FLC-703 List 3 FLC-703 List 4	FRC-751 List 1 FRC-753 List 2 FRC-753 List 4	4 8 8	X X	 X		FAU-728 List 1	X			X	Configuration fault/alarm, time slot allocation fault are not supported on the RT line unit menus. -48 Vdc “wetting” voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test.

Table 5. *PG-Flex Line Unit Compatibility Matrix —Loop Start POTS-Only Service with PGTC Testability*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	RT	CO	RT	Channel	LS	LS/GS	ISDN		4Tel	PGTC	CC	Mux	
FLL-712 List 2	FRL-742 List 2	FLC-703 List 3 FLC-703 List 4	FRC-753 List 2 FRC-753 List 4	8 8	X	 X		FAU-729 List 1		X		X	Supports configuration faults/alarms and timeslot (DS0) allocation faults.
FLL-712 List 2	FRL-742 List 3	FLC-703 List 3 FLC-703 List 4	FRC-753 List 2 FRC-753 List 4	8 8	X	 X		FAU-729 List 1		X		X	Supports configuration faults/alarms and timeslot (DS0) allocation faults.
FLL-712 List 3	FRL-742 List 3	FLC-703 List 3 FLC-703 List 4	FRC-753 List 2 FRC-753 List 4	8 8	X	 X		FAU-729 List 1	X	X		X	Configuration fault/alarm, time slot allocation fault are supported. -48 Vdc "wetting" voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test.

Table 6. *PG-Flex Line Unit Compatibility Matrix —Loop Start and/or Ground Start POTS Service*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	RT	CO	RT	Channel	LS	LS/GS	ISDN		4Tel	PGTC	CC	Mux	
FLL-712 List 3	FRL-742 List 3	FLC-703 List 3 FLC-703 List 4	FRC-753 List 2 FRC-753 List 4	8 8	X	 X		FAU-729 List 1	X			X	Configuration faults/alarms and timeslot allocation faults are supported. -48 Vdc "wetting" voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test

Table 7. *PG-Flex Line Unit Compatibility Matrix —Loop Start and/or Ground Start POTS Service with PGTC Testability*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	RT	CO	RT	Channel	LS	LS/GS	ISDN		4Tel	PGTC	CC	Mux	
FLL-712 List 3	FRL-742 List 3	FLC-703 List 3	FRC-753 List 2	8	X			FPI-729 List 1		X		X	Supports configuration faults/alarms and timeslot (DS0) allocation faults. -48 Vdc "wetting" voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test
		FLC-703 List 4	FRC-753 List 4	8		X							

Table 8. *PG-Flex Line Unit Compatibility Matrix —ISDN Service with or without Loop Start and/or Ground Start POTS Service with PGTC Testability*

Line Unit Combination		Compatible Channel Units						Common Equipment					Comments
CO	RT	CO	RT	Channel	LS	LS/GS	ISDN		4Tel	PGTC	CC	Mux	
FLL-712 List 3	FRL-742 List 3	FLC-706 List 1	FRC-756 List 1	4			X	FPI-729 List 1	X	X	X	X	COT Bridging and RT Bridging line access functions are not supported for ISDN. Configuration faults/alarms and timeslot (DS0) allocation faults are supported. -48 Vdc "wetting" voltage is applied to the Ring lead of the Maintenance Bypass pair when the system is not in test
		FLC-703 List 3	FRC-753 List 2	8	X								
		FLC-703 List 4	FRC-753 List 4	8		X							

Guidelines to Preprovisioning HDSL Lines

The HDSL line should be preprovisioned before installing PG-Flex equipment. Use local practices for installation/turn-up of HDSL lines.

The HDSL transmission scheme uses two-wire pairs between the Central Office Terminal (COT) and the Remote Terminal (RT). The wire pairs should have identical electrical make-ups. Keep exposure to crosstalk and the differences in total wire length, wire gauge, and bridge taps to a minimum. Pair isolation (Tip-ring, Tip-ground, and Ring-ground) must be 100 kΩ.

The wire pairs from the COT to the RT must meet the following design guidelines (use local practices to determine the guidelines listed below):

- nonloaded cable only
- multi-gauge restricted to two gauge changes, except for stubbing or fusing
- total bridge taps can not exceed 2.5 kft. No single bridge tap may exceed 2.0 kft

The distance limitation for HDSL transmission is based on a maximum signal attenuation of 35 dB at 196 kHz. Since signal attenuation decreases as cable size increases, the larger the gauge (that is, 19 AWG vs. 26 AWG), the greater the distance between the COT and the RT. Table 9 identifies these distances at a cable temperature of 68°F.

Table 9. *12/24 Channel HDSL Transmission Distance*

Gauge	Loop Length	DC Resistance
19 AWG 0.9 mm	22.8 kft 7.0 km	367 Ω
22 AWG 0.6 mm	16.1 kft 4.9 km	521 Ω
24 AWG 0.5 mm	12.3 kft 3.7 km	638 Ω
26 AWG 0.4 mm	9.0 kft 2.7 km	750 Ω

Installing the Remote Terminal Equipment

Follow the steps in Table 10 in the presented order to install PG-Flex remote terminal equipment.

These installation procedures are recommendations. Local practices, if conflicting, should take precedence. PairGain practices, where indicated, provide detailed instructions for completing these steps. These should be followed but the sequence may be altered where local needs dictate.

The following procedures are for the FRE-765 List 4A remote terminal enclosure. For information not covered in this document, refer to the applicable PairGain technical practice.

Table 10. *Installing the Remote Terminal Equipment*

Steps		Go To	Comments
1	"Mount the Remote Terminal Enclosure"	page 27	Local policy determines the terminal installation sequence, size, and capacity of the shelf. If the RT line unit is installed first, HDSL initializing attempts are not accessible until the COT is powered.
2	"Connect the HDSL Lines"	page 30	Use local practices to resolve T1 trouble.
3	"Connect the Bypass Pair"	page 31	Local policy determines testing strategy, so this is an optional step.
4	"Connect the Subscriber Lines"	page 32	Local policy indicates distribution points and protection steps to be taken.
5	"Install the Line Unit"	page 34	Factors to consider in selection of the line unit are: • size of shelf installed • loop test systems utilized • end terminal type Refer to Table 4 on page 21 through Table 8 on page 24 for line unit compatibility.
6	"Install the Channel Units"	page 35	Refer to Table 4 on page 21 through Table 8 on page 24 for channel unit compatibility.

Mount the Remote Terminal Enclosure

The FRE-765 RT enclosure mounts on a pole or a wall. Follow local practices to ensure a secure mounting.

For pole mounting the FRE-765, use the Pole Mounting kit, part number 150-1397-0x. Follow the instructions below to install the pole mounting bracket. Then mount the FRE-765 to the bracket. Do not install any cabling until the FRE-765 is securely mounted.

Mount the RT enclosure for ease of access to the cable entry points on the bottom of the enclosure. Provide ample room for the enclosure door to open fully.

1 Mount the pole bracket to the pole with screws or nails (not provided). Position the screws or nails through the small holes near the top and bottom edges of the bracket (Figure 10).

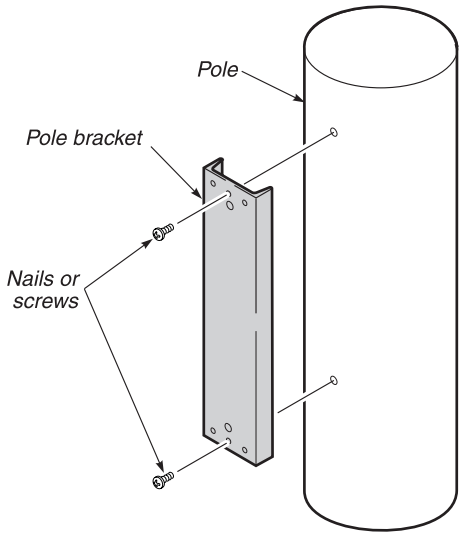


Figure 10. *Mounting the Pole Bracket*

2 Align the flanges on the RT enclosure with the large holes (top and bottom) on the pole bracket.

3 Insert the 3/8" lag screws (supplied in the Pole-Mount Kit) through the RT enclosure flanges and the pole bracket, then tighten.

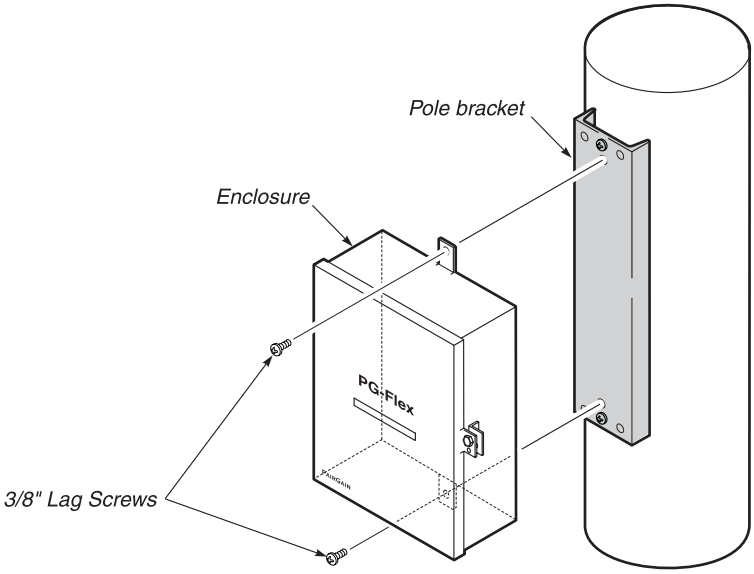


Figure 11. *Mounting the RT Enclosure*

Connect the Chassis Ground Wiring

Use 6 AWG wire to ensure a good ground connection to the FRE-765 RT enclosure.

1. Route the chassis ground wire through the small hole in the strain relief on the bottom of the enclosure.
2. Connect one end of the chassis ground wire to the grounding bar.
3. Connect the other end of the chassis ground wire to a suitable ground termination point (ground rod or cold water pipe).
4. Tighten the strain relief around the wire.

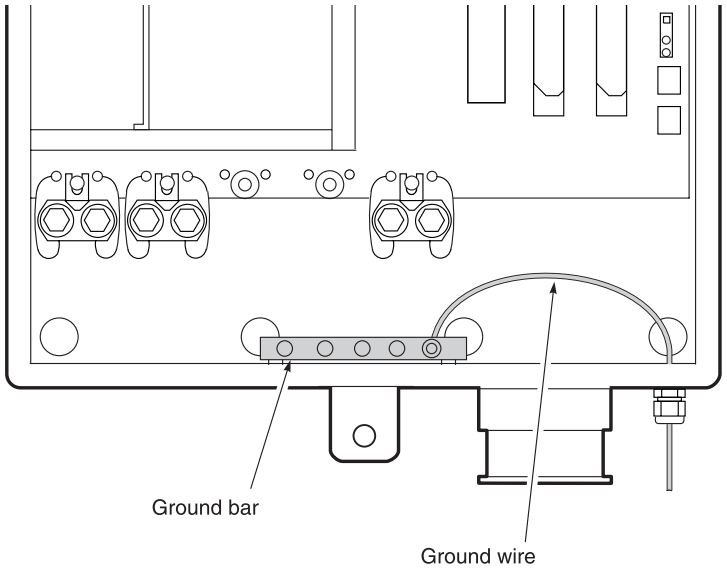


Figure 12. *Chassis Ground Wiring*

Connect the HDSL Lines

Use 6 AWG wire to ensure a good ground connection to the FRE-765 RT enclosure.

1. Route the HDSL pairs through the strain relief on the bottom of the enclosure.
2. Terminate HDSL Pair #1 on the Quiet-Front terminals HDSL_1_T (Tip) and HDSL_1_R (Ring).
3. Terminate HDSL Pair #2 on the Quiet-Front terminals HDSL_2_T (Tip) and HDSL_2_R (Ring).
4. Secure with a cable tie to the bracket near the cable entrance.

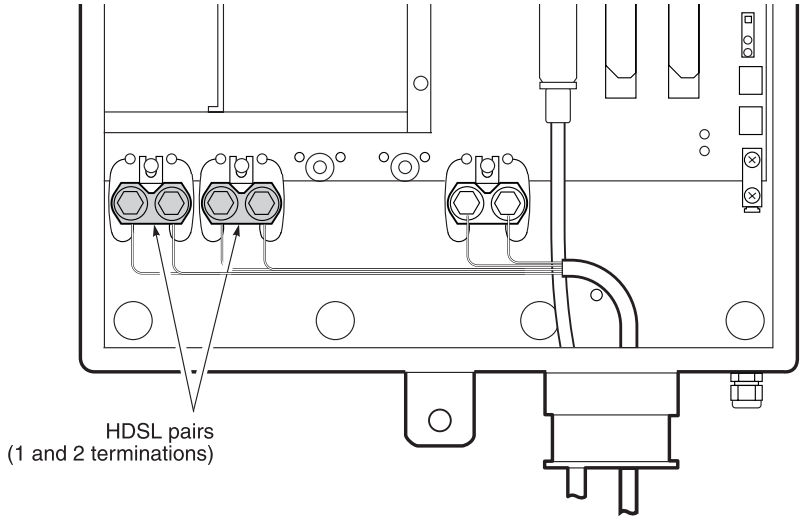


Figure 13. *HDSL Pair*

Connect the Bypass Pair

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

1. Route the bypass pair through the strain relief on the bottom of the enclosure.
2. Terminate the bypass pair on the Quiet Front terminals BYPASS_T and BYPASS_R.
3. Use a cable tie to secure to the bracket near the cable entrance.

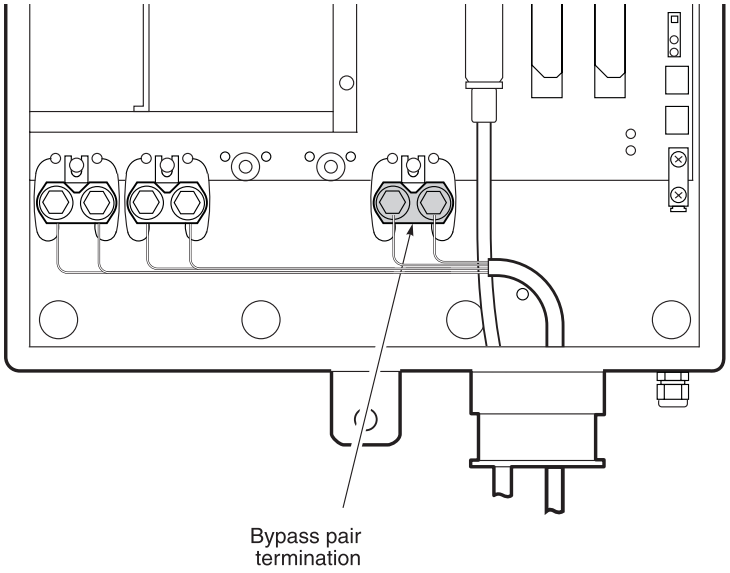


Figure 14. *Bypass Pair Termination*

Connect the Subscriber Lines

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

To install subscriber lines for the FRE-765 List 4A enclosure do the following:

1. Route the subscriber line cables through the bottom of the enclosure.
2. Terminate the cables per Table 11.
3. Secure with a cable tie to the bracket near the cable entrance.

Table 11. *Subscriber Terminations for List 4A (12/24 channel systems)* * †*

		Subscriber		Protector	
Channel Unit	**Circuit**	**Connector**	**Pair**	**Strip**	**Socket**
1	1	TB1	1	PB1	1
	2	TB1	2	PB1	2
	3	TB1	3	PB1	3
	4	TB1	4	PB1	4
	5	TB1	5	PB1	5
	6	TB1	6	PB1	6
	7	TB1	7	PB1	7
	8	TB1	8	PB1	8
2	1	TB1	9	PB1	9
	2	TB1	10	PB1	10
	3	TB1	11	PB2	1
	4	TB1	12	PB2	2
	5	TB2	1	PB2	3
	6	TB2	2	PB2	4
	7	TB2	3	PB2	5
	8	TB2	4	PB2	6
3	1	TB2	5	PB2	7
	2	TB2	6	PB2	8
	3	TB2	7	PB2	9
	4	TB2	8	PB2	10
	5	TB2	9	PB3	1
	6	TB2	10	PB3	2
	7	TB2	11	PB3	3
	8	TB2	12	PB3	4

* For the FRE-765 List 4A RT Enclosure, the cable on the rear of the AMP Quiet Front termination module is installed in connector P1 on the RT enclosure backlane.

† Shaded terminations are used only with 8 Channel POTS or 4 Channel DDS Units.

The installer must provide suitable protection for the subscriber drops.

Protector Plugs

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

Install five-pin protector plugs into the protector strips for each subscriber line installed (see Figure 15). Refer to Table 11 on page 32 for protector socket assignments.

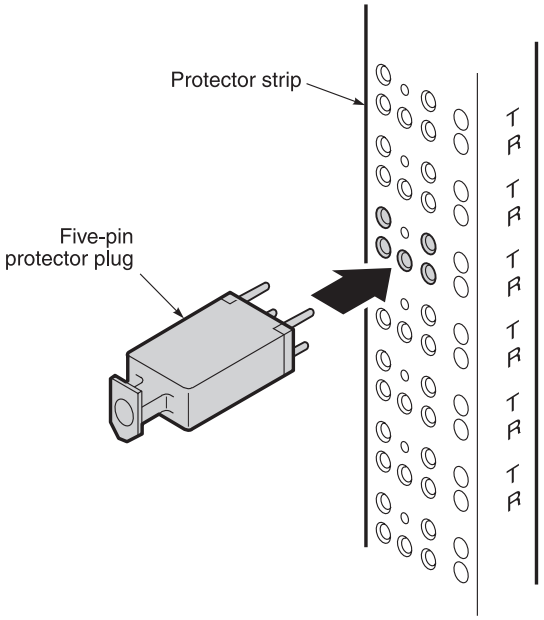


Figure 15. *Installing Five-Pin Protector Plugs*

Install the Line Unit

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

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

Install the RT line unit and verify operation as follows (see Figure 16 “Line Unit and Channel Unit Installation Locations” on page 36):

1 Insert the RT line unit into the RT enclosure and verify:

- all LEDs turn on for about seven seconds, then scan from top to bottom
- PWR LED remains 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 (turns off after about two minutes, but pressing the ACO button will turn it back 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

Install the Channel Units

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

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

Install the channel unit and verify operation as follows (see Figure 16 for channel unit locations):

1 Insert the channel unit into the RT enclosure and verify that all LEDs:

- turn on for about two seconds,
- then scan from top to bottom,
- then turn off.

If the LEDs do not follow the above sequence, refer to the troubleshooting section.

2 Provision the channel unit as described in the "Channel Configuration" on page 81. For each channel provisioned, select loop start or ground start.

3 Place a connection from the subscriber interface to the RT termination.

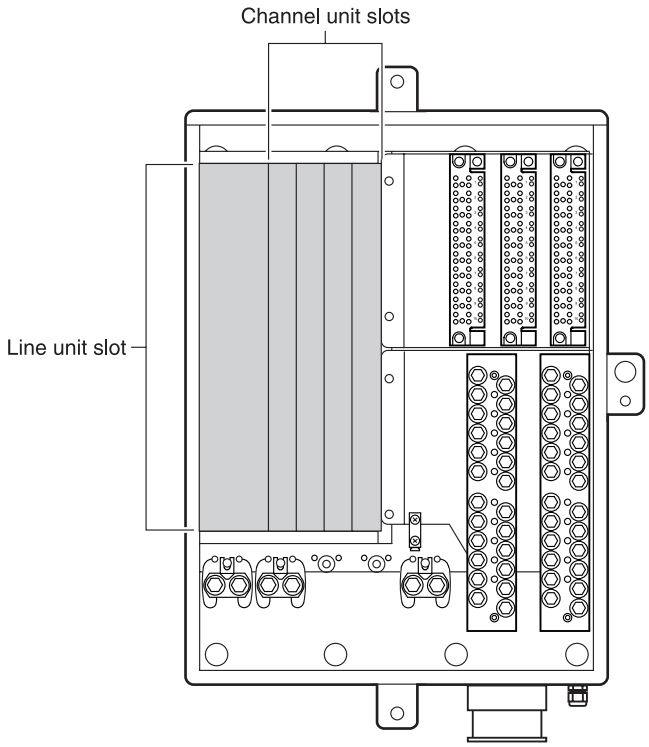


Figure 16. *Line Unit and Channel Unit Installation Locations*

Installing the Central Office Terminal Equipment

Follow the steps in Table 12 in the presented order to install PG-Flex central office terminal equipment.

These installation procedures are recommendations. Local practices, if conflicting, should take precedence. PairGain practices, where indicated, provide detailed instructions for completing these steps. These should be followed but the sequence may be altered where local needs dictate.

The following procedures are for the 23" COT shelf. For information not covered in this document, refer to the applicable PairGain technical practice.

Table 12. *Installing Central Office Terminal Equipment*

Steps		Go To	Comments
1	"Mount the COT Shelf"	page 39	Local policy determines the sequence of terminal installation and size capacity of the shelf.
2	"Wire Power to the Shelf"	page 40	Do NOT fuse the power source at this time. Use local grounding plan.
3	"Connect the HDSL Lines"	page 42	Use local practices to resolve HDSL trouble.
4	"Connect Bypass Pairs"	page 43	Local policy determines testing strategy, so this is an optional step.
5	"Connect the Alarms"	page 45	Local policy indicates termination points for alarm leads.
6	"Connect the Composite Clock"	page 46	This is required only when ISDN channel units are installed. A building integrated timing supply (BITS) or equivalent clock source is recommended.
7	"Connect the Subscriber Lines"	page 47	Local policy indicates distribution points and protection steps to be taken.
8	"Auxiliary Power Pairs"	page 48	Local policy indicates distribution points and protection steps to be taken (> 200 Vdc is present on the power pairs).
9	"Power-Up the System"	page 49	Insert fuse in the central office power source. The fuse should not operate.
10	"Verify System Voltages"	page 49	Check for appropriate battery and ground voltages.
11	"Install the Alarm Unit or the PGTC"	page 50	 ***Either an Alarm Unit or PGTC Interface Unit can be used but not both.*** This is not required for service provisioning. Local policy determines the appropriate alarm reporting and line testing strategy. Only one alarm unit or PGTC is required per COT shelf (supports up to 4 systems).

Table 12. *Installing Central Office Terminal Equipment (Continued)*

Steps		Go To	Comments
12	"Install the Line Units"	page 51	Factors to consider in selection of the line unit are: • size of shelf installed • loop test systems utilized • end terminal type Refer to Table 4 on page 21 through Table 8 on page 24 for line unit compatibility.
13	"Install the Channel Units"	page 52	Select type of channel unit using the following factors: • number of channels required • size of the shelf installed (timeslots available) • type of service required • Loop Start POTS only • Loop/Ground Start POTS • ISDN (Repeat this step until all channel units are installed in the COT shelf and RT terminals).

Mount the COT Shelf

The PG-Flex COT shelf mounts in a standard 23-inch CO equipment bay. The shelf has a mounting height requirement of 8.75 inches.

1. Align the shelf (Figure 17) universal mounting brackets with the four vertical mounting holes.
2. Install the mounting screws.

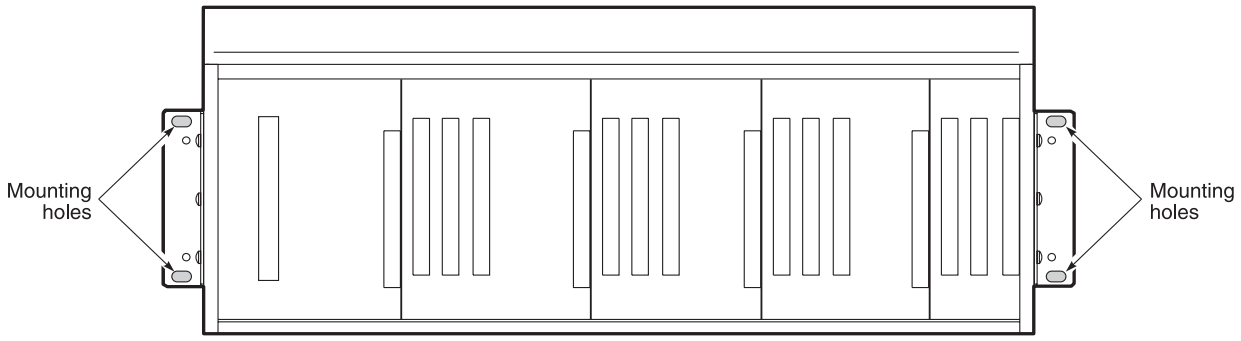


Figure 17. *Mounting the FCS-719 COT Shelf*

Wire Power to the Shelf

Follow the provisions of the current edition of the National Electric Code for wiring external to the PG-Flex product(s).

Use 12 AWG or larger wire (or multiple wires of a smaller gauge) to ensure good power connections to PG-Flex.

Before You Begin

Before wiring power to the shelf, do the following:

1. Remove the clear Plexiglass™ cover.
2. Remove the fuses in the equipment bay fuse panel for each circuit (two circuit, -48V_A and -48V_B) where the PG-Flex CO battery wires are terminated.

Follow local grounding practices to ensure a good frame ground connection to PG-Flex. This frame grounding is required for secondary voltage protection of the PG-Flex equipment.

Connect the Frame Ground

Follow the instructions below and refer to Figure 18 to connect the frame ground:

1. Connect one end of the frame ground wire to the grounding lug G1 (frame ground).
2. Connect the other end of the frame ground wire to the CO ground termination point.

The minimum frame ground wire size is 6 AWG.

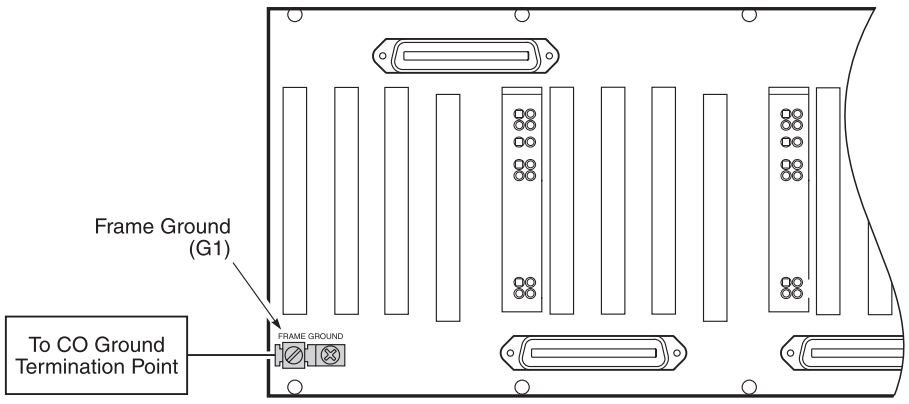


Figure 18. *Connecting the Frame Ground*

Connect the CO Battery

Connect the CO Battery (Figure 19). The FCS-719 List 4B COT shelf may be powered from a single battery feed or from a split battery feed where you would connect Battery A (-48V_A) for Systems 1 and 2, and Battery B (-48V_B) for Systems 3 and 4.

1 For split battery feed:

- Remove and discard the jumper between TB1 and TB2.
- Connect the wire used for the CO battery A to TB1 (-48V_A) termination point.
- Connect the wire used for the CO battery B to TB2 (-48V_B) termination point.
- Connect the wire for the CO battery return A to TB4 (RTN_A) termination point.
- Connect the wire for the CO battery return B to TB3 (RTN_B) termination point.
- Connect the CO battery return wire from TB4 on the COT shelf to the CO battery return termination point.
- Connect the CO battery return wire from TB3 on the COT shelf to the CO battery return termination point.
- Connect the CO battery wires from TB1 (-48V_A) and TB2 (-48V_B) on the COT shelf to the equipment bay fuse panel termination points.

2 For single battery feed:

- Connect the wire used for the CO battery A to TB1 (-48V_A) termination point.
- Connect the wire for CO battery return A to TB4 (RTN_A) termination point.
- Connect the CO battery wire from TB1 (-48V_A) on the COT shelf to the equipment bay fuse panel termination points.
- Connect the CO battery return wire from TB4 on the COT shelf to the CO battery return termination point.

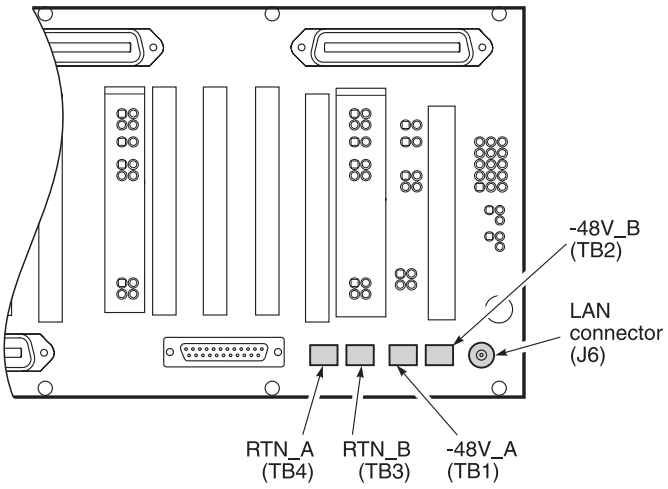


Figure 19. *Connecting the CO Battery*

Connect the HDSL Lines

Connect the HDSL lines as shown in Figure 20.

For the following procedure, n is 1 for System 1, 2 for System 2, 3 for System 3, and 4 for System 4.

For ease of identification and added safety, red vinyl caps (provided) should be installed over the HDSL wire-wrapped pins.

1. Connect HDSL Pair #1 onto wire-wrap pins HDSL_***n***_T1 (Tip) and HDSL_***n***_R1 (Ring) on the shelf for system ***n***.
2. Connect HDSL Pair #2 onto wire-wrap pins HDSL_***n***_T2 (Tip) and HDSL_***n***_R2 (Ring) on the shelf for system ***n***.
3. Repeat steps 1 and 2 for each system installed.

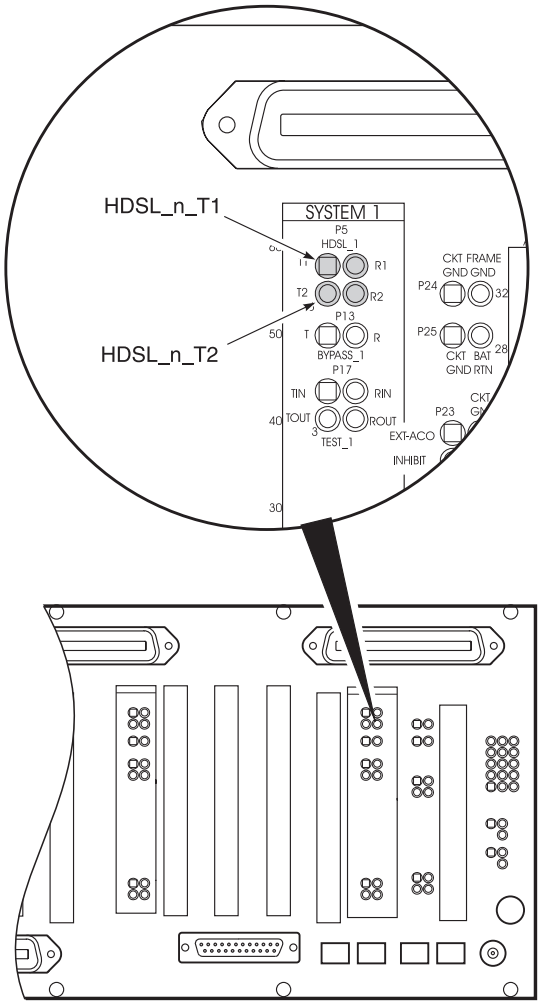


Figure 20. *Connecting the HDSL Lines*

Connect Bypass Pairs

If subscriber drop testing is required, connect the metallic bypass pairs to the COT shelf backplane as shown in Figure 21. The bypass pairs can either be connected directly to each PG-Flex system, or can be cascaded between other PG-Flex systems.

For the following procedure, n is 1 for System 1, 2 for System 2, 3 for System 3, and 4 for System 4.

Individual Bypass Pairs

To connect the bypass pairs directly to each system, do the following:

1. For System ***n***, connect the metallic bypass pair from the main distribution frame (MDF) to wire wrap posts BYPASS_***n***_T (Tip) and BYPASS_***n***_R (Ring) on the COT shelf.
2. Repeat step 1 for each system installed.

Shared Bypass Pairs

To cascade bypass pairs between PG-Flex systems, do the following:

When metallic bypass pairs are cascaded between PG-Flex COT shelves or to other digital loop carrier (DLC) systems, the INHIBIT line must also be shared between the cascaded systems.

1. Connect the metallic bypass pair from the MDF to wire wrap posts BYPASS_***n***_T (Tip) and BYPASS_***n***_R (Ring) on the first COT shelf in the cascade.
2. Connect the metallic bypass pair BYPASS_***n***_T (Tip) and BYPASS_***n***_R (Ring) on the first COT shelf in the cascade to the next bypass pair in the cascaded system.
3. Connect the INHIBIT line from the first COT shelf in the system to the next COT shelf in the cascade.
4. Repeat steps 2 and 3 for each PG-Flex system in the cascade.

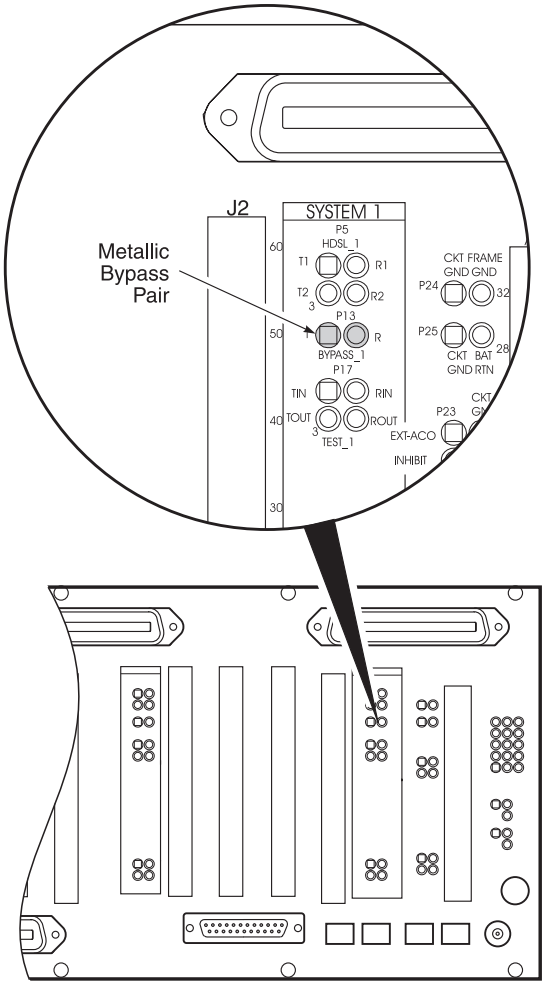


Figure 21. *Connecting the Metallic Bypass Pair*

Connect the Alarms

If external audible and visual alarm indications are required, connect the audible and visual alarm leads from the CO alarm panel to the COT alarm contacts on PG-Flex according to local practice, Figure 22, and Table 13.

External Alarm Cutoff (EXT_ACO, CKT_GND). A momentary connection between EXT_ACO (P23, pin 1) and CKT_GND (P23, pin 2) silence the PG-Flex audible alarms (Figure 22).

Table 13. *Alarm Termination*

Posts	Contact Post NO*	Contact Post COM*	Contact Post NC*	FUNCTION†
SHELF_ID	1	2	3	Shelf ID indicates a major or minor shelf alarm is active.
MAJ_AUD	4	5	6	Indicates a major alarm. The alarm can be silenced using the ACO button. Connect this relay to the major alarm audible indicator of the CO alarm system.
MAJ_VIS	7	8	9	Indicates a major alarm. This alarm cannot be disabled. Connect this relay to the major alarm visual indicator of the CO alarm system.
MIN_AUD	10	11	12	Indicates a minor alarm. The alarm can be silenced using the ACO button. Connect this relay to the minor alarm audible indicator of the CO alarm system.
MIN_VIS	13	14	15	Indicates a minor alarm. This alarm cannot be disabled. Connect this relay to the minor alarm visual indicator of the CO alarm system.

* For the relay contacts, NO is normally opened, NC is normally closed, and COM is common.

† All relays provide form "C" contacts.

Connect the Composite Clock

When required for digital services, connect the composite clock (Figure 22). You can cascade the composite clock to other PG-Flex shelves. When cascading the composite clock to other PG-Flex shelves, terminate only on the last shelf in the cascade.

1. Connect the primary composite clock leads from the master clock source in the CO to CC1_TIP and CC1_RING wire-wrap pins on the backplane.
2. Connect the secondary composite clock leads from the master clock source in the CO to CC2_TIP and CC2_RING wire-wrap pins on the backplane.

If the composite clock is connected, it must be terminated by connecting a jumper from CC1_TIP to CC1_TERM wire-wrap pins, and from CC2_TIP to CC2_TERM wire-wrap pins at the last shelf in the cascade.

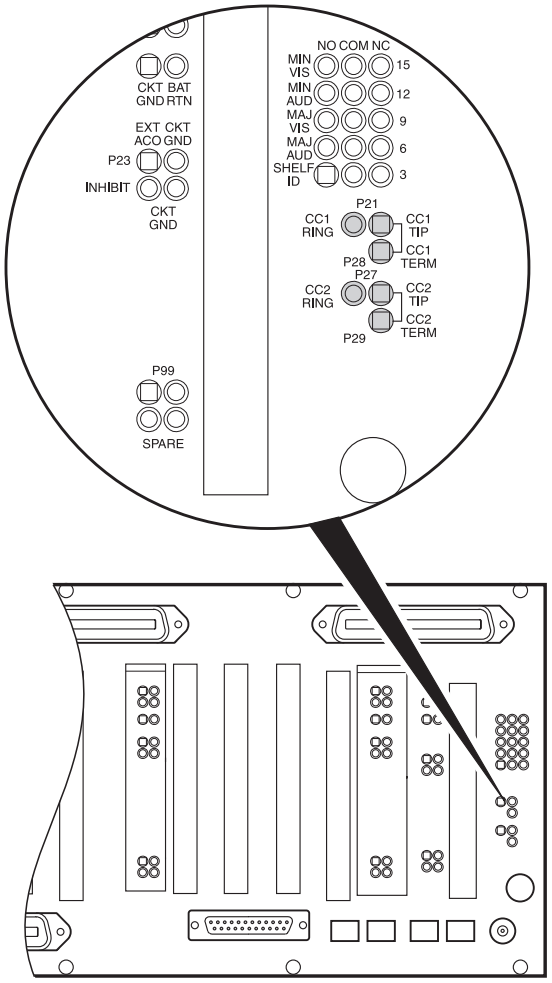


Figure 22. *Connecting the Composite Clock and Alarms*

Connect the Subscriber Lines

Connect the subscriber circuits to the subscriber terminations:

1. Refer to Table 14 to connect the CO switch subscriber lines to P1 using a 25-pair Amphenol cable for system 1.
2. Repeat step 1 for each system installed, using the adapter cables on P2 for system 2, P3 for system 3, and P4 for system 4.

Table 14. *Systems 1 through 4 Subscriber Terminations*

Channel Unit	Circuit	Conn P*n** Tip	Conn P*n** Ring	Tip	Ring
1	1	26	1	WH/BL	BL/WH
	2	27	2	WH/OR	OR/WH
	3	28	3	WH/GN	GN/WH
	4	29	4	WH/BN	BN/WH
	5	30	5	WH/SL	SL/WH
	6	31	6	RD/BL	BL/RD
	7	32	7	RD/OR	OR/RD
	8	33	8	RD/GN	GN/RD
2	1	34	9	RD/BN	BN/RD
	2	35	10	RD/SL	SL/RD
	3	36	11	BK/BL	BL/BK
	4	37	12	BK/OR	OR/BK
	5	38	13	BK/GN	GN/BK
	6	39	14	BK/BN	BN/BK
	7	40	15	BK/SL	SL/BK
	8	41	16	YL/BL	BL/YL
3	1	42	17	YL/OR	OR/YL
	2	43	18	YL/GN	GN/YL
	3	44	19	YL/BN	BN/YL
	4	45	20	YL/SL	SL/YL
	5	46	21	VI/BL	BL/VI
	6	47	22	VI/OR	OR/VI
	7	48	23	VI/GN	GN/VI
	8	49	24	VI/BN	BN/VI
BYPASS		50	25	VI/SL	SL/VI

***** Where *n* is 1 on System 1, 2 on System 2, 3 on System 3, and 4 on System 4.

Auxiliary Power Pairs

When PG-Flex is used with a doubler, wire the auxiliary power pairs to the COT shelf (Figure 9) as follows:

1. Wire-wrap auxiliary power pair 1 to PWR_1_T1 (Tip) and PWR_1_R1 (Ring) for system ***n***.
2. Wire-wrap auxiliary power pair 2 to PWR_2_T2 (Tip) and PWR_2_R2 (Ring) for system ***n***.
3. Repeat steps 1 and 2 when required for systems 2, 3, and 4.

For ease of identification and added safety, red vinyl caps (provided) may be installed over the auxiliary power pairs wire-wrapped pins.

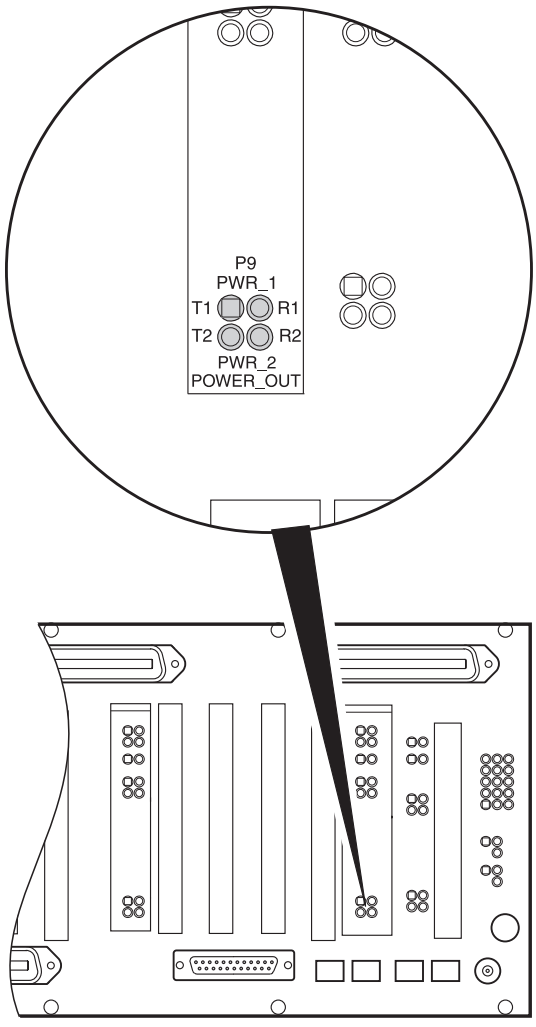


Figure 23. *Installing the Auxiliary Power Pairs*

Power-Up the System

When the COT shelf is configured for split power, insert a 5 amp fuse in the equipment bay's fuse panel for each circuit (two circuits) where the PG-Flex CO battery wires are terminated. When the FCS-719 List 4B COT shelf is powered from a single battery feed, insert a 10 amp fuse in the equipment bay's fuse panel where the PG-Flex CO battery wire is terminated.

Verify System Voltages

The following verifications should be done before any cards are inserted into the COT shelf.

1. Verify that there is a minimum of -42 Vdc and a maximum of -56 Vdc between the TB1 (-48V_A) and TB4 (RTN_A) screw terminals on the COT shelf.
2. When the COT shelf is split powered, verify that there is a minimum of -42 Vdc and a maximum of -56 Vdc between the TB2 (-48V_B) and TB3 (RTN_B) screw terminals on the COT shelf.
3. Visually verify the HDSL lines are terminated properly and with the correct polarity.
4. Verify that the HDSL lines are "dry":
   a. There should be 0 Vdc between the Tip and Ring, Tip and Ground, and Ring and Ground of each of the HDSL circuits terminated on the shelf.
   b. There should be > 100 kohm resistance between the Tip and Ring, Tip and Ground, and Ring and Ground of each of the HDSL circuits terminated on the shelf.
5. Replace the clear Plexiglass cover.

Install the Alarm Unit or the PGTC

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 is required for normal operation of the ISDN channel units. Removing the FPI-729 List 1 or FAU-728 List 2 during an ISDN will terminate the call.

Insert the FAU-728 List 2 (alarm unit) or FPI-729 List 1 (PGTC interface) into the PG-Flex COT shelf and verify the following:

- front panel LEDs scan from top to bottom
- after the scan completes, all LEDs should blink twice
- PWR LED should remain on, all other LEDs turn off

Apply the following rules when installing the alarm unit or PGTC interface into a PG-Flex system:

- To provide clocking to PG-Flex ISDN channel units, you must have:

  – the composite clock on the PG-Flex COT shelf connected and properly terminated

  – the alarm unit or PGTC interface card installed at all times

- Do not connect metallic bypass pairs between PG-Flex systems or to other DLC systems.

To install the alarm unit or PGTC interface into a List 1 or List 4 FCS-718 or FCS-719 PG-Flex COT shelf, you must terminate the composite clock using a 130 ohm to 135 ohm resistor. (Refer to “Connect the Composite Clock” on page 46.)

Install the Line Units

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

Install the COT line unit and verify operation as follows (see Figure 24 “Card Locations for a 19" COT Shelf” or Figure 25 “Card Locations for a 23" COT Shelf”):

1 Insert the COT line unit into the COT shelf and verify:

- all LEDs on the Line Card turn on for about seven seconds, then scan from top to bottom
- PWR and FAULT LEDs turn on
- after four seconds, the COT starts its power management routine and the PWR LED flashes

If line powering fails, the COT line unit will attempt to connect with the RT line unit every minute. 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 +120 Vdc between the HDSL_T2 pin and chassis ground

4 Perform system setup, if not previously accomplished (refer to “Provisioning Your System” on page 63).

Install the Channel Units

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 is required for normal operation of the ISDN channel units. Removing the FPI-729 List 1 or FAU-728 List 2 during an ISDN will terminate the call.

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 procedures are the same for POTS, LS/GS, and ISDN channel units. Refer to Table 4 on page 21 through Table 8 on page 24 for line unit and system compatibility.

Install channel unit and verify operation as follows (see Figure 24 “Card Locations for a 19" COT Shelf” or Figure 25 “Card Locations for a 23" COT Shelf”):

1 Insert the channel unit into the COT shelf and verify that all LEDs:

- turn on for about two seconds,
- then scan from top to bottom,
- then turn Off.

If the LEDs do not follow the above sequence, refer to the troubleshooting section.

2 Provision the channel unit as described in the provisioning section

3 Place a cross-connect (jumper) from the CO to the appropriate COT shelf termination for the circuit(s) selected.

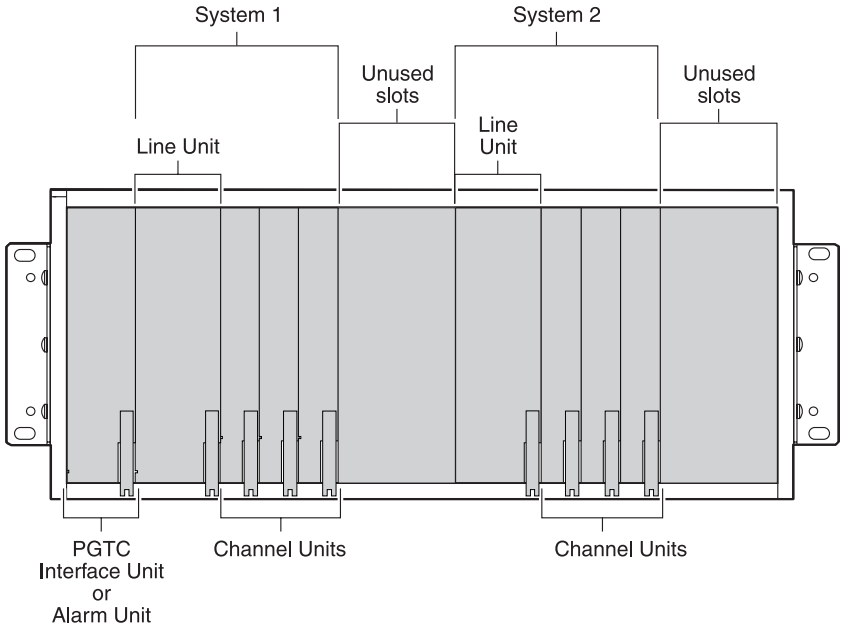


Figure 24. *Card Locations for a 19" COT Shelf*

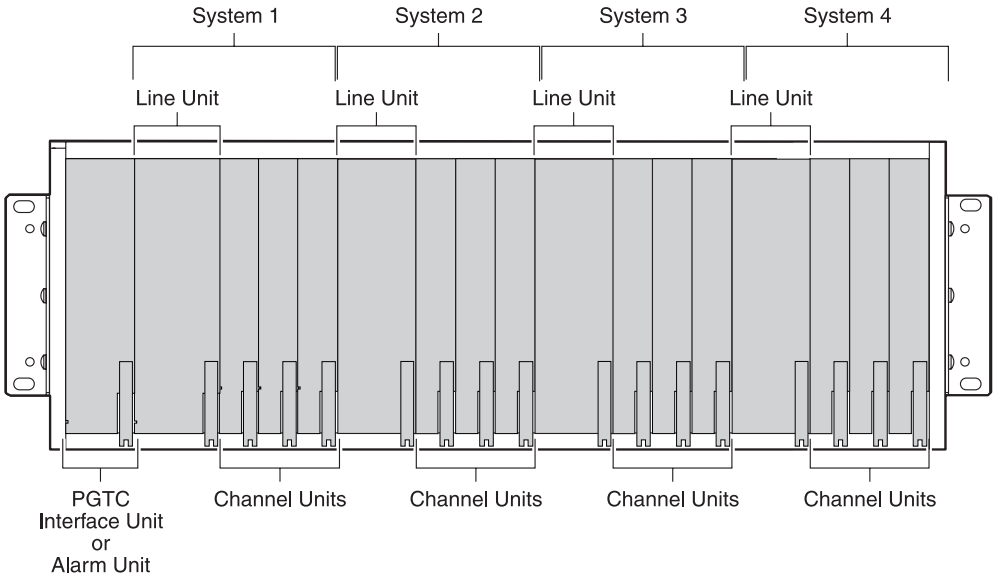


Figure 25. *Card Locations for a 23" COT Shelf*

TERMINAL MANAGEMENT

This section describes how to use the terminal management features of a PG-Flex system, and describes the following options:

The PG-Flex system is accessed through an ASCII terminal connected to the Craft port located on the front of the COT Line Unit, or through the RS-232 craft maintenance port on the Pair Gain Test Controller Interface Unit (FPI-729 List 1) or Alarm Unit (FAU-728 List 2).

Management Functions

The terminal management function allows the technician to do the following functions:

- view system status
- set configuration parameters
- metallic access to subscriber circuits
- monitor system performance
- obtain an inventory report

A password may be required for system security

When an FPI-729 List 1 or FAU-728 List 2 is installed in a COT shelf, the Craft ports on the PG-Flex line units, installed in the same shelf, are disabled. All configuration, provisioning, performance monitoring, and metallic access must be done through the FPI-729 or FAU-728 List 2 Craft port.

Craft Port

Each PG-Flex line unit provides a Craft port. The craft maintenance port is a female DB-9 connector wired as a Data Communication Equipment (DCE) interface. This connector provides communication with a DTE device such as an ASCII terminal or a computer with terminal emulation software. The signals and pin assignments for this "straight-through" connector are listed in Table 15.

Cable Connections

The DB-9 connector on the front panel of the line unit, alarm unit, or PGTC interface allows you to connect your system to an ASCII terminal or a PC running terminal emulation software with a standard RS-232 cable. Figure 26 shows the cable connections between the front panel connector and a DTE DB-9 or DB-25 connector.

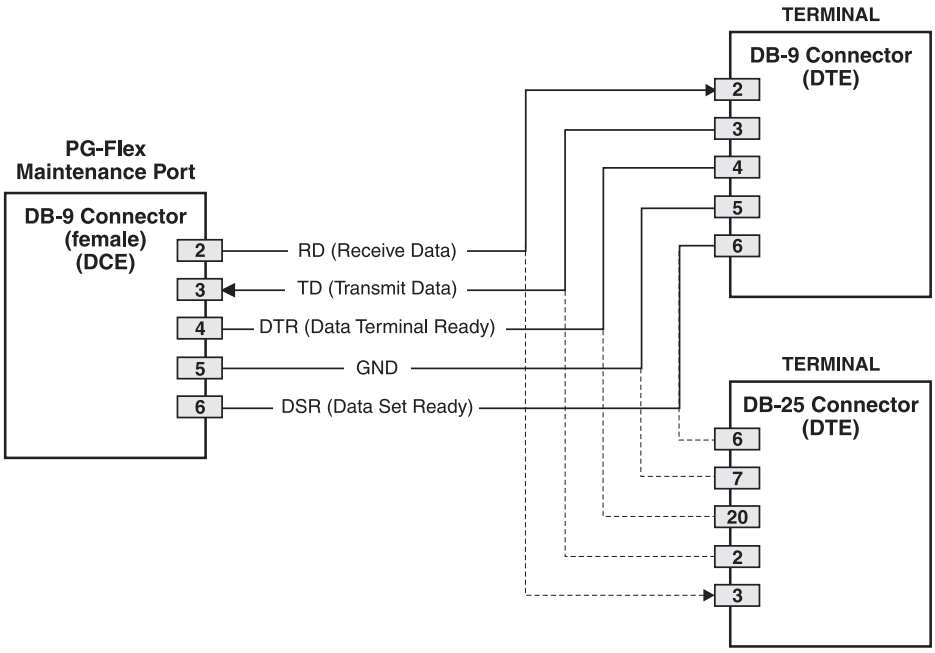


Figure 26. *DCE to DTE Cable Connections*

Table 15 *DB-9 Connector Pinouts*

DB-9 Pin	Signal
2	Received Data
3	Transmitted Data
4	Data Terminal Ready
5	Signal Common (GND)
6	Data Set Ready

Connecting to a Terminal

1 Connect a standard RS-232 cable between the PG-Flex and your ASCII terminal:

- If the PG-Flex system has a FPI-729 List 1 or FAU-728 List 2 installed, connect the RS-232 cable to the either the alarm unit or the PGTC interface front panel (Figure 27).
- If the PG-Flex system does not have an alarm unit or PGTC interface installed, connect the RS-232 cable to the appropriate system line unit (Figure 28).

2 Configure your terminal to the following communications settings:

- 1200 to 9600 baud (9600 baud recommended)
- No Parity
- 8 data bits
- 1 stop bit
- Hardware Flow Control Off

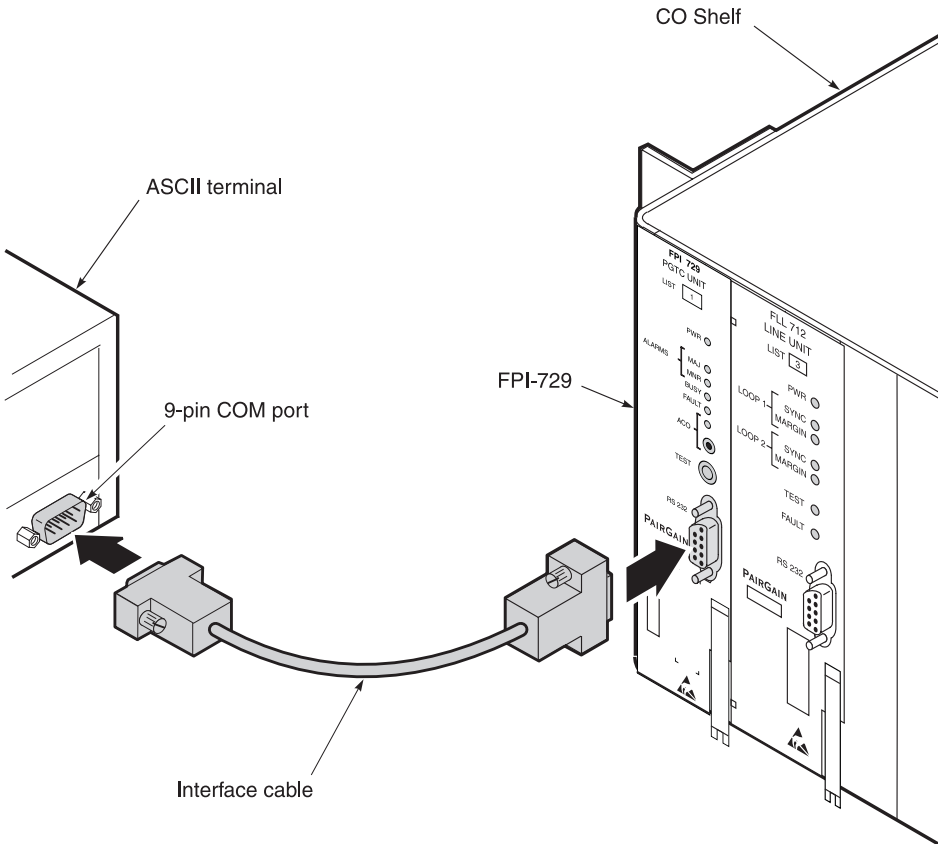


Figure 27. *Connecting an ASCII Terminal to an FPI-729 or FAU-728 List 2 Unit*

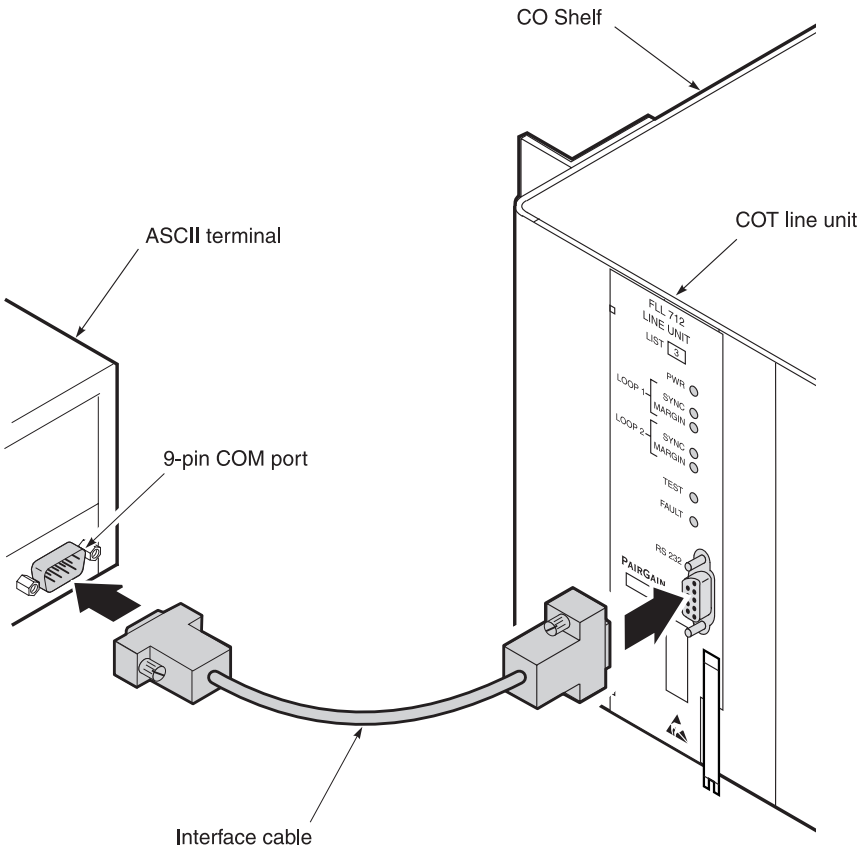


Figure 28. *Connecting an ASCII Terminal to a Line Unit*

Connecting to a Modem

A modem may also be connected to the craft maintenance port to allow remote access. In this configuration, a null modem cable or adapter must be used between the line unit and the modem. Figure 29 shows the pinouts for connecting to a modem using a null-modem cable cross-over.

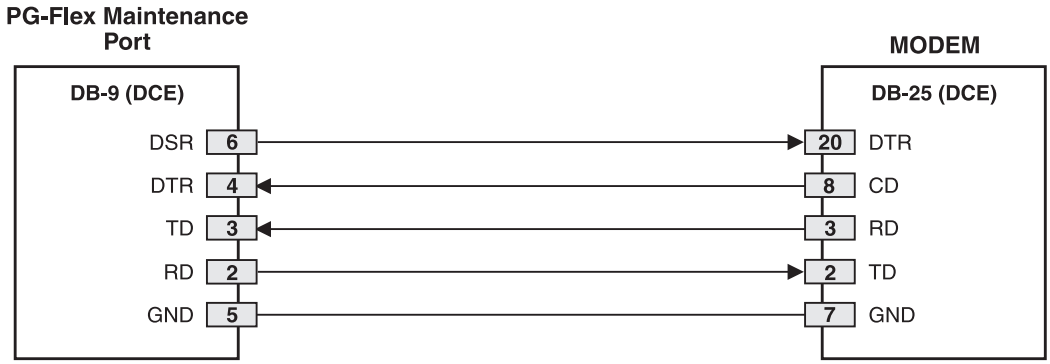


Figure 29. *Null-Modem Cable Pinouts*

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 the CD signal when it connects with another modem and to drop CD when it disconnects. If set ON, the line unit connection functions properly but does not log out properly when disconnected.

Set the modem as follows:

- 8 data bits
- 1 stop bit
- no parity

Using Data Carrier Detect (DCD) from the modem ensures that the line unit logs off if the carrier signal disappears.

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

Craft Port Menu Structure

The Craft port uses a series of menus (Figure 30) to guide the technician to the appropriate display or data entry screen. (Refer to Table 16 on page 61 for a description of menu options and definitions.)

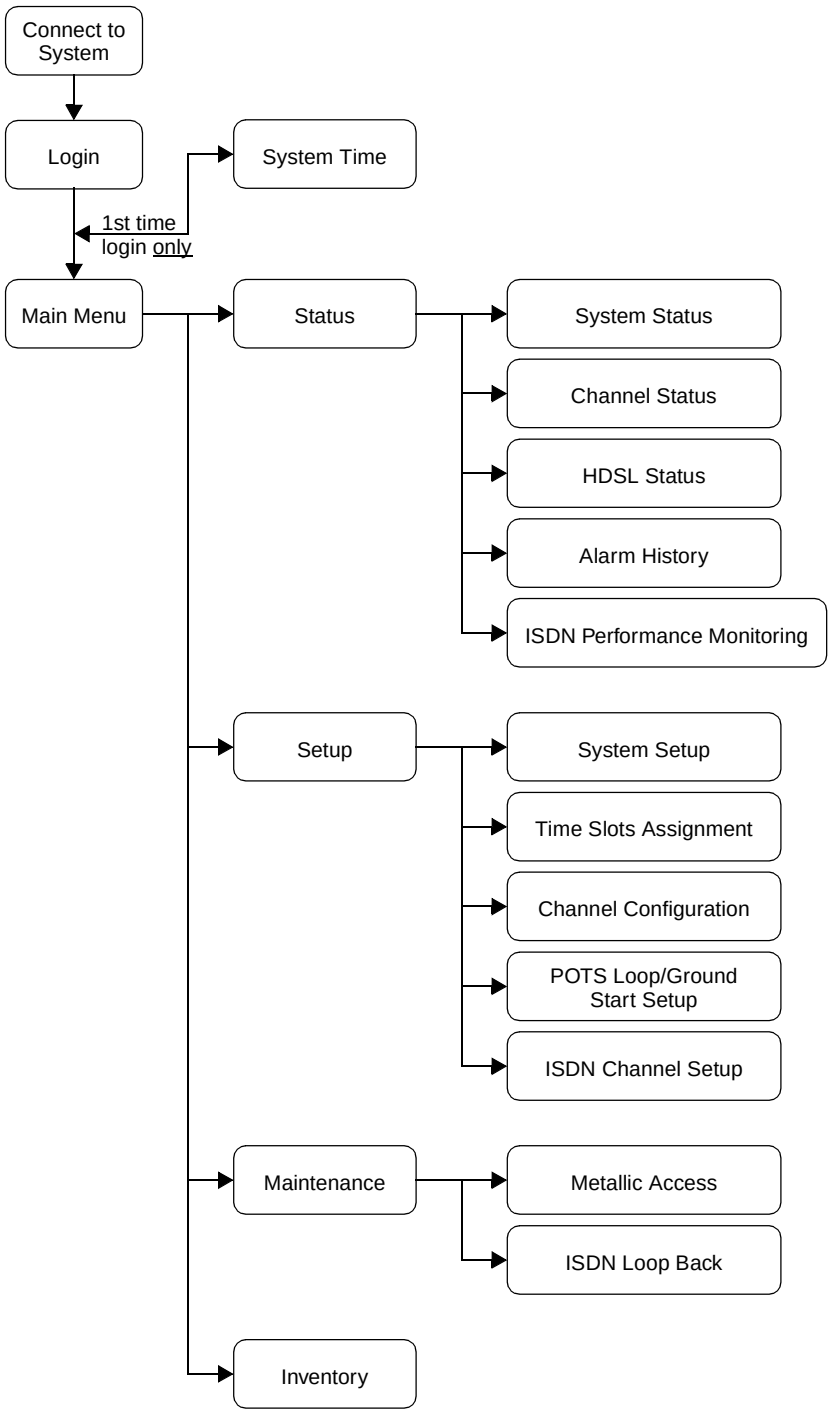


Figure 30. *PG-Flex Main Menu Display Structure*

Main Menu Options

After entering the correct password, the terminal displays the Main Menu from which you can access any of the options shown in Table 16.

Table 16. *Main Menu Options*

Type Letter	Parameter	Function
A	Status	Select the Status option 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. 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 volts test request SERR: PCM bus frame sync error FIDL: forced idle TDSB: time slots disabled RBAT: reverse battery ****: unknown NSYN: ISDN line is not synchronized with the CO switch SYN: ISDN line is synchronized with the CO switch • HDSL Status to show the status of the HDSL span. You can view either the 24-hour or 7-day performance history. • Alarm History to show the status of system alarm conditions. Examples of alarm conditions are: COT Shelf Alarm History, RT Shelf Alarm History, and Span Alarm History. • ISDN Performance Monitoring to show the following conditions: PM Error Count, and 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: • 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 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.

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 17 describes keys you can use from the ASCII terminal keyboard to navigate through the menus.

Table 17. *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 options 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.

PROVISIONING YOUR SYSTEM

This section describes procedures for provisioning your PG-Flex 24 Channel subscriber carrier system using an ASCII terminal connected to either the Craft port of an FPI-729 or FAU-728 List 2 card, or to the craft maintenance port of each system's line unit. The following procedures are described:

This section covers the basic options to configure a PG-Flex system. Refer to "Performance Monitoring" on page 87 for performance and status information, and refer to "Screen Menus and Definitions" on page A-1 for a complete list of screen menus and definitions.

All configurable options are preprovisioned with factory defaults to minimize field provisioning.

Before You Begin

The provisioning procedures assume that the PG-Flex system is powered up and connected to an ASCII terminal (refer to *Terminal Management* for details). Before you begin, verify the front panel indications of the units listed below:

Before you can provision a PG-Flex system, make sure that HDSL has established synchronization, no alarms are indicated, and that no calls are in progress.

Line Unit Front Panel Indications

Verify the following line unit front panel indications:

- 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:

FPI-729 List 1 or FAU-728 List 2 Front Panel Indications

Verify the following front panel indications:

- POWER is ON
- MAJOR ALARM in OFF
- MINOR ALARM in OFF
- BUSY is OFF
- FAULT is OFF
- ALARM CUTOFF is OFF

Channel Unit Front Panel Indications

Verify the channel unit (POTS or ISDN) front panel indications:

- ACTIVE indicators are OFF
- FAULT is OFF

All RT line unit LEDs, except the SYNC, go off to save power.

If any of the front panel LEDs display a fault, refer to the Troubleshooting section for the appropriate diagnostic procedures.

Logging On to Your PG-Flex

When either an FAU-728 List 2 (Alarm unit) or FPI-729 List 1 Pair Gain Test Controller (PGTC) interface is installed in your PG-Flex system, you must log on to each system through the Alarm unit or PGTC interface front panel, where you are prompted for a password. You are not asked for an additional password when accessing each system. However, if there is no Alarm unit or PGTC interface installed in your system, you can connect to each system individually through the craft maintenance port of that system's line unit. You are then prompted for a password when you log onto each system.

Figure 31 shows the logon sequence for accessing a PG-Flex system through an alarm unit or PGTC interface.

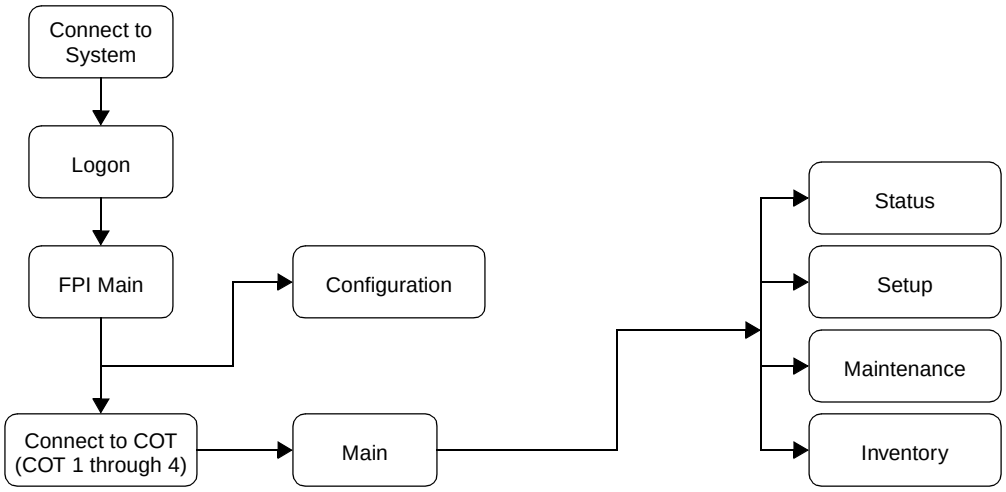


Figure 31. *Logon Sequence Through an Alarm Unit or PGTC Interface*

Figure 32 shows the logon sequence for accessing a PG-Flex system through a line unit.

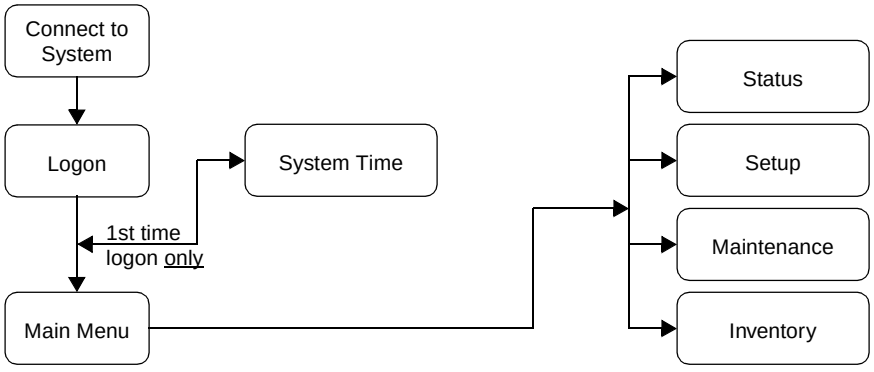


Figure 32. *Logon Sequence Through a Line Unit*

If your PG-Flex system does not have an Alarm unit or PGTC interface installed, proceed to "Logging On to a Line Unit" on page 72.

Logging On to the Alarm Unit or PGTC Interface

Although this section does not show the alarm unit logon screens, they are very similar to the PGTC interface screens in both display and functional parameters. If you have an FAU-728 List 2 installed in your system, follow the procedures for the FPI-729 card.

FPI Log On Screen

1 Press the Spacebar several times to start the autobaud feature. This establishes connection and displays the following FPI logon screen:

```
Access Key:094548









   [FPI] Enter Password>
```

2 Press Enter or type your password. For security reasons, the password is displayed as "*" characters in your terminal screen.

The Password default is Enter. This can be left at this default or set to any desired password of 10 or fewer characters (including spaces).

FPI Main Menu

After entering your password or pressing Enter, the FPI Main Menu appears on your terminal screen. This menu displays the status (Active/Inactive) of each line unit installed in a PG-Flex system. The following screen indicates that system 1 is active and systems 2 through 4 are inactive:

```
                PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL
                    Shelf ID: PG-Flex 24 Channel System

  CURRENT ALARMS: NONE

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

   1) Connect to COT 1   Active
   2) Connect to COT 2   Inactive
   3) Connect to COT 3   Inactive
   4) Connect to COT 4   Inactive


   5) Configuration

   Q) Quit



  [FPI] ENTER COMMAND> 5
```

From the FPI Main Menu you can access each PG-Flex system (COT 1 through COT 4), and access the FPI Configuration menu (option 5):

- To access PG-Flex system 1, go to “Accessing the Main Menu through the FPI Unit” on page 68.
- To access the FPI Configuration menu, go to “Accessing the FPI Configuration Menu” on page 70.

Accessing the Main Menu through the FPI Unit

1 To access PG-Flex system 1, type 1 then press Enter from the FPI Main Menu. The Main Menu for system 1 is displayed on your terminal screen:

```
12-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         05:09:16
                     SYSTEM ID: PG-Flex 24 Channel 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



     [FPI] ENTER COMMAND>
```

From the Main Menu, you access other menus where you can configure a PG-Flex system, initiate or view test options, and view status information. Table 18 on page 69 describes the options associated with these four Main Menu options (A through D).

2 To exit the PG-Flex system, press Q then press Enter.

Table 18. *Main Menu Options*

Type Letter	Parameter	Function
A	Status	Select the Status option 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. 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 volts test request SERR: PCM bus frame sync error FIDL: forced idle TDSB: time slots disabled RBAT: reverse battery ****: unknown NSYN: ISDN line is not synchronized with the CO switch SYN: ISDN line is synchronized with the CO switch • HDSL Status to show the status of the HDSL span. You can view either the 24-hour or 7-day performance history. • Alarm History to show the status of system alarm conditions. Examples of alarm conditions are: COT Shelf Alarm History RT Shelf Alarm History Span Alarm History • ISDN Performance Monitoring to show the following conditions: PM Error Count 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: • 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 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.

Accessing the FPI Configuration Menu

The FPI Configuration menu displays manufacturing information on the FPI-729 unit (Table 19).

1 From the FPI Main Menu, type 5 then press Enter. The FPI Configuration menu displays on your terminal screen:

```
                PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL
                     Shelf ID: PG-Flex 24 Channel System

  CURRENT ALARMS: NONE

                             FPI CONFIGURATION
--------------------------------------------------------------------------------
   Type:          PGTC Interface Unit
   Model:         FPI 729
   List:          1
   Issue:         1
   CLEI Code:     VACEKL0BAA
   P1 Tag:        1337001752
   S/W:           1.4


   S) Set Shelf ID:                          PG-Flex 24 Channel System
   C) Set CC Alarm:  OFF                     (OFF  ,MINOR,MAJOR)
   P) Set Password
   X) Exit

  [FPI] ENTER COMMAND> x
```

Table 19. *FPI Manufacturing Information*

Information	Description
Type	Displays the type of unit
Model	Displays the FPI model number
List	Displays the FPI unit list number
Issue	Displays the FPI Issue number
CLEI Code	Displays the CLEI code
P1 Tag	Displays the manufacturing ID
S/W	Displays the firmware version

There are three configurable parameters on the FPI card, all accessible through the FPI Configuration menu. Refer to Table 20 on page 71 for FPI configuration options.

Table 20. *FPI Configuration Options*

Type Letter	Parameter	Default Value	Function
S	Shelf ID	(all spaces)	A shelf ID can indicate the physical location of the PG-Flex shelf. This parameter can be left blank or set to any text using up to 24 characters (including spaces). This name can be any mixture of alphanumeric characters (including upper case, lower case, numerals, and punctuation marks) and is displayed at the top of the FPI Main Menu. The shelf ID is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted. If the FPI card is replaced, it is necessary to reenter the shelf ID for the new FPI card.
C	CC Alarm	Minor	A minor alarm may be generated when the FPI card cannot detect a valid composite clock signal from the primary or secondary source. A composite clock is required for ISDN and DDS services. • OFF: No alarms are generated when a composite clock signal is not present. • MINOR: A minor alarm is generated when a valid composite clock is not present. • MAJOR: A major alarm is generated when a valid composite clock is not present. This parameter is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted.
P	Password	Enter	The password option is provided to limit access to the PG-Flex system(s). The password can be left at this default or set to any desired password of 10 or fewer characters (including spaces). This name can be any mixture of alphanumeric characters (including upper case, lower case, numerals, spaces, and punctuation marks). This parameter is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted.

From here, proceed to "Logging on to a Line Unit" and go to the "Accessing the Main Menu through a Line Unit" on page 74.

Logging On to a Line Unit

If there is no alarm unit or PGTC interface installed in your PG-Flex system, you must log on to each system through the line unit for that system.

Each system in a shelf (up to four systems in a 23" shelf) is configured individually. Therefore, when you log on to each of the systems in a shelf (one at a time), you set the parameters for each system separately.

Log On Screen

1 Press the Spacebar several times to start the autobaud feature. This establishes connection and displays the following logon screen:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:06
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1









     [COT] LOGIN PASSWORD>
```

2 Press ↵ Enter or type your password. For security reasons, the password is displayed as "*" characters in your terminal screen.

System Time Set Screen

The System Time screen appears the first time you log on to a PG-Flex system, or after the power has been turned off then on. Enter the new system time in hours (HH) and minutes (:MM); seconds ([:SS]) are optional:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:08
                     SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

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









   System Time has NOT been initialized!!

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

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

Accessing the Main Menu through a Line Unit

The Main Menu is displayed on your terminal screen after a successful log on:

```
12-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         05:09:16
                     SYSTEM ID: PG-Flex 24 Channel 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>
```

From the Main Menu, you access other menus where you can configure a PG-Flex system, initiate or view test options, and view status information. Table 18 on page 69 describes the options associated with these four Main Menu options (A through D).

To exit the PG-Flex system, press Q then press ↵ Enter.

Setting System Parameters

System parameters are accessed from the Setup Menu, where you can view the current setup or change a system configurable item.

From the Main Menu, type B and press Enter. The Setup Menu is displayed on your terminal screen:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 2

   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
```

System Settings

From the Setup Menu, type A and press Enter. The System Settings menu is displayed on your terminal screen:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:39:52
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

                               SYSTEM SETTINGS
 ------------------------------------------------------------------------------
   A)  SYSTEM DATE:    .   .   .   .  .01-SEP-97
   B)  SYSTEM TIME:    .   .   .   .  .03:39:52
   C)  SYSTEM ID: .    .   .   .   .  .PG-Flex 24 Channel 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

      [RT] ENTER CHOICE> A
```

3 Type a letter (A through N) and press Enter to choose a system parameter. Select one of the options available for each parameter. Refer to Table 21 for default settings.

Table 21. *System Settings Menu Options*

Type Letter	Parameter	Default Value	Function
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	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 21. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
			***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. • 5: The user is automatically logged out after 5 minutes. • 30: The user is automatically logged out after 30 minues. • 60: The user is automatically logged out after 60 mines.
F	Metered Tone Frequency	DISABLED	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. • DISABLED: No tones are recognized. • 12: Recognizes 12 kHz as the signal frequency. • 16: Recognizes 16 kHz as the signal frequency.
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.
I	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). A default setting of 4 indicates that a minor alarm occurs when the HDSL margin is ≤ 4 dB. The HDSL Margin Threshold can be set between 0 dB and 15 dB (0 dB = Disabled).

Table 21. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
J	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: • DISABLED: A minor alarm does not occur when the HDSL ES Alarm Threshold and HDSL Margin Threshold is exceeded. • ENABLED: A minor alarm occurs when the HDSL ES Alarm Threshold and 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.
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.

Table 21. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
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 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.

View Time Slot Assignments

View time slot assignments, starting at the Setup menu.

Type B and press ↵ Enter to display the Time Slot Assignment menu:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel 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       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
```

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

Channel Configuration

Each POTS and ISDN circuit installed in a PG-Flex system can be individually enabled or disabled from the Channel Configuration menu.

1 From the Setup Menu, type C and press Enter. The Channel Configuration menu is displayed on your terminal screen:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System             SYSTEM: 2

                                CHANNEL CONFIGURATION
--------------------------------------------------------------------------------
                           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
```

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. ON indicates that the channel is enabled with a time slot. OFF means that the channel is enabled but does not have the necessary time slot(s) assigned.

2 Type D (disable) or E (enable) and press Enter. You get a prompt.

3 At the prompt, type the numbers for the channel unit and channel you want to disable/enable specified x,x (channel unit, channel) and press Enter.

Table 22. *Channel Configuration Options*

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

POTS Ground/Loop Start Configuration

Some screens are different when channel units are installed in a 19-inch or 23-inch shelf. The example screens, where appropriate, show only a 23-inch shelf with three channel units.

1 From the Setup Menu, type D and press Enter. The POTS Ground/Loop Start Configuration menu is displayed:

```
01-SEP-97      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                   SYSTEM ID: PG-Flex 24 Channel 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           -

                         CTRL-X) Main Menu    e(X)it

       [COT] ENTER COMMAND>x
```

This menu shows that channel unit 1 (CU1) has eight POTS channels enabled, channel unit 2 (CU2) has eight POTS ground start channels enabled, and channel unit 3 (CU3) has 4 ISDN channels enabled.

2 To change a channel unit parameter, do one of the following:

- Type L and press Enter to change the channel to loop start.
- Type G and press Enter to change the channel to ground start.

3 To enable or disable a channel unit, type the number for the channel unit (CU1 - CU3) followed by a comma, and then type the channel number (1 - 8) and press Enter.

Table 23. *POTS Ground/Loop Start Configuration Options*

Parameter	Default Value	Function
Channel Configuration	Loop	Each POTS channel may be individually configurable as Loop Start or Ground Start. This configuration is stored in both the COLU and the channel card. If any one card (COLU, RTLU, COCU or RTCU) is removed and replaced or reinserted, the Loop/Ground Start Configuration is automatically preserved. Can be set to the following parameters: • LOOP: The selected channel is set for Loop Start. • GND: The selected channel is set for Ground Start.

ISDN Channel Setup

An FPI-729 List 1 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.

An ISDN channel card occupies three timeslots for each channel that is enabled. So if all four ISDN channels are enabled, twelve timeslots are required. If there are not enough timeslots available, you must disable several POTS channels. (See "Channel Configuration" on page 81.)

If there are no ISDN cards present in the system, the display indicates that there are no ISDN cards installed, and does not allow you to continue to the ISDN Channel Setup menu.

1 From the Setup Menu, type E and press Enter to display the ISDN Channel Setup menu:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:44:42
                     SYSTEM ID: PG-Flex 24 Channel System             SYSTEM: 1

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


                     Press ESCAPE to return to previous menu









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

2 At the prompt for the system to be configured, enter the card number followed by a comma, and then enter the channel number. In the screen above, the ISDN card in slot 2 on system 3 is configured.

3 Press Enter and the ISDN Channel Setup menu for the selected ISDN card and system is displayed:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:39:52
                      SYSTEM ID: PG-Flex 24 Channel 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
```

Changing ISDN Parameters

1 Type A through E and press Enter to select an ISDN parameter. Select one of the options available for each parameter. Refer to Table 24 for default values and possible settings.

2 Type S and press Enter to select a new ISDN channel unit and channel to configure.

3 Type the channel unit number and channel for the new ISDN channel unit to be configured.

All of the parameters discussed in the remainder of this section (ISDN Channel Setup) are stored in the COLU card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted.

Table 24. *ISDN Channel Setup Options*

Type Letter	Parameter	Default Value	Function
A	PM Mode	Interim Path	Performance monitoring of the ISDN channels is done considering the channel as one path (Interim Path) or several separate sections (Segmented), according to the setting of this parameter. The default setting is Interim Path. Interim Path performance monitoring collects end-to-end error rate for the entire transport path. Segmented monitoring collects error rates for each DSL loop individually.
B	eoc Mode	Normal	With the "Normal" setting, ISDN eoc messages are decoded and re-transmitted within the PG-Flex system. In the "transparent" mode, ISDN eoc messages are not decoded and are passed through the system transparently. The default setting is "Normal."
C	B1 <-> B2 swap	Normal	With the "Swap" setting, ISDN channel "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B2" and "B1" at the RT ISDN "U" interface. The "D" signaling channel is unaffected. The default is "Normal."
D	Sealing current	Off	When Sealing Current is set to "On," there is a constant current of approximately 5 ma. flowing in the ISDN subscriber loop at all times. The default setting is "Off" (no sealing current).
E	Zero Byte Substitution	Off	When this parameter is set to ENABLED, the PG-Flex system uses a ZBS code to prevent long string of zeros in the data. This is not required for proper operation of the PG-Flex system and this parameter is normally left at "Off." The default setting is "Off."

Configure Alarm on ISDN PM Threshold

Enable/Disable the Alarm On ISDN PM Threshold Cross starting from the Setup Menu:

1 Type A and press Enter to display the System Settings menu.

2 Type N and press Enter to display the Alarm On ISDN PM Threshold Cross menu:

```
07-APR-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         01:44:42
                        SYSTEM ID: PG-Flex 24 Channel System          SYSTEM: 1

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


                                CURRENTLY: DISABLED









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

3 Type Y and press Enter to enable the alarm, or type N and press Enter to disable the alarm.

PERFORMANCE MONITORING

PG-Flex system performance is accessed from the Status Menu, where you can display the following performance and status information:

- System Status—page 88
- Channel Status—page 89
- HDSL Status—page 90
- Alarm History—page 92
- ISDN Performance Monitoring—page 95

Starting at the Main Menu, type A and press ↵ Enter. The Status Menu is displayed:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:18
                SYSTEM ID: PairGain 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
```

System Status

The System Status menu shows the equipment installed in your PG-Flex system and the current alarm status of the equipment. View the system status starting from the Status Menu.

Type A and press Enter for System Status menu:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 2

                                 SYSTEM STATUS
 ------------------------------------------------------------------------------
   LOCATION     LINE UNIT        CU1     CU2     CU3     CU4     CU5     CU6
 ------------------------------------------------------------------------------
      COT     LU1 24-CH T1       ---    ISDN4   POTS8   POTG8    ---     ---
      RT      LU  *********      ---    ISDN4   POTS8   POTG8

    ACTIVE ALARM(S): NONE




                          CTRL-X) Main Menu    e(X)it

      [COT] ENTER COMMAND> x
```

An “*” next to the unit name indicates that the unit is currently in the alarm state.

Channel Status

The Channel Status menu shows the current status of each channel in the system. Each channel has a status condition (see Table 25).

Type B and press ↵ Enter for the Channel Status menu:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 2

                                 COT CHANNEL STATUS
 ------------------------------------------------------------------------------
                    CU1       CU2       CU3       CU4       CU5       CU6
    Channel COT   (---)    (ISDN4)   (POTS8)   (POTG8)    (---)     (---)
 ------------------------------------------------------------------------------
           1          -        NSYN      OPEN      OPEN       -         -
           2          -        TDSB      OPEN      OPEN       -         -
           3          -        NSYN      OPEN      OPEN       -         -
           4          -        NSYN      OPEN      OPEN       -         -
           5          -         -        OPEN      TDSB       -         -
           6          -         -        OPEN      TDSB       -         -
           7          -         -        OPEN      TDSB       -         -
           8          -         -        OPEN      TDSB       -         -

                    A) TOGGLE BETWEEN COT AND RT CHANNEL STATUS

                              CTRL-X) Main Menu    e(X)it

      [COT] ENTER COMMAND> x
```

Table 25. *Channel Status Conditions*

Information	Description
IDLE	The channel is not off-hook or ringing
RING	The channel is ringing
BUSY	The channel is off-hook
OPEN	There is no connection to the central office switch
ACTN	The ISDN channel is active
NACT	The ISDN channel is not active
TDSB	The ISDN card does not have sync
NSYN	The ISDN channel is not synchronized with the CO switch

Option “A” allows toggling between the CO and RT channel status.

HDSL Status

The HDSL Status menu displays the interterminal status of the HDSL span (see Table 26). You can view either a 24-hour or a 7-day performance history.

1 Type C and press ↵ Enter at the Status menu. The HDSL Status menu is displayed:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel 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):         8/ 9/9      14/16/17     14/15/15     13/13/14
      PULSE ATTN (db):       36           27           28           28
      PPM OFFSET (ppm):       0            0          163          164
      24 HOUR ES:             0            1            2            6
      24 HOUR UAS:           51           57            3            9
 ------------------------------------------------------------------------------
           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> x
```

Table 26. *HDSL Status Conditions*

Status	Description
ALARMS	COT/RT end.
MARGIN (db)	Signal-to-noise ratio relative to a 10^{-7} BER. Normal is 6 - 22 db.
PULSE ATTENUATION	Attenuation of 2B1Q signal. Normal is 1 - 32 db.
PPM OFFSET	Crystal oscillator offset. Normal is -64 to +64.
24 HOUR ES	Number of one second intervals which contained at least one CRC error.
24 HOUR UAS	Number of seconds the HDSL loop was out-of-sync.

2 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.
R	Resets minimum and maximum margins, 24-Hour ES, 24-Hour UAS, and 24-Hour Performance History. When the prompt displays, you type <Y> to confirm the reset or type <N> to cancel the reset.
X	Exits the current screen, and returns you to the 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.

* A Doubler unit must be installed in the circuit to display the "S" option.

The status for the doubler unit(s) can be viewed through the alarm history menu (see See "Alarm History" on page 92).

Alarm History

The Alarm History menu displays the status history of COT, RT, and span alarm conditions (see Table 27).

1 Type D and press Enter at the Status Menu. The System Alarm History menu is displayed:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel 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
```

Table 27. *Alarm History Conditions*

Status	Description
LAST CLEARED	Date and time when the counters were last zeroed.
COT SHELF	Conditions that only relate to the CO.
RT SHELF	Conditions that only relate to the RT.
SPAN ALARM	Conditions that only relate to spans.

2 Type C and press ↵ Enter at the Main Menu. The Alarm History menu displays:

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:01:56
                     SYSTEM ID: PairGain PG-Flex System               SYSTEM: 1

                                SPAN-1 ALARM HISTORY
-------------------------------------------------------------------------------
 Type            First           Last            Status     Current   Count
 ------         --------------  --------------  ----------  -------    -----
 HDSL1 UAS       JUN 12, 00:00   JUN 12, 00:00    Enabled     NONE       1
 HDSL2 UAS       JUN 12, 00:00   JUN 12, 00:00    Enabled     NONE       2
 HDSL1 MARGIN    JUN 12, 00:00   JUN 12, 00:00    Enabled     NONE       1









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

Table 28 lists the span alarm conditions, listed under the “Type” heading, in the above screen.

Table 28. *Span Alarm History Conditions*

Status	Description
HDSL1 UAS	The number of seconds (unavailable seconds) the HDSL1 loop was out of synchronization.
HDSL2 UAS	The number of seconds (unavailable seconds) the HDSL2 loop was out of synchronization.
HDSL1 MARGIN	Indicates the excess signal to noise ratio, at either the COT or RT, relative to a 10^{-7} Bit Error Rate. The normal range of a typical margin is from 22 to 6 dB.

3 Type S and 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.

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:56
                      SYSTEM ID: PairGain PG-Flex System             SYSTEM: 1

                                SPAN-2 ALARM HISTORY
--------------------------------------------------------------------------------
 Type            First           Last            Status     Current   Count
 ------         --------------  --------------  ----------  -------    -----
 HDSL1 UAS       JUN 12, 00:00   JUN 12, 00:00    Enabled     NONE       1









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

ISDN Performance Monitoring

Access the menus for PM Error Count and Threshold Alert information for the ISDN channel units, starting from the Status Menu.

1 Type E and press Enter to display the ISDN Performance Monitoring Menu:

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 2

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

                     Press ESCAPE to return to previous menu









    Enter Card and Channel (CARD,CHANNEL): 2,1
```

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

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 2

                         ISDN PERFORMANCE MONITORING MENU
 ------------------------------------------------------------------------------
     INTERIM PATH ENABLED   CARD:2   CHANNEL:1
 ------------------------------------------------------------------------------

                          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
```

TROUBLESHOOTING

This section provides troubleshooting procedures for isolating PG-Flex system faults. The troubleshooting methods are organized into three groups:

- troubleshooting using front panel LED indications—page 98
- PG-Flex metallic test access—page 102
- subscriber drop testing—page 103
- troubleshooting using standard test equipment—page 110

Troubleshooting Using Front Panel LED Indications

The following tables provide troubleshooting procedures based on indications displayed by the front panel LEDs of a COT line unit, an FPI-729 or FAU-728 List 2 unit, or a COT channel unit.

Line Unit Troubleshooting

Table 29 provides troubleshooting procedures based on indications displayed by the front panel LEDs of a COT line unit.

Table 29. *COT Line Unit Troubleshooting*

Indication	Problem	Action
POWER LED off	The COT Shelf is no longer receiving CO battery.	**1** Verify that the fuse on the CO fuse panel is good. **2** Verify wiring between the COT shelf and the CO fuse panel, and from the panel to the CO battery.
	The COT line unit fuse F1 has blown.	Replace the fuse.
LOOP 1 (2) SYNC LED flashing or off	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).	**1** Verify the HDSL circuits are terminated properly and with the correct orientation. **2** 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 9 on page 25. **3** Ensure that the HDSL circuit span is within proper design limits: • line loss <35 dB @ 196 kHz • pulse attentuation is <28 dB See “HDSL Status” on page 13.
	COLU and RTLU incompatible. That is, one is a T1 version and the other is an E1 version.	Replace either CO or RT end with the correct E1 or T1 line unit.
LOOP 1 (2) MARGIN LED on	The HDSL line margin level is below a preset level.	**1** Ensure that the HDSL circuit span is within proper design limits: • line loss <35 dB @ 196 kHz • pulse attentuation is <28 dB See “HDSL Status” on page 13. **2** Verify that the HDSL margin threshold is set correctly. See “Setting System Parameters” on page 75.
FAULT LED on	System alarm/fault is detected.	Review Alarm History for trouble source.

FPI-729 or FAU-728 List 2 Troubleshooting

Table 30 provides troubleshooting procedures based on indications displayed by the front panel LEDs of an FPI-729 or FAU-728 List 2.

Table 30. *FPI-729 or FAU-728 List 2 Troubleshooting*

Indication	Problem	Action
POWER LED off	**1** The COT Shelf is no longer receiving CO battery.	**1** Verify that the fuse on the CO fuse panel is good. **2** Verify wiring between the COT shelf and the CO fuse panel, and from the panel to the CO battery. If the POWER LED is still off, the FPI-729 is defective.
ALARMS	Indicates the current alarm state of a shelf.	Use a terminal to access the fault information.
MAJOR	Major alarm toggles on and off. The COT line unit fault LED toggles on and off. The HDSL sync LEDs indicate sync.	Verify that the composite clock terminations are properly terminated (135 Ω across CC1 and CC2 Tip and Ring leads). This can also be a minor alarm.
MINOR	Minor alarm LED is on.	Verify the status of fault LEDs on the line units and channel units.
BUSY	**1** There is a problem in the connections between the FPI-729 backplane connector and the Pair Gain Test Controller.	Verify proper terminations between the FPI-729 connector on the PG-Flex backplane and the Pair Gain Test Controller.
	2 The FPI-729 is defective.	Replace the FPI-729 unit
	3 The PG-Flex system is in active test mode.	No action
FAULT LED on	Faulty FPI-729 unit.	Replace the FPI-729 unit

Channel Unit Troubleshooting

Table 31 provides troubleshooting procedures based on indications displayed by the front panel LEDs of a channel unit and customer reports.

Table 31. *Channel Unit Troubleshooting*

Indication	Problem	Action
FAULT LED ON	The processor has detected a fault.	Remove and reinsert the channel unit. If the FAULT LED does not extinguish, replace the channel unit.
Troubleshooting based on customer-originated trouble reports		
No Dial tone, Can Not Dial	• faulty RT or COT channel unit • facility short/open • CO switch problem • faulty customer instrument/wiring	**1** Verify that dial tone is present at the CO. (COT Looking-In or Bridging). **2** Lift the subscriber pair at the network interface. If dial tone is present and you can place a call, refer the problem to the customer per local practice. (RT Looking-In or Bridging). **3** If the problem still exists, refer the problem to the CO switch. **4** If you cannot hear dial tone or cannot place a call at the network interface (with the subscriber pair lifted), check for dial tone at the RT. If dial tone is present, check the pair between the RT and the network interface. If no dial tone is present, replace the RT channel unit. **5** If the problem still exists, reinsert the original RT channel unit and replace the COT channel unit. Test for operation.
Phone Does Not Ring	• high-resistance subscriber line short • faulty RT or CO channel unit • loop length too long • CO switch	**1** Lift the subscriber pair at the network interface. If ringing is present, refer the problem to the customer per local practice. **2** If ringing is not present, check for ringing at the RT. If ringing is present, check the pair between the RT and the network interface. If no ringing is present, replace the RT channel unit. If ringing is still not present, check a circuit on another channel unit. If ringing is still not present, replace the line unit. **3** If ringing is still not present at the RT, reinsert the original channel unit and line unit. Test for ringing at the COT. **4** Test for ringing into the COT from the CO switch. If no ringing is present, refer the trouble to the CO switch. If ringing is present, replace the COT channel unit. Test again for ringing at the network interface. If ringing is still not present, contact PairGain “Technical Support” on page 113. **5** Verify the resistance of the copper loop between the RT Enclosure and the network interface is less than 530 Ω.
Phone Does Stop Ringing	• faulty subscriber instrument • faulty RT channel unit • loop length too long	**1** Test for ring trip at the network interface. If the ringing is tripped, refer the trouble to the customer per local practice. **2** If the ringing is not tripped, test for tripping at the RT. If ring trip does occur, check the loop for excessive length. If ring trip does not occur, replace the RT channel unit. If ring trip still does not occur, contact PairGain “Technical Support” on page 113. **3** Verify the resistance of the copper loop between the RT Enclosure and the network interface is less than 530 Ω.

Table 31. *Channel Unit Troubleshooting (Continued)*

Indication	Problem	Action
Can Not Hear, Can Not Be Heard	• subscriber problem • faulty RT or COT channel unit • CO switch	**1** Lift the subscriber line at the network interface and check the signal level. If correct, refer trouble to the customer per local practice. **2** If the level is too low, check the level at the RT. If the level is correct at the RT, check the pair between the RT and the network interface. If the level is too low at the RT, replace the RT channel unit. **3** If the level is still too low, reinsert the original RT channel unit. **4** Check the level at the COT coming from the CO switch. If it is correct, replace the COT channel unit. If it is not correct, refer the problem to the CO regarding the switch. **5** If the level is still not correct, reinsert the original COT channel unit. Contact PairGain “Technical Support” on page 113.

PG-Flex Metallic Test Access

PG-Flex provides a break-out function and automatic line test support used to diagnose a faulty subscriber connection. Manual subscriber line metallic access is activated and deactivated via the Craft Port Interface. Test Desk support for 4TEL line testing is handled via recognition of control voltages to the Channel Under Test. Automatic line testing is accomplished by supporting the Pair Gain Test Controller (PGTC).

Manual Subscriber Line Metallic Access

Manual test activation is accomplished by selecting the line access function, then channel card and channel number from the Metallic Access Menu. The manual line metallic access functions available are: COT Bridging, COT Looking-In, COT Looking-Out, RT Bridging, RT Looking-In, RT Looking-OUT, and Subscriber Bypass.

COT and RT Bridging functions are not available for ISDN cards due to the low impedance nature of the bridging relays. The low impedance connection would cause data drop-outs or circuit disconnections to ISDN circuits.

Manual subscriber line metallic access can aid in isolating single-channel failures in channel cards from the central office—used prior to dispatching a service technician to the field. In particular, COT and RT "looking-in" functions can be used to check for dial tone and ring signals at the central office and subscriber drop terminations.

Test Desk Activation

Test desk activation is activated by receipt of +116VDC to the Tip lead of the Central Office channel unit for the Channel Under Test. The POTS connection from the CO switch to the Channel Under Test is dropped and the connection is routed to the Metallic Bypass line.

The routing is completed at the Remote Terminal end where the Metallic Bypass line is connected to the subscriber POTS circuit. In effect, PG-Flex is removed from this particular subscriber connection. The phone company personnel can then perform whatever testing is necessary to verify the condition of the subscriber line.

Deactivation is accomplished upon detection of -116 Vdc to the Tip lead of the Metallic Bypass line at the COT line unit. The subscriber connection is then restored to the PG-Flex system.

4TEL test activation is only accomplished with the FAU-728 Alarm Card.

Automatic Line Metallic Access

Automatic line metallic access is provided by the use of the FPI-729 PGTC Interface Unit. The PGTC Interface card handles and provides the handshakes necessary to establish and maintain the connections for the Pair Gain Test Controller to perform its stimulus and measurement testing of the Channel Under Test.

Subscriber Drop Testing

PG-Flex provides metallic access to the subscriber circuit in support of subscriber drop testing. Using standard metallic access techniques and equipment, you can access a specific subscriber drop and have a metallic test path back to the Central Office test equipment.

Only one subscriber circuit in a PG-Flex shelf can be accessed at a time when an FPI-729 List 1 or an FAU-728 List 2 is installed.

If an FAU-728 List 1 is installed, one subscriber circuit in each PG-Flex system can be accessed simultaneously.

PG-Flex allows subscriber line test functions on a first-come, first-served basis. Only one line access function can be established on a single system at a time. When testing in conjunction with an FPI-729, only one line test per COT Shelf is allowed. In this particular instance, a PGTC test established on another PG-Flex system within the shelf terminates another line access function in progress.

To ensure that the test system can identify a carrier channel unit, all channel units incorporate the appropriate three-terminal dc signature resistances (Table 32) and conform to Bellcore's TR-NWT-000057.

Table 32. *COT Channel Unit Signatures*

Termination	FLC-701, List 2 FLC-703, List 3	All Other COT POTS Channel Units
Tip-Ring	(open)	475 kΩ, 1%
Tip-Ground	162 kΩ, 1%	332 kΩ, 1%
Ring-Ground	162 kΩ, 1%	(open)

Bridging and Breaking

The basic subscriber line access methods are bridging and breaking. The access functions have been designed primarily with POTS circuits in mind although it works with other 2-wire services, such as ISDN.

Bridging provides a low impedance connection in parallel across the circuit. Breaking separates the subscriber connection at the point of interest; providing exclusive access to the line for the attached test equipment. The metallic access points are reached via the test jack(s) on the FAU-728 alarm card or the FPI-729 PGTC interface unit.

There are two different 'Looks' when providing break-out access to the subscriber line—Looking-In and Looking-Out. The terms 'In' and 'Out' are relative to the direction of the Central Office switch. 'In' is the direction toward the switch and 'Out' is in the direction of the subscriber.

Craft Port Metallic Access

Subscriber drop tests are accessed through a terminal connected to the Craft port of the line unit front panel, or through the RS-232 interface on the PGTC Interface Unit (FPI-729 List 1) or Alarm Unit (FAU-728 List 2). Refer to *Terminal Management* for procedures on accessing the craft maintenance port.

Using an ASCII terminal and the COT line unit's maintenance port, the technician can access a specific subscriber drop. Instead of connecting the metallic bypass pair back to the local test system through the CO switch, the metallic connection appears on the PGTC or Alarm Unit test jack. As shown in Figure 33, this method of metallic access does not require a local test system, and provides the technician with a means to perform metallic testing of the subscriber drop without traveling to the remote location.

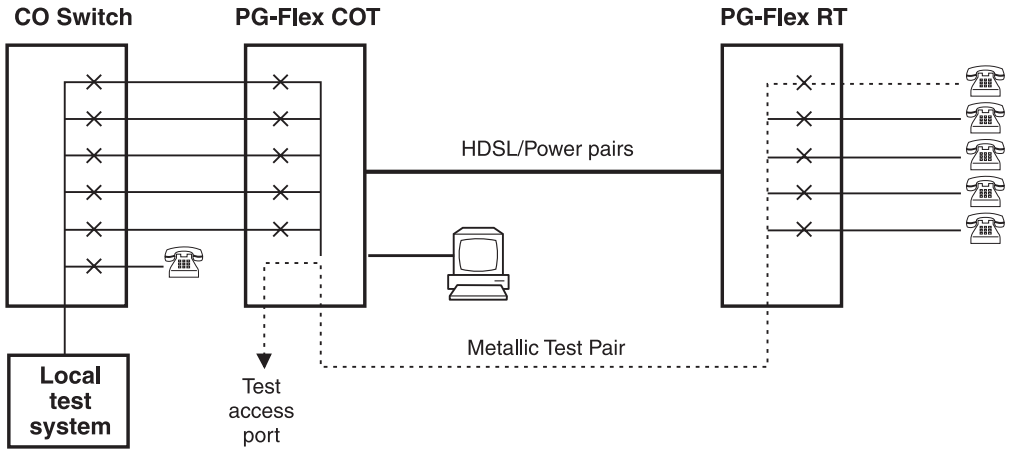


Figure 33. *Metallic Test Access Using the Craft Maintenance Port*

Maintenance Menu

From the Maintenance Menu you can select “Metallic Access” which includes: COT bridging, COT looking in, COT looking out, RT looking out, RT looking in, RT bridging, and subscriber bypass. Additionally, there is an ISDN loop back test option available.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:17:02
                     SYSTEM ID: PG-Flex 24 Channel 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
```

From the Maintenance Menu, type A or B and press Enter. The selected menu (Metallic Access or ISDN Loop Back) is displayed.

Metallic Access Menu

Starting at the Maintenance Menu, select A and press ↵ Enter. The Metallic Access Menu is displayed on your terminal screen: Refer to Table 33 for the Metallic Access Menu options.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:17:10
                      SYSTEM ID: PG-Flex 24 Channel 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 33: *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.
C	COT - Looking Out	Provides the ability to stimulate and measure the subscriber connection through the CO channel unit. The switch is disconnected from PG-Flex for this function.
D	RT - Looking Out	Provides the ability tostimulate and measure the subscriber circuit connection between the RT channel unit tip/ring pair and the subscriber terminal device.
E	RT - Looking In	Provides the ability to connect a terminal device to the specified channel through the Bypass pair. This provides the ability to verify the channel connection through PG-Flex but excluding the subscriber loop and subscriber's terminal device.
F	RT - Bridging	Provides the ability to directly examine a subscriber terminal device through the Bypass pair.
G	Subscriber Bypass	Provides a metallic connection from the switch to the subscriber's terminal device for the channel under test utilizing the bypass pair.

Metallic Access Sample Menus

From the Metallic Access Menu, type a letter (A through G) and press Enter. The Metallic Access selection Menu is displayed on your terminal screen:

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:18:50
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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


                                  METALLIC ACCESS
--------------------------------------------------------------------------------

                    Press ESCAPE to return to previous menu









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

To test a subscriber drop. From the Metallic Access Menu, select the access required. (Refer to Table 33, “Metallic Access Menu Options,” on page 106 for description of each option).

1 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 List 1 or FAU-728 List 2 front panel.)

2 At the prompt for the system to be tested, enter the card number followed by a comma, and then enter the channel number. The Metallic Access Menu displays:

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:19:14
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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

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

               A) COT - BRIDGING    (ENABLED ON CU2/CH1)
               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>
```

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

To release a subscriber drop.

1 Select the card and channel for the subscriber circuit being tested.

2 Select Y to stop the test and return the circuit to service.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:19:44
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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


                                 METALLIC ACCESS
--------------------------------------------------------------------------------
                (COT - BRIDGING ACCESS IN PROGRESS ON CU2/CH1)


                    Press ESCAPE to return to previous menu




   Do you wish to stop the channel access/bypass test? [Y/N] y
```

ISDN Loopback Menu

ISDN loop backs can be initiated as:

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

To initiate a loop back on an ISDN line:

1 Select ISDN Loopback from the Maintenance Menu.

2 Select C from the ISDN Loopback Menu.

3 Select the card and channel to be tested.

4 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.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:20:36
                      SYSTEM ID: PG-Flex 24 Channel 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
```

To release Loopback on an ISDN line:

1 Select “Change Loopback Mode” from the ISDN Loopback Menu.

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

3 Select “Set Normal” from the loopback mode menu.

Troubleshooting Using Standard Test Equipment

Table 34 describes basic troubleshooting methods using standard test equipment.

Table 34. *Troubleshooting Using Standard Test Equipment*

Indication	Problem	Action
No HDSL Loop Sync	HDSL wire pair is impaired. (too long, open, shorted, or grounded)	See Table 35, "12/24 Channel HDSL Transmission Distance," on page 111 Use the local practices to test the wire pairs.
No power to the RT	The tip and ring voltages are incorrect.	Measure the voltage from T1 to frame ground and from R1 to frame ground. This should be a positive voltage up to +130 Vdc. Measure the voltage from T2 to frame ground and from R2 to frame ground. This should be a negative voltage down to -130 Vdc.
	The HDSL voltages are incorrect	Measure the voltage from T1 to frame ground and from R1 to frame ground. This should be a positive voltage up to -130 Vdc. Measure the voltage from T2 to frame ground and from R2 to frame ground. This should be a negative voltage down to +130 Vdc.
No dial tone		Move or swap cards to isolate the defective unit.
No dial tone for all systems		Check for MAJOR alarm, this terminates dial tone to the RT. Check the alarm history. If still no dial tone and no major alarms, verify that the channels are not disabled. Refer to "Channel Configuration."
No ring on one channel		Swap cards.
No ring on all channels		Check for a major alarm on the FPI-729 or FAU-728 front panels. If yes, replace the channel unit. If no, check for a dial tone. Note: The ring generator is on the line unit, not the channel unit.
"Popping" intermittent dial tone (POTS only)	Service disconnects or Major Alarms	If using an FAU 728 List 2 or and FPI-729 List 1, verify that the composite clock is terminated. (Refer to "Connect the Composite Clock" on page 46.)

HDSL Transmission Distance

The distance limitation for HDSL transmission is based on a maximum signal attenuation of 35 dB at 196 kHz. Since signal attenuation decreases as cable size increases, the larger the gauge (i.e., 19 AWG vs. 26 AWG), the greater the distance between the COT and the RT. Table 35 identifies these distances (at a cable temperature of 68°F).

Table 35. *12/24 Channel HDSL Transmission Distance*

Gauge	Loop Length	DC Resistance
19 AWG 0.9 mm	22.8 kft 7.0 km	367 Ω
22 AWG 0.6 mm	16.1 kft 4.9 km	521 Ω
24 AWG 0.5 mm	12.3 kft 3.7 km	638 Ω
26 AWG 0.4 mm	9.0 kft 2.7 km	750 Ω

TECHNICAL SUPPORT AND WARRANTY

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 - 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) 730-3299. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

Certification and Warranty

Certification

FCC Compliance. PG-Flex complies with the limits for Class B 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 is required to correct any interference at his own expense.

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

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

Warranty

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 repairs or replaces 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.

Only an authorized PairGain representative can perform repairs. If the unit fails, replace it with another unit and immediately report the failure to PairGain. Any repairs or modifications made to the unit by an unauthorized field personnel 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 Repair Center
14352 Franklin Avenue
Tustin, CA 92780-7013

FAX: (714) 730-2961
Phone: (714) 730-2800 or (800) 370-7670

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

Appendix A
SCREEN MENUS AND DEFINITIONS

The following appendix lists all screen menus and definitions for a PG-Flex 24 channel subscriber carrier system. The screen menus and definitions include the following:

Logon Screens

Figure A-1 shows the logon sequence for accessing a PG-Flex system through an FAU-728 List 2 or a PGTC interface card. Refer to “FPI-729 Main Menu and Configuration Screens” on page 5.

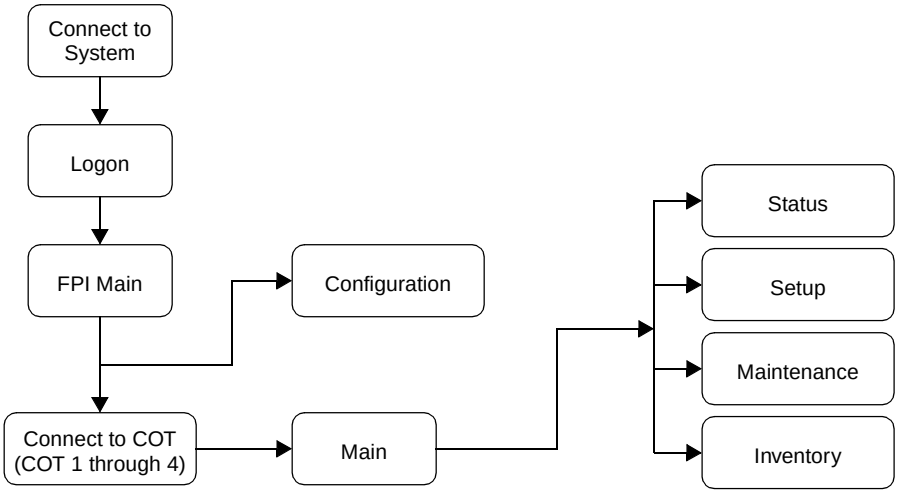


Figure A-1. *Logon Sequence Through an Alarm Unit of PGTC Interface*

Figure A-2 shows the logon sequence for accessing a PG-Flex system through a line unit. Refer to “Main Menu Screen” on page 7.

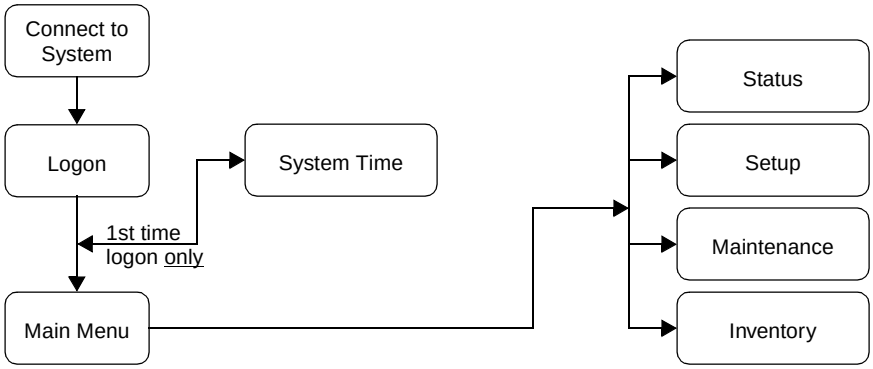


Figure A-2. *Logon Sequence Through a Line Unit*

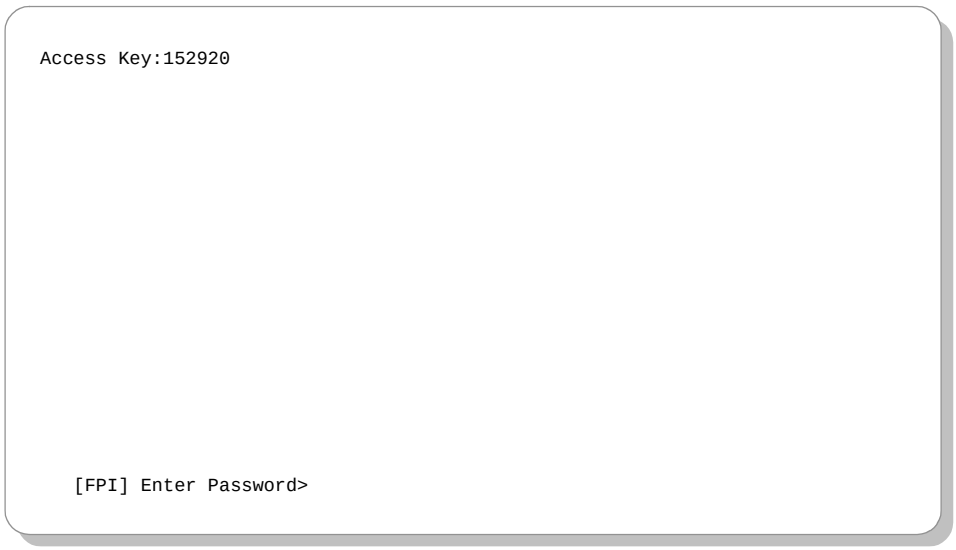
The following pages contain samples of logon screens for the PG-Flex system.

Connect to FPI System Screen

The connection screen appears after connecting an ASCII terminal to the FPI unit.

FPI Logon Screen

The FPI logon screen appears after pressing the Spacebar several times starting the autobaud feature.



System Time Screen

The System Time screen appears the first time you log on to a PG-Flex system, or after loosing power.

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:01:08
                     SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

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









   System Time has NOT been initialized!!

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

If you logged on through the FPI unit, after entering the system time, the FPI Main Menu will display (see "FPI-729 Main Menu and Configuration Screens" on page 5).

If you logged on through a line unit, after entering the system time, the Main Menu will display (see "Main Menu Screen" on page 7).

FPI-729 Main Menu and Configuration Screens

After entering your password, the FPI Main Menu displays on your terminal screen. PG-Flex systems (COT 1 through COT 4) and the FPI Configuration menu are accessed from this menu.

```
                PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL
                    SYSTEM ID: PG-Flex 24 Channel System

  CURRENT ALARMS: NONE

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

   1) Connect to COT 1   Active
   2) Connect to COT 2   Active
   3) Connect to COT 3   Inactive
   4) Connect to COT 4   Inactive


   5) Configuration

   Q) Quit



  [FPI] ENTER COMMAND> 5
```

The FPI configuration information is accessed from this menu. Table A-1 defines the FPI Configuration menu options.

```
                PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL
                    SYSTEM ID: PG-Flex 24 Channel System

  CURRENT ALARMS: NONE

                            FPI CONFIGURATION
------------------------------------------------------------------------------
   Type:          PGTC Interface Unit
   Model:         FPI 729
   List:          1
   Issue:         1
   CLEI Code:     VACEKL0BAA
   P1 Tag:        1337001752
   S/W:           1.4


   S) Set Shelf ID:
   C) Set CC Alarm:  OFF                      (OFF  ,MINOR,MAJOR)
   P) Set Password
   X) Exit

  [FPI] ENTER COMMAND> x
```

Table A-1. *FPI Configuration Options*

Type Letter	Parameter	Default Value	Function
S	Shelf ID	(all spaces)	A shelf ID is provided to indicate the physical location of the PG-Flex shelf. This parameter can be left blank or set to any name using up to 24 characters (including spaces). This name can be any mixture of alphanumeric characters (including upper case, lower case, numerals, and punctuation marks) and is displayed at the top of the FPI Main Menu. The shelf ID is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted. If the FPI card is replaced, it is necessary to reenter the shelf ID for the new FPI card.
C	CC Alarm	Minor	A minor alarm may be generated when the FPI card cannot detect a valid composite clock signal from the primary or secondary source. A composite clock is required for ISDN and DDS services. • OFF: No alarms are generated when a composite clock signal is not present. • MINOR: A minor alarm is generated when a valid composite clock is not present. • MAJOR: A major alarm is generated when a valid composite clock is not present. This parameter is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted.
P	Password	Enter	The password option is provided to limit access to the PG-Flex system(s). This password can be left at this default or set to any desired password of 10 or fewer characters (including spaces). This name can be any mixture of alphanumeric characters (including upper case, lower case, numerals, and punctuation marks). This parameter is stored in the FPI card NVRAM and therefore does not change when power is cycled or cards are removed and reinserted.

Main Menu Screen

From the Main Menu you access other menus where you can configure a PG-Flex system, initiate or view test options, and view status information. See Figure A-3 for a Main Menu block diagram.

```
12-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         05:09:16
                      SYSTEM ID: PG-Flex 24 Channel 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



     [FPI] ENTER COMMAND>
```

Table A-2 on page 9 describes the options associated with these four Main Menu options (A through D).

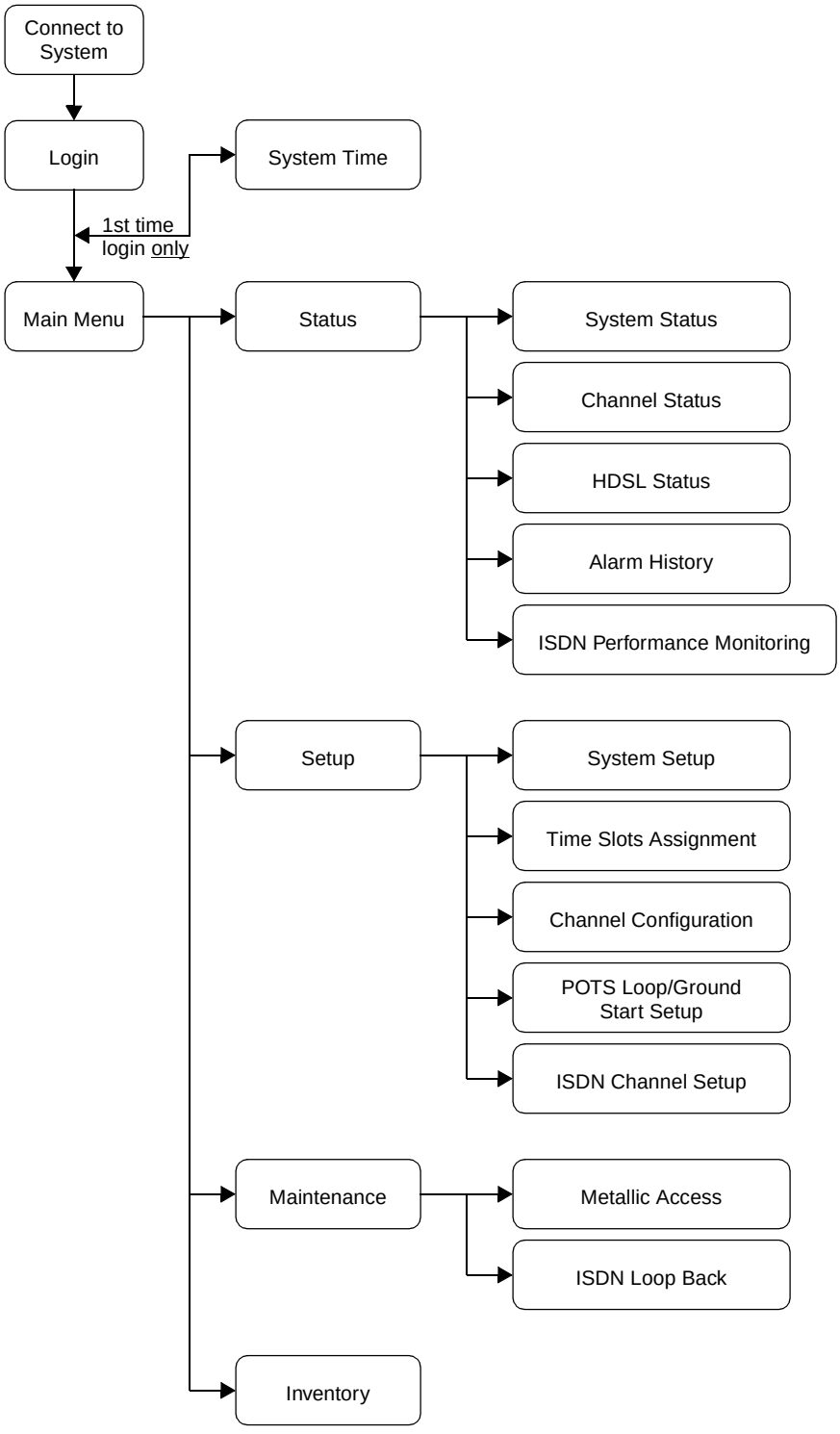


Figure A-3. *PG-Flex Main Menu Structure*

Table A-2. *Main Menu Options*

Type Letter	Parameter	Function
A	Status	Select the Status option 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. 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 volts test request SERR: PCM bus frame sync error FIDL: forced idle TDSB: time slots disabled RBAT: reverse battery ****: unknown NSYN: ISDN line is not synchronized with the CO switch SYN: ISDN line is synchronized with the CO switch • 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 show the status of system alarm conditions. Examples of alarm conditions are: COT Shelf Alarm History RT Shelf Alarm History Span Alarm History • ISDN Performance Monitoring to show the following conditions: PM Error Count 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: • System Setup • Time Slots Assignment (view only) • Channel Configuration • POTS Loop/Ground Start Setup • ISDN Channel Setup
C	Maintenance	Select the Maintenance option 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 FPI). At the CO Line Unit terminal or the RT Line Unit terminal, the command displays all units in the system.

Status Menu Screens

The Status Menu displays the equipment installed, the channel status conditions, the system alarm conditions, and the ISDN performance conditions of the PG-Flex system. Refer to Figure A-4 for a block diagram of the Status Menu structure.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:04:06
                      SYSTEM ID: PG-Flex 24 Channel 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> a
```

System Status

The System Status menu shows the equipment installed in your PG-Flex system and the current alarm status of that equipment. View the system status starting from the Status Menu.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:04:10
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

                                SYSTEM STATUS
------------------------------------------------------------------------------
           LOCATION     LINE UNIT        CU1     CU2     CU3
------------------------------------------------------------------------------
              COT     LU1 24-CH T1      ISDN4   POTS8   POTS8
              RT      LU  *********     ISDN4   POTS8   POTS8   POTS8


   ACTIVE ALARM(S): NONE




                             CTRL-X) Main Menu    e(X)it


      [COT] ENTER COMMAND>
```

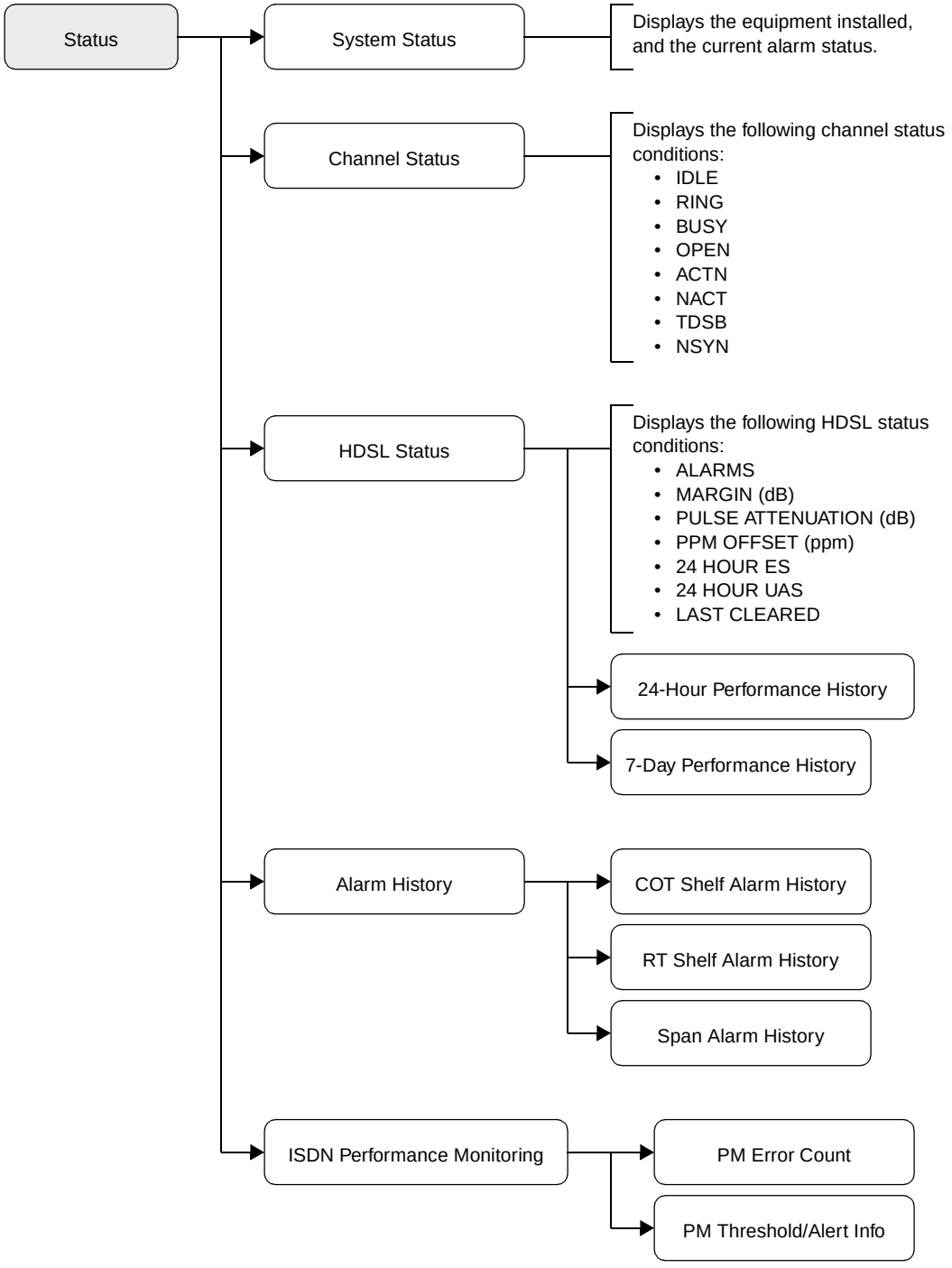


Figure A-4. *Status Menu Structure*

Channel Status

The Channel Status menu shows the current status of each channel in the system.

COT Channel Status

The COT Channel Status menu displays the current status of each channel in the COT shelf.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:04:22
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

                                COT CHANNEL STATUS
-------------------------------------------------------------------------------
                    CU1       CU2       CU3
   Channel COT   (ISDN4)   (POTS8)   (POTS8)
-------------------------------------------------------------------------------
          1         NSYN      OPEN      OPEN
          2         NSYN      OPEN      OPEN
          3         TDSB      OPEN      OPEN
          4         TDSB      OPEN      OPEN
          5           -       OPEN      OPEN
          6           -       OPEN      OPEN
          7           -       OPEN      OPEN
          8           -       OPEN      OPEN

                  A) TOGGLE BETWEEN COT AND RT CHANNEL STATUS

                          CTRL-X) Main Menu    e(X)it

     [COT] ENTER COMMAND> a                              Please wait a moment..
```

Type A then press ↵ Enter to toggle between the COT and RT channel status.

RT Channel Status

The RT Channel Status menu displays the current status of each channel in the RT enclosure.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:04:38
                      SYSTEM ID: PG-Flex 24 Channel System            SYSTEM: 1

                                RT CHANNEL STATUS
-------------------------------------------------------------------------------
                    CU1       CU2       CU3       CU4
   Channel  RT   (ISDN4)   (POTS8)   (POTS8)   (POTS8)
-------------------------------------------------------------------------------
          1         NSYN      IDLE      IDLE      TDSB
          2         NSYN      IDLE      IDLE      TDSB
          3         TDSB      IDLE      IDLE      TDSB
          4         TDSB      IDLE      IDLE      TDSB
          5           -       IDLE      IDLE      TDSB
          6           -       IDLE      IDLE      TDSB
          7           -       IDLE      IDLE      TDSB
          8           -       IDLE      IDLE      TDSB

                  A) TOGGLE BETWEEN COT AND RT CHANNEL STATUS

                          CTRL-X) Main Menu    e(X)it

     [COT] ENTER COMMAND>
```

HDSL Status

The HDSL Status menu displays the interterminal status of the HDSL span. You can view either a 24-hour or a 7-day performance history.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:04:58
                      SYSTEM ID: PG-Flex 24 Channel System             SYSTEM: 1

                                  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):       15/16/16     16/17/17     20/20/20     20/20/20
      PULSE ATTN (db):      19           20           19           20
      PPM OFFSET (ppm):      0            0           13           13
      24 HOUR ES:            0            1            2            1
      24 HOUR UAS:          25           24            1            0
 ------------------------------------------------------------------------------
           LAST CLEARED: NONE
 ------------------------------------------------------------------------------

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

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

24-Hour HDSL Performance History

The 24-Hour HDSL Performance History menu displays a 24-hour performance history of the HDSL span.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          00:05:04
                      SYSTEM ID: PG-Flex 24 Channel System             SYSTEM: 1

                          24-HOUR HDSL PERFORMANCE HISTORY
 ------------------------------------------------------------------------------
     TIME         COT << HDSL-1 >> RT     ES/UAS    COT << HDSL-2 >> RT
 ------------------------------------------------------------------------------
     20:15        0/0              0/0              0/0              0/0
     20:30        0/0              0/0              0/0              0/0
     20:45        0/0              0/0              0/0              0/0
     21:00        0/0              0/0              0/0              0/0
     21:15        0/0              0/0              0/0              0/0
     21:30        0/0              0/0              0/0              0/0
     21:45        0/0              0/0              0/0              0/0
     22:00        0/0              0/0              0/0              0/0
     22:15        0/0              0/0              0/0              0/0
     22:30        0/0              0/0              0/0              0/0
     22:45        0/0              0/0              0/0              0/0
     23:00        0/0              0/0              0/0              0/0
     23:15        0/0              0/0              0/0              0/0
     23:30        0/0              0/0              0/0              0/0
     23:45        0/0              0/0              0/0              0/0
     00:00        0/0              0/0              0/0              0/0

    (N)ext  (P)revious  e(X)it >
```

7-Day Performance History

The 7-Day HDSL Performance History menu displays a 7-day performance history of the HDSL span.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:05:34
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                         7-DAY HDSL PERFORMANCE HISTORY
--------------------------------------------------------------------------------
                     (ERRORED SECONDS/UNAVAILABLE SECONDS)
                               HDSL-1                   HDSL-2
         DATE            COT         RT           COT         RT
--------------------------------------------------------------------------------
        JUN 22           0/0         0/0          0/0         0/0
        JUN 23           0/0         0/0          0/0         0/0
        JUN 24           0/0         0/0          0/0         0/0
        JUN 25           0/0         0/0          0/0         0/0
        JUN 26           0/0         0/0          0/0         0/0
        JUN 27           0/0         0/0          0/0         0/0
        JUN 28           0/0         0/0          0/0         0/0


                          CTRL-X) Main Menu    e(X)it


     [COT] ENTER COMMAND>
```

Alarm History

The System Alarm History menu displays the status history of COT, RT, and span alarm conditions.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:05:52
                      SYSTEM ID: PG-Flex 24 Channel 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> a
```

COT Shelf Alarm History

The COT Shelf Alarm History menu displays a log of the COT shelf alarm history since it was powered up. The alarm history will reset when the shelf is powered down or the line unit is removed.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:05:58
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                            COT SHELF ALARM HISTORY
--------------------------------------------------------------------------------
 Type            First           Last            Status     Current   Count
 ------         --------------  --------------  ----------  -------    -----
 HDSL1 UAS       JUN 29, 00:00   JUN 29, 00:00    Enabled     NONE       1
 HDSL2 UAS       JUN 29, 00:00   JUN 29, 00:00    Enabled     NONE       1
 NO RT POWER     JUN 29, 00:00   JUN 29, 00:00    Enabled     NONE       1
 HDSL OOS        JUN 29, 00:00   JUN 29, 00:00    Enabled     NONE       1
 ISDN DSL FRM    JUN 29, 00:00   JUN 29, 00:00    Enabled     INFO       1
 ISDN D+ FRM     JUN 29, 00:00   JUN 29, 00:00    Enabled     NONE       1
 INSUFFICIENT TS JUN 29, 00:00   JUN 29, 00:00    Disabled    MINOR      1









     e(X)it >
```

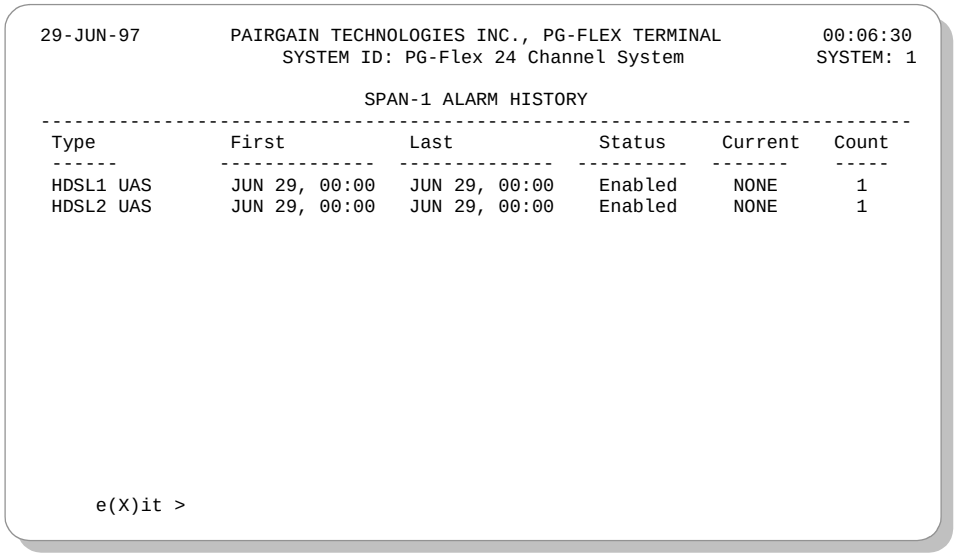
RT Shelf Alarm History

The RT Shelf Alarm History menu displays a log of the RT enclosure alarm history since it was powered up. The alarm history will reset when the enclosure is powered down or the line unit is removed.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:06:18
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                             RT SHELF ALARM HISTORY
--------------------------------------------------------------------------------
 Type            First           Last            Status     Current   Count
 ------         --------------  --------------  ----------  -------    -----
 HDSL1 UAS       JAN 01, 00:00   JAN 01, 00:00    Enabled     NONE       1
 HDSL2 UAS       JAN 01, 00:00   JAN 01, 00:00    Enabled     NONE       1
 HDSL1 MARGIN    JAN 01, 00:00   JAN 01, 00:00    Enabled     NONE       1
 HDSL2 MARGIN    JAN 01, 00:00   JUN 29, 00:00    Enabled     NONE       2
 HDSL OOS        JAN 01, 00:00   JAN 01, 00:00    Enabled     NONE       1
 ISDN DSL FRM    JUN 29, 00:00   JUN 29, 00:00    Enabled     INFO       1









     e(X)it >
```

Span Alarm History

The Span Alarm History menu displays a log of the span alarm history of a PG-Flex system. The span alarm history will reset when the PG-Flex system is powered down.



ISDN Performance Monitoring Menu

Access the menus for PM Error Count and Threshold Alert information for the ISDN channel units, starting from the Status Menu. From this menu you can select a specific ISDN card and channel to display the ISDN performance information.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:07:12
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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

                    Press ESCAPE to return to previous menu









   Enter Card and Channel (CARD,CHANNEL): 1,1
```

The ISDN Performance Monitoring Menu for the selected card and channel is displayed after entering the card and channel numbers.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:07:24
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                         ISDN PERFORMANCE MONITORING MENU
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------

                          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
```

Select New Card and Channel

From this menu you can select a new card and channel to access ISDN performance information.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:07:24
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                        ISDN PERFORMANCE MONITORING MENU
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------

                         A) SELECT NEW CARD AND CHANNEL

                         B) PM ERROR COUNT

                         C) PM THRESHOLD/ALERT INFO


                           CTRL-X) Main Menu    e(X)it




   Enter Card and Channel (CARD,CHANNEL): 1,1
```

PM Error Count

The PM Error Count menu provides the daily and hourly error performance of data transport in both the customer and network directions for the selected channel on the COT and RT.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:08:20
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                                PM ERROR COUNT
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------
COT                           CUSTOMER/NETWORK
          Hourly ES    Hourly SES   Hourly BE    Daily ES     Daily SES
PREVIOUS  00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
CURRENT   00000/00470  00000/00471  00000/38969  00000/00473  00000/00474

RT                            CUSTOMER/NETWORK
          Hourly ES    Hourly SES   Hourly BE    Daily ES     Daily SES
PREVIOUS  00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
CURRENT   00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
--------------------------------------------------------------------------------
    LAST CLEARED: NONE
--------------------------------------------------------------------------------
                         A) SELECT NEW CARD AND CHANNEL
                         B) 8-HOUR PM ES COUNT HISTORY

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

     [COT] ENTER COMMAND> b
```

Select New Card and Channel. From this menu you can select a new card and channel to display the PM Error Count information.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:08:20
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                                PM ERROR COUNT
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------
COT                             CUSTOMER/NETWORK
          Hourly ES    Hourly SES   Hourly BE    Daily ES     Daily SES
PREVIOUS  00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
CURRENT   00000/00470  00000/00471  00000/38969  00000/00473  00000/00474

RT                              CUSTOMER/NETWORK
          Hourly ES    Hourly SES   Hourly BE    Daily ES     Daily SES
PREVIOUS  00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
CURRENT   00000/00000  00000/00000  00000/00000  00000/00000  00000/00000
--------------------------------------------------------------------------------
    LAST CLEARED: NONE
--------------------------------------------------------------------------------
                        A) SELECT NEW CARD AND CHANNEL
                        B) 8-HOUR PM ES COUNT HISTORY

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

8-Hour PM ES Count History. The 8-Hour PM ES Count History menu provides a log of the last 8-hour errored seconds (ES) count for both the customer and network directions for the selected channel on the COT and RT.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:09:20
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                          8-HOUR PM ES COUNT HISTORY
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------
                                CUSTOMER/NETWORK
HOUR                    COT      <<Hourly ES>>      RT
--------------------------------------------------------------------------------
16:00               00000/00000                 00000/00000
17:00               00000/00000                 00000/00000
18:00               00000/00000                 00000/00000
19:00               00000/00000                 00000/00000
20:00               00000/00000                 00000/00000
21:00               00000/00000                 00000/00000
22:00               00000/00000                 00000/00000
23:00               00000/00000                 00000/00000

                        A) SELECT NEW CARD AND CHANNEL


                          CTRL-X) Main Menu    e(X)it

     [COT] ENTER COMMAND>
```

PM Threshold/Alert Info

From the PM Threshold/Alert Info menu you can do the following:

- Set a threshold count on a selected channel for both hourly and daily ES and SES, and also displays if the threshold has been exceeded.
- Enable or Disable a threshold crossing alarm.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:11:16
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                           PM THRESHOLD/ALERT INFO
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------
COT                           CUSTOMER/NETWORK
                         Hourly ES    Hourly SES   Daily ES     Daily SES
Threshold Count          00040        00010        00100        00025
Threshold Exceeded       no/no        no/no        no/no        no/no
Threshold Cross Alarm    dis/dis      dis/dis      dis/dis      dis/dis

RT                            CUSTOMER/NETWORK
                         Hourly ES    Hourly SES   Daily ES     Daily SES
Threshold Count          00000        00000        00000        00000
Threshold Exceeded       yes/yes      yes/yes      yes/yes      yes/yes
Threshold Cross Alarm    ena/ena      ena/ena      ena/ena      ena/ena

                  A) SELECT NEW CARD AND CHANNEL
                  B) CHANGE PM THRESHOLD COUNT
                  C) ENABLE/DISABLE THRESHOLD CROSSING ALARM
                          CTRL-X) Main Menu    e(X)it

     [COT] ENTER COMMAND> c
```

Select New Card and Channel. From this menu you can select a new card and channel to display the PM Threshold/Alert information.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:11:16
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                           PM THRESHOLD/ALERT INFO
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------
COT                           CUSTOMER/NETWORK
                         Hourly ES    Hourly SES   Daily ES     Daily SES
Threshold Count          00040        00010        00100        00025
Threshold Exceeded       no/no        no/no        no/no        no/no
Threshold Cross Alarm    dis/dis      dis/dis      dis/dis      dis/dis

RT                            CUSTOMER/NETWORK
                         Hourly ES    Hourly SES   Daily ES     Daily SES
Threshold Count          00000        00000        00000        00000
Threshold Exceeded       yes/yes      yes/yes      yes/yes      yes/yes
Threshold Cross Alarm    ena/ena      ena/ena      ena/ena      ena/ena

                  A) SELECT NEW CARD AND CHANNEL
                  B) CHANGE PM THRESHOLD COUNT
                  C) ENABLE/DISABLE THRESHOLD CROSSING ALARM
                          CTRL-X) Main Menu    e(X)it

   Enter Card and Channel (CARD,CHANNEL): 1,1
```

Change PM Threshold Count. From this menu you can change the PM Threshold Count for hourly and daily errored seconds (ES) and severely errored seconds (SES) for both the COT and RT.

```
25-JUL-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         19:52:30
                      SYSTEM ID: ABCDEFGHIJKLMNOPQRSTUVWX            SYSTEM: 1

                                  PM THRESHOLD
--------------------------------------------------------------------------------
    INTERIM SEGMENTED ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------

                   A) COT Hourly ES       E) RT Hourly ES
                   B) COT Hourly SES      F) RT Hourly SES
                   C) COT Daily ES        G) RT Daily ES
                   D) COT Daily SES       H) RT Daily SES


                         CTRL-X) Main Menu    e(X)it









     [COT] ENTER COMMAND> a
```

Enable/Disable Threshold Crossing Alarms. From this menu you can Enable or Disable the Threshold Crossing Alarm on a selected channel in either network or customer directions on the COT and RT.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:11:36
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                                  PM ALERT INFO
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:1   CHANNEL:1
--------------------------------------------------------------------------------

          A) COT Hourly ES - Customer    I) RT Hourly ES - Customer
          B) COT Hourly ES - Network     J) RT Hourly ES - Network
          C) COT Hourly SES - Customer   K) RT Hourly SES - Customer
          D) COT Hourly SES - Network    L) RT Hourly SES - Network
          E) COT Daily ES - Customer     M) RT Daily ES - Customer
          F) COT Daily ES - Network      N) RT Daily ES - Network
          G) COT Daily SES - Customer    O) RT Daily SES - Customer
          H) COT Daily SES - Network     P) RT Daily SES - Network


                          CTRL-X) Main Menu    e(X)it




     [COT] ENTER COMMAND> a
```

Setup Menu Screens

From the Setup Menu you can view the PG-Flex system current system setup and change the following configurable options: time slots assignments, channel configuration, POTS loop/ground start setup, and ISDN channel setup. Refer to Figure A-5 for a block diagram of the Setup Menu structure.

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:03:02
                      SYSTEM ID: PG-Flex 24 Channel 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
```

System Settings

From the System Settings menu you can change a PG-Flex systems parameter. Refer to Table A-3 on page 24 for the System Settings menu options.

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:39:52
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                               SYSTEM SETTINGS
------------------------------------------------------------------------------
  A)  SYSTEM DATE:   .   .   .   .  .01-SEP-97
  B)  SYSTEM TIME:   .   .   .   .  .03:39:52
  C)  SYSTEM ID: .   .   .   .   .  .PG-Flex 24 Channel 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

      [RT] ENTER CHOICE> A
```

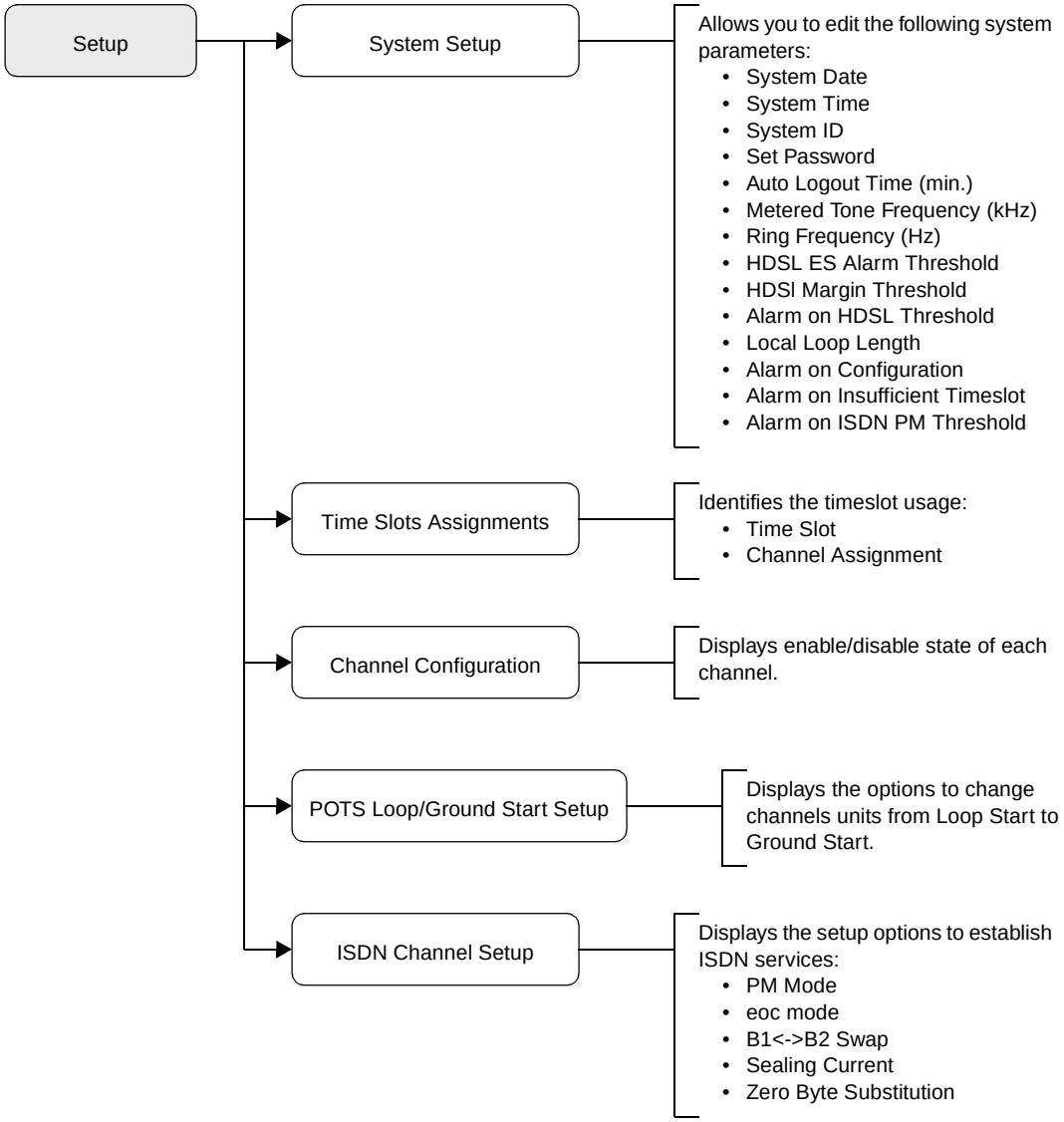


Figure A-5. *Setup Menu Structure*

Table A-3. *System Settings Menu Options*

Type Letter	Parameter	Default Value	Function
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	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 A-3. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
			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. • 5: The user is automatically logged out after 5 minutes. • 30: The user is automatically logged out after 30 minutes. • 60: The user is automatically logged out after 60 mines.
F	Metered Tone Frequency	DISABLED	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. • DISABLED: No tones are recognized. • 12: Recognizes 12 kHz as the signal frequency. • 16: Recognizes 16 kHz as the signal frequency.
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.
I	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). A default setting of 4 indicates that a minor alarm occurs when the HDSL margin is ≤ 4 dB. The HDSL Margin Threshold can be set between 0 dB and 15 dB (0 dB = Disabled).

Table A-3. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
J	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: • 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.
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.

Table A-3. *System Settings Menu Options (Continued)*

Type Letter	Parameter	Default Value	Function
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 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.

Time Slots Assignment

From the Time Slots Assignment menu, you can view the automatically generated time slots assignments.

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:10
                 SYSTEM ID: PairGain 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       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
```

Channel Configuration

From Channel Configuration menu, you can individually enable or disable each POTS and ISDN circuit installed in a PG-Flex system. See Table A-4 for channel configuration options.

```
06-FEB-96        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                SYSTEM ID: PairGain PG-Flex System                    SYSTEM: 2

                              CHANNEL CONFIGURATION
--------------------------------------------------------------------------------
                           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
```

Table A-4. *Channel Configuration Options*

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

POTS Loop/Ground Start

From the POTS Loop/Ground Start menu, you can change a channel unit parameter to loop start or ground start. Refer to Table A-5 for POTS ground/loop start configuration options.

```
01-SEP-97      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:41:20
                    SYSTEM ID: PairGain 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           -

                             CTRL-X) Main Menu    e(X)it

       [COT] ENTER COMMAND>x
```

Table A-5. *POTS Ground/Loop Start Configuration Options*

Parameter	Default Value	Function
Channel Configuration	Loop	Each POTS channel may be individually configurable as Loop Start or Ground Start. This configuration is stored in both the COLU and the channel card. If any one card (COLU, RTLU, COCU or RTCU) is removed and replaced or reinserted, the Loop/Ground Start Configuration is automatically preserved. Can be set to the following parameters: • LOOP: The selected channel is set for Loop Start. • GND: The selected channel is set for Ground Start.

ISDN Channel Setup

From the ISDN Channel Setup menu, you can change an ISDN parameter for a selected channel and card. Refer to Table A-6 for ISDN channel setup options.

```
01-SEP-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         03:39:52
                SYSTEM ID: PairGain 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
```

Table A-6. *ISDN Channel Setup Options*

Type Letter	Parameter	Default Value	Function
A	PM Mode	Interim Path	Performance monitoring of the ISDN channels is done considering the channel as one path (Interim Path) or several separate sections (Segmented), according to the setting of this parameter. The default setting is Interim Path. Interim Path performance monitoring collects end-to-end error rate for the entire transport path. Segmented monitoring collects error rates for each DSL loop individually.
B	eoc Mode	Normal	With the "Normal" setting, ISDN eoc messages are decoded and re-transmitted within the PG-Flex system. In the "transparent" mode, ISDN eoc messages are not decoded and are passed through the system transparently. The default setting is "Normal."
C	B1 <-> B2 swap	Normal	With the "Swap" setting, ISDN channel "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B2" and "B1" at the RT ISDN "U" interface. The "D" signaling channel is unaffected. The default is "Normal."
D	Sealing current	Off	When Sealing Current is set to "On," there is a constant current of approximately 5 ma. flowing in the ISDN subscriber loop at all times. The default setting is "Off" (no sealing current).
E	Zero Byte Substitution	Off	When this parameter is set to ENABLED, the PG-Flex system uses a ZBS code to prevent long string of zeros in the data. This is not required for proper operation of the PG-Flex system and this parameter is normally left at "Off." The default setting is "Off."

Maintenance Menu

From Maintenance Menu, you can setup a metallic access connection to a subscriber circuit or perform an ISDN loop back test for a PG-Flex system. Figure A-6 illustrates the Maintenance Menu options.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:17:02
                     SYSTEM ID: PG-Flex 24 Channel 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
```

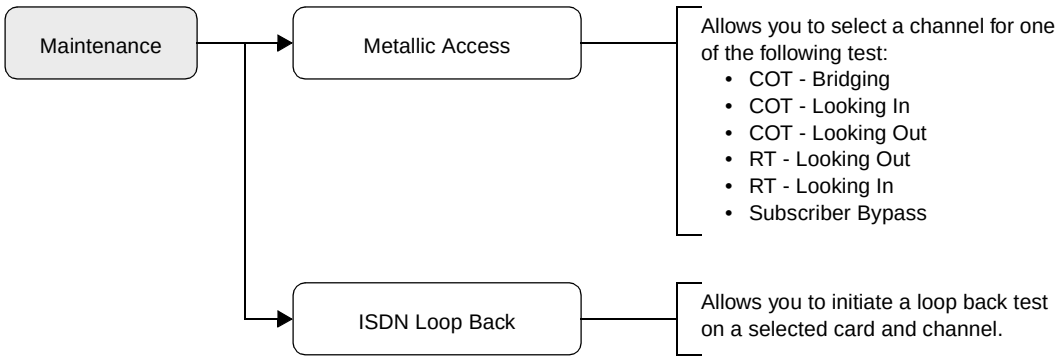


Figure A-6. *Maintenance Menu Structure*

Metallic Access Menus

From the Metallic Access Menu, you can setup a metallic access connection to a subscriber circuit.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:17:10
                      SYSTEM ID: PG-Flex 24 Channel 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
```

After selecting a metallic test, the following menu displays. From this menu, you select a card and channel to setup a metallic access connection.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:18:50
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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


                                 METALLIC ACCESS
------------------------------------------------------------------------------

                   Press ESCAPE to return to previous menu









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

The following menu displays the selected card and channel under test.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:19:14
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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

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

                A) COT - BRIDGING    (ENABLED ON CU2/CH1)
                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>
```

The following menu displays after typing R then pressing Enter. This menu provides an option to stop the access/bypass test in progress.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:19:44
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

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

                                  METALLIC ACCESS
--------------------------------------------------------------------------------
                (COT - BRIDGING ACCESS IN PROGRESS ON CU2/CH1)


                   Press ESCAPE to return to previous menu




   Do you wish to stop the channel access/bypass test? [Y/N] y
```

ISDN Loopback Menus

From the ISDN Loopback menu you can display the loopback mode settings on all COT channels of a selected ISDN card. You can also change the mode settings from normal to active.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:20:36
                      SYSTEM ID: PG-Flex 24 Channel 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
```

From the ISDN RT Loopback menu you can display the loopback mode settings on all RT channels of a selected ISDN card. You can also change the mode settings from normal to active.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:21:02
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                               ISDN LOOPBACK MENU
--------------------------------------------------------------------------------
RT 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> c                              [RT LOOPBACK] Enter
Card and Channel (CARD,CHANNEL):
```

Inventory Menu

The Inventory menu displays manufacturing and version information for all units in the PG-Flex system, except the FPI unit.

```
29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:21:32
                      SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1

                                  INVENTORY
-------------------------------------------------------------------------------
 LOC  SLOT    MODEL   LIST  ISSUE     TYPE      S/W     P1 TAG     CLEI CODE
-------------------------------------------------------------------------------
 COT  LU1    FLL-712 ****  ****     24-CH T1    3.3   **********   **********
 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>
```

Logout Menu

The Logout menu display the log in and log out times for each provisioning session.

```
 29-JUN-97        PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL         00:21:54
                       SYSTEM ID: PG-Flex 24 Channel System           SYSTEM: 1




User-initiated logout




LOGGED IN:  29-JUN-97, 00:04:00
LOGGED OUT: 29-JUN-97, 00:21:54
```

ACRONYMS AND GLOSSARY

This section provides a list of acronyms and a glossary of terms used in this provisioning manual.

Acronyms

ACO	Alarm Cutoff
ANSI	American National Standards Institute
B8ZS	Bipolar with 8 Zero Substitution
BE	Block Errors
BER	Bit Error Rate
BITS	Building Integrated Timing Supply
CCITT	International Telegraph and Telephone Consultative Committee
CO	Central Office
CLEI	Common Language Equipment Identifier
COT	Central Office Terminal
CPE	Customer Premises Equipment
crc	Cyclic Redundancy Check
DCS	Digital Cross-connect System
DDS	Digital Data Service
DLC	Digital Loop Carrier System
DS0	Digital Signal Level Zero (64 kb/s)
DS1	Digital Signal Level One (1.544 Mb/s)
DSL	Digital Subscriber Line
EOC	Embedded Operations Channel

eoc	EOC on ISDN Basic Access Facility
ES	Errored Seconds
FCC	Federal Communications Commission
FCS	Frame Check Sequence
FPI	Flex PGTC Interface
HDSL	High-bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
kb/s	Kilo-bits per second
kft	Kilo-foot
LOS	Loss of Signal
LOSW	Loss of Synchronization Word
LSB	Least Significant Bit
LU	Line Unit
MBP	Metallic Bypass Pair
MLT	Mechanized Loop Test System
MSB	Most Significant Bit
NI	Network Interface
OS	Operations System
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PGTC	Pair Gain Test Controller
PM	Performance Monitoring, in-service, based on CRC and FEBE
POTS	Plain Old Telephone Service
RT	Remote Terminal
SES	Severely Errored Seconds
UAS	Unavailable Seconds

Glossary of Terms

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 pairs 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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