PG-FLEX

TECHNICAL PRACTICE

32-CHANNEL REMOTE LINE UNIT

Model	List	CLEI Code
FRL-746	3C	N/A

SECTION SCP-FRL746-033-03H

Revision History of This Practice

Revision	Release Date	Revisions Made
01	March 5, 1999	Initial Release
02	January 10, 2002	Release to rebrand document to comply with ADC standards
03	January 6, 2003	Updated Product Support Information

USING THIS PRACTICE

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

Notes indicate information about special circumstances.

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

Electrostatic Discharge (ESD) susceptibility symbols indicate that a device or assembly is susceptible to damage from electrostatic discharge.You must wear an antistatic wrist strap connected to the appropriate ground connection prior to performing installation procedures. You must also observe normal ESD precautions when handling electronic equipment. Do not hold electronic plugs by their edges. Do not touch components or circuitry.

INSPECTING YOUR SHIPMENT

Upon receipt of the equipment:

- Unpack each container and visually inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in "Returns" on page 33. If you must store the equipment for a prolonged period, store the equipment in its original container.

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PRODUCT

This section describes the ADC® PG-Flex® FRL-746 List 3C Remote Terminal (RT) Line Unit, and defines its features and specifications.

DESCRIPTION AND FEATURES

The FRL-746 List 3C RT line unit is the RT end of the PG-Flex subscriber carrier system, and resides in an RT enclosure. The FRL-746 carries up to 32 subscriber channels between a COT and an RT. The FRL-746 Line Unit provides access through the RS-232 interface (craft port) to display the PG-Flex system using an ASCII terminal.

This product uses ADC's High-bit-rate Digital Subscriber Line (HDSL) 2B1Q (2 binary 1 quaternary line code) technology to provide the equivalent of 2.048 Mbps digital transmission rates, plus signaling, over two copper pairs. The HDSL can include unterminated bridge taps, and is used without:

- using repeaters
- loop conditioning
- pair selection

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

Additionally, this product supports:

- 32 subscriber channels
- PG-Flex doublers in systems transporting POTS and ISDN circuits
- 4Tel compatible Loop Test Systems
- ISDN channel units
- loop start and ground start channel units

FRONT PANEL

Figure 1 shows the FRL-746 front panel. Table 1 lists the indicators and states for the FRL-746 front panel LEDs. When pressed, the Alarm Cut Off (ACO) button activates the LEDs for two minutes for displaying channel status.

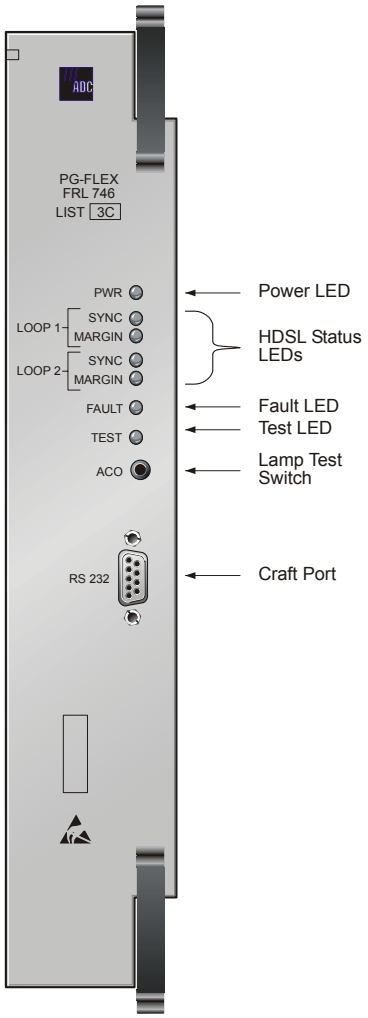

Figure 1. *FRL-746 List 3C Front Panel*

Table 1. *FRL-746 Front Panel LEDs*

LED	LED State	Indicates
PWR	Solid Green	Power applied and line feed operating normally.*
	OFF	Not receiving power from COLU.
LOOP 1 SYNC	Solid Green	HDSL line 1 is in sync between the COT and RT.
	Flashing Green	HDSL line 1 is attempting to sync between COT and RT.
	OFF	HDSL line 1 does not detect an active CO Line Unit.
LOOP 1 MARGIN	Solid Yellow	HDSL line 1 is below present margin threshold.
	OFF	HDSL line 1 margin is above the preset margin threshold.
LOOP 2 SYNC	Solid Green	HDSL line 2 is in sync between the COT and RT.
	Flashing Green	HDSL line 2 is attempting to sync between COT and RT.
	OFF	HDSL line 2 does not detect an active CO line unit.
LOOP 2 MARGIN	Solid Yellow	HDSL line 2 is below present margin threshold.
	OFF	HDSL line 2 margin is above the preset margin threshold.
TEST	Blinking Yellow	A subscriber test connection has been established.
	OFF	No tests active in system.
FAULT	Solid Red	A fault has been detected in the FRL-746.
	OFF	No faults have been detected in the FRL-746.

(*) Power LED goes out after approximately 2 minutes to conserve power.

SPECIFICATIONS

Electrical Characteristics

RT Power Supply Input Voltage	-65 to -130 Vdc (Line 1) +65 to +130 Vdc (Line 2)
RT Power Supply Input Power	Less than 40 W

Environmental

Operating Elevation	-200 to 13,000 ft (-60 to 4,000 m)
Operating Temperature & Humidity	-40 to +150 °F (-40 to +65 °C) 5% to 95% (non-condensing)

Physical

Height:	12.0 in. (30.5 cm.)
Width:	2.25 in. (5.7 cm.)
Depth:	4.50 in. (11.4 cm.)
Weight	1.4 lb. (0.6 kg.)

FUNCTIONAL DESCRIPTION

This section describes the applications and operation capabilities of the FRL-746 List 3C.

OVERVIEW

PG-Flex is a small-capacity, universal subscriber carrier system supporting up to 32 DS0 channels including Plain Old Telephone Service (POTS), Loop Start (LS) or Ground Start (GS), and Integrated Services Digital Network (ISDN) services.

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

The CO side of a PG-Flex system mounts into a COT shelf and supports up to two systems. An Alarm Unit (common to all systems installed in the shelf) provides an interface for maintenance alarm relays and metallic access to the remote subscriber lines.

The RT side of a PG-Flex system mounts into an FRE-765 RT enclosure and supports one system, which includes one line unit and up to four channel units. The RT line unit includes the HDSL transceivers and converts the line power from the COT into the voltages required by the remote terminal electronics. The channel units must be the same type of card as the channel units installed at the CO.

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

Although 32 POTS subscribers can be connected to a 32 channel PG-Flex system, line powering limitations restrict service to a maximum of 24 subscribers simultaneously off-hook, or a maximum of 21 subscribers simultaneously off-hook while ringing up to 15 Ringer Equivalency Number (REN) of ringers.

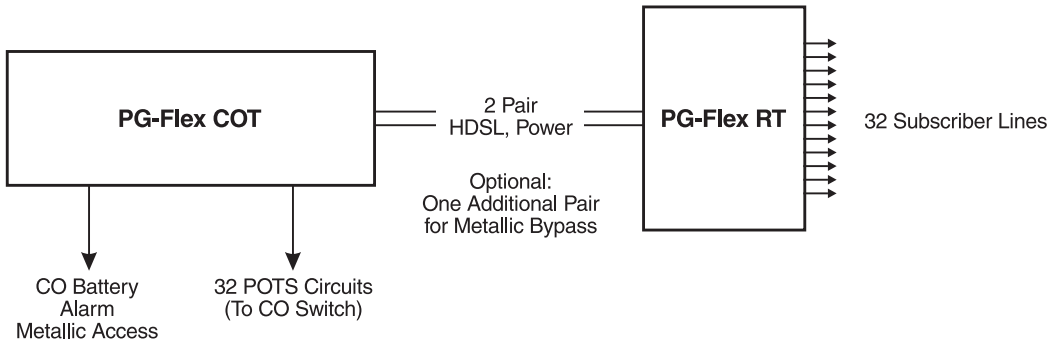

Figure 2. *Typical PG-Flex Configuration*

HDSL TRANSMISSION

PG-Flex uses HDSL transmission technology between the COT and RT. This technology provides up to 32 DS0s, plus signaling, over two copper pairs without using repeaters, loop conditioning, or pair selection. Adaptive equalization, scrambling, and a four-level 2B1Q line coding increase range and minimize crosstalk. Because of HDSL transmission technology, the HDSL lines require no special conditioning and may include unterminated bridge taps, but cannot include load coils.

The line interface is a two-pair, 1110-kbps full-duplex 2B1Q transmission format. The dual HDSL lines provide 32 channels at 64-kbps, with signaling and an operations channel for management control. The signal characteristics on the carrier pairs comply with TR-NWT-001210, *Generic Requirements for High-bit-rate Digital Subscriber Line (HDSL) Systems*.

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

Table 2. *32-Channel HDSL Transmission Distances*

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

SUBSCRIBER DROP TESTING

For subscriber drop testing from the CO, PG-Flex is able to select and connect any subscriber drop to a metallic bypass pair at the RT. The PG-Flex system extends this connection back to the COT where it switches it to the test jack on the FAU-728 Alarm Unit and to the corresponding subscriber line on the COT channel card.

Metallic access is performed by momentarily placing and removing +116 Vdc (from the CO) on the subscriber's Tip lead. (The Ring lead should be between GND and the Tip value.) With POTS, LS/GS, and ISDN channel cards, the selected subscriber drop (assuming there is a working metallic bypass pair) connects to the corresponding COT subscriber line. The metallic connection drops when –116 Vdc is momentarily placed then removed from the subscriber's COT Tip lead.

Metallic access can also be activated through an ASCII terminal connected to the craft port located on the front of the FRL-746 List 3C line unit or through the FAU-728 List 2 Alarm Unit. (Refer to "Metallic Access" on page 28 for metallic access test procedures.)

OPERATIONAL CAPABILITIES

The FRL-746 RT line unit provides the following functions for each 32-channel system:

- power supply
- HDSL line transceivers
- front-panel status indicators
- alarm cutoff switch (used to perform a lamp test)
- RS-232 craft port interface (DCE)
- line and drop test circuits
- 4Tel loop test system compatibility

Figure 3 shows a block diagram of the FRL-746. The COT line unit powers the remote terminal. During power-up, the system checks the HDSL lines for hazardous voltages or other line faults that might affect the system. If a fault condition is detected, the system stops the power-up sequence and the LED indicators on the front panel indicate a line fault problem.

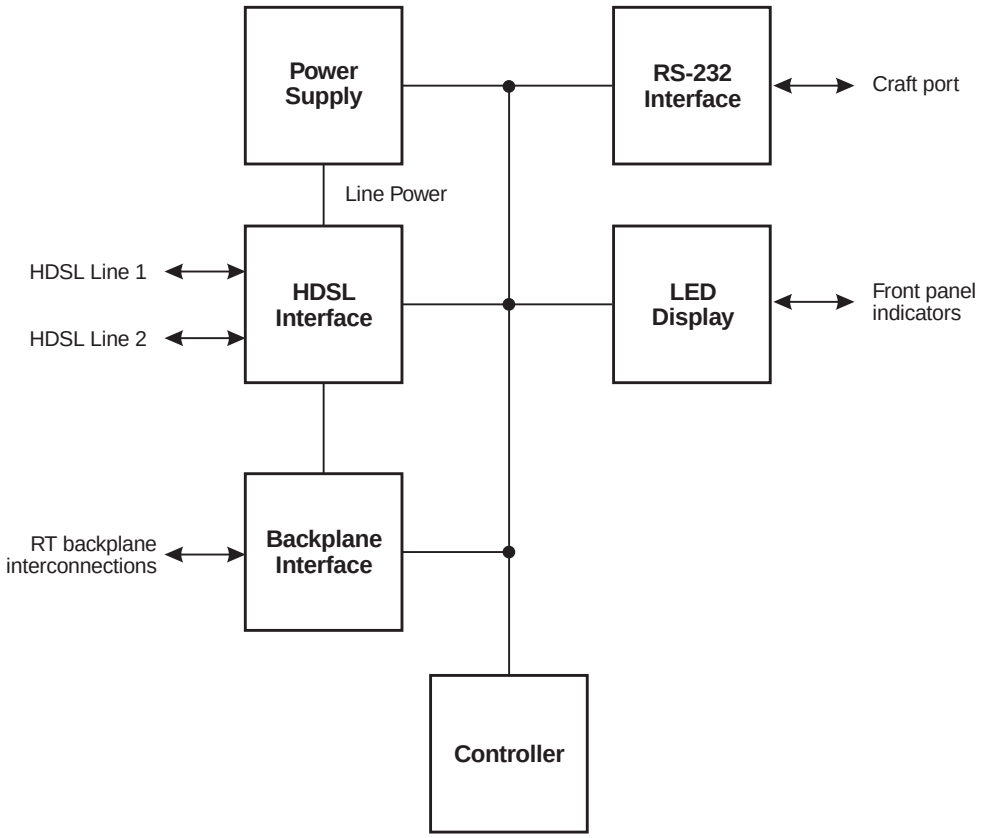

Figure 3. *FRL-746 RT Line Unit Block Diagram*

INSTALLATION AND VIEWING THE SYSTEM STATUS

This section describes how to unpack, install, and display the status of the FRL-746 List 3C system.

UNPACKING

Upon receipt of the equipment, proceed as follows:

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

2 Check the contents versus the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact ADC as described in the Product Support section. For prolonged storage periods, use the equipment's original container.

INSTALLATION

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

An FAU-728 List 2 (or higher) 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 that is required for normal operation of the ISDN channel units. Removing the FAU-728 List 2 Alarm Unit during an ISDN call for more than one minute may terminate the call.

The following procedure assumes that an FLL-716 is installed in the system.

To install the FRL-746 and verify operation:

1 Insert the FRL-746 RT line unit into the RT enclosure and verify:

- **a** All LEDs turn on for about 1/2 second.
- **b** PWR LED remains on.
- **c** After a few seconds, SYNC LEDs for Line 1 and Line 2 begin to flash (both COT and RT).
- **d** Within 35 seconds, SYNC LEDs for Line 1 and Line 2 remain 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:

- PWR 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

TERMINAL MANAGEMENT

The terminal management function at the RT allows a technician to display information about the PG-Flex system using an ASCII terminal (or modem with a null modem cable) connected to the craft port. With this function, the technician can:

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

Connecting the FRL-746 to an ASCII Terminal or Modem

Table 3 identifies the connector terminations, signal designations, and signal sources used when connecting a terminal, a computer with terminal-emulation software, or a modem to the PG-Flex craft port.

Table 3. *RS-232 Connector Pin Assignments*

Connector		Signal Designation		Source	
DB-25	**DB-9**	**Function**	**Label**	**EIA**	**ADC**
1	–	Shield		Shield	(not used)
2	3	Transmitted Data	TxD	DTE	Terminal or Modem
3	2	Received Data	RxD	DCE	PG-Flex
4	7	Request to Send	RTS	DTE	(not used)
5	8	Clear to Send	CTS	DCE	(not used)
6	6	Data Set Ready	DSR	DCE	PG-Flex
7	5	Signal Ground	SG	Common	Common
8	1	Carrier Detect	CD	DCE	Modem
20	4	Data Terminal Ready	DTR	DTE	Terminal or Modem
22	9	Ring Indicator	RI	DCE	(not used)

Shaded signals are not used by PG-Flex, and these pins are unterminated.

DCE = Data Communications Equipment.

DTE = Data Terminal Equipment.

The data interface supported by PG-Flex is defined in Table 4. PG-Flex automatically sets the data rate for the craft port after it receives several carriage return characters (corresponding to ENTER from the keyboard) from the terminal or modem.

Table 4. *PG-Flex Craft Port Data Interface*

Parameter	Value
Connector	DB-9 (female)
Transmission	Asynchronous
Data Rate	1.2 kbps 2.4 kbps 4.8 kbps 9.6 kbps
Data Rate Selection	Automatic
Data Bits	8
Stop Bits	1
Parity	None

Figure 4 and Figure 5 show the connections required between the PG-Flex craft port and an ASCII terminal (or computer running terminal-emulation software) equipped with DB-9 and DB-25 connectors (respectively).

To support automatic logoff from the PG-Flex craft port when the ASCII terminal is unplugged from the craft port, Data Terminal Ready (DTR) must be connected between the craft port and the ASCII terminal. If this connection is not made, the technician must manually log off the PG-Flex session before disconnecting the terminal.

Failure to observe the above precautions can compromise security. Specifically, the next person accessing the PG-Flex system could enter the system at the same point where the previous user exited, thus bypassing the logon and password screens.

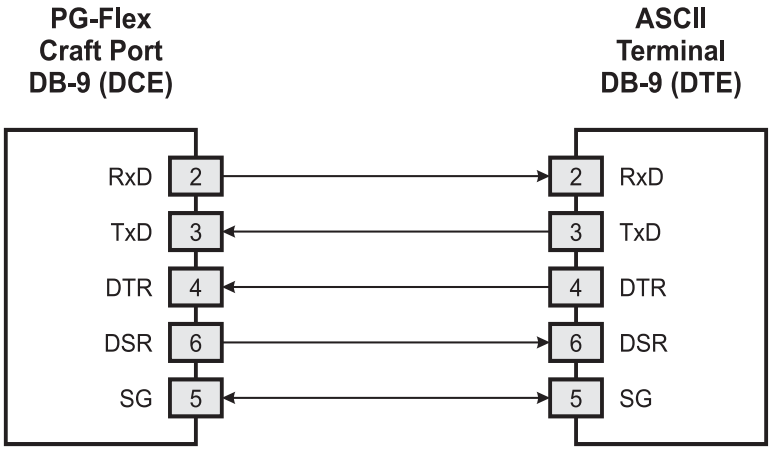

Figure 4. *PG-Flex to Terminal (DB-9)*

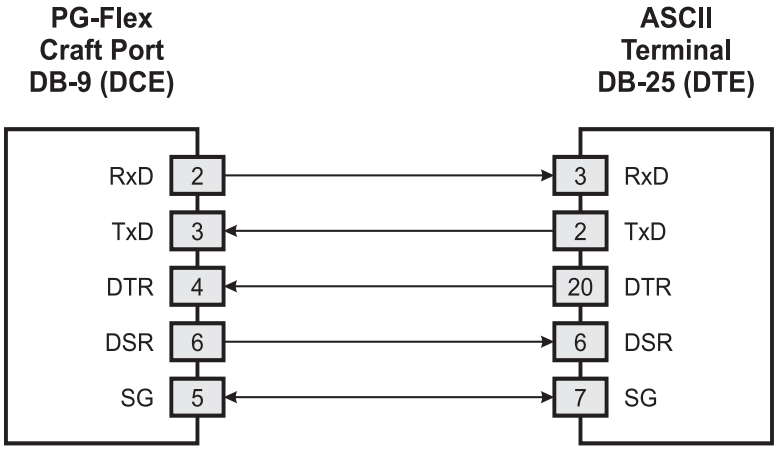

Figure 5. *PG-Flex to Terminal (DB-25)*

Figure 6 shows the connections required between the PG-Flex craft port and a modem equipped with a DB-25 connector. Because both the PG-Flex and modem are considered DCE devices, a null-modem cable must be used.

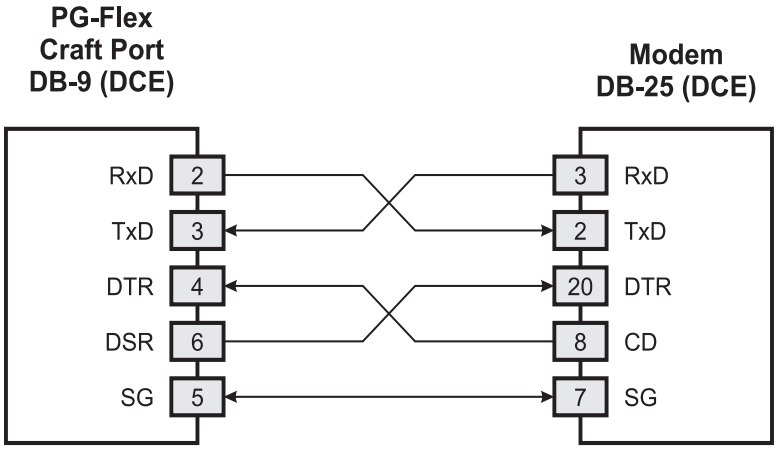

Figure 6. *PG-Flex to Modem (DB-25)*

The modem must be configured to enable monitoring of the DTR lead and to provide control of the CD lead to support automatic logoff from the PG-Flex craft port. If the modem is not properly configured, the technician must manually log off the PG-Flex session before terminating the call. This prevents the next user from continuing the same session.

The modem's DTR input must be connected to the Data Set Ready (DSR) output of the PG-Flex craft port through the null-modem cable. When the PG-Flex system automatically logs off after a programmable period of inactivity on the craft port, its DSR lead signals the modem (through the modem's DTR lead) to disconnect the call.

Also, the modem's CD output lead must be connected to the craft port's DTR input lead through the null-modem cable. When the originating terminal disconnects the call, the modem's CD lead signals the PG-Flex system (through the craft port's DTR lead) to perform an automatic logoff.

If the modem is not configured correctly and a null-modem cable (wired as shown in Figure 6) is not used between the PG-Flex craft port and modem, the next person to access the PG-Flex system can enter the system at the same point the previous user left the system, thereby bypassing the logon and password screens.

DISPLAYING THE SYSTEM STATUS

While system configuration can only occur through the COT, the system settings can still be displayed through the terminal management system of the RT. The following sections provide a walk-through of the screens and menus available for system monitoring.

Menus and Display Structure

Figure 7 shows the menu structure of the terminal management system.

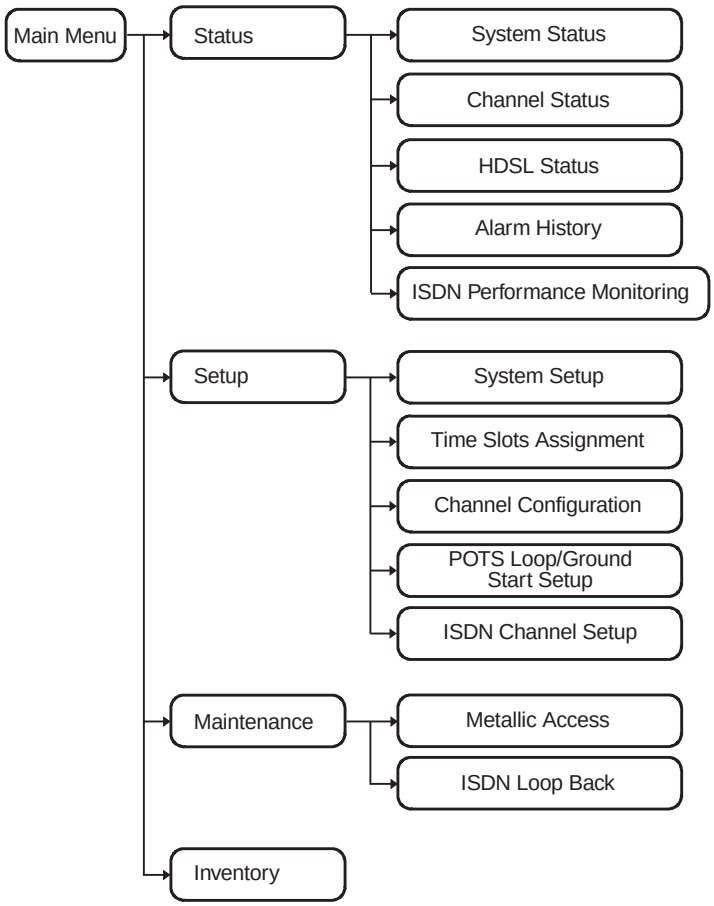

Figure 7. *Terminal Menu and Display Structure*

Power-Up and Connection Screen

After connecting the ASCII terminal to the FRL-746 line unit, press **ENTER** several times to start the autobaud feature. Autobaud covers transmission rates of 1200, 2400, 4800 and 9600 bps only. The Power-Up and Connection screen is displayed.

```
[RT] Ready
```

Press **ENTER** to display the Main Menu.

Main Menu

The Main Menu provides access to other menus. These menus enable you to display the PG-Flex system status, setup, maintenance, and inventory information.

```
08-OCT-98         PG-FLEX TERMINAL         12:41:44
                      SYSTEM ID: List 3C - Tech Pubs       SYSTEM: 1

   CURRENT STATUS: OK                                      LOGGED IN: RT
   ALARMING TERMINAL: NONE


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

                               A) STATUS

                               B) SETUP

                               C) MAINTENANCE

                               D) INVENTORY

                                   Q)uit


     [RT] ENTER COMMAND>
```

Table 5 describes the functions associated with these four main menu options (A through D).

Table 5. *Main Menu Options*

Main Menu Option	Function
A) Status	• System Status shows the equipment installed in the system and the current status (in alarm or not) of the equipment. • Channel Status shows the current status of all channels in the system. Each channel has a status condition. Status conditions vary for the different types of channel cards. Examples of status are: IDLE: channel is not off-hook or ringing RING: channel is ringing BUSY: channel is off-hook OPEN: no connection to CO switch TEST: in test mode TREQ: 116 Vdc test request SERR: PCM bus frame sync error FIDL: forced idle TDSB: time slots disabled RBAT: reverse battery ****: unknown • HDSL Status shows the status of the HDSL span, listing either a 24-hour or 7-day performance history. • Alarm History displays the status history of COT, RT, and span alarms. • ISDN Performance Monitoring Menu displays PM error count and PM threshold for a specific ISDN card and channel.
B) Setup	Display the current setup: • System Setup • Time Slots Assignment (view only) • Channel Configuration • POTS Loop/Ground Start Setup • ISDN Channel Setup
C) Maintenance	Display metallic access connection to a subscriber circuit or display 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. ISDN loopback testing includes the ability to switch between COT and RT loopback and change the loopback mode for each card and channel.
D) Inventory	Display manufacturing information and version information for all the units in the system (except the FAU/FPI unit). At the CO line unit terminal or the RT line unit terminal, the command displays all units in the system.
Q) Quit	Logs the user off.

Display PG-Flex System Status

On the Main Menu, type **A** then press **ENTER** to display the Status Menu.

```
23-OCT-98         PG-FLEX TERMINAL         11:12:20
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

   CURRENT STATUS: OK                                      LOGGED IN: RT
   ALARMING TERMINAL: NONE



                                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


[RT] ENTER COMMAND>
```

System Status

1 Type **A** then press **ENTER** to display the System Status screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:03:32
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                                SYSTEM STATUS
------------------------------------------------------------------------------
  LOCATION    LINE UNIT      CU1     CU2     CU3     CU4     CU5     CU6
------------------------------------------------------------------------------
     COT      32-CH E1*     POTG8   POTS8   POTS8   ISDN4    ---     ---
     RT       32-CH E1*     POTG8   POTS8   POTS8   ISDN4

   ! - ACTIVE ALARM(S): NONE




                         CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

2 Type **X** and then **ENTER** to return to the Status Menu.

Channel Status

1 On the Status Menu, type **B** then press **ENTER** to display the RT Channel Status screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:03:36
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                           RT CHANNEL STATUS
--------------------------------------------------------------------------------
                  CU1       CU2       CU3       CU4
   Channel  RT  (POTG8)   (POTS8)   (POTS8)   (ISDN4)
--------------------------------------------------------------------------------
         1         IDLE      IDLE      IDLE      NSYN
         2         IDLE      IDLE      IDLE      NSYN
         3         IDLE      IDLE      IDLE      TDSB
         4         BUSY      IDLE      IDLE      TDSB
         5         IDLE      IDLE      IDLE       -
         6         IDLE      IDLE      IDLE       -
         7         IDLE      IDLE      IDLE       -
         8         IDLE      IDLE      IDLE       -

                  A) TOGGLE BETWEEN COT AND RT CHANNEL STATUS

                         CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

2 Type **A** then press **ENTER** to display the COT Channel Status screen. Otherwise, type **X** then press **ENTER** to return to the Status Menu.

HDSL Status

1 On the Status Menu, type **C** then press **ENTER** to display the HDSL Status screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:03:42
                      SYSTEM ID: List 3C - Tech Pubs                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):       12/12/13     12/13/13     10/10/11     11/12/12
     PULSE ATTN (db):      31           30           32           32
     PPM OFFSET (ppm):      0            0           -2           -2
     24 HOUR ES:            1            1            2            2
     24 HOUR UAS:          32           40            0            8
--------------------------------------------------------------------------------
         LAST CLEARED: NONE
--------------------------------------------------------------------------------

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

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

[RT] ENTER COMMAND>
```

2 Type an option (Table 6) then press **ENTER** to bring about one of the following.

Table 6. *HDSL Status Menu Configuration Options*

Option	Response
A	Shows the 24-hour performance history.
B	Shows the 7-day performance history.
CTRL-X	Exits the current screen and returns to the Main Menu.
R	Resets minimum and maximum margins, 24-Hour ES, 24-Hour UAS, and 24-Hour Performance History. Type **Y** to confirm the reset, or type **N** to cancel the reset.
X	Exits this screen and returns to Status Menu.

3 Choose options **A** or **B** for either a 24-hour or 7-day performance history. Type **X** then press **ENTER** to return to the Status Menu.

Alarm History Menu

This menu enables the technician to display both the COT and RT shelf alarm histories.

1 On the Status Menu, type **D** then press **ENTER** to display the System Alarm History menu.

```
01-JAN-00         PG-FLEX TERMINAL          11:13:58
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                              SYSTEM ALARM HISTORY
--------------------------------------------------------------------------------
 LAST CLEARED: OCT 22 14:39
--------------------------------------------------------------------------------

                            A) COT SHELF ALARM HISTORY

                            B) RT  SHELF ALARM HISTORY


                           CTRL-X) Main Menu    e(X)it




[RT] ENTER COMMAND>
```

Span Alarm History cannot be displayed at the RT.

2 To return to the Status Menu, type **X** then press **ENTER**.

ISDN Performance Monitoring

1 On the Status Menu, type **A** then press **ENTER** to display the ISDN Performance Monitoring Menu.

```
17-OCT-98         PG-FLEX TERMINAL         03:57:44
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 2

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

                     Press ESCAPE to return to previous menu









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

If no ISDN cards are installed in the PG-Flex system, the display so indicates, and does not proceed to the ISDN Channel Setup menu.

2 Type the card number followed by a comma. Then type the channel number for the ISDN circuit being configured then press **ENTER** (for example, "1,2") to display the ISDN Channel Setup menu.

3 Enter the channel unit number and the channel for the new ISDN channel unit.

```
08-OCT-98         PG-FLEX TERMINAL         12:45:18
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

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

                         A) SELECT NEW CARD AND CHANNEL

                         B) PM ERROR COUNT

                         C) PM THRESHOLD/ALERT INFO

                          CTRL-X) Main Menu    e(X)it









     [RT] ENTER COMMAND>
```

4 Type **B** then press **ENTER** to display the 8-Hour PM ES Count History screen.

5 Type **A** then press **ENTER** to display another card and channel. Otherwise, type **X** then press **ENTER** to return to the ISDN Performance Monitoring Menu.

```
17-OCT-98         PG-FLEX TERMINAL         00:07:08
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1
                          8-HOUR PM ES COUNT HISTORY
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:2   CHANNEL:1
--------------------------------------------------------------------------------
                                CUSTOMER/NETWORK
HOUR                     COT      <<Hourly ES>>      RT
--------------------------------------------------------------------------------
16:00                    0/    0                     0/    0
17:00                    0/    0                     0/    0
18:00                    0/    0                     0/    0
19:00                    0/    0                     0/    0
20:00                    0/    0                     0/    0
21:00                    0/    0                     0/    0
22:00                    0/    0                     0/    0
23:00                    0/    0                     0/    0

                         A) SELECT NEW CARD AND CHANNEL


                          CTRL-X) Main Menu    e(X)it

[RT] ENTER COMMAND>
```

6 Type **C** then press **ENTER** to display the PM Threshold/Alert Info screen.

```
17-OCT-98         PG-FLEX TERMINAL         00:07:38
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1
                           PM THRESHOLD/ALERT INFO
--------------------------------------------------------------------------------
    INTERIM PATH ENABLED   CARD:2   CHANNEL:1
--------------------------------------------------------------------------------
COT                           CUSTOMER/NETWORK
                         Hourly ES    Hourly SES   Daily ES     Daily SES
Threshold Count             40           10          100          25
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             40           10          100          25
Threshold Exceeded       no/no        no/no        no/no        no/no
Threshold Cross Alarm    dis/dis      dis/dis      dis/dis      dis/dis

                  A) SELECT NEW CARD AND CHANNEL
                  B) CHANGE PM THRESHOLD COUNT
                  C) ENABLE/DISABLE THRESHOLD CROSSING ALARM

                           CTRL-X) Main Menu    e(X)it
[RT] ENTER COMMAND>
```

7 Type **CTRL**+**X** and return to the Main Menu.

Display PG-Flex System Setup Menus

On the Main Menu, type **B** then press **ENTER** to display the Setup Menu.

```
01-JAN-00         PG-FLEX TERMINAL         11:16:50
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

   CURRENT STATUS: OK                                        LOGGED IN: RT
   ALARMING TERMINAL: NONE



                                  SETUP MENU
------------------------------------------------------------------------------

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


                         CTRL-X) Main Menu    e(X)it



     [RT] ENTER COMMAND>
```

System Settings Menu

1 On the Setup Menu, type **A** then press **ENTER** to display the System Settings screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:08:16
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                               SYSTEM SETTINGS
------------------------------------------------------------------------------
   SYSTEM DATE: .   .   .   .   .   01-JAN-00
   SYSTEM TIME: .   .   .   .   .   00:08:18
   SYSTEM ID:   .   .   .   .   .   List 3C - Tech Pubs
   AUTO LOGOUT TIME (min.): .   .   DISABLED    (DISABLED,5,30,60)
   METERED TONE FREQUENCY (kHz):    DISABLED    (DISABLED,12,16)
   RING FREQUENCY (Hz): .   .   .   20          (20,25,30)
   HDSL ES ALARM THRESHOLD: .   .   DISABLED    (DISABLED,17,170)
   HDSL MARGIN THRESHOLD:   .   .   4           (0-15,0=DISABLED)
   ALARM ON HDSL THRESHOLD: .   .   DISABLED    (DISABLED,ENABLED)
   LOCAL LOOP LENGTH:   .   .   .   LONG        (SHORT,LONG)
   ALARM ON CONFIGURATION:  .   .   DISABLED    (DISABLED,MINOR,MAJOR)
   ALARM ON INSUFFICIENT TIMESLOT:  DISABLED    (DISABLED,ENABLED)
   ALARM ON ISDN PM THRESHOLD:  .   DISABLED    (DISABLED,ENABLED)


                         CTRL-X) Main Menu    e(X)it

[RT] ENTER CHOICE>
```

2 Type **X** then press **ENTER** to return to the Setup Menu.

Table 7. *System Settings Menu Options*

Parameter	Default Value	Description
System Date	01-JAN-00	System date. (This product meets or exceeds the current technical quality requirements for Year 2000 compliance and properly processes dates up to and beyond December 31, 1999.)
System Time	00:00:00 at power on	System (military) time (hh:mm:ss). The System Time is set individually for each PG-Flex system. The time setting is lost whenever the system shelf loses power or the COLU or RTLU module is removed and reinserted.
	**All the parameters discussed in the remainder of this table are stored in the CO line unit card NVRAM and normally do not change when power is cycled or cards are removed and reinserted.**	
System ID	(all spaces)	Indicates the physical location of the PG-Flex system (CO or RT terminal) through any combination of up to 24 alphanumeric characters. Each PG-Flex system should have a unique, System ID. The default for System ID is "blank" (all spaces). If the CO line unit is replaced, re-enter the appropriate system ID.
Auto Logout Time	DISABLED	The system automatically logs off after a time determined by this parameter: • DISABLED: The user is never automatically logged off. • 5: 5 minutes. • 30: 30 minutes. • 60: 60 minutes.
	**If the user leaves the system without logging out, and if Auto Logout Time is "DISABLED," the next person who accesses the system can do so without logging on and does not need a password.**	
Meter Tone Frequency	12	Meter 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. • 12: 12 kHz. • 16: 16 kHz.
Ring Frequency	20	Determines the frequency of the ringing voltage on all subscriber lines • 20: 20 Hz. • 25: 25 Hz. • 30: 30 Hz.
HDSL ES Alarm Threshold	DISABLED	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. • DISABLED: No minor alarm is generated, regardless of the number of error seconds. • 17: A minor alarm is generated after 17 error seconds. • 170: A minor alarm is generated after 170 error seconds.

Table 7. *System Settings Menu Options (Cont.)*

Parameter	Default Value	Description
HDSL Margin Threshold	4	If the HDSL margin attains a value equal to or less than the setting for this parameter, a minor alarm is generated (determined by the Alarm setting 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 1 dB and 15 dB.
Alarm on HDSL Threshold	DISABLED	Controls whether a minor alarm is generated if the HDSL ES Alarm Threshold or HDSL Margin Threshold is exceeded. • DISABLED: A minor alarm does not occur when the HDSL ES Alarm Threshold or HDSL Margin Threshold is exceeded. • ENABLED: A minor alarm occurs when the HDSL ES Alarm Threshold or HDSL Margin Threshold is exceeded.
Local Loop Length	Long	Determines the length of subscriber loop supported by PG-Flex and affects all subscriber loops within a single PG-Flex system. The loop length affects the total power required by the PG-Flex system: the shorter the loop, the less the power required. • 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. For most applications, the power saved by the SHORT setting is relatively insignificant; therefore, select the default value (LONG) in most cases.
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. If a mismatch condition exists between the CO and RT, replace the corresponding channel unit with a matching channel unit. • 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.
Alarm on Insufficient Time Slot	DISABLED	The system can generate a minor alarm if more circuits are 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.) • 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.
Alarm on ISDN PM Threshold	DISABLED	This parameter determines whether a minor alarm occurs if any of the PM thresholds are exceeded. • 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

1 On the Setup Menu, type **B** then press **ENTER** to display the Time Slots Assignment screen.

```
01-JAN-00         PG-FLEX TERMINAL          00:08:22
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

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


                          CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

The system automatically generates these values. However, cycling power to the system or hot plugging a new channel unit can change these values.

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

2 Type **X** to return to the Setup Menu.

Channel Configuration Menu

1 On the Setup Menu, type **C** then press **ENTER** to display the Channel Configuration screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:08:28
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                           CHANNEL CONFIGURATION
-------------------------------------------------------------------------------
                   CU1       CU2       CU3       CU4       CU5       CU6
   Channel COT  (POTG8)   (POTS8)   (POTS8)   (ISDN4)    (---)     (---)
             RT  (POTG8)   (POTS8)   (POTS8)   (ISDN4)
-------------------------------------------------------------------------------
         1          ON        ON        ON        ON        -         -
         2          ON        ON        ON        ON        -         -
         3          ON        ON        ON       OFF        -         -
         4          ON        ON        ON       OFF        -         -
         5          ON        ON        ON         -        -         -
         6          ON        ON        ON         -        -         -
         7          ON        ON        ON         -        -         -
         8          ON        ON        ON         -        -         -

                              2 Time slots Available

                             CTRL-X) Main Menu    e(X)it


     [RT] ENTER COMMAND>
```

Table 8 describes the channel configuration options.

Table 8. *Channel Configuration Options*

Parameter	Default Value	Function
Channel Configuration	ENABLED	Each channel is individually enabled or disabled through the COLU. This configuration is stored in both the COLU and the COCU. If any one card (COLU, RTLU, COCU, or RTCU) is removed, replaced, or reinserted, the Channel Configuration as automatically reserved. The values can be set to one of the following parameters: • DISABLED: The selected channel is disabled. • ENABLED: The selected channel is enabled. The display indicates when a channel is enabled but no slots are available.

2 Type **X** then press **ENTER** to return to the Setup Menu.

POTS Ground/Loop Start Configuration

1 On the Setup Menu, type **D** then press **ENTER** to display the POTS Ground/Loop Start Configuration screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:08:32
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                    POTS GROUND/LOOP START CONFIGURATION
--------------------------------------------------------------------------------
                  CU1       CU2       CU3       CU4       CU5       CU6
   Channel COT  (POTG8)   (POTS8)   (POTS8)   (ISDN4)    (---)     (---)
             RT  (POTG8)   (POTS8)   (POTS8)   (ISDN4)
--------------------------------------------------------------------------------
         1         LOOP      LOOP      LOOP      N/A        -         -
         2         LOOP      LOOP      LOOP      N/A        -         -
         3         LOOP      LOOP      LOOP      N/A        -         -
         4         LOOP      LOOP      LOOP      N/A        -         -
         5         LOOP      LOOP      LOOP       -         -         -
         6         LOOP      LOOP      LOOP       -         -         -
         7         LOOP      LOOP      LOOP       -         -         -
         8         LOOP      LOOP      LOOP       -         -         -



   CTRL-X) Main Menu   e(X)it >

[RT] ENTER COMMAND>
```

2 Type **X** then press **ENTER** to return to the Setup Menu.

ISDN Channel Setup Menu

1 On the Setup Menu, type **E** and then press **ENTER** to display the ISDN Channel Setup screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:08:40
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

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

                   Press ESCAPE to return to previous menu









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

If no ISDN cards are installed in the PG-Flex system, the display so indicates, and does not continue to the ISDN Channel Setup menu.

2 To display the ISDN Channel Setup Menu: Type the card number followed by a comma. Then type the channel number for the ISDN module you wish to display, then press **ENTER**.

```
01-JAN-00         PG-FLEX TERMINAL         00:08:44
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                              ISDN CHANNEL SETUP
-------------------------------------------------------------------------------
   CARD:2    CHANNEL:1
-------------------------------------------------------------------------------
   PM Mode: .   .   .   .   .   .   Int. Path   (Int. Path,Int. Segmented)
   eoc Mode:    .   .   .   .   .   Normal      (Normal, Transparent)
   B1 <-> B2 Swap:  .   .   .   .   Normal      (Normal, Swap)
   Sealing Current: .   .   .   .   On          (Off, On)
   Zero Byte Substitution:  .   .   Off         (Off, Enabled)

                         S)ELECT NEW CARD AND CHANNEL

                         CTRL-X) Main Menu    e(X)it









[RT] ENTER CHOICE>
```

Table 9 describes the ISDN channel unit configuration parameters.

Table 9. *ISDN Channel Unit Configuration Options*

Parameter	Default Value	Description
A) PM Mode	Interim	Method of performance monitoring. • Interim Performance: Considers the channel as one path and collects the end-to-end error rate for the entire transport path. • Segmented Performance: Considers the channel as separate sections and individually collects error rates for each DSL loop.
B) eoc mode	Normal	How ISDN eoc (embedded operations channel) messages are handled by the PG-Flex system: • Normal: eoc messages are decoded and retransmitted within the PG-Flex system. • Transparent: eoc messages are not decoded and are passed through the PG-Flex system transparently.
C) B1<-> B2 Swap	Normal	Whether the B channels are swapped between the PG-Flex CO ISDN "U" interface and the RT ISDN "U" interface. The "D" signaling channel is unaffected by this parameter. • Normal: channels "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B1" and "B2" at the RT ISDN "U" interface. • Swap: channels "B1" and "B2" at the CO ISDN "U" interface are routed to channels "B2" and "B1" at the RT ISDN "U" interface.
D) Sealing Current	On	Whether sealing current is applied to the ISDN subscriber loop. • Off: No sealing current is applied to the ISDN subscriber loop. • On: A constant current of approximately 5 mA flows in the ISDN subscriber loop at all times.
E) Zero Byte Substitution	Off	How ISDN eoc messages are handled by the PG-Flex system. • Off: The PG-Flex system passes all data through without any special encoding. • On: The PG-Flex system uses a ZBS code to prevent long string of zeros in the data.

3 To display another ISDN channel unit and channel, type **S** then press **ENTER**, and repeat Step 2.

4 When finished, type **X** then press **ENTER** to return to the Setup Menu.

Metallic Access and ISDN Loopback

The following paragraphs describe how to display the metallic access and test options of a PG-Flex system.

From the Main Menu, type **C** then press **ENTER** to access the Maintenance Menu.

```
01-JAN-00         PG-FLEX TERMINAL         00:09:00
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

   CURRENT STATUS: OK                                        LOGGED IN: RT
   ALARMING TERMINAL: NONE


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

                              A) METALLIC ACCESS

                              B) ISDN LOOPBACK


                          CTRL-X) Main Menu    e(X)it




     [RT] ENTER COMMAND>
```

Metallic Access

A metallic access connection to a subscriber circuit can be displayed through the Metallic Access Menu.

On the Maintenance Menu, type **A** then press **ENTER** to display the Metallic Access Menu.

```
01-JAN-00         PG-FLEX TERMINAL         00:09:02
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

   CURRENT STATUS: OK                                        LOGGED IN: RT
   ALARMING TERMINAL: NONE


                             METALLIC ACCESS MENU
------------------------------------------------------------------------------
                          COT - BRIDGING
                          COT - LOOKING IN
                          COT - LOOKING OUT
                          RT  - LOOKING OUT
                          RT  - LOOKING IN
                          RT  - BRIDGING
                          SUBSCRIBER BYPASS


                          CTRL-X) Main Menu    e(X)it




     [RT] ENTER COMMAND>
```

Type **X** then press **ENTER** to return to the Maintenance Menu.

Table 10 defines the functions of the Metallic Access Menu parameters.

Table 10. *Metallic Access Menu Options*

Parameter	Function
COT - Bridging	Monitors a subscriber circuit connection between the switch and the specified CO channel unit Tip/Ring pair.
COT - Looking In	The subscriber connection between the switch and the specified channel unit Tip/Ring pair can be tested. The channel under test is disconnected from the switch for this function. The technician will be able to verify connectivity between the channel under test and the CO switch.
COT - Looking Out	The subscriber connection through the CO channel unit toward the subscriber can be tested. The switch is disconnected from PG-Flex for this function.
RT - Looking In	Provides a connection to the subscriber circuit at the RT channel unit Tip/Ring pair with the subscriber terminal equipment disconnected. (Metallic bypass pair required.)
RT - Looking Out	Provides a connection to the subscriber drop with the RT channel unit disconnected. (Metallic bypass pair required.)
RT - Bridging	Monitors the connection between the RT channel unit and the subscriber terminal equipment. (Metallic bypass pair required.)
Subscriber Bypass	Provides a metallic connection from the switch to the subscriber's terminal equipment for the selected channel, bypassing the PG-Flex carrier transport. This is the only access connection that can be maintained after the technician logs off the craft port. (Metallic bypass pair required.)

ISDN Loopbacks

1 On the Maintenance Menu, type **B** then press **ENTER** to display the ISDN Loopback Menu.

```
01-JAN-00         PG-FLEX TERMINAL         00:09:06
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                               ISDN LOOPBACK MENU
--------------------------------------------------------------------------------
COT LOOPBACK MAP    CARD:2
--------------------------------------------------------------------------------
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

                           CTRL-X) Main Menu  e(X)it



[RT] ENTER COMMAND>
```

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

Display System Inventory

This option allows displaying of manufacturing and version information for all the units in the system (except the FAU/FPI unit).

1 On the Main Menu, type **D** then press **ENTER** to display the System Inventory screen.

```
01-JAN-00         PG-FLEX TERMINAL         00:09:14
                      SYSTEM ID: List 3C - Tech Pubs                SYSTEM: 1

                                  INVENTORY
--------------------------------------------------------------------------------
 LOC  SLOT    MODEL   LIST  ISSUE     TYPE      S/W     P1 TAG     CLEI CODE
--------------------------------------------------------------------------------
 COT  LU1    FLL-716   3C     1     32-CH E1*   4.7   2658001749
 COT  CU1    FLC-703    4     1       POTG8     1.3   2057000141   VACHCHGCAA
 COT  CU2    FLC-703    3     1       POTS8     1.3   0217001889   VACHCDGCAA
 COT  CU3    FLC-703    3     1       POTS8     1.3   0217001722   VACHCDGCAA
 COT  CU4    FLC-706    1     1       ISDN4     1.4   0148002670   VACHEGJCAA
 RT   LU     FRL-746   3C     1     32-CH E1*   4.7   3108001710
 RT   CU1    FRC-753    4     1       POTG8     1.5   0838004040   VARHCKGCAA
 RT   CU2    FRC-753    2     1       POTS8     1.4   2067001665   VARHCGGCAA
 RT   CU3    FRC-753    2     1       POTS8     1.4   3486001316   VARHCKGCAA
 RT   CU4    FRC-756    1     1       ISDN4     1.3   1747001417   VARHEJJCAA

                          CTRL-X) Main Menu    e(X)it



[RT] ENTER COMMAND>
```

Table 11. *Inventory Menu Definitions*

Parameter	Definition
LOC	Card location (the COT shelf or the RT enclosure)
SLOT	Slot location
MODEL	Card model
LIST	Card list number
ISSUE	Issue number
TYPE	Type (E1, T1, POTS, ISDN)
S/W	The software version of the installed card
P1 TAG	An ASCII character string up to 10 characters representing the manufacturing serial number
CLEI CODE	Card CLEI code

2 Type CTRL + X to return to the Main Menu.

TROUBLESHOOTING

Table 12 provides troubleshooting procedures based on indications displayed by the FRL-746 front panel indicators.

Table 12. *FRL-746 RT Line Unit Troubleshooting*

Indication	Problem	Action
PWR LED off	One or both HDSL lines are not connected between the COT and RT. Verify the connections at the RT and COT.	**1** Measure 130 Vdc to 260 Vdc between HDSL_T and HDSL_T on the RT enclosure backplane. **2** On the COT shelf backplane, measure -65 to -130 Vdc between HDSL_T1 and chassis ground and +65 Vdc to +130 Vdc between HDSL_T2 and chassis ground.
	COT line unit fuse F1 has blown.	Replace the fuse in the CO line unit with a 3A GMT fuse.
	RT line unit power supply has failed.	Replace RT line unit.
	CO line unit power supply has failed.	Replace CO line unit.
LOOP 1 (2) SYNC LED flashing or off	The HDSL line is attempting to synchronize with the CO unit or cannot detect the HDSL signal from the CO unit. This is usually an indication that there is a problem with the HDSL circuit between the COT and RT (assuming the FAULT LED is *off*).	**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 2.
	COLU and RTLU incompatible (that is, one is a T1 version and the other is an E1 version).	Install compatible versions of the COLU and RTLU (that is, install both COLU and RTLU as T1 or E1 versions).
LOOP 1 (2) MARGIN LED on	The HDSL line margin level is below a preset level.	**1** Check the preset Margin Alarm level in the Setup Menu. **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 2.
FAULT LED on	Faulty FRL-746 RT line unit.	Replace the RT line unit.

PRODUCT SUPPORT

TECHNICAL SUPPORT

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

Telephone:	800.366.3891 The 800 telephone support line is toll-free in the U.S. and Canada.
Email:	wsd_support@adc.com
Knowledge Base:	http://adc.com/Knowledge_Base/index.jsp
Web:	www.adc.com

LIMITED WARRANTY

Product warranty is determined by your service agreement. Refer to the ADC Warranty/Software Handbook for additional information, or contact your sales representative or Customer Service for details.

RETURNS

To return equipment to ADC:

1. Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to ADC's Return Material Authorization (RMA) Department.
2. Call or write ADC's RMA Department to ask for an RMA number and any additional instructions. Use the telephone number, fax number or email address listed below:
   - Telephone: 800.366.3891
   - Email Address: rma@ADC.com
3. Include the following information, in writing, along with the equipment you are returning:
   - Company name and address.
   - Contact name and telephone number.
   - The shipping address to which ADC should return the repaired equipment.
   - The original purchase order number.
   - A description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.
   - The reason for the return. For example:
     - The equipment needs an ECO/ECN upgrade.
     - The equipment is defective.

If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.

If there is another reason for returning the equipment, please let us know so we can determine how best to help you.

4 Pack the equipment in a shipping carton.

5 Write ADC's address and the RMA Number you received from the RMA Department clearly on the outside of the carton and return to:

ADC DSL Systems, Inc.
14352 Franklin Ave.
Tustin, CA 92780-7013

Attention: **RMA (Number)**

All shipments are to be returned prepaid. ADC will not accept any collect shipments.

FCC CLASS A COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A 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 the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the use will be required to correct the interference at his own expense.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ADC Technologies, Inc. voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

ACRONYMS

AWG	American Wire Gauge
CO	Central Office
COLU	Central Office Line Unit
COT	Central Office Terminal
CRC	Cyclic Redundancy Check
DCE	Data Communications Equipment
DIP	Dual In-Line Package
DSL	Digital Subscriber Line
DTR	Data Terminal Ready
ES	Errored Seconds
HDSL	High-bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
LED	Light-Emitting Diode
LU	Line Unit
MLT	Mechanized Loop Testing
NVRAM	Non Volatile Random Access Memory
PBX	Private Branch Exchange
PCM	Pulse Code Modulation
PM	Performance Monitoring
POTS	Plain Old Telephone Service
PPM	Pulse Position Modulation
REN	Ringer Equivalency Number
RMA	Return Material Authorization
RT	Remote Terminal
UAS	Unavailable Seconds

GLOSSARY

Margin	The excess signal to noise ratio (in dB), 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 between 22 and 6 dB.
Pulse Attenuation	The attenuation of the 2B1Q pulse from the distant end. PG-Flex operates with pulse attenuations in excess of 30 dB. This value is related to the cable pair's 196-kHz loss. The pulse attenuation is a more direct indication of the loop attenuation to the 2B1Q signal than the 196-kHz loss. The normal range of pulse attenuation is between 1 and 32 dB.
PPM	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. One or both line units should be replaced.
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 unavailable seconds the HDSL loop was out of synchronization.

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