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# PG-FLEX 24 CHANNEL REMOTE TERMINAL LINE UNIT

Model	List Number	Part Number	CLEI Code
FRL-742	3	150-1342-03	VARHDFHCAA



**PAIRGAIN TECHNOLOGIES, INC.**  
**ENGINEERING PLANT SERIES TECHNICAL PRACTICE**  
**SECTION 363-742-103-01**

**Revision History of this practice.**

Revision 01—June 23, 1997

A) Initial Release

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## USING THIS TECHNICAL PRACTICE

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



**A note informs you of special circumstances.**



**A caution indicates the possibility of equipment damage.**



**A warning indicates the possibility of personal injury.**

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## A. PRODUCT OVERVIEW

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### 1. Description and Features

**1.1** The PairGain® PG-Flex FRL-742 List 3 Remote Terminal (RT) Line Unit is the remote end of the PG-Flex subscriber carrier system and resides in a RT enclosure. The FRL-742 Line Unit carries up to 24 subscriber channels between a COT and an RT. The FRL-742 Line Unit provides access through the RS-232 port to display system options, performance, and status using an ASCII terminal.

The FRL-742 RT Line Unit uses PairGain's High-bit-rate Digital Subscriber Line (HDSL) 2B1Q technology to provide the equivalent of 1.544 Mbps digital transmission rate, plus signaling, over two copper pair wires. The HDSL line can include unterminated bridge taps. The technology is implemented:

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

The FRL-742 Line Unit supports the use of a PG-Flex FDU-451 doubler to extend the range of a PG-Flex subscriber carrier system.

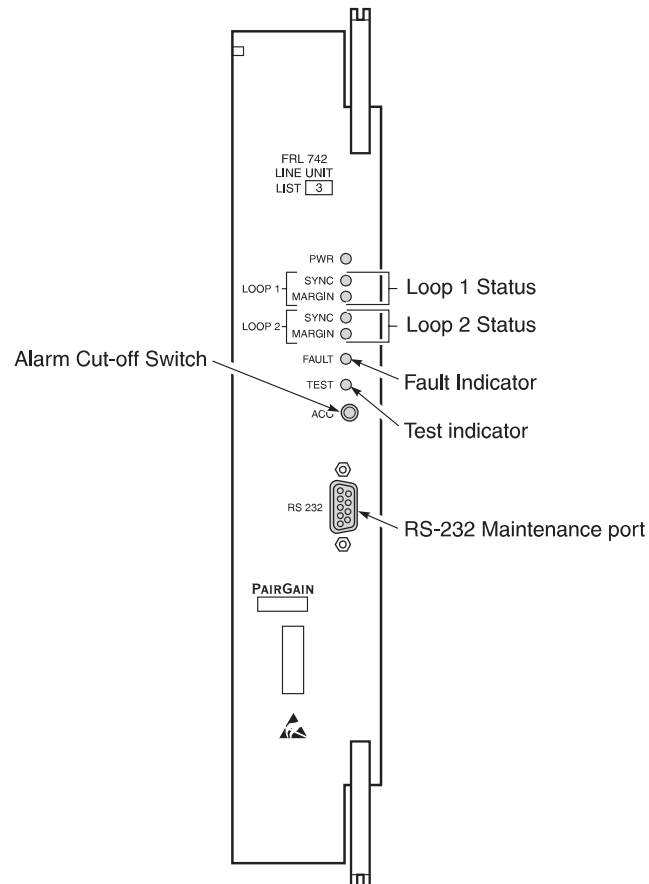
**1.2** Features of the FRL-742 RT Line Unit are:

- supports 4Tel compatible Loop Test Systems
- compatible with Mechanized Loop Testing (MLT) and Pair Gain Test Controller (PGTC)
- supports ISDN channel units
- supports loop start/ground start channel units
- uses distributed subscriber carrier system architecture

## 2. Front Panel

Figure 1 shows the front panel for the FRL-742 Line Unit. Table 1 lists the indicators and states for the FRL-742 front panel LEDs.

Figure 1 shows the RS-232 maintenance port on the FRL-742 front panel that is used display system options, performance, and status on an ASCII terminal. Also, it includes the Alarm Cut-off switch (ACO) that you can use to perform a lamp test (i.e., turn all the RTL and RTCU LEDs on).



**Figure 1 . FRL-742 List 3 Front Panel.**

**Table 1. FRL-742 Front Panel LEDs.**

<b>LED</b>	<b>LED State</b>	<b>Indicates</b>
POWER	Solid Green	Power applied and line feed operating normal. After the system is powered on for about two minutes, the POWER LED turns off. Pressing the ACO button will turn it back on for another two minutes.
	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	Fault in the system.
	OFF	No faults are detected in system.

### 3. Specifications

#### Electrical Characteristics

RT Power Supply Input Voltage.....+130 Vdc to +65 Vdc (Line 1)  
 -130 Vdc to 0 Vdc (Line 2)

RT Power Supply Input Power .....Less than 30 Watts

#### Environmental

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

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

#### Physical

##### Dimensions

Height: ..... 12.00 in. (30.5 cm)

Width: ..... 2.25 in. (5.7 cm)

Depth: ..... 4.50 in. (11.4 cm)

Weight ..... 1.4 lb. (0.6 kg)

## B. FUNCTIONAL DESCRIPTION

### 4. Applications

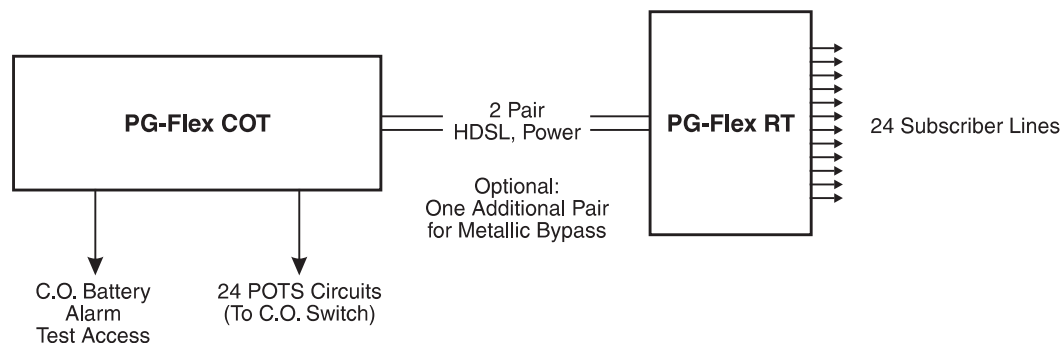
- 4.1 Overview.** PG-Flex is a small-capacity, universal subscriber carrier system supporting up to 24 channels including both Plain Old Telephone Service (POTS) and Integrated Services Digital Network (ISDN) services. The system is based on HDSL transmission technology and remote power is supplied from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

PG-Flex systems easily mount in either 19 or 23-inch COT Shelves. A system comprises one Line Unit and at least one Channel Unit. The Line Unit and Channel Unit(s) can be hot-swapped without affecting other systems in the same COT shelf. The POTS Channel Units use 64 kbps  $\mu$ -Law PCM encoding scheme that allows high speed modem and group 3 facsimile operation on all channels.

PG-Flex uses HDSL transmission technology over two 24 AWG unconditioned copper pairs. Over the HDSL transmission lines, power is supplied from the CO to the Remote Terminal (RT). The maximum distance from the CO to the RT is 12.3 kft.

- 4.2 System Flex Configuration.** A PG-Flex system, shown in Figure 2, consists of:

- Central Office Terminal (COT). The 19-inch COT Shelf accommodates two complete systems and the 23-inch COT Shelf accommodates four complete systems. Each system requires one COT Line Unit and up to six (19-inch shelf) or three (23-inch shelf) Channel Units. A common Alarm Unit or Pair Gain Test Controller Interface Unit in each shelf provides an interface for maintenance alarm relays and metallic access to the remote subscriber lines.
- Remote Terminal (RT). The RT Enclosure provides a weatherproof housing for the PG-Flex remote electronics and subscriber terminations. The enclosure accepts one common RT Line Unit and up to four Channel Units.



*Figure 2. Typical PG-Flex Configuration*

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

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



The system configuration in Figure 2 shows the maximum distance between the COT and the RT is 12.3 kft (3.8 km) using 24 gauge lines. Table 2 shows the maximum distance between the COT and the RT for various gauge wire. Because of HDSL transmission technology, the HDSL lines require no special conditioning and may include unterminated bridge taps, but cannot include load coils.

**Table 2. PG-Flex Distances**

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

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

Test access is performed from the subscriber's COT. Refer to the FLL-712 technical practice for more information.

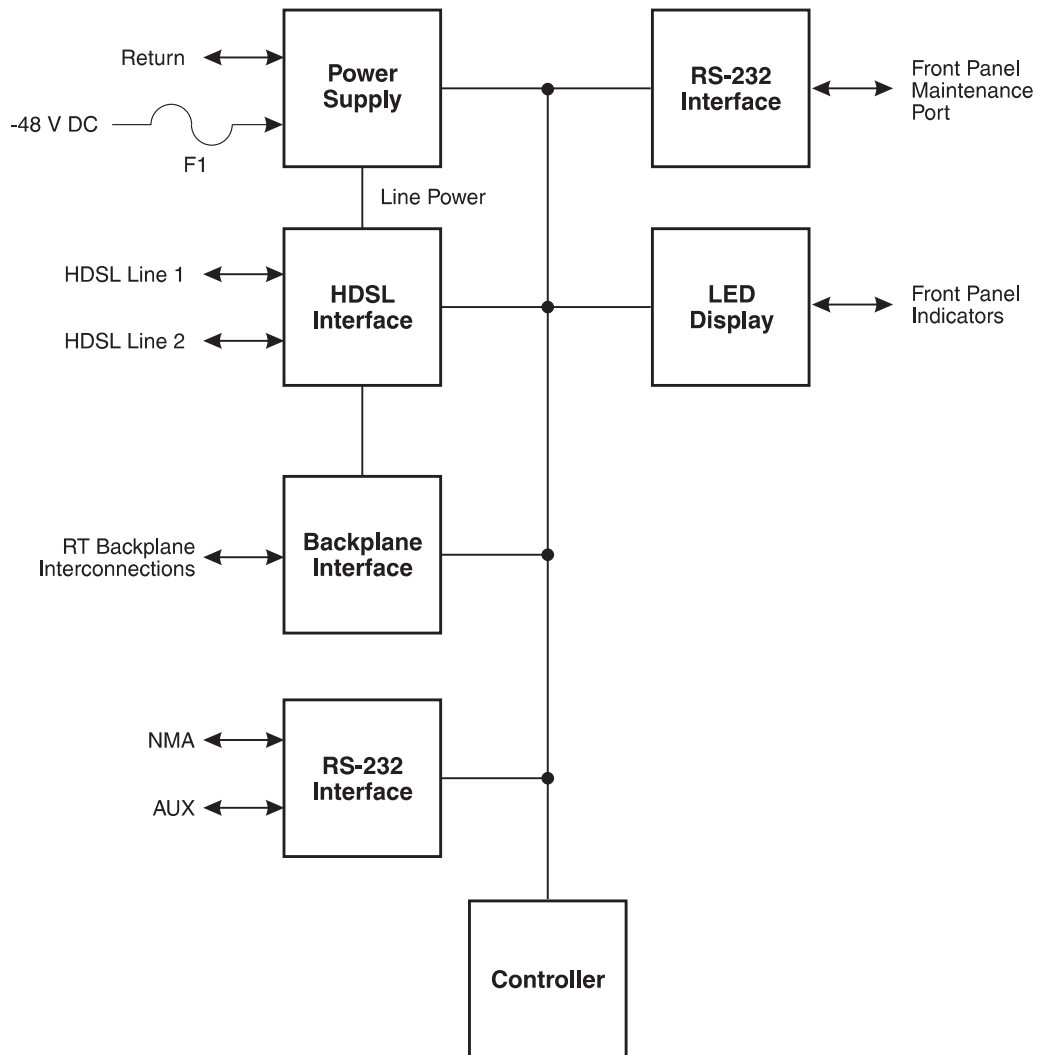
## 5. Operational Capabilities

- 5.1** The FRL-742 RT Line Unit provides the following functions:

- power supply
- HDSL line transceivers
- front-panel status indicators
- alarm cut-off switch (used to perform a lamp test)
- RS-232 Maintenance Interface (DCE)
- line and drop test circuits
- MLT/PGTC loop test system compatibility
- 4Tel loop test system compatibility

**5.2** The RS-232 Maintenance Port (Figure 1) provides access to display system options, performance, and status of the PG-Flex system using an ASCII terminal (see Section 9).

Figure 3 shows a block diagram of the FRL-742.



**Figure 3.** FRL-742 RT Line Unit Block Diagram

## 6. Terminal Management

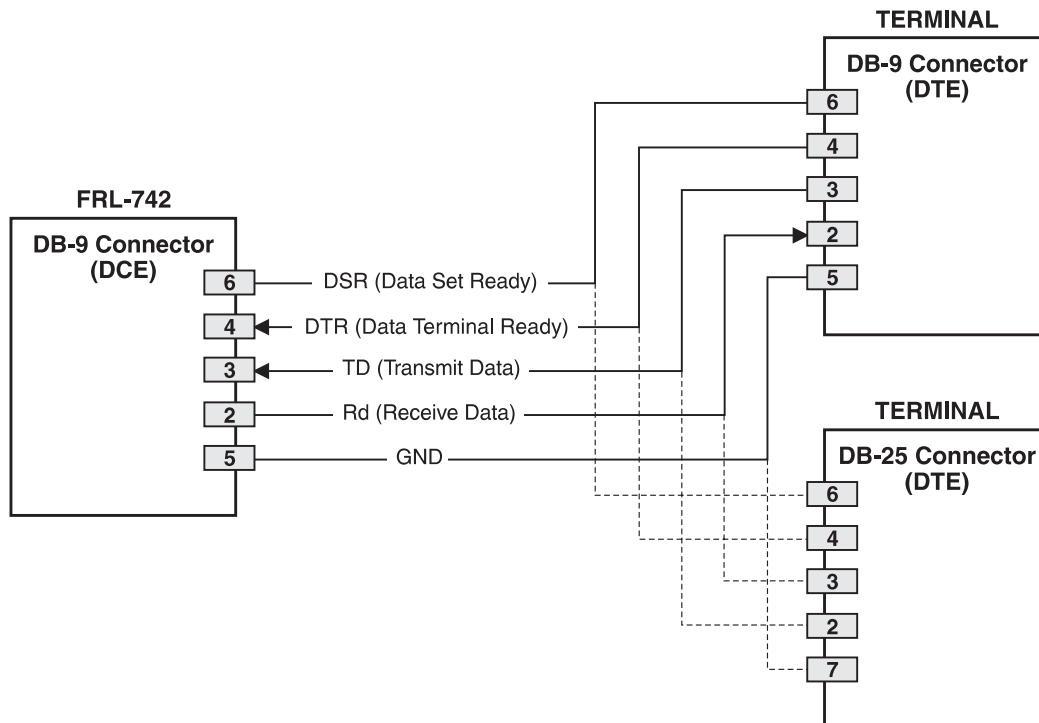
**6.1** The terminal management function at the RT allows the technician to display information about the PG-Flex system using an ASCII terminal (or modem with a null modem cable) connected to the maintenance port. With this function, the technician can:

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

**6.2 Connecting FRL-742 to a Terminal or Modem.** A standard RS-232 (DB-9) connector on the front panel provides access to the menu interface feature via an ASCII terminal. Figure 4 shows the pinouts for connecting the FRL-742 standard RS-232 (DB-9) maintenance port to an ASCII terminal.



The FRL-712 line unit will not automatically log off when a terminal is unplugged from the craft maintenance port unless the DTR signal is connected between the terminal and the maintenance port. The technician must manually log off the line unit before unplugging from the port. Otherwise, the line unit remains logged in. The next time a terminal is connected, the terminal session will still be in the same place.

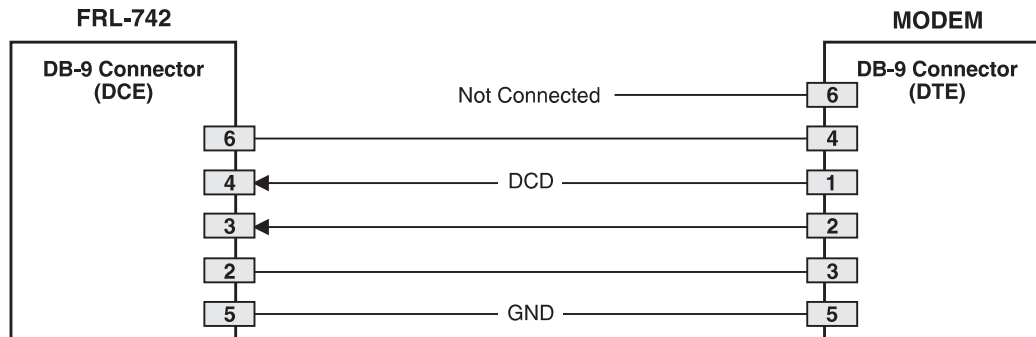


**Figure 4.** Connecting the FRL-742 to an ASCII Terminal

Figure 5 shows the pinouts for connecting the FRL-742 to a modem using a null-modem cable. Using Data Carrier Detect (DCD) from the modem ensures that the FRL-742 Line Unit logs off if the carrier signal disappears.

When configuring a modem, ensure that either the DIP switches or the software configuration is set OFF for Carrier Detect (CD) override. This causes the modem to send CD signal when it connects with another modem and to drop CD when it disconnects. Otherwise, if set ON, the FRL-742 connection will function properly but will not log out properly when disconnected.

It is recommended that Data Terminal Ready (DTR) override be OFF. This allows a modem call to terminate properly when the FRL-742 drops DSR (which is null-modemmed to DTR input on the modem).



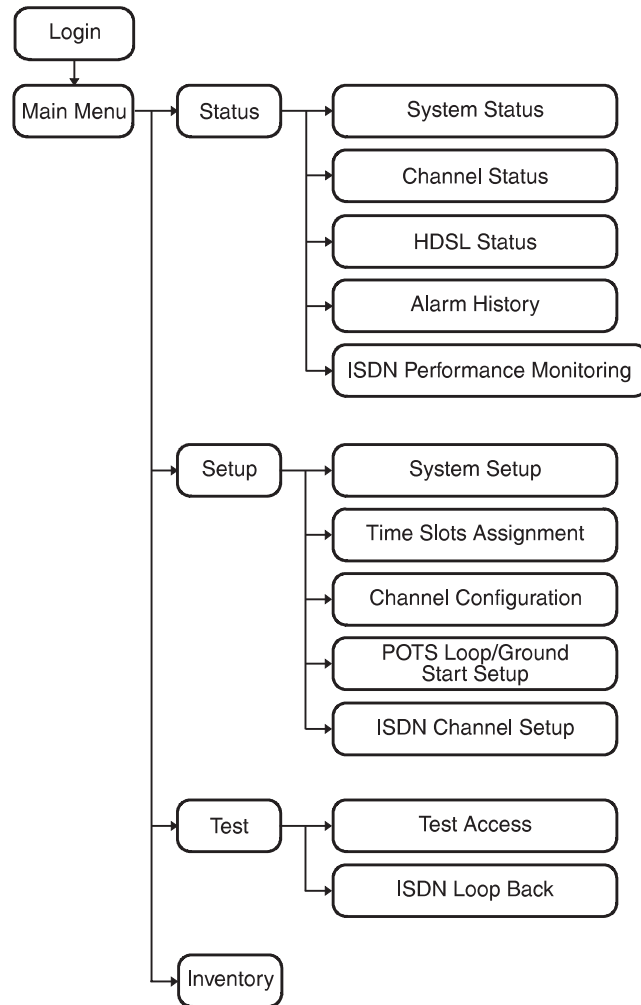
*Figure 5. Connecting the FRL-742 to a Modem*

The connector is set up as:

- DCE with 8 data bits
- 1 stop bit
- no parity

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

**6.3 Menus and Display Structure.** Figure 6 shows the menu structure of the terminal management system. The Main Menu has four menu options from which the technician can select.



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

- 6.4 Power-up and Connection Screen.** After connecting the ASCII terminal to the FRL-742 Line Unit, press the SPACE bar several times to start the autobaud feature. Autobaud covers transmission rates of 1,200, 2,400, 4,800 and 9,600 bps only.

The Power-Up and Connection screen appears:



- 6.5 Main Menu.** From the Main menu, you access other menus where you can view a PG-Flex system, view test procedures, and view status information. The main menu appears after a successful log on:

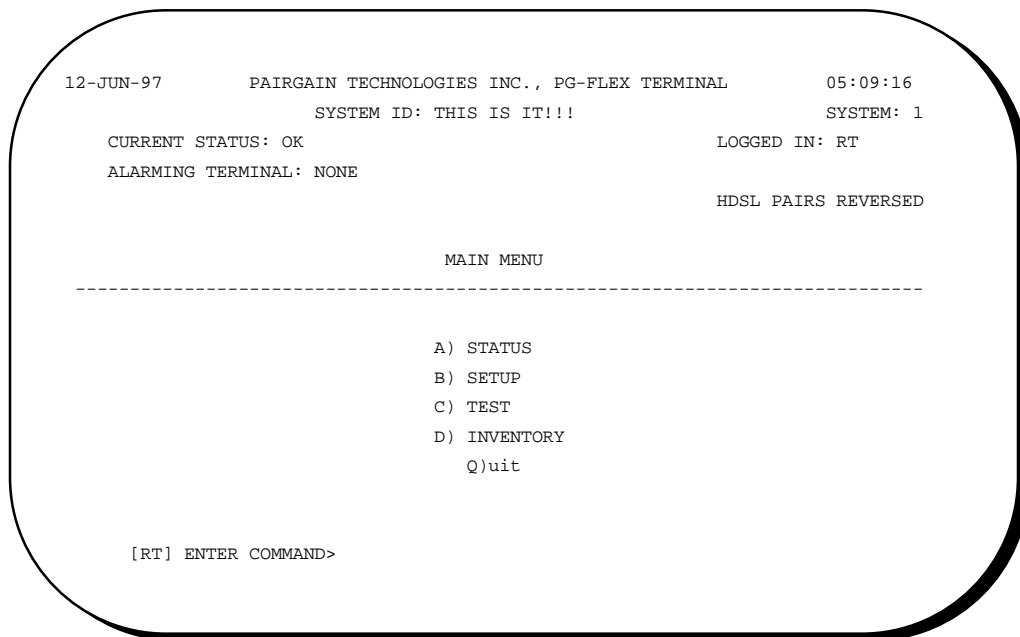


Table 3 describes the functions associated with these four main menu options (A through D).

**Table 3. Main Menu Options**

<b>Main Menu Option</b>	<b>Function</b>
Status	<p>By selecting the Status option (A) from the Main Menu, the technician can display:</p> <ul style="list-style-type: none"> <li>• System Status to show the equipment installed in the system and the current status (in alarm or not) of the equipment.</li> <li>• Channel Status to show the current status of all channels in the system. Each channel has a status condition. Status conditions vary for the different types of channel cards. Examples of status are: <ul style="list-style-type: none"> <li>IDLE: channel is not off-hook or ringing</li> <li>RING: channel is ringing</li> <li>BUSY: channel is off-hook</li> <li>OPEN: no connection to CO switch (Forward Disconnect)</li> <li>TEST: in test mode</li> <li>SERR: PCM bus frame sync error</li> <li>FIDL: forced idle</li> <li>TDSB: time slots disabled</li> <li>RBAT: reverse battery</li> <li>****: unknown</li> </ul> </li> <li>• HDSL Status to show the status of the HDSL span. You can view either a 24-hour or 7-day performance history.</li> <li>• Alarm History to show the status history of COT, RT, and Span alarms.</li> <li>• ISDN Performance Monitoring Menu to show PM error count and PM threshold for a specific ISDN card and channel.</li> </ul>
Setup	<p>Select the Setup option (B) from the Main Menu, the technician can view the current setup:</p> <ul style="list-style-type: none"> <li>• System Setup</li> <li>• Time Slots Assignment (view only)</li> <li>• Channel Configuration</li> <li>• POTS Loop/Ground Start Setup</li> <li>• ISDN Channel Setup</li> </ul>
Test	<p>Select the Test option (C) from the Main Menu for viewing ISDN loopbacks.</p>
Inventory	<p>Selecting the Inventory option (D) from the Main Menu to view manufacturing information and version information for all the units in the system (except FPI)..</p>

## C. INSTALLATION AND TEST

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### 7. Unpacking

- 7.1 Upon receipt of the equipment, proceed as follows:
- 1 Unpack each container and visually inspect it for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to PairGain. Order replacement equipment if necessary.
  - 2 Check the contents versus the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact PairGain as described in Section 5. If you must store the equipment for a prolonged period, store the equipment in its original container.

### 8. Installation



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

**An FPI-729 List 1 PGTC Interface Unit or and 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 call will terminate the call.**

- 8.1 Install FRL-742 RT Line Unit and verify operation as follows:
- 1 Insert the FRL-742 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 may 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



## 9. Provisioning

### 9.1 View System Settings. View the system settings.

- 1 Type B and press <Enter> from the Main menu.

The Setup menu appears:

```
06-FEB-96   PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL   03:39:50
              SYSTEM ID: 123456789012345678901234         SYSTEM: 2
CURRENT STATUS: OK                               LOGGED IN: RT
ALARMING TERMINAL: NONE                           HDSL PAIRS REVERSED

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

              e(X)it

[RT] ENTER COMMAND> A
```

2 Type A and press <Enter> at the Setup menu.

The System Settings menu appears:

```

06-FEB-96          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:39:52
                   SYSTEM ID: 123456789012345678901234                SYSTEM: 2

                                SYSTEM SETTINGS
                                -----
A) SYSTEM DATE:      . . . . .          06-FEB-96
B) SYSTEM TIME:     . . . . .          03:39:52
C) SYSTEM ID:       . . . . .          123456789012345678901234
D) SET PASSWORD     . . . . .
E) AUTO LOGOUT TIME (min.): . . .          5          (DISABLED,5,30,60)
F) METERED TONE FREQUENCY (kHz): . . . . .          N/A
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)

                                e(X)it

[RT] ENTER CHOICE> A

```

**9.2 Viewing Configuration for an ISDN Channel Unit.** Sections 9.2.1 through 9.2.3 accomplish viewing of configuration and status for an ISDN channel unit.

### 9.2.1 View the set up for an ISDN module, starting from the Setup menu:

- 1 Type E and press <Enter> at the Setup menu.

The ISDN Channel Setup screen appears:

```

07-APR-97      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL      01:44:42
                SYSTEM ID: 123456789012345678901234              SYSTEM: 2

                ISDN CHANNEL SETUP
                -----

                Press ESCAPE to return to previous menu

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

```

- 2 Type the card and channel numbers and press <Enter> for the ISDN module you want to view.

The ISDN Channel Setup screen appears:

```

06-FEB-96      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL      03:39:52
                SYSTEM ID: 123456789012345678901234              SYSTEM: 2

                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
                   e(x)it

[RT] ENTER CHOICE> A

```

- 3 View the parameters set up for the channel unit and channel (Table 4):

**Table 4. ISDN Channel Unit Configuration Choices**

<b>Parameter</b>	<b>Options</b>
A) PM Mode	Interim Path performance monitoring collects the end-to-end error rate for the entire transport path. Segmented monitoring collects error rates for each DSL loop individually.
B) Current eoc mode	Normal Transparent
C) Current B1, B2 settings	Use Normal option.
D) Current Sealing Current Setting	Off - none On - sealing current applied ( $\approx 5\text{mA}$ ).
E) Current Zero Byte Substitution Setting	Use Off option.

- 4 Type S and press <Enter> to select a new ISDN channel unit and channel to view. Type the channel unit number and channel for the new ISDN channel unit.

## 9.2.2 View channel configuration, starting at the Setup menu:



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

**For channel configuration, ON means the channel is enabled with a time slot. OFF means the channel is enabled but does not have a time slot assigned.**

- 1 Type C and press <Enter> for the Channel Configuration menu.

The following screen appears:

```

06-FEB-96          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:41:20
                   SYSTEM ID: 123456789012345678901234                SYSTEM: 2
                   CHANNEL CONFIGURATION
-----
Channel   COT      CU1      CU2      CU3
          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
                e(X)it

[RT] ENTER COMMAND> D

```

- 2 Type x and press <Enter> to go back one screen.

- 9.2.3 Time Slot Assignment.** View time slot assignment, starting at the Setup menu. Type B and press <Enter> to display the following screen:

```

06-FEB-96          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:41:10
                   SYSTEM ID: 123456789012345678901234                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:  ----
-----

                                e(X)it

[RT] ENTER COMMAND> X

```



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

- 9.3 View Loop Start/Ground Start Channel Units.** Paragraphs 9.3.1 through 9.3.3 accomplish viewing the configuration for a loop start/ground start channel unit.



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

### 9.3.1 View the channels for loop start or ground start:

- 1 From the Main menu, type B and press <Enter> for the Setup menu.

The following screen appears:

```

06-FEB-96      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL      03:39:50
                SYSTEM ID: 123456789012345678901234            SYSTEM: 2

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

                HDSL PAIRS REVERSED

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

                e(X)it

[RT] ENTER COMMAND> D

```

- 2 Type D and press <Enter> to view the Pots Ground/Loop Start setup screen:

```

06-FEB-96      PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL      03:41:20
                SYSTEM ID: 123456789012345678901234            SYSTEM: 2

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

                L) Change to Loop Start
                G) Change to Ground Start
                e(X)it

[RT] ENTER COMMAND>L

```

- 3 Type X and press <Enter> to go back one screen.

### 9.3.2 View channel configuration, starting at the Setup menu:



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

**For channel configuration, ON means the channel is enabled with a time slot. OFF means the channel is enabled but does not have a time slot assigned.**

- 1 Type C and press <Enter> for the Channel Configuration menu.

The following screen appears:

```

06-FEB-96          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:41:20
                    SYSTEM ID: 123456789012345678901234          SYSTEM: 2
                    CHANNEL CONFIGURATION
-----
Channel    COT      CU1      CU2      CU3
           RT      (POTS8) (POTS8) (ISDN4)  (---)
-----
1          ON      ON      ON
2          ON      ON      ON
3          ON      ON      DISABLED
4          ON      ON      DISABLED
5          ON      ON      -
6          ON      ON      -
7          ON      ON      -
8          ON      ON      -

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

[RT] ENTER COMMAND> D

```

- 2 Type x and press <Enter> to go back one screen.



**9.3.3 Time Slot Assignments.** View time slot assignments, starting at the Setup menu. Type B and press <Enter> to display the following screen:

```

06-FEB-96          PAIRGAIN TECHNOLOGIES INC., PG-FLEX TERMINAL          03:41:10
                   SYSTEM ID: 123456789012345678901234                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:   ----
-----

                                e(X)it

[RT] ENTER COMMAND> X

```



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

## 10. Troubleshooting

**10.1** Table 5 provides troubleshooting procedures based on indications displayed by the front panel indicators of FRL-742 RT Line Unit.

*Table 5. FRL-742 RT Line Unit Troubleshooting*

<b>Indication</b>	<b>Problem</b>	<b>Action</b>
POWER LED off	1 One or both HDSL lines are not connected between the COT and RT. Verify the connections at the RT and COT	1 Measure for 130 Vdc to 250 Vdc between HDSL_T and HDSL_T on the RT enclosure backplane. 2 On the COT shelf backplane, measure for -130 Vdc, $\pm 10\%$ between HDSL_T1 and chassis ground and 0 Vdc to +120 Vdc between HDSL_T2 and chassis ground.
	2 COT Line Unit fuse F1 has blown.	Replace the fuse.
	3 RT Line Unit power supply failed.	Replace RT Line Unit.
	4 COT HDSL power supply failed.	Replace COT Line Unit.
LOOP 1 (2) SYNC LED flashing or off	1 The HDSL line is attempting to synchronize with the central office 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 <i>off</i> ).	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 1.
	2 COLU and RTLU incompatible (i.e., one is a T1 version and the other is an E1 version).	
LOOP 1 (2) MARGIN LED on	The HDSL line margin level is below a preset level.	See the previous discussion on the SYNC LED <i>flashing</i> or <i>off</i> .
FAULT LED on	Faulty FRL-742 RT Line Unit.	1 Replace the RT Line Unit.

## D. TECHNICAL SUPPORT

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### 11. Technical Support

- 11.1** PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contacting PairGain Customer Service Engineering group at:
- Telephone:** (800) 638-0031 or (714) 832-9922
- Fax:** (714) 832-9924
- 11.2** During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday - Friday, excluding holidays), technical assistance calls are normally answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process normally results in a callback within 30 minutes of initiating the request.
- 11.3** In addition, PairGain maintains a computer bulletin board system for obtaining current information on PairGain products, product troubleshooting tips and aids, accessing helpful utilities, and for posting requests or questions. This system is available 24-hours-a-day by calling (714) 730-3299. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

## E. CERTIFICATION AND WARRANTY

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### 12. Certification

- 12.1 FCC Compliance.** The FRL-742 RT Line Unit complies with the limits for Class A digital devices pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operating this equipment in a residential area can cause harmful interference in which case the user will be required to correct any interference at his own expense.
- 12.2** For information on cabling, proper connections, grounding and line power, refer to the appropriate instruction manual for the unit being installed.
- 12.3** All external wiring must follow the provisions in the current edition of the National Electrical Code.

### 13. Warranty

- 13.1** PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 5 years from the date of original shipment, given proper customer installation and regular maintenance. PairGain will repair or replace any unit without cost during this period if the unit is found to be defective for any reason other than abuse or improper use or installation.
- 13.2** Only an authorized PairGain representative can perform repairs. If unit fails, replace it with another unit and immediately report failure to PairGain. Any repairs or modifications made to the unit by unauthorized field personnel will void the warranty.
- 13.3** If a unit needs repair, call PairGain for a Return Material Authorization (RMA) number and return the defective unit, freight prepaid, along with a brief description of the problem, to:
- PairGain Technologies, Inc.  
14402 Franklin Avenue  
Tustin, California 92780-7013  
ATTN: Customer Repair Facility
- 13.4** PairGain will continue to repair faulty modules beyond the warranty program for a nominal charge. Contact your PairGain sales representative for details and pricing.

## F. ABBREVIATIONS AND GLOSSARY

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### 14. Abbreviations

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

### 15. Glossary

<b>Margins</b>	Indicates the excess signal to noise ratio, at either the COT or RT, relative to a $10^{-7}$ Bit Error Rate. <i>cr</i> is the current margin, <i>mn</i> is the minimum margin since last cleared, <i>mx</i> 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.
<b>Pulse Attenuation</b>	Indicates the attenuation of the 2B1Q pulse from the distant end. PG-Flex operates with pulse attenuations in excess of 30 dB. This value is related to the cable pair's 196-kHz loss. The pulse attenuation is a more direct indication of the loop attenuation to the 2B1Q signal than the 196-kHz loss. The normal range of pulse attenuation is from 1 to 32 dB.
<b>PPM</b>	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.
<b>HDSL 24 Hour ES</b>	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.
<b>HDSL 24 Hour UAS</b>	The number of seconds (unavailable seconds) the HDSL loop was out of synchronization.

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