

PAIRGAIN TECHNOLOGIES PG-FLEX™ RT CHANNEL UNIT

MODEL FRC-751 List 1

PairGain #150-1351-01
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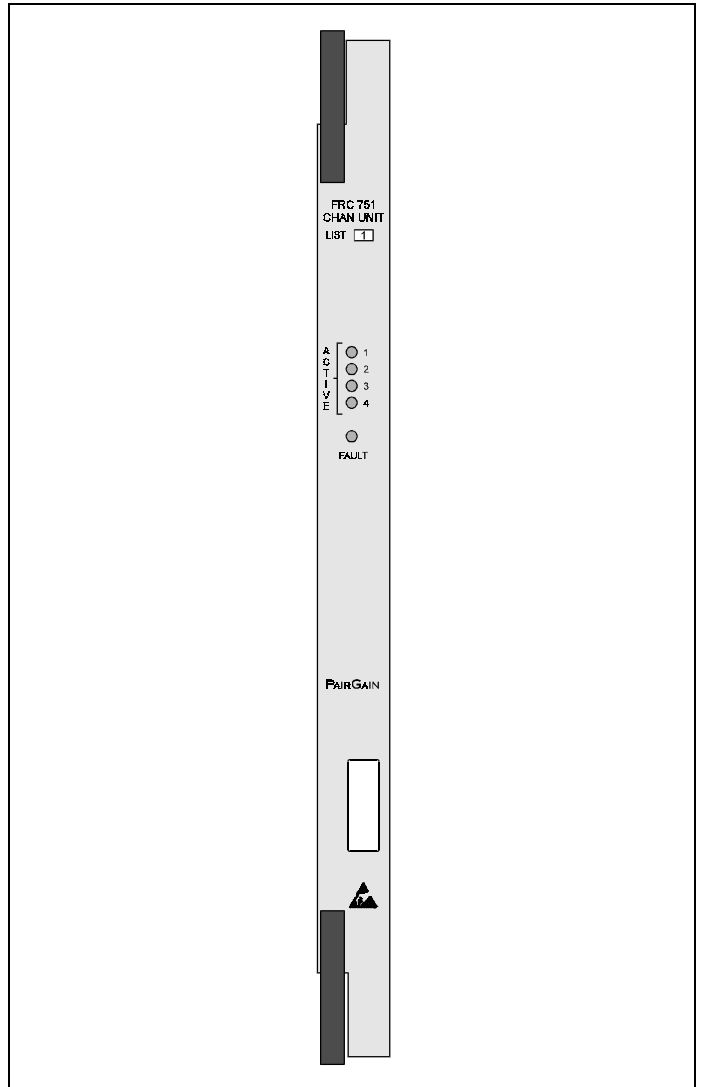


Figure 1. FRC-751 Channel Unit, List 1, Front Panel. The PairGain FRC-751 provides four POTS interfaces between a PG-Flex Remote Terminal and the subscriber.

CAUTION
This product incorporates static sensitive components.
Proper electrostatic discharge procedures must be followed.

A. PRODUCT OVERVIEW

1. DESCRIPTION AND FEATURES

1.01 The FRC-751 Channel Unit provides four POTS interfaces between a PG-Flex Remote Terminal (RT) and subscribers. The FRC-751 Channel Unit uses μ -Law PCM encoding. The unit includes status LEDs for each line indicating idle, ringing and off-hook conditions, as well as an LED indicating a fault condition on the Channel Unit. The unit provides metallic test access to the subscriber line for connecting through an optional metallic bypass pair.

1.02 Revision History of this practice.

Revision 01 - February 12, 1996

a) Initial release.

1.03 Features of the PG-Flex FRC-751 RT Channel Unit:

- Four POTS subscriber interfaces
- 64 kbps μ -Law PCM encoding
- Front panel ACTIVE LEDs indicate idle, ringing, and off-hook conditions for each channel
- Front panel FAULT LED indicator simplifies troubleshooting

2. APPLICATIONS

2.01 PG-Flex is a small capacity universal subscriber carrier system supporting up to 24 subscriber channels, including POTS and ISDN services. The system is based on HDSL transmission technology and the remote power is powered from the central office. Using two 24 gauge unconditioned copper pairs, the remote terminal may be located up to 12.3 kft from the central office terminal. Standard 19- or 23-inch shelves contain multiple systems; circuit cards may be hot-swapped without affecting other systems installed in the shelf. POTS channel units use 64-kbps μ -Law PCM encoding to allow Group 3 facsimile or high-speed modem operation on all channels.

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

- Central Office Terminal (COT). Two complete systems may be installed in a 19-inch COT Shelf and four complete systems may be installed in a 23-inch COT Shelf. Each system requires one COT Line Unit and up to three (23-inch shelf) or six (19-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. The Remote Terminal communicates with, and is line-powered from, the COT over two pairs of 19- to 26-gauge twisted-pair telephone wire. Each pair carries both power and HDSL signaling.

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

2.04 The line interface is a two-pair, 784-kbps full-duplex 2B1Q transmission format. The dual HDSL lines provide 24 64-kbps channels with signaling, and an embedded 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.

2.05 For the system configuration depicted in Figure 2, the maximum distance between the COT and the RT is 12.3 kft (3.8 km), assuming the HDSL lines are 24 gauge. Table 1 shows the maximum distance between the COT and RT for various gauge wire. Due to the nature of HDSL transmission technology, the HDSL lines do not require any special conditioning and may include unterminated bridge taps, but cannot include load coils.

2.06 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 test pair at the RT. PG-Flex extends this connection back to the COT where technicians can switch it onto a test access bus, or to the corresponding subscriber line on the COT channel card.

2.07 Test access is achieved by placing +116 V on the subscriber's COT tip lead for 1.5 seconds, then removing the +116 V. Depending on the configuration of the PG-Flex system, the selected subscriber drop (assuming a working metallic bypass pair) will be connected to either the corresponding COT subscriber line or to the test access bus.

2.08 The test connection will be dropped when -116V is applied to the subscriber's COT tip for 1.5 seconds, then removing the -116 V.

2.09 Test access may also be activated through the RS-232 Maintenance Port located on the front of the COT and RT Line Units, using an ASCII terminal.

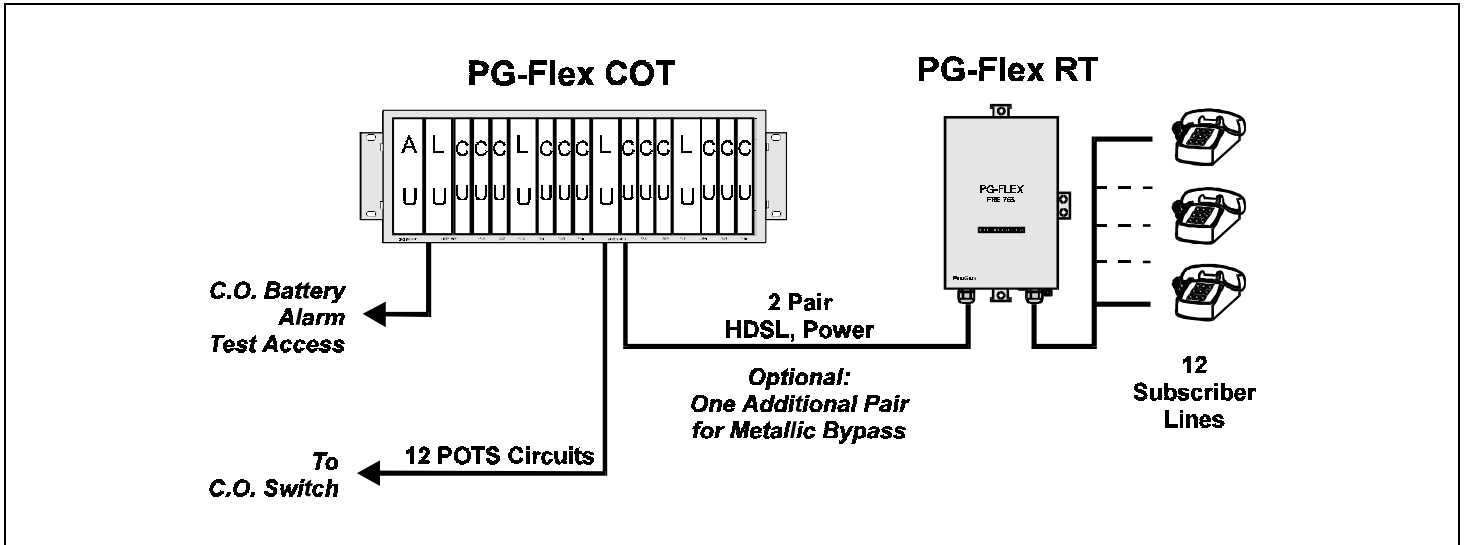


Figure 2. Typical PG-Flex Configuration.

TABLE 1. PG-FLEX DISTANCES

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

3. SPECIFICATIONS

Analog Impedance

600 ohms

DC Loop Current

Greater than 23 mA into off-hook dc resistance

Ringer Output Drive

15 REN maximum per RT, 5 REN maximum per channel

RT DC Supervisory Range

960 ohms. Maximum cable loop resistance, minus 430 ohms for handset, is 530 ohms

RT Idle State Loop Voltage (On-Hook)

Greater than 40 V dc. Ring is negative with respect to Tip

RT Loop Closure (Off-Hook) Detection

Less than 960 ohms between Tip and Ring

RT On-Hook Detection

Greater than 10 kohms

Operating Temperature & Humidity

-40° to +65° Celsius, 5% to 95% non-condensing

Operating Elevation

200 feet (60 m) below sea level to 13,000 feet (4,000 m) above sea level.

Dimensions

Height: 12.00" (30.5 cm)
Width: 1.00" (2.5 cm)
Depth: 4.50" (11.4 cm)

Weight

0.6 lb. (0.3 kg)

4. CERTIFICATION

4.01 FCC Compliance. The FRC-751 Channel 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

- Cabling
- Proper connections
- Grounding
- Line vs. local power

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

5. WARRANTY

5.01 PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 36 months 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.

5.02 This module should not be field repaired. If it fails, replace it with another unit and return the faulty unit

to PairGain for repair. Any modifications of the unit by anyone other than an authorized PairGain representative will void the warranty.

5.03 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, CA 92680
ATTN: Repair and Return Dept.
(800) 638-0031

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

B. FUNCTIONAL DESCRIPTION

6. OPERATIONAL CAPABILITIES

6.01 Each FRC-751 RT Channel Unit provides four POTS interfaces between the RT and subscribers, and performs the following functions:

- 64 kbps μ -Law PCM encoding
- Applies ringing voltage
- Generates forward disconnect
- Detects an off-hook or ring-trip condition
- Connects a subscriber loop to a metallic test pair
- Protects against secondary surges and power line cross

6.02 A block diagram of the FRC-751 is shown in Figure 3.

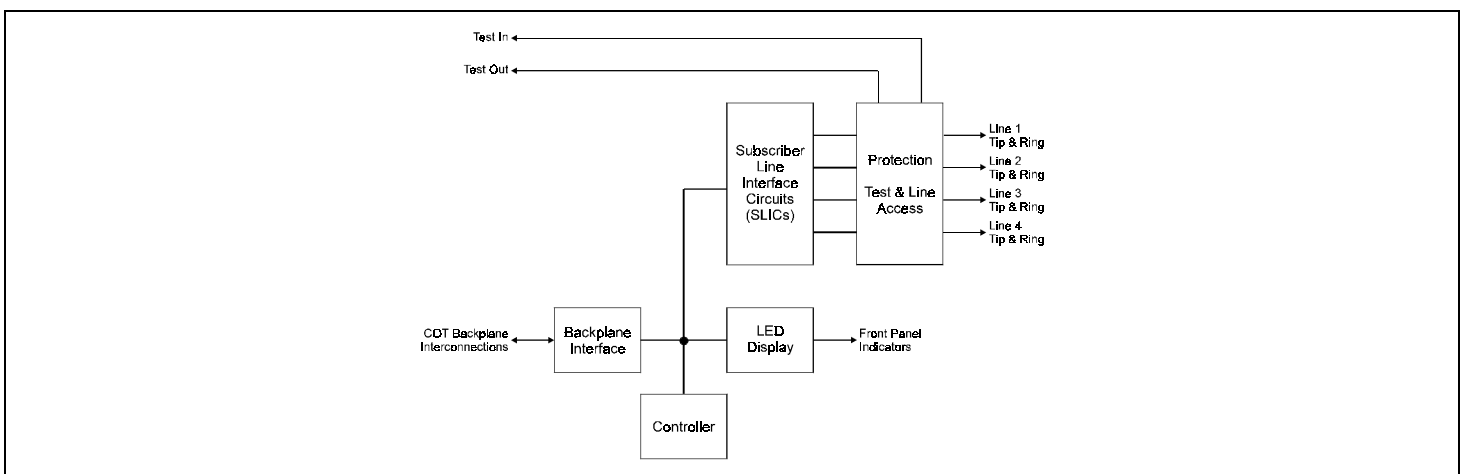


Figure 3. FRC-751 Block Diagram.

7. FRONT PANEL

7.01 The front panel of the FLC-751 Channel Unit contains the following indicators (see Figure 1):

- **ACTIVE 1, 2, 3, 4 LED Indicators**
Green—the channel is off-hook.
Flashing Green—the channel is ringing (the LED will track the ringing) or the line has been switched to the test pair.
Off—the channel is on-hook.
- **FAULT LED Indicator**
Red—a fault has been detected on the unit.
Off—no faults are detected on the unit.

C. INSTALLATION AND TEST

8. UNPACKING

- 8.01** 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.

9. TURN-UP AND TESTING

9.01 Table 2 provides step-by-step turn-up and test procedures for the FRC-751 Channel Unit.

10. TROUBLESHOOTING

10.01 Table 3 provides troubleshooting procedures based on indications displayed by the front panel indicators of FRC-751 Channel Unit.

TABLE 2. FRC-751 RT CHANNEL UNIT TURN-UP AND TESTING

CAUTION			
Observe normal electrostatic discharge precautions when handling electronic equipment. Do not hold electronic plug-ins by their edges. Take care not to touch components or circuitry.			
Step	Operation	Action	Observe
1	Install RT Channel Units	a. Insert each FRC-751 Channel Unit into the FRE-765 RT Enclosure.	All LEDs on the Channel Unit will turn <i>on</i> for approximately 2 seconds, then scan from top to bottom, then turn <i>off</i> .
		b. After the system has powered up, established HDSL synchronized communications, and no calls are in progress, observe the Channel Unit front panel indicators.	ACTIVE 1 <i>off</i> ACTIVE 2 <i>off</i> ACTIVE 3 <i>off</i> ACTIVE 4 <i>off</i> FAULT <i>off</i>
2	Test Subscriber Circuits	a. Test each subscriber circuit by placing and receiving calls.	ACTIVE 1 through 4 LEDs track call as described in paragraph 7.01.

TABLE 3. FRC-751 RT CHANNEL UNIT TROUBLESHOOTING

Indication	Problem	Action
FAULT LED <i>on</i>	The processor in the RT Line Unit has stopped.	Remove and replace the RT Line Unit. If the system does not restart, replace the RT Line Unit.
<i>Troubleshooting based on customer-originated trouble reports</i>		
No Dialtone, Can't Dial	Short circuit, faulty COT, or faulty RT Channel Unit.	<ol style="list-style-type: none"> 1. Lift the subscriber pair at the RT. If dialtone is present at the RT and calls can be placed, check for shorts toward the subscriber or on the customer's premises. 2. If you cannot hear a dialtone and/or cannot make calls at the RT with the subscriber drop lifted, lift the jumper in the CO between the CO switch and the COT. If you hear a dialtone and/or can make calls at the switch, replace the COT Channel Unit and/or RT Channel Unit. Otherwise, the problem is in the CO switch.
Phone Doesn't Ring	High-resistance short on subscriber drop, faulty RT Channel Unit, or faulty RT Line Unit.	<ol style="list-style-type: none"> 1. Check for ringing at the RT. If ringing isn't present on the line under test, try ringing another line terminated on the same RT Channel Unit. If ringing is present on other lines, check for high resistance shorts on the subscriber drop. 2. If ringing isn't present on a circuit terminated on the same RT Channel Unit, try ringing a line terminated on another RT Channel Unit. If the line rings, replace the RT Channel Unit. If the line doesn't ring, replace the RT Line Unit.
Phone Doesn't Stop Ringing	Faulty subscriber station instrument, faulty RT Channel Unit, or loop length too long.	<p>Phone stops ringing when using a butt-in at subscriber location: Subscriber's station instrument's internal resistance is too high. Replace instrument according to local policies.</p> <p>If phone doesn't stop ringing when using a butt-in at the subscriber location, re-test at the RT: If phone still doesn't stop ringing, replace the RT Channel Unit.</p> <p>Otherwise, loop length between RT and subscriber is too long.</p>
Can't Hear, Can't Be Heard	Subscriber problem, faulty COT Channel Unit, or faulty RT Channel Unit.	<ol style="list-style-type: none"> 1. Lift the subscriber drop at the RT. If audible level is acceptable, there is a problem toward the subscriber. 2. If audible level is too low at the RT with the subscriber drop lifted, lift the jumper in the CO between the CO switch and the COT. If audible level is acceptable, replace the COT Channel Unit and/or RT Channel Unit. Otherwise, the problem is in the CO switch.