PG-Flex 24 Channel Remote Terminal Line Unit – Quick Installation Guide

Overview

The PG-Flex® FRL-842 List 1C 24 Channel Remote Terminal (RT) Line Unit is located in a PG-Flex RT Enclosure. The system uses High-bit-rate Digital Subscriber Line (HDSL) 2B1Q technology to transport 24 DS0s of Plain Old Telephone Service (POTS) and Integrated Services Digital Network (ISDN) services between the FLL-812 Universal Central Office Line Unit or the FLL-814 Integrated Central Office Line Unit and the FRL-842. The FRL-842 is line powered from the Central Office (CO).

The FRL-842 L1C RT Line Unit is compatible with the FLL-814 L1A and L2 or later CO Line Units. The FRL-842 L1C cannot be used in conjunction with the FLL-814 L1 CO Line Unit unless the application software on the FLL-814 L1 has been upgraded to 2.X or later.

If a single CO Line Unit or RT Line Unit has to be replaced, the new card does not have to be reconfigured because the existing settings are maintained.

Description

When used with the PG-Flex*Plus*, a typical integrated system configuration is comprised of a FLL-814 in the CO, one FRL-842 and three RT Channel Units at the RT. Up to eight integrated systems can be supported in a PCS-719 COT Shelf. A management unit, common to all systems installed in the COT Shelf, provides an interface for alarm relays and testing of subscriber circuits.

When used with the PG-Flex, a typical universal system is comprised of one line unit and three channel units at both the COT and RT. The FCS-719 COT shelf supports up to four systems. The channel unit card in the COT must be the same type of slot specific card (POTS or ISDN) as the channel unit installed at the RT.

A PG-Flex FPI-829 Pair Gain Test Controller (PGTC) Interface Unit (common to all systems installed in the shelf) provides an interface for maintenance, alarm relays, and metallic access to the remote subscriber lines.

The remote end of either system type is housed in a RT Enclosure. RT Enclosures are designed for indoor and outdoor applications and are provided with a diverse selection of mounting options. These RT Enclosures support one or more systems that include one FRL-842 and up to three RT Channel Units for each system.

Features

Features supported by the FRL-842 include:

- Line powered from FLL-812/FLL-814
- Front panel status indicators
- Downloadable firmware
- Environmental Alarms
- Support for FFU-865 (Fan Card) and associated alarm
- Mechanized Loop Test (MLT) test system compatibility
  - TR-909
  - Bypass

MLT components include bypass pair and TR-909 type testing. In TR-909 mode, an internal test head for determining the condition of the subscriber drop calculates the results and inserts TR-909 resistive signatures for MLT to read.

Subscriber Drop Testing

The FRL-842 supports subscriber drop testing using an internal test head that eliminates the metallic bypass pair.

This test head reports its results through the Flex PGTC Interface Unit (FPI-829) (for universal systems) or management unit (for integrated systems) using three-terminal signature resistors that are measured by MLT and converted to subscriber drop condition messages that can be viewed on the VT-100 terminal.

Subscriber Drop Test is not available on the FPI-729, FLL-712, and FRL-742.

HDSL Transmission

The system uses HDSL 2B1Q technology to transport 24 DS0s plus signaling over two copper pairs. The HDSL circuits can be used without repeaters or loop conditioning. Adaptive equalization, scrambling, and a four-level 2B1Q line coding scheme are used to maximize distance and minimize crosstalk.

Table 1 on page 2 shows the maximum distance between the COT and RT for various wire gauges with or without doublers in the circuit. These distances are shown for a cable temperature of 68º F (20º C). As the temperature of the cable increases, the distance decreases.

Table 1. HDSL Distances

Wire Gauge	HDSL Distance (6 dB Margin / 35 db Loss / 68° F)			Analog Drop (530 Ω)
	No Doubler	1 Doubler	2 Doublers	
26 AWG 0.4 mm	9.0 kft 2.8 km	18.0 kft 5.6 km	27.0 kft 8.4 km	6.3 kft 1.9 km
26 AWG 0.5 mm	12.3 kft 3.8 km	24.6 kft 7.6 km	36.9 kft 11.4 km	10.2 kft 3.1 km
22 AWG 0.6 mm	16.1 kft 5.0 km	32.2 kft 10.0 km	48.3 kft 15.0 km	16.3 kft 5.0 km
19 AWG 0.9 mm	22.8 kft 7.0 km	45.6 kft 14.0 km	67.4 kft 21.0 km	32.9 kft 10.0 km

When the RT is powered from the COT, two auxiliary power pairs are required between the COT and RT for each doubler installed in the HDSL circuit. Refer to the COT Shelf or RT Enclosure technical practice for additional information on the power pairs.

FRONT PANEL

Figure 1 shows the FRL-842 List 1C front panel.

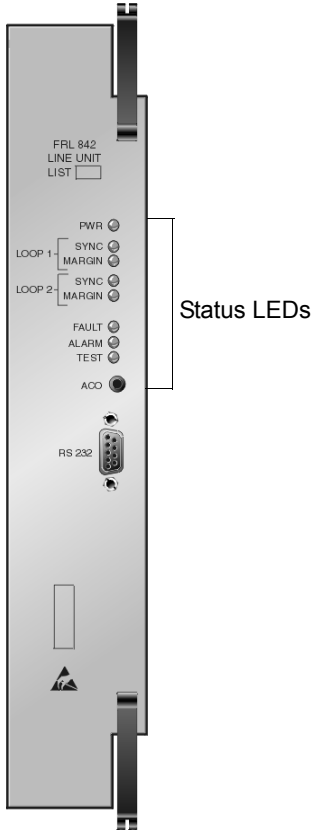

Figure 1. FRL-842 Front Panel

Table 2 lists the front panel LED indications for the FRL-842.

Table 2. FRL-842 Front Panel LEDs

LED	Color	State	Function
PWR	Green	On	FRL-842 is receiving power
		Flashing	FLL-812/FLL-814 is attempting to power-up the FRL-842
		Off	FRL-842 is not receiving power or internal fault
LOOP 1/ LOOP 2 SYNC	Green	On	Loop 1/Loop 2 is in synchronization between the FLL-812/FLL-814 or Doubler Unit
		Flashing	Loop 1/Loop 2 is attempting to synchronize with the FLL-812/FLL-814 or Doubler Unit
		Off	Active FLL-812/FLL-814 or Doubler Unit is not detected
LOOP 1/ LOOP 2 MARGIN	Yellow	On	Loop 1/Loop 2 margin at the FRL-842 is equal to or below the provisioned threshold level
		Flashing	Loop 1/Loop 2 margin at the FLL-812/FLL-814 or Doubler Unit is equal to or below the provisioned threshold level
		Off	Loop 1/Loop 2 margin is above the provisioned threshold level
TEST	Yellow	On	Test active
		Off	Test not active
ALARM	Red	On	FRL-842 alarm condition exist
		Flashing	FLL-812/FLL-814 alarm condition exist
		Off	No alarm conditions exist
FAULT	Red	On	Fault in the FRL-842
		Off	No fault is detected

INSTALLATION

You must install the FRL-842 in the left slot of the RT Enclosure. No special tools or equipment are required for installing the FRL-842.

INTIALIZE AND POWER-UP THE FRL-842

By default, the FLL-812/FLL-814 periodically attempts to power up and synchronize with the FRL-842 and/or Doubler Unit(s) in the circuit until end-to-end HDSL synchronization is established. If the FLL-812/FLL-814 is unable to establish synchronization, it powers down the loops and waits approximately one minute before re-trying. The FLL-812/FLL-814 repeats this process continuously until it is able to synchronize with the FRL-842 or doubler.

The FLL-812/FLL-814 initialization and power up sequence described below assumes:

- **HDSL pairs are wired from the COT shelf, through doubler housings (if required) and terminated at the RT enclosure**
- **Auxiliary Power pairs (when using doublers) are wired from the COT shelf and terminated at the RT enclosure (these pairs do not need to pass through the Doubler housing)**
- **COT shelf has been wired to CO battery**
- **Bay fuses have been installed**
- **Doublers (if required) have been installed**
- **FRL-842 has been installed**

When the FLL-812/FLL-814 synchronizes with the FRL-842, the following occurs:

1. When the FRL-842 is installed with power applied to the COT shelf, all LEDs turn on for one second, then go off. The PWR Led remains on.
2. After a few seconds, SYNC LEDs for Line 1 and Line 2 begin to flash.
3. After 30 to 60 seconds, SYNC LEDs for Line 1 and Line 2 remain on.
4. Assumption: The HDSL margins are above alarm thresholds and there are no subscriber drop tests or other alarm/faults in the system. Therefore, verify Table 3 front panel indications after the system powers up and establishes HDSL synchronized communications.

Table 3. FRL-842 LED Status

LED	State
PWR	On
LOOP 1/LOOP 2 SYNC	On
LOOP 1/LOOP 2 MARGIN	Off
TEST	Off
ALARM	Off
FAULT	Off

It takes approximately two minutes before end-to-end synchronization is established with two doublers installed in the circuit. However, depending on the condition of the cable plant and length of the spans, it may take up to four minutes before synchronization is established.

SPECIFICATIONS

Table 4 lists the specifications for the FRL-842.

Table 4. FRL-842 Specifications

Category	Item	Value
Electrical	Input Voltage	130 Vdc to 260 Vdc (± 65 Vdc to ± 130 Vdc with respect to ground)
	Input Power	Less than 40 Watts
Compliance	NEBS	SR-3580 Level 3
	Human Safety	UL-1950 for Restricted Access
	Emissions Radiation and Immunity	GR-1089-CORE for Class B equipment
HDSL	Line Interface	Two pair, 784-kbps full-duplex 2B1Q transmission format
	Signal Characteristics	TR-NWT-001210, Generic Requirements for HDSL Systems
Environmental	Elevation	-200 ft. to 13,000 ft. -60 m to 4,000 m
	Temperature	-40° F to +150° F -40° C to +65° C
	Humidity	5% to 95% (non-condensing)
Physical	Height	12.0 in. (30.5 cm.)
	Width	2.2 in. (5.6 cm.)
	Depth	4.5 in. (11.4 cm.)
	Weight	1.4 lbs. (0.64 kg.)

Fault Isolation and Troubleshooting

Table 5 provides fault isolation and troubleshooting for the FRL-842.

Table 5. Fault Isolation and Troubleshooting

LED	Probable Cause	Solution
PWR LED off	One or both HDSL lines are not connected between the COT Shelf and FRL-842. Verify the connections at the FRL-842 and COT Shelf.	Measure 130 Vdc to 260 Vdc between HDSL_T1 and HDSL_T2 on the RT enclosure backplane during the periodic power-up time frame
	FLL-812/FLL-814 on-board fuse or office fuse has blown	If power is present at COT Shelf backplane, replace the FLL-812/FLL-814 If power is not present at COT Shelf backplane, replace the CO fuse
	FRL-842 power supply has failed	Replace the FRL-842
	FLL-812/FLL-814 power supply has failed	Replace the FLL-812/FLL-814
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 FRL-842.	Verify the HDSL circuits are terminated correctly and with the correct orientation Measure the loop length of each HDSL circuit (shorting the pair at the far end). The loop length must be less than that shown in Table 1 on page 2.
LOOP 1 (2) MARGIN LED on	The HDSL line margin level is below a preset level	See the previous discussion on the SYNC LED flashing or off
FAULT LED on	Faulty FRL-842	Replace the FRL-842

Subscriber Reported Faults

Table 6 provides fault isolation procedures for the system. Problems are listed in decreasing order of probability; the most likely action to resolve the problem is listed first. It is assumed that the system has successfully powered up, the HDSL circuits are synchronized end-to-end, there are no ES, UAS, or margin errors occurring, and no Fault LEDs are illuminated on the units installed in the COT shelf or RT enclosure.

Table 6. Subscriber Fault Isolating

LED	Probable Cause	Solution
All subscriber circuits cannot draw dial tone, telephones are not ringing, and ISDN circuits are not synchronizing	Incorrect provisioning of the PMX-744(s) in integrated mode only	PMX-744 - Verify the system options are set correctly
		FLL-814 - Verify the system options are set correctly
	Problem with the DS1 signals in integrated mode only	DS1 - Verify the presence and integrity of the DS1 signals terminated on the COT shelf
	Undetected hardware problem	Replace the following units with known good units in the following order: • FLL-812 or FLL-814 • FRL-842 • PMX-744(s) • RT channel units • COT channel units
One or more subscriber circuits cannot draw dial tone, telephones are not ringing and ISDN circuits are not synchronizing	Undetected hardware problem	Replace the following units with known good units in the following order: • RT channel unit on which the failures are occurring • FRL-842 • All RT channel units of the same type on which the failures are occurring

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.

FCC Class B Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

* Reorient or relocate the receiving antenna.
* Increase the separation between the equipment and receiver.
* Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
* Consult the dealer or an experienced radio/TV technician for help.

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 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.

Technical Support

Technical assistance is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center (TAC) at:

Telephone:	800.366.3891 (toll-free in the U.S. and Canada)
E-mail:	wsd_support@adc.com
Knowledge Base:	http://adc.com/Knowledge_Base/index.jsp
Web:	www.adc.com

Revision History

Rev	Date	Revisions
01	4/22/2003	Initial Release

PG-Flex
24 Channel
Remote Terminal Channel Unit
Quick Installation Guide

Section SCP-FRL842-013-01Q
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This document applies to the following products:

Model	List	CLEI
FRL-842	1C	VAR1KH0A~~

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

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