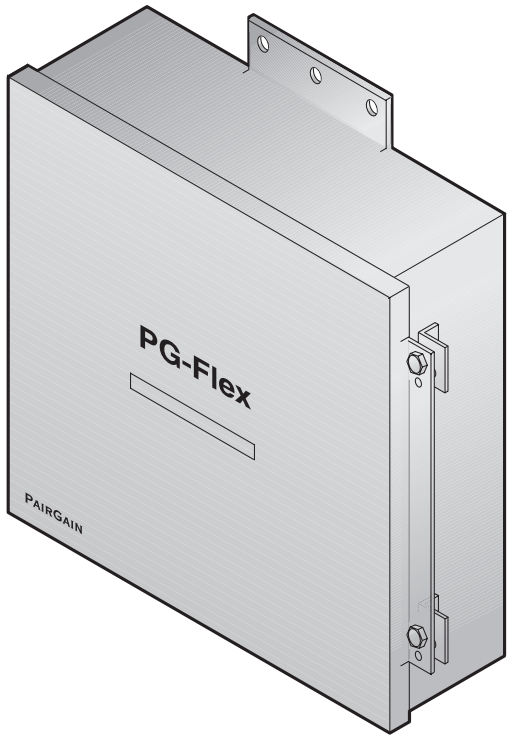
PG-FLEX REMOTE TERMINAL ENCLOSURE

Model	List Number	Part Number
FRE-765	5	150-1365-05
FRE-765	5A	150-1365-51



PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING SERVICES TECHNICAL PRACTICE
SECTION 363-765-105-01

Revision History of this practice.
Revision 01—June 2, 1997
A) Identifies List 5*x* RT Enclosures

PAIRGAIN
THE COPPEROPTICS COMPANY

TABLE OF CONTENTS

USING THIS TECHNICAL PRACTICE

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

A note informs you of special circumstances.

A caution indicatess the possibility of equipment damage.

A warning indicates the possibility of personal injury.

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A. PRODUCT OVERVIEW

1. Description and Features

1.1 The PairGain® PG-Flex™ FRE-765 List 5*x* RemoteTerminal (RT) Enclosures (Figures 1 and 2) provide convenient mounting of one Line Unit and up to four Channel Units, supporting up to 32 channels. The enclosures also provide termination points for subscriber circuits, auxiliary power pairs, and metallic bypass pair. AMP Quiet Front™ terminations, with internal gas tube protectors, are provided on the backplane for HDSL and Bypass connections. Optionally, you can add AMP Quiet Front terminations for auxiliary power pairs when PG-Flex is used with a PG-Flex doubler. The enclosure can be pole or wall-mounted and is environmentally sealed for outside plant installations.

Use the List 5*x* RT Enclosures only with the FCS-718 List 2 (or higher) or the FCS-719 List 2 (or higher) COT Shelves.

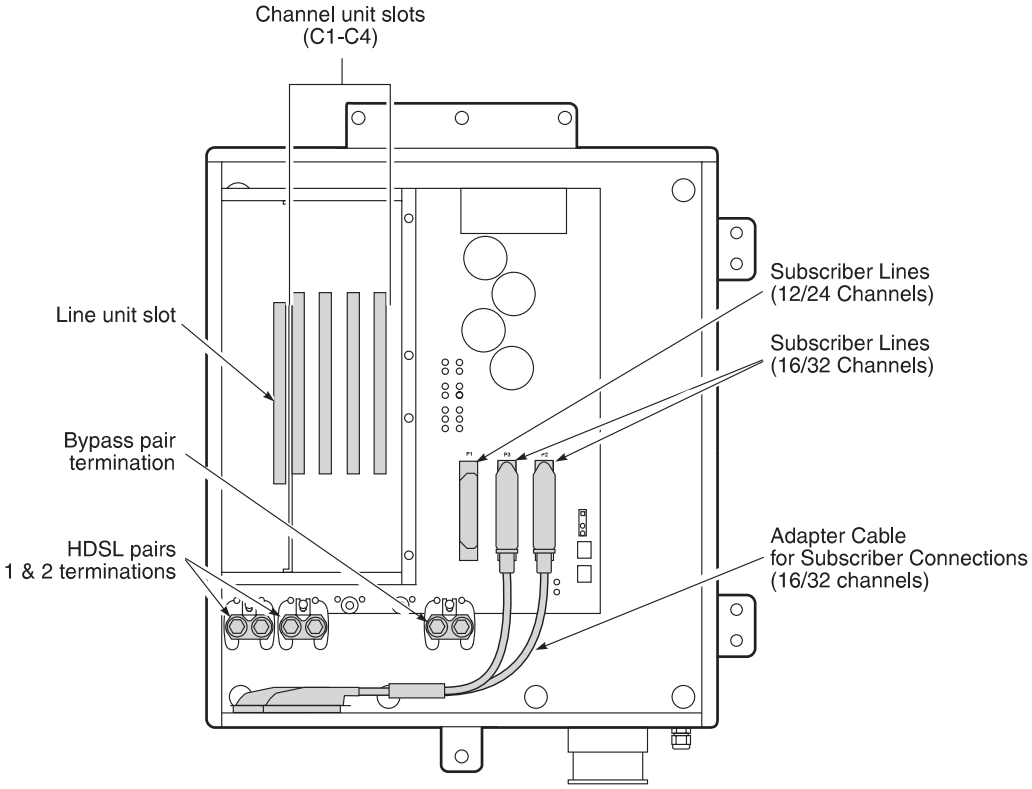

Figure 1. *FRE-765 List 5 RT Enclosure (Inside View)*

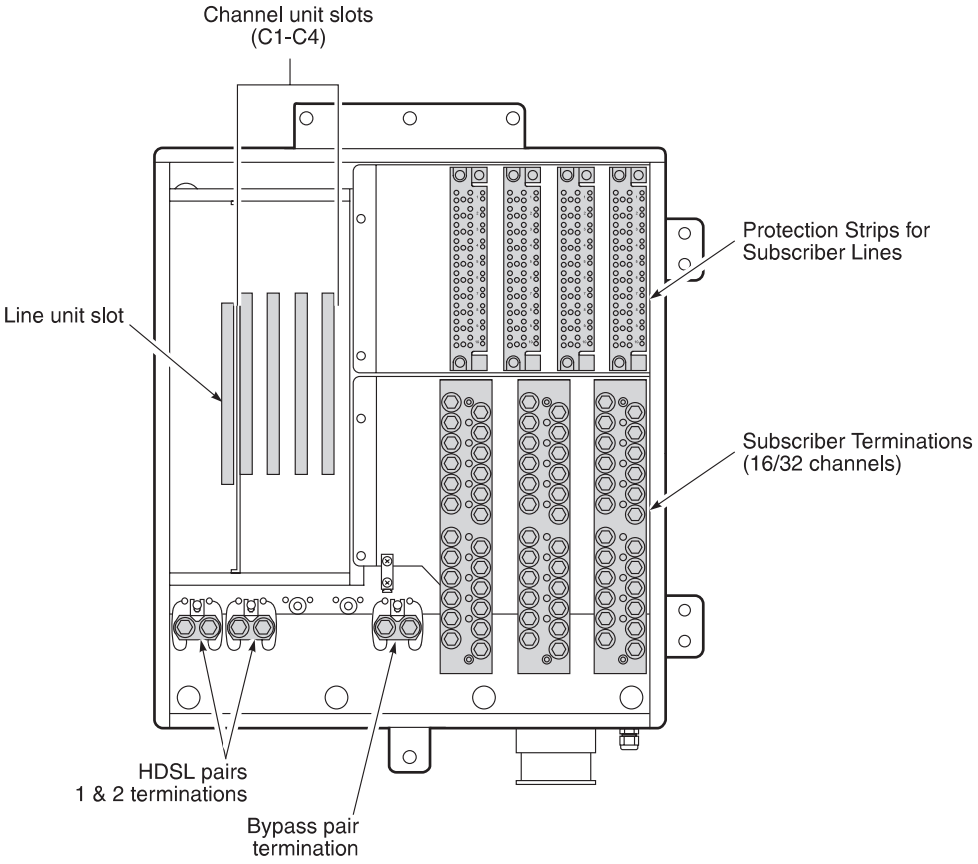

Figure 2. *FRE-765 List 5A RT Enclosure (Inside View)*

1.2 Features of the FRE-765 RT Enclosure List 5*x* include:

- pole or wall mounting
- line power from Central Office Terminal (COT)
- AMP Quiet Front terminations for HDSL inputs, metallic bypass pair, and subscriber connections (List 5A only)
- AMP Quiet Front terminations can be added for auxiliary power pairs when PG-Flex is used with a doubler
- 5-pin protector strips and AMP Quiet Front terminations for subscriber connections (List 5A only)
- ¾-, 1-, 1½-, 2-inch cable entrance conduct knockouts with rubber grommet
- hinged cover over electronics inside the RT Enclosure

See Table 1 to identify which features are available with each RT Enclosure List 5*x* model.

Table 1. *Features of FRE-765 5x RT Enclosures*

		List 5 (Figure 1)	List 5A (Figure 2)
System	16 Channel	●	●
	32 Channel	●	●
Subscriber Terminations	25-pr Amphenol (male)	●	
	AMP Insulation Displacement		●
Subscriber Protection	5 pin sockets (short housing)		●
HDSL Terminations	AMP Insulation Displacement	●	●

2. Specifications

Environmental

Operating Temperature .....-40° F to +150° F (-40° C to +65° C)

Operating Humidity .....5% to 95% (non-condensing)

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

Physical

Dimensions

Height: .....19.25 in. (48.9 cm)

Width: .....16.50 in. (41.9 cm)

Depth: .....06.44 in. (16.4 cm)

Weight:

List 5: .....24.4 lb (11.1 kg)

List 5A: .....35.7 lb (16.2 kg)

B. FUNCTIONAL DESCRIPTION

3. Operational Capabilities

3.1 The FRE-765 List 5*x* RT Enclosure requires the following plug-in units:

- one RT Line Unit which is line powered via the HDSL pairs that connect the RT to the PG-Flex COT installed in a COT Shelf.
- one Channel Unit, minimum, with a maximum installation of four Channel Units, supporting up to 32 channels.

3.2 Table 2 shows how circuit assignments are configured in the FRE-765 with the following deployment rules:

- For channel units providing four (4) circuits, Ckt 1 through Ckt 4 are used for Tip and Ring terminations.
- For channel units providing eight (8) circuits, Ckt 1 through Ckt 8 are used for Tip and Ring terminations.
- For a 32-channel system, you can provision a maximum of 32 circuits.

Each PG-Flex channel unit provides four (4) or eight (8) circuits. Table 3 shows how the channels are assigned, dependent on the type of service provided, such as:

- Plain Old Telephone Service (POTS)
- Integrated Services Digital Network (ISDN)
- Digital Data System (DDS).

Table 2. *FRE-765 Circuit Assignments*

Line Unit	Channel Unit 1	Channel Unit 2	Channel Unit 3	Channel Unit 4
Refer	Ckt 1	Ckt 1	Ckt 1	Ckt 1
to	Ckt 2	Ckt 2	Ckt 2	Ckt 2
Tables 8, 9, and 10	Ckt 3	Ckt 3	Ckt 3	Ckt 3
for	Ckt 4	Ckt 4	Ckt 4	Ckt 4
Line	Ckt 5	Ckt 5	Ckt 5	Ckt 5
Unit	Ckt 6	Ckt 6	Ckt 6	Ckt 6
Terminations	Ckt 7	Ckt 7	Ckt 7	Ckt 7
	Ckt 8	Ckt 8	Ckt 8	Ckt 8

Table 3. *Channel Unit Circuit Utilization*

	Channel Unit Service Configurations			
Channel Unit	**4-Channel POTS**	**8-Channel POTS**	**4-Channel ISDN**	**4-Channel DDS**
T/R 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1 Tx
T/R 2	Ckt 2	Ckt 2	Ckt 2	Ckt 1 Rcv
T/R 3	Ckt 3	Ckt 3	Ckt 3	Ckt 2 Tx
T/R 4	Ckt 4	Ckt 4	Ckt 4	Ckt 2 Rcv
T/R 5	—	Ckt 5	—	Ckt 3 Tx
T/R 6	—	Ckt 6	—	Ckt 3 Rcv
T/R 7	—	Ckt 7	—	Ckt 4 Tx
T/R 8	—	Ckt 8	—	Ckt 4 Rcv

4. Backplane Connections

4.1 Table 4 lists the FRE-765 List 5*x* backplane connectors and where each connector is described in this practice.

Table 4. *FRE-765 List 5x Backplane Connectors*

List	Connector or Fuse	Go to Table(s)	On Page(s)
5	Subscriber Connectors (16/32)	5 and 6	5 and 6
5A	Subscriber Connectors (16/32)	7	7 and 8
All	Test and Configuration Line-Unit Terminations	8	8
All	HDSL, Metallic Bypass, and Auxiliary Power Line-Unit Terminations	9	9
All	Power and Ground Line Unit Terminations	10	9
All	Fuse	11	9

Table 5. *List 5 Subscriber Cable J3 on Connector P3 (16/32 channel)*

		Cable J3		Connector P3	
Channel Unit	**Circuit**	**Tip**	**Ring**	**Tip**	**Ring**
1	1	WH/BL	BL/WH	26	1
	2	WH/OR	OR/WH	27	2
	3	WH/GN	GN/WH	28	3
	4	WH/BN	BN/WH	29	4
	5	WH/SL	SL/WH	30	5
	6	RD/BL	BL/RD	31	6
	7	RD/OR	OR/RD	32	7
	8	RD/GN	GN/RD	33	8
2	1	RD/BN	BN/RD	34	9
	2	RD/SL	SL/RD	35	10
	3	BK/BL	BL/BK	36	11
	4	BK/OR	OR/BK	37	12
	5	BK/GN	GN/BK	38	13
	6	BK/BN	BN/BK	39	14
	7	BK/SL	SL/BK	40	15
	8	YL/BL	BL/YL	41	16

Shaded terminations are only used with the 8 channel POTS or 4 channel DDS units.

Table 6. *List 5 Subscriber Cable J2 on Connector P2 (16/32 channels)*

		Cable J2		Connector P2	
Channel Unit	**Circuit**	**Tip**	**Ring**	**Tip**	**Ring**
3	1	WH/BL	BL/WH	26	1
	2	WH/OR	OR/WH	27	2
	3	WH/GN	GN/WH	28	3
	4	WH/BN	BN/WH	29	4
	5	WH/SL	SL/WH	30	5
	6	RD/BL	BL/RD	31	6
	7	RD/OR	OR/RD	32	7
	8	RD/GN	GN/RD	33	8
4	1	RD/BN	BN/RD	34	9
	2	RD/SL	SL/RD	35	10
	3	BK/BL	BL/BK	36	11
	4	BK/OR	OR/BK	37	12
	5	BK/GN	GN/BK	38	13
	6	BK/BN	BN/BK	39	14
	7	BK/SL	SL/BK	40	15
	8	YL/BL	BL/YL	41	16

Shaded terminations are only used with the 8 channel POTS or 4 channel DDS units.

Table 7. *List 5A Subscriber Terminations*

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

(continued on next page)

Table 7. *List 5A Subscriber Terminations (continued)*

Channel Unit	Circuit	Subscriber		Protector	
		Connector	Pair	Strip	Socket
4	1	TB3	1	PB3	5
	2	TB3	2	PB3	6
	3	TB3	3	PB3	7
	4	TB3	4	PB3	8
	5	TB3	5	PB3	9
	6	TB3	6	PB3	10
	7	TB3	7	PB4	1
	8	TB3	8	PB4	2

For the FRE-765, List 5A RT Enclosure the cables on the rear of the protector/termination module are installed in connectors P3 and P2 on the FRE-765 backplane.

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

Table 8. *Test and Configuration Line Unit Terminations*

Connector	Type	Function
ID_0 GND	.045 in. Wire-wrap	(No Connection - Future)
ID_1 GND	.045 in. Wire-wrap	(No Connection - Future)
ID_2 GND	.045 in. Wire-wrap	(No Connection - Future)
TEST_IN_TIP TEST_IN_RING	.045 in. Wire-wrap	(No Connection - Future)
TEST_OUT_TIP TEST_OUT_RING	.045 in. Wire-wrap	(No Connection - Future)
SSC1_A SSC1_B	.045 in. Wire-wrap	(No Connection - Future)
SSC2_A SSC2_B	.045 in. Wire-wrap	(No Connection - Future)

Table 9. *HDSL, Metallic Bypass, and Auxiliary Power Line Unit Termination*

Backplane Connector	6 Pair Cable Stub (Lists 4D, 4E)	Type	Function
HDSL_1_T HDSL_1_R	WH/BL BL/WH	AMP Quiet Front	Tip and Ring terminations for HDSL Pair #1 from the COT. -130 Vdc is simplexed on this line for powering the RT.
HDSL_2_T HDSL_2_R	WH/OR OR/WH	AMP Quiet Front	Tip and Ring terminations for HDSL Pair #2 from the COT. +130 Vdc is simplexed on this line for powering the RT.
BYPASS_T BYPASS_R	WH/GN GN/WH	AMP Quiet Front	Tip and Ring terminations for the metallic bypass pair to the COT. (Note: Do not connect metallic bypass pairs between PG-Flex systems or between other DLC systems.)
PWR_1_T PWR_1_R	WH/BN BN/WH	AMP Quiet Front	Termination for auxiliary power pairs when using a PG-Flex doubler unit. Note that these connectors must be ordered separately (PN 150-1399-25).
PWR_2_T PWR_2_R	WH/SL SL/WH	AMP Quiet Front	Termination for auxiliary power pairs when using a PG-Flex doubler unit. Note that these connectors must be ordered separately (PN 150-1399-25).
(Spare) (Spare)	RB/BL BL/WH	— —	(No connection. For future use.) (No connection. For future use.)

Table 10. *Power and Ground Line Unit Terminations*

Connector	Type	Function
-48V	Screw	(No Connection - Future)
GND	Screw	(No Connection - Future)
CHASSIS GND*	Screw	Chassis Ground

***** Where The FRE-765 is shipped with the “CHASSIS GND” wire-wrap post connected to the adjacent “GND” wire-wrap post on the RT Backplane.

Table 11*. Fuse*

Fuse	Type	Function
F1	GMT 2A	(Not required - Future)

C. INSTALLATION AND TEST

5. Unpacking

5.1 Upon receipt of the equipment:

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 against the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact PairGain as described in Section 12.3. If you must store the equipment for a prolonged period, store the equipment in its original container.

6. Installation Requirements

6.1 Prior to installing the FRE-765, be aware of these installation requirements or conditions shown in Table 12.

Table 12. *Installation Requirements*

Requirement	Description
Environmental	The FRE-765 can operate in an outside plant environment. It can operate in a temperature range of -40°F to +150°F (-40°C to +65°C) and a humidity range of 5% to 95% (non-condensing).
Mounting	The FRE-765 has external mounting flanges with a clearance hole for a 3/8-inch bolt for pole or wall mounting. The customer must provide the appropriate mounting hardware. When mounting to a pole using the Pole Mounting Kit (PN 150-1397-00), ensure that the pole mounting bracket and FRE-765 are fully installed before installing cabling.
Power	The FRE-765 gets power from the HDSL lines connected to the COT shelf in the Central Office (CO). When a doubler is installed between the PG-Flex COT Shelf and RT enclosure, two additional power pairs are required from the COT shelf and RT enclosure.
HDSL Lines	Two HDSL pairs are terminated in the FRE-765.
Subscriber Lines	
List 5	Provides three 25-pair Amphenol connectors (male) for subscriber line terminations.
List 5A	Provides AMP Quiet Front insulation displacement connections for subscriber terminations.
Metallic Bypass Pair	The metallic bypass pair for subscriber line testing is terminated in the FRE-765. Do not connect the bypass pairs between PG-Flex systems or to other DLC systems.
Doubler	When using a doubler, add two AMP Quiet Front terminals to the FRE-765 to terminate the auxiliary power pairs from the COT. Order the Quiet Front kit (PN 150-1399-25) which contains two Quiet Front terminations, four jumpers, and a tool for inserting the jumpers into the insulation displacement barrels.
Cable Entry	Knockouts are located on the bottom of the FRE-765 and accept ¾-, 1-, 1½-, and 2-inch fittings. Install grommet (provided with FRE-765), conduit, or cable strain relief fittings prior to wiring the FRE-765.
Protectors	Install 5-pin protectors (short housing) for each working subscriber circuit in the FRE-765 List 5A. These may be carbon, gas tube, or solid state protectors, depending on local practice.

7. Mounting

7.1 The FRE-765 mounts on a pole or a wall. Follow local practices to ensure a secure mounting. Mount the FRE-765 for easy access to the cable entry points on the bottom of the enclosure. Provide ample room to open the door completely.

7.2 For pole mounting the FRE-765, use the Pole Mounting Kit PN 150-1397-00. Follow the instructions that are included to install the pole mounting bracket. Then, mount the FRE-765 to the bracket. Do not install any cabling until the FRE-765 is securely mounted.

7.3 When required, install the grommet into the base of the FRE-765 (Figure 3) prior to performing any wiring.

1 Select only one concentric knockout hole on the FRE-765.

2 Remove the largest knockout so that the entire hole is open.

3 Install the grommet from the outside of the FRE-765. (Hint - Hold it at an angle to the hole and roll it into position.)

4 Ensure the lip of the grommet rests on the bottom of the FRE-765 around the knockout hole.

5 Use an appropriate tool to open the required hole(s) in the bottom of the grommet.

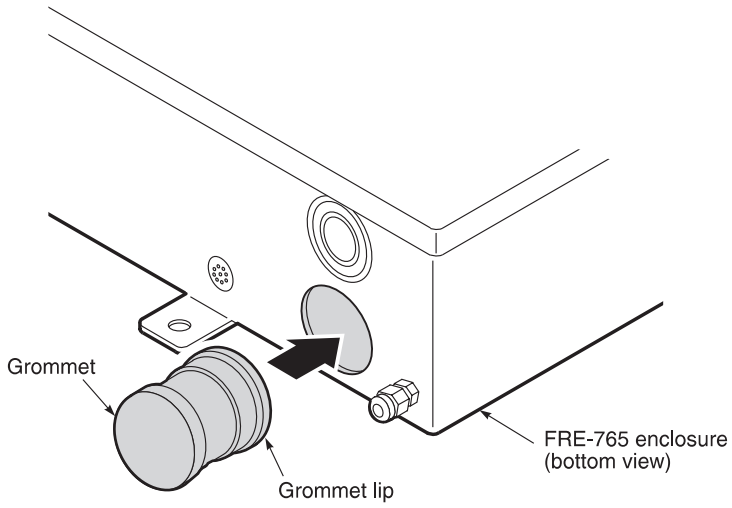

Figure 3. *Installing the Grommet*

Table 13 shows the wire gauges that can be installed through the holes in the grommet.

Table 13. *Grommet Hole Diameters*

For this grommet hole size	Use this cable
.410 to .765 in. diameter (two) *	• 24 or 26 AWG, 25- or 50-pair Primary Interexchange Carrier (PIC) (filled or non-filled) • 22 AWG, 25-pair PIC (filled or non-filled) • 22, 24, or 26 AWG , 6- or 11-pair PIC (filled or non-filled)
.240 to .275 in. diameter (one)	ground wire †
.155 to .240 in. diameter (one)	ground wire †

* Recommend using one hole for both the HDSL and the bypass pairs (i.e., 6-pair cable) and the second hole for POTS (subscriber) lines.
† Dependent upon gauge of wire used.

8. Wiring

8.1 Sections 8.2 through 8.7 describe how to connect the FRE-765 cables. Section 8.8 verifies the installation.

8.2 **Chassis Ground Wiring.** Install the chassis ground (Figure 4):

Use 6 AWG or larger wire to ensure a good ground connection to the FRE-765.

1. Route the chassis ground wire through the small hole in the strain relief on the bottom of the enclosure (Figure 4).
2. Connect one end of the chassis ground wire to grounding lug CHASSIS GND.
3. Connect the other end of the chassis ground wire to a suitable ground termination point (ground rod or cold water pipe).
4. Tighten the strain relief around the wire or use a cable tie to secure to the bracket near the cable entrance.

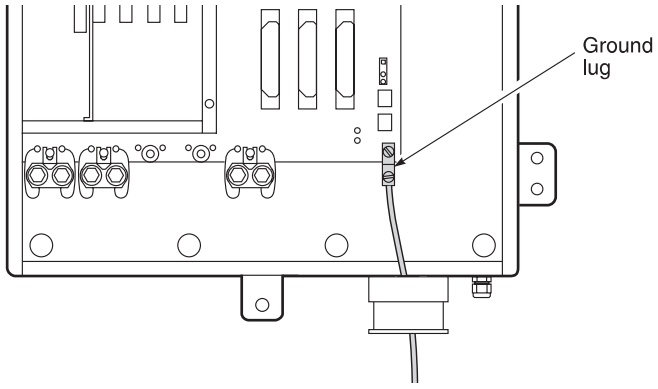

Figure 4. *Installing the Ground*

8.3 HDSL Lines. Install the HDSL lines (Figure 5):

1 Route the HDSL pairs through the strain relief on the bottom of the enclosure.

2 Terminate HDSL Pair #1 on the Quiet-Front terminals HDSL_1_T (Tip) and HDSL_1_R (Ring).

3 Terminate HDSL Pair #2 on the Quiet-Front terminals HDSL_2_T (Tip) and HDSL_2_R (Ring).

4 Use a cable tie to secure to the bracket near the cable entrance.

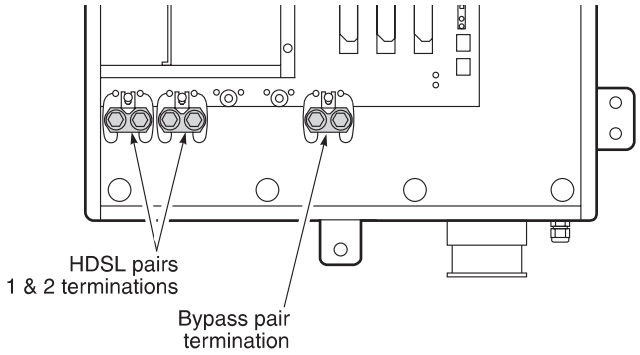

Figure 5. *Installing HDSL Lines and Bypass Pair*

8.4 Bypass Pair. Install the Bypass Pair (Figure 5):

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

1 Route the bypass pair through the strain relief on the bottom of the enclosure.

2 Terminate the bypass pair on the Quiet Front terminals BYPASS_T and BYPASS_R.

3 Use a cable tie to secure to the bracket near the cable entrance.

8.5 Subscriber Lines. To install the subscriber lines, do one of the following:

Use the cable adapter (PN 120-1111-02) installed on the RT Enclosure to ensure the subscriber terminations match the information shown in Tables 5 through 9.

- For List 5 FRE-765 enclosure:

  1 Route the subscriber line cables through the strain relief on the bottom of the enclosure and connect to P2 and P3 connectors.

  2 Terminate the subscriber line cables per Tables 4 and 5.

  3 Secure with a cable tie to the bracket near the cable entrance.

- For List 5A FRE-765 enclosure:

  1 Route the subscriber line cables through the desired knockout on the bottom of the enclosure.

  2 Terminate the subscriber line cables per Table 6.

  3 Use a cable tie to secure to the bracket near the cable entrance.

8.6 Protector Plugs. For the FRE-765 List 5A, install five-pin protector plugs into the protector strips for each subscriber line installed (Figure 6). See Table 7 for protector socket locations.

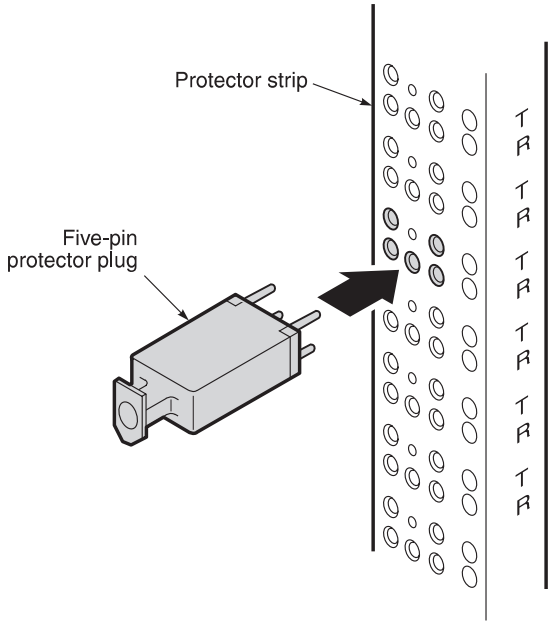

Figure 6. *Installing Five-Pin Protector Plugs*

8.7 Auxiliary Power Pairs. When PG-Flex is used with a doubler, install the two AMP Quiet Front terminations (PN 150-1399-25) and wire for the doubler. The installation kit provides white and blue jumper wires. Install the two AMP Quiet Front terminations into the FRE-765 (Figure 7) enclosure:

1 Connect a white jumper wire to PWR_1_T (J10) and a blue jumper wire to PWR_1_R (J11) barrel connectors.

2 Connect a white jumper wire to PWR_2_T (J12) and a blue jumper wire to PWR_2_R (J13) barrel connectors.

3 Back out the phillips-head screw for each connector and slide the bracket on the AMP Quiet Front terminator under it.

4 Tighten the phillips-head screw.

5 Insert and tighten the white and blue jumpers into the AMP Quiet Front terminations.

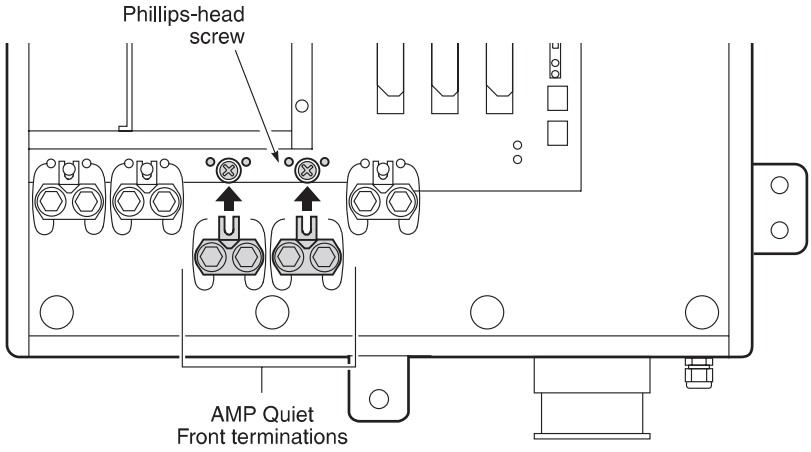

Figure 7. *Installing Doubler Termination Points*

8.8 **Cabling Verification.** Verify the following connections.

Perform the following verifications before inserting any cards in the COT shelf.

1 Visually ensure the ground wire is tightly secured to the grounding lug inside the FRE-765 and at the ground termination point.

2 Visually verify the HDSL lines are terminated properly and with the correct orientation. If the HDSL lines are not connected properly, the COT will not communicate with the FRE-765.

3 Verify that the HDSL lines are "dry."

a Verify 0 Vdc between the Tip and Ring, Tip and ground, and Ring and ground of each of the HDSL pairs terminated at the FRE-765.

b Verify a value greater than 100 kohms resistance between Tip and ground and Ring and ground for each of the HDSL pairs terminated at the FRE-765.

9. Turn-Up and Testing

9.1 Refer to the COT Line Unit Technical Practice or RT Line Unit Technical Practice for complete COT and RT turn-up and testing procedures.

10. Troubleshooting

10.1 Refer to the COT Line Unit Technical Practice or RT Line Unit Technical Practice for complete COT and RT troubleshooting procedures

D. TECHNICAL SUPPORT

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. WARRANTY AND CERTIFICATION

12. Warranty

12.1 PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 60 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.

12.2 Do not try to repair the unit. 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 voids the warranty.

12.3 If a unit needs repair:

1 Call PairGain for a Return Material Authorization (RMA) number at (800) 638-0031.

2 Return the defective unit, freight prepaid, along with a brief description of the problem, to:

PairGain Technologies, Inc.
14402 Franklin Avenue
Tustin, CA 92780-7013
ATTN: Repair and Return Dept.

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

13. Certification

13.1 **FCC Compliance.** The FRE-765 List 5*x* RT Enclosure has been tested and found to comply 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.

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

- cabling
- proper connections
- grounding

13.3 Follow the provisions of the current edition of the National Electrical Code for wiring external to the product(s).

F. ABBREVIATIONS AND GLOSSARY

14. Abbreviations and Glossary

CO	Central Office
COT	Central Office Terminal
DDS	Digital Data System
DLC	Digital Loop Carrier
HDSL	High bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
PIC	Primary Interexchange Carrier
POTS	Plain Old Telephone Service
RT	Remote Terminal

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ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

PAIRGAIN
THE COPPEROPTICS COMPANY