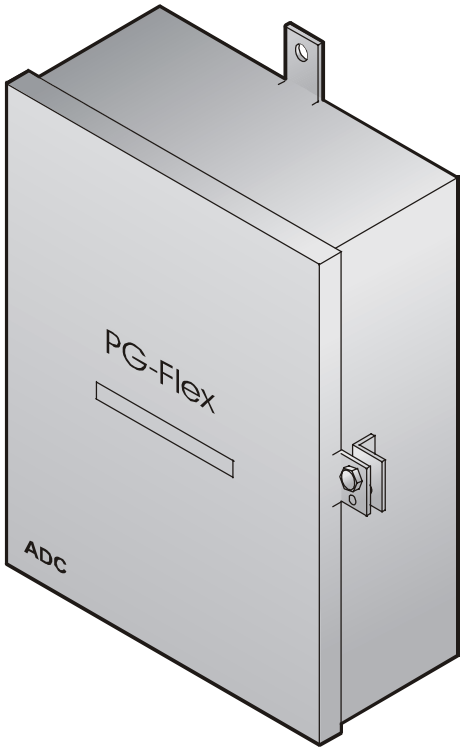
PG-FLEX

TECHNICAL PRACTICE



REMOTE TERMINAL ENCLOSURE

Model	List	CLEI Code
FRE-765	4A	VAMRBN0L~~

Revision History of This Practice

Revision	Release Date	Revisions Made
01	July 26, 2001	Initial Release. This practice updates the connection types used on the FRE-765 List 4A enclosure and replaces 363-765-104-04 for the FRE-765 List 4A only.
02	January 10, 2002	Release to rebrand document to comply with ADC standards
03	January 6, 2003	Updated Product Support Information

USING THIS TECHNICAL PRACTICE

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

Notes contain information about special circumstances.

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

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OVERVIEW

DESCRIPTION AND FEATURES

The PG-Flex® FRE-765 List 4A Remote Terminal (RT) Enclosure, see Figure 1, "FRE-765 List 4A RT Enclosure (Interior View)," on page 1, provides convenient mounting of one RT Line Unit and up to three Channel Units, supporting up to 24 channels. The enclosure provides termination points for subscriber circuits, High bit-rate Digital Subscriber Line (HDSL), power, and metallic bypass pairs. For each doubler, two auxiliary power pairs must be provided between the Central Office Terminal (COT) shelf and the RT. The enclosure can be pole or wall mounted and is environmentally sealed for outside plant installations.

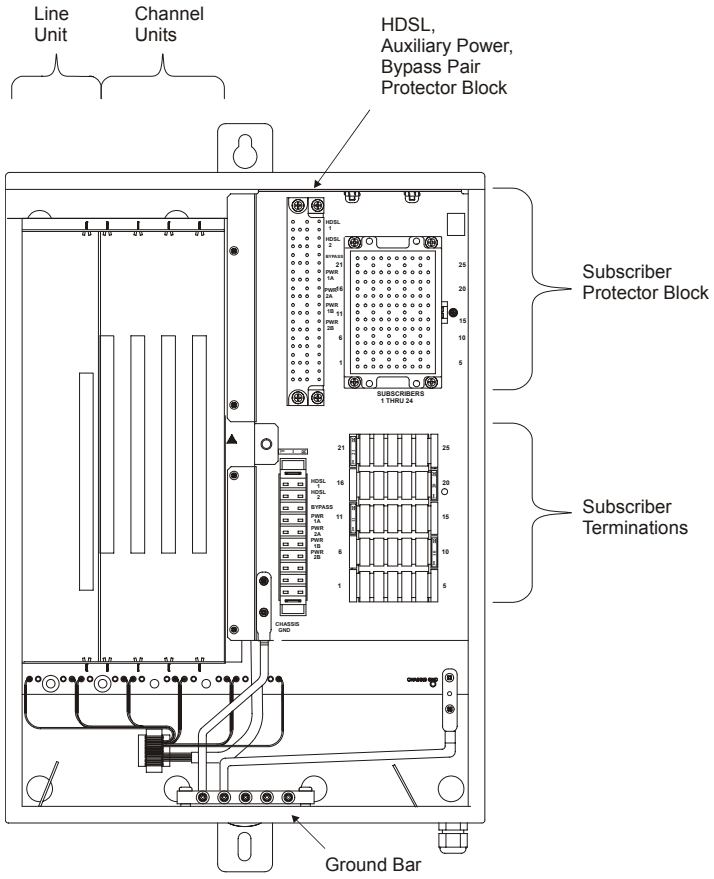

Figure 1. *FRE-765 List 4A RT Enclosure (Interior View)*

Features of the FRE-765 List 4A RT Enclosure include:

- pole or wall mounting
- line power from COT
- $^{3}/_{4}$-, 1-, $1^{1}/_{2}$-, 2-inch cable entrance conduit knockouts with rubber grommet (provided)
- hinged cover for electronics inside RT Enclosure
- Marconi® RLS type gel-filled terminations
- 5-pin sockets for circuit protection

PG-Flex HDSL, auxiliary power, and bypass pair circuits must be protected with 3-mil carbon blocks, or equivalent. Subscriber circuits must also be protected with 3-mil carbon blocks, or equivalent, when these circuits are exposed to the outside plant.

Use the List 4A RT Enclosures only with the FCS-718 List 2 or higher, or the FCS-719 List 2 or higher COT Shelves.

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)

Dimensions

Weight:	26.3 lb. (11.9 kg.)
Height:	19.25 in. (48.9 cm.)
Width:	14.25 in. (36.2 cm.)
Depth:	5.93 in. (15.1 cm.)

FUNCTIONAL DESCRIPTION

Operational Capabilities

The FRE-765 List 4A 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 line units installed in a COT Shelf.
- one Channel Unit, minimum, with a maximum installation of three Channel Units, supporting up to 24 channels.

Table 1, "FRE-765 Circuit Assignments," on page 4 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 24-channel system, you can provision a maximum of 24 POTS circuits or 8 ISDN circuits.

Each PG-Flex channel unit provides four (4) or eight (8) circuits. Table 2, "Channel Unit Circuit Utilization," on page 4 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)

Table 1. *FRE-765 Circuit Assignments*

Line Unit	Channel Unit 1	Channel Unit 2	Channel Unit 3	Channel Unit 4
Refer to Table 6, "Power and Ground Line Unit Terminations," on page 6, and Table 8, "HDSL, Metallic Bypass, and Auxiliary Power Line Unit Terminations," on page 10 for Line Unit Terminations from the Backplane	Ckt 1	Ckt 1	Ckt 1	
	Ckt 2	Ckt 2	Ckt 2	
	Ckt 3	Ckt 3	Ckt 3	
	Ckt 4	Ckt 4	Ckt 4	Not
	Ckt 5	Ckt 5	Ckt 5	Used
	Ckt 6	Ckt 6	Ckt 6	
	Ckt 7	Ckt 7	Ckt 7	
	Ckt 8	Ckt 8	Ckt 8	

Table 2. *Channel Unit Circuit Utilization*

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

Backplane Connections

Table 3, "FRE-765 List 4A Backplane Connectors," on page 5 lists the FRE-765 List 4A backplane connectors and where each connector is described in this practice.

Table 3. *FRE-765 List 4A Backplane Connectors*

Connector or Fuse	Go to
Subscriber terminations (24 channel systems)	Table 9, "Subscriber Termination," on page 13
P3 and P2 Connectors (reference only)	Table 4, "Connector P3," on page 5 and Table 5, "Connector P2 (b)," on page 6
HDSL, Metallic Bypass, and Auxiliary Power Line-Unit Terminations	Table 8, "HDSL, Metallic Bypass, and Auxiliary Power Line Unit Terminations," on page 10
Power and Ground Line-Unit Terminations	Table 6, "Power and Ground Line Unit Terminations," on page 6

Table 4. *Connector P3* †*

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

(*) Terminations in this table are used only with the 8 Channel POTS or 4 Channel ISDN Unit.

(†) Shaded terminations used only with the 8 Channel POTS Units.

Table 5. *Connector P2 * (b)*

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

(*) Shaded terminations used only with the 8 Channel POTS or 4 Channel ISDN Units.

(b) Shaded terminations used only with the 8 Channel POTS Units.

Table 6. *Power and Ground Line Unit Terminations*

Connector	Type	Function
-48V	Screw	No connection—reserved for future use.
GND	Screw	No connection—reserved for future use.
CHASSIS GND*	Screw	Chassis Ground

(*) The RT enclosure is shipped with the “CHASSIS GND” wire-wrap post connected to the adjacent “GND” wire-wrap post on the RT Backplane.

INSTALLATION AND TEST

Mounting

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.

For pole mounting the FRE-765, use the Pole Mounting kit, part number FMK 2397 List 1. 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.

When required, install the grommet into the base of the FRE-765 (see Figure 2, "Installing the Grommet," on page 7) prior to performing any wiring. Table 7, "Grommet Hole Diameters," on page 7 shows the wire gauges that you can install through the holes in the grommet):

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 that 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.

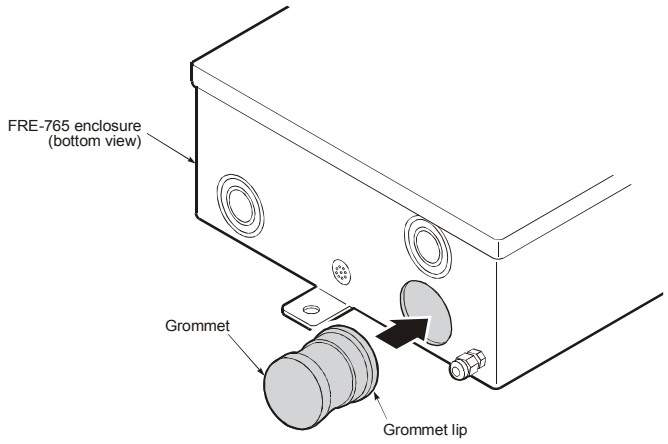

Figure 2. *Installing the Grommet*

Table 7. *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 using the second hole for POTS (subscriber) lines.

(†) Dependent upon gauge of wire used.

Chassis Ground Wiring

To install the chassis ground wire, follow the instructions below and refer to Figure 3, "Installing the Ground Wire," on page 8.

Use 6 AWG 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.
2. Connect one end of the chassis ground wire to the grounding bar.
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.

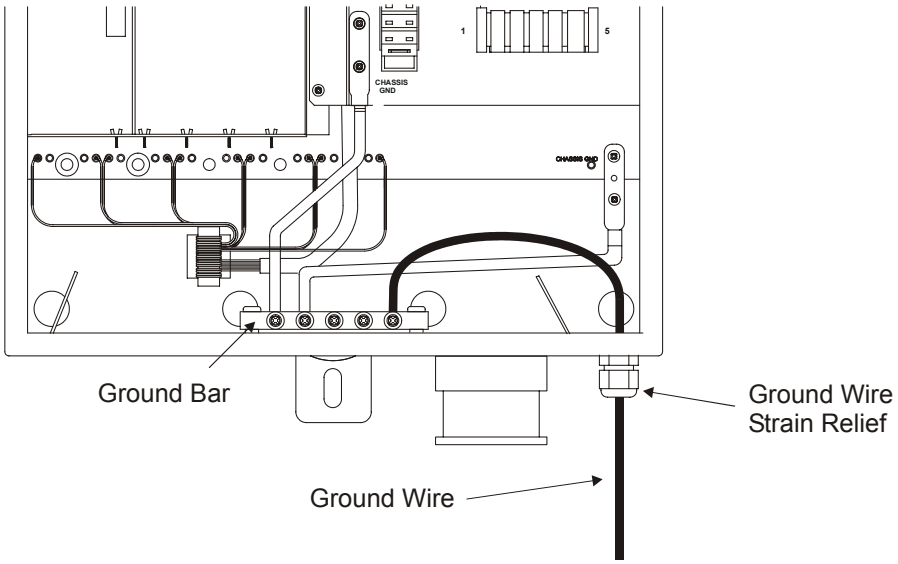

Figure 3. *Installing the Ground Wire*

HDSL, Auxiliary Power, Bypass Pair Wiring

When the system does not require any doublers, only two pair for HDSL transport are required between the COT or Field Shelf and the FRE-765 RT Enclosure, see Figure 4, "COT or Field Shelf to FRE-765 RT Enclosure, No Doublers," on page 9.

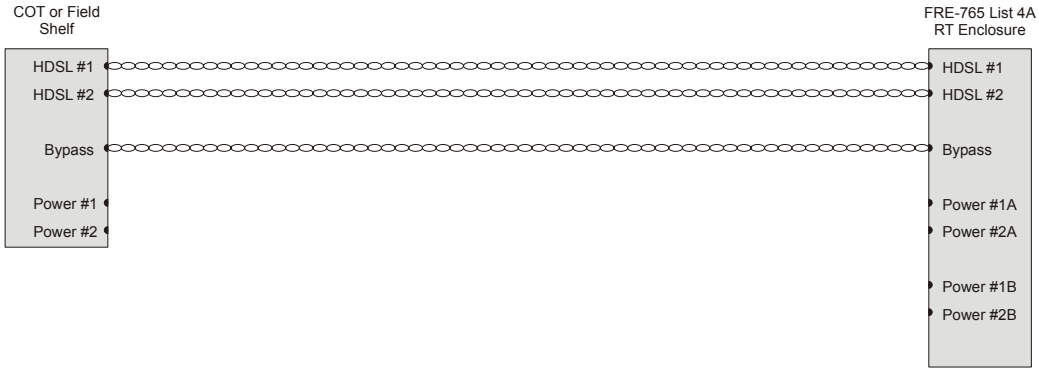

Figure 4. *COT or Field Shelf to FRE-765 RT Enclosure, No Doublers*

With one doubler, two HDSL pairs plus two power pairs are required between the COT or Field Shelf and the FRE-765 RT Enclosure. These power pairs do not pass through the doubler, see Figure 5, "COT or Field Shelf to FRE-765 RT Enclosure, 1 Doubler," on page 9.

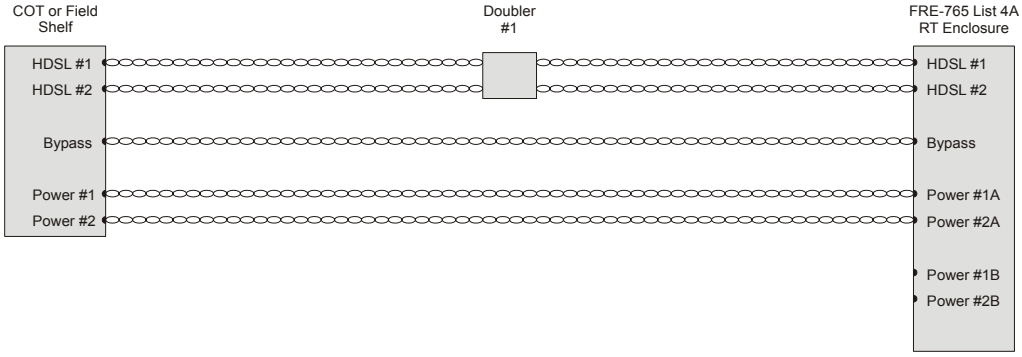

Figure 5. *COT or Field Shelf to FRE-765 RT Enclosure, 1 Doubler*

With two doublers, two HDSL pairs plus four power pairs are required between the COT or Field Shelf and the FRE-765 RT Enclosure. The third and fourth power pairs are wired to the same terminations as the first and second power pairs (respectively) on the COT or Field Shelf and the FRE-765 RT Enclosure. These power pairs do not pass through the doublers, Figure 6, "COT or Field Shelf to FRE-765 RT Enclosure, 2 Doublers," on page 9.

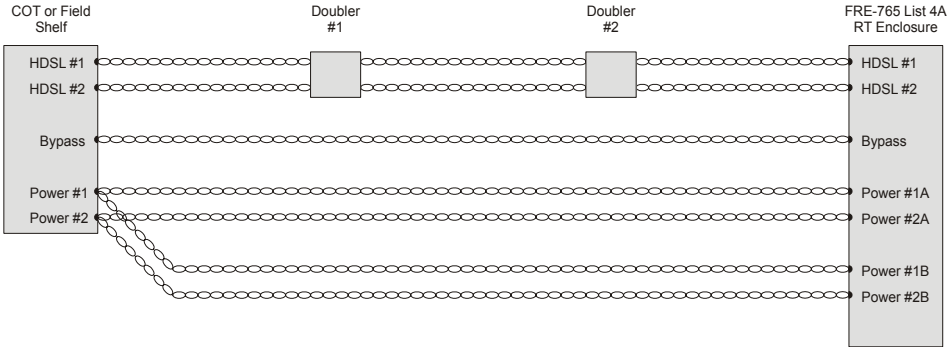

Figure 6. *COT or Field Shelf to FRE-765 RT Enclosure, 2 Doublers*

HDSL Pairs

Use the following instructions to connect the HDSL pairs and see Figure 7, "Installing HDSL Lines," on page 10.

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

2 Terminate HDSL Pair #1 on the HDSL 1 terminations.

3 Terminate HDSL Pair #2 on the HDSL 2 terminations.

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

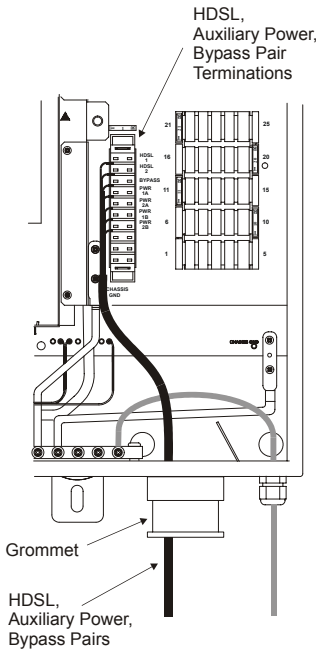

Figure 7. *Installing HDSL Lines*

Table 8. *HDSL, Metallic Bypass, and Auxiliary Power Line Unit Terminations*

Backplane Connector	Function
HDSL1	Tip and Ring terminations for HDSL Pair #1 from the COT. -130 Vdc is simplexed on this line for powering the RT.
HDSL2	Tip and Ring terminations for HDSL Pair #2 from the COT. +130 Vdc is simplexed on this line for powering the RT.
BYPASS	Tip and Ring terminations for the metallic bypass pair to the COT.
PWR 1A	Termination for auxiliary power pairs when using a doubler unit. Note: This line is simplexed with +130 Vdc for powering the RT.
PWR 2A	Termination for auxiliary power pairs when using a PG-Flex doubler unit. Note: This line is simplexed with -130Vdc for powering the RT.
PWR 1B	Termination for auxiliary power pairs when using two doubler units. This line is simplexed with +130Vdc for powering the RT.
PWR 2B	Termination for auxiliary power pairs when using two doubler units. This line is simplexed with -130Vdc for powering the RT.

Bypass Pair

Use the following instructions to install the Bypass Pair and view Figure 7, “Installing HDSL Lines,” on page 10.

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

2 Terminate the bypass pair on the BYPASS termination.

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

Auxiliary Power Pairs

Follow these instructions when PG-Flex is used with a doubler and see Figure 7, “Installing HDSL Lines,” on page 10.

1 Route the auxiliary power pairs through the strain relief on the bottom of the enclosure. Use a cable tie to secure to the bracket near the cable entrance.

2 Terminate the power pairs on the Auxiliary Power terminations per Table 8, “HDSL, Metallic Bypass, and Auxiliary Power Line Unit Terminations,” on page 10.

Subscriber Line Wiring

Use the following instructions to install the subscriber lines for the FRE-765 enclosure and see Figure 8, "Installing Subscriber Lines," on page 12 .

1 Route the subscriber line cables through the bottom of the enclosure.

2 Terminate the cables per Table 9, "Subscriber Termination," on page 13.

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

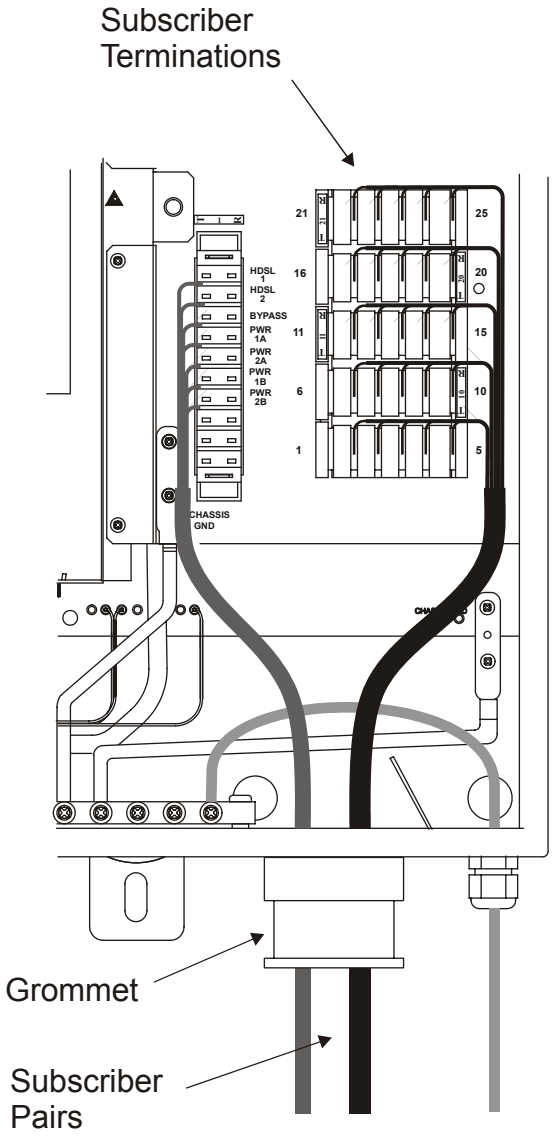

Figure 8. *Installing Subscriber Lines*

Table 9. *Subscriber Termination[*] [†]*

Channel Unit		Subscriber Connector
Slot	**Circuit**	
1	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
2	1	9
	2	10
	3	11
	4	12
	5	13
	6	14
	7	15
	8	16
3	1	17
	2	18
	3	19
	4	20
	5	21
	6	22
	7	23
	8	24

(*) The cable on the rear of the termination module is installed in connector P1 on the RT enclosure backplane.

(†) Shaded terminations used only with the 8 Channel POTS Units.

Cabling Verification

Verify the following connections:

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

1. Visually ensure that the ground wire is tightly secured to the grounding lug inside the FRE-765 and at the ground termination point.
2. Visually verify that 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 kΩ resistance between Tip and ground, and Ring and ground for each of the HDSL pairs terminated at the FRE-765.

Turn-Up and Testing

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

Troubleshooting

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

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 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 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
Ckt	Circuit
CO	Central Office
COT	Central Office Terminal
CU	Channel Unit
FCC	Federal Communications Commission
FRE	PG-Flex Remote Enclosure
GND	Ground
HDSL	High bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
POTS	Plain Old Telephone Service
RT	Remote Terminal

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