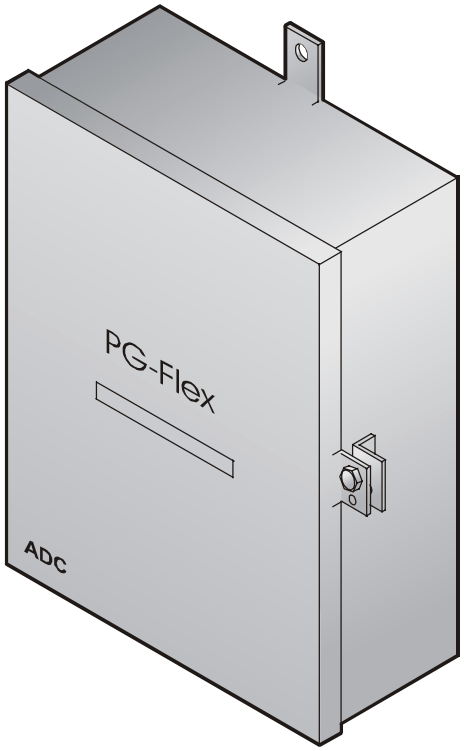
PG-FLEX

TECHNICAL PRACTICE



REMOTE TERMINAL ENCLOSURE

Model	List	CLEI Code
FRE-765	5A	N/A

Revision History of This Practice

Revision	Release Date	Revisions Made
01	June 2, 1997	Initial Release. Identifies List 5A RT Enclosures.
02	January 10, 2002	Release to rebrand document to comply with ADC standards. Remove references to List 5
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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PRODUCT OVERVIEW

Description and Features

The ADC® PG-Flex® FRE-765 List 5A RemoteTerminal (RT) Enclosure (see Figure 1) provides 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 5A RT Enclosures only with the FCS-718 List 2 (or higher) or the FCS-719 List 2 (or higher) COT Shelves.

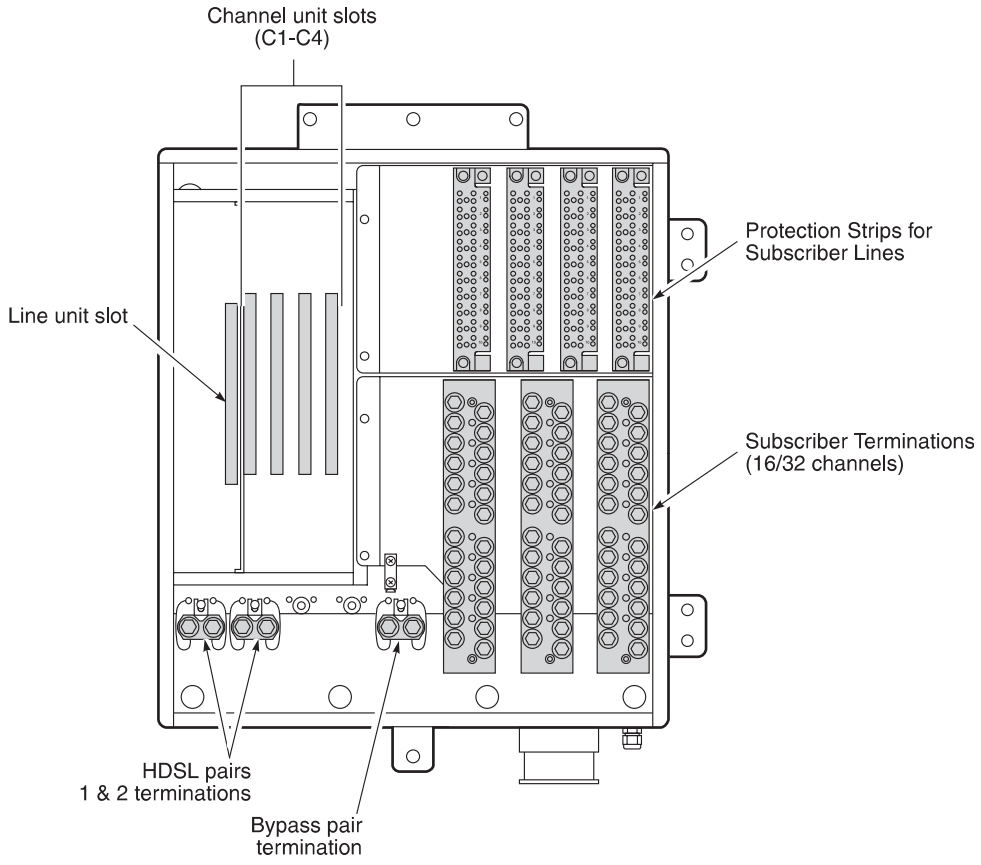

Figure 1. *FRE-765 List 5A RT Enclosure (Inside View)*

Features of the FRE-765 RT Enclosure List 5A 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
- 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
- ¾-, 1-, 1½-, 2-inch cable entrance conduct knockouts with rubber grommet
- hinged cover over electronics inside the RT Enclosure

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:..... 6.44 in. (16.4 cm.)

Weight:..... 35.7 lb. (16.2 kg.)

FUNCTIONAL DESCRIPTION

Operational Capabilities

The FRE-765 List 5A 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.

Table 1 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 2 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	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 2. *Channel Unit Circuit Utilization*

Channel Unit Service Configurations			
Channel Unit	**4-Channel POTS**	**8-Channel POTS**	**4-Channel ISDN**
T/R 1	Ckt 1	Ckt 1	Ckt 1
T/R 2	Ckt 2	Ckt 2	Ckt 2
T/R 3	Ckt 3	Ckt 3	Ckt 3
T/R 4	Ckt 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 lists the FRE-765 List 5A backplane connectors and where each connector is described in this practice.

Table 3. *FRE-765 List 5A Backplane Connectors*

Connector or Fuse	Go to Table(s)	On Page(s)
Subscriber Terminations	4	5
Test and Configuration Line-Unit Terminations	5	6
Power and Ground Line Unit Terminations	6	6
Fuse	7	6

Table 4. *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
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 P2 and P3 on the FRE-765 backplane.

Table 5. *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 6. *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 7. *Fuse*

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

INSTALLATION AND TEST

UNPACKING

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 ADC. 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 ADC as described in the Product Support section. If you must store the equipment for a prolonged period, store the equipment in its original container.

INSTALLATION Requirements

Prior to installing the FRE-765, be aware of these installation requirements or conditions shown in Table 8.

Table 8. *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	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.

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 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.

When required, install the grommet into the base of the FRE-765 (Figure 2) 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.

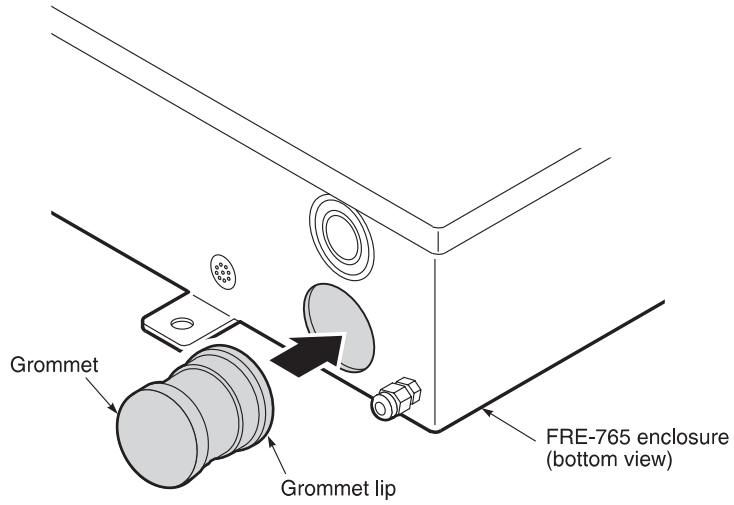

Figure 2. *Installing the Grommet*

Table 9 shows the wire gauges that can be installed through the holes in the grommet.

Table 9. *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.

WIRING

The sections below describe how to connect the FRE-765 cables. Refer to Cabling Verification section to verify the installation.

Chassis Ground Wiring

Install the chassis ground (Figure 3).

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 3).
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.

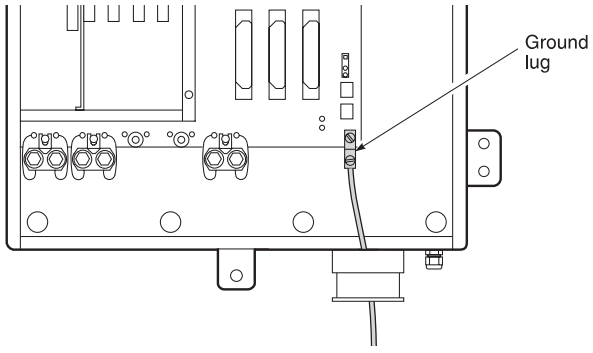

Figure 3. *Installing the Ground*

HDSL Lines

Install the HDSL lines (Figure 4).

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.

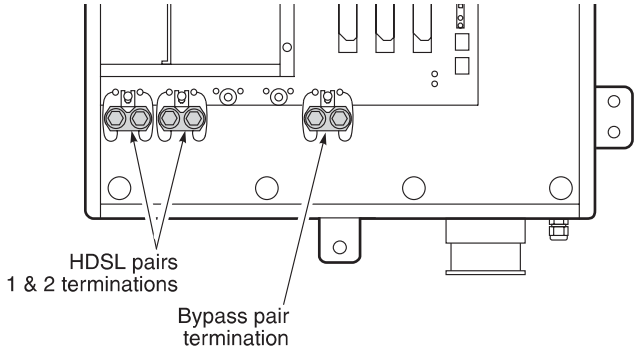

Figure 4. *Installing HDSL Lines and Bypass Pair*

Bypass Pair

Install the Bypass Pair (Figure 4).

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.

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 Table 4.

1. Route the subscriber line cables through the desired knockout on the bottom of the enclosure.
2. Terminate the subscriber line cables per Table 4.
3. Use a cable tie to secure to the bracket near the cable entrance.

Protector Plugs

For the FRE-765 List 5A, install five-pin protector plugs into the protector strips for each subscriber line installed (Figure 5). See Table 4 for protector socket locations.

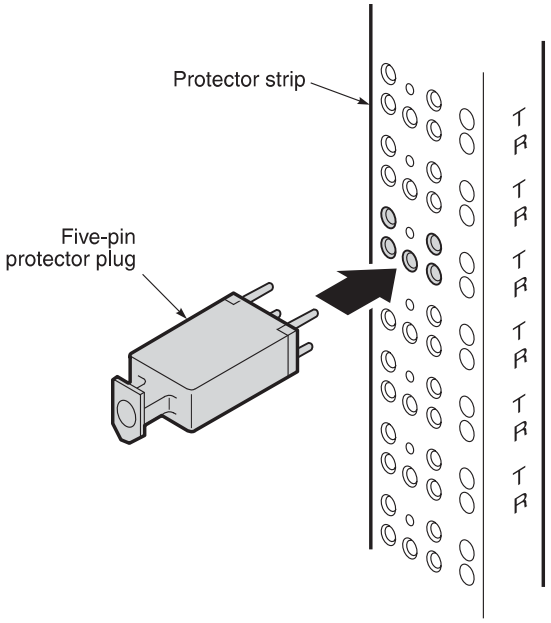

Figure 5. *Installing Five-Pin Protector Plugs*

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 6) 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.

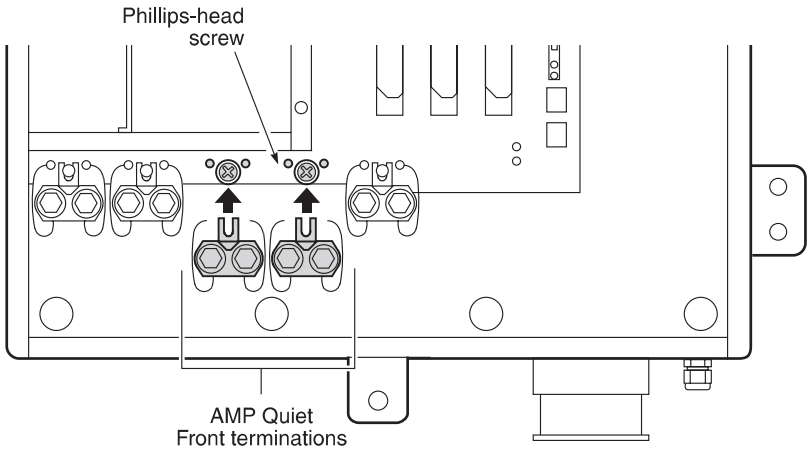

Figure 6. *Installing Doubler Termination Points*

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.

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

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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