

1. Purpose and Overview

This document is provided with each line powered RTU-4e unit as an installation aid. Installation instructions are included on the inside of the lid of the RTU. This supplement provides timely updated and/or additional information that may not yet be incorporated into the lid instructions.

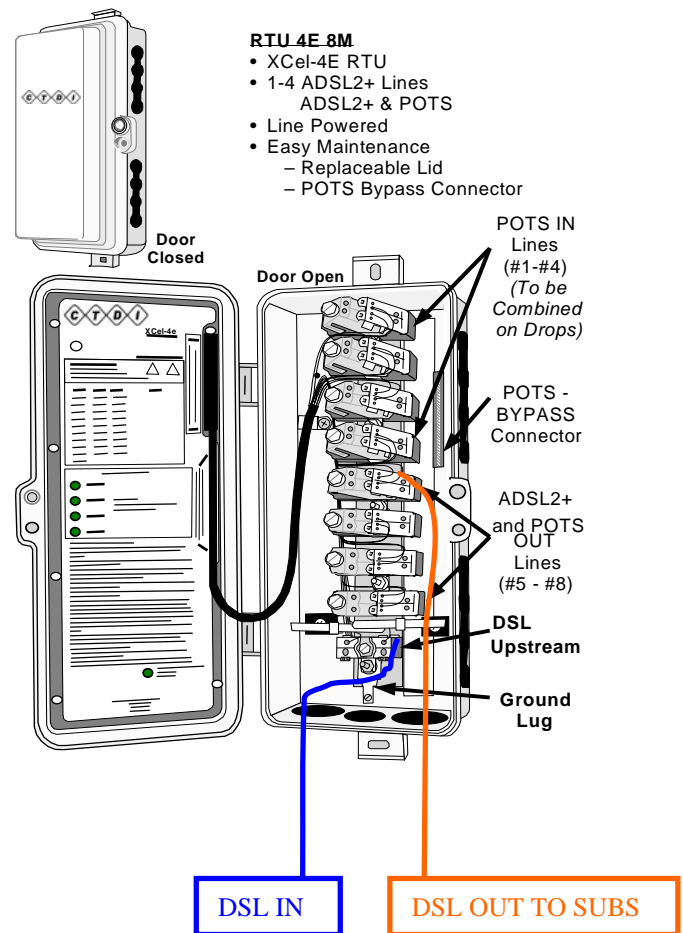
2. Products

This Installation Note is relevant for the following CTDI products:

System / Product Name	Part #	Description
XCel-4e / RTU-4e 8M	990486	Remote Terminal Unit, 1 - 4 ADSL or ADSL + POTS Lines

3. Overview

RTU units are packaged in standard CTDI gray plastic housing with flanges for pole or wall mounting. The RTU units have upstream DSL and ADSL2+ service line drops. In addition The RTU-4e has four inputs for optional POTS lines that the RTU can combine and place on the same drops as the ADSL2+ lines. All pairs have separate protectors in the base and are labeled. The installation instructions on the lid specify the TIP and RING pairs and GROUND connections. An RTU-4e has four drops that support ADSL or ADSL plus POTS drops. There are no provisioning switches in the RTU. The lid of the RTU-4e can be quickly removed from the base using the cable harness connector for ease of maintenance. POTS service to the customer prem can be maintained while the lid is being changed by using the POTS-BYPASS connector.



ATTENTION!

When wiring the DSL pairs it is important to use

two separate cables to prevent cross talk! Do not use pairs in the same sheath.
(See diagram above)

Installation Note 010265

XCel-4e Remote Terminal Unit (RTU-4e)



4. Summary of Engineering and Installation Steps

1. Verify that the loop has been designed in accordance with the CTDI Configur8r™ System.
2. Mount the RTU housing to a pole, or other designated mounting location.
3. Ground the RTU unit properly to an adequate local ground (25 Ohms or less).
4. Using separate cable, connect the upstream DSL pair to the RTU unit.
5. Consult the work order to verify the proper pairs for INPUT of POTS lines, and OUTPUT of ADSL or ADSL plus POTS line connections.
6. (Optional) Connect the input POTS lines (#1 to #4) to the RTU at the labeled protectors for POTS.
7. Using separate cable, connect the (#5 to #8) drops as appropriate to the ADSL drop protector terminals.
8. After the loop is completely built, apply power by seating the CTU in the Central Office Shelf.
9. The RTU will automatically link in the standard XCel linking process.

5. Unit Grounding

Verify that the ground established is in accordance with standard industry and local practices with respect to the OSP element, the ground wire clamp and the earth ground rod.

CAUTION: XCel Outside Plant (OSP) elements require proper grounding in accordance with standard telco and local practices for reliable extended operation and lightning protection. Units not properly grounded will be subject to damage from lightning and power surges and are not covered by warranty. Do NOT use the cable sheath ground to ground OSP devices. The ground must be established to a properly installed ground rod.

6. Identification of the Upstream Transport Cable Pair

The installation instructions on the lid of the unit specify the color-coded DSL and Ring/Tip wiring.

NOTE: The XCel-4e system is not sensitive to DSL pair Tip and Ring polarity.

If you do not know which cable pair goes toward the central office (Upstream) you can:

- Request that the system be powered up in the office and look for the presence of the line powering voltage on the upstream pair, **or**
- Request the upstream pair be shorted and use your Volt/Ohm meter to detect the correct pair.

7. System Turn-up and Transport Loop Link-up

The installation instructions and linking sequence are on the inside lid of the enclosure. See Table 7-1 for the LED display indications that will be present during the linking process for the XCel-4e transport loop and for the ADSL drops to the CPE.

- 7.1 Once all OSP units are in place and properly connected, including the RTU, the linking process is initiated when the CTU 4e is seated in the XCel Shelf.
- 7.2 The CTU 4e powers the loop and begins the signal linking with each unit in the loop beginning with the first unit downstream from the CTU.
- 7.3 If the loop and span are within the specified distance limitations and are free of load coils, the linkup will typically occur in three to five minutes. Allow ten minutes for linking before beginning troubleshooting.
- 7.4 Section 5.6 *System Turn-Up and Verification* of the XCel System Practice, details the XCel-4e loop turn-up sequence for an XCel-4e System with multiple STRs and an RTU.

7.5 The XCel-4e RTU has 5 LEDs.

- The four CPE LEDs indicate the status of the four ADSL links between the RTU and the CPE (ADSL).
- The CO LINK LED indicates the status of the CTU-STR-RTU link.

Table 7-1: RTU-4e LED indications

LED	QTY	COLOR(S)	State	Description
CO LINK	1	Green	Off	No Power
			Blinking Green	Establishing ADSL link
			Solid Green	ADSL link established
			Winking once every 5 seconds	System Communication Heartbeat
CPE # (1-4)	4	Green/Amber	Off	No link / No CPE detected
			Alternating Green through all 4 LEDs	System is booting up
			Blinking Green	Establishing ADSL link
			Solid Green	ADSL link established
			Flickering Green	Presence of User Data Traffic
			Solid Amber	POST (Power On Self Test) Failed
Blinking, alternating Green/Amber	Software download in progress			

8. Loop Link-up Trouble Conditions

8.1 For complete troubleshooting guidelines, see the XCel System Practice, Section 7, *Troubleshooting*.

8.2 If the RTU-4e appears to power up, but the transport link cannot be established, one of the following conditions likely exists: (these states do not prevent line powering, but do block the transport DSL signal).

- There is a load coil in the loop. A check for an unknown load coil is recommended.
- Transport loop limits have been exceeded, **or**
- Transport DSL In / Out connections are reversed at a repeater.

8.3 If the linking cycle is not successful, the XCel-4e CTU will initiate a re-linking attempt/sequence:

- The CTU's SPAN LED will BLINK GREEN (on/off, 1 per sec.) for approximately 5 minutes.
- If a link is not established within 5 minutes, the CTU will go into the 60-second power down period. SPAN LED will BLINK RED (on/off, 1 per sec.). Line power is turned off.
- The linking process will begin again after the 60-second power down period and continue to repeat until the transport link is established.

Note: This is the same LED indication that will be seen if the loop distance is too great or if a load coil exists.

9. XCel-4e System Reach & Planning

NOTE: The XCel System Practice, Section 3.1.6, XCel-4e System Planning, addresses various options and sensitivities for deploying the XCel-4e System, including spectrum management with standard ADSL lines in the same cable binder group as the XCel-4e.

NOTE: The Configur8r software tool is the ONLY planning tool that can properly support the power and performance engineering of a XCel-4e System. Do NOT engineer a XCel-4e loop without the proper Configur8r. XCel-4e System loops should not be installed without using the Configur8r software tool.

Installation Note 010265

XCel-4e Remote Terminal Unit (RTU-4e)



9.1 Span Reach. See Table 7-1 for XCel-4e Span Reach Planning. Make certain the Configu8r Software tool used for planning loops that include the use of RTU-4e units is current.

SPAN Reach

Span Reach is the distance between two active XCel-4e loop units on a particular cable type/grade. Examples:

- CTU 4e – RTU-4e (with no repeater), **or**
- CTU 4e – STR 4e, **or**
- STR 4e – RTU-4e

Table 7-1: XCel 4e Span Reach

XCel-4e MAX Span Reach for 8 Mbps (Feet)				
	19 AWG	22 AWG	24 AWG	26 AWG
PIC UG	17,000 ft	14,300 ft	11,350 ft	9,000 ft
XCel-4e MAX Span Reach for 1.5 Mbps (Feet)				
	19 AWG	22 AWG	24 AWG	26 AWG
PIC UG	28,200 ft	23,841 ft	19,016 ft	14,000 ft
XCel-4e MAX Span Reach for 8 Mbps (Meters)				
	19 AWG	22 AWG	24 AWG	26 AWG
PIC UG	5,181 m	4358 m	3459 m	2743 m
XCel-4e MAX Span Reach for 1.5 Mbps (Meters)				
	19 AWG	22 AWG	24 AWG	26 AWG
PIC UG	8594 m	7220 m	5731 m	4267 m

9.2 Drop Reach. See Table 7-2 for XCel-4e ADSL Drop Reach from the RTU-4e.

DROP Reach

Drop Reach is for an ADSL service drop and is based on the signal loss of the ADSL signal on a particular cable type/grade.

NOTE: If service is being delivered as ADSL plus POTS, the reach may be limited by the ringing and off-hook characteristics of the POTS lines that have been added at the RTU-4e. For that case this table will NOT APPLY.

Table 7-2: XCel-4e Drop Reach

XCel-4e ADSL Drop Reach (feet and meters)			
26 Ga.	Drop Reach	9,000 ft	2,743 m
	<i>Calculated Res.</i>	<i>789 Ohms</i>	
24 Ga.	Drop Reach	11,350 ft	3,459 m
	<i>Calculated Res.</i>	<i>641 Ohms</i>	
22 Ga.	Drop Reach	14,300 ft	4,358 m
	<i>Calculated Res.</i>	<i>513 Ohms</i>	
19 Ga.	Drop Reach	17,000 ft	5,181 m
	<i>Calculated Res.</i>	<i>366 Ohms</i>	
<i>@ 8 Mbps Downstream</i>			

10. Replacement Protector Options

Note: Protectors normally shipped with new products are identified with arrows. → CTDI reserves the right to use any listed gel-fill protector for ADSL lines in new product shipments.

RTU-4e is shipped with gel-filled protectors to provide lightning protection for the unit on each ADSL line and POTS line. The protectors for the transport pair lines require higher breakdown voltage than protectors for the ADSL lines, and as a result the transport protectors may be a different protector than the ADSL protectors. See Tables 9-1, 9-2 and 9-3 for APPROVED and NON-APPROVED replacement protectors.

Table 9-1: APPROVED ADSL Line Protectors

Approved XCel OSP POTS Line Protectors:		
MFG	MODEL or PART #	Type
TYCO *	GSSP-0302-00-WOOB-A *	Gel
Other approved ADSL2+ replacement protectors		
TYCO	GSSP-0202-00-WOOB-A	Gel
TYCO	GSSP-0101-00-WOOB-A	Gel
TII	AD-03-W-FS	Gel
TII	AD-M2-W-FS	Gel
TII	AD-02-W-FS	Gel
TII	AD-01-W-FS	Gel
Corning (Siecor)	SPD 127-XV-S	Gel
TII	356M2	356
Corning (Siecor)	356-XY	356
Corning (Siecor)	356-SW	356
Surge-Tek	ST 356 IDC-350V-D	Gel

Table 9-2: APPROVED Transport Line Protectors

Approved XCel OSP DSL Line Protectors, Gel Filled:		
MFG	MODEL or PART #	Type
TII	AD-03-W-FS	Gel
Corning (Siecor)	SPD 127-XV-S	Gel
Other approved DSL replacement protectors		
Corning (Siecor)	356-XY	356
Surge-Tek	ST 356 IDC-350V-D	Gel

Table 9-3: NON-Approved ADSL2+ Line Protectors

NON-Approved XCel OSP DSL Line Protectors:		
MFG	MODEL or PART #	Type
TYCO *	GSSP-0302-00-WOOB-A *	Gel
TYCO	GSSP-0202-00-WOOB-A	Gel
TYCO	GSSP-0101-00-WOOB-A	Gel
TII	AD-M2-W-FS	Gel
TII	AD-02-W-FS	Gel
TII	AD-01-W-FS	Gel
Corning (Siecor)	356-SW	356
TII	356M2	356

CONTACTING CTDI

1373 Enterprise Drive
 West Chester, PA 19380
 Tech Support
 1-800-297-2424 or 1-510-979-2200
 Fax 510-226-8785