

### 1. Purpose

This document provides installation instructions for each CTU (Central Office Terminal Unit) for the XCel-4e System. This document is provided with each CTU-4e shipped and is also available separately. An up to date copy is included as an attachment to the *XCel System Practice* with each XCel COT Shelf shipped. CTDI recommends that one copy of the *System Practice* be kept in each Central Office that is equipped with XCel Systems.

### 2. Products

This Installation Note is relevant for the following CTDI products:

**Table 2-1**

System / Product Name	Part #	Description
XCel-4e / CTU-4e 8M	990484	Central Terminal Unit, 4-Port ADSL Extension

#### SHELF BACKPLANE CONNECTIONS / INPUTS

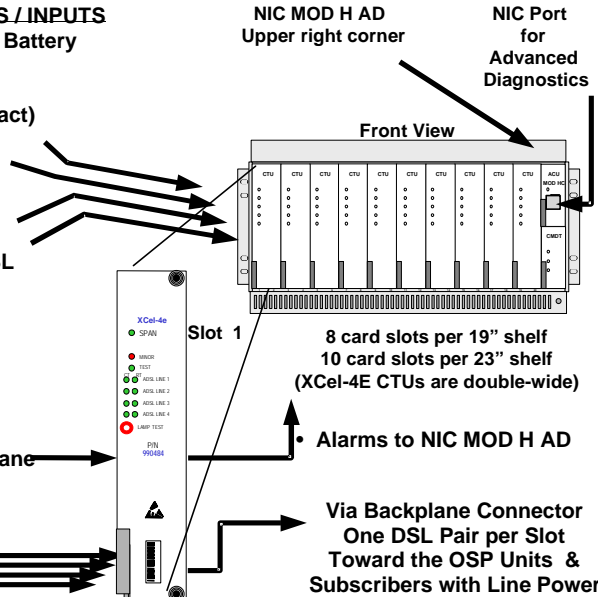
- A & B, -48Vdc connections to CO Battery
- Reference Ground
- Chassis Ground
- Contact Alarms (Form C Dry Contact)

#### Service/Traffic to/from CTUs

- Used: XCel-4e: 4 Lines for ADSL
- 1 DSL Line Out / Slot

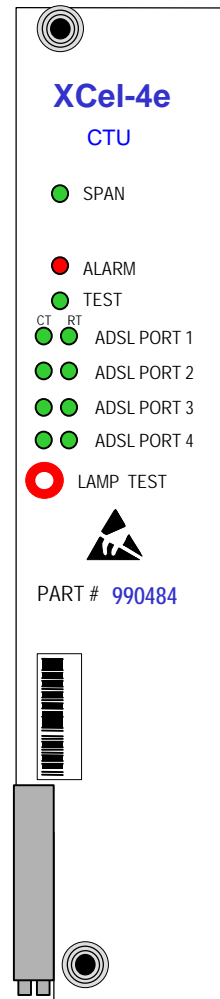
- -48 Vdc Power Direct From Backplane

Via Backplane Connector  
Up to 4 Individual ADSL  
Line Pairs per Slot



**Figure 2-1: CTU-4e in the XCel Multi-Service Shelf**

**Figure 2-2 XCel-4e CTU Faceplate**



### 3. Overview

The CTU card is used for the CTDI® XCel Subscriber Access System. It plugs into the XCel Multi-Service Central Office Terminal Shelf and interfaces with the XCel repeaters and Remote Terminal Units to comprise a System. There are multiple types of CTU Plug-ins and they can be mixed in the Multi-Service Shelf slots, in any sequence, in the same shelf. The CTU in any individual slot functions independently of other CTU cards. Each CTU-4e supports up to four (4) ADSL line extensions to a XCel-4e Remote Terminal Unit (RTU 4e 8M).

### 4. Engineering and Installation Summary of Steps. For detail see paragraphs 5.1 through 5.8.

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Verify that the loop has been designed in accordance with the Configur8r™ design tool</li> <li>2. Unpack and Inspect the XCel CTU Card.</li> <li>3. Verify the 19" or 23" Multi-Service Shelf is properly installed and grounded.</li> <li>4. Consult work order to verify proper pairs (up to four per CTU-4e) provisioned for INPUT of ADSL lines.</li> </ol> | <ol style="list-style-type: none"> <li>5. Consult work order to verify proper pair (one each) provisioned for OUTPUT of the ADSL line.</li> <li>6. Verify or install the proper MDF protector.</li> <li>7. Insert the CTU into the Multi-Service Shelf.</li> <li>8. The CTU will automatically link with XCel OSP units in the standard XCel linking process.</li> </ol> |
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## XCel-4e Central Office Terminal Unit (CTU-4e)



### 4.1 General Engineering Notes

- XCel CTUs have no requirement for MML or computer interfaces, however to benefit from the Advanced Diagnostic capability available with the XCel-4e, a PC interface is supported via the XCel Shelf and Network Interface Card or remotely through a static IP address programmed into the NIC.
- The CTU-4e is hot-loadable and can be placed in any shelf slot 1 through 15 in a 19" shelf or slot 1 through 19 in a 23" shelf. The CTU-4e is a double-wide CTU and will occupy two slots in a MSA Shelf.
- A Network Interface Card, NIC MOD H AD (P/N 990444-A) plug-in card, is required in the upper right hand common slot, and is needed to take advantage of the PC-based Advanced Diagnostic features in the XCel-4e System. A timing reference to the NIC is NOT required for XCel-4e Systems, but is required if XCel POTS CTUs with V.90 support are also being hosted in the same shelf as an XCel-4e.
- The CTU card maximum current draw is 0.75 Amp and the fuse rating is 2 Amp at 48 VDC. There is one voltage selection switch located in the upper right hand quadrant of the CTU.

**The XCel-4e loop must be properly designed with the CTDI Config8r System Design software. Separate Config8rs are available for different system types. Improper system design can result in difficulty in link-up, troubleshooting, and spectrum management.**

### 5. Installation Detail

#### 5.1 Verify that the loop has been designed in accordance with the Config8r™ design tool

- 5.1.1 The XCel-4e uses ADSL2+ encoding technology; which minimizes issues of spectrum compatibility in the distribution cable plant.
- 5.1.2 If the XCel-4e pair resides in a binder group that does (or may in the future) include CO-sourced ADSL pairs, then special consideration must be given to locating the OSP units (STR and RTU).
- 5.1.3 These considerations are accommodated in the XCel-4e Config8r. They are also described and outlined with tables in INST NOTE 010114 *Config8r READ ME*, and in the XCel System Practice.

#### 5.2 Unpack and Inspect the CTU Card.

Make a quick visual check of the CTU card for any shipping damage.

#### 5.3 Verify that the Multi-Service Shelf is properly installed and grounded

**CAUTION: The COT shelf MUST BE GROUNDED in accordance with installation instructions and local practices by attaching a maximum #14 AWG conductor between the CO ground screw on the rear of the COT shelf and CO ground. A Central Office CO ground should be a maximum 5 ohms. Failure to properly ground the COT shelf can result in equipment damage during normal turn-up and operation! The COT will be susceptible to lightning damage without a proper CO ground.**

#### 5.4 Consult the work order to verify the proper pairs (up to four per CTU-4e) have been provisioned for INPUT of ADSL lines.

There are one to four (1-4) ADSL lines that run from the designated DSLAM to the XCel Shelf backplane and slot for each of the ADSL services to be transported in the XCel-4e. Cabling distance between the DSLAM and the XCel shelf should NOT exceed 1,000 feet. See *XCel COT Multi-Service Shelf Installation* in Sec. 5.3 of the System Practice for connector pin-outs.

#### 5.5 Consult the work order to verify the proper pair (one each) has been provisioned for OUTPUT of the CTDI ADSL line.

This is the pair from the designated XCel Shelf, backplane connector and slot for the specific XCel-4e loop. Reference Section 5.3, *XCel COT Multi-Service Shelf Installation* in the XCel System Practice for connector pin-out descriptions.

- 5.6 **Verify or install the proper MDF protector.** See Section 10 of this document for approved protectors.

**CAUTION:** Replace any existing MDF protectors on the DSL pairs with the Corning/Siecor 303M-11A7T0 or other approved MDF protector. See Section 10 of this Installation Note. Failure to do this will result in protectors firing and causing intermittent system outages and possible equipment damage.

- 5.7 **Insert the CTU into the Multi-Service Shelf.**

Insert the CTU by pushing it in on the face-plate until it seats firmly in slot and backplane. Seat the ejector lever and tighten the two thumbscrews located at the top and the bottom of the CTU.

**WARNING:** Insertion of the CTU in a powered XCel Shelf will IMMEDIATELY place up to  $\pm 190$  Vdc on each conductor in the ADSL distribution pair. This can result in 380 Vdc Tip to Ring. Installers should verify that the XCel loop has been connected and is ready to respond to line power and ready to initiate the linking process prior to inserting the CTU.

- 5.8 **The CTU will automatically begin linking with XCel OSP units in the standard XCel linking process.** Once the CTU and OSP units (STRs and RTU) have been installed, the linking process is automatic. Section 6 of this document describes the linking process.

## 6. Turn Up and Link Up

- 6.1 Upon insertion, the CTU-4e will power up the DSL pair and downstream OSP units with  $\pm 130$  or  $\pm 190$  volts DC on each side. Voltage level is determined by setting the on-board slide switch SW1.
- 6.2 The CTU-4e begins a search cycle to automatically detect and link with the first Repeater or the Remote Terminal on the DSL. The CTU links with the first outside plant element and then each subsequent element continues to link up in turn down the line. The SPAN LED will continue to BLINK, even though linked to intermediate repeaters (STRs), until the RTU is linked.
- 6.3 If an open circuit (DSL pair) is detected, after five (5) minutes, the SPAN LED will BLINK red, power down for one minute, begin blinking green, then re-attempt linking. If no link, the cycle will repeat.
- 6.4 If the CTU does not detect a repeater or RTU after 5 minutes of trying, it will go into a power down state and remove power from the loop. The CTU will automatically re-attempt linking every 5 minutes.
- 6.5 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.
- 6.6 After ten minutes, if the System does not link, go to Section 7, *Troubleshooting* in the *System Practice*.

## 7. Troubleshooting

Detailed troubleshooting procedures are provided in Section 7, *Troubleshooting*, in the XCel System Practice.

- 7.1 Once the XCel-4e System links, check for ADSL service at the RTU 4e. If no service, verify at the Main Distribution Frame (MDF) that a connection does exist to the DSLAM.
- 7.2 If the OSP units appear to be powering up, but no DSL link can be established, one of the following conditions likely exists: (these states do not prevent line powering, but do block the ADSL signal).
- There is a load coil in the loop. A check for an unknown load coil is recommended.
  - DSL loop limits have been exceeded, or
  - DSL in/out connections are reversed at a repeater.

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## XCel-4e Central Office Terminal Unit (CTU-4e)



### 8. CTU-4e Display LEDs

The CTU-4e has eleven (11) LED lamps (see Table 8-1 summarizing the CTU-4e LEDs and indications) to display information or states during normal operation:

- Each of the four (4) ADSL channels between the DSLAM and the CPE has 2 LEDs showing link status:
  - CT LEDs (1-4): ADSL link between DSLAM- CTU.
  - RT LEDs (1-4): ADSL link between RTU-CPE.
- SPAN LED: status of the Span transport link.
- MINOR LED is illuminated if a minor alarm is reported.
- The TEST LED is used by the on-board diagnostics.

**Table 8-1: CTU-4e LED Descriptions**

LED	QTY	Color(s)	State	Description
SPAN	1	Green/ Red	OFF	No power
			BLINKING Green	Establishing transport link
			STEADY Green	Transport link is established all the way to an RTU
			BLINKING Red	Fails to establish link within the previous 5-minute attempt.
			STEADY Red	CTU detected a power fault on the transport pair
			WINKING Green Once Every 5 Seconds	System Communications Heartbeat
MINOR	1	Red	OFF	Normal
			STEADY / WINK / BLINKING	Minor alarm has been raised. Transport Link down for more than 10 minutes.
			STEADY	Minor alarm has been raised. POST (Power On Self Test) Failed
ADSL PORT 1-4	CT (DSLAM) 1-4	Green/ Amber	OFF	No link
			BLINKING Green	Establishing ADSL link
			STEADY Green	ADSL link established
	RT (CPE) 1-4	Green/ Amber	OFF	No link
			BLINKING Green	Establishing ADSL link
			STEADY Green	ADSL link established
TEST	1	Green/ Red	Off	Normal Operations
			STEADY Red	POST (Power On Self Test) Failed
			BLINKING, alternating Green and Red	Software download in progress

### 9. Example DSLAM Provisioning Screens

Examples of the provisioning screens for several of the more frequently used DSLAM types are provided on the following pages.

#### 9.1 Example: Alcatel A1000 Provisioning Screen

**DSLAM Manufacture: Alcatel A1000**  
**Line card version: HH3CAB.455**  
**Software Release of DSLAM 5.1.1**

#### Listing of all ADSL profiles, Profile #2 is used for G-Lite

```
/* RTRV-PROFILE-ADSL::ALL::, */
"1:\defaultProfile\",LOCAL,FAST,ACTIVE"
"2:\"eqa_GLite_profile\",LOCAL,INTERLEAVED,ACTIVE"
"3:\"EQA_FAST\",LOCAL,FAST,ACTIVE"
```

#### UPSTREAM Parameters corresponding to each of the ADSL profile, #2 is used for G-Lite

```
/* RTRV-PROFILE-ADSLUP::ALL:: */
"1::MINNMR=0,MAXNMR=31,TNMR=6,MAXAPLVL=13,PIBR=0,MAXIBR=0,MINIBR=0,
MAXIDEL=0,PFBR=160,MAXFBR=640,MINFBR=96"
"2::MINNMR=0,MAXNMR=31,TNMR=6,MAXAPLVL=13,PIBR=128,MAXIBR=512,MINIBR=64,
MAXIDEL=16,PFBR=0,MAXFBR=0,MINFBR=0"
"3::MINNMR=0,MAXNMR=31,TNMR=6,MAXAPLVL=13,PIBR=0,MAXIBR=0,MINIBR=0,
MAXIDEL=16,PFBR=512,MAXFBR=512,MINFBR=0"
```

#### DOWNSTREAM Parameters corresponding to each of the ADSL profile, #2 is used for G-Lite

```
/* RTRV-PROFILE-ADSLDN::ALL:: */
"1::MINNMR=0,MAXNMR=31,TNMR=6,MAXPSD=-40,MAXAPLVL=20,RAMODE=AT_INIT,PIBR=0,
MAXIBR=0,MINIBR=0,MAXIDEL=0,PFBR=8M,MAXFBR=6144,MINFBR=1024"
"2::MINNMR=0,MAXNMR=31,TNMR=6,MAXPSD=-40,MAXAPLVL=20,RAMODE=AT_INIT,
PIBR=256,MAXIBR=8M,MINIBR=128,MAXIDEL=16,PFBR=0,MAXFBR=0,MINFBR=0"
"3::MINNMR=0,MAXNMR=31,TNMR=6,MAXPSD=-40,MAXAPLVL=20,RAMODE=AT_INIT,PIBR=0,
MAXIBR=0,MINIBR=0,MAXIDEL=16,PFBR=8M,MAXFBR=8M,MINFBR=0"
```

**Example of an ADSL port configuration showing ADSL profile #2 assigned to it. It also shows the port is currently IN-SERVICE & in G-Lite mode.**

```
/* RTRV-ADSL::ADSL-1-1-2-1::: */
"ADSL-1-1-2-1::QOSCLASSF=UBR,QOSCLASSI=UBR,ADSLPROF=2,
ADSLPROFNM=\"eqa_GLite_profile\",CACPROFUPF=3,
CACPROFUPFNM=\"eqa_lt_cac_profile\",CACPROFUPI=3,
CACPROFUPINM=\"eqa_lt_cac_profile\",CACPROFDNF=3,
CACPROFDNFMNM=\"eqa_lt_cac_profile\",CACPROFDNI=3,
CACPROFDNINM=\"eqa_lt_cac_profile\",ATMACCPROFF=3,
ATMACCPROFFNM=\"eqa_lt_atmacc_profile\",ATMACCPROFI=3,
ATMACCPROFINM=\"eqa_lt_atmacc_profile\",PORTID=2_1,ANSI=N,ITUDMTA=N,UAWG=N,
ITULITE=N,ETSIIISDN=N,ITUIISDN=N,ETSIPOTS=N,ITUPOTS=N,CUROPMODE=ITULITE:
IS-NR,"
```

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## XCel-4e Central Office Terminal Unit (CTU-4e)



### 9.2 Example: Lucent Stinger Provisioning Screen

```
DSLAM Manufacture:      Lucent Stinger
Software Release of DSLAM TAOS S/W 9.1-142
Configuration for      G.Lite for Lucent Stinger (Line side Profile)

lab>READ AL-DMT {1 1 1}
AL-DMT/{ shelf-1 slot-1 1 } read

lab>LIS
[in AL-DMT/{ shelf-1 slot-1 1 }]
name = 1:1:1
physical-address* = { shelf-1 slot-1 1 }
enabled = yes
sparing-mode = inactive
ignore-lineup = system-defined
line-config = { 1 15 automatic-at-startup automatic-at-startup 100 100 13 20
40+
fast-path-config = { 64 512 1280 8500 800 8000 }
interleave-path-config = { 64 64 512 8M 512 8M 16 16 }
margin-config = { 6 6 0 0 31 31 0 0 0 0 0 0 0 0 no }
thresh-profile = default

lab>LIS LINE-CONFIG
[in AL-DMT/{ shelf-1 slot-1 1 }:line-config]
nailed-group = 1
vp-switching-vpi = 15
rate-adapt-mode-up = automatic-at-startup
rate-adapt-mode-down = automatic-at-startup
rate-adapt-ratio-up = 100
rate-adapt-ratio-down = 100
max-aggr-power-level-up = 13
max-aggr-power-level-down = 20
max-power-spectral-density = 40
line-code = g-lite
line-latency-down = interleave
line-latency-up = interleave
trellis-encoding = yes
gain-default = 20-db
upstream-start-bin = 6
upstream-end-bin = 31
downstream-start-bin = 32
downstream-end-bin = 255
loop-back = none
bit-swapping = no
fbm-dbm-mode = fbm
alcatel-us-413-boost = unknown

lab>LIS INTERLEAVE-PATH-CONFIG
[in AL-DMT/{ shelf-1 slot-1 1 }:interleave-path-config]
min-bitrate-up = 64
min-bitrate-down = 64
max-bitrate-up = 512
max-bitrate-down = 8M
planned-bitrate-up = 512
planned-bitrate-down = 8M
max-delay-up = 16
```

max-delay-down = 16

### 10. MDF Protectors

#### 10.1 CTDI APPROVED MDF Protectors

Table 10-1

Mfg	Model Number	Ordering Number	Type Number
<b>5 Pin</b>			
Corning	303M-11A7W0 <i>(Repl. for 6ESH)</i>	303M-11A7W0 Ver I.D.#1004861	--
Corning	303M-11A7T0 <i>(Repl. for 6SSH)</i>	303M-11A7T0 Ver I.D.#11004860	--
Corning	303M-12A1TA	303M-12A1TA Ver I.D.#87210236	--
Corning	6SSH-AT-C <i>(Mfg. Disc.)</i>	6SSH-AT-C Ver I.D.#530836	--
Corning	6ESH-AT-C <i>(Mfg. Disc.)</i>	6ESH-AT-C Ver I.D.#530835	--
Corning	303M-11A1E0	A0358313	3B1FS
Corning	303M-11A3E0	A0396098	3B3FS
Corning	303M-11A1G0	A0341959	3B1ES
Corning	303M-11A3G0	A0341960	3B3ES
Corning	303M-12A1EA	A0361530	4B1FSC
Corning	303M-12A3EA	A0361531	4B3FSC
Corning	303M-12A1GA	A0353716	4B1ESC
Corning	303M-12A3GA	A0353717	4B3ESC
Corning	303M-12A9GA	A0353727	4B9ESC
Corning	303M-11A1K0	A0342431	--
Corning	303M-11A3K0	A0342434	--
Corning	303M-11A1T0	A0341961	--
Corning	303M-11A3T0	A0341962	--
Corning	303M-12A1KA	A0353723	--
Corning	303M-12A3KA	A0353724	--
Corning	303M-12A9KA	A0365900	--
Corning	303M-12A1TA	A0353718	--
Corning	303M-12A3TA	A0353719	--
Corning	303M-12A9TA	A0365902	--
Marconi	R3B3S	--	--
Marconi	R4B1S	--	--
Porta Systems	115SCNHDSL-230	--	--
Corning	7A / 303-0750	A0312598	7A
Corning	7A / 303-0770	A0313096	7A
Corning	7X / 303-0755	A0328090	7X
Corning	7X / 303-0775	A0312973	7X
Marconi	R3B3E	--	--
Marconi	R4B1E	--	--
<b>Single Pin</b>			
Corning	12P1KA	12P1KA	--
Corning	12P1KE	12P1KE	--
Porta Systems	15SCNHDSL-230	--	--

#### 10.2 NON-approved XCel MDF Protectors

Table 10-2

MFG	Model Number	Ordering Number	Type Number
<del>Corning</del>	<del>6SPE</del>	<del>--</del>	<del>--</del>
<del>Corning</del>	<del>6SSE</del>	<del>--</del>	<del>--</del>
<del>Lucent</del>	<del>980H39</del>	<del>--</del>	<del>--</del>
<del>Lucent</del>	<del>99OH02</del>	<del>--</del>	<del>--</del>
<del>Sylvania</del>	<del>5G-GT</del>	<del>--</del>	<del>--</del>

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Websites

[www.CTDI.com](http://www.CTDI.com)

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