

1. Purpose

This document provides installation instructions for each CTU (Central Office Terminal Unit) for the XCel-4a System. This document is provided with each CTU 4A 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. GoDigital 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 GoDigital products:

Table 2-1

System / Product Name	Part #	Description
XCel-4a Systems		
CTU H 4A 130V 1536	990197	XCel-4a CTU, 130V
CTU H 4A 190V 1536	990263	XCel-4a CTU, 190V

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-4A: 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

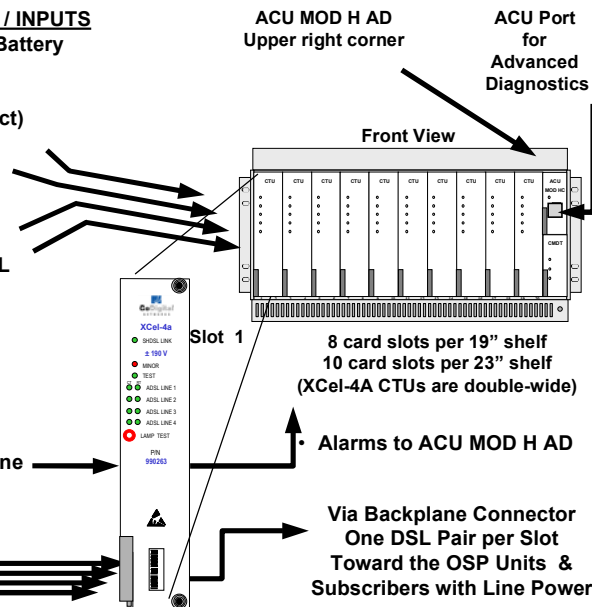


Figure 2-1: CTU 4A in the XCel Multi-Service Shelf

3. Overview

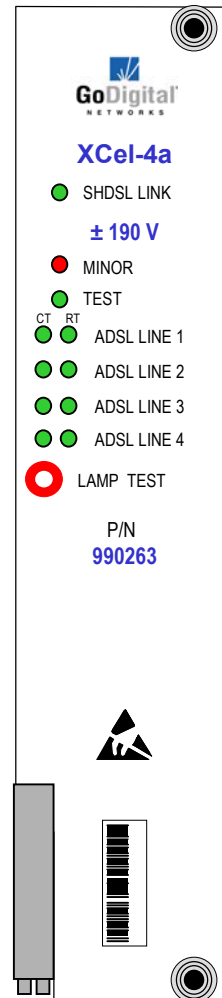
The CTU card is used for the GoDigital® XCel Subscriber Access System. It plugs into the XCel Multi-Service Central Office Terminal Shelf and interfaces with the XCel repeaters and remote terminal units to comprise a System. There are multiple types of CTU Plug-ins and they can be mixed in the Multi-Service Shelf slots, in any sequence, in the same shelf. The CTU in any individual slot functions independently of other CTU cards. CTU 4As each support up to four (4) ADSL line extensions to XCel-4a Remote Terminal Units (RTU 4A 1536).

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

1. Verify that the loop has been designed in accordance with the Configu8r™ design tool
2. Unpack and Inspect the XCel CTU Card.
3. Verify the 19" or 23" Multi-Service Shelf is properly installed and grounded.
4. Consult work order to verify proper pairs (up to four per CTU 4A) provisioned for INPUT of ADSL lines.

5. Consult work order to verify proper pair (one each) provisioned for OUTPUT of the GoDigital SHDSL line.
6. Verify or install the proper MDF protector.
7. Verify and/or set the DSLAM ADSL lines to be speed-limited to 1.536 Mbps and for proper ADSL formats.
8. Insert the CTU into the Multi-Service Shelf.
9. The CTU will automatically link with XCel OSP units in the standard XCel linking process.

Figure 2-2 XCel-4a CTU Faceplate



Installation Note

XCel-4a CTUs (CTU H 4A xxxV 1536)



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-4a, a PC interface is supported via the XCel Shelf and Alarm Card or remotely through the backplane.
- The CTU 4A is hot-loadable and can be placed in any shelf slot #1 through #16 (20 on 23" shelf). The CTU 4A is a double-wide CTU and will take up two slots in an XCel Shelf.
- GoDigital recommends that DSLAM ADSL lines be set, or speed-limited to 1.536 Mbps. While most DSLAMs will operate fine without speed limiting, some DSLAMs do require limiting in order to ensure reliable operation with the XCel-4a System.
- An Alarm Control Unit, ACU MOD H AD (p/n 990249-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-4a System. A timing reference to the ACU is NOT required for XCel-4a Systems, but is required if XCel POTS CTUs with V.90 support are also being hosted in the same shelf as an XCel-4a.
- The CTU card maximum current draw is 0.75 Amp and fuse rating is 2 Amp at 48 VDC. There are no Engineering or Provisioning options, straps, or jumpers on the CTU.

The XCel-4a loop must be properly designed with the GoDigital Configur8r System Design software. Separate Configur8rs 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 Configur8r™ design tool

- 5.1.1 The XCel-4a uses G.shdsl (SHDSL) encoding technology; which minimizes issues of spectrum compatibility in the distribution cable plant.
- 5.1.2 If the XCel-4a 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 (STRs RTU).
- 5.1.3 These considerations are accommodated in the XCel-4a Configur8r. They are also described and outlined with tables in INST NOTE 010114 *Configur8r READ ME*, and in the XCel System Practice, Section 3.1.7, *XCel-4a System Planning*.

5.2 Unpack and Inspect the XCel 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 4A) 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 (not to exceed 1,000 feet), backplane and slot for each of the ADSL services to be transported in the XCel-4a. 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 GoDigital SHDSL line.

This is the pair from the designated XCel Shelf, backplane connector and slot for the specific XCel-4a 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 #6SSH 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 **Verify and/or set the DSLAM ADSL lines to be speed-limited to 1.536 Mbps.**

DSLAM ADSL lines that feed directly to the XCel-4a should normally be speed-limited to 1.536 Mbps and for proper ADSL formats. See Paragraph 9 of this INST NOTE for example DSLAMs.

- 5.8 **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 at the top and the bottom of the CTU.

WARNING: Insertion of the CTU in a powered XCel Shelf will IMMEDIATELY place up to ± 190 Vdc on each conductor in the SHDSL 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.

- 5.9 **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 4A will power up the DSL pair and downstream OSP units with DC voltage.
- 6.2 The CTU 4A 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 SHDSL LINK 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 SHDSL LINK 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-4a loop turn-up sequence for an XCel-4a 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-4a System links, check for ADSL service at the RTU 4A. 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 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 230 kHz DSL signal.)
- There is a loading coil in the loop. A check for an unknown load coil is recommended.
 - DSL loop limits have been exceeded, or
 - DSL connection is reversed at a repeater.

Installation Note

XCel-4a CTUs (CTU H 4A xxxV 1536)



8. CTU 4A Display LEDs

The CTU 4A has eleven (11) LED lamps (see Table 8-1 summarizing the CTU 4A 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 : DSLAM- CTU.
 - RT LEDs (1-4): ADSL link between RTU-CPE.
- SHDSL LINK LED: status of the CTU-STR-RTU 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 4A LED Descriptions

LED	QTY	Color(s)	State	Description
SHDSL LINK	1	Green/ Red	OFF	No power
			BLINKING Green	Establishing SHDSL link
			STEADY Green	SHDSL link is established
			BLINKING Red	CTU detected a SHDSL pair open
			STEADY Red	CTU detected a SHDSL pair short
			Alternating Green/Red	Future use
MINOR	1	Red	OFF	Normal
			STEADY / WINK / BLINKING	Minor alarm has been raised. SHDSL Link down for more than 10 minutes.
			STEADY	Minor alarm has been raised. POST (Power On Self Test) Failed
		Red	WINK OFF	Number of WINKs OFF identifies the dropped span, counting from CTU
ADSL LINE 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	STEADY Red	POST (Power On Self Test) Failed
			OFF	Normal
			BLINKING, alternating Green and Red	CTU being downloaded.
			STEADY / WINK / BLINKING	Diagnostic running. See Section 7.3.4, <i>Troubleshooting of the System Practice</i>

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=1536,MAXFBR=6144,MINFBR=1024"
"2::MINNMR=0,MAXNMR=31,TNMR=6,MAXPSD=-40,MAXAPLVL=20,RAMODE=AT_INIT,
PIBR=256,MAXIBR=1536,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=1536,MAXFBR=1536,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,ETSIISDN=N,ITUISDN=N,ETSIPOTS=N,ITUPOTS=N,CUROPMODE=ITULITE:
IS-NR,"
```

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XCel-4a CTUs (CTU H 4A xxxV 1536)



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 1536 512 1536 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 = 1536
planned-bitrate-up = 512
planned-bitrate-down = 1536
max-delay-up = 16
max-delay-down = 16
```

10. MDF Protectors

10.1 GoDigital APPROVED MDF Protectors

Table 10-1

MFG	PART #
Lucent	21NA98
Lucent	990H01
Northern Telecom	F03
Northern Telecom	11A1G0
Northern Telecom	M08C
OneAC	92S5
Porta Systems	4597M
Porta Systems	4797M
Reltec	6U2VS
Reltec	R3B3E
Reltec	R4B1E
Corning/Siecor	4B3ESC
Corning/Siecor	6SSH
Corning/Siecor	6ESH
Corning/Siecor	3010
Corning/Siecor	12A9KA
Corning/Siecor	12A9TA
Corning/Siecor	4110
Corning/Siecor	P2510
Corning/Siecor	P4210

10.2 NON-approved XCell MDF Protectors

Table 10-2

MFG	PART #
Lucent	980H39
Lucent	99OH02
Corning/Siecor	6SPE
Corning/Siecor	6SSE
Sylvania	5G-GT

Installation Note

XCel-4a CTUs (CTU H 4A xxxV 1536)



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