### 1. Purpose

This document provides installation instructions for each XCel POTS CTU (**C**entral Office **T**erminal **U**nit). This document is provided with each CTU shipped to customers and is also available separately. In addition, an up to date copy is included as an attachment to the ***System Practice*** with each XCel COT Shelf shipped. GoDigital recommends that one copy of the complete ***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:

| System / Product Name | Part # | Description |
|---|---|---|
| **XCel-8 Systems** | | |
| CTU H 8P 190V 544 UNI M9 V90 | 990106 | XCel 8 CTU, 190V, MDT (909 Sigs), V.90 |
| CTU H 8P 190V 544 UNI 4T V90 | 990120-A | XCel 8 CTU, 190V, 4Tel, V.90 |
| CTU H 8P 130V 544 UNI M9 V90 | 990124-A | XCel 8 CTU, 130V, MDT (909 Sigs), V.90 |
| **XCel-12 Systems** | | |
| CTU H 12P 130V 544 UNI M9 V90 | 990127 | XCel-12 CTU, 130V, MDT (909 Sigs), V.90 |
| CTU H 12P 190V 544 UNI M9 V90 | 990144 | XCel-12 CTU, 190V, MDT (909 Sigs), V.90 |
| CTU H 12P 190V 544 UNI 4T V90 | 990153 | XCel-12 CTU, 190V, 4Tel, V.90 |
| CTU H 12P 130V 544 UNI M9 V90 | 990235 | XCel-12 CTU, 130V, MDT (398 Sigs), V.90 |
| CTU H 12P 190V 544 UNI M3 V90 | 990237 | XCel-12 CTU, 190V, MDT (398 Sigs), V.90 |

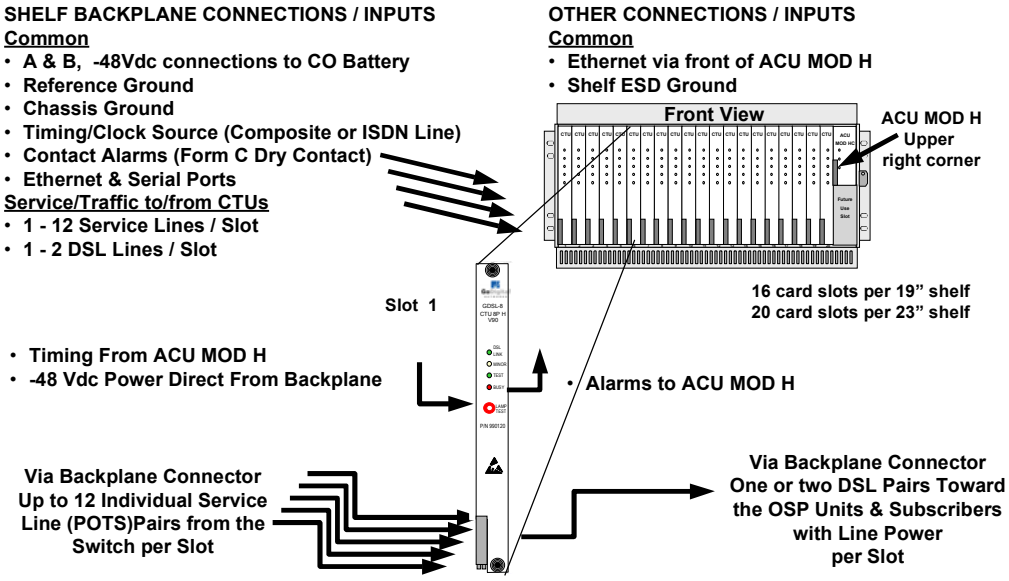


**Figure 1:**
**XCel CTU Line Card**

**Figure 2**
**XCel CTU**
**Faceplate**


### 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 will function independently of any other CTU card. XCel CTUs support analog POTS and include powerful GoDigital XCel DSP processing that enables V.90 modem support at V.90 speeds.

### 4. Summary of Engineering and Installation Steps

### 4.1 Installation Summary

1. **Verify that the loop has been designed in accordance with the Configur8r™ 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. **Verify or install the proper MDF protector.**
5. **Insert the CTU into the Multi-Service Shelf**
6. **The CTU will automatically link with XCel OSP units in the standard XCel linking process.**

### 4.2 Engineering Notes

- The XCel CTU has no need for a MML or computer interface.
- This card is hot-loadable and can be placed into any shelf slot numbered 1 through 16 (20 on 23" shelf).
- An Alarm Control Unit (ACU MOD H CB) or ACU plug in card is required to in the upper right hand common slot to process alarms and to provide reference timing sources to the CTUs.
- Timing is required for XCel CTU V.90 modem support. Without timing, XCel V.90 modem support will not be available.
- V.90 XCel CTUs require that the XCel Muli-Service Shelf normally be mounted within 300 feet (total POTS cabling distance) of the central office POTS switch. The maximum distance should not exceed 500 feet. If the shelf is mounted too far from the switch service ports, the XCel V.90 signal processing capability on analog POTS lines may be reduced or disabled.
- 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.

### 5. Installation

**5.1** Verify that the proposed loop has been properly designed with the GoDigital Configur8r System Design software tool. Separate Configur8rs are available for different system types. Improper system design can result in difficulty in link-up and troubleshooting.

**5.2** 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 shelf 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** Verify or install the proper MDF protector. See Section 9 of this document for approved MDF protectors.

**CAUTION: Replace any existing MDF protectors on the DSL pairs with the Siecor #6SSH or other approved MDF protector. See Section 9 of this Installation Note. Failure to do this will result in protectors firing and causing intermittent system outages and possible equipment damage.**

**5.5** Insert the CTU into the slot designated by the work order. Push it in by the face plate until it seats firmly in the card edge connector of the shelf backplane, and make sure the ejector lever seats properly on the front lip of the shelf.

**5.6** The CTU will automatically initiate its linking process with the XCel OSP units.

NOTE: Upon initial insertion and power up, and until the XCel link is established for the first time, no alarm will be indicated by the ALARM LED lamp or will be reported to the ACU MOD H card.

**6. Turn Up and Link Up**

**6.1** Upon insertion the CTU will power up the DSL pair with DC voltage. Voltage levels on the DSL will be either +/-190Vdc, +/-130Vdc, or +/-100Vdc depending on the specific CTU version being used. The CTU will immediately begin a search cycle to automatically detect and link with the first Repeater or Remote Terminal on the DSL.

**6.2** 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 reattempt to link with a repeater or RTU every 10 minutes. During the pre-linking phase, the DSL LED will fast blink (once per second) and the MINOR LED will be OFF. If the card senses a shorted DSL or if it has exhausted its attempts to link, the DSL LED will go into a slow blink (once every two seconds).

**6.3** The CTU links with the first outside plant element and then each subsequent element continues to link up in turn down the line. Allow up to five minutes for all sections to link before beginning any troubleshooting.

**7. LED Diagnostic Lamps**

There are five LED lamps used to display different information or states during normal operation.

**Table 1.0**

| LED | State | Description |
|---|---|---|
| DSL (Green) | ON | CTU is linked with first element |
| DSL (Green) | Fast Blink (2 / sec) | CTU is trying to link with first element |
| DSL (Green) | Slow Blink (1 / sec) | CTU has detected a short and is waiting to restart |
| MINOR (Yellow) | ON | CTU has linked once but has now dropped link |
| MINOR (Yellow) | ON with (.5 sec) Wink | CTU will wink the number of the bad span every 10 sec |
| CLK/TEST (Green) | ON | CTU detects a proper timing reference from the ACU |
| CLK/TEST (Green) | Fast Blink | A Loop or Drop test is in progress (4Tel or MLT) |
| BUSY (Red) | ON | A phone is off hook or is ringing on at least one channel |
| DIAG (Multi) | OFF | Diagnostics (Not used in initial release) |

**8. Troubleshooting**

**8.1** When the CTU is first plugged in all LED lamps illuminate briefly followed by a blinking DSL LED as it initiates the linking process. The CTU blinks its DSL link LED until it is linked with an ADR, TAD or RTU even though it may have already linked with a Straight Through Repeater (STR) or Straight Through Repeater Module (STR MOD). This time can vary depending on the length of the loop, from 20 seconds to five minutes. If the CTU shows no LED indications, check the power connections to the shelf. If the shelf and other installed cards are operating, return the card for repair.

**8.2** If the CTU determines there is a shorted DSL it will stop powering the line immediately. This condition is indicated by a slow blink of the DSL lamp. Once every minute, the CTU will briefly power the DSL to determine if the shorted condition has been corrected. If so, the CTU will continue with the linking process.

**8.3** Once the system links, check for dial tone at the XCel field unit(s). If unable to draw dial tone: verify at the Main Distribution Frame (MDF) that a connection does exist to the switch. Although the pair may be physically connected, the necessary translations may not be complete.

**8.4** In new installations before the outside plant elements are installed the DSL LED lamp should blink two times per second as the CTU attempts to link.

NOTE: All XCel field units have a blinking LED indicator to show that it is being powered, and glows steadily when linked.

**8.5** If the outside plant elements are installed and no DSL link can be established, there is either a loading coil in the loop or the DSL loop limits have been exceeded. If the pair assigned is thought to be non-loaded, then a check for an unknown load coil is highly recommended.

NOTE: If the DSL connection is reversed, similar LED indicators will result. A load coil does not prevent line powering, but does block the 136 kHz digital signal from the RTU.

**8.6** When the CTU initially links with the entire loop, it 'inventories' all of the "smart" elements. If any cable section is cut, or if any OSP element fails the MINOR LED lamp will illuminate. Once every ten seconds the MINOR lamp will blink (dark) the sequence number of the failed intelligent OSP element or bad span on the DSL, (NOT COUNTING the STRs or STR MODs). For example: for a system comprised of one STR, 2-ADRs and 1-RTU. The STR and STR MOD are 'dumb' elements and are not inventoried. Thus, there are three elements in this example system. If the RTU fails, or if the cable leading to the RTU fails, the MINOR lamp will blink three times every 10 seconds. If the first ADR away from the CO fails, the MINOR lamp will blink once every 10 seconds.

**8.7** Anytime the central office battery is removed from any working line, the CTU assumes this is a mechanized loop test signal. The TEST lamp illuminates, and the tip and ring for the line under test on the switch side of the line card are immediately switched to the test signature resistor network. The appropriate fault condition is then reported to the 4Tel or MLT system. During the course of re-arranging lines from the switch to the CTU, you may remove battery on one or more lines and cause the CTU to respond by illuminating the TEST lamp. You can ignore this condition-it will time out after three minutes and reset to normal. All other lines continue to operate normally during the TEST state.

## 9. MDF Protectors

### 9.1 GoDigital APPROVED MDF Protectors

**Table 2**

| 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 |

### 9.2 NON-approved XCel MDF Protectors:

**Table 3**

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

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