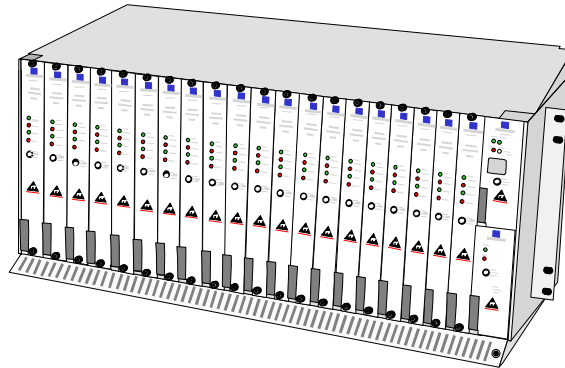


1. Purpose

This document provides detailed installation instructions for each XCel Multi-Service Central Office Terminal Shelf (COT). This document is included as an attachment to the *System Practice*. GoDigital recommends that one copy of the complete *System Practice* be kept in each Central Office that is equipped with XCel Systems.

Figure 1-1



2. Products

This Installation Note is relevant for the following GoDigital products:

System / Product Name	Part #	Description
XCel Multi-Service Shelves		
SHLF H 19 REAR ACCESS	990117	19-inch XCel Multi-Service Shelf
SHLF H 23 REAR ACCESS	990118	23-inch XCel Multi-Service Shelf

2.1 Contents

Overview.....Item 3
 Engineering Information.....Item 4
 Multi-Service Shelf Step By Step Installation – Office Installations.....Item 5

Summary of Installation Steps for CO Shelf Installations Ref Paragraph

 Unpack the Shelf Hardware from the Shipping Package5.1
 Review this INST NOTE5.2
 Mounting Flanges (For 19-inch Shelf Only).....5.3
 Mount the XCel Multi-Service Shelf in the Relay Rack5.4
 Chassis Ground5.5
 Connect the 25 Pair AMP Connectors.5.6
 Secure the AMP Connectors to the Shelf with Tie-Wraps.....5.7
 Timing 1 Reference.....5.8
 Timing 2 Reference (Optional).....5.9
 Digital Ground (Optional).....5.10
 Bypass Pairs (Optional).....5.11
 Contact Alarms5.12
 Install Fuses in the Fuse Panel.....5.13
 “A” and “B” –48 Vdc Office Power Cabling5.14
 Continuity Check (Optional).....5.15
 Attach label for POSITION CIRCUIT ASSIGNMENT5.16
 Attach label for SHELF NUMBER5.17
 Shelf Installation is Complete5.18

CTU Plug-Ins 6
 ACU Plug-In Slot 7
 Detail of Grounding Options 8
 XCel Shelf Installation in CABINETS and REMOTE Locations 9
 Service Line Connector Pin-Out Assignments 10
 DSL Connector Pin-Out Assignments..... 11
 GoDigital Approved and Non-Approved Protectors 12

Installation Note

XCel Shelf Installation: Central Office & Remote



3. Overview

Section 5 of this document provides detailed “step-by-step” shelf installation instructions for Central Office installations. Section 12 of this document provides detailed instructions when installing an XCel Multi-Service Shelf in cabinet or remote location.

The XCel Multi-Service COT is used for GoDigital’s XCel Subscriber Access Systems. This includes the XCel-8, XCel-12 and XCel-4a Systems. The Multi-Service Shelf has provisions for up to twelve (12) network-side pair connections per slot to the Main Distribution Frame, and for connection to up to two (2) outside cable pairs for Digital Subscriber Line (DSL) distribution per slot. Plug-in cards for the shelf digitize and multiplex combinations of data and voice channels and transmit them over the DSL to remote terminal units where they are de-multiplexed and reconverted to analog signals for subscriber access. This shelf requires standard –48Vdc central office battery power. A diagram of the shelf connectivity is provided in **Figure 4.7-1**.

4. Engineering Information

4.1 XCel Shelf Placement Guidelines

- 4.1.1 Cable distance from Switch (POTS) to Shelf: 300 feet or less recommended, 500 feet maximum.
- 4.1.2 Cable distance from DSLAM (ADSL) to Shelf: 1,000 feet or less recommended, 1,000 feet maximum.

4.2 Mounting Options for XCel Shelves

XCel Shelves (part no. 990117 and 990118) are 11.5” high and mount in a 19” or 23” rack.

4.3 Rack Spacing for XCel Shelves

Shelves must be spaced in a rack based on the following spacing between shelves.

Table 4.3-1: XCel Shelf Rack Spacing Between Shelves

XCel Shelf	Part No.	Spacing	Max per 7' Bay
19-inch Multi-Service Shelf	990117	2U or 3.5 inches	5 shelves
23-inch Multi-Service Shelf	990118	3U or 5.25 inches	4 Shelves

4.4 Cooling and Heat Dissipation in XCel Shelves

- 4.4.1 The XCel Shelves are convection cooled. No external cooling or fans are required.
- 4.4.2 **7-foot Bay Heat Dissipation and Bay Loading**
XCel Shelves are compliant with GR-63 in the Central Office when bays are loading in accordance with the following table.

Table 4.4-1

XCel Shelves in 7 Foot Rack/Bay: Heat Dissipation Loading and Shelf Loading

XCel-8					
	<i>(XCel-8 # of STRs Assumed: 3.0 STRs per System)</i>				
# of Shelves @ 6 CCS	Width	W/shelf (HEAT)	Tot Watts (HEAT)	W/sq ft (HEAT)	POTS Lines
4 Shelves Max 23"	23 in	189 W	756 W	94.5 W	640
5 Shelves Max 19"	19 in	152 W	760 W	95.0 W	640
XCel-12					
	<i>(XCel-12 # of STRs Assumed: 1.5 STRs per System)</i>				
# of Shelves @ 6 CCS	Width	W/shelf (HEAT)	Tot Watts (HEAT)	W/sq ft (HEAT)	POTS Lines
4 Shelves Max 23"	23 in	238 W	952 W	119.0 W	960
5 Shelves Max 19"	19 in	192 W	960 W	120.0 W	960
XCel-4a					
	<i>(XCel-4a # of STRs Assumed: 3.0 STRs per System)</i>				
# of Shelves	Width	W/shelf (HEAT)	Tot Watts (HEAT)	W/sq ft (HEAT)	ADSL Lines
4 Shelves Max 23"	23 in	216 W	863 W	107.9 W	160
5 Shelves Max 19"	19 in	173 W	865 W	108.1 W	160

4.4.3 Single Shelf Heat Dissipation and Power Required

XCel Shelves can also be mounted in OSP cabinets. The following table gives the heat dissipation for single shelves based on various card loads, and is useful in planning cabinet heat dissipation.

Table 4.4-2: Single Shelf Heat Dissipation and Power Required 19-inch and 23-inch XCel Shelves

@ 6 CCS	XCel-8			XCel-12			XCel-4a			
	<i>(STRs Assumed: 3.0 STRs per System)</i>			<i>(STRs Assumed: 1.5 STRs per System)</i>			<i>(STRs Assumed: 3.0 STRs per System)</i>			
Loop Assumptions	W/shelf (HEAT)	W/shelf (PWR Rqd)	POTS Lines	W/shelf (HEAT)	W/shelf (PWR Rqd)	POTS Lines	# of Line Cards	W/shelf (HEAT)	W/shelf (PWR Rqd)	ADSL Lines
1	13 W	45 W	8	20 W	36 W	12	1	45 W	55 W	4
6	60 W	159 W	48	77 W	162 W	72	3	88 W	160 W	12
8	78 W	205 W	64	100 W	212 W	96	4	109 W	212 W	16
10	97 W	251 W	80	123 W	263 W	120	5	130 W	265 W	20
12	115 W	307 W	96	146 W	312 W	144	6	152 W	317 W	24
16 <i>Max 19-inch</i>	152 W	405 W	128	192 W	410 W	192	8 <i>Max 19-inch</i>	173 W	422 W	32
20 <i>Max 23-inch</i>	189 W	504 W	160	238 W	508 W	240	10 <i>Max 23-inch</i>	216 W	527 W	40
<i>At -44 Vdc</i>										

4.5 Fusing and Input Power to XCel Shelves

4.5.1 Fusing

-48Vdc A and B input power feeds must be independently fused. There are three options (20, 15 or Amp Fuses). See [Paragraph 5.13](#).

4.5.2 Input Current Requirements

The following table identifies the current requirements for XCel Shelves.

Table 4.5-1: XCel Shelf Peak Current for Fusing

System:	XCel-8				XCel-12				XCel-4a	
	<i>(STRs Assumed: 3.0 STRs per System)</i>				<i>(STRs Assumed: 1.5 STRs per System)</i>				<i>(STRs Assumed: 3.0 STRs per System)</i>	
Loop Assumptions	Amps at 6 CCS	Amps at 9 CCS	Amps at 18 CCS	Amps at 36 CCS	Amps at 6 CCS	Amps at 9 CCS	Amps at 18 CCS	Amps at 36 CCS	# of Line Cards	CCS Does NOT APPLY to XCel-4a
1	1.0 A	1.1 A	1.1 A	1.1 A	0.8 A	0.9 A	1.0 A	1.1 A	1	1.2 A
6	3.6 A	3.8 A	4.3 A	4.7 A	3.7 A	3.9 A	4.4 A	4.9 A	3	3.6 A
8	4.7 A	4.9 A	5.6 A	6.2 A	4.8 A	5.1 A	5.7 A	6.4 A	4	4.8 A
10	5.7 A	5.9 A	6.9 A	7.6 A	6.0 A	6.3 A	7.1 A	7.9 A	5	6.0 A
12	7.0 A	7.3 A	8.2 A	9.1 A	7.1 A	7.5 A	8.4 A	9.6 A	6	7.2 A
16 <i>Max 19-inch</i>	9.2 A	9.6 A	10.7 A	12.1 A	9.3 A	9.9 A	11.0 A	12.8 A	8 <i>Max 19-inch</i>	9.6 A
20 <i>Max 23-inch</i>	11.5 A	11.9 A	13.2 A	15.1 A	11.6 A	12.2 A	13.6 A	15.9 A	10 <i>Max 23-inch</i>	12.0 A
<i>At -44 Vdc</i>										

4.6 XCel Shelf Cabling

4.6.1 CO battery, battery return, and CO ground to the shelf through a rack mounted fuse panel. A and B power feeds are wired together inside the shelf. Providing separate fuses at the fuse panel to each of these feeds supports battery redundancy.

4.6.2 Following is a summary of all required and optional XCel Shelf cabling.

Installation Note

XCel Shelf Installation: Central Office & Remote



Table 4.6-1: Cable and Wire Connections to the XCel Shelf

Input/Output	# of Pairs / Conductors	Connection	Conductor AWG	Destination
Chassis Ground	- / 1 wire	screw down	26 gauge or larger	Rack Frame
Service Lines from Switch or DSLAM	19-inch: 8 each 25 pair cables	C1-C8: 25 pair AMP Champ	26 gauge or larger	Switch or DSLAM via MDF
	23-inch: 10 each 25 pair cables	H1-H10: 25 pair AMP Champ		
XCel (DSL) System Loops	2 each 25 pair cables	DSL A & DSL B 25 pair AMP Champ	26 gauge or larger	OSP Loops: DSL #1-1 through DSL #20-2 (2 per slot) via MDF
Timing				
• Single Shelf	1 pair / 2 wires	wire wrap	26 gauge or larger	Clock Source
• Daisy Chained Timing	2 pair / 4 wires	wire wrap	26 gauge or larger	Clock + Other Shelves
Contact Alarms				
• MAJOR Audible	1 pair / 2 wires	wire wrap	26 gauge or larger	Office Alarm System (Form C dry, normally open, contacts)
• MAJOR Visible	1 pair / 2 wires	wire wrap	26 gauge or larger	
• MINOR Audible	1 pair / 2 wires	wire wrap	26 gauge or larger	
• MINOR Visible	1 pair / 2 wires	wire wrap	26 gauge or larger	
Digital Ground (Optional)	- / 1 wire	screw down	26 gauge or larger	See XXXX
By-pass Pair (Optional)				
• Daisy Chained By-pass	2 pair / 4 wires	wire wrap	26 gauge or larger	
Power				
• -48 Vdc Battery A	- / 1 wire	screw down conn.	12 or 14 gauge	Battery Power From Fuse Panel
• Battery Return A	- / 1 wire	screw down conn.	12 or 14 gauge	
• -48 Vdc Battery B	- / 1 wire	screw down conn.	12 or 14 gauge	
• Battery Return B	- / 1 wire	screw down conn.	12 or 14 gauge	
• CO Ground	- / 1 wire	screw down conn.	12 or 14 gauge	Main Ground Bar/Bus
Craft Access (Rear)	cable	RS232	26 gauge or larger	Craft Access - PC
Craft Access (Front)	cable	RS232	26 gauge or larger	Craft Access - PC

4.7 XCel Equipment Provisioning and Service Provisioning.

- 4.7.1 The XCel Shelf requires no provision. It just needs proper mounting and cable connections.
- 4.7.2 However, the XCel Shelf plug-in modules may require provisioning of some switch options. Details of XCel plug-in provisioning options and settings are provided in the INST NOTE shipped with each plug-in module. Additional copies of these and all INST NOTES are available from GoDigital on request.
- 4.7.3 Any XCel System supported in the XCel Multi-Service Shelf is supported with LFACS tables from Telcordia for facilities (cable pair) tracking. GoDigital issues a separate summary of LFACS table support for GoDigital Systems, including all XCel Systems and this is available for LFACS users directly from GoDigital (reference: GoDigital document 010188, INST NOTE, LFACS Guidelines for XCel & GDSL Systems).
- 4.7.4 Service lines with XCel-8 (POTS), XCel-12 (POTS) and XCel-4a (ADSL) are provisioned at the switch and DSLAM in accordance with normal procedures, as though the services are being delivered from the office directly to the subscriber. XCel Systems act only as extensions. They do not provision services themselves.

Installation Note

XCel Shelf Installation: Central Office & Remote

Figure 4.7-1

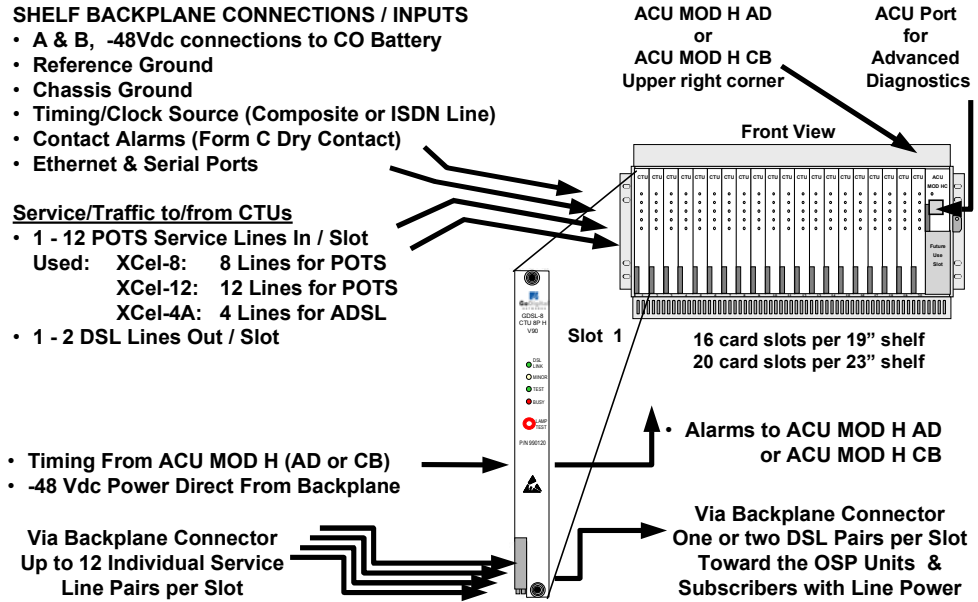


Figure 4.7-2
Front View of 23-inch Multi-Service Shelf

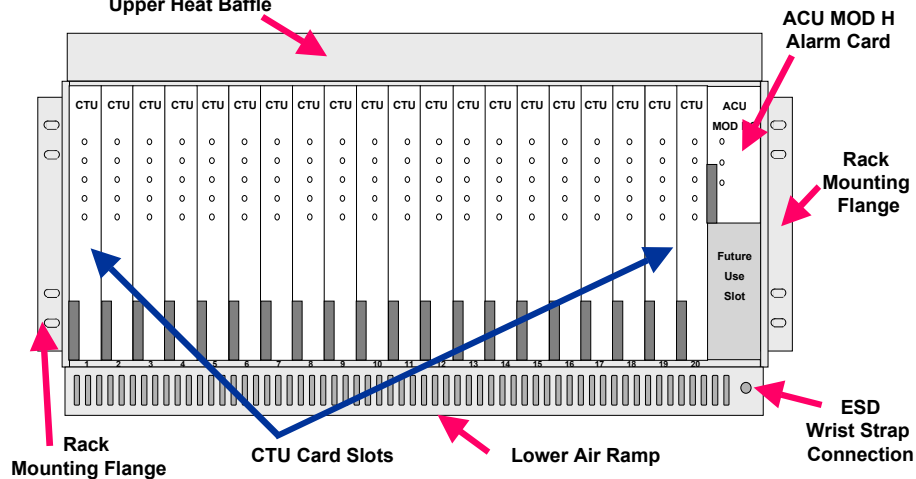
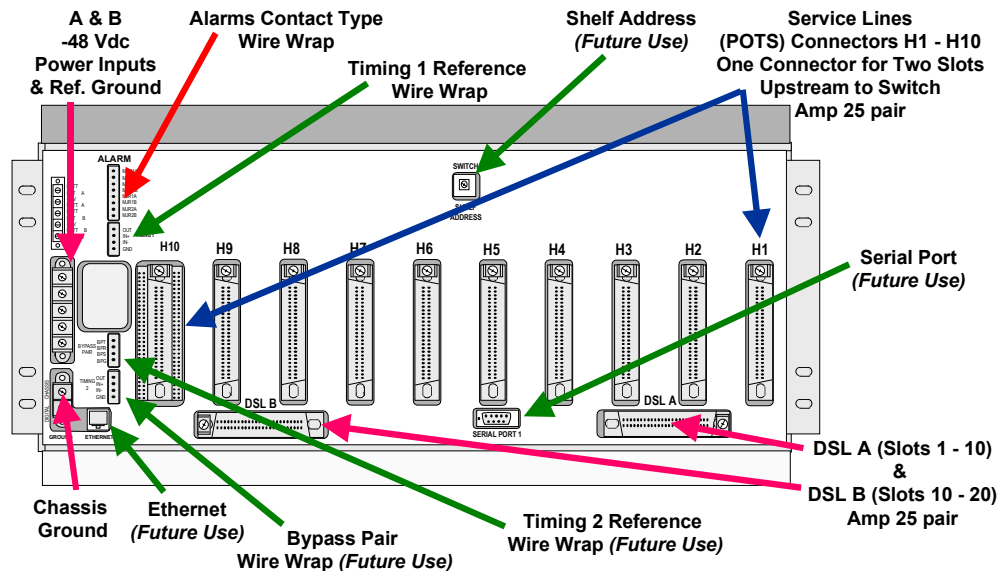


Figure 4.7-3: Rear View of 23-inch Multi-Service Shelf



Installation Note

XCel Shelf Installation: Central Office & Remote

5. Multi-Service Shelf Step by Step Installation Instructions.

5.1 Unpack the Shelf Hardware from the Shipping Package

Materials include:

- 19-inch or 23-inch Shelf
- XCel System Practice documentation
- Mounting Hardware Kit, including:
 - 4 ea. mounting screws
 - Tie wraps for Amp Connectors
 - Stick on label for SHELF NO.
 - Stick on label for POS. CIRCUIT ASSIGNMENT

5.2 Review this INST NOTE

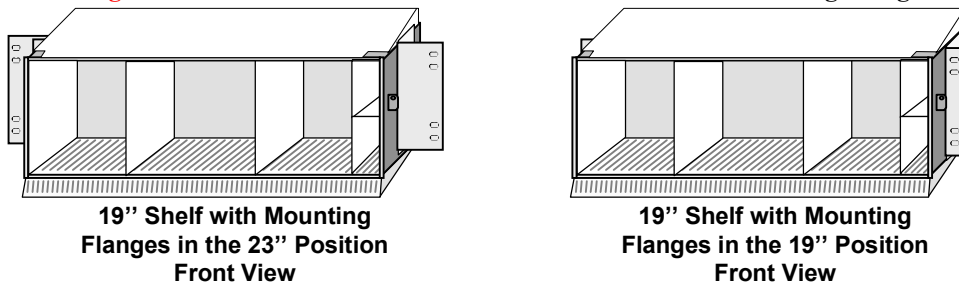
Review and become familiar with this INST NOTE prior to starting. This will make installation efficient and avoid unnecessary delays.

5.3 Mounting Flanges (For 19-inch Shelf Only)

If the 19-inch Shelf is to be mounted in a 23-inch rack, unscrew and flip the mounting flanges on the side of the shelf to the 23-inch rack mounting position. See the following figure.

NOTE: The 19-inch Shelf has convertible mounting flanges and can mount on either a 19-inch or 23-inch rack. No extension ears are needed.

Figure 5.3-1: 19-inch Multi-Service Shelf – Convertible Mounting Flanges



5.4 Mount the XCel Multi-Service Shelf in the Relay Rack

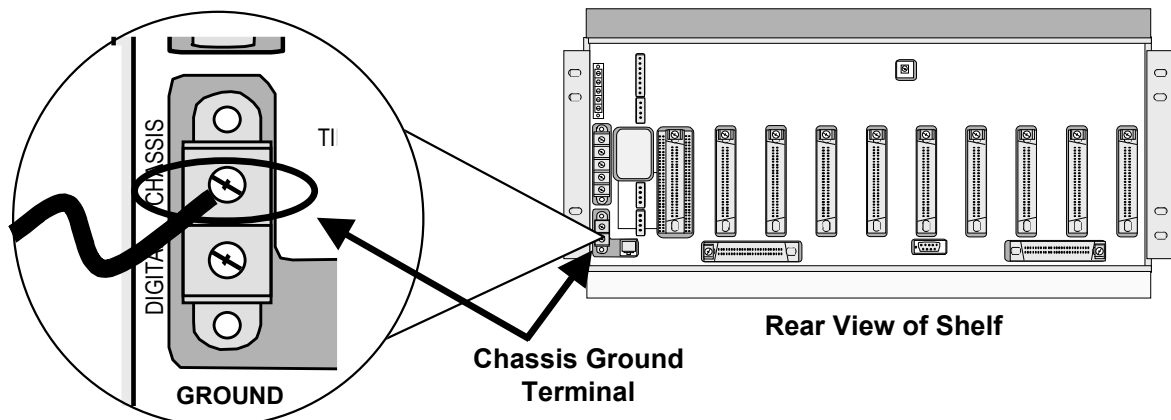
Mount the Multi-Service Shelf in the selected relay rack using the four screws provided. The XCel Multi-Service Shelf should normally be mounted:

- Within 300 feet total POTS cabling distance (max of 500 feet) to the central office POTS switch for XCel-8 and XCel-12 with analog POTS switch interfaces.
- Within 1,000 feet total ADSL cabling distance to ADSL DSLAM host for ADSL extension use.

5.5 CHASSIS GROUND

A "CHASSIS GROUND" is provided on the backplane. Attach the CHASSIS GROUND to bare metal on the rack that the shelf is installed in. This is a safety and ESD ground. See the following figure.

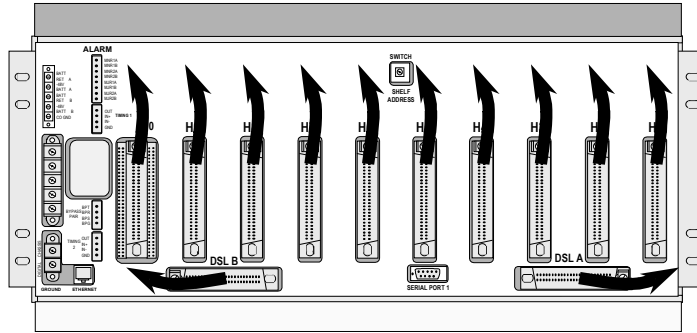
Figure 5.5-1: Multi-Service Shelf CHASSIS GROUND



5.6 Connect the 25 Pair AMP Connectors

Pull ten (19-inch Shelf) or twelve (23-inch Shelf) 25-pair cables to the MDF. At the shelf, terminate the cables with AMP Champ 90-degree Female connectors or the exact equivalent. See below for cabling.

Figure 5.6-1: Multi-Service Shelf – AMP Champ Cabling



NOTE: Each backplane 25-pair connector is located between two card slots, and provides the connections for those two slots. See *Section 10 and Section 11* of this document for connector and pin assignment information.

5.7 Secure the AMP Connectors to the Shelf with Tie-Wraps

Secure the AMP Connectors to the Shelf with Tie-Wraps to the Tie-Wrap anchors on each connector.

5.8 TIMING 1 Reference

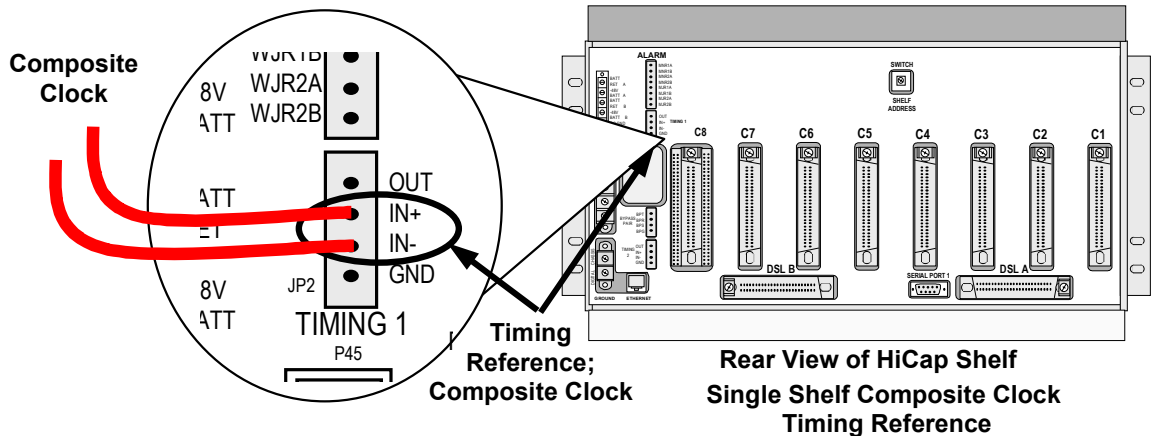
Route a Composite Clock (64 kHz) timing reference (source) or alternatively a Basic Rate ISDN line as a reference to the TIMING 1 backplane connector with one of the approved clock sources. There are three basic wiring options for the timing reference source:

- Option 1 Single Shelf with Direct Composite Clock Timing Reference,
- Option 2 Single Shelf with Direct ISDN Timing Reference, or
- Option 3 Daisy Chained (multi-shelf) Configuration with Composite Clock Timing Reference.

NOTE: GoDigital's XCel Analog POTS systems are designed to support V.90 analog modems and require a timing reference. A single reference is adequate. Loss of timing reference in an XCel POTS V.90 System will NOT cause a loss of POTS service, but will cause modem speeds to drop to V.34 speeds. A timing reference is NOT required when supporting only the XCel-4a, ADSL extension system in the XCel Shelf. The XCel-4a does not use reference timing, it draws timing from the ADSL lines coming from the DSLAM.

Option 1: Single Shelf with Direct Composite Clock (64 kHz) Timing Reference

Figure 5.8-1A: Single Multi-Service Shelf with Composite Clock (64 kHz) Timing Reference



Installation Note

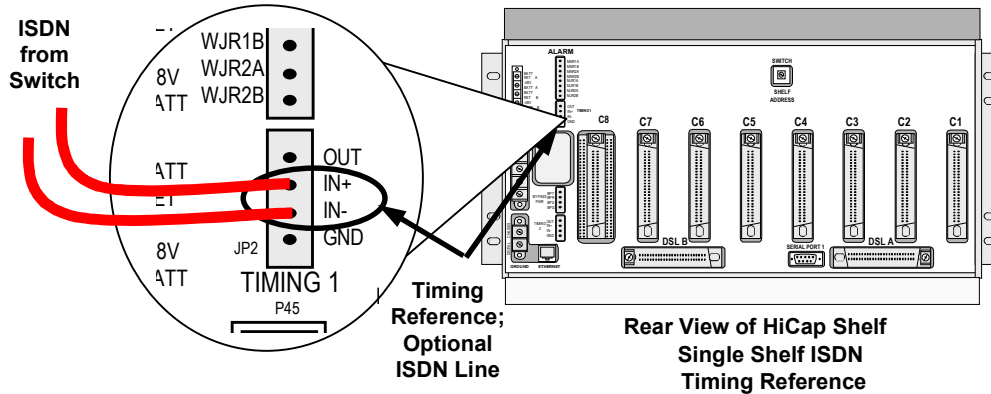
XCel Shelf Installation: Central Office & Remote



Option 2. Single Shelf with Direct ISDN Timing Reference.

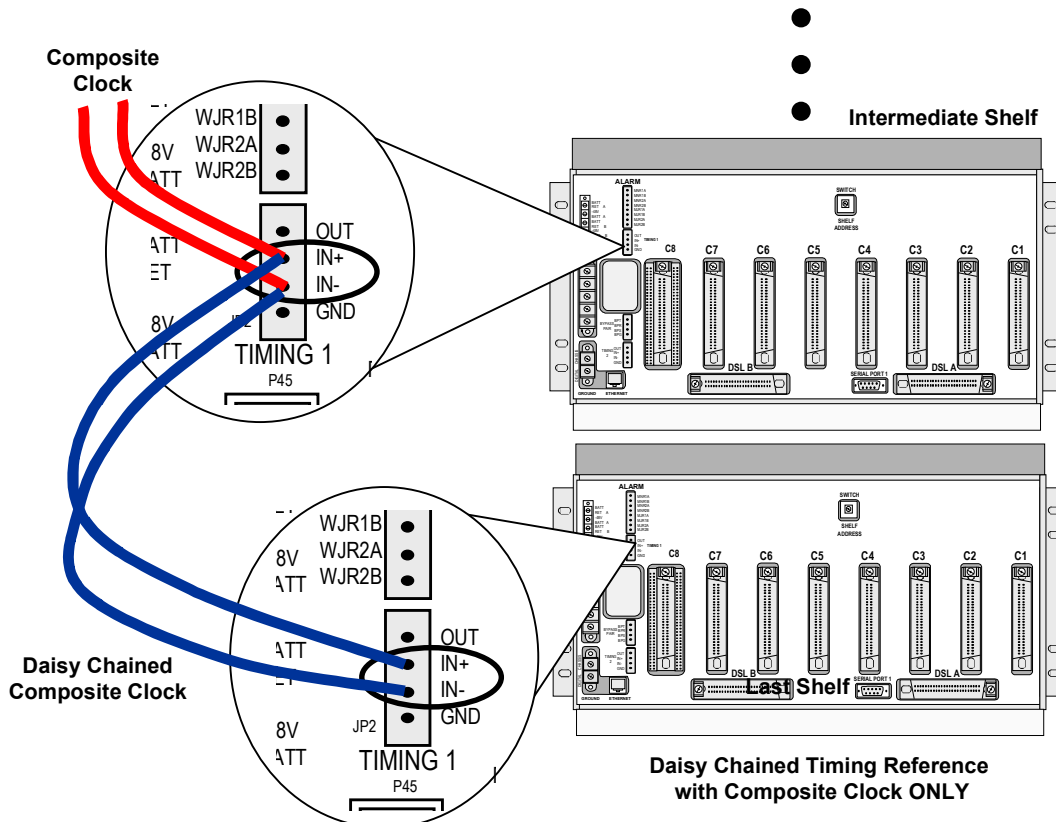
In some remote offices or locations, a composite clock may not be available. In this case a switched ISDN Line can be used as a timing reference. The wiring is the same as used in a Single Shelf Composite Clock reference but with an ISDN line. See the following figure.

Figure 5.8-2: Single Multi-Service Shelf with ISDN Timing Reference



Option 3. Daisy Chained (multi-shelf) Configuration with Composite Clock (64 kHz) Timing.

Figure 5.8-3: Multiple Shelf Daisy Chained Composite Clock (64 kHz) Timing Reference.



NOTE: Timing Settings: The XCel Timing options for Composite Clock (64 kHz), ISDN, and Daisy Chained Composite Clock (64 kHz) require settings be made on the Alarm Card used in the Shelf. See the XCel System Practice or the Alarm Card Installation Note shipped with each Alarm Card.

NOTE: A T1 timing source is NOT supported by the XCel Multi-Service Shelf. If a composite clock source is used this must be a standard 64 kHz timing source.

5.9 TIMING 2 Reference (Optional)

Each XCell Multi-Service Shelf has a second connector to support a back-up or redundant timing source. This connector is wired in the same manner as the TIMING 1 connector. SEE THE BELOW NOTE.

NOTE: Wire the TIMING 2 Reference ONLY IF REAR ACCESS to the Shelf will NOT BE AVAILABLE once the shelf is installed. TIMING 2 connections MAY BE USED in future XCell Systems (including those planned with integrated interfaces) to enable a redundant timing source for the XCell Shelf. Current XCell Systems do not require or support redundant timing. If a shelf is being mounted WITHOUT FUTURE ACCESS to the backplane connections, the TIMING 2 connections should be wired.

5.10 DIGITAL GROUND (Optional)

5.10.1 The “DIGITAL GROUND” is provided on the backplane below the CHASSIS GROUND.

5.10.2 Prior to wiring the DIGITAL ground, read the following note.

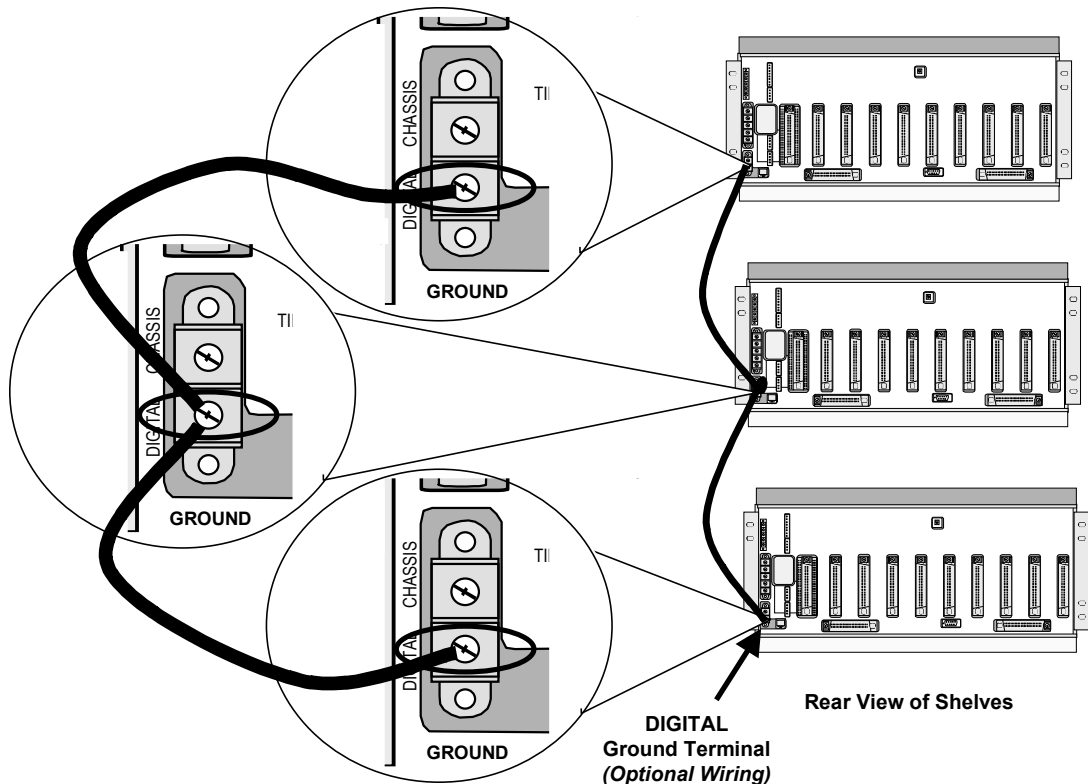
NOTE: The “DIGITAL” ground lug on the backplane does not require grounding on current XCell applications. The DIGITAL ground connection is for future use in applications that require connection between multiple shelves sharing high-speed digital payload or backplane data.

Wire the DIGITAL ground ONLY if BOTH of the following are true:

- REAR ACCESS to the Shelf will NOT be available once the shelf is installed, AND
- More than one XCell Shelf is being installed in the same cabinet or rack.

5.10.3 Attach the Multi- DIGITAL GROUND to other XCell Shelves in the rack or remote location. See the following figure.

Figure 5.10-1: Multi-Service Shelf DIGITAL GROUND (Optional)



Installation Note

XCel Shelf Installation: Central Office & Remote



5.11 BYPASS Pairs (Required when NO REAR ACCESS will be available once installed.)

NOTE: Wire the BYPASS Pairs ONLY IF REAR ACCESS to the Shelf will NOT BE AVAILABLE once the shelf is installed.

BYPASS connections WILL BE USED in future XCel Systems (including those planned with integrated interfaces) to present loop and drop test results to either the MLT test controller in an office, or at a DLC remote terminal site to an MCU for digital bypass, for direct bypass transport of MLT test results/signatures.

While current XCel Systems are not using this feature, it is planned. If a shelf is being mounted without future access to the backplane wiring connections, the BYPASS connections should be pre-wired.

5.11.1 Grounding BPG to CO GND if required:

5.11.1.1 To determine whether this grounding step for BPG is required, check the label on the side of the XCel Shelf. See below figure.

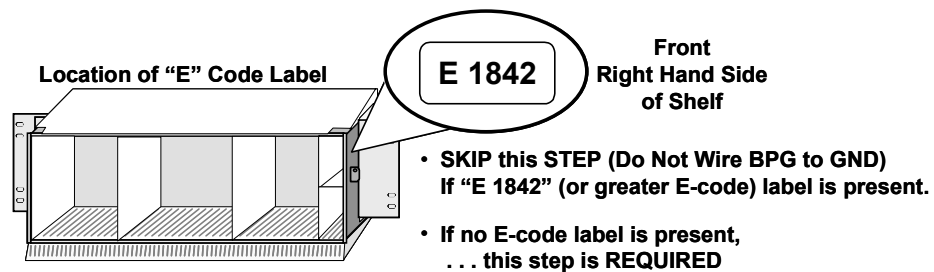
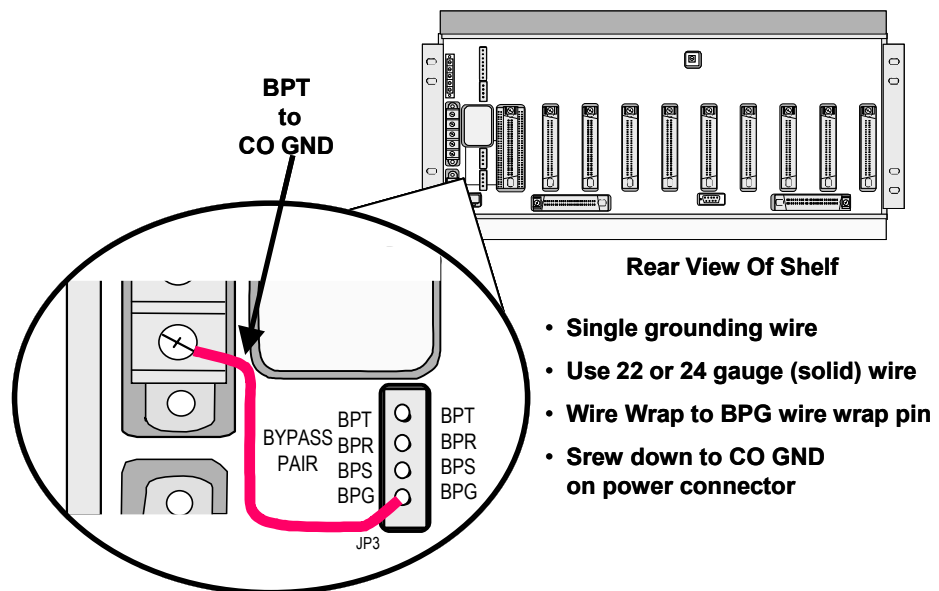


Figure 5.11-1: Location of E-Code Label

- If the "E-Code" label is present and is "E 1842" or greater, then skip [step 5.11.1](#) and go to [Step 5.11.2](#).
- If the "E-Code" label is not present then ATTACH a single grounding wire from the CO GND to the BPG wire wrap pin. See below figure. Then go to [step 5.11.2](#).

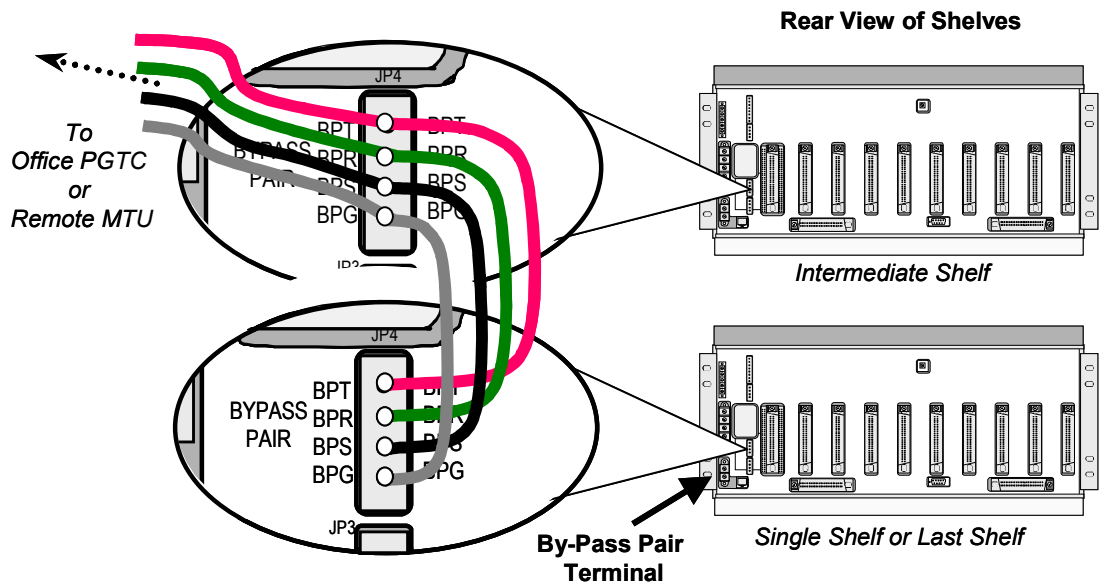
Figure 5.11-2: Grounding BPG to CO GND



5.11.2 ATTACH four BYPASS conductors to the XCel Shelf in the rack or remote location. See the following figure for both single shelf and for daisy-chained or intermediate shelves.

- BPT By-Pass Tip REQUIRED
- BPR By-Pass Ring REQUIRED
- BPS By-Pass Sleeve Not normally required.
Used when bypass pair runs in a shielded pair cable.
- BPG By-Pass Ground Not normally required, but shelf should be wired.

Figure 5.11-1: XCel MSA Shelf BYPASS Pair(s)
(REQUIRED, if NO REAR ACCESS will be available after installed.)



Installation Note

XCel Shelf Installation: Central Office & Remote

5.12 Contact Alarms

Contact Alarms are provided to support Audible and Visual Alarms for both MAJOR and for MINOR alarms. The following table identifies the Alarm functions for each of the XCel Multi-Service Shelf Alarm contacts. Wire wrap leads from office alarms to rear of shelf. See the following figure for location of Contact Alarm wire wrap connections.

Figure 5.12-1: Location of Major and Minor Contact Alarm Terminals

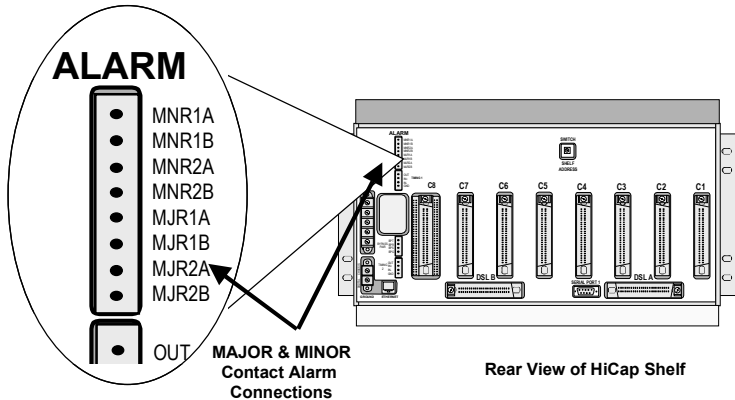


Table 5.12-1: Contact Alarms and Functions

Alarm Pin	Relay Contact Sets	Function
MN1A & MN1B	Minor 1A & Minor 1B	Minor VISUAL Alarm Contact set, not affected by Alarm Cutoff Switch
MN2A & MN2B	Minor 2A & Minor 2B	Minor AUDIBLE Alarm Contact set, Disabled by Alarm Cutoff Switch
MJ1A & MJ1B	Major 1A & Major 1B	Major VISUAL Alarm Contact set, not affected by Alarm Cutoff Switch
MJ2A & MJ2B	Major 2A & Major 2B	Major AUDIBLE Alarm Contact set, Disabled by Alarm Cutoff Switch

5.13 Install Fuses in the Fuse Panel

There are three fusing options for the -48 Vdc (“A” & “B”) power. These options are presented below. Options #1 and #2 support full loading of either the 19-inch or 23-inch Multi-Service Shelf at 36 CCS. Option #3 has some limitations that are noted below. See also the current tables in Section 3 of the System Practice for actual fusing (peak) peak current requirements

Two “A” & “B” power feeds provide full redundancy. Each feed must be fused separately. A full shelf will draw approximately 10 Amps under normal operation.

Fusing Option #1.

ONE (1) EACH 20 AMP FUSE: for each A and B power Feed

Fusing Option #1:

- Supports XCel-8 or XCel-12 Systems fully loaded in a 19-inch or 23-inch Multi-Service Shelf.
- Supports up to a full 36 CCS in either shelf, based on worst case peak traffic current demands (36 CCS) and office power (-48 Vdc).

Fusing Option #2.

Two (2) EACH 10 AMP FUSES: for EACH A and B power Feed

Fusing Option #2:

- Supports the same Multi-Service Shelf Load as Option #1, but may be easier for some office sites to implement due to the greater availability of 10 Amp fuses and rated fuse panels and cabling:
- Supports XCel-8 or XCel-12 Systems fully loaded in a 19-inch or 23-inch Multi-Service Shelf.
- Supports up to a full 36 CCS in either shelf, based on worst case peak traffic current demands (36 CCS) and office power (-48 Vdc).
- Note: Special cabling considerations must be made for Option #2. See [Paragraph 5.14.2.2](#)

Fusing Option #3.

ONE (1) EACH 15 AMP FUSE: for EACH A and B power Feed

Fusing Option #3 for 19-inch Multi-Service Shelf:

- Supports 19-inch Multi-Service Shelf with XCel-8 or XCel-12 Systems fully loaded with 16 CTUs.
- Supports 19-inch XCel Shelf with XCel-8 or XCel-12 Systems, based on worst case peak traffic (36 CCS).

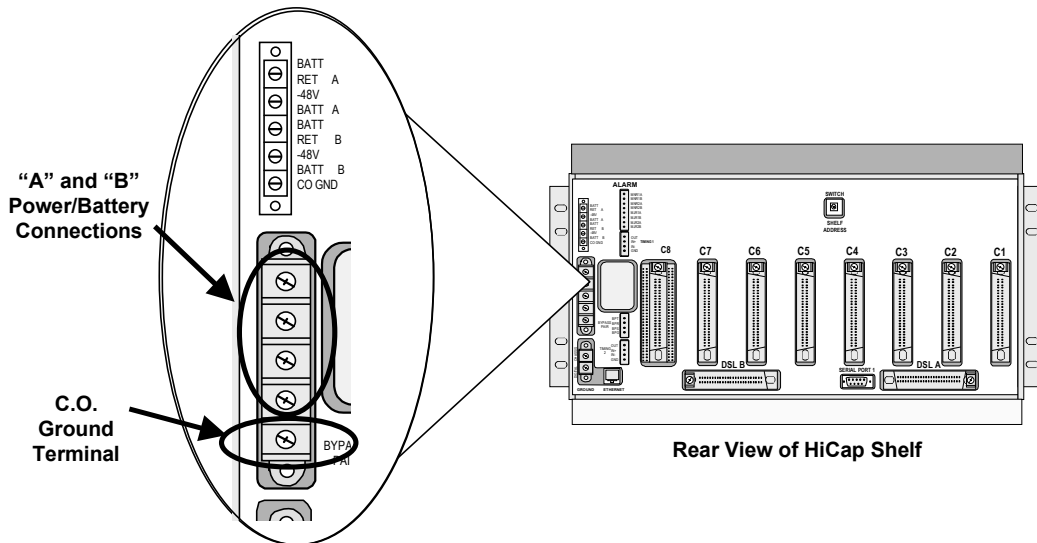
Fusing Option #3 for 23-inch Multi-Service Shelf:

- Supports XCel-8 Systems fully loaded in a 23-inch Multi-Service Shelf with 20 CTU-8s and at 36 CCS.
- Supports XCel-12 Systems fully loaded in 23-inch XCel Shelf with 20 CTU-12s up to 18 CCS, or
- Supports XCel-12 Systems with 18 CTU12s in a Multi-Service shelf to 36 CCS.
- Based on worst case peak traffic current demands at the designated and office power (-48 Vdc).

5.14 “A” and “B” -48 Vdc Office Power Cabling *(From the Fuse Panel to the XCel Shelf)*

GoDigital recommends power cabling using 14 AWG or larger cables in accordance with local practice. The power connector is designed for #14 spade lugs. Run the A and B office power from the fuse panel to the XCel Shelf. See following figure.

Figure 5.14-1: Power and CO Grounding Backplane Connector



5.14.1 Attach the office ground to the “CO GND” terminal on the backplane connector. See above for the location of the Office CO GND.

For detailed Office Ground procedures see **Section 8** of this document.

CAUTION: The COT requires that the CO GND ground terminal is adequately grounded or damage to the equipment will result. It is recommended that #14 AWG wire gauge is used.

5.14.2 Attach CO Battery and Battery Return to the shelf from a fuse panel.

NOTE: The CO power wiring configuration for Fusing Option #1 and Fusing Option #3 are the same. Wiring for Fusing Option #2 is different. Be certain to use the proper wiring as described below.

Installation Note

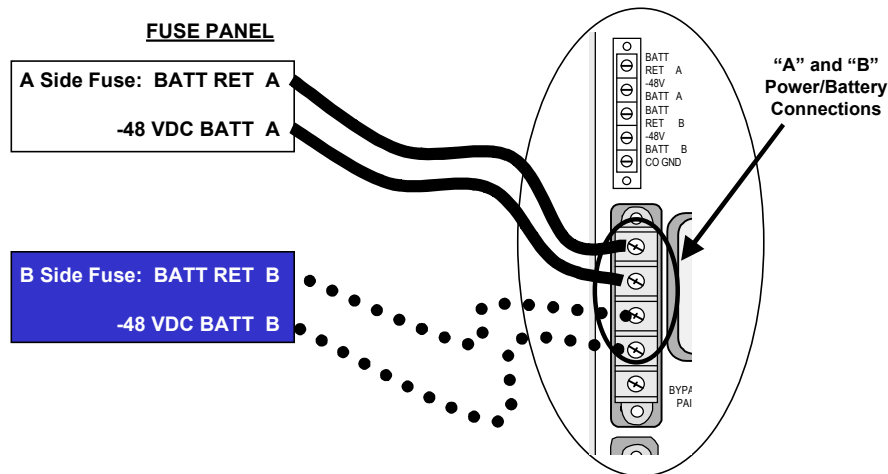
XCel Shelf Installation: Central Office & Remote

5.14.2.1 A & B power feed wiring for Fusing Options #1 (20 Amp) and #3 (15 Amp).

Run CO Battery and Battery Return to the shelf from a fuse panel. See the following figure.

- The “A” and the “B” battery connections are single leads wired in parallel. Wire both, the “A” and the “B” power (-48 Vdc Battery and + Battery Return) to individual fused circuits for redundancy at the fuse panel.

Figure 5.14-2: Cabling for Office Power Fusing Option #1 and Fusing Option #3



5.14.2.2 A & B power feed wiring for Fusing Option #2 (10 Amp)

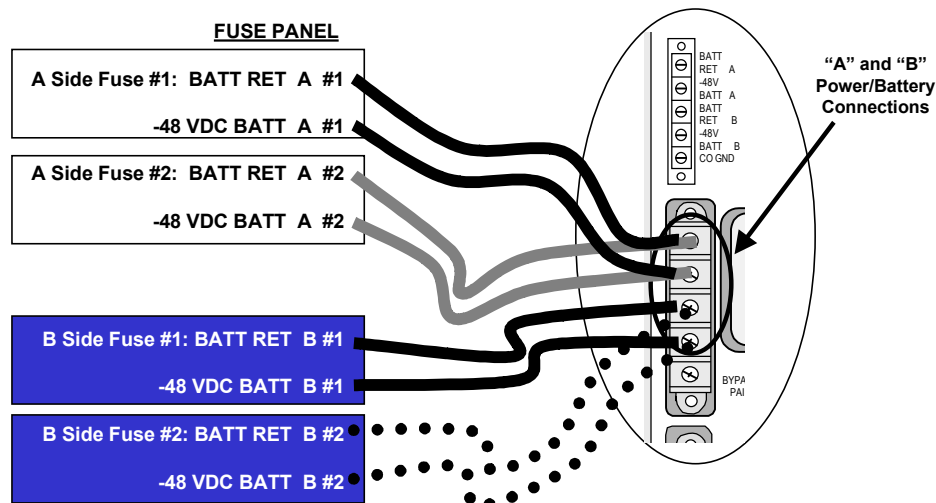
Run CO Battery and Battery Return to the shelf from a fuse panel. See the following figure.

- The “A” and the “B” battery connections are wired in parallel.
- Two “A” fuses are used, AND Two “B” fuses are used, FOUR fuses total.

NOTE: Cable Restrictions for Fusing Option #2: Power Cables from the Shelf to the Fuse Panel.

1. **MUST BE no longer than 20 feet** between the Shelf and the Fuse Panel
2. **MUST BE the same gauge**
3. **MUST go the same fuse panel.**
4. **A Side Cables MUST go to the same A side on the Fuse Panel**
5. **B Side Cables MUST go to the same B-side on the Fuse Panel**

Figure 5.14-3: Cabling for Office Power Fusing Option #2



5.15 Continuity Check (Optional)

Continuity between the shelf and the frame block can be verified using the optional STREAKER test card available from GoDigital. See **INST NOTE 010111** for continuity checking procedures using the STREAKER card.

5.16 Attach label for POSITION CIRCUIT ASSIGNMENT

A separate label is provided that enables the tracking of which slot supports specific circuits. Slot numbers are identified with blanks that can be filled in with the circuit (pair) number being served from the shelf.

5.17 Attach label for SHELF NO.

A separate label is provided that enables the identification and assignment of any local number or designation that is given to the shelf for tracking.

5.18 Shelf Installation is Complete.

The XCel Shelf is ready to accept -48Vdc power and to receive XCel CTU plug-in cards.

6. CTU (Channel Terminal Units) Cards (line cards)

- CTU cards plug into slots 1 through 16 in a 19-inch Shelf, or 1 through 20 in a 23-inch Shelf, starting left to right. All slots are equivalent. All cards are hot-loadable. Any Multi-Service XCel card may be intermixed in any ratio, e.g. XCel-8 CTUs, XCel-12 CTUs, XCel-4a etc.
- Each line card has its own power supply and backup timing source, although on POTS Systems with analog switch interfaces, V.90 modem performance requires the external clock source.
- A frame protector must be installed for each XCel system that will be driving an OSP loop. Use only GoDigital Approved frame protectors. See **Section 12** of this document for Approved and Non-Approved frame protectors, or the CTU Installation Note shipped with each line card.

7. ACU Plug-In Slot

- At the extreme right end of the shelf, the small upper card slot, is reserved for the ACU. The ACU collects alarms from the Central Office Terminal Unit (CTU) for display and contact alarm functionality. The ACU MOD H must be installed for alarm reporting.
- The ACU MOD H card must be installed with a timing reference for V.90 modem performance. However, XCel POTS CTUs will continue to deliver POTS service with without the ACU installed.
- The ACU MOD H AD version or later is required to support XCel Advanced Diagnostics craft interface and for future software download.

8. Detail of XCel Office Shelf Grounding Procedures and Options

SPECIAL NOTE ON GROUNDING:

The COT requires that the CO GND ground terminal is adequately grounded or damage to the equipment will result. The following section covers two methods of grounding that have proven to be adequate in locations that have difficulty establishing adequate CO Ground by other means.

Local practices may dictate that the CO GND be made from a shelf directly to a rack. This is ONLY sufficient when the rack grounds have been properly maintained in an office, and have not degraded.

If the measured resistance from the CO GND connection at the shelf, to the Central Office Main Grounding Bus, is less than 5 Ohms, then it can be assumed that grounding CO GND to the rack will be adequate.

Otherwise one of the following methods should be used.

Failure to establish a proper and adequate ground, will result in intermittent system operation and can also result in equipment damage.

Two methods are typically used in offices for providing adequate backplane reference ground. Method #1 and Method #2 are described below and detailed procedures for each method are provided on the following pages. Either of the TWO methods can be used with the XCel Multi-Service Shelf. Both methods are described below.

Installation Note

XCel Shelf Installation: Central Office & Remote

CAUTION: The COT requires that the CO GND ground terminal is adequately grounded or damage to the equipment will result. It is recommended that #14 AWG (MAXIMUM) and #22 AWG (MINIMUM) wire gauge is used. The CO ground should be a measured maximum of 5 ohms between the COT shelf CO GND terminal and the Master Central Office Ground.

- In general, standard/local office practices should be followed ensuring that a proper ground exists and is accessible. The procedures below address grounding of the reference backplane CO GND ground terminal to Central Office ground.
- Proper grounding of the XCel Multi-Service Shelf in the CO relies upon access to a master/office ground reference that is installed and maintained in accordance with standard (Telco) practices.

CAUTION: It is important to be certain which standard practice is used in the CO in order that proper COT shelf grounding is established or damage to equipment will result.

Method #1: Used when a CO ground is available with an overhead ground bus and CO Equipment Battery Return is not grounded to Main Grounding Bus.

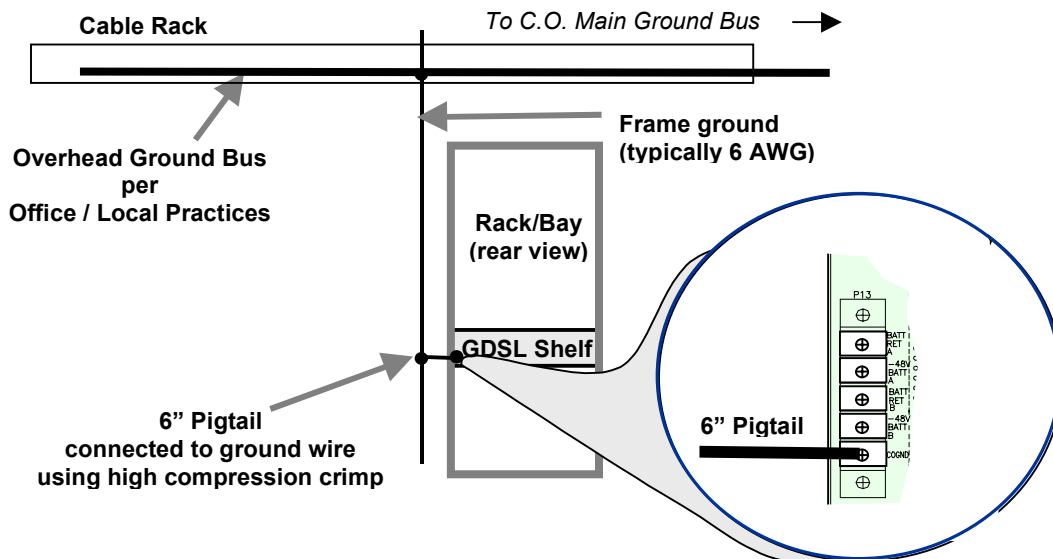
Typically in this case, the frame ground is attached to the overhead ground bus at each rack. When this ground is maintained in the office and feeds back to the Master Central Office Ground, it will provide adequate ground when all connections are properly made.

Method #2: Used when Central Office practices dictate that Return Battery (+48 Volt DC) is used as a reference ground for the signal ground and when the Return Battery is connected to the Main Grounding Bus.

In this case, per local practices, overhead cable rack ground bus may only be provided as a safety ground for racks and bays, and the ground reference of the overhead bus may not be an adequate grounding reference for the COT shelf.

Method #G-1: Used when a CO ground is available with an overhead ground bus and CO Equipment Battery Return is not grounded to Main Grounding Bus.

Figure 8.G-1



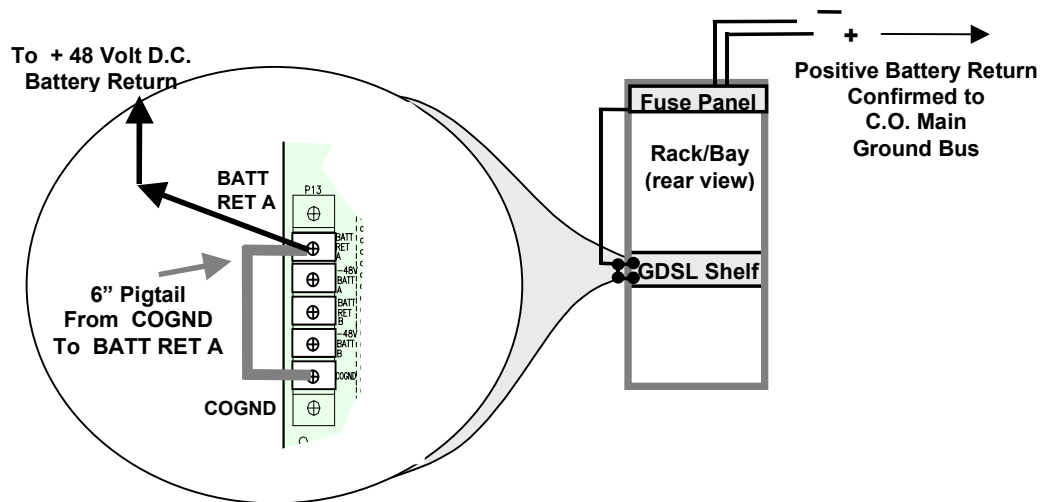
- G-1.1** Verify that local practices support adequate and maintained overhead ground bus as the primary reference ground.
- G-1.2** Verify that the XCel Shelf is properly mounted in the rack.
- G-1.3** Verify that no power is applied to the shelf.

- G-1.4** Securely attach the ground wire pigtail on the CO GND ground terminal (COT backplane, P13) to the ground wire using a #14 to #6 high compression crimp connector.
- G-1.5** If a ground wire has already been installed from the Grounding Bus to serve the rack, then this wire can be used. Typically offices use a 6 AWG wire that runs from the overhead ground bus down the length of the rack.
- G-1.6** Note: If no ground wire extends down the side of the rack, then remove the pigtail on the CO GND terminal, and use a separate #14 to #22 AWG conductor from the CO GND terminal on the backplane to the Overhead Ground Bus.
- G-1.7** A check to determine if the system is grounded properly: Measure the voltage on the DSL cable pair both Tip to Ground and Ring to Ground. This measurement is taken at the MDF with the OSP cable pair “picked out.”
- G-1.8** A properly functioning XCel system will exhibit “closely-balanced” DSL voltages at the MDF and at each field element and should measure within + / - 15 volts of each other. For example, a XCel-8 system measuring: From Tip to Ground = +185 Vdc; and from Ring to Ground = -189 Vdc, indicates a properly grounded XCel-8 system.

CAUTION: Do NOT ground the backplane CO GND to the Relay Rack.

Method G-2: Used when Central Office practices dictate that Return Battery (+48 Volt DC) be used as a reference ground for backplane ground reference connections.

Figure 8.G-2



- G-2.1** Verify that local practices require that backplane reference grounding is established using the (+48 Volt DC) Return Battery. And, verify that the Return Battery is referenced to Earth Ground at the CO Master Ground Bus (CO MGB).

CAUTION: If this method is used (grounding using return battery) and a proper ground is not established to the CO MGB, then damage to equipment can occur when power is applied.

- G-2.2** Verify that the XCel Shelf is properly mounted in the equipment rack.
- G-2.3** Verify that no power is applied to the shelf.
- G-2.4** Securely attach the pigtail between the COGND ground terminal and the BATT RET A, return battery terminal (COT backplane, P13).

CAUTION: Do NOT ground the backplane COGND to the Relay Rack.

Installation Note

XCel Shelf Installation: Central Office & Remote



- G-2.5 It is not necessary to jumper the COGND to both A and B returns.
- G-2.6 Connect the power feeds from the fuse panel in accordance with local practices.
- G-2.7 A check to determine if the system is grounded properly: Measure the voltage on the DSL cable pair both Tip to Ground and Ring to Ground. This measurement is taken at the MDF with the OSP cable pair “picked out.”
- G-2.8 A properly functioning XCel system will exhibit “closely-balanced” DSL voltages at the MDF and at each field element and should measure within + / - 15 volts of each other.
- G-2.9 For example, a XCel-8 system measuring: From Tip to Ground = +185 Vdc; and from Ring to Ground = -189 Vdc, indicates a properly grounded XCel-8 system.

9. XCel Shelf Installation in CABINETS and REMOTE Locations

9.1 Overview of Remote Installation

XCel Shelves and Systems may be used in remote cabinets or locations on the distribution-side of a Digital Loop Carrier remote terminal to greatly increase the flexibility of the DLC and total reach of access loops. The general procedures for placing an XCel Shelf in a cabinet or remote site are the same as when placing it in the Central Office, however the order of the steps may vary. The two general scenario’s are:

- Installation in previously deployed cabinets or sites with no little or no rear access to a mounted shelf.
- Installation in a cabinet when the cabinet is being assembled, prior to cabinet placement.

9.2 Planning and Engineering Considerations for Remote Shelf Installation

XCel Shelves and Systems may be used in remote cabinets or locations on the distribution-side of a Digital Loop Carrier remote terminal to greatly increase the flexibility of the DLC and total reach of access loops.

9.2.1 Mechanical and Environmental Considerations

Both 19” and 23” shelves fit into standard equipment racks found in most Outside Plant cabinets. XCel Multi-Service Shelves, ACU cards, and CTU line cards are all rated for -40° C to +65° C, 95% relative humidity, non-condensing conditions. XCel Shelves equipment should only be used inside an office or in an environmentally conditioned standard telephone equipment cabinet.

9.2.2 Surge Protection

It is necessary to provide primary lightning protection around the CTU line cards, both on the network side and the DSL side. CTUs are designed to make use of the frame protectors in a central office. CTU line cards have secondary protection in accordance with Bellcore TR-1089. Section 12 of this INST NOTE identifies the Approved and NON-Approved protection options.

9.2.3 Grounding

As with any XCel Shelf installation, adequate grounding is required.

CAUTION: The XCel Shelf must be grounded by attaching a maximum #14 AWG conductor between the CO ground screw on the rear of the Shelf and earth ground or main grounding bar. The ground between the Shelf and the grounding bar in remote locations should be a maximum 25 ohms. Failure to properly ground the XCel Shelf can result in equipment damage during normal turn-up and operation! The XCel Shelf and electronics will be susceptible to lightning damage without proper CO ground.

9.2.4 Remotely Placed XCel POTS Systems with Analog POTS to the Switch

- XCel POTS CTU line cards are designed to interface with central office switch analog POTS cards having a 1000 ohm impedance. In contrast, POTS cards in a DLC typically have 600 ohm impedance. Matching a XCel POTS line card with a 600 ohm DLC card will increase insertion loss. This may be acceptable on some loops, but the preferred implementation is to use an 800 ohm POTS card in the DLC for the XCel POTS card interfaces.
- The end-to-end insertion loss for a system implementation of this type will be at least the sum of the insertion losses of the DLC, typically around 3 dB, and the XCel system loss of 4 dB. A total insertion loss of 7 dB provides acceptable subscriber performance. It is important to guard against interface-related losses that could cause the total loss to exceed 10 dB.

- XCel POTS CTU capability to support V.90 modem performance may not be as effective in a particular remote DLC location as it would in the Central Office. The CTU V.90 processing capability will normally correct for modem speed loss at the C.O. switch. If an XCel System is placed at the end of a DLC, and if that DLC has an analog POTS front end, the combination of two D-A conversions (at the switch and on the POTS card at the DLC's RT) can preclude optimum modem throughput.

9.2.5 Remotely Placed XCel-4a Systems with ADSL Interfaces to a DSLAM

- The XCel-4a CTU line cards normally interface with a central office DSLAM and the maximum distance from the DSLAM to the CTU 4A is 1,000 feet.
- If the XCel Shelf at a remote site is hosting XCel-4a Systems, then the DSLAM should also be located at that site or within 1,000 feet of the XCel Shelf.
- Verify that the DSLAM type is compatible with the XCel-4a based on the most current product software release for the XCel-4a in the *Specifications* section of the System Practice.

9.2.6 Power Requirements, Battery Sizing and Heat Dissipation

Most of the power received by an XCel Shelf from the power/battery system is sent over the DSL pairs for line powering of outside plant XCel repeaters and remotes. Only about one third to one half is actually used in the Shelf and released as heat. Tables for current (amperage), total power (watts) and heat dissipation (watts) are presented in *Section 4 of this INST NOTE* and in the *Planning and Engineering Section of the XCel System Practice*. These tables show the power and heat estimates for full shelves as well as partially filled shelves. Recommendations:

- Use the highest traffic value to determine the fuse size to protect the shelf.
- Use the 6 CCS shelf Current and Power for battery sizing.
- The Heat Dissipation values in the tables use a 6 CCS service level.

9.3 Installation Steps for Remote or Cabinet Placement of XCel-Shelves

Remote Installation Sequence of Steps	Ref Paragraph
Step 1. Unpack the Shelf Hardware from the Shipping Package	5.1
Step 2. Review this INST NOTE	5.2
Step 3. Pre-wire cables / pairs in Cabinet or RT, to Shelf Location	none
Step 4. Chassis Ground	5.5
Step 5. Connect the 25 Pair AMP Connectors.	5.6
Step 6. Secure the AMP Connectors to the Shelf with Tie-Wraps	5.7
Step 7. Timing 1 Reference	5.8
Step 8. Timing 2 Reference (Optional)	5.9
Step 9. Digital Ground (Optional)	5.10
Step 10. Bypass Pairs (Required when NO REAR ACCESS will be available)	5.11
Step 11. Contact Alarms	5.12
Step 12. Mounting Flanges (For 19-inch Shelf Only)	5.3
Step 13. Mount the XCel Multi-Service Shelf in the Relay Rack	5.4
Step 14. "A" and "B" -48 Vdc Office Power Cabling	5.14
Step 15. Continuity Check (Optional)	5.15
Step 16. Attach label for POSITION CIRCUIT ASSIGNMENT	5.16
Step 17. Attach label for SHELF NUMBER	5.17
Step 18. Install Fuses in the Fuse Panel	5.13
Step 19. Shelf Installation is Complete	5.18

Installation Note

XCel Shelf Installation: Central Office & Remote



10. Service Line Connector Pin-Out Assignments

Service line inputs are accessed via the 25 pair Amp Champ connectors that run across the rear of the shelf. One 25 pair Amp connector for every two slots. Highlights:

- XCel-8: Eight each POTS lines per slot
- XCel-12: Twelve each POTS lines per slot
- XCel-4A: Four ADSL lines per double-wide slot
- 19-inch XCel Shelf service connectors: C1 to C8
- 19-inch XCel Shelf service connectors: H1 to H8

10.1 “Single-wide” CTUs take up one slot in an XCel Shelf and pairs from single-wide CTUs are routed to the odd or even slot pairs as noted in **Table 10-1**. “Double-wide” CTUs take up two slots each in an XCel Shelf and pairs from the double-wide CTUs are routed to the odd or even slot pairs as noted in **Table 10-2**. Double-wide cards have a wider faceplate ensuring that shelf loading is properly managed. It is recommended that double-wide CTUs be placed with the left side of the CTU in the ODD slot for optimum capacity loading, but this is not required.

Table 10-1: Single-Wide CTU Service Line Pin Assignments

Connector #	Wire Pair Connector Pin # & Standard Color Coding				Single-Wide CTUs (X = Odd slot)	
	Tip		Ring		XCel-8 POTS Line #	XCel-12 POTS Line #
	Color Code	Cable Pin #	Cable Pin #	Color Code		
C1 - C8 (19")	White/Blue	26	1	Blue/White	1	1
	White/Orange	27	2	Orange/White	2	2
	White/Green	28	3	Green/White	3	3
	White/Brown	29	4	Brown/White	4	4
	White/Slate	30	5	Slate/White	5	5
	Red/Blue	31	6	Blue/Red	6	6
	Red/Orange	32	7	Orange/Red	7	7
	Red/Green	33	8	Green/Red	8	8
	Red/Brown	34	9	Brown/Red	not used	9
	Red/Slate	35	10	Slate/Red	not used	10
	Black/Blue	36	11	Blue/Black	not used	11
	Black/Orange	37	12	Orange/Black	not used	12
or H1 - H10 (23")					Even # Slot X + 1	
	Black/Green	38	13	Green/Black	1	1
	Black/Brown	39	14	Brown/Black	2	2
	Black/Slate	40	15	Slate/Black	3	3
	Yellow/Blue	41	16	Blue/Yellow	4	4
	Yellow/Orange	42	17	Orange/Yellow	5	5
	Yellow/Green	43	18	Green/Yellow	6	6
	Yellow/Brown	44	19	Brown/Yellow	7	7
	Yellow/Slate	45	20	Slate/Yellow	8	8
	Violet/Blue	46	21	Blue/Violet	not used	9
	Violet/Orange	47	22	Orange/Violet	not used	10
	Violet/Green	48	23	Green/Violet	not used	11
	Violet/Brown	49	24	Brown/Violet	not used	12
Violet/Slate	50	25	Slate/Violet	not used	not used	

Table 10-2
Double-Wide CTU
Service Line Pin Assignments

Connector #	Wire Pair Connector Pin # & Standard Color Coding				Double-Wide CTUs (X = Odd slot)	
C1 - C8 (19") or H1 - H10 (23")	Tip		Ring		XCel-4a ADSL Line #	
	Color Code	Cable Pin #	Cable Pin #	Color Code		
		White/Blue	26	1	Blue/White	1
		White/Orange	27	2	Orange/White	2
		White/Green	28	3	Green/White	3
		White/Brown	29	4	Brown/White	4
		White/Slate	30	5	Slate/White	not used
		Red/Blue	31	6	Blue/Red	not used
		Red/Orange	32	7	Orange/Red	not used
		Red/Green	33	8	Green/Red	not used
		Red/Brown	34	9	Brown/Red	not used
		Red/Slate	35	10	Slate/Red	not used
		Black/Blue	36	11	Blue/Black	not used
		Black/Orange	37	12	Orange/Black	not used
						Even # Slot X + 1
		Black/Green	38	13	Green/Black	1
		Black/Brown	39	14	Brown/Black	2
		Black/Slate	40	15	Slate/Black	3
		Yellow/Blue	41	16	Blue/Yellow	4
		Yellow/Orange	42	17	Orange/Yellow	not used
		Yellow/Green	43	18	Green/Yellow	not used
		Yellow/Brown	44	19	Brown/Yellow	not used
		Yellow/Slate	45	20	Slate/Yellow	not used
		Violet/Blue	46	21	Blue/Violet	not used
		Violet/Orange	47	22	Orange/Violet	not used
		Violet/Green	48	23	Green/Violet	not used
	Violet/Brown	49	24	Brown/Violet	not used	
	Violet/Slate	50	25	Slate/Violet	not used	

Installation Note

XCel Shelf Installation: Central Office & Remote



11. DSL Connector Pin-Out Assignments

Two each 25 pair Amp Champ connectors at the bottom of the backplane. “DSL A” includes the DSLs for the first half of the CTU card slots, and “DSL B” for the second half of the CTU card slots.

NOTE: Each slot in the XCel Shelf is wired for two (2) DSL pairs. The second pair (designated below as “DSL n-2”) is not used in current XCel System options but may be part of future products. Only ONE of these DSL pairs is used at this time. The even-numbered pairs are unused and do not need to be terminated at the MDF upon initial installation for current system (XCel-8, XCel-12, and XCel-4a) cabling/operation.

11.1 “DSL A” Connector Pin-Out Assignments

Table 11-1
“DSL A” Connector
DSL Line Pin Assignments

Connector #	Wire Pair Connector Pin # & Standard Color Coding				23” XCel Multi-Service Shelf		19” XCel Multi-Service Shelf	
	Tip		Ring		Slot #	DSL Line	Slot #	DSL Line
Color Code	Cable Pin #	Cable Pin #	Color Code					
DSL A	White/Blue	26	1	Blue/White	1	DSL 1-1	1	DSL 1-1
	White/Orange	27	2	Orange/White	1	DSL 1-2	1	DSL 1-2
	White/Green	28	3	Green/White	2	DSL 2-1	2	DSL 2-1
	White/Brown	29	4	Brown/White	2	DSL 2-2	2	DSL 2-2
	White/Slate	30	5	Slate/White	3	DSL 3-1	3	DSL 3-1
	Red/Blue	31	6	Blue/Red	3	DSL 3-2	3	DSL 3-2
	Red/Orange	32	7	Orange/Red	4	DSL 4-1	4	DSL 4-1
	Red/Green	33	8	Green/Red	4	DSL 4-2	4	DSL 4-2
	Red/Brown	34	9	Brown/Red	5	DSL 5-1	5	DSL 5-1
	Red/Slate	35	10	Slate/Red	5	DSL 5-2	5	DSL 5-2
	Black/Blue	36	11	Blue/Black	6	DSL 6-1	6	DSL 6-1
	Black/Orange	37	12	Orange/Black	6	DSL 6-2	6	DSL 6-2
	Black/Green	38	13	Green/Black	7	DSL 7-1	7	DSL 7-1
	Black/Brown	39	14	Brown/Black	7	DSL 7-2	7	DSL 7-2
	Black/Slate	40	15	Slate/Black	8	DSL 8-1	8	DSL 8-1
	Yellow/Blue	41	16	Blue/Yellow	8	DSL 8-2	8	DSL 8-2
	Yellow/Orange	42	17	Orange/Yellow	9	DSL 9-1	not used	not used
	Yellow/Green	43	18	Green/Yellow	9	DSL 9-2	not used	not used
	Yellow/Brown	44	19	Brown/Yellow	10	DSL 10-1	not used	not used
	Yellow/Slate	45	20	Slate/Yellow	10	DSL 10-2	not used	not used
Violet/Blue	46	21	Blue/Violet	not used	not used	not used	not used	
Violet/Orange	47	22	Orange/Violet	not used	not used	not used	not used	
Violet/Green	48	23	Green/Violet	not used	not used	not used	not used	
Violet/Brown	49	24	Brown/Violet	not used	not used	not used	not used	
Violet/Slate	50	25	Slate/Violet	not used	not used	not used	not used	

11.2 “DSL B” Connector Pin-Out Assignments:

Table 11-2
“DSL B” Connector
DSL Line Pin Assignments

Connector #	Wire Pair Connector Pin # & Standard Color Coding				23” XCel Multi-Service Shelf		19” XCel Multi-Service Shelf	
	Tip		Ring					
	Color Code	Cable Pin #	Cable Pin #	Color Code	Slot #	DSL Line	Slot #	DSL Line
DSL B	White/Blue	26	1	Blue/White	11	DSL 11-1	9	DSL 9-1
	White/Orange	27	2	Orange/White	11	DSL 11-2	9	DSL 9-2
	White/Green	28	3	Green/White	12	DSL 12-1	10	DSL 10-1
	White/Brown	29	4	Brown/White	12	DSL 12-2	10	DSL 10-2
	White/Slate	30	5	Slate/White	13	DSL 13-1	11	DSL 11-1
	Red/Blue	31	6	Blue/Red	13	DSL 13-2	11	DSL 11-2
	Red/Orange	32	7	Orange/Red	14	DSL 14-1	12	DSL 12-1
	Red/Green	33	8	Green/Red	14	DSL 14-2	12	DSL 12-2
	Red/Brown	34	9	Brown/Red	15	DSL 15-1	13	DSL 13-1
	Red/Slate	35	10	Slate/Red	15	DSL 15-2	13	DSL 13-2
	Black/Blue	36	11	Blue/Black	16	DSL 16-1	14	DSL 14-1
	Black/Orange	37	12	Orange/Black	16	DSL 16-2	14	DSL 14-2
	Black/Green	38	13	Green/Black	17	DSL 17-1	15	DSL 15-1
	Black/Brown	39	14	Brown/Black	17	DSL 17-2	15	DSL 15-2
	Black/Slate	40	15	Slate/Black	18	DSL 18-1	16	DSL 16-1
	Yellow/Blue	41	16	Blue/Yellow	18	DSL 18-2	16	DSL 16-2
	Yellow/Orange	42	17	Orange/Yellow	19	DSL 19-1	not used	not used
	Yellow/Green	43	18	Green/Yellow	19	DSL 19-2	not used	not used
	Yellow/Brown	44	19	Brown/Yellow	20	DSL 20-1	not used	not used
	Yellow/Slate	45	20	Slate/Yellow	20	DSL 20-2	not used	not used
Violet/Blue	46	21	Blue/Violet	not used	not used	not used	not used	
Violet/Orange	47	22	Orange/Violet	not used	not used	not used	not used	
Violet/Green	48	23	Green/Violet	not used	not used	not used	not used	
Violet/Brown	49	24	Brown/Violet	not used	not used	not used	not used	
Violet/Slate	50	25	Slate/Violet	not used	not used	not used	not used	

Installation Note

XCel Shelf Installation: Central Office & Remote



12. GoDigital Approved and Non-Approved Protectors

12.1 MDF-Style Protectors for DSL Lines

The following two tables identify GoDigital APPROVED and NON-APPROVED MDF-style protectors for XCel System DSL lines.

Table 12.1-1: APPROVED MDF-Style Protectors for DSL Lines

Approved XCel DSL Line MDF-Style Protectors	
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

Table 12.1-2: NON- APPROVED MDF-Style Protectors for DSL Lines

NON-Approved XCel DSL Line MDF-Style Protectors	
MFG	PART #
Lucent	980H39
Lucent	99OH02
Corning/Siecor	6SPE
Corning/Siecor	6SSE
Sylvania	5G-GT

12.2 Station-Type Protectors (DSL & POTS)

The following two tables identify GoDigital APPROVED and NON-APPROVED Station-type protectors for XCel Systems. These protectors are normally used in GoDigital OSP Units, but could also be used for protection in remote cabinets supporting lines to and from an XCel Shelf

Table 12.2-1: APPROVED Station-Type Protectors for DSL Lines

Approved XCel DSL Line Protectors:		
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

Table 12.2-1: NON-APPROVED Station-Type Protectors for DSL Lines

NON-Approved XCel OSP DSL Line Protectors:		
MFG	MODEL or PART #	Type
TYCQ *	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
TII	356M2	356
Corning (Siecor) *	356-SW *	356

Table 12.2-1: APPROVED Station-Type Protectors for POTS Lines

Approved XCel OSP POTS Line Protectors:		
MFG	MODEL or PART #	Type
TYCO *	GSSP-0302-00-WOOB-A *	Gel
Other approved POTS 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
Corning (Siecor)	356-XY	356
Corning (Siecor)	356-SW	356
TII	356M2	356