Installation Note
XCel-4a Remote Terminal Unit (RTU 4A 1536)

1. Purpose and Overview

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

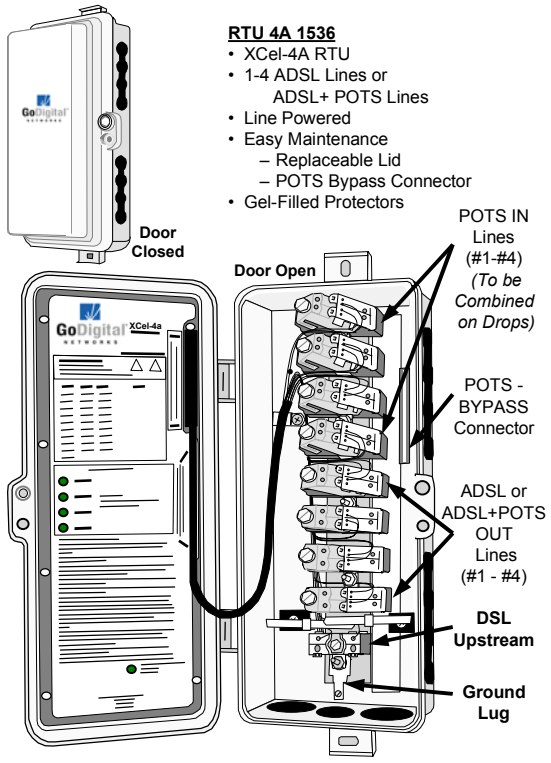
2. Products

This Installation Note is relevant for the following GoDigital products:

System / Product Name	Part #	Description
XCel-4a		
RTU 4A 1536	990198	XCel-4a RTU, 1 - 4 ADSL or ADSL+POTSLines

3. Overview

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



4. Summary of Engineering and Installation Steps

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

5. XCel Unit Grounding

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

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

6. Identification of Upstream SHDSL Cable Pair

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

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

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

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

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

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

7.1 Once all OSP units are in place and properly connected, including the RTU, the linking process is initiated when the CTU 4A is seated in the XCel Shelf.

7.2 The CTU 4A powers the loop and begins the signal linking with each unit in the loop beginning with the first unit downstream from the CTU.

7.3 If the loop and span are within the specified distance limitations and are free of load coils the linkup will typically occur in three to five minutes. Allow ten minutes for linking before beginning troubleshooting.

7.4 Section 5.6 ***System Turn-Up and Verification*** of the XCel System Practice, details the XCel-4a loop turn-up sequence for an XCel-4a System with multiple STRs and an RTU.

7.5 The XCel-4a RTU has 5 LEDs.

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

Table 7-1: RTU 4A LED indications

LED	QTY	COLOR(S)	State	Description
CO LINK	1	Green	OFF	No link
			BLINKING Green	Establishing SHDSL link
			SOLID Green	SHDSL link established
CPE # (1-4)	4	Green/Amber	OFF	No link
			BLINKING Green	Establishing ADSL link
			SOLID Green	ADSL link established
			SOLID Amber	POST (Power On Self Test) Failed
			BLINKING, alternating Green/Amber	RTU is being downloaded.

8. XCel Loop Link-up Trouble Conditions

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

8.2 If the RTU 4A appears to powering up, but no SHDSL 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.
- SHDSL loop limits have been exceeded, or
- SHDSL connection is reversed at a repeater.

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

- CO LINK LED will BLINK (on/off, 1 per sec.) for approximately 5 minutes.
- The RTU will be powered down (LEDs OFF) for 60 seconds.
- The linking process will begin again after the 60 second power down period and continue to repeat until reversal is cleared.
- After the second attempt, an alarm LED will illuminate on the CTU and the ACU.

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

9. XCel-4a System Reach & Planning

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

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

9.1 Span Reach. See Table 9-1 for XCel-4a Span Reach Planning. .Make certain the Configur8r Software tool used for planning loops that include use of RTU 4A units is current.

SPAN Reach

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

CTU 4A – RTU 4A (with no repeater), or
CTU 4A – STR 4A
STR 4A – RTU 4A, etc

Table 9-1: XCel-4a Span Reach

XCel-4a SPAN Reach (feet and meters)				
Feet	**19 AWG**	**22 AWG**	**24 AWG**	**26 AWG**
PIC UG	24,850 ft	17,580 ft	13,650 ft	10,170 ft
PIC AER	23,710 ft	16,660 ft	12,760 ft	9,380 ft
Pulp UG	21,240 ft	15,520 ft	12,320 ft	9,800 ft
Pulp AER	20,250 ft	14,750 ft	11,550 ft	9,080 ft
Meters	**19 AWG**	**22 AWG**	**24 AWG**	**26 AWG**
PIC UG	7,570 m	5,350 m	4,160 m	3,090 m
PIC AER	7,220 m	5,070 m	3,880 m	2,850 m
Pulp UG	6,470 m	4,730 m	3,750 m	2,980 m
Pulp AER	6,170 m	4,490 m	3,520 m	2,760 m
41.5 dB @ 230 kHz				

9.2 Drop Reach. See Table 9-2 for XCel-4a ADSL Drop Reach from the RTU 4A.

DROP Reach

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

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

Table 9-2: XCel-4a Drop Reach

XCel-4a ADSL Drop Reach (feet and meters)			
26 Ga.	Drop Reach	8,500 ft	2,590 m
	Calculated Res.	*789 Ohms*	
24 Ga.	Drop Reach	11,000 ft	3,350 m
	Calculated Res.	*641 Ohms*	
22 Ga.	Drop Reach	14,000 ft	4,260 m
	Calculated Res.	*513 Ohms*	
19 Ga.	Drop Reach	20,000 ft	6,090 m
	Calculated Res.	*366 Ohms*	
@ 1.5 Mbps Downstream and 6 dB SNR			

10. Replacement Protector Options

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

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

Table 9-1: APPROVED ADSL Line Protectors

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

Table 9-2: APPROVED SHDSL Line Protectors

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

Table 9-2: NON-Approved SHDSL Line Protectors

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

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