Installation, Support, and Maintenance Guide

X7 Series Satellite Router

Router Products

Evolution and Velocity

March 13, 2017

iDIRECT

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Revision History

The following table shows all revisions for this document. To determine if this is the latest revision, check the TAC Web site at http://tac.idirect.net.

Revision	Date	Updates
A	September 30, 2013	Initial release (JS)
B	October 25, 2013	Corrected RF transmit power specification (SKS)
C	October 18, 2016	Added support for Velocity. Added a chapter on preparing a remote to get into the Velocity network. This ISM is common for both Evolution and Velocity.
D	March 13, 2017	Updated Appendix F with examples.

Contents

Figures

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About

This manual provides important safety information and explains how to install and maintain the iDirect X7 Satellite Router.

This chapter contains the following sections:

Intended Audience

This manual is intended for use by the VSAT (Very Small Aperture Terminal) equipment installer, System Engineer, and Network Operator responsible for maintaining the iDirect Network. Only qualified service personnel should install the X7 Router. Familiarity with cabling and wiring practices is beneficial.

Manual Contents

In addition to the information in this chapter, this manual also includes the following:

- Chapter 1, *Introduction* on page 1, provides an overview and description of the X7 Router
- Chapter 2, *Specifications* on page 3 describes the mechanical, environmental and RF specifications of the X7 Router
- Chapter 3, *Interfaces* on page 7 provides connector descriptions of the X7 Router
- Chapter 4, *Installation* on page 13 describes procedures for installing the X7 Router
- Chapter 5, *Maintenance* on page 21 describes maintenance procedures for the X7 Router

- Chapter 6, *Updating the X7 Software using the CLI* describes the procedure to update the X7 software using the CLI

NOTE: A basic list of acronyms and abbreviations can be found in Appendix A, *Acronyms and Abbreviations*.

Document Conventions

This section illustrates and describes the conventions used throughout this document.

Convention	Description	Example
`Command`	Used when the user is required to enter a command at a command line prompt or in a console.	Enter the command: **`cd /etc/snmp/`**

`Terminal Output`	Used when showing resulting output from a command that was entered at a command line or on a console.	**`crc report all`**
		`8350.3235 : DATA CRC [ 1]`
		`8350.3502 : DATA CRC [5818]`
		`8350.4382 : DATA CRC [ 20]`

Screen Reference	Used when referring to text that appears on the screen on a Graphical User Interface (GUI). Used when specifying names of commands, menus, folders, tabs, dialogs, list boxes, and options.	1. To add a remote to an inroute group, right-click the Inroute Group and select **Add Remote**. The Remote dialog box has a number of user-selectable tabs across the top. The **Information** tab is visible when the dialog box opens.
Hyperlink	Used to show all hyperlinked text within a document or external links such as web page URLs.	For instructions on adding a line card to the network tree, see *Adding a Line Card* on page 108.

WARNING: A ***Warning*** highlights an essential operating or maintenance procedure, practice, condition, or statement which, if not strictly observed, could result in injury, death, or long term health hazards.

CAUTION: A ***Caution*** highlights an essential operating or maintenance procedure, practice, condition, or statement which, if not strictly observed, could result in damage to, or destruction of, equipment or a condition that adversely affects system operation.

NOTE: A ***Note*** is a statement or other notification that adds, emphasizes, or clarifies essential information of special importance or interest.

Document Set

The following iDirect documents are available at TAC and contain information relevant to installing and using iDirect satellite network software and equipment. Refer to *Getting Help on page xiii* for TAC access information.

For Evolution®:

- *iDX iBuilder User Guide*
- *iDX iMonitor User Guide*
- *Web iSite User Guide*
- *Satellite Router Installation and Commissioning Guide*
- *Evolution Release Notes*
- *Evolution Technical Reference Guide*
- *Quick Start Guide (QSG), included in package with router*

For iDirect Velocity®:

- *Pulse NMS User Guide*
- *Regulatory Guide (Quick Start Guide)*
- *iDirect Velocity® Software Release Notes*
- *Terminal WUI User Guide*
- *Velocity Network Operations Using Pulse*

Related Training Services

iDirect offers scheduled classroom training at various global training centers, as well as eLearning, in the installation, operation, maintenance and management of iDirect satellite networks. For training course descriptions and available training dates visit the iDirect web site ***Training and Services*** at: http://www.idirect.net/Training-and-Services.aspx or call +1 (800) 648-8240 for class registration and information.

Getting Help

The iDirect Technical Assistance Center (TAC) and the iDirect Government Technical Assistance Center (TAC) are available to provide assistance 24 hours a day, 365 days a year. Software user guides, installation procedures, FAQs, and other documents that support iDirect and Direct Government products are available on the respective TAC Web site:

- Access the iDirect TAC Web site at http://tac.idirect.net
- Access the iDirect Government TAC Web site at http://tac.idirectgov.com

The iDirect TAC may be contacted by telephone or email:

- Telephone: (703) 648.8151
- E-mail: tac@idirect.net

The Direct Government TAC may be contacted by telephone or email:

- Telephone: (703) 648.8111

- Email: tac@idirectgov.com

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- iDirect: techpubs@idirect.net
- iDirect Government: techpubs@idirectgov.com

For sales or product purchasing information contact iDirect Corporate Sales at the following telephone number or e-mail address:

- Telephone: (703) 648.8000
- E-mail: sales@idirect.net

Warranty, RoHS, WEEE, Declaration of Conformity

Complete iDirect hardware product statements for the X7 Router are available at these Web sites:

- http://www.idirect.net/warranty, for the hardware warranty
- http://www.idirect.net/rohs, for the RoHS statement of compliance
- http://www.idirect.net/weee, for the WEEE statement of compliance
- http://www.idirect.net/doc, for the Declaration of Conformity

1 Introduction

The iDirect X7 Series Satellite Router (X7 Router) is a next-generation router supporting DVB-S2/ACM on the outbound and A-TDMA. It uses a compact, rack-mount design, embedded 8-port switch, and variant power supply configurations making it an ideal enterprise class solution. In addition to the user interface support, the availability of a Downstream Configuration template and multi-image support on the X7 Router enables simple deployments and seamless upgrades.

This chapter contains the following sections:

This manual explains how to safely install and maintain the X7 Router. The X7 Series Satellite Router is shown in Figure 1-1.

Figure 1-1. X7 Router

1.1 Features

Highlights:

- Increased throughput capabilities
- 1 RU high router chassis fitting in standard telecom racks
- Variant power supply module configurations
- Dual image support and user interface for ease of deployment and upgrades
- Communications-on-the-Move (COTM) support
- AES Encryption

1.2 Power Supply Options

NOTE: The X7 can be ordered in any of the three configurations specified in Table 1-1. The Power Supply Unit (PSU) is a Field Replaceable Unit (FRU) and can be swapped in the field.

The X7 Router is available with these power supply configurations:

Table 1-1. Power Supply Configurations

Power Supply Option	Description
100-240V AC +24V Power Supply (Standard)	This AC power module for the X7 Router is standard with a single +24V power support for the BUC.
100-240V AC +24 V, +48 V Power Supply	This AC power module for the X7 Router comes with dual selectable +24V/+48V power support for either a +24V or +48V BUC.
36-76V DC +24 V, +48 V Power Supply	This DC power module for the X7 Router comes with dual selectable +24V/+48V power support for either a +24V or +48V BUC.

2 Specifications

This chapter describes the mechanical, environmental, power, RF specifications for the X7 Router, and contains the following sections:

2.1 Mechanical and Environmental Specifications

The installation site must be able to accommodate the X7 Router mechanical and environmental specifications. The mechanical and environmental specifications are listed in Table 2-1.

Table 2-1. Mechanical and Environmental Specifications

Category	Description
Dimensions	17.5 in (44.5 cm) W x 18 in (45.7 cm) D x 1.75 in (4.45 cm) H 19-inch rack mountable, 1RU
Weight	10 lbs (4.55 kg)
Heat Dissipation	40 W (TYP), < 50 W (MAX)
Airflow	Front Panel Fan Assist (2 fans), Power Supply (1 fan), Rear Exhaust, No Filter
Ambient Temperature	
Operational	+32˚ F to +122˚ F (0˚ C to 50˚ C) De-rate 1.8˚ F (1˚ C) per 1,000 ft (304 m) above 5,000 ft (1,524 m) Safety certified to 6,562 ft (2,000 m)
Storage	-40˚ F to +176˚ F (-40˚ C to +80˚ C)
Temperature Gradient	.9˚ F (.5˚ C) per minute (but ≤ +36˚ F (+20˚ C) per hour)
Relative Humidity	
Operational	90%, non-condensing
Storage	5 to 93%

Table 2-1. Mechanical and Environmental Specifications (continued)

Category		Description
Altitude		
	Operational	≤ 6,562 ft (2,000 m)
	Storage	≤ 35,000 ft (10,668 m)
Shock		
	Operational	≤ 20G
	Survival	≤ 40G (ISTA-1A)
Vibration		
	Operational	0.21 g_{RMS} @ 500 Hz
	Survival	2.09 g_{RMS} @ 500 Hz

2.2 Power Specifications

The X7 Router power specifications are listed in Table 2-2.

CAUTION: If negative voltages are used such as Telecom -48VDC, the negative most voltage is always connected to –ve terminal (in the Telecom case this would be -48V) and the positive most voltage is always connected to the +ve terminal (in the Telecom case this would be 0VR). Chassis can be referenced to +ve, -ve or left floating (i.e. not connected to either +ve or –ve) as required as the power module is fully isolated input to the chassis.

Table 2-2. Power Specifications

Category	Description
Input Voltage Range	Option 1: 100-240 VAC, Auto-Ranging Option 2: 100-240 VAC, Auto-Ranging Option 3: 36-76 VDC
Frequency	Options 1 & 2: 50-60 Hz, Auto-Ranging
AC Power Consumption	Option 1: 2.7 A, 270 W Option 2: 3.4 A, 340 W
DC Power Consumption	Option 3: 8.3 A, 310 W
BUC Voltage	Option 1: 24 VDC Option 2 & 3: Selectable, 24 or 48 VDC
DC Power @ TX Output	Option 1, 2, &3: 24 VDC @ 4.9 A (117 W MAX) Option 2 & 3: 48 VDC @ 3.3 A (158 W MAX)
DC Power @ RX Input	13-18 VDC @ 500 mA, voltage is software configurable

Table 2-2. Power Specifications (continued)

Category	Description
Protection	Over-Voltage Protection for LNB and BUC DC Over-Current Limiting for LNB and BUC DC Options 1 & 2: Primary AC fuse within PS module (250 VAC, T6.3 A) Option 3: Primary DC fuse within PS module (250 VDC, 16 A)
AC Power Cord	Supplied, per country of use
DC Input Connector	Self-capturing terminal block, 14-18 AWG
Efficiency of the Power Supply	87% (MIN)

2.3 RF Specifications

The X7 Satellite Router RF specifications are listed in Table 2-3.

Table 2-3. RF Specifications

Category		Description
LNB Support		Fsym > 10 Msps DRO LNB Fsym > 1 Msps +/-10ppm PLL LNB Fsym > 1 Msps Uni-Ku LNB Internal reference LNBs only
IF Interface, Impedance		Type “F”, Zo = 75 ohms
Frequency Range		
	Transmit	950 - 1950 MHz
	Receive	950 - 2150 MHz
Tuning Step Size		
	Transmit	10 Hz
	Receive	55 KHz
RF Power		
	Transmit	-35 to +3 dBm, 0.5 dB step
	Receive, Minimum	-130 + 10Log(Sym rate) dBm (Single carrier)
	Receive, Maximum	-5 dBm (Wideband Composite)
Tx SSB Phase Noise		<table><tr><th>Frequency</th><th>Phase Noise</th></tr><tr><td>1 KHz</td><td>-75</td></tr><tr><td>10 KHz</td><td>-85</td></tr><tr><td>100 KHz</td><td>-95</td></tr><tr><td>1 MHz</td><td>-105</td></tr></table>
Receiver Noise Figure		15 dB

Table 2-3. RF Specifications (continued)

Category	Description
Transmit Carrier Suppression	≤ -40 dBc
Spurious & Harmonic Content	≤ -60 dBc, with output @ -20 dBm, (In-band ≤ -32 dBc)
Transmitter Muting	50 dB (MIN) - residual in OFF state ≤ -90 dBm

3 Interfaces

This chapter describes the X7 Router physical interfaces and LEDs, and contains the following sections:

3.1 X7 Router Front LEDs

The X7 Router front panel is shown in Figure 3-1 and defined in Figure 3-1.

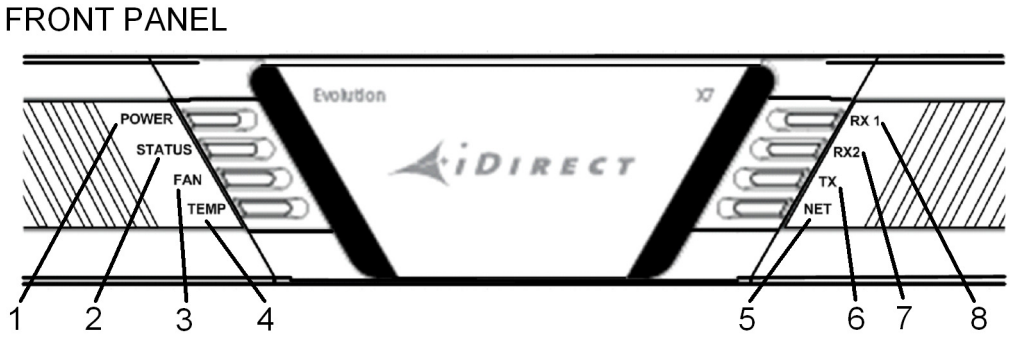


Figure 3-1. X7 Router Front Panel LED Display

NOTE: The descriptions of the LEDs may vary between iDX Software Releases. Check the release specific *Evolution Satellite Router Installation and Commissioning Guide*, *Evolution Web iSite User Guide*, *Velocity Terminal WUI User Guide*, *and Release Notes* for details.

Table 3-1. X7 Router Front Panel Description

Callout - Label	Description
1 - POWER	Indicates power status and any power-related problems
2 - STATUS	Indicates basic operational state and problems with core hardware
3 - FAN	Provides fan status
4 - TEMP	Indicates any problems with the current operating temperature
5 - NET	Modem Network Status: indicates the state of the satellite network connection
6 - TX	Indicates the state of the transmitter, see Table 3-3 on page 11, callout 9, for BUC power LED information
7 and **8 - RX1** and **RX2 (future)**	Provides downstream receive status, see Table 3-3 on page 11, callouts 12 and 14, for rear power receive status LED information

3.2 X7 Front Panel LED Status Descriptions

Descriptions for states of LEDs may vary between iDX Software Releases. Check the release specific *iDX Satellite Router Installation and Commissioning Guide*, *Evolution Web iSite User Guide*, *Velocity Terminal WUI User Guide*, *and Release Notes* for details. Figure 3-1 on page 8 shows the front panel and Table 3-2 describes the front panel LED color and status

information:

Table 3-2. X7 Router Front Panel LED Descriptions

Label	Signal Color/Type	Definition
POWER		Indicates X7 board power status and any power-related problems; a solid green indicates good power supply status and an unlit LED indicates insufficient power
	Off	No or low power input
	Green	Valid power input detected
	Yellow	Problem with BUC voltage selection
STATUS		IBoot Sequence and Overall Hardware Status: Indicates basic operational state and problems with core hardware; a solid green indicates good operational state and a solid red indicates a problem affecting basic operation
	Off	Powered off or going through initial Power-on Self-test (POST)
	1 second flashing Green	Initial POST failed
	Green	HW operation is normal (all self-tests passed)
	Red	Fault: hardware, software, one or more self-test failures, or configuration error
FAN		Provides fan status
	Green	All fans working
	Red	Failure of one or more fans
TEMP		Operating Temperature Status: Indicates any problems with the current operating temperature; a solid red indicates a problem affecting basic operation
	Off	Router OFF or booting if **STATUS** LED is not Green
	Green	Normal operating temperature
	Yellow	Operating temperature is nearing the over-temp or under-temp threshold
	Red	Operating temperature has exceeded the over-temp or under-temp threshold

Table 3-2. X7 Router Front Panel LED Descriptions (continued)

Label	Signal Color/Type	Definition
NET		Modem Network Status: Indicates the state of the satellite network connection
	Off	Router off or in sleep mode if **TX** LED is yellow (mute ON)
	Yellow	Demodulator is not locked on the primary downstream carrier
	1 second flashing Yellow	Demodulator locked on primary downstream carrier, NCR not yet locked
	2 second flashing Green	Demodulator locked on the primary downstream, NCR locked
	1 second flashing Green	**Evolution** - Network acquisition in progress **iDirect Velocity™** - Network acquisition and authentication in progress
	Green	**Evolution** - Network acquired; if **TX** LED is OFF, then router is in Rx (receive) only mode **iDirect Velocity™** - Network acquired and authenticated
	Red	**Evolution** - NA **iDirect Velocity™** - Authentication failed
TX		Indicates the state of the transmitter
	Off	Transmitter is off: if **STATUS** LED is green, then transmission disabled by configuration
	Yellow	Transmitter enabled, mute ON
	Green	Transmitter enabled, mute OFF
RX1 and **RX2**		Provides downstream receive status, **RX2 is reserved for future use**
	Off	**Evolution** - Receiver off or not configured **iDirect Velocity™** - Receiver is deactivated
	Yellow	Downstream carrier configured, demodulator not yet locked
	1 second flashing Yellow	Downstream carrier configured, demodulator locked to downstream carrier, Network Clock Reference (NCR) not yet locked **Evolution** - This is not applicable when the receiver is configured to receive multicast on second receiver
	Green	Downstream carrier configured, demodulator and NCR locked to downstream carrier **Evolution** - This is not applicable when the receiver is configured to receive multicast on second receiver

3.3 X7 Router Rear Panel Description

The X7 Router rear panel is shown in Figure 3-2 and defined in Table 3-3 on page 11.

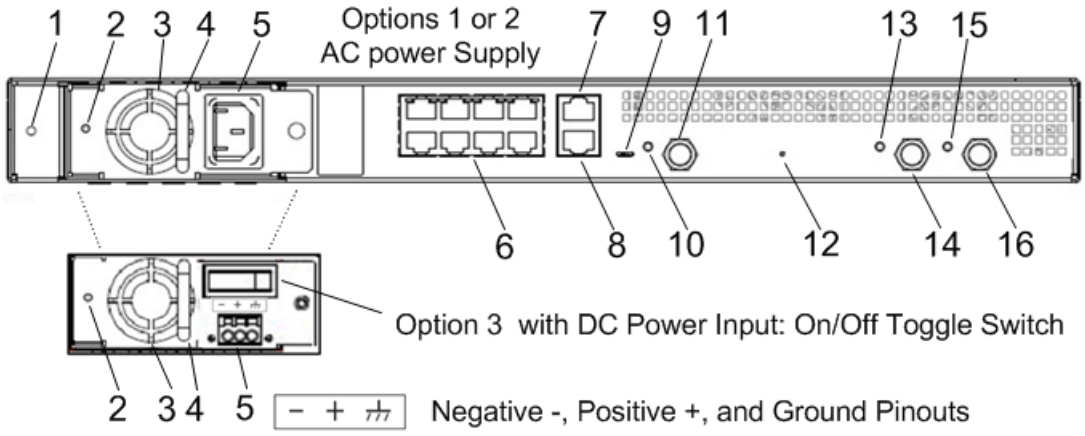


Figure 3-2. Rear Panel Description

Table 3-3. X7 Router Rear Panel Connector and LED Descriptions

Callout	Label	Interface Definition and Connector Type
1	⏚	Grounding stud, #6-32tpi
2	no label	Power Supply Module LED OFF - No valid output Green - Valid DC output
3	no label	Fan
4	no label	Power supply extraction handle
5	no label	Terminal Block Header Option 1 & 2: AC input connector IEC-320-C13 Option 3: DC input terminals - Negative, Positive, and Ground; 14-16 AWG
6	**LAN 1-8**	Ethernet Communications Ports, RJ-45
7	**BUC I/O**	BUC Communications Port, RJ-45
8	**Console**	Console Communications Port, RS-232 Serial, RJ-45
9	**+24, +48**	BUC voltage selector switch
10	**BUC PWR**	BUC Power LED: if off, no power to BUC Green - No fault Red - Fault condition

Table 3-3. X7 Router Rear Panel Connector and LED Descriptions (continued)

Callout	Label	Interface Definition and Connector Type
11	**TX OUT**	Transmitter Output (F)
12	none	Internal Reset Switch
13, 15	**LNB1, LNB2 PWR**	LNB Power LEDs: if off, no power to LNB Green - No fault Red - Fault condition
14, 16 (future)	**RX1 IN, RX2 IN**	Receiver Inputs (F), **RX 2 IN** is reserved for future use

4 Installation

This chapter describes the guidelines and procedures for installing the X7 Router and contains these sections:

NOTE: See *Document Conventions* on page xii for a description of the warning icons that are used in this manual.

4.1 Installation Steps at a Glance

CAUTION: Only trained and qualified personnel should be allowed to install or replace this equipment.

The following steps must be followed for successful installation of the X7 Router. Each step refers to other sections or appendices, as appropriate, with more detailed information.

4.1.1 Pre-Installation Guidelines

X7 Router installation guidelines:

- When selecting the site, consider accessibility, power availability, signal, network connections, and the possibility of future expansion
- Carefully examine the work area for possible hazards, such as wet floor, ungrounded power extension cables, and missing safety grounds
- Install the X7 Router in a location where access is unobstructed
- Ensure the X7 Router has adequate ventilation

- Do not install the X7 Router on the floor
- Select a suitable dust free location
- To protect the equipment and to avoid personal injury, observe the physical and environmental considerations below when installing an X7 Router:
  - **Ventilation**

    A single-core protective vent on the back of the chassis provides pressure equalization and allows reliable operation of the product. To protect the chassis from overheating do not place this product in a built-in installation, such as a bookcase or enclosed rack, unless proper ventilation is provided or the manufacturer instructions have been followed
  - **Power Cord Protection**

    Route power supply cords so they will not be walked on or pinched; pay particular attention to cords at plugs, convenience receptacles, and at the exit points
  - **Overloading**

    Do not overload wall outlets, extension cords, or integral convenience receptacles
  - **Heat**

    Do not place the X7 Router near heat sources, such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat
  - **Attachments**

    Do not use attachments unless recommended by the manufacturer
  - **Grounding**

    Never defeat the ground conductor or operate the equipment without a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if it is uncertain that suitable grounding is available

4.1.2 Installation Checklist

NOTE: The X7 Satellite Router is designed to be installed in a sheltered environment per environmental specifications. See Section 2.1, on page 3.

NOTE: Where applicable, mating connectors must be prepared for installation. See Appendix C, *Cable Preparation* on page 33 and Appendix D, *DC Power Supply Installation* (for routers with DC power supply options, only).

1. Unpack the router according to the unpacking instructions in Section 4.3, *Unpacking iDirect Equipment* on page 15.
2. Account for all components for the installation. A typical list is given in Section 4.4, *Components Typically Included in an Order* on page 16.
3. The recommended tools should be available for installation. See Section 4.2, *Tools and Supplies Required for Installation* on page 15.

4. Prepare the coax cables as directed in Section C.1, *Coax Cable Preparation* on page 33 to connect to **RX 1 IN** and **TX Out.**

CAUTION: Do not connect or disconnect the Tx or Rx IFL cable while the satellite router is powered on; this action may result in damage to the BUC, LNB, and/or X7 Router.

ATTENTION: Ne pas connecter ou déconnecter les câbles « Tx IFL » ou « Rx IFL » quand le routeur X7 Router est sous tension, sous risque de dommage au BUC, au LNB, et/ou au routeur X7 Router.

5. Prepare the Ethernet cable(s) and connector(s) as described in Section C.2, *Ethernet Port Pinouts* on page 37. For connection to the user interface, use **LAN 1** port with an RJ-45 cable as described in Section C.2.2, on page 38.
6. If using the **Console** port for servicing, prepare the console port cable and connector as described in Section C.3, *Console Port Connection* on page 38.
7. Mount the router as directed in Section 4.5, *X7 Router Mounting* on page 16.
8. Connect the power as directed for either AC or DC power supplies:
   - See Section 4.5.1, *Installing With an AC Power Supply (Option 1 or 2)* on page 17
   - See Section 4.5.2, *Installing With a 36-76 VDC Power Supply (Option 3)* on page 18
9. Monitor front and rear panels during startup. See Section 3.1, *X7 Router Front LEDs* on page 8 and Section 3.3, *X7 Router Rear Panel Description* on page 11.
10. Prepare PC for X7 Router connection as specified in Section 4.6, *Preparing the PC for Connection to the X7 Router* on page 19.
11. Login PC to the user interface.
12. Install the firmware and configure the satellite router as specified in Section 4.7, *Configuring the X7 Router* on page 19.
13. If the router needs repacking or maintenance see Chapter 5 on page 21.
14. When the X7 Router is physically installed, the firmware and configuration of the satellite router need to be completed. Refer to the *iDX Satellite Router Installation and Commissioning Guide* for the release of software installed on the system and for instructions.

4.2 Tools and Supplies Required for Installation

Appendix B, *Tools Needed* on page 31 specifies recommended tools and supplies used when installing the X7 Router.

4.3 Unpacking iDirect Equipment

The satellite router and related equipment may be shipped in one or more shipping containers. Once all of the boxes have been received, perform the following tasks:

- Confirm the boxes are facing upward (refer to the box orientation arrows on the shipping container)
- Inspect all shipping containers

- If any damage or other signs of mishandling are evident, inform the carrier and either iDirect or the reseller
- Remove the tape and any exterior covering from the box lid

Save the X7 Satellite Router shipping boxes after unpacking the system. These boxes will be needed in the event of moving or shipping the system in the future. See Section 5.5, *Repacking the X7 Router* on page 25 for repacking information.

Remove items from the box only as needed. Verify all of the proper X7 Router components and accessory items listed in the order have been received, including the optional equipment ordered. See Section 4.4, *Components Typically Included in an Order* on page 16.

4.4 Components Typically Included in an Order

Prior to installation, account for all necessary components for a complete VSAT installation. If any items are missing or damaged, contact the Network Operator/Distributor for replacement.

A typical installation includes the following items:

- 1 (one) X7 Satellite Router with installed AC or DC power supply
- 2 (two) hardware mounting ear kits
- 1 (one) LAN Ethernet cable
- 1 (one) Quick Start Guide (11 X 17 inch brochure)
- For DC (options 3 and 4), 1 (one) connector kit containing: one cable tie, one terminal block plug (P/N Phoenix 1779848), one cable strain relief, P/N 1803947
- Additional components normally required are available in several sizes and types. Consult the iDirect Account Manager for details. The components typically are:
  - One antenna
  - IFL (Inter Facility Link) or coaxial cable appropriate for the installation
  - One appropriate feed assembly for the antenna (OMT)
  - One BUC (Block Up Converter)
  - One LNB (Low Noise Block Converter)

4.5 X7 Router Mounting

This section describes the mounting of the X7 Router. Follow the pre-installation guidelines, Section 4.1.1, on page 13, before attempting installation.

The X7 Router requires a minimum of one rack unit (1.75 inches) of vertical rack space. Measure the proposed rack location before mounting. If the X7 Router is mounted in an enclosed rack, the router must have adequate ventilation. An enclosed rack should have louvered sides and top with fans to provide cooling air. Before using a particular rack, check for obstructions that could impede installation.

1. All mating connectors must be prepared correctly for installation. See Appendix C, *Cable Preparation* on page 33 (for all routers) and Appendix D, *DC Power Supply Installation* (for routers with DC power supply options, only).
2. Attach the rack ears (included) to the X7 Router with the hardware provided.

3. Mount the X7 Router in the rack.
4. Follow installation procedures for power supply options:
   - Option 1 or Option 2 (Section 4.5.1, on page 17) for AC power supply
   - Or, Option 3 (Section 4.5.2, on page 18) for DC power supply

4.5.1 Installing With an AC Power Supply (Option 1 or 2)

For an X7 Router with an AC power supply Option 1 and 2 follow these steps:

CAUTION: Direct connections to the power source should only be made by a properly licensed electrician. Installation must meet applicable electrical codes.

CAUTION: Improper power source rating, excessive noise or transients, or undersized circuit breaker will result in service interruption.

CAUTION: If power must be removed from the chassis, the power cord must be disconnected, first.

CAUTION: The BUC power requirement must match the proper voltage. The BUC may sustain damage if used with the incorrect power supply.

NOTE: Install an easily accessible socket-outlet near the equipment.

1. First, perform steps 1-6 of the Installation Checklist, Section 4.1, on page 13.
2. Select the appropriate BUC voltage (**+24** or **+48** VDC) by sliding the BUC voltage selector switch (Table 3-3, *X7 Router Rear Panel Connector and LED Descriptions* on page 11: Callout #8). 24 VDC BUC voltage selection is the factory setting.
3. Connect the TX and RX coax cables to the X7 Router and secure but do not over-tighten. See C.1, *Coax Cable Preparation* on page 33 for preparation details.

CAUTION: Do not connect or disconnect the Tx or Rx IFL cable while the satellite router is powered on; this action may result in damage to the BUC, LNB, and/or X7 Router.

ATTENTION: Ne pas connecter ou déconnecter les câbles « Tx IFL » ou « Rx IFL » quand le routeur X7 Router est sous tension, sous risque de dommage au BUC, au LNB, et/ou au routeur X7 Router.

4. Connect the AC power cord to the power source. This will power ON the X7 Router.
5. Monitor the front and rear panel lights during power on startup. See Section 3.1, *X7 Router Front LEDs* on page 8.

6. Prepare PC for X7 Router connection as specified in Section 4.6, *Preparing the PC for Connection to the X7 Router* on page 19.
7. Login PC to the user interface. See *Preparing the PC for Connection to the X7 Router*.
8. Install the firmware and configure the satellite router as specified in Section 4.7, *Configuring the X7 Router* on page 19.

4.5.2 Installing With a 36-76 VDC Power Supply (Option 3)

CAUTION: If negative voltages are used such as Telecom -48VDC, the negative most voltage is always connected to –ve terminal (in the Telecom case this would be -48V) and the positive most voltage is always connected to the +ve terminal (in the Telecom case this would be 0VR). Chassis can be referenced to +ve, -ve or left floating (i.e. not connected to either +ve or –ve) as required as the power module is fully isolated input to chassis.

For an X7 Router using a 36-76 VDC power supply (Option 3):

1. First, perform steps 1-6 of the Installation Checklist, Section 4.1, on page 13.
2. Set the X7 Router power switch to the OFF position (0).
3. Prepare the power cables per the instructions in Appendix D, *DC Power Supply Installation* on page 41 and connect the power cables.

CAUTION: The BUC power requirement must match the proper voltage. The BUC may sustain damage if used with the incorrect power supply.

4. Select the appropriate BUC voltage (**+24** or **+48** V), by sliding the BUC voltage selector switch (Table 3-3, *X7 Router Rear Panel Connector and LED Descriptions* on page 11: Callout #8). 24 V BUC voltage selection is the factory setting.
5. Set the X7 Router power switch to the ON position (1).
6. Upon powering up, a Level 0 Reset occurs. Reset options are available in Appendix E, *X7 Reset* on page 45.
7. Monitor front and rear panel lights during startup. See Section 3.1, *X7 Router Front LEDs* on page 8.
8. Prepare PC for X7 Router connection as specified in Section 4.6, *Preparing the PC for Connection to the X7 Router* on page 19.
9. Login PC to the user interface. See *Preparing the PC for Connection to the X7 Router*.
10. Install the firmware and configure the satellite router as specified in Section 4.7, *Configuring the X7 Router* on page 19.

4.6 Preparing the PC for Connection to the X7 Router

See Section 3.1, *X7 Router Front LEDs* on page 8 for more information about the LEDs, as well as either the *iDX Release Notes* and *iDX Satellite Router Installation and Commissioning Guide*, *Velocity Terminal WUI User Guide*, *or Evolution Web iSite User Guide*.

Confirm the PC:

- Has a Web browser installed
- Has an IP address that is on the same subnet of the X7 Router
- Includes a Network Interface Card (NIC) connected with a CAT 5 Ethernet cable

4.7 Configuring the X7 Router

When the X7 Router is physically installed, the downloading the firmware and configuration of the satellite router need to be completed. Refer to the *iDX Satellite Router Installation and Commissioning Guide* for the release of software installed on the system and for instructions. To download the guide, go to http:\\tac.idirect.net and click **Satellite Routers**.

5 Maintenance

This chapter describes the required maintenance procedures for the correct functioning of the X7 Router.

This chapter contains the following sections:

5.1 Safety Guidelines to Observe During Servicing

WARNING: Do not attempt to service the router internal assemblies, as opening and removing covers may expose personnel to dangerous voltages or other hazards. There are no user serviceable parts inside.

When an X7 Router requires service, observe the safety guidelines in this section.

5.1.1 Servicing

Do not attempt to service the X7 Router internal assembly. Opening and removing covers exposes dangerous voltages and/or other hazards. There are no user serviceable parts inside. Opening the units will void the warranty. Refer all servicing to qualified service personnel.

5.1.2 Conditions Requiring Service

Disconnect the X7 Router from the power source and refer servicing to qualified service personnel if any of the following conditions occur:

- When the power supply cord or plug is damaged
- If the X7 Router does not operate normally when following the operating instructions (adjust only those controls that are covered by the operating instructions)
- If the X7 Router has been dropped or if the chassis has been damaged

- When the X7 Router exhibits a distinct change in performance

5.2 Maintaining the X7 Router

The X7 Router requires basic maintenance to keep it running efficiently and to prolong its life.

WARNING: This unit is not serviceable. Return unit to provider for all servicing issues.

ATTENTION: Cette unité n'est pas réparable sur site. Renvoyer au fournisseur pour tout réparation.

5.2.1 Temperature Control

The X7 Router has a built-in temperature sensor which measures the actual circuit board temperature. If the board temperature exceeds a defined threshold, the X7 Router alerts the NMS about the high temperature condition. See Table 2-1 on page 3, for the proper temperature range.

Elevated internal temperature may be caused by:

- Objects blocking the vent
- Dust accumulated on the enclosure or the vent
- Ambient temperature elevated over the specified limits 90 Day Regular Maintenance

5.2.2 90 day maintenance

Typically, the only maintenance needed to be performed on the unit, is to maintain the temperature of the X7 Router and keep its external areas free from moisture, dust or dirt, which are included in a 90-day maintenance cycle.

Perform the following procedures every 90 days:

- Keep the staging area clear and free of dust during and after installation
- Make sure that no objects are blocking the vents
- If there are objects blocking the vents, remove them safely so there is at least 6 inches (15 cm) from the unit
- Make sure that no dust has accumulated on the enclosure or the vent. If dust has accumulated use a soft brush to remove dust
- Make sure that the ambient temperature remains within the specified limits

5.3 Troubleshooting the X7 Router

Table 5-1 describes the most common X7 Router troubleshooting events and actions to take. Consult with the iDirect TAC when considering a reset. Reset functions are described in

Section E.1, *Level 0 Reset* on page 45.

Table 5-1. Troubleshooting Events and Actions to Take

Event	Action
Router not functioning	Check status LEDs. Compare LEDs to Table 3-1 on page 8
POWER LED ON and Router not functioning	When the root-cause (external or internal) of the issue in the router is not known, perform the following steps: 1. Power down and restart the router to see if that resolves the issue. 2. When the problem still exists, disconnect the external cabling apart from the power and console cables. 3. Connect to the console port and during the boot process, check if the PCB passes the POST boot-up tests. 4. Check if the router gets to the login prompt. 5. Check if all the option files are in the correct location under */sysopt/config/sat_router*. ***NOTE:*** Option files varies in each revision of the software. 6. Check the status LEDs. Compare LEDs to Table 3-1 on page 8.
48 V BUC not working	Is the installer expecting 48V BUC power? If so: • The correct BUC voltage (**+24** or **+48** VDC) must be selected by sliding the BUC voltage selector switch (Table 3-3, *X7 Router Rear Panel Connector and LED Descriptions* on page 11: Callout #8), 24 VDC BUC voltage selection is the factory setting • Check the model of power module: the model may not allow 48 V BUC power and check the bar-codes for 48V BUC support These bar codes applied on the unit for Option 2 and Option 3 power modules indicate SUPPORT for 48V BUC: Option 2  Option 3  The Option 1 Power Module **does not support** a 48V BUC, and has this barcode: Option 1  ***NOTE:*** The above bar codes are just an example. The actual Revision letter applied on the unit could be different.

Table 5-1. Troubleshooting Events and Actions to Take (continued)

Event	Action
Router cannot be accessed by Web iSite or Web User Interface	Router may have a bad options file, settings, or software package. 1. Power down and restart the router to see if that resolves the issue. 2. Perform a Level 2 reset (Boot into Recovery mode) and manually load the correct options file and a software package that is appropriate; and the user interface will be accessed with the default IP address: 192.168.0.1. See Appendix E, *X7 Reset* on page 45 for more information on Reset
Lost or forgot IP address of the Router	1. Visually check the Ethernet port to ensure there is no physical damage. 2. Perform a Level 2 reset (Boot into Recovery mode) so that the X7-ER Satellite Router will have the default IP address: 192.168.0.1. Load new package / options / configuration files with a new IP address, if desired. 3. Reboot with a Level 0 reset, and connect with the current / known IP address. See Appendix E, *X7 Reset* on page 45 for more information on Reset.

5.4 Removing and Replacing the Power Module

WARNING: Before installing or working on the outdoor equipment, unplug the power cord from the power source. Ensure you always check if power is disconnected.

In the event the Power Module must be removed and/or replaced, Table 5-2 describes the steps to take.

Table 5-2. Removing and/or Replacing the Power Module

Event	Steps to Take
Removing the Power Module	• Make sure power cord is unplugged • Unscrew chassis screw • Pull firmly but gently on the handle pull of the power supply to extract the power module from the slot
Replacing the Power Module	• Slide in power supply • Make sure the power supply is securely pushed in and flush • Tighten screw • Plug power cord into power supply input receptacle

5.5 Repacking the X7 Router

If the X7 Router system is damaged or if the chassis needs to be moved to another location, the unit needs to be repacked in the original shipping boxes.

To repack the system:

1. Disconnect all cables.
2. Place the X7 Router inside the original foam cutout in the shipping box.
3. Properly seal the box with packing tape.

For warranty service, obtain a Return Material Authorization (RMA) number from the reseller or iDirect prior to shipping. Direct customers of iDirect, may contact the iDirect TAC directly to obtain an RMA number and shipping instructions. Follow the shipping instructions, complete the RMA form, and attach the form to the outside of the shipping box.

Appendix A Acronyms and Abbreviations

The list in this appendix is meant to be generic and may contain acronyms and abbreviations not found in this manual and some terms may not be defined based on industry standards of knowledge.

0…9

16APSK	Sixteen Amplitude and Phase Shift Keying
8PSK	Eight Phase Shift Keying

A

A-TDMA	Adaptive Time Division Multiple Access
ABS	Automatic Beam Switching
AC	Alternating Current
ACM	Adaptive Coding and Modulation
ACS	Antenna Control System
AES	Advanced Encryption Standard
APSK	Amplitude and Phase-shift keying
AZ	Azimuth

B

BB	BaseBand
BIM	Below-Decks Interface Module
BIST	Built-In Self-Test
BITE	Built-In Test Equipment
BPN	BUC Part Number
BPSK	Binary Phase Shift Keying
BSN	BUC Serial Number
BTP	Burst Time Plan
BUC	Block Up Converter

C

C/N	Carrier to Noise ratio
CBIT	Continuous Built In Test
CDR	Critical Design Review
CIR	Committed Information Rate
CPE	Customer Premise Equipment
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CSA	Canadian Space Agency

D

DAC	Digital to Analog Converter
dB	deciBel
dBi	deciBel isotropic
dBm	deciBel milli-Watt
dBW	deciBel Watt
DC	Direct Current
DDR	Double Data Rate

DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Service
	DVB-S2
	Digital Video Broadcasting over Satellite, Second Generation

E

EIRP	Effective Isotropic Radiated Power
Eb/N0	Bit Energy to Noise Power Spectral Density ratio
EEPROM	Electrically Erasable Programmable Read-Only Memory
EL	Elevation
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
ETSI	European Telecommunications Standards Institute

F

FCC	Federal Communication Commission
FEC	Forward Error Correction
FID	Functional ID
FMECA	Failure Mode Effects Criticality Analysis
FPGA	Field Programmable Gate Array
FS	Functional Specification

G

G/T	Gain over Temperature
GHz	GigaHertz
GPIO	General-Purpose Input/Output
GPS	Global Positioning System

H

HCP	High-Capacity Payload

I

IBIT	Initiated Built In Test
ICD	Interface Control Document
ICMP	Internet Control Message Protocol
iDX	Evolution Software System
IEC	International Electrotechnical Commission
IFL	Inter-Facility Link
IF	Intermediate-frequency
IP	Ingress Protection
IP	Internet Protocol
IR	Information Rate

J

K

kbps	kilobit per second
kHz	kilohertz
KRFU	Ku/Ka-band Radio Frequency Unit
ksps	kilosymbol per second

L

LAN	Local Area Network
LDPC	Low-Density Parity Coding
LED	Light Emitting Diode
LNB	Low Noise Block Converter
LOS	Loss of Signal
LRU	Line-Replaceable Unit

M

Mbps	Megabits per second
Mcps	Megachips per second
MES	Mobile Earth Station
MF-TDMA	Multi-Frequency TDMA

MHz	Megahertz
MID	Manufacturer ID
MIL-STD	US Military Standard
MODCOD	Modulation and Coding
Msps	Mega Symbols per Second
MTBF	Mean Time Between Failures
MTBUR	Mean Time Between Unscheduled Removals

N

NAND	Not AND
NF	Noise Figure
NOR	Not OR
NMS	Network Management System

O

OAE	Outside Antenna Equipment
ODU	Outdoor Unit
OEM	Original Equipment Manufacturer
OMT	Orthogonal-Mode Transducer
OpenAMIP	Open Antenna-Modem Interface Protocol
OTA	Over The Air
OTP	One Time Programmable

P

PA	Power Amplifier
PAST	Person-Activated Self-Test
PCB	Printed Circuit Board
PC	Personal Computer
PDR	Preliminary Design Review
PLL	Phased Locked Loop
PSK	Phase Shift Keying
PSU	Power Supply Unit

Q

QEF	Quasi Error Free
QoS	Quality of Service
QPSK	Quadrature Phase Shift Keying

R

RF	Radio Frequency
RGMII	Reduced Gigabit Media Independent Interface
RMS	Root Mean Square
RoHS	Restriction of Hazardous Substances
ROM	Read-Only Memory
RSSI	Receive Signal Strength Indication
RTP	Real-Time Protocol
Rx or RX	Receive

S

SAS	Satellite Access Station
SCPC	Single Channel Per Carrier
SGMII	Serial Gigabit Media Independent Interface
SIM	Subscriber Identity Module
SNR	Signal to Noise Ratio
SRS	Systems Requirement Specification
SRU	Shop Replaceable Unit
SSB	Single Side Band

T

TBD	To Be Defined
TCP	Transmission Control Protocol
TDMA	Time Division Multiple Access
TFI	Terminal Functional ID
TMI	Terminal Manufacturer ID
TPCFEC	Turbo Product Code FEC
TPN	Terminal Part Number

TSN	Terminal Serial Number
TTC	Terminal Transmit Control
Tx or TX	Transmit

U

UDP	Universal Data Protocol
UL	Underwriters Laboratories

V

VAC	Volts Alternating Current
VDC	Volts Direct Current
VSAT	Very Small Aperture Terminal

W

WFQ	Weighted Fair Queuing
WGS	Wideband Global SATCOM

X

X

Z

Appendix B Tools Needed

Figure B-1 and Table B-1 specify recommended tools and supplies for a typical installation. Additional tools and equipment may be required to install related equipment and cables. Test equipment may be required to check signal, power levels, and communication links.

Figure B-1. Recommended Installation Tools

Table B-1. Recommended Installation Tools and Equipment

Quantity	Tool
1	Number 2 Phillips screwdriver
1	F-type Compression Tool
1	RG-6 Coax Stripper
1	Coax / Wire Cutter
Length as Needed	RG-6 or RG-11 solid copper conductor coax outdoor rated cable

Appendix C Cable Preparation

This appendix describes the cable preparation details and has these sections:

C.1 Coax Cable Preparation

NOTE: The procedures in this section, for preparing coaxial cables, are meant to be generic. Cables and connectors should be installed per manufacturer's requirements specific to the brands preferred. In general, specific and detailed instructions are for RG-6 cables and connectors, only.

Use high quality coaxial outdoor cable to connect the X7 Satellite Router to the Outdoor Unit (ODU) equipment. iDirect recommends that a solid copper center conductor, coaxial cable be used with a minimum of 60% + 40% braid and double foil shield to connect the equipment, such as:

- RG-6 — 0.04 inch (1 mm), outdoor rated, Quad Shielded, solid bare copper center conductor, for cable lengths less than or equal to 225 feet (68.5 meters)
- RG-11 — 0.064 inch (1.6 mm), outdoor rated, Quad Shielded, solid bare copper center conductor, for cable lengths less than or equal to 400 feet (121.9 meters)

Before connecting the cables, connectors on each end must be installed.

The center conductor must be straight and extend 1/8 inch (3.2 mm) beyond the end of the F-connector, and the connector should be securely crimped to the cable.

NOTE: iDirect does not recommend using RG-59 with solid bare copper center conductor. RG-6 or RG-11 Quad Shield or other outdoor quality, 75-ohm type of coax can be used.

If different types of coaxial cable are used other than the recommended quad shield RG-6, the following problems can occur:

- **Co-channel Interference** – If signals at the same frequency are carried on long, parallel runs of coaxial cable (for example, in cable trays, or riser) interference can occur between the signals
- Higher quality cable helps to prevent this with better shielding

- Co-channel interference causes degradation and higher packet loss rate
- **Good return loss** – High quality cable and correct connectors help ensure an optimal return loss of 10 dB or more

NOTE: Excessive DC Resistance – will result in excessive voltage drop across the IFL cable. Hence, the voltage at the BUC may be too low to operate properly.

NOTE: Appendix B, *Tools Needed* on page 31 lists all of the recommended tools for terminating coax cables.

To terminate the cables with F-Type connectors:

1. Cut off each end of the coax cable squarely, using the proper cable cutter as shown in Figure C-1.

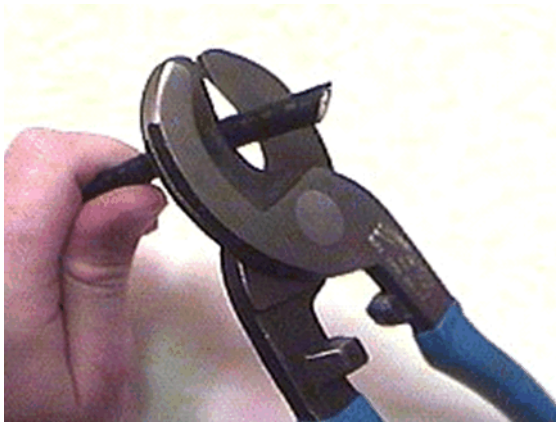


Figure C-1. Coax Cable Cutting Technique

WARNING: Wear protective eye wear while cutting cables and terminating connectors.

WARNING: The center conductor must be straight and cylindrical without any burrs. Failure to do so can damage the satellite router, BUC, and/or LNB input connector.

2. Remove the jacket material and foam insulation according to the length defined under **Length A** in Table C-1. For RG-6, use a two-step Coax Stripper such as the LC-CST 1257 from Paladin Tools.

Table C-1. Coax Trim Dimensions

	Length A (inch (mm))	**Length B** (inch (mm))	**Length C** (inch (mm))
RG-6	5/8 (15.9)	1/4 (6.4)	3/8 (9.5)

Table C-1. Coax Trim Dimensions

RG-11	13/32 (10.3)	3/32 (2.4)	13/32 (10.3)

3. Remove any foil in the braid as shown in Figure C-2.

Figure C-2. Cutting Technique for Removing Foil in the Braid

4. Fold the braid back over the jacket and trim the braid to the length as defined under **Length C** in Table C-1 on page 34 and shown in Figure C-3.

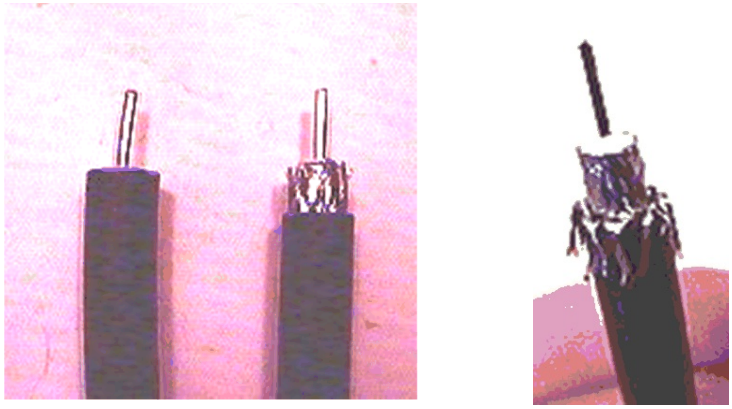


Figure C-3. Folding the Braid

5. Flare the inner, outer braids and the outer foil shield only. Do not flare the inner foil shield (last foil around dielectric).
6. (If using a coax stripper, skip this step.) Being careful not to cut into the copper of the center conductor, remove the foil and cut the dielectric to the length shown under **Length B** in Table C-1 on page 34. Remove any dielectric residue.
7. If the conductive foil is burred, then smooth out the burr so that the edge (area where the dielectric material was removed) is smooth and provides a lead-in for the connector mandrel.
8. Install the RG-6 connector compression sleeve, or mandrel, (top left (A) in Figure C-4) over foil and underneath the braid. A good, weatherproof outdoor connector mandrel

should have a visible O-Ring (bottom right (B) Figure C-4).

NOTE: The white colored inner dielectric insulation should be flush with the inner rear surface of the connector. Refer to the picture on the right (C) in Figure C-4 for an RG-6/RG-11 termination.

NOTE: Since the RG-11 connector has a built-in center pin, ensure that the coax center pin makes contact to the internal seizing pin of the connector. Refer to Figure C-4.

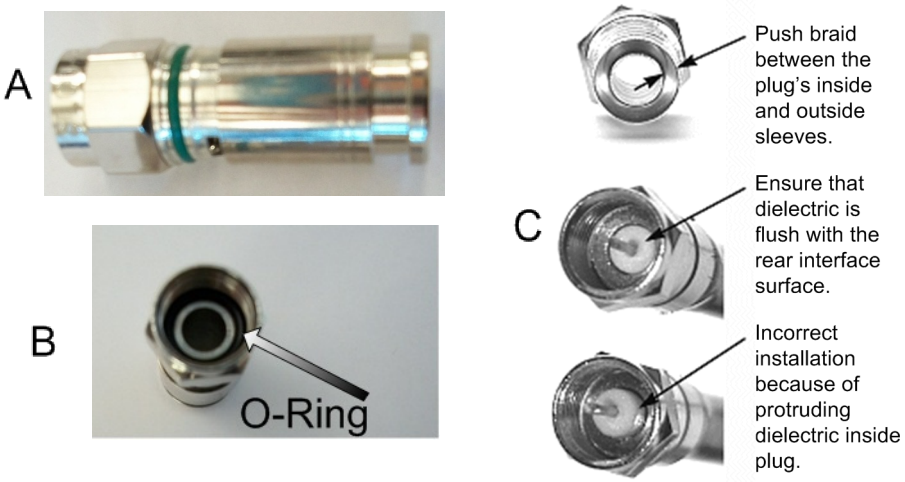


Figure C-4. Attaching the Compression fitting F-type Connector

9. Finish connecting the cable to the connector with the compression tool connector, such as Holland Compression Tool 1855 as shown in Figure C-5.

Figure C-5. Compression fitting F-Type Weatherproof Plug and Tool

10. Inspect and ensure that the copper center conductor only protrudes 1/8 inch (3.2 mm) nominally beyond the rim of the F-connector. Trim if necessary.

CAUTION: The center conductor length must be a minimum of 1/16 inch (1.6 mm) to a maximum of 1/8 inch (3.2 mm) protrusion beyond the rim of the F type connector. It must be straight and cylindrical without any burrs at the end. Failure to follow this technique could result in damage to the satellite router, BUC, LNB connector and/or possible intermittent service.

C.2 Ethernet Port Pinouts

The Ethernet cable included in the order is typically a straight through cable typically used for connection to a PC. The X7 Router is capable of Universal Cable Recognition or auto-MIDX (auto-sensing) and will connect to a PC with the straight through Ethernet cable for using the user interface.

LAN 1 port is the recommended port to connect the Ethernet cable to the Ethernet port on the PC running the user interface.

Either crossover or straight through cables may be used with the X7 Router. It is not necessary for the PC to auto-sense. Details of the X7 Router LAN/Ethernet port pinouts are described in Section C.2.1 and Section C.2.2 defines straight through and crossover cables.

C.2.1 Ethernet Port Pinouts

Table C-2 lists the pinouts for the Ethernet ports (labeled **LAN 1-8)** of the X7 Router and the pinout order is shown in Figure C-6.

Table C-2. Ethernet Port Pinouts

RJ-45 Pin	Description
1	Tx+
2	Tx-
3	Rx+
6	Rx-

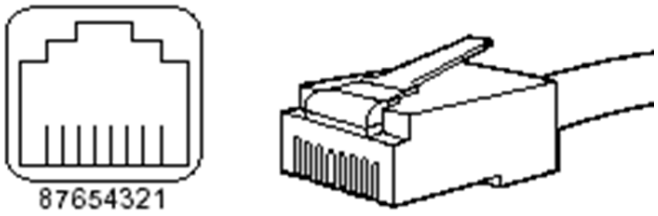


Figure C-6. RJ-45 Cable Connectors: Receptacle and Plug

The 10 Base-T/100 Base-T Fast Ethernet ports support IEEE 802.3 and IEEE 802.3u specifications for the 10-Mbps and 100-Mbps transmission over Unshielded Twisted-Pair (UTP) cables. Use Category-3 or Category-5 UTP cable with RJ-45 connectors to attach the 10/100 Base-T Ethernet LAN ports on the X7 Satellite Router chassis to the customer provided LAN Hub or switch.

NOTE: iDirect supplies one 7-foot Category 5 UTP cable to connect the X7 Router to the LAN hub or switch. If additional cables or different lengths are needed, they may be bought commercially.

C.2.2 Straight Through and Crossover RJ-45 Cables

To confirm the RJ-45 cable type, hold the cable ends as depicted in Figure C-7. The sequence of the colored wires should be as follows:

- Straight through — The colored wires are in the same sequence at both ends of the cable
- Crossover — The first (far left) colored wire at one end of the cable is the third colored wire at the other end of the cable, and the second colored wire at one end of the cable is the sixth colored wire at the end of the cable

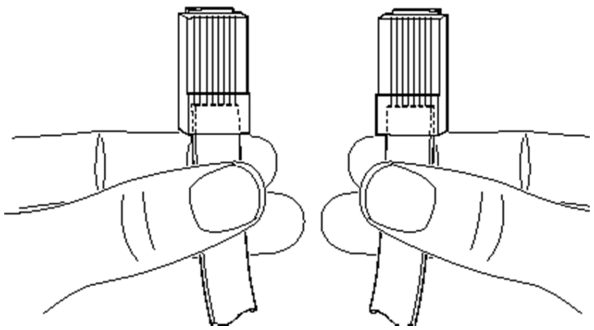


Figure C-7. Holding the RJ-45 Cable Connectors

C.3 Console Port Connection

The Console port is used for servicing the X7 Router.

Connect as follows:

1. Connect an RJ-45 to RJ-45 straight through cable, such as the Ethernet cable included, to **LAN 1** port on the X7 Router.
2. Connect the opposite end of the Ethernet cable to an RJ-45 to DB-9 female DTE adapter, or a USB dongle (such as a Trendnet TU-S9).
3. Connect to a PC running terminal emulation software.

PC serial port settings should be:

- asynchronous mode
- 9600 baud
- eight (8) data bits, no (N) parity bit, and one (1) stop bit, (9600/8-N-1)

The signal and pinouts for the asynchronous serial **Console** port (RS-232) of the X7 Router and an RJ-45 to DB-9 female DTE adapter are listed in Table C-3. A picture of the RJ-45 to DB-9 Female DTE adapter is shown in Figure C-8 on page 40.

Table C-3. RJ-45 to DB-9 Pinouts

Console Port (DTE)	RJ-45 Pin	Color Code	RJ-45 to DB-9 Terminal Adapter	Console Device
RTS	1	Blue	8	CTS
DTR	2	Orange	6	DSR
TxD	3	Black	2	RxD
GND	4	Red	NC	GND
GND	5	Green	5	GND
RxD	6	Yellow	3	TxD
DSR	7	Brown	4	DTR
Rx-RF-Power	8	White/Grey	9	Not Connected

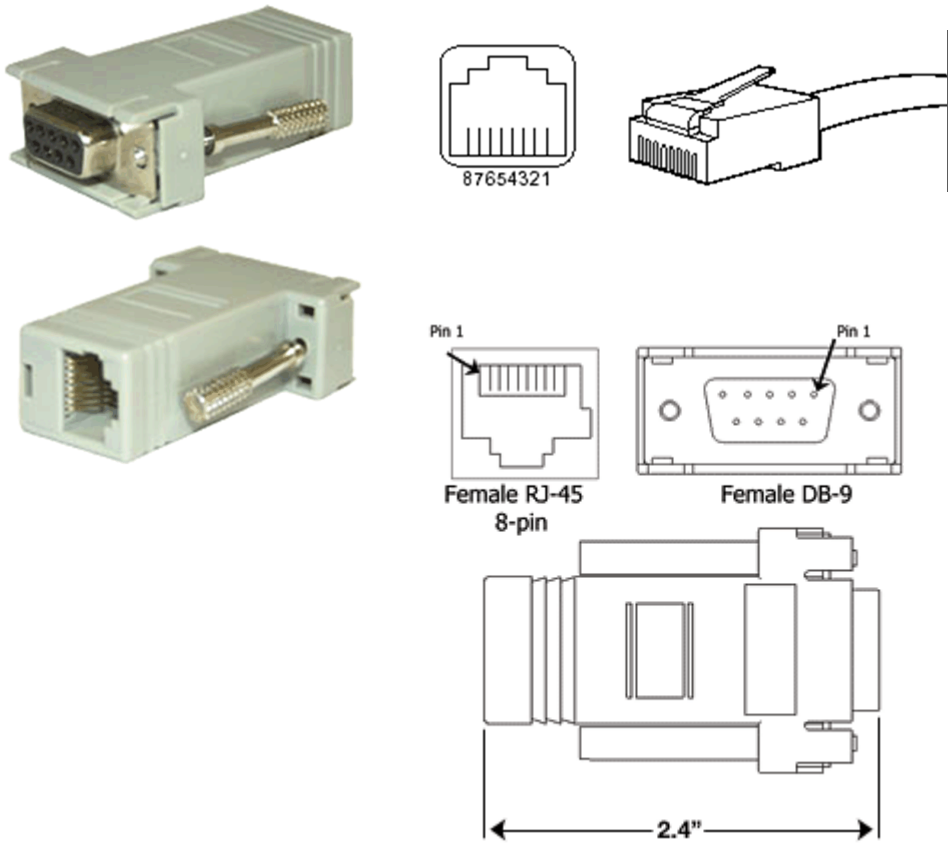


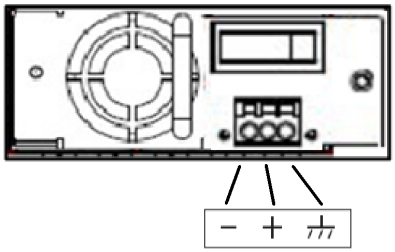
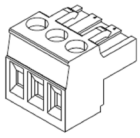
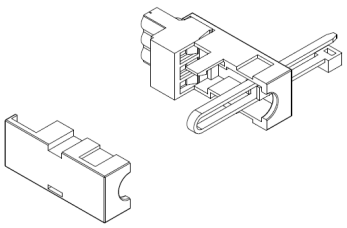
Figure C-8. RJ-45 to DB-9 Female DTE Adapter

Appendix D DC Power Supply Installation

This appendix describes the installation of the DC power supply wiring for Option 3.

Make sure all items are available to prepare the cable entry housing. Descriptions and diagrams of the items included with the router or necessary for the DC wiring are found in Table D-1. “At a Glance” instructions are in Figure D-1 on page 42 with corresponding detailed steps in Table D-2 on page 42.

Table D-1. X7 Router DC Power Module Connector Parts

Name	Description	Diagram or Reference
DC Terminal block	Rear panel, DC terminal block area	
3 DC input wires	Appropriately labeled wires, such as: • red = positive + • black = negative - • blue = ground - ⏚	14-18 AWG (American Wire Gauge) Reference: http://en.wikipedia.org/wiki/American_wire_gauge
Terminal block plug	Included in kit, P/N Phoenix 1779848	
Cable Entry Housing Strain Relief and Cable Tie	Cable Entry Housing Strain Relief and Cable Tie, included in kit, P/N 1803947, and cable tie	

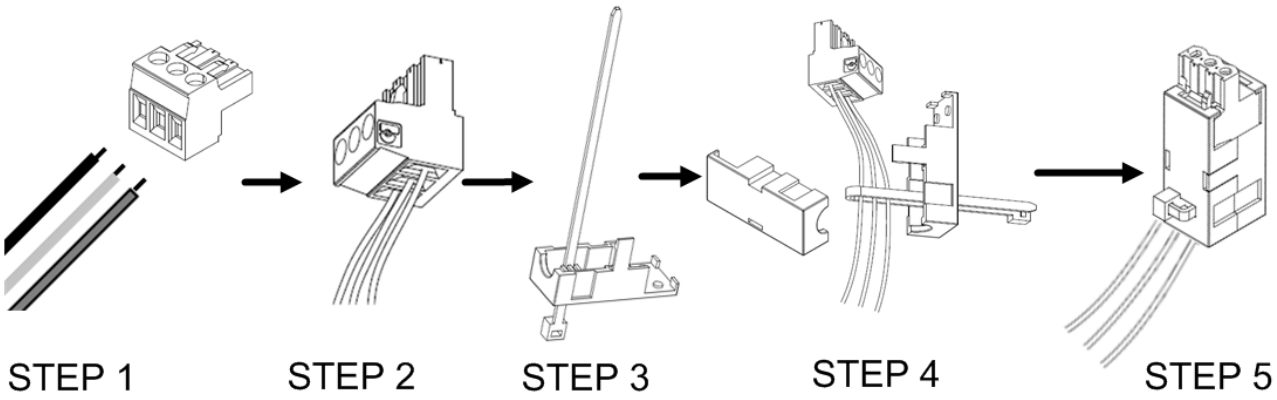


Figure D-1. DC-DC Power Supply Assembly at a Glance

DC-DC Power Supply Assembly at a Glance

Table D-2. Power Module Power Cable Installation Instructions Detail

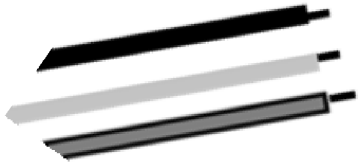
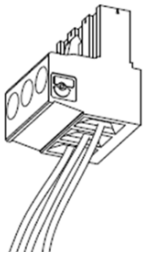
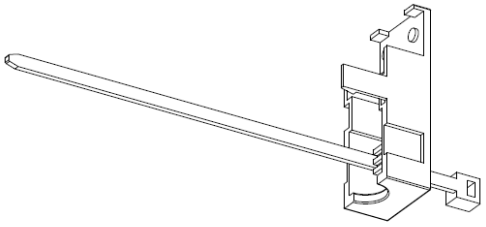
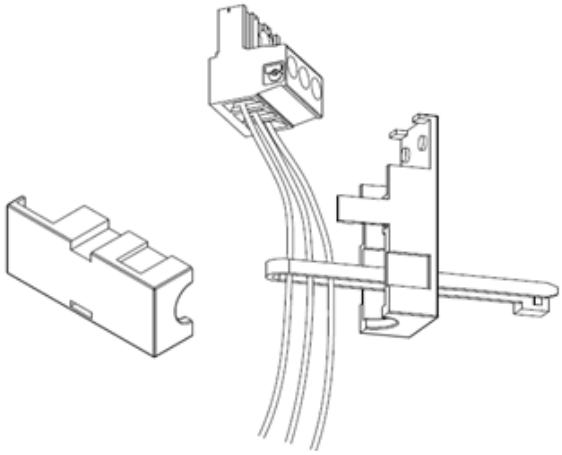
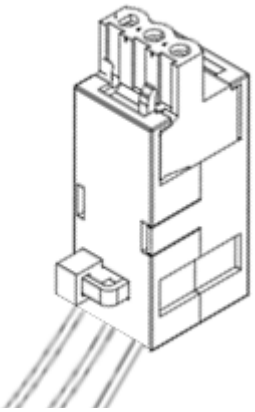
Step	Instructions	Diagram
1.	Strip approximately 1/4 inch of insulation from the ends of three appropriately sized (14-18 AWG) DC input wires.	
2.	Loosen the three screws on the terminal block plug . Insert DC (-), DC (+), and ground wires into the corresponding terminals of the DC terminal block plug. Fasten the three screws securely. Do not over-tighten.	
3.	Insert the cable tie through one of the holes in the right half of the strain relief clip.	

Table D-2. Power Module Power Cable Installation Instructions Detail

Step	Instructions	Diagram
4.	1. Wrap the cable tie around the wires, and tighten. 2. Insert the “three screw end” of the terminal block plug into the half of the strain relief clip. Be sure the two end screw holes fit securely into the two small protruding screw holders.	
5.	1. Clip the other half of the strain relief clip around the cable entry housing and tighten the cable tie. 2. Insert the finished terminal block plug, with the cable entry housing, into the terminal block header in the power supply.	

Appendix E X7 Reset

The X7 Router has three types of reset functions: Level 0, Level 1, and Level 2. Each type has a different effect on the router. Contact the iDirect TAC center for more information.

NOTE: This section references Web iSite. Refer to the *Evolution Web iSite User Guide* or *Velocity Terminal WUI User Guide* for more information. It is good practice to clear browser history, and turn off Web page caching, before accessing the user interface.

E.1 Level 0 Reset

Level 0 reset provides a basic reset function with the following features:

- Initiated by:
  - Router powering up
  - Briefly pressing the reset button and not keeping it pressed for more than 1 second, see Section 3.3, *X7 Router Rear Panel Description* on page 11 for the reset button location
  - In the user interface, select the File Management menu > Restart Device > Restart
- Used to boot to a newly-loaded software image and configuration
- Recovery: initiate a Level 0 reset
- Router rear LEDs: **RX1 PWR** LED turns green and then goes off; **RX2 PWR** LED and **BUC PWR** LED go off

E.2 Level 1 Reset

Level 1 reset is used to run hardware diagnostics and validate router hardware.

NOTE: Debug diagnostics are triggered by this reset. If router hardware requires diagnostics and validations call the iDirect TAC center. Exit and recover from a Level 1 reset by briefly pressing, for less than 1 second, the reset button.

- Initiated by: Pressing the reset button for more than 1 second but less than 4 seconds. See Section 3.3, *X7 Router Rear Panel Description* on page 11 for the reset button location.
- Recovery: initiate a Level 0 reset

- Router rear LED conditions when pressing reset for Level 1 reset, see Table 3-3 on page 11 for LED descriptions: **RX1 PWR** LED turns green when the reset button is initially pressed, then goes off; **RX2 PWR** and **BUC PWR** LED go off, initially; after pressing the reset button for 1 second, the **RX2 PWR** LED turns green, then goes off

E.3 Level 2 Reset

Level 2 reset provides a means of returning the router to factory default settings.

NOTE: This reset must not be used unless there is an intent to reconfigure or reload the software and options. There is no recovery once this reset occurs. New options file, software, and configuration must be loaded using the user interface once this reset has been initiated.

Level 2 reset features:

- Initiated by: Pressing the reset button and keeping it pressed for more than 15 seconds, see Section 3.3, *X7 Router Rear Panel Description* on page 11 for the reset button location
- Intended for recovery of modem, only, and new options file, configuration, and software must be loaded
- Router boots with factory default image (default options file, software, and passwords), access to the user interface is available at 192.168.0.1
- Recovery: none - reload software, options file, configuration
- Router rear LEDs: **BUC PWR** LED (see callout #9, Table 3-3 on page 11) will turn solid green when the reset button is held for greater than 15 seconds

Appendix F Preparing a Remote to Get Into Velocity Network

This chapter describes the procedure to prepare a remote to get into a Velocity network for the first time and contains the following sections:

NOTE: After the remote is brought into the Velocity network using the procedure in this chapter, use the Terminal WUI or Web iSite to update the option files or upgrade the software packages.

F.1 Provisioning a Remote on the NMS

This procedure is performed by the service provider or network operator. To provision a remote and the terminal_type in Pulse, perform the following steps:

1. Create a terminal type with appropriate LNB, BUC, BIM, and AIM for a remote to be provisioned.
2. Provide the GLOBAL_PKI and CONSTELLATION_OPT files for a network to the remote installer.
3. Provide the TERMINAL_OPT file to the terminal vendor.

F.2 Installing the Velocity Software

1. Using SCP, transfer the Velocity package to */common* on the remote.

NOTE: Use SCP on Linux machines and WINSCP on Windows machines to transfer files to the remote.

NOTE: The factory default IP address of a remote is 192.168.0.1.

2. Usign SSH, login to the remote as **root**/**iDirect** and create a temporary directory under */common*

   ```
   # cd /common
   # mkdir temp
   # cd temp
   ```

3. Execute the following command to extract the package:

   ```
   # package -mx -a ../<package name>
   ```

   For example, *# package -mx -a ../CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg* or *CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

4. Execute the following command to create a executable called *package_install.sh*:

   ```
   # chmod +x package_install.sh
   ```

5. Execute the following command to install the package on partition 5:

   ```
   # ./package_install.sh /dev/mmcblk0p5 "$(sha512sum ../<package
   name> | awk '{print $1}')"
   ```

   where *<package name>* is the name of the package. For example, *CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg or CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

6. Execute the following command to check the installation status:

   ```
   # cat /common/pkgDb/mmcblk0p5/<package name>/status
   ```

   where *<package name>* is the name of the package. For example, *CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg or CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

   NOTE: Once the installation is complete and successful, the temp directory and its contents are deleted.

7. Execute the following command to recreate the temp directory under */common*:

   ```
   # mkdir temp
   # cd temp
   ```

8. Execute the following command to extract the package:

   ```
   # package -mx -a ../<package name>
   ```

   For example, *# package -mx -a ../CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg* or *CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

9. Execute the following command to create a executable called *package_install.sh*:

   ```
   # chmod +x package_install.sh
   ```

10. Execute the following command to install the package on partition 6:

    ```
    # ./package_install.sh /dev/mmcblk0p6 "$(sha512sum ../<package
    name> | awk '{print $1}')"
    ```

    where *<package name>* is the name of the package. For example, *CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg or CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

11. Execute the following command to check the installation status:

    #cat /common/pkgDb/mmcblk0p6/*<package name>*/status

    where ***<package name>*** is the name of the package. For example, *CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg or CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

12. Execute the following command to delete the Velocity package in */common* on the remote:

    # rm *<package name>*

    where ***<package name>*** is the name of the package. For example, *CX7xx_rootfs_ga_rmt_1.4.0.2-113.pkg or CX7xx_rootfs_rmt_1.4.0.0-469.pkg*.

13. Execute the following command to setup to boot from the installed package:

    # flashdbmgr --set 5 6 0 0 main

14. Execute the following command to reboot the remote:

    # reboot

F.3 Preparing the Velocity Remote for Network Operation

1. Once the remote is rebooted, the remote address can be either 192.168.0.1 or 192.168.1.1 depending on the Velocity release.
2. Using the browser of your choice, type *https://192.168.0.1* in the address bar of the browser to connect to the Terminal Web User Interface.
3. Login as **admin**/**iDirect**.
4. Click **Administration**> **Software and Configuration**. The **Manage Software Packages** page is displayed.
5. On the **Manage Software Packages** page, upload the *GLOBAL_PKI*, *TERMINAL_OPT*, and *CONSTELLATION_OPT* files obtained from your service provider.

   NOTE: The GLOBAL_PKI and CONSTELLATION_OPT files are common across all remotes and are provided by the service provider. The TERMINAL_OPT is a remote-specific option file and is common for all remotes of specific type and can be obtained from the service provider or created by the terminal vendor.

6. Reset the remote using the Terminal WUI.

   NOTE: A remote that is capable of one-touch commissioning will first execute one-touch commissioning, reboot, and then attempt to acquire into the network, assuming all files have been loaded.

F.4 Manually Commissioning a Remote

On the Terminal WUI, click **Commissioning** > **Commissioning Wizard** and follow the procedure to commission the remote and acquire into network (time varies based on terminal type). For more information on commissioning, see the *Terminal WUI User Guide*.

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