

Installation, Support, and Maintenance Guide

Evolution X1 Satellite Router

Router Products

June 28, 2013



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Contents

About	xi
Intended Audience	xi
Manual Contents	xi
Document Conventions	xii
Safety Definitions	xiii
Related Documents	xiii
Related Training Services	xiii
Getting Help	xiii
1 Introduction	1
1.1 X1 Router (Indoor)	1
1.2 X1 Outdoor Router	2
2 Safety	3
2.1 Installation Safety Guidelines	4
2.2 Electrical Safety	5
2.3 Physical and Environmental Considerations	6
3 Specifications	9
3.1 X1 Router (Indoor) Specifications	10
3.1.1 Mechanical and Environmental Specifications	10
3.1.2 Power Specifications	10
3.1.3 RF Specifications	11
3.2 X1 Outdoor Router Specifications	13
3.2.1 Mechanical and Environmental Specifications	13
3.2.2 Power Specifications	14

3.2.3 RF Specifications	15
4 Physical Interfaces	17
4.1 X1 Router (Indoor) Interfaces	18
4.1.1 X1 Router (Indoor) Front Panel Power and Network LED Status Indicators.	18
4.1.2 X1 Router (Indoor) Rear Panel	19
4.2 X1 Outdoor Router Interfaces	20
4.2.1 X1 Outdoor Router Panel and LED.	20
4.2.2 X1 Outdoor Router Power Module Unit Connectors	22
5 X1 Router (Indoor) Installation	25
5.1 X1 Router (Indoor) Installation at a Glance	26
5.2 Unpacking X1 Router (Indoor) Equipment	27
5.3 Components Typically Included in an Order	27
5.4 X1 Router (Indoor) Mounting.	28
5.4.1 Guidelines for Desktop or Shelf Mounting	28
5.4.2 Guidelines for Rack Mounting	28
5.5 Installation with AC (Option 1) or DC (Option 2) Power Supplies	28
5.5.1 Installation with AC Power Supply (Option 1).	28
5.5.2 Installing with DC Power Supply (Option 2)	28
5.6 Powering on the X1 Router (Indoor).	29
5.6.1 Checking Conditions before Powering Up the System.	29
5.6.2 Powering Up the System.	30
5.7 Preparing the PC/Laptop for Connection to the X1 Router (Indoor)	30
5.8 Monitoring the LEDs.	31
5.9 Configuring the X1 Router (Indoor)	32
6 X1 Outdoor Router Installation	33
6.1 X1 Outdoor Router Installation at a Glance	34
6.2 Unpacking X1 Outdoor Router Equipment.	35
6.3 Components Typically Included in an Order	35
6.4 Installation with AC (Option 1) or DC (Options 2 and 3) Power Supplies	36
6.4.1 Installation with AC Power Supply to the Power Module - Option 1 (AC)	36
6.4.2 Installation with DC Power Supply to the Power Module - Option 2 and Option 3 (DC)	37
6.5 X1 Outdoor Router Mounting	37

6.5.1 Pre-Installation Guidelines for Mounting Configurations	37
6.5.2 Mounting the Router on a Wall or Pole	37
6.5.3 Attaching the Mounting Plate to the Router.	39
6.6 External Power Module Mounting Instructions	40
6.6.1 Attaching the Mounting Plate to the Power Module	41
6.7 Connecting the Ethernet LAN Cable.	42
6.8 Preparing and Connecting the Coax RX and TX cables	44
6.9 Connecting the DC Power Module	45
6.9.1 Connecting the DC power from the Power Module to the X1 Outdoor Router	45
6.9.2 Connecting Power Supply to The Power Module	46
6.10 Powering Up the System.	48
6.10.1 Checking Conditions before Powering Up the System	48
6.10.2 Powering Up the System	49
6.10.3 Powering Up in Cold Temperatures	49
6.11 Preparing the PC/Laptop for Connection to the X1 Outdoor Router	50
6.12 Front Panel Power Indicator and Web Interface LED Status Indicators	50
6.12.1 Front Panel Power Indicator	50
6.12.2 Web Interface LED Status Indicators	50
6.13 Configuring the X1 Outdoor Router	51
7 Maintenance	53
7.1 Safety Guidelines to Observe During Servicing	53
7.1.1 Servicing	53
7.1.2 Conditions Requiring Service	53
7.2 Maintaining the X1 Router (Indoor)	53
7.2.1 Temperature Control.	54
7.2.2 Dust Removal	54
7.2.3 90 Day Regular Maintenance	54
7.3 Maintaining the X1 Outdoor Router	54
7.3.1 Temperature Control.	55
7.3.2 90 Day Regular Maintenance	55
7.4 Repacking the X1 Router	55
Appendix A Tools Needed	57
A.1 Indoor Coax Installation Tools Needed	57
A.2 Outdoor (ODU) Coax Installation Tools Needed	58

Appendix B Preparing the Coax Cable	61
Appendix C Ethernet and Console RJ45 Pinouts	65
C.1 Ethernet Port Pinouts	65
C.2 Console Port Pinouts and RJ-45-DB9 Female DTE Adapter Pinouts	66
Appendix D DC Power Supply Installation	69
Appendix E X1 Reset	73
E.1 Level 0 Reset	73
E.2 Level 1 Reset	73

Figures

Figure 1-1. Front View of the iDirect Evolution X1 Satellite Router (Indoor)	1
Figure 1-2. X1 Outdoor Router (Left), and the Power Module (Right)	2
Figure 4-1. X1 Router (Indoor) Front Panel Indicators	18
Figure 4-2. X1 Router (Indoor) Rear Interface Connectors	19
Figure 4-3. X1 Outdoor Router Panel	21
Figure 4-4. X1 Outdoor Router Power Module with Connectors Labeled	22
Figure 6-1. Packaged Items	36
Figure 6-2. Router Mounting Kit Parts	38
Figure 6-3. Attaching the Mounting Plate	39
Figure 6-4. X1 Outdoor Router Wall Mount	39
Figure 6-5. X1 Outdoor Router Pole Mount	40
Figure 6-6. Mounting the Power Module	41
Figure 6-7. Power Module Wall Mount	41
Figure 6-8. Power Module Pole Mount	42
Figure 6-9. Power Gland Assembly	46
Figure A-1. Installation Tools	58
Figure B-1. Coax Cable Cutting Technique	62
Figure B-2. Cutting Technique for Removing Foil in the Braid.	63
Figure B-3. Folding the Braid	63
Figure B-4. Attaching the Compression fitting F-type Connector	64
Figure B-5. Compression fitting F-Type Weatherproof Plugs and Tool	64
Figure C-1. RJ-45 Cable Connectors, Plug and Receptacle	65
Figure C-2. Holding the RJ-45 Cable Connectors	66
Figure C-3. RJ-45 to DB-9 Female DTE Adapter	67
Figure D-1. DC-DC Power Supply Assembly at a Glance	70

Tables

Table 2-1. General Safety Warnings and Cautions	5
Table 2-2. Electrical Safety Warnings and Cautions	5
Table 3-1. X1 Router (Indoor) Mechanical and Environmental Specifications	10
Table 3-2. X1 Router (Indoor) Power Specifications	10
Table 3-3. X1 Router (Indoor) RF Specifications.....	11
Table 3-4. X1 Outdoor Router Mechanical and Environmental Specifications	13
Table 3-5. X1 Outdoor Router Power Specifications.....	14
Table 3-6. X1 Outdoor Router RF Specifications	15
Table 4-1. X1 Router (Indoor) Panel LED Indicators	18
Table 4-2. X1 Router (Indoor) Connectors.....	20
Table 4-3. X1 Outdoor Router Panel and LED Descriptions	21
Table 4-5. X1 Outdoor Router Power Module Connector Descriptions	22
Table 4-4. X1 Outdoor Router Connector-Cable Cross-Reference	22
Table 4-6. Pin Assignments for AC Power Module Gland (4 pin)	23
Table 4-7. Pin Assignments for DC Power Module Gland (4 pin)	23
Table 6-1. RJ 45 LAN Ethernet Cable Installation Steps.....	43
Table 6-2. Coax RX and TX Cable Installation	44
Table 6-3. X1 Outdoor Router Power Module DC to DC Installation Instructions	45
Table 6-4. Power Module Power Cable Installation Instructions	47
Table 6-5. X1 Outdoor Router Warm-Up Periods	49
Table A-1. Recommended Installation Tools and Equipment for Indoor Coax	57
Table A-2. Tools Included in the order	58
Table A-3. Recommended Installation Tools and Equipment for Outdoor Coax.....	59
Table B-1. Coax Trim Dimensions.....	62
Table C-1. Ethernet Port Pinouts	65
Table C-2. RJ-45 to DB-9 Pinouts	66
Table D-1. X1 Router (Indoor) DC Power Module Connector Parts.....	69
Table D-2. Power Module Power Cable Installation Instructions Detail.....	70

About

This manual provides important safety and compliance information, and explains how to install and maintain the X1 Router.

This chapter contains the following sections:

- *Intended Audience* on page xi
- *Manual Contents* on page xi
- *Document Conventions* on page xii
- *Safety Definitions* on page xiii
- *Related Documents* on page xiii
- *Getting Help* on page xiii

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 and operate the X1 Router solutions. Familiarity with cabling and wiring practices is beneficial.

Manual Contents

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

- *Introduction* provides an overview and description of the X1 Router
- *Safety* describes general cautions
- *Specifications* covers the mechanical, environmental and connector interface requirements
- *Physical Interfaces* covers connector and LED descriptions
- *X1 Router (Indoor) Installation* details procedures for installing the X1 Router (Indoor)
- *X1 Outdoor Router Installation* details procedures for installing the X1 Outdoor Router
- *Maintenance* covers important maintenance procedures for the X1 Router

The following appendixes are also provided:

- [Appendix A, Tools Needed on page 57](#) describes the tools needed
- [Appendix B, Preparing the Coax Cable on page 61](#) describes coax cable preparation
- [Appendix D, DC Power Supply Installation on page 69](#) provides instructions for assembly of the X1 Indoor router’s DC power module strain relief and terminal block plugs
- [Appendix C, Ethernet and Console RJ45 Pinouts on page 65](#) describes the pinouts for the NET connection
- [Appendix E, X1 Reset on page 73](#) describes the reset functions

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: <code>cd /etc/snmp/</code>
Terminal Output	Used when showing resulting output from a command that was entered at a command line or on a console.	<code>crc report all</code> 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.

Safety Definitions

The symbols that are used throughout this manual, are warnings or when to use caution, and are shown here:



WARNING: *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: When this alert symbol is displayed with the CAUTION heading, strictly follow the warning instructions to avoid personal injury, equipment damage, or loss of data.

Related Documents

The following documents are available at <http://tac.idirect.net>. Please consult these documents for information about installing and using iDirect's satellite network software and equipment.

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

Related Training Services

iDirect offers scheduled classroom training at various global training centers, as well as eLearning, for 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

iDX Software user's guides, installation procedures and guides, an FAQ page, and other documentation that supports iDirect products, are available on the TAC Web site located at: <http://tac.idirect.net>.

To find answers to questions or information, contact the iDirect Technical Assistance Center (TAC) at (703) 648-8151.

iDirect makes every effort to produce documentation that is technically accurate, easy to use, and helpful to our customers. Feedback is welcomed! Send comments to techpubs@idirect.net.

1 Introduction

The Evolution X1 Satellite Router is optimized for use in large networks with small inbound channels such as SCADA, point-of-sale and ATM. The X1 features DVB-S2/ACM, TDMA, basic routing and VLAN functionality at a cost-effective price point.

This chapter contains the following sections:

- [Section 1.1, X1 Router \(Indoor\) on page 1](#)
- [Section 1.2, X1 Outdoor Router on page 2](#)

1.1 X1 Router (Indoor)

X1 Router (Indoor) is a cost-effective satellite router optimized for large, narrowband networks with small inbound channels and single client sites. The X1 Router (Indoor) leverages the bandwidth efficiencies of the DVB-S2/ACM standard and incorporates basic routing and VLAN functionality. Developed specifically to support large-scale broadband access networks, the low-cost X1 Router (Indoor) is ideal for demanding broadband applications such as SCADA, point-of-sale and ATM.

The X1 Router (Indoor) is shown in [Figure 1-2](#). The router specifications are described in [Section 3.1, X1 Router \(Indoor\) Specifications on page 10](#). The front panel LEDs and rear panel connectors are described in [Section 4.1, X1 Router \(Indoor\) Interfaces on page 18](#).



Figure 1-1. Front View of the iDirect Evolution X1 Satellite Router (Indoor)

1.2 X1 Outdoor Router

The iDirect Evolution X1 Outdoor Satellite Router is a cost-effective remote bundle ideal for large, narrowband networks for SCADA, femtocells or pipeline monitoring. The X1 Outdoor Router features DVB-S2/ACM and TDMA, basic routing, VLAN functionality and Quality of Service (QoS), and is embedded in a IP67 weatherproof enclosure enabling an extended temperature range, and passive cooling.

The X1 Outdoor Router is shown in [Figure 1-2](#). The router specifications are described in [Section 3.2, X1 Outdoor Router Specifications on page 13](#). The Router and Power Module front panels and Router LED are described in [Section 4.2, X1 Outdoor Router Interfaces on page 20](#).



Figure 1-2. X1 Outdoor Router (Left), and the Power Module (Right)

2 Safety

Follow the safety guidelines in this chapter carefully during installation of the Evolution X1 Satellite Router. These guidelines help to protect the X1 Router from potential damage and help to ensure personal safety. Keep this safety information handy to where it is easily referred.

Read this entire chapter before attempting to install or use the X1 Router. Adhere to all warnings listed on the product's warning labels and in the operating instructions. Follow all operating and usage instructions carefully.



NOTE: See *Safety Definitions* on page xiii for a description of the warning icons that are used in this manual.

This chapter contains the following sections:

- [Section 2.1, *Installation Safety Guidelines* on page 4](#)
- [Section 2.2, *Electrical Safety* on page 5](#)
- [Section 2.3, *Physical and Environmental Considerations* on page 6](#)

2.1 Installation Safety Guidelines



WARNING: Do not attempt to service the X1 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 installing the X1 Router, observe all caution and warning statements. Follow the general warnings and cautions in [Table 2-1 on page 5](#) and [Table 2-2 on page 5](#) for personal safety and to protect equipment. These guidelines may not cover all of the potentially hazardous situations that may be encountered during installation.

The installation of the X1 Router must comply with the national and local electrical codes, as follows:

- In the United States, the National Fire Protection Association (NFPA) 70, United States National Electric Code
- In Canada, the Canadian Electric Code, Part 1, CC22.1
- In other countries, the International Electromechanical Commission (IEC) Recommendation 364, part 1 through part 7
- All cables (IFL, LAN, and other cables) that run from the outdoor equipment to the indoor equipment must be connected to a surge protector at the point of entry to the building
- Lightning protection should be installed to protect the X1 Outdoor Satellite Router unit as appropriate for local conditions and per local codes
- Equipment connected to the protective grounding of the building installation through the main connection or through other equipment with a connection to protective grounding, and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system must be made through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11).

Review the safety instructions in this chapter before installing, configuring, or performing maintenance on the system:

- Always remove or disconnect ALL power connections before installing or removing a chassis
- Keep the staging area clear and free of dust during and after installation
- Keep tools, X1 Router components, and shipping boxes away from walkway area
- The X1 Router operates safely when it is used in accordance with its marked electrical ratings and product usage instructions
- In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1.5 KV rms, 50 Hz or 60 Hz, for 1 minute.
 - Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkøpelt utstyr - og er tilkøpelt et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkøpling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel- TV nettet.
 - Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för

brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.

Table 2-1. General Safety Warnings and Cautions



WARNING: Before working on the ODU equipment, unplug the power cord from the power source.



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



CAUTION: This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.4 Service Personnel.



CAUTION: Do not remove the enclosure. Do not touch internal circuitry when the power cord is connected.



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

2.2 Electrical Safety

Follow the warnings and cautions in [Table 2-2](#) for personal safety and to protect the equipment from electrical hazards.

Table 2-2. Electrical Safety Warnings and Cautions



WARNING: Do not work on the system, or connect or disconnect cables, during periods of lightning activity.



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

Follow the following basic guidelines when working with any electrical equipment:

- Disconnect all power and external cables before installing or removing the chassis
- Do not work alone when potentially hazardous conditions exist
- Never assume that power has been disconnected; always check
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe. Never install equipment that appears damaged
- Carefully examine the work area for possible hazards, such as wet floor, ungrounded power extension cables, and missing safety grounds

2.3 Physical and Environmental Considerations

To protect the equipment and to avoid personal injury, observe the physical and environmental considerations below when installing a X1 Router:

- **Ventilation**

A single core protective vent on the back of the chassis provides pressure equalization and ensures 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 Sources**

Operate this product only from the type of power source indicated on the bottom of approved power supplies. If the type of power supply is unknown, consult the teleport operator or local power company.

- **Power Cord Protection**

Route power supply cords so they are not likely to be walked on or pinched by items placed upon or against them; pay particular attention to cords at plugs, convenience receptacles, and at the point where they exit the product.

- **Overloading**

Do not overload wall outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electrical shock.

- **Electrical Safety**

For electrical safety, power line operated equipment accessories connected to this unit should bear the UL, NRTL, CE listing mark and should not be modified so as to defeat the safety features. This helps to avoid any potential hazard from electrical shock or fire. If in doubt, contact qualified service personnel.

- **Heat**

Do not place the X1 Router near heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.

- **Accessories**

To avoid personal injury or damage to the X1 Router, do not place the chassis on any unstable rack, cart, stand, table, or bracket. Any mounting of the product should follow the manufacturer's instructions.

- **Attachments**

Do not use attachments unless recommended by the manufacturer as they may cause hazards or damage to equipment.

- **Restricted Access**

This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key or other means of security, and is controlled by the authority responsible for the location.

- **Grounding**

Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if it is uncertain that suitable grounding is available.

- **Operational and Maintenance Safety**

As the X1 Router is used, the following safety guidelines must be observed:

- Cables – Never use any other RF cable than what is supplied or recommended by iDirect
- Cleaning – Do not use liquid cleaners or aerosol cleaners. Use a cloth for wiping up dust

3 Specifications

The specifications in this chapter describe the mechanical, environmental and RF specifications for the Evolution X1 Satellite Router. The installation site must accommodate the mechanical and environmental specifications of the X1 Router.

This chapter contains the following sections:

- [Section 3.1, X1 Router \(Indoor\) Specifications on page 10](#)
- [Section 3.2, X1 Outdoor Router Specifications on page 13](#)

3.1 X1 Router (Indoor) Specifications

3.1.1 Mechanical and Environmental Specifications

The X1 Router (Indoor) mechanical and environmental specifications are defined in [Table 3-1](#).

Table 3-1. X1 Router (Indoor) Mechanical and Environmental Specifications

Category	Description
Dimensions	W 9 in (22.86 cm) x H 1.8 in (4.6 cm) x D 6.8 in (17.3 cm)
Weight	1.8 lbs (0.82 kg)
Heat Dissipation	10 W (34.2 BTU/Hour)
Airflow	Natural Convection Cooling
Ambient Temperature	
Operational	32° F to 122° F (0° C to 50° C) at Sea Level
Altitude	
Operating	≤ 10,000 feet (3048 m)
Storage	≤ 35,000 feet (9144 m)

3.1.2 Power Specifications

[Table 3-2](#) provides the power specifications for the router and the typical BUC/LNB for the X1 Router (Indoor).



NOTE: Only use the iDirect approved and provided power supply.

Table 3-2. X1 Router (Indoor) Power Specifications

Category	Description
Power Supply Input Voltage Range	Option 1 (AC Power Supply): 100-240 VAC Single Phase to 24 VDC, 18 AWG, country dependent Option 2 (DC Power Supply): 12-36 VDC
Frequency	Option 1 (only): 47-63 Hz
Power Supply Power Consumption	Option 1: 1.2 A (TYP) Option 2: 9 A (MAX)
Router Input Power	+24 VDC, 2.7 A (MAX)
DC Power Consumption	36 W (TYP), 65 W (MAX)
DC Power @ Tx Output	+24 VDC @ 1.5 A (MAX)
DC Power @ Rx Input	+24 VDC @ 300 mA (MAX)

Table 3-2. X1 Router (Indoor) Power Specifications (continued)

Category	Description
Protection	Internal, primary current fuse, inside power supply Over current protection Short circuit protection
Power Factor Correction	Option 1 (only): Complies with EN61000-3-2 and EN61000-3-3
Input Transient Response	0.5 ms for 50% Load Change (TYP)
Power Supply Input Power Connector	Option 1: IEC-320-C6 Option 2: Phoenix 1757488
Power Cord	Option 1: 18 AWG, country dependent Option 2: 14-18 AWG
Efficiency	87% (MIN)

3.1.3 RF Specifications

Table 3-3 defines the X1 Router (Indoor) RF specifications.

Table 3-3. X1 Router (Indoor) RF Specifications

Category	Description				
Frequency Range	<table> <tr> <td>Transmit</td> <td>950-1700 MHz</td> </tr> <tr> <td>Receive</td> <td>950-2150 MHz</td> </tr> </table>	Transmit	950-1700 MHz	Receive	950-2150 MHz
Transmit	950-1700 MHz				
Receive	950-2150 MHz				
Frequency Tuning Step Size	<table> <tr> <td>Transmit</td> <td>0.6 Hz</td> </tr> <tr> <td>Receive</td> <td>Sub-Hertz with Demodulator</td> </tr> </table>	Transmit	0.6 Hz	Receive	Sub-Hertz with Demodulator
Transmit	0.6 Hz				
Receive	Sub-Hertz with Demodulator				
RF Power Range	<table> <tr> <td>Transmit</td> <td>-30 dBm to 0 dBm</td> </tr> <tr> <td>Receive</td> <td>Single Carrier Input Power: Minimum: $-130 + 10\log(\text{Symbol Rate})$ dBm to -5 dBm Pmax = 0 dBm (MIN), 30 dB attenuation adjustable in 1 dB steps Composite Wideband Input Power: -5 dBm (MAX)</td> </tr> </table>	Transmit	-30 dBm to 0 dBm	Receive	Single Carrier Input Power: Minimum: $-130 + 10\log(\text{Symbol Rate})$ dBm to -5 dBm Pmax = 0 dBm (MIN), 30 dB attenuation adjustable in 1 dB steps Composite Wideband Input Power: -5 dBm (MAX)
Transmit	-30 dBm to 0 dBm				
Receive	Single Carrier Input Power: Minimum: $-130 + 10\log(\text{Symbol Rate})$ dBm to -5 dBm Pmax = 0 dBm (MIN), 30 dB attenuation adjustable in 1 dB steps Composite Wideband Input Power: -5 dBm (MAX)				
RF Power Adjustability	<table> <tr> <td>Transmit</td> <td>1.0 dB Nominal Step Size</td> </tr> <tr> <td>Receive</td> <td>Under AGC for all valid Rx input power range</td> </tr> </table>	Transmit	1.0 dB Nominal Step Size	Receive	Under AGC for all valid Rx input power range
Transmit	1.0 dB Nominal Step Size				
Receive	Under AGC for all valid Rx input power range				

Table 3-3. X1 Router (Indoor) RF Specifications (continued)

Category	Description								
Typical Transmit and Receive									
Phase Noise (dBc/Hz) at:	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Phase Noise</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency	Phase Noise	1 KHz	-75	10 KHz	-85	100 KHz	-95
Frequency	Phase Noise								
1 KHz	-75								
10 KHz	-85								
100 KHz	-95								
Typical Phase Jitter at 14 KHz to 1 MHz	≤ 1.8° rms								
Transmit Carrier Suppression	– 40 dBc (MAX)								
Discrete Spurs, harmonics and non-harmonics	≥ 50 dBc, with output ≥ -15 dBm Inband 32 dBc								
Modulator Spectral Shaping	DVB-S2 (ETSI EN302307)								
Transmitter On/Off	≥ 50 dBc, with output power ≥ -15 dBm								
Frequency Range	<table> <tbody> <tr> <td>Transmit</td> <td>950-1700 MHz</td> </tr> <tr> <td>Receive</td> <td>950-2150 MHz</td> </tr> </tbody> </table>	Transmit	950-1700 MHz	Receive	950-2150 MHz				
Transmit	950-1700 MHz								
Receive	950-2150 MHz								

3.2 X1 Outdoor Router Specifications

3.2.1 Mechanical and Environmental Specifications

The X1 Outdoor Router mechanical and environmental specifications are defined in [Table 3-1](#).

Table 3-4. X1 Outdoor Router Mechanical and Environmental Specifications

Category	Description
Dimensions	X1 Router: W 10.25 in (26.04 cm) x H 10 in (25.4 cm) x D 3 in (7.62 cm) Power Module: W 5 in (12.7cm) x H 8.75 in (22 cm) x D 2.25 in (5.7 cm)
Weight	X1 Router: 5 lbs (2.27 kg) Power Module: 2.7 lbs (1.19 kg)
X1 Router Heat Dissipation	10W (34.2 BTU/Hour)
Power Module Unit Heat Dissipation	5 to 8W (17 to 27.3 BTU/Hour)
Airflow	Natural Convection Cooling
Ambient Temperature	
Operational	-40° F to 140° F (-40° C to 60° C) at Sea Level 32° F to 113° F (0° C to 45° C) at 10,000 Feet
Storage	-40° F to 176° F (-40° C to 80° C)
Temperature Gradient	1.8° F (1.0° C) per 1 minute
Relative Humidity	
Operational	100% condensing
Altitude	
Operating	≤ 10,000 ft (3048 m)
Storage	≤ 35,000 ft (9144 m)

3.2.2 Power Specifications

The X1 Outdoor Router power specifications are defined in [Table 3-2](#).



NOTE: Only use the iDirect approved and provided power supply.



NOTE: The power supply provides power to the external Power Module. The Power Module supplies DC power only to the X1 Outdoor Router.

Table 3-5. X1 Outdoor Router Power Specifications

Category	Description
Power Supply Input Voltage Range	Option 1: 100 - 240 VAC Option 2: 12-36 VDC Option 3: 36-76 VDC
Frequency	Option 1 (only): 50-60 Hz
Power Supply Power Consumption	Option 1: 1.2 A (TYP) Option 2: 9 A (MAX) Option 3: 3 A (MAX)
Router Input Power	+24 VDC, 2.7 A (MAX)
DC Power Consumption	36 W (TYP), 65 W (MAX)
DC Power @ Tx Output	+24 VDC @ 1.5 A (MAX), 10 MHz Reference
DC Power @ Rx Input	+24 VDC @ 300 mA (MAX), 22 KHz tone
Protection	Internal, primary current fuse (on-board fuse protection in the outdoor Power Module) Over current protection Short circuit protection
Power Factor Correction	Option 1 (only): Complies with EN61000-3-2 and EN61000-3-3
Input Transient Response	4% (recovery within 1% less than 500 m/sec for 50-75% and 75-50% load step)
Router Input Power Connector	IP67 Connector
Power Cord	Option 1: 18 AWG (American Wire Gauge), country dependent Option 2 and 3: 14-18 AWG
Efficiency	85% (AVG)

3.2.3 RF Specifications

The X1 Outdoor Router RF specifications are defined in [Table 3-3](#).

Table 3-6. X1 Outdoor Router RF Specifications

Category	Description										
Frequency Range	Transmit 950-1700 MHz, Composite Power 0 dBm/-30 dBm Receive 950-2150 MHz, Composite Power -5 dBm/-65dBm										
Frequency Tuning Step Size	Transmit 0.6 Hz Receive Sub-Hertz with Demodulator										
RF Power Range	Transmit -30 dBm to 0 dBm Receive Single Carrier Input Power: Minimum: $-130 + 10\log(\text{Symbol Rate})$ dBm to -5 dBm Pmax = 0 dBm (MIN), 30 dB attenuation adjustable in 1 dB steps Composite Wideband Input Power: -5 dBm (MAX)										
RF Power Adjustability	Transmit 1.0 dB Nominal Step Size Receive Under AGC for all valid Rx input power range										
Typical Transmit and Receive Phase Noise (dBc/Hz) at	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Phase Noise</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency	Phase Noise	1 KHz	-75	10 KHz	-85	100 KHz	-95	1 MHz	-105
Frequency	Phase Noise										
1 KHz	-75										
10 KHz	-85										
100 KHz	-95										
1 MHz	-105										
Typical Phase Jitter at 14 KHz to 1 MHz	$\leq 1.8^\circ$ rms										
Transmit Carrier Suppression	-40 dBc (MAX)										
Discrete Spurs, harmonics and non-harmonics	≥ 50 dBc, with output ≥ -15 dBm Inband 32 dBc										
Modulator Spectral Shaping	DVB-S2 (ETSI EN302307)										
Transmitter On/Off	≥ 50 dBc, with output power ≥ -15 dBm										

4 Physical Interfaces

This chapter describes physical interfaces and LEDs on the X1 Router (Indoor) and the physical interfaces and LED on the X1 Outdoor Router.

This chapter contains the following sections:

- [Section 4.1, X1 Router \(Indoor\) Interfaces on page 18](#)
- [Section 4.2, X1 Outdoor Router Interfaces on page 20](#)

4.1 X1 Router (Indoor) Interfaces

The X1 Router (Indoor) front panel indicators are described in [Section 4.1.1](#) and the rear panel is described in [Section 4-2](#).

4.1.1 X1 Router (Indoor) Front Panel Power and Network LED Status Indicators

Once the X1 Router (Indoor) is powered up with the appropriate Options file, check the LEDs to confirm the router is functioning properly. The front panel indicators are shown in [Figure 4-1](#) and described in [Table 4-1](#).

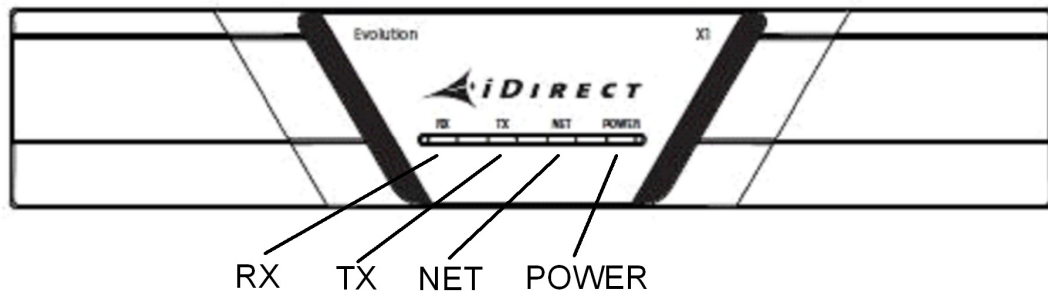


Figure 4-1. X1 Router (Indoor) Front Panel Indicators



NOTE: The LED displayed colors (red, yellow, green) indicate the state of the X1 Router and are documented in the *iDX Web iSite User Guide*, *iDX Satellite Router Installation and Commissioning Guide*, and *iDX Release Notes*. The definitions of the states may be software version dependent.

Table 4-1. X1 Router (Indoor) Panel LED Indicators

LED Label	LED Color	Indicated X1 Status
RX	Off	Receiver is disabled or not configured.
	Solid Yellow	Downstream carrier is configured, but the demodulator is not locked.
	Slow Flashing Yellow	Downstream carrier is configured and the demodulator is locked. NCR is not locked.
	Solid Green	Downstream carrier is configured, demodulator and NCR are locked.
	Flashing Red	All LEDs simultaneously flashing red indicates a software exception or bad options file.
TX	Solid Yellow	Transmitter is disabled.
	Solid Green	Transmitter is enabled.
	Flashing Red	All LEDs simultaneously flashing red indicates a software exception or bad options file.

Table 4-1. X1 Router (Indoor) Panel LED Indicators (continued)

LED Label	LED Color	Indicated X1 Status
NET	Flashing Yellow	Demodulator is not locked on the Downstream carrier.
	Solid Yellow	Demodulator is locked on the Downstream carrier.
	2 Second Flashing Green	Demodulator is locked on the Downstream carrier. Network acquisition is in progress.
	1 Second Flashing Green	Demodulator and NCR are locked on the Downstream carrier. Network acquisition is in progress.
	Solid Green	Network is acquired. Link Layer is up.
	Flashing Red	All LEDs simultaneously flashing red indicates a software exception or bad options file.
POWER	Off	No or low DC power input to the X1.
	Solid Green	Acceptable DC power level to the X1 is detected.
	Solid Yellow	BUC/LNB power fail.
	Flashing Red	All LEDs simultaneously flashing red indicates a software exception or bad options file.

4.1.2 X1 Router (Indoor) Rear Panel

This section describes and illustrates the rear panel connectors and LED indicators. They are shown in [Figure 4-2](#) and defined in [Table 4-2](#) on page 20. The LAN/RJ45 pin assignments are listed in [Appendix C, Ethernet and Console RJ45 Pinouts](#) on page 65.

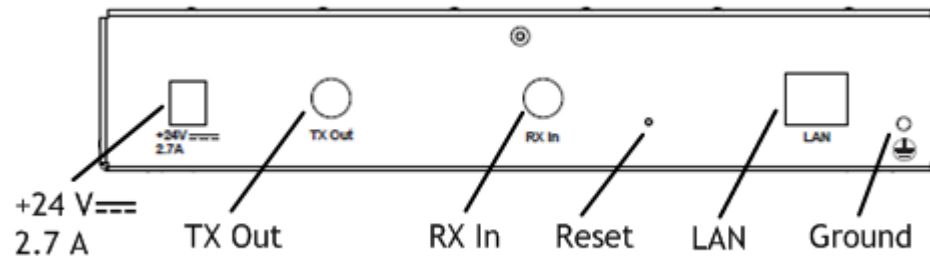




Figure 4-2. X1 Router (Indoor) Rear Interface Connectors

Table 4-2. X1 Router (Indoor) Connectors

Label	Connector Type	Interface and Purpose
+24V  2.7A	CUI 2.5 mm	External +24 VDC power supply
TX Out	75 ohm, F-Type	L-Band Transmit signal to Block UpConverter (BUC) capable of 10 MHz Reference and +24 VDC @ 1.5 Amps maximum over operating temperature
RX In	75 ohm, F-Type	L-band receive signal and DC power to LNB
Reset, no label	Internally recessed push button	Factory default reset, see Appendix E, X1 Reset on page 73 for reset button operation
LAN A	RJ-45	Category-5 STP or UTP cable, 10/100 Base-T Ethernet LAN port connects the X1 Router to the customer LAN Hub/switch. The LAN port is normally assigned to the WAN (towards the VPN). Its IP address is the next hop for the VPN.
	4-40 mounting stud	Chassis ground

4.2 X1 Outdoor Router Interfaces



CAUTION: Install where access to the connectors is unobstructed.

4.2.1 X1 Outdoor Router Panel and LED

The X1 Outdoor Router interface connectors are shown in [Figure 4-3 on page 21](#) and defined in [Table 4-3 on page 21](#). Recommendations and a cross-reference for the connectors and cables are further specified in [Table 4-4 on page 22](#). The reset button is shown in [Figure 4-3 on page 21](#) and is housed above the LAN connector.



NOTE: X1 Outdoor Router has only one LED. However, during installation, the Web Interface (Web iSite) provides four simulated LEDs, reflecting the LEDs, similar to the X1 Router (Indoor). The simulated LED displayed colors (red, yellow, green) indicate the state of the X1 Outdoor Router and are documented in the *iDX Web iSite User Guide*, *iDX Satellite Router Installation and Commissioning Guide*, and *iDX Release Notes*. The definitions of the states may be software version dependent.

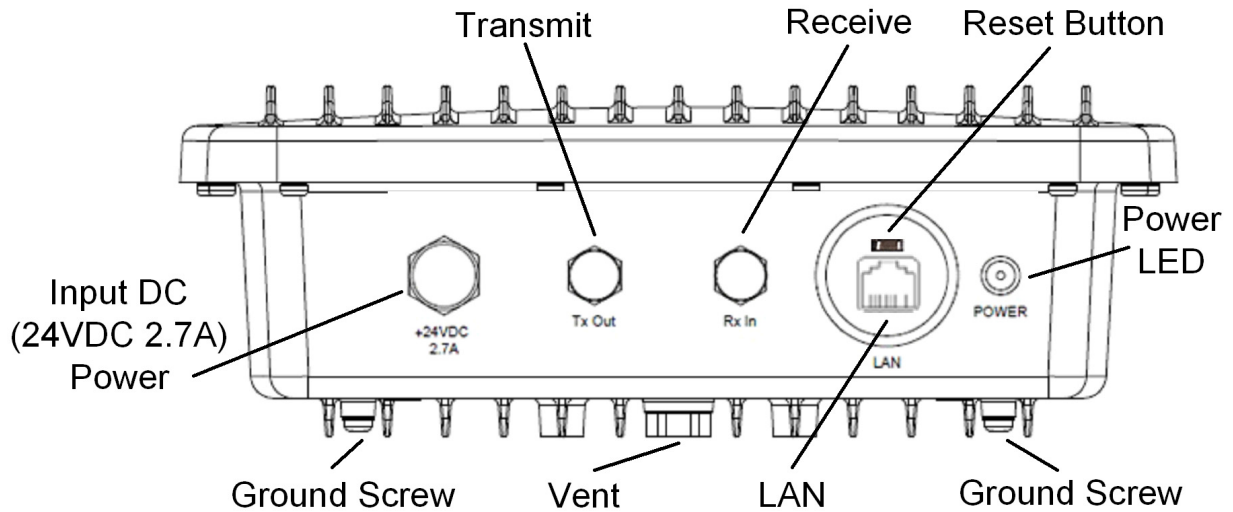


Figure 4-3. X1 Outdoor Router Panel

Table 4-3. X1 Outdoor Router Panel and LED Descriptions


Callout	Label	Connector Type	Interface and Purpose
Input DC (24 VDC 2.7A) Power	+24VDC 2.7A	DC connector	Input DC power from the Power Module.
Ground Screw		none	Grounding screw (provided)
Vent	none	none	Environmental pressure relief valve
Transmit	TX Out	75 ohm, F-Type	L-Band Transmit signal to Block Up Converter
Receive	RX In	75 ohm, F-Type	L-Band receive signal
Reset Button	None	Above the RJ-45 port, a small square	Factory default reset, location of the reset button shown in Figure 4-3 on page 21 and description of operation in Appendix E, X1 Reset on page 73 .
LAN	LAN	RJ-45	Ethernet LAN port connecting the X1 Router to the customer LAN Hub switch; See Appendix C, Ethernet and Console RJ45 Pinouts on page 65
Power LED	POWER	Off	No or low DC power input to the X1 Outdoor Router.
		Solid Red	Acceptable DC power level to the X1 Outdoor Router is detected.

Table 4-4. X1 Outdoor Router Connector-Cable Cross-Reference

Connector Label	Connector Type	Cable Type
24 VDC 2.7A	Supplied with order	DC power cable supplied with order
TX Out and RX In	Either: <ul style="list-style-type: none"> Standard (crimp type) F connector and wrapping with weatherproof tape Waterproof (compression type) F connector 	Coax RG 6 or RG 11
LAN (Ethernet)	RJ45, protected with an M25 Cable Gland (gland supplied with order)	Cat 5 - Cat 7

4.2.2 X1 Outdoor Router Power Module Unit Connectors

The Power Module interface connectors for the X1 Outdoor Router are shown in [Figure 4-4](#) and described in [Table 4-5](#). The pin assignments for the AC power connector are defined in [Table 4-6 on page 23](#) and pin assignments for the DC power connector are defined in [Table 4-7 on page 23](#).

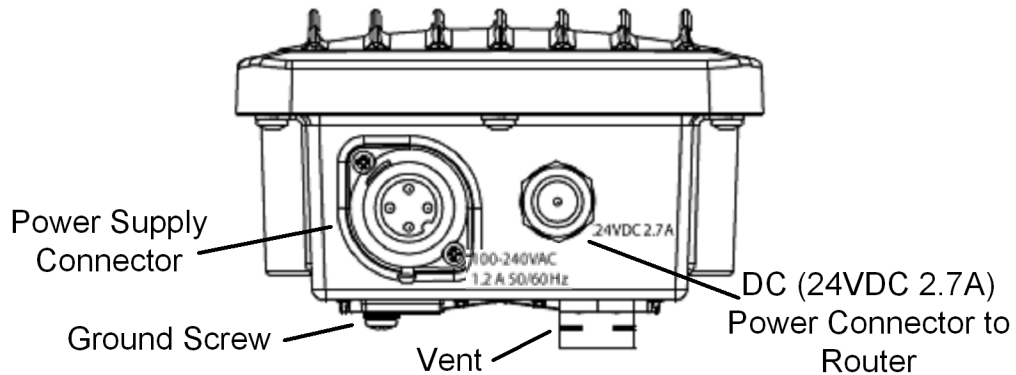


Figure 4-4. X1 Outdoor Router Power Module with Connectors Labeled

Table 4-5. X1 Outdoor Router Power Module Connector Descriptions


Callout	Label	Description
Ground Screw		Grounding screw (provided)
Power Supply Connector	Option 1: 100-240 VAC, 1.2 A 50/60 Hz Option 2: 12-36 V \equiv 9 A Option 3: 36-76 V \equiv 3 A	Power supply connector
Vent	None	Environment pressure relief vent

Table 4-5. X1 Outdoor Router Power Module Connector Descriptions

Callout	Label	Description
DC (24VDC 2.7A) Power Connector to Router	Option 1: 24 VDC 2.7 A Options 2 & 3: 24 V \equiv 2.7 A	DC power connector to Router

Table 4-6. Pin Assignments for AC Power Module Gland (4 pin)


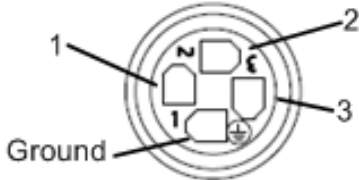

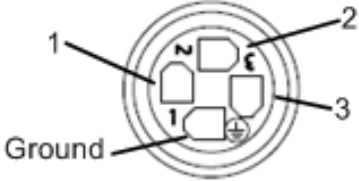
Pin	Definition	Diagram
	Ground (Pin 4)	
1	Option 1: Live (L), 100-240 VAC	
2	Do Not Use	
3	Neutral	

Table 4-7. Pin Assignments for DC Power Module Gland (4 pin)

Pin	Definition	Diagram
	Ground (Pin 4)	
1	Do Not Use	
2	Option 2: +12-36 VDC Option 3: +36-76 VDC	
3	DC Return	

5 X1 Router (Indoor) Installation

This chapter describes the guidelines and procedures for installing the iDirect Evolution X1 Satellite Router (Indoor) at the VSAT location.

This chapter contains the following sections:

- [Section 5.1, X1 Router \(Indoor\) Installation at a Glance on page 26](#)
- [Section 5.2, Unpacking X1 Router \(Indoor\) Equipment on page 27](#)
- [Section 5.3, Components Typically Included in an Order on page 27](#)
- [Section 5.4, X1 Router \(Indoor\) Mounting on page 28](#)
- [Section 5.5, Installation with AC \(Option 1\) or DC \(Option 2\) Power Supplies on page 28](#)
- [Section 5.6, Powering on the X1 Router \(Indoor\) on page 29](#)
- [Section 5.7, Preparing the PC/Laptop for Connection to the X1 Router \(Indoor\) on page 30](#)
- [Section 5.8, Monitoring the LEDs on page 31](#)
- [Section 5.9, Configuring the X1 Router \(Indoor\) on page 32](#)



NOTE: Thoroughly review all the information in [Chapter 2, Safety on page 3](#) before attempting the procedures in this chapter.

5.1 X1 Router (Indoor) Installation at a Glance

Follow these guidelines when installing the X1 Router (Indoor):

- Follow the safety guidelines in [Chapter 2, Safety on page 3](#)
- When selecting the site, consider accessibility, availability of power, signal and network connections, and the possibility of future expansion
- Install the X1 Router (Indoor) in a location where access is unobstructed. Plan for access to both the front and rear panels
- Confirm that the room where the X1 Router (Indoor) operates has adequate ventilation
- Review the ambient temperatures and other environmental specifications listed in [Table 3-1 on page 10](#)
- Ambient air temperature may not cool the X1 Router (Indoor) to acceptable operating temperatures without adequate ventilation
- Select an installation location away from any area that tends to collect dust
- Do not install the X1 Router (Indoor) on the floor
- Use only the iDirect approved and provided Power Module
- Ground the X1 Router according to local and area codes and regulations

The numbered steps in this section must be followed for successful installation of the X1 Router (Indoor). Steps refer to more detailed sections:

1. Confirm the recommended tools are available for installation. See [Appendix A, Tools Needed on page 57](#).
2. Unpack the router according to the instructions in [Section 5.2, Unpacking X1 Router \(Indoor\) Equipment on page 27](#).
3. Check that all components are available, see [Section 5.3, Components Typically Included in an Order on page 27](#).
4. Mount the router as directed in [Section 5.4, X1 Router \(Indoor\) Mounting on page 28](#).
5. Prepare the coax cables as directed in [Appendix B, Preparing the Coax Cable on page 61](#).
6. Prepare the Ethernet LAN cable and connector. The pinouts are described in [Appendix C, Ethernet and Console RJ45 Pinouts on page 65](#).
7. Connect the power as directed for either AC or DC power supplies as described in [Section 5.5, Installation with AC \(Option 1\) or DC \(Option 2\) Power Supplies on page 28](#) for either Option 1 or Option 2.
 - See [Section 5.5.1, Installation with AC Power Supply \(Option 1\) on page 28](#)
 - See [Section 5.5.2, Installing with DC Power Supply \(Option 2\) on page 28](#)
8. Power the router on as directed in [Section 5.6, Powering on the X1 Router \(Indoor\) on page 29](#).
9. Prepare the PC/Laptop as directed in [Section 5.7, Preparing the PC/Laptop for Connection to the X1 Router \(Indoor\) on page 30](#)
10. Monitor the LED indicators with the Web Interface (Web iSite) as directed in [Section 5.8, Monitoring the LEDs on page 31](#).

11. Configure the router as indicated in [Section 5.9, Configuring the X1 Router \(Indoor\)](#) on page 32.
12. If the router needs repacking or maintenance see [Chapter 7, Maintenance](#) on page 53.

5.2 Unpacking X1 Router (Indoor) Equipment

The X1 Router (Indoor) and related equipment, may be shipped in one or more containers, depending on the type of bundle purchased. Once all of the boxes have been received, perform the following tasks:

- Place the boxes so they 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



NOTE: Save the X1 Router shipping boxes after unpacking the system. The boxes may be needed if the unit needs to be moved or shipped in the future.

Remove items from the box only as needed. Confirm the X1 Router (Indoor) components and accessory items listed on the order form have been received, including the optional equipment ordered.

5.3 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:

- 1 (one) X1 Router (Indoor)
- One Power Module: +24 VDC Power Module with either Option 1 or Option 2 power module with connectors
- 1 (one) LAN Ethernet cable
- 1 (one) Quick Start Guide (11 X 17 inch brochure)
- For DC (option 2) Power Module: 1 (one) connector kit containing: one cable tie, one terminal block plug (P/N Phoenix 1754465), 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)

5.4 X1 Router (Indoor) Mounting



NOTE: The X1 Router (Indoor) is designed for indoor use only.

5.4.1 Guidelines for Desktop or Shelf Mounting

If the X1 Router (Indoor) is mounted in an enclosed shelf, the shelf must have adequate ventilation. An enclosed shelf should have openings on the sides and top to provide air circulation.

5.4.2 Guidelines for Rack Mounting

The X1 Router (Indoor) requires a minimum of two rack units (3.5 inches) of vertical rack space. The proposed rack location should be measured before mounting the chassis. An enclosed rack should have louvered sides and top with fans to provide cooling air. Before using a particular rack, check for obstructions, such as a power strip, that could impair rack-mount installation.

5.5 Installation with AC (Option 1) or DC (Option 2) Power Supplies

This section describes installation with either an AC power Supply (Option 1) or DC Power supply (Option 2).

5.5.1 Installation with AC Power Supply (Option 1)

Perform the steps below with an AC power supply:



NOTE: iDirect recommends that the chassis be powered from a low noise, low transient AC power source.

1. Connect the AC power cord.
2. Turn on power.

5.5.2 Installing with DC Power Supply (Option 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). The Chassis can be referenced to +ve, -ve or left floating (i.e. not connected to either +ve or -ve) as required because the power module is fully isolated input to chassis.



NOTE: The DC source to DC Power Module rating and capacity must be 12-36 V DC, 9 A.



NOTE: Per IEC60950-1, the Input voltage is SELV: double/reinforced insulation must be provided between AC Mains and SELV.

For an X1 Router (Indoor) using the DC power supply (Option 2), see [Appendix D, DC Power Supply Installation on page 69](#) for assembly details:

1. Set the X1 Router (Indoor) power module switch to the OFF position (0).
2. Strip approximately 1/4 inch (.6 cm) of insulation from the ends of three appropriately sized (14-18 AWG) DC input wires. For details see [Appendix D, DC Power Supply Installation on page 69](#).
3. Loosen the three screws on the terminal block plug (included, P/N Phoenix 1754465). Insert DC (-), DC (+), and ground wires into the corresponding terminals of the DC terminal block plug. Fasten securely. Do not over-tighten. For details see [Appendix D, DC Power Supply Installation on page 69](#).
4. Assemble the cable entry housing (included for cable strain relief, P/N 1803947 DigiKey 277-5758-ND) around the three DC wires and terminal block plug, locking pieces securely with the provided cable tie. [Appendix D, DC Power Supply Installation on page 69](#).
5. Insert the finished terminal block plug, with the cable entry housing, into the terminal block header in the power supply.
6. Set the X1 Router (Indoor) power module switch to the ON position (1).

5.6 Powering on the X1 Router (Indoor)

This section describes powering on the X1 Router (Indoor).

5.6.1 Checking Conditions before Powering Up the System

Before powering up the system, verify that no RF coax cables are connected to the TX and RX ports on the rear of the chassis.

Also verify that an Ethernet cable connects the LAN port of the PC/laptop to the LAN port of the X1 Router (Indoor).



CAUTION: Do not connect or disconnect the Tx or Rx IFL cable during the time the X1 Router (Indoor) is being powered on; this action may result in damage to the BUC, LNB, and/or X1 Router (Indoor).

5.6.2 Powering Up the System

The X1 Router (Indoor) can be powered directly from the facility AC power source from 100 VAC to 240 VAC or from a DC power supply, per specifications in [Chapter 3 on page 9](#).



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



WARNING: If power from the chassis must be removed, disconnect power using the AC power cord.



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 X1 Router.

1. Connect the power module to the X1 Router (Indoor)
2. Apply power

Upon boot up, the **POWER** LED illuminates green, and within several seconds the **STATUS** LED flashes green as the unit performs a self-diagnostic test. If this test is successful, the **STATUS** LED illuminates green. If the test fails, the **STATUS** LED illuminates red.

After the initial hardware diagnostic, the system takes approximately one minute to complete the boot up cycle, during which the **STATUS** LED flashes green. If the application successfully loads, the **STATUS** LED illuminates solid green. If the application cannot start due to configuration or other errors, all LEDs may simultaneously flash red. Once the router is initialized, a typical functional factory default option file is loaded.



NOTE: The **STATUS** LED is normally green. A red **STATUS** LED indicates a malfunction of the X1 Router (Indoor). iDirect recommends that the chassis be powered from a low noise, low transient power source.

5.7 Preparing the PC/Laptop for Connection to the X1 Router (Indoor)

Connect the laptop to the LAN port, see [Section 4.1.2, X1 Router \(Indoor\) Rear Panel on page 19](#) location. The LAN port is normally assigned to the WAN (towards the VPN). Its IP address is the next hop for the VPN. The IP address of the X1 Router, 192.168.0.1, is important to have to be able to use the Web Interface program (Web iSite).

Ensure that the PC/laptop:

- Has an IP address that is on the same subnet of the X1 Router
- Includes a Network Interface Card (NIC) connected with a CAT 5 cable to the 10/100 LAN port of the X1 Router (Indoor)
- Has a Web browser installed

5.8 Monitoring the LEDs

The X1 Router (Indoor) has one LED on the front panel, see [Table 4-1 on page 18](#) for a detailed description of the states of the LEDs. For diagnostic purposes, the X1 Router (Indoor) displays four LEDs in the Web Interface software (see, [iDX Web iSite User Guide](#)):



NOTE: The LED displayed colors (red, yellow, green) indicate the state of the X1 Router and are documented in the *iDX Web iSite User Guide*, *iDX Satellite Router Installation and Commissioning Guide*, and *iDX Release Notes*. The definitions of the states may be software version dependent.

- RX LED indicates the receive status
- TX LED indicates the transmit status
- NET LED indicates the network acquisition status
- POWER LED indicates whether the unit is powered on or off

5.9 Configuring the X1 Router (Indoor)

When the X1 Router (Indoor) has been installed, next step is installing the firmware and configuring the satellite router. For instructions on how to do this, refer to the *iDX Satellite Router Installation and Commissioning Guide*. To download the guide, go to <http://tac.idirect.net> and click Satellite Routers.

6 X1 Outdoor Router Installation

This chapter describes the guidelines and procedures for installing the X1 Outdoor Router.

This chapter contains the following sections:

- [Section 6.1, X1 Outdoor Router Installation at a Glance on page 34](#)
- [Section 6.2, Unpacking X1 Outdoor Router Equipment on page 35](#)
- [Section 6.3, Components Typically Included in an Order on page 35](#)
- [Section 6.4, Installation with AC \(Option 1\) or DC \(Options 2 and 3\) Power Supplies on page 36](#)
- [Section 6.5, X1 Outdoor Router Mounting on page 37](#)
- [Section 6.6, External Power Module Mounting Instructions on page 40](#)
- [Section 6.7, Connecting the Ethernet LAN Cable on page 42](#)
- [Section 6.8, Preparing and Connecting the Coax RX and TX cables on page 44](#)
- [Section 6.9, Connecting the DC Power Module on page 45](#)
- [Section 6.10, Powering Up the System on page 48](#)
- [Section 6.11, Preparing the PC/Laptop for Connection to the X1 Outdoor Router on page 50](#)
- [Section 6.12, Front Panel Power Indicator and Web Interface LED Status Indicators on page 50](#)
- [Section 6.13, Configuring the X1 Outdoor Router on page 51](#)



NOTE: Thoroughly review all the information in [Chapter 2, Safety on page 3](#) before attempting the procedures in this chapter.

6.1 X1 Outdoor Router Installation at a Glance

Follow these guidelines when installing the X1 Outdoor Router:

- Follow the safety guidelines in [Chapter 2, Safety on page 3](#)
- When selecting the site, consider accessibility, availability of power, signal and network cable connections, and the possibility of future expansion
- Review the ambient temperatures and other environmental specifications listed in [Table 3-4 on page 13](#)
- Install the X1 Outdoor Router in a location where access is unobstructed
- Do not install the X1 Outdoor Router on the floor. Install only on a wall or pole.
- Use only the iDirect approved Power Module
- Ground the X1 Outdoor Router according to local codes and regulations. For ground screw locations see [Section 4.2.1, on page 20](#) and [Section 4.2.2, on page 22](#).

The numbered steps in this section must be followed for successful installation of the X1 Outdoor Router. Steps refer to more detailed sections:

1. Confirm the recommended tools are available for installation. See [Appendix A, Tools Needed on page 57](#).
2. Unpack the router according to the instructions in [Section 6.2, Unpacking X1 Outdoor Router Equipment on page 35](#).
3. Check that all items have been received, see [Section 6.3, Components Typically Included in an Order on page 35](#).
4. Mount the router as directed in [Section 6.5, X1 Outdoor Router Mounting on page 37](#).
5. Mount the external power module as directed in [Section 6.6, External Power Module Mounting Instructions on page 40](#).
6. Prepare the coax cables as directed in [Appendix B, Preparing the Coax Cable on page 61](#).



NOTE: Once the Coax cables are connected to the TX and RX ports, do not remove or replace them as the Router is powering on.

7. Prepare the Ethernet cable and connector as described in [Appendix C, Ethernet and Console RJ45 Pinouts on page 65](#).
8. Connect the power supply as directed for either AC or DC power. There are three power supply options (Options 1, 2, 3) and two sections describing installation:
 - see [Section 6.4.1, Installation with AC Power Supply to the Power Module - Option 1 \(AC\) on page 36](#) for AC power supply input to the Power Module
 - see [Section 6.4.2, Installation with DC Power Supply to the Power Module - Option 2 and Option 3 \(DC\) on page 37](#) for either 12-36 VCD or 36-76 VDC power supply input to the Power Module
9. Attach DC power connector from the Power Module to the Router, as described in [6.9, Connecting the DC Power Module on page 45](#).
10. Follow the guidelines for applying power in [Section 6.10, Powering Up the System on page 48](#).

11. Prepare the PC/Laptop as directed in [Section 6.10.1, Checking Conditions before Powering Up the System](#) on page 48.
12. Monitor the LED indicators with the Web Interface (Web iSite) as directed in [Section 6.12, Front Panel Power Indicator and Web Interface LED Status Indicators](#) on page 50.
13. Configure the router as indicated in [Section 6.13, Configuring the X1 Outdoor Router](#) on page 51.
14. If the router needs repacking or maintenance see [Section 7, Maintenance](#) on page 53.

6.2 Unpacking X1 Outdoor Router Equipment

The X1 Outdoor Router and related equipment, may be shipped in one or more containers, depending on the type of bundle purchased. Once all of the boxes have been received, perform the following tasks:

- Place the boxes so they 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



NOTE: Save the X1 Outdoor Router shipping boxes after unpacking the system. These boxes will be needed in the event of moving or shipping the system in the future.

Remove items from the box only as needed. Confirm the X1 Outdoor Router components and accessory items listed on the order form have been received, including the optional equipment ordered. See [Section 6.3, Components Typically Included in an Order](#) on page 35 for the packing list.

6.3 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:

- One X1 Outdoor Router
- One Power Module, either Option 1, 2, or 3, with connectors, see [Section 6.4, on page 36](#)
- Two (2) hardware mounting kits (one for the X1 Outdoor Router and one for the power module for wall or pole mounting, see [Figure 6-1 on page 36](#), items labeled A and E:
 - Package item labeled A: (part number GTT:GLBAC-WALLMOU-SCC-M) with M6 screws for the X1 Outdoor Router mounting plates
 - Package item labeled E: (part number GTT:GLBAC-WALLMOU-SCC) with M5 screws for the Power Module mounting plates
- One (1) power module gland, package also includes a small Allen wrench, see [Figure 6-1 on page 36](#), item labeled B

- One (1) LAN Ethernet gland, see [Figure 6-1 on page 36](#), item labeled C
- One (1) DC 6 foot power cable, see [Figure 6-1 on page 36](#), item labeled D
- Additional components normally required 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)



Figure 6-1. Packaged Items

6.4 Installation with AC (Option 1) or DC (Options 2 and 3) Power Supplies

This section describes installation with either an AC power Supply (Option 1) or a DC Power supply (Option 2 or 3).

6.4.1 Installation with AC Power Supply to the Power Module - Option 1 (AC)

For an X1 Outdoor Router with an AC power supply:

1. Assemble the AC power gland, as described in [Section 6.9.2, Connecting Power Supply to The Power Module on page 46](#), using the AC Pin assignments in [Table 4-6](#).
2. Connect the AC power gland assembly to the Power Supply Connector on the Power Module, labeled **100-240 VAC, 1.2 A 50/60 Hz**. See [Figure 4-4 on page 22](#) for Power Module connector descriptions.

6.4.2 Installation with DC Power Supply to the Power Module - Option 2 and Option 3 (DC)



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). The Chassis can be referenced to +ve, -ve or left floating (i.e. not connected to either +ve or -ve) as required because the power module is fully isolated input to chassis.

For an X1 Outdoor Router using a DC power supply:

1. Assemble the DC power gland assembly, as described in [Section 6.9.2, Connecting Power Supply to The Power Module on page 46](#), using the DC pin assignments in [Table 4-7](#).
2. Connect the DC power gland assembly to the Power Supply Connector on the Power Module, labeled either **12-36 V \equiv 9A**, for Option 2; or, **36-76 V \equiv 3A**, for Option 3. See [Figure 4-4 on page 22](#) for Power Module connector descriptions.

6.5 X1 Outdoor Router Mounting

The X1 Outdoor Router must be mounted to a wall or to a pole. This section provides details for an outdoor installation.

6.5.1 Pre-Installation Guidelines for Mounting Configurations

When installing the X1 Outdoor Router, follow these guidelines:

- When selecting the site, consider accessibility, availability of power, signal and network cable connections, and the possibility of future expansion
- Install the X1 Outdoor Router in a location where access is unobstructed
- The X1 Outdoor Router operation area must have adequate ventilation
- Do not install the X1 Outdoor Router on the floor, install only on a wall or pole

6.5.2 Mounting the Router on a Wall or Pole



CAUTION: If the X1 Outdoor Router and the Power Module are mounted on the same pole, the router should be installed above the Power Module.



CAUTION: The X1 Outdoor Router and the Power Module must be wall or pole mounted with the cable and power connectors on the bottom of the units, facing downward.



NOTE: The X1 Outdoor Router connectors and cables for power, TX, RX, and Ethernet may be attached before or after mounting on a wall or pole.

The X1 Outdoor Router may be mounted to a wall or a pole by using the GLBAC-WALLMOU-SCC-M mounting kit. The kit includes:

- 1 mounting plate
- 2 stainless steel tie back straps
- 4 wood screws
- 4 wood/gyprock plugs (anchors)
- 4 M6x20 screws
- 4 flat washers for M6 screws
- 4 spring (lock) washers for the M6 screws
- 1 spacer

For easy identification, the mounting kit parts are shown in [Figure 6-2](#).



Figure 6-2. Router Mounting Kit Parts

6.5.3 Attaching the Mounting Plate to the Router

Attach the mounting plate and spacer using the four flat washers, spring washers, and M6x20 screws as shown in [Figure 6-3](#) (horizontal and vertical mounting options are shown).

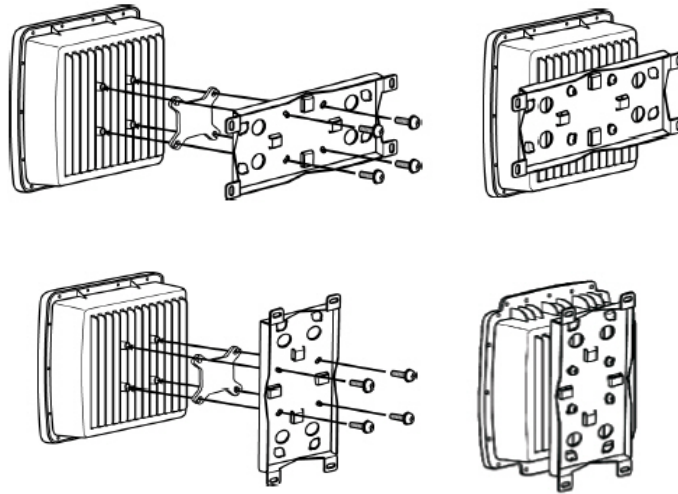


Figure 6-3. Attaching the Mounting Plate

6.5.3.1 Router Wall Mount

After attaching the mounting plate to the router, mount the X1 Outdoor Router to a wall, mount the assembly to the wall using the four wood screws and wood/gyprock plugs as shown in [Figure 6-4](#).

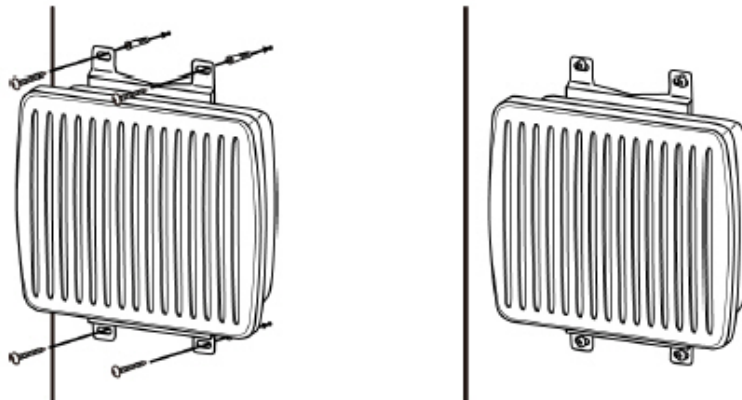


Figure 6-4. X1 Outdoor Router Wall Mount

6.5.3.2 Router Pole Mount

After attaching the mounting plate to the router, mount the X1 Outdoor Router to a pole, mount the assembly to the pole using the two stainless steel tie back straps as shown in [Figure 6-5](#) (various mounting options are shown).

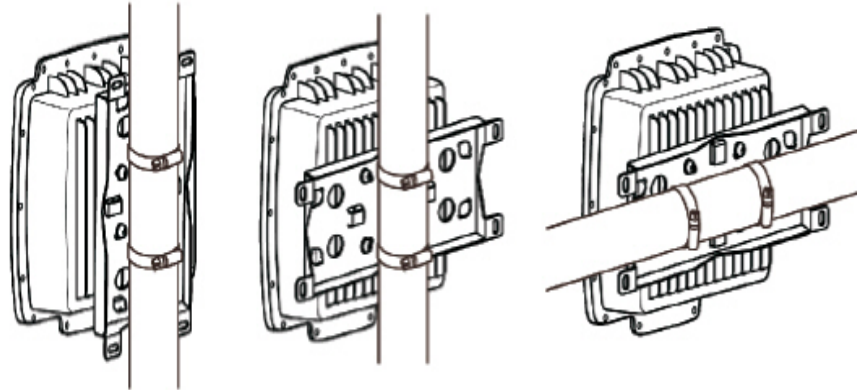


Figure 6-5. X1 Outdoor Router Pole Mount

6.6 External Power Module Mounting Instructions

The Power Module may be mounted to a wall or to a pole by using the GTT-MNT-LP22 (GTT:GLBAC-WALLMOU-SCC) mounting kit, The kit includes:

- 1 mounting plate
- 2 stainless steel tie back straps
- 4 wood screws
- 4 wood/gyprock plugs (anchors)
- 4 M5x20 screws
- 4 flat washers for M5 screws
- 4 spring (lock) washers for M5 screws
- 1 spacer



CAUTION: The Power Module must be wall or pole mounted with the cable and power connectors on the bottom of the unit, facing downward.



CAUTION: The Power Module should be installed below or side-by-side the X1 Outdoor Router if installed on poles.

6.6.1 Attaching the Mounting Plate to the Power Module

Before mounting the Power Module, first attach the mounting plate, to the Power Module, using the M6x20 screws as shown in [Figure 6-6](#).

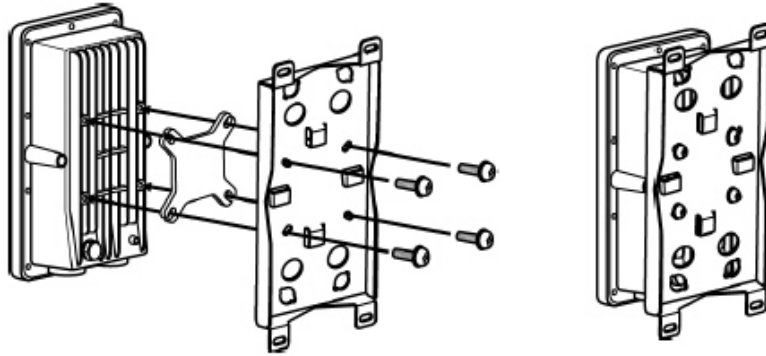


Figure 6-6. Mounting the Power Module

6.6.1.1 Wall Mount

After attaching the mounting plate to the Power Module, mount the Power Module assembly to the wall as shown in [Figure 6-7](#).

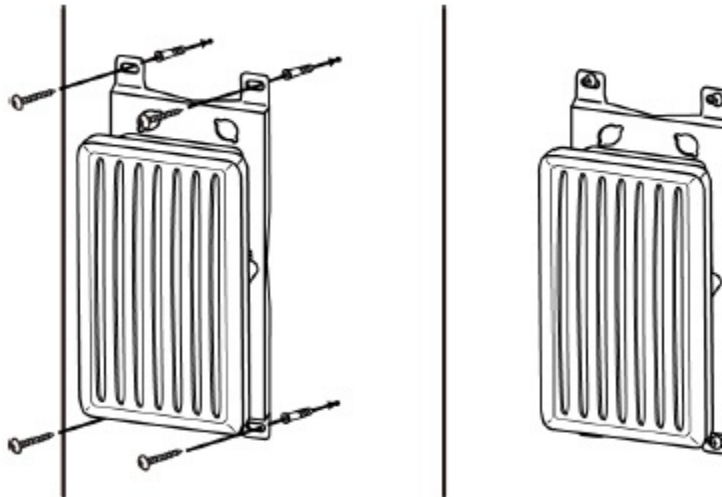


Figure 6-7. Power Module Wall Mount

6.6.1.2 Pole Mount

After attaching the mounting plate to the Power Module, mount the Power Module assembly to the pole as shown in [Figure 6-8](#) (horizontal and vertical mounting options are shown).

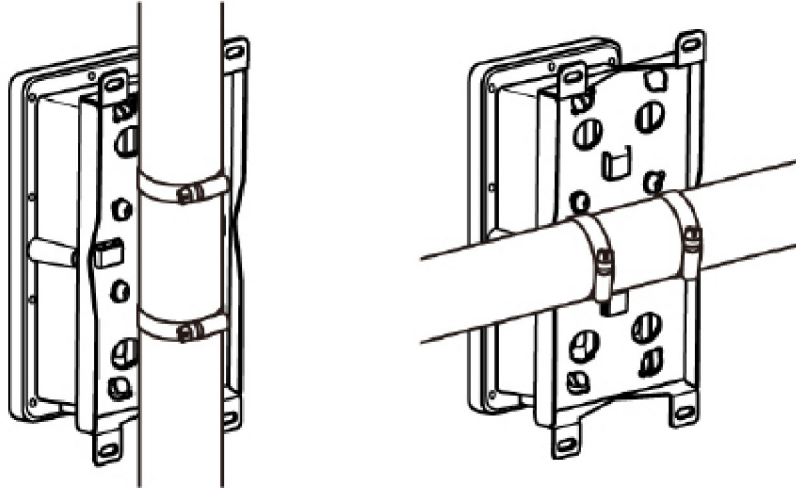


Figure 6-8. Power Module Pole Mount

6.7 Connecting the Ethernet LAN Cable

This section describes the installation of the Ethernet LAN cable. [Appendix C, Ethernet and Console RJ45 Pinouts](#) on page 65 lists the pinout details, [Table C-1](#) on page 65 shows the pin order, and [Table 6-1](#) shows the X1 Outdoor Router Ethernet cable installation steps.



CAUTION: Failure to follow the steps in [Table 6-1](#) on page 43, in the order they are listed, can cause damage to the Ethernet LAN cable.



CAUTION: After tightening the power connectors, wrap with weatherproofing tape, if necessary, following manufacturer's guidelines.



CAUTION: All cables should be installed with a drip loop or service loop.



NOTE: The X1 Outdoor Router connectors and cable for Ethernet may be attached before or after mounting on a wall or pole.

Table 6-1. RJ 45 LAN Ethernet Cable Installation Steps

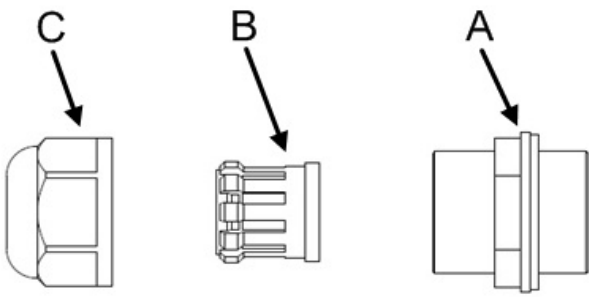
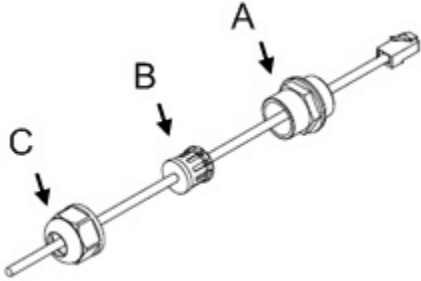
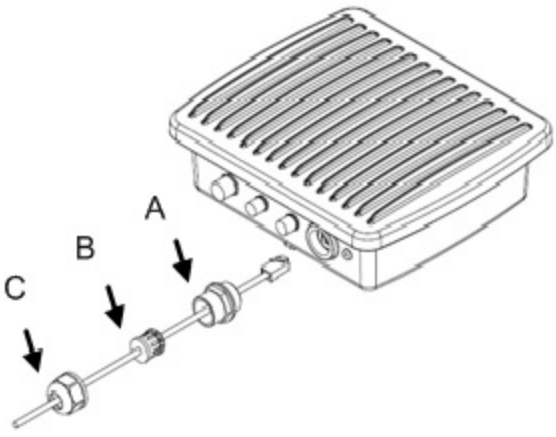
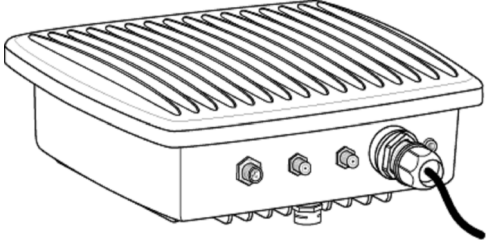
Step	Instructions	Diagram
1.	<p>Take the gland out of the package and disassemble. Parts are labeled on the right.</p> <p>A - Sealing nut B - "Compression nut" - Clamping claw (black, plastic) and sealing/compression ring (gray, rubber) - part B of the gland is split, so that, if the RJ45 clip is already on the cable, the gasket can be easily opened and placed around the cable. C - Lock nut body</p>	
2.	<ol style="list-style-type: none"> Place C, the lock nut body, onto the cable. Place A, the Sealing nut onto the cable with the threads facing the RJ45 end of the cable, towards the router. The compression nut B, has a slit, so it can be placed on the cable. 	
3.	<ol style="list-style-type: none"> Clip the RJ45 connector and cable into the RJ45 receptacle. Screw the sealing nut (A) into the X1 Outdoor Unit. Push the compression ring (B) into the sealing nut (A). Pass the lock nut body (C) over the compression ring (B). Twist the lock nut body (C) into the sealing nut (A) until tightly compressing the entire gland around the Ethernet cable forming a weather tight seal. It is not necessary to fasten too tightly, just so the compression fits securely. A wrench may be used to secure the assembly to the router. Wrap with weatherproofing (self-amalgamate tape) over the connector and cable junctions according to manufacturer's guidelines. 	

Table 6-1. RJ 45 LAN Ethernet Cable Installation Steps (continued)

Step	Instructions	Diagram
4.	Completed and connected LAN assembly shown.	

6.8 Preparing and Connecting the Coax RX and TX cables

Table 6-2 describes connecting the RX and TX coax cables.



CAUTION: After tightening the power connectors, wrap with weatherproofing (self-amalgamate) tape, if necessary, following manufacturer’s guidelines.



CAUTION: All cables should be installed with a drip loop or service loop.



NOTE: The X1 Outdoor Router connectors and cables for power, TX, RX, and Ethernet may be attached before or after mounting on a wall or pole.

Table 6-2. Coax RX and TX Cable Installation

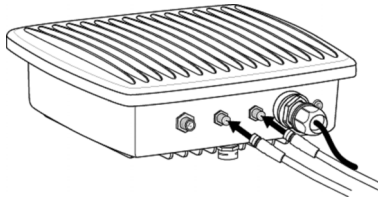
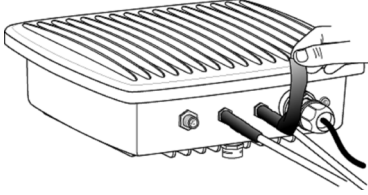
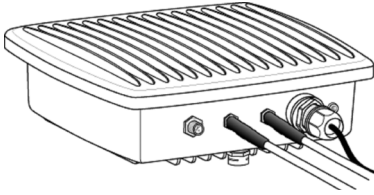
Step	Instructions	Diagram
1.	Prepare the ends of the coaxial cables (F connectors) for outdoor use.	For preparation diagram details see Appendix B, Preparing the Coax Cable on page 61.
2.	Insert F connector assemblies into RX-in interface and lock the connector.	

Table 6-2. Coax RX and TX Cable Installation (continued)

Step	Instructions	Diagram
3.	Use self-amalgamate tape over the connectivity of connector and cable as waterproof function, as per manufacturer's instructions.	
4.	Repeat step 1 and step 2 for TX-out interface.	

6.9 Connecting the DC Power Module

This section details connecting the DC to DC power from the Power Module to the X1 Outdoor Router and connecting the AC power to the Power Module.

6.9.1 Connecting the DC power from the Power Module to the X1 Outdoor Router

Follow the steps in [Table 6-3 on page 45](#) to connect the DC power cable from Power Module to the X1 Outdoor Router.



CAUTION: After tightening the power connectors, wrap with weatherproofing tape, if necessary, following manufacturer's guidelines.



CAUTION: All cables should be installed with a drip loop or service loop.

Table 6-3. X1 Outdoor Router Power Module DC to DC Installation Instructions

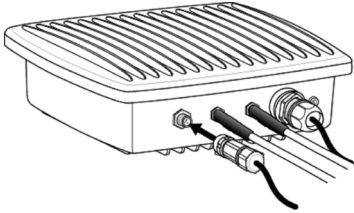
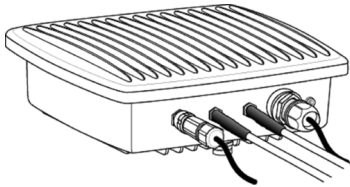
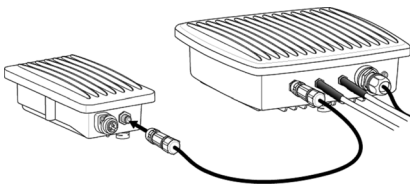
Step	Instructions	Diagram
1.	Observe the location of the keyway in the face of the DC input jack. Align and insert either end of the DC power cable into the jack and tighten the locking ring securely by hand. Tip: connector ends of the DC-DC input cable are identical	

Table 6-3. X1 Outdoor Router Power Module DC to DC Installation Instructions

Step	Instructions	Diagram
2.	Final X1 Outdoor Router DC power connection completed; proceed to step 3.	
3.	Lock the opposite end of the DC power cord into the Power Module.	

6.9.2 Connecting Power Supply to The Power Module

Table 6-4 on page 47 shows the detailed installation steps for the Power Module and gland assembly and Figure 6-9 shows a blow up of the gland assembly parts.



CAUTION: Install power on a GFI (Ground Fault Interrupter) protected circuit.



CAUTION: All cables should be installed with a drip loop or service loop.

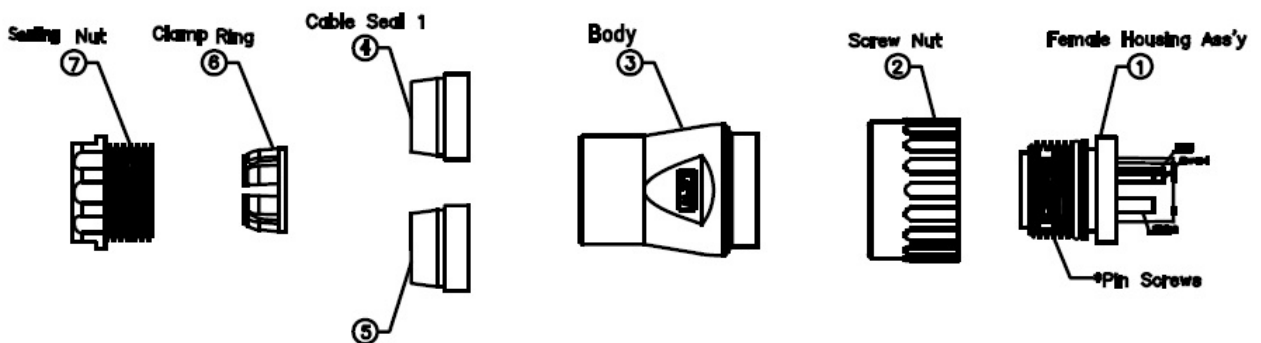
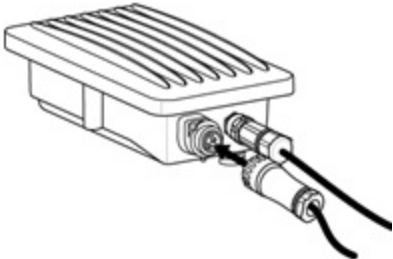


Figure 6-9. Power Gland Assembly

Table 6-4. Power Module Power Cable Installation Instructions

Step	Instructions	Diagram
1.	<p>Make sure all parts of the gland are available</p> <ul style="list-style-type: none"> 1 - Female Housing Assembly (Ass’y) 2 - Screw Nut 3 - Body 4 - 6 mm (.24 in) diameter Cable Seal, which is split for easy application to cable 5 - 12 mm (.47 in) diameter Cable Seal, which is split for easy application to cable 6 - Clamp Ring 7 - Sealing Nut 	
2.	<p>Select a cable seal size (item 4 or 5, in Step 1), providing the best fit for the diameter of cable to be used.</p>	
3.	<p>Table 4-6, <i>Pin Assignments for AC Power Module Gland (4 pin)</i> on page 23 and Table 4-7, <i>Pin Assignments for DC Power Module Gland (4 pin)</i> on page 23 shows the pin assignments for the AC and DC, respectively, power wires in the Female Housing Assembly.</p> <ul style="list-style-type: none"> 1. Connect the AC or DC wires into the assembly according to the pin assignment descriptions in Table 4-6 on page 23 (for AC power) or Table 4-7 on page 23 (for DC power). 2. Using the Allen Wrench (provided), tighten the pin screws for each of the power wires in the Female Housing Assembly. 	

Table 6-4. Power Module Power Cable Installation Instructions (continued)

Step	Instructions	Diagram
4.	<ol style="list-style-type: none"> 1. Connect the power cable into power source. Use a voltmeter to confirm correct AC or DC voltage. Remove plug to de-energize the circuit. 2. Connect the DC power cable into to the Power Module. The connector is keyed and can only be inserted one way. Hand-tighten the screw nut. Weather-tape the assembly as needed following the manufacturer's instructions. 3. Tighten and inspect the cable for final assembly. 	

6.10 Powering Up the System

The X1 Outdoor Router can only be powered directly from the Power Module’s DC power output connector. iDirect recommends that the chassis of the Power Module be powered from a low noise, low transient power source.

The power cord is specific to the needs of the installation site. Only the mating connector is supplied by iDirect and is referred to, in this manual, as the “power gland”.



CAUTION: Install power on a GFI (Ground Fault Interrupter) protected circuit.



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

6.10.1 Checking Conditions before Powering Up the System

Verify that an Ethernet cable connects the LAN port of the PC/laptop to the LAN port of the X1 Outdoor Router.



CAUTION: Do not connect or disconnect the Tx or Rx cable while the X1 Outdoor Router is powered; this action may result in damage to the BUC, LNB, and/or satellite router.

The X1 Outdoor Router operates in temperatures above -40°F (-40°C), see [Section 6.10.3, Powering Up in Cold Temperatures on page 49](#) for starting in extremely cold temperatures.

6.10.2 Powering Up the System



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 X1 Outdoor Router.

After checking the setup as outlined in [Section 6.10.1, on page 48](#), power up the X1 Outdoor Router as follows:

- Connect the iDirect supplied 2 meter DC power cable from the Power Module to the 4-pin power connector on the X1 Outdoor Router
- Plug external power supply cord into the power source

There is a weather sealed power LED indicator on the right side of the Ethernet connector. When power is detected and the X1 Outdoor Router is powered up, the LED light is solid red. If no power is detected, the LED is off.

6.10.3 Powering Up in Cold Temperatures

An X1 Outdoor Router operates in outdoor ambient temperatures as low as -40°F (-40°C). However, if the satellite router is powered off long enough for the internal temperature to fall below -13°F (-25°C) then the modem must warm up before it will become operational.

The warm-up period for the X1 Outdoor Router depends on the internal modem temperature measured at the time it is powered on. [Table 6-5](#) provides the warm-up periods.

Table 6-5. X1 Outdoor Router Warm-Up Periods

Internal Temperatures	Warm-Up Period
-13°F to -31°F (-25°C to -35°C)	1.5 minutes
-31°F to -40°F (-35°C to -40°C)	4.0 minutes

During the long warm-up or short warm-up, the Web interface (Web iSite) will show the **POWER LED** as GREEN and the other LEDs will be yellow. The satellite Rx state on the dashboard shows "Waiting for DEMOD Lock" during the warm-up. The Dashboard of the Web Interface will display a temperature reading, so, this can be observed during warm-up to ensure the temperature is increasing.

Once warm-up has completed, the "Web Interface" (Web iSite) simulation of LEDs will change as the remote goes through the steps to become acquired in the network. See the [Related Documents on page xiii](#) section for guidance to other helpful manuals.



NOTE: If unit is "on" it will operate without any interruptions down to a -40°C (-40°C) outdoor ambient temperature.



NOTE: The Web Interface (Web iSite) always shows 4 simulated LEDs, although the outdoor unit has a single **POWER** LED.

6.11 Preparing the PC/Laptop for Connection to the X1 Outdoor Router

See [Section 4.2, X1 Outdoor Router Interfaces on page 20](#) for more information about the interface connectors.

Ensure that the PC/laptop:

- Has an IP address that is on the same subnet of the X1 Outdoor Router
- Includes a Network Interface Card (NIC) connected with a CAT 5 cable to the 10/100 LAN port of the X1 Outdoor Router
- Has a Web browser installed

6.12 Front Panel Power Indicator and Web Interface LED Status Indicators

The X1 Outdoor Router has a single LED light on the front panel signifying that the power is either on or off, with a solid red LED meaning . However, the Web Interface software (Web iSite) displays a detailed status interpretation with a virtual panel of four LED status indicators. [Section 6.12.1, on page 50](#) and [Section 6.12.2, on page 50](#) describe the functions and display indicators for the physical front panel LED and the four virtual LEDs displayed in the Web Interface software, respectively.

6.12.1 Front Panel Power Indicator

A single LED on the front panel of the X1 Outdoor Router displays power status as described in [table Table 4-3 on page 21](#).

6.12.2 Web Interface LED Status Indicators

For diagnostic purposes, the X1 Outdoor Router displays as having four “LED” indicators in the Web Interface software (see [Related Documents on page xiii](#), *iDX Web iSite User Guide*). The four software interpreted “LED” indicators are described below:



NOTE: The LED displayed colors (red, yellow, green) indicate the state of the X1 Router and are documented in the *iDX Web iSite User Guide*, *iDX Satellite Router Installation and Commissioning Guide*, and *iDX Release Notes*. The definitions of the states may be software version dependent.

- **RX** LED indicates the transmitter status
- **TX** LED indicates the receiver status
- **NET** LED indicates the network acquisition status
- **POWER** LED indicates whether the unit is powered on or off

6.13 Configuring the X1 Outdoor Router

When the X1 Outdoor Router is physically installed, the firmware and configuration of the satellite router need to be completed. For instructions on how to do this, refer to the *iDX Satellite Router Installation and Commissioning Guide*. To download the guide, go to <http://tac.idirect.net> and click **Satellite Routers**.

7 Maintenance

This chapter describes maintenance procedures necessary for ensuring the correct functioning of the X1 Router at a VSAT location.

This chapter contains the following sections:

- [Section 7.1, *Safety Guidelines to Observe During Servicing* on page 53](#)
- [Section 7.2, *Maintaining the X1 Router \(Indoor\)* on page 53](#)
- [Section 7.3, *Maintaining the X1 Outdoor Router* on page 54](#)
- [Section 7.4, *Repacking the X1 Router* on page 55](#)

7.1 Safety Guidelines to Observe During Servicing

When an X1 Router requires service, observe the safety guidelines in this section.

7.1.1 Servicing

Do not attempt to service the X1 Router internal assemblies, as opening and removing covers may expose personnel to dangerous voltages or other hazards. There are no user serviceable parts inside. Opening the X1 Router or Power Module will void the warranty. Refer all servicing to qualified service personnel.

7.1.2 Conditions Requiring Service

Unplug the X1 Router from the power source and refer servicing to qualified service personnel under the following conditions:

- When the power supply cord or plug is damaged
- If the X1 Router does not operate normally when following the operating instructions
- If the X1 Router has been dropped or if the chassis has been damaged
- When the X1 Router exhibits a distinct change in performance

7.2 Maintaining the X1 Router (Indoor)

The X1 Router (Indoor) requires basic maintenance to keep it running efficiently and to prolong its life.

Typically, the only maintenance needed to be performed on the unit, without explicit directions from iDirect, is to maintain the temperature of the X1 Router (Indoor) and keep its external areas free from dust or dirt.



NOTE: There are no user-serviceable parts within the X1 Outdoor Router. Do not attempt to repair/replace a malfunctioning or defective component/module. Doing so may void the warranty.

7.2.1 Temperature Control

The X1 Router (Indoor) has a built-in temperature sensor. The temperature sensor measures the actual circuit board temperature. If the board temperature exceeds a defined threshold, the X1 Router (Indoor) alerts the NMS about the high temperature condition. See [Table 3-1 on page 10](#), for the proper temperature range.

Various conditions can cause the satellite router chassis to have an elevated internal temperature, such as:

- Objects blocking the enclosure vents
- Dust accumulated on the enclosure or the vent
- Ambient temperature elevated beyond the specified limits

7.2.2 Dust Removal

A dusty environment requires frequent maintenance. With the unit powered down, use a slightly damp cloth with the excess moisture wrung out (not a saturated, dripping-wet cloth) to wipe away the dust that collects on the outside of the enclosure

7.2.3 90 Day Regular Maintenance

The X1 Router (Indoor) should have the following procedures performed every 90 days:

- Make sure that no objects are blocking the core protective vents
- If there are objects blocking the core protective vents, remove them safely so there is at least 6 inches (12 cm) from the unit
- Make sure that the ambient temperature remains within the specified limit

7.3 Maintaining the X1 Outdoor Router

The X1 Outdoor Router requires basic maintenance to keep it running efficiently and to prolong its life.

Typically, the only maintenance needed to be performed on the unit, without explicit directions from iDirect, is to maintain the temperature of the X1 Outdoor Router and keep its external areas free from dust or dirt.



NOTE: There are no user-serviceable parts within the X1 Outdoor Router. Do not attempt to repair/replace a malfunctioning or defective component/module. Doing so may void the warranty.

7.3.1 Temperature Control

The X1 Outdoor Router has a built-in temperature sensor. The temperature sensor measures the actual circuit board temperature. If the board temperature exceeds a defined threshold, the X1 Outdoor Router alerts the NMS about the high temperature condition. See [Table 3-4 on page 13](#), for the proper temperature range.

Various conditions can cause the satellite router chassis to have an elevated internal temperature, such as:

- Dust or debris accumulated on the enclosure
- Ambient temperature elevated beyond the specified limits

7.3.2 90 Day Regular Maintenance

The X1 Outdoor Router should have the following procedures performed every 90 days:

- Walk around the area where the router and power supply are installed and make sure nothing is impeding the units
- Make sure weatherproofing on the cabling (tape) is in good condition
- Make sure that the ambient temperature remains within the specified limits

7.4 Repacking the X1 Router

If the X1 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 X1 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 Tools Needed



NOTE: The tools intended for use in this section are intended to be generic. Equipment should be installed per manufacturer's requirements specific to the brands preferred.

This section describes tools needed for X1 Router installation.

A.1 Indoor Coax Installation Tools Needed

[Table A-1](#) specifies recommended tools and supplies for a typical indoor installation and [Figure A-1 on page 58](#) shows the tools.

Table A-1. Recommended Installation Tools and Equipment for Indoor Coax

Quantity	Tool
1	Number 2 Phillips screwdriver Figure A-1
1	F-Connector crimper or Compression Tool Figure A-1
1	RG-6 Coax Stripper, see Figure A-1
1	Coax / Wire Cutter, see Figure A-1
length as needed	RG-6 or RG-11 solid copper conductor coax outdoor rated cable



Figure A-1. Installation Tools

A.2 Outdoor (ODU) Coax Installation Tools Needed

Table A-2 specifies the tools that are included with the order and Figure A-1 and Table A-3 specify recommended tools and supplies for a typical installation.

Table A-2. Tools Included in the order

Quantity	Tool
1	1.5 mm Allen wrench

Table A-3. Recommended Installation Tools and Equipment for Outdoor Coax

Quantity	Tool
1	Number 2 Phillips screwdriver (for rack mounting)
1	F-Connector Compression Tool, such as: Holland Compression Tool 1855, see Figure A-1 on page 58
1	RG-6 Coax Stripper, see Figure A-1 on page 58
1	Coax / Wire Cutter, see Figure A-1 on page 58
1	SOJW 18AWG (OD (outdoor) must comply with AC connector), AC Power Cable Where: S - Service Grade, O - Oil Resistant, a single O means only the outer jacket is oil resistant, J - Hard Service, W - Outdoor rated, includes sunlight resistant jacket and wet location rated conductors, 18AWG - 18 American Wire Gauge Reference http://en.wikipedia.org/wiki/American_wire_gauge
2	F-type weatherproof outdoor connectors with weatherproofing gasket (O-ring), such as: Holland SLCU6-Q0, see labeled figures A and B in Figure B-5, Compression fitting F-Type Weatherproof Plugs and Tool on page 64
1	RG-6 or RG-11 solid copper conductor coax outdoor rated cable
1	3M Temflex™ 2155 Rubber Splicing Tape covered with Scotch® Super 33+, recommended to weatherproof connectors, if connectors are not weatherproof certified or according to manufacturer's recommendations
1	RJ-45 connector
1	DB-9 to RJ-45 Adapter
1	Length of outdoor rated Ethernet LAN cable
1	(Optional) Wrench for securing/un-securing the plastic sealing nut designated as part A in Table 6-1, RJ 45 LAN Ethernet Cable Installation Steps on page 43 .

Outdoor (ODU) Coax Installation Tools Needed

Appendix B Preparing the Coax Cable



NOTE: The procedures in this section, for preparing outdoor 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 Evolution X1 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

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 A, *Tools Needed* on page 57 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 B-1.



Figure B-1. Coax Cable Cutting Technique



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

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 B-1. For RG-6, use a two-step Coax Stripper such as the LC-CST 1257 from Paladin Tools.

Table B-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)
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 B-2.



Figure B-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 B-1 on page 62](#) and shown in [Figure B-3](#).

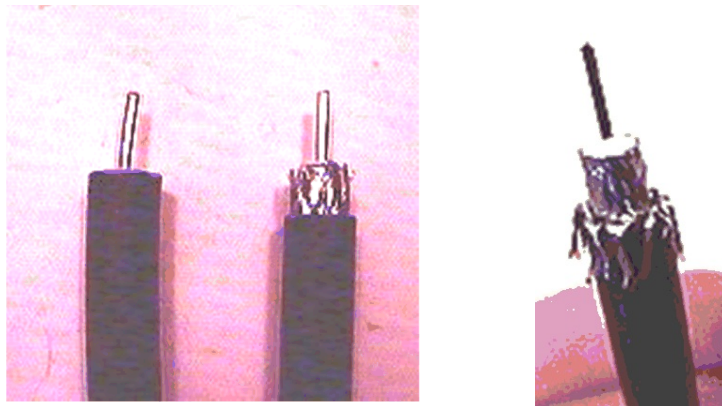


Figure B-3. Folding the Braid

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 B-1 on page 62](#). 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 B-4 on page 64](#)) over foil and underneath the braid. A good, weatherproof outdoor connector mandrel should have a visible O-Ring (bottom right (B) [Figure B-4 on page 64](#)).



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 B-4 on page 64](#) for an RG-6/RG-11 termination.

9. 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-3](#).

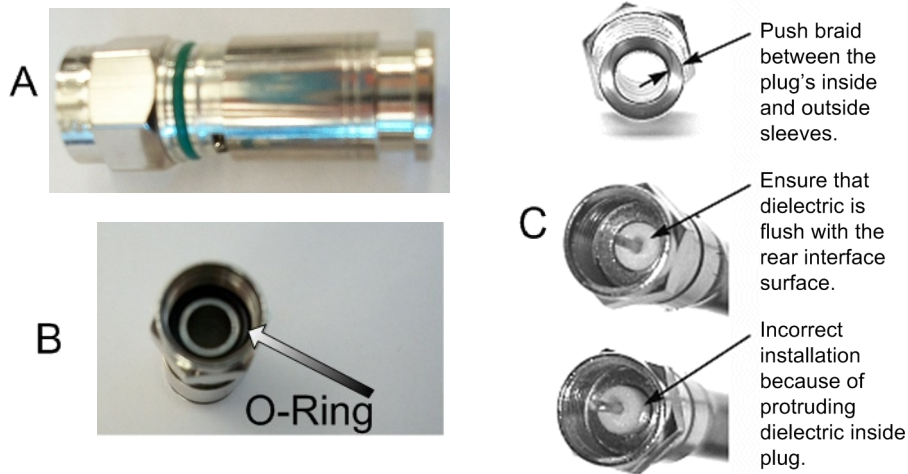


Figure B-4. Attaching the Compression fitting F-type Connector

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



Figure B-5. Compression fitting F-Type Weatherproof Plugs and Tool

11. 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.

Appendix C Ethernet and Console RJ45 Pinouts

This appendix describes the Ethernet and console cable pinout details and has these sections:

- [Section C.1, Ethernet Port Pinouts on page 65](#)
- [Section C.2, Console Port Pinouts and RJ-45-DB9 Female DTE Adapter Pinouts on page 66](#)

C.1 Ethernet Port Pinouts

Table C-1. Ethernet Port Pinouts

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

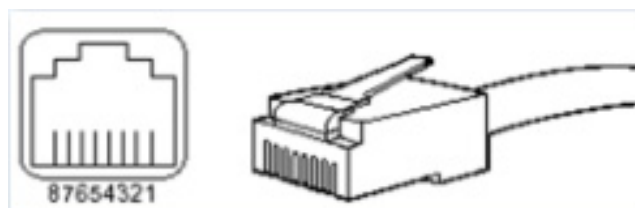


Figure C-1. RJ-45 Cable Connectors, Plug and Receptacle

The LAN A port is normally assigned to the WAN (towards the VPN). Its IP address is the next hop for the VPN.

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 A port on the Evolution X1 Satellite Router chassis to the customer provided LAN Hub or switch.



NOTE: iDirect supplies one 7-foot Category 5 UTP cable to connect the X1 Router to the LAN hub or switch. If additional cables or different lengths are needed, they may be bought commercially.

Be sure the Ethernet cable is a straight through cable. To determine the type of RJ-45 cable, examine, holding the cable ends as depicted in [Figure C-2](#) the sequence of the colored wires 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

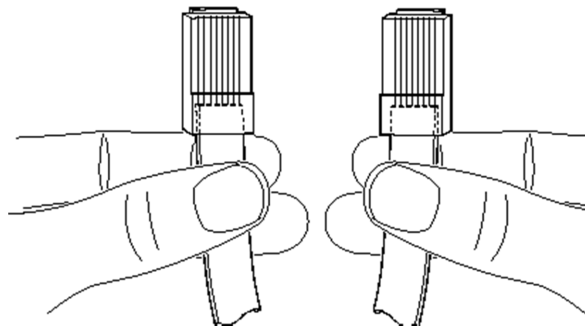


Figure C-2. Holding the RJ-45 Cable Connectors

C.2 Console Port Pinouts and RJ-45-DB9 Female DTE Adapter Pinouts

The Console port may use the Ethernet net port (NET) described in the above section, or, if a PC is running terminal emulation software, then, an RJ-45 to RJ-45 straight cable and RJ-45 to DB-9 female DTE adapter may be used to connect the console port to the PC running terminal emulation software.

The signal and pinouts for the asynchronous serial console port of the X1 Router and the RJ-45 to DB-9 female DTE adapter are listed in [Table C-2](#).

Table C-2. 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

Table C-2. RJ-45 to DB-9 Pinouts

Console Port (DTE)	RJ-45 Pin	Color Code	RJ-45 to DB-9 Terminal Adapter	Console Device
RxD	6	Yellow	3	TxD
DSR	7	Brown	4	DTR
Rx-RF-Power	8	White/Grey	9	Not Connected

A picture of the RJ-45 to DB-9 Female DTE adapter is shown in [Figure C-3](#).



Figure C-3. 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 the X1 Router (Indoor), Option 2.

A summary of the parts are listed in [Table D-1](#). Follow the at a glance instructions in [Figure D-1](#) and for detailed instructions in [Table D-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). The Chassis can be referenced to +ve, -ve or left floating (i.e. not connected to either +ve or -ve) as required because the power module is fully isolated input to chassis.

Table D-1. X1 Router (Indoor) DC Power Module Connector Parts

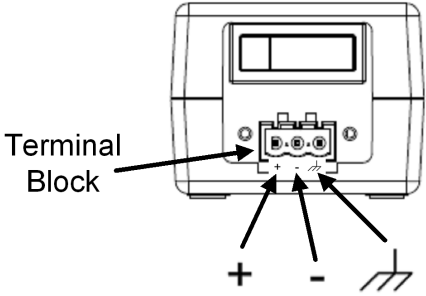

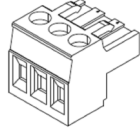
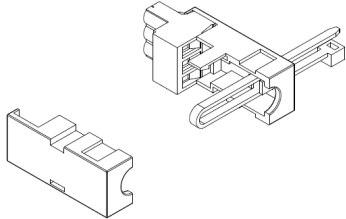
Name	Description	Diagram or Reference
DC Terminal block	Rear panel, DC terminal block area	
3 DC input wires	Appropriately labeled wires, such as: <ul style="list-style-type: none"> • red = positive + • black = negative - • blue = ground -  	14-18 AWG (American Wire Gauge) Reference: http://en.wikipedia.org/wiki/American_wire_gauge

Table D-1. X1 Router (Indoor) DC Power Module Connector Parts

Name	Description	Diagram or Reference
Terminal block plug	Included in kit, P/N Phoenix 1754465	
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	

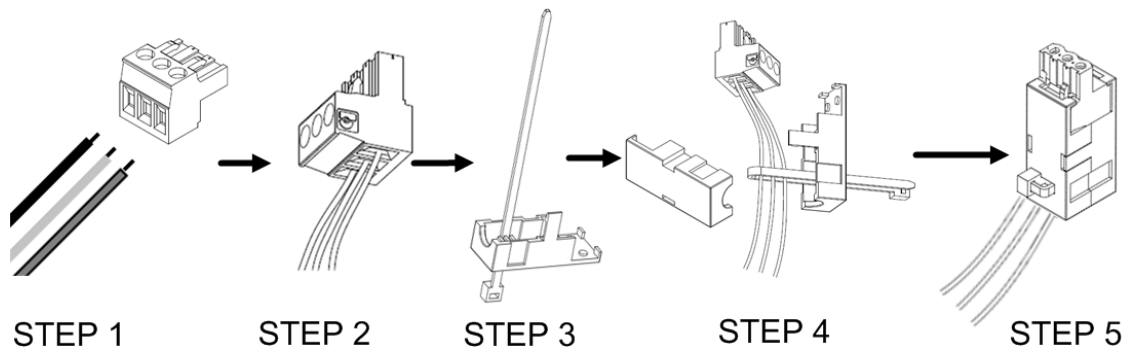


Figure D-1. DC-DC Power Supply Assembly at a Glance

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

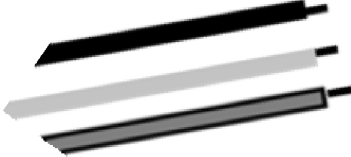
Step	Instructions	Diagram
1.	Strip approximately 1/4 inch of insulation from the ends of three appropriately sized (14-18 AWG) DC input wires.	

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

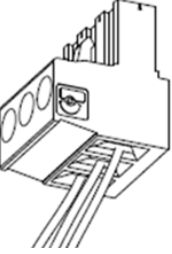
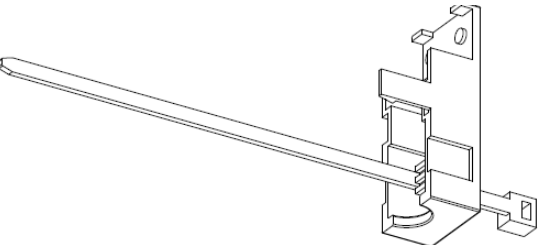
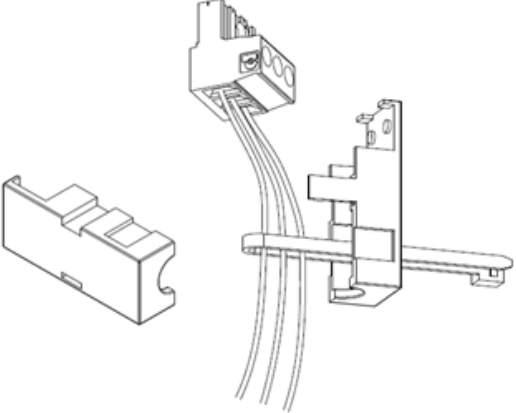
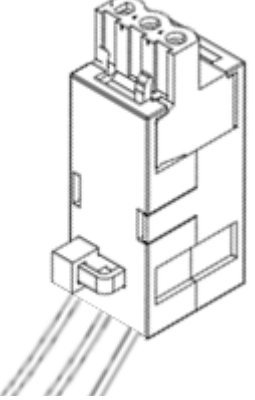
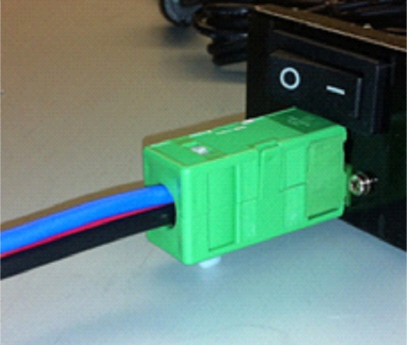
Step	Instructions	Diagram
2.	Loosen the three screws on the terminal block plug . Insert DC (-), DC (+), and ground wires into the corresponding terminals of the DC terminal block plug. Fasten securely. Do not over-tighten.	
3.	Insert the cable tie through one of the holes in the right half of the strain relief clip.	
4.	<ol style="list-style-type: none">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.	Clip the other half of the strain relief clip around the cable entry housing and tighten the cable tie.	

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

Step	Instructions	Diagram
6.	Insert the finished terminal block plug, with the cable entry housing, into the terminal block header in the power supply.	

Appendix E X1 Reset

The X1 Router has two types of reset functions: Level 0 and Level 1. Each type has a different effect on the router. Contact the iDirect TAC center for more information.

E.1 Level 0 Reset

Level 0 reset provides a basic reset function.



CAUTION: Level 0 reset can be triggered in 3 ways: by powering up the X1 Router; briefly pressing the reset button; or, in Web iSite: selecting File Management > Restart Device > Restart.

Level 0 reset features:

- Initiated by:
 - Router powering up
 - Briefly pressing the reset button and not keeping it pressed for more than 1 second, see [Figure 4-2, X1 Router \(Indoor\) Rear Interface Connectors on page 19](#) and [Figure 4-3, X1 Outdoor Router Panel on page 21](#) for the reset button locations
 - In Web iSite select the File Management menu > Restart Device > Restart
- Used to boot to a newly-loaded software image and configuration
- Recovery: recover by briefly pressing the reset button again, for not more than 1 second, or cycle the power off, then on

E.2 Level 1 Reset

Level 1 reset provides a means of returning the router to factory default settings.



CAUTION: 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 with Web iSite once this reset has been initiated.

Level 1 reset features:

- Initiated by:
 - Pressing the reset button and keeping it pressed for more than 8 seconds, see [Figure 4-2, X1 Router \(Indoor\) Rear Interface Connectors on page 19](#) for the reset button location

Level 1 Reset

- Intended for recovery of modem, only; new options file, configuration, and software must be loaded
- Router boots with factory default image (default options file, software, and passwords), access to Web iSite is available at 192.168.0.1
- Recovery: none - software, options file, configuration must be reloaded

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