



**BLiNQ Networks Inc.**

**X-1200 Intelligent Wireless Backhaul System**

***Installation Guide***

**Release 1.0**

**Issue 01 D1**

**April 2014**

## Revision History

Date	Issue	Reason for Issue
August 2013	01	Early Availability
January 2014	1.0	Final Document
April 2014	1.0 D1	Label Update (Approvals); Compliance update including Antenna

### Contact Information:

BLiNQ Networks Inc.  
400 March Road, Suite 240  
Ottawa, ON K2K 3H4

### Web Site:

<http://www.blingnetworks.com>

### Sales Inquiries:

Email: [sales@blingnetworks.com](mailto:sales@blingnetworks.com)  
Telephone: 1-613-599-3388 x280

### Customer Support:

Web: <http://www.blingnetworks.com/support>  
Email: [support@blingnetworks.com](mailto:support@blingnetworks.com)  
Telephone: 1-613-599-3388 x270

## Table of Contents

<b>1</b>	<b>Important Safety and Service Notices</b> .....	<b>1</b>
1.1	Safety Warnings .....	1
1.2	Important Service and Warranty Information .....	1
1.3	Overvoltage (Lightning/Surge) Protection .....	2
<b>2</b>	<b>System Description</b> .....	<b>4</b>
<b>3</b>	<b>Flowchart: Installation Process Overview</b> .....	<b>7</b>
<b>4</b>	<b>Required Installation Items</b> .....	<b>8</b>
<b>5</b>	<b>Site Preparation</b> .....	<b>11</b>
5.1	Operating Sector Frequency Check.....	11
5.2	HM and RBM Pre-Installation Checks and Service Provisioning .....	11
<b>6</b>	<b>Installing the Modules (General)</b> .....	<b>13</b>
6.1	General Safety Information .....	13
6.2	Equipment Distance and Orientation .....	14
6.2.1	Hub Modules.....	14
6.2.2	Remote Backhaul Modules .....	14
6.3	Mounting to a Pole or Wall.....	14
6.3.1	Attaching Pole Clamps to Mounting Bracket .....	14
6.3.2	Mounting with U- or V-Clamps .....	16
6.3.3	Mounting with Steel Straps.....	17
6.3.4	Mounting onto a Wall .....	18
6.4	Assembling the Module Brackets .....	19
6.4.1	Attach Elevation Bracket.....	19
6.4.2	Attach Azimuth Bracket .....	21
6.5	Installing the Power Supply Unit (Optional) .....	23
6.5.1	Installing the PSU Bracket .....	23
6.5.2	Installing the Power Supply Unit.....	24
6.6	Installing the Module onto a Mounting Bracket.....	26
6.7	Grounding and Overvoltage Protection Instructions.....	28
6.7.1	Installing the Grounding Cable.....	28
6.7.2	Installing the Lightning/Surge Arrestor.....	29
6.8	Connecting to DC Power .....	31
6.9	Verifying Basic Installation .....	33
6.10	Connecting to the Ethernet Backhaul Network .....	34
6.10.1	Connecting to the RJ45 Ethernet Port .....	34
6.10.2	Connecting to the SFP Port .....	36
6.11	Cable Management.....	36

<b>7</b>	<b>Installing the Hub Module.....</b>	<b>38</b>
7.1	Adjusting the Hub Module.....	38
7.2	Assembling the Beam Steering Antenna (If Required) .....	41
7.2.1	Installing the Bracket on to the Beam Steering Antenna .....	41
7.2.2	Mounting the Antenna Assembly on to HM .....	42
7.2.3	Connections for Antenna and Hub.....	44
<b>8</b>	<b>Installing the Remote Backhaul Module .....</b>	<b>46</b>
8.1	Using the BSI Feature and Adjusting the Module .....	46
<b>9</b>	<b>System and Network Provisioning.....</b>	<b>51</b>
<b>10</b>	<b>Appendix.....</b>	<b>52</b>
10.1	BLiNQ Wireless Devices and RF Safety/Les appareils sans fil BLiNQ et la sécurité RF.....	52
10.2	Equipment Compliance.....	54
10.2.1	Federal Communications Commission (FCC) Notices .....	54
10.2.2	Industry Canada Notice.....	54
10.2.3	Bonded Network .....	54
10.3	Troubleshooting Guide .....	55
10.4	List of Acronyms.....	57

## List of Figures

Figure 1	Module Casing Labels .....	2
Figure 2	Hub Module .....	6
Figure 3	Remote Backhaul Module.....	6
Figure 4	Pole/Wall Mount Bracket.....	15
Figure 5	Attaching Pole Clamps to Pole/Wall Mount Bracket .....	15
Figure 6	Attaching Assembled Pole/Wall Mount Bracket to Pole with U-Clamp or V-Clamp.....	17
Figure 7	Attaching Assemble Pole/Wall Mount Bracket to Pole with Straps .....	18
Figure 8	Attaching Assembled Pole/Wall Mount Bracket to Wall .....	19
Figure 9	Elevation Bracket and Associated Hardware .....	20
Figure 10	Elevation Bracket Mounting Position.....	20
Figure 11	Attaching Elevation Bracket to Back of Module .....	21
Figure 12	Azimuth Bracket and Associated Hardware.....	21
Figure 13	Attaching Azimuth Bracket to Elevation Bracket on Module.....	22
Figure 14	PSU Mounting Bracket .....	23
Figure 15	Attaching PSU Bracket to Back of Module .....	24
Figure 16	Power Supply Unit (PSU).....	24
Figure 17	PSU Bracket PSU Mounting Studs.....	25
Figure 18	Power Connection via the PSU.....	26
Figure 19	Module with PSU Installed.....	26
Figure 20	Pole/Wall Mount Bracket Locknut Hardware .....	26
Figure 21	Unit Installed onto the Pole/Wall Mount Bracket .....	27

Figure 22	Module with Grounding Lug .....	29
Figure 23	Wiring of Lightning/Surge Arrester (Sold by BLiNQ Networks).....	31
Figure 24	HM and RBM LED States .....	33
Figure 25	Ethernet Connector Encased in Environmental Housing .....	34
Figure 26	Ethernet Connector Assembly - Separated .....	35
Figure 27	Module Cable Management .....	37
Figure 28	Hub Module Showing All Connectors .....	38
Figure 29	HM Horizontal Plane Adjustment via Azimuth Bracket .....	39
Figure 30	HM Vertical Plane Adjustment via Elevation Bracket .....	39
Figure 31	HM Theta Adjustment Via Elevation Bracket Mounting Holes .....	40
Figure 32	HM Down-tilt Adjustment with Antenna Mount .....	40
Figure 33	Beam Steering Antenna Mounting Bracket .....	41
Figure 34	Hub Module Antenna Mounting Holes .....	43
Figure 35	Antenna attached to a Hub Module .....	43
Figure 36	Beam Steering Antenna RF Connections .....	44
Figure 37	RF Connections on the Hub Module .....	44
Figure 38	RBM Module Showing All Connectors .....	46
Figure 39	RBM Horizontal Plane Adjustment via Azimuth Bracket .....	48
Figure 40	RBM Vertical Plane Adjustment via Elevation Bracket .....	48
Figure 41	RBM Theta Adjustment Via Elevation Bracket Mounting Holes .....	49

## List of Tables

Table 1	X-1200 System Specifications.....	4
Table 2	Required Items for Hub Module Installation .....	8
Table 3	Required Items for Remote Backhaul Module Installation .....	9
Table 4	Summary of Required Installation Tools (Not Provided by BLiNQ Networks) .....	9
Table 5	Recommended Torque Values for Self-Tapping Bolts.....	15
Table 6	Recommended Torque Values for U-Bolt or V-Clamp Bolts .....	16
Table 7	Recommended Torque Values for Elevation Bracket Bolts.....	20
Table 8	Recommended Torque Values for Azimuth Bracket Bolts .....	22
Table 9	Recommended Torque Values for PSU Bracket Bolts .....	23
Table 10	Recommended Torque Values for PSU Bolts .....	25
Table 11	Recommended Torque Values for Pole/Wall Mount Bracket Locknuts.....	27
Table 12	Recommended Torque Value for the RJ45 Ethernet Connection .....	34
Table 13	Recommended Torque Values for HM Bracket Bolts.....	39
Table 14	Recommended Torque Values for Antenna Bracket Nuts .....	42
Table 15	Recommended Torque Values for Antenna Bracket Bolts.....	42
Table 16	Recommended Torque Values for Antenna Cable Connections .....	44
Table 17	Recommended Torque Values for RBM Bracket Bolts.....	47
Table 18	X-1200 System Troubleshooting Guide.....	55
Table 19	List of Acronyms .....	57


This Page Intentionally Left Blank.

# 1 Important Safety and Service Notices

Read this *X-1200 System Installation Guide* and follow all operating and safety instructions.

Installation of the X-1200 system must be done by a qualified professional installer who is experienced with installing telecommunications equipment and networks. Installations must adhere to the information and specifications within this *X-1200 System Installation Guide*.

## 1.1 Safety Warnings

 <b>WARNING!</b>	<p><b>Follow all health and safety procedures and recommendations made by BLiNQ Networks within this <i>X-1200 System Installation Guide</i>. Failure to do so could result in injury, death, or damage to the equipment.</b></p>
--	---

- The product-marketing label indicates the power requirements. Do not exceed the described limits.
- Each module's power supply must have a resettable circuit breaker rated to a maximum of 20 Amps.
- The antenna must be permanently grounded before making any of the connections to the antenna used with the Hub.
- Use only a damp cloth for cleaning. Do not use liquid or aerosol cleaners. Disconnect the power before cleaning.
- Disconnect the power when the unit is stored for long periods.
- Do not locate the outdoor unit near power lines or other electrical power circuits.
- The system must be properly grounded to protect against power surges and accumulated static electricity. It is the user's responsibility to install this device in accordance with the local electrical codes.

## 1.2 Important Service and Warranty Information

Keep all product information for future reference.

Refer all repairs to qualified service personnel. Do not remove the covers or modify any part of the X-1200 system, as this action will void the warranty.

Be sure to do the following upon unpacking the X-1200 system modules. For each Hub Module (HM) and Remote Backhaul Module (RBM) in your system:

- Locate the label on the module casing that lists the Serial Number (SN) and Media Access Control (MAC) address for the module (Figure 1, "Module Casing Labels")
- Record the SN on your registration card for future reference
- Record the MAC address for future reference when provisioning the system

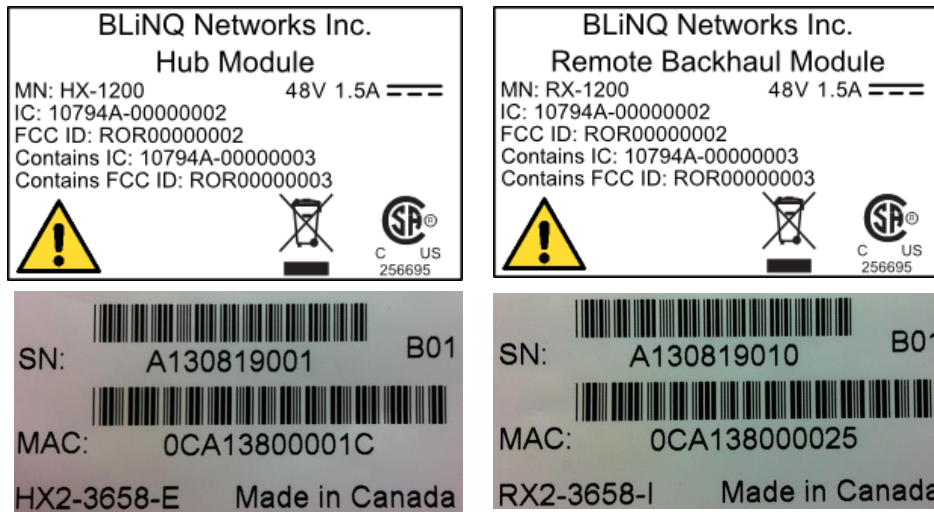



Figure 1 Module Casing Labels

### 1.3 Overvoltage (Lightning/Surge) Protection

 <b>WARNING!</b>	<p><b>A qualified professional installer should install the wireless equipment. The installer must follow local and national codes for electrical grounding and safety. Failure to meet safety requirements and/or use of non-standard practices and procedures could result in personal injury and damage to equipment. A direct lightning strike may cause serious damage even if these guidelines are followed.</b></p>
---	--

All outdoor wireless equipment is susceptible to lightning damage from a direct hit or induced current from a near strike. Lightning protection and grounding practices in local and national electrical codes serve to minimize equipment damage, service outages and serious injury. Reasons for lightning damage can be summarized as follows:

- Poorly grounded antenna sites that can conduct high lightning strike energy into equipment.
- Lack of properly installed lightning protection equipment that can cause equipment failures from lightning induced currents.

An overvoltage protection system provides a means by which the energy may enter earth without passing through and damaging parts of a structure. An overvoltage protection system does not prevent lightning from striking; it provides a means for controlling it and preventing damage by providing a low resistance path for the discharge of energy to travel safely to ground. Improperly grounded connections are also a source of noise that can cause sensitive equipment to malfunction.

A good grounding system disperses most of the surge energy from a lightning strike away from the building and equipment. The remaining energy on the cable can be directed safely to ground through a lightning/surge arrester in series with the cable.



The X-1200 system is designed with consideration for resistance to the effects of lightning on the access point electronics. When installing a lightning/surge arrester for your system installation, observe the following general industry practices:

- Install lightning/surge arrestors in series with the Ethernet and power cables at the point of entry to the building. If the power cable does not enter the building, the location is at the installer's discretion.
- In each case the grounding wire should be connected to the same termination point used for the tower or mast.
- Provide direct grounding from the unit, the mounting bracket, the antenna, and the Ethernet cable surge protection to the same ground bus on the building. Use the grounding screws provided for terminating the ground wires.

## 2 System Description

The X-1200 is a dual carrier, Point-to-Multipoint (PMP) intelligent wireless transport system distinguished for its high performance and advanced traffic management capabilities. The X-1200 platform consists of a Hub Module (HM) and up to four (eight<sup>1</sup>) Remote Backhaul Modules (RBM).

BLiNQ Networks X-1200 system operates in the sub 6 GHz licensed frequency bands. It offers deployment flexibility for both Line-of-Sight (LOS) and Non Line-of-Sight (TrueNLOS™) operation by incorporating advanced Physical Layer (PHY) and Media Access Control (MAC) layer algorithms and techniques. BLiNQ Networks has developed proprietary interference mitigation algorithms and incorporated self-organizing network techniques into its solutions to increase capacity and reliability beyond that of ordinary backhaul solutions. This is because in a NLOS environment, interference and shadowing are the two main reasons that limit capacity and link reliability. Mitigating interference and enhancing signal reliability maximizes system performance.

The X-1200 system delivers 11 bps/Hz spectral efficiency. The system is designed for use in multiple applications that include small cell mobile backhaul, optical fiber cable extension and enterprise data backhaul services by providing up to 400 Mbps of throughput in dual 2x20 MHz channels.

Table 1 lists the system specifications.

**Table 1 X-1200 System Specifications**

RADIO SPECIFICATIONS	
<b>Frequency Band</b>	3.65-3.70 GHz, 3.40-3.60 GHz, 2.50-2.69 GHz, and 5.47-5.875 GHz
<b>Tuning Resolution</b>	50 kHz, minimum
<b>Transmit Power, 3.65 GHz</b>	-15 dBm to +27 dBm* per port, 0.25 dB resolution
<b>Transmit Power, 5.8 GHz</b>	-15 dBm to +23 dBm* per port, 0.25 dB resolution
<b>Channel Bandwidth</b>	20 MHz (5/10 MHz <sup>1</sup> )
<b>Receiver Sensitivity</b>	-92 dBm with QPSK @ 1e-03 PER (typ.)
<b>Modulation &amp; Coding</b>	QPSK/16QAM/64QAM/256QAM, bi-directional, fully adaptive
PERFORMANCE	
<b>Throughput</b>	Up to 400 Mbps, L2 aggregate uplink and downlink
<b>Spectral Efficiency</b>	11 bps/Hz
<b>Physical Layer</b>	Cyclic Single Carrier Frequency Domain Equalized
<b>Operating Mode</b>	TDD
<b>Latency</b>	3.5 msec for 4 RBM's assigned to Hub, dual carrier mode
<b>Traffic ratios</b>	50:50, 65:35, 75:25, 35:65, 25:75; user configurable
<b>Frame Size</b>	Up to 2016 bytes

<sup>1</sup> Future Software Release

\* Licensed:+26dBm for MCS 7 and +25dBm for MCS 8; Unlicensed: +22dBm for MCS 6, +21 for MCS 7 and +20 for MCS 8

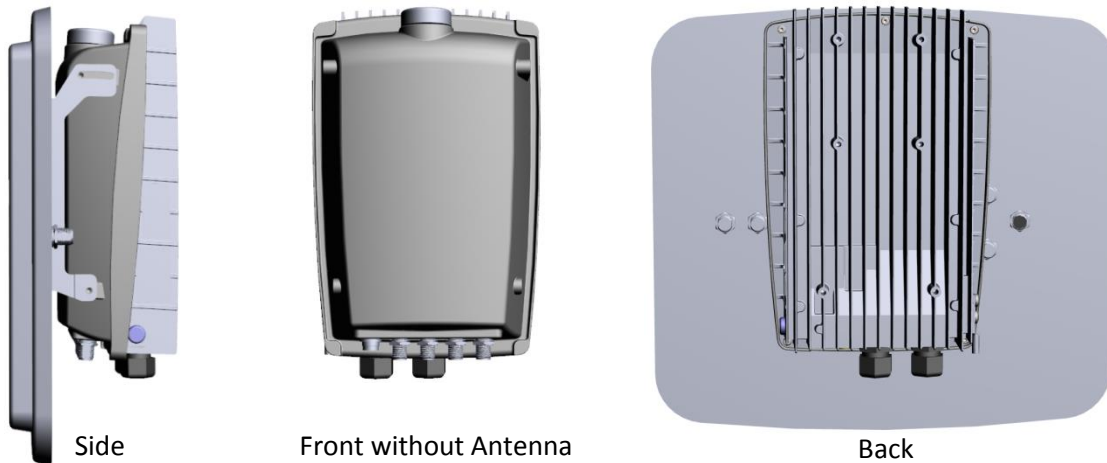
<b>PERFORMANCE (Cont)</b>	
<b>Antenna System</b>	2x2 MIMO, Spatial Multiplexing / Tx & Rx Diversity Remote Backhaul Module: Integral antenna, 14 dBi Hub Module: Beam Steering Antenna, 17 dBi
<b>Configuration</b>	PTP or PMP up to 4 <sup>2</sup> Remotes
<b>Power Consumption</b>	< 72 W
<b>Power</b>	-48 Vdc nominal, -36 to -60 Vdc range
<b>Connectivity</b>	Copper 1000BaseT Optional Fiber Gig-E (Hub only)
<b>Synchronization</b>	Integral GPS antenna and receiver, 1588v2, SyncE
<b>QoS</b>	8 queues per service flow, 4 SF's per RBM per direction
<b>Security</b>	AES-256
<b>NETWORKING</b>	
<b>Configuration</b>	Ethernet bridge
<b>Attributes</b>	802.1Q, 802.1ad, DSCP/ToS/802.1p (IPv4/IPv6)
<b>Features</b>	Per RBM service flows, Dynamic Bandwidth Sharing
<b>OPERATIONS, ADMINISTRATION AND MANAGEMENT (OAM)</b>	
<b>Configuration</b>	WebUI / CLI, radio and Ethernet performance monitoring
<b>EMS Integration</b>	SNMP v2c/v3
<b>OAM Protocols</b>	HTTP(S), TCP/IP, UDP, (S)FTP, SSH
<b>MECHANICAL/ENVIRONMENTAL/COMPLIANCE</b>	
<b>RBM Dimensions</b>	12.6" x 8.3" x 5.1" (32 x 21 x 13 cm)
<b>Hub Dimensions</b>	15.0" x 18.0" x 5.1" (38 x 46 x 13 cm)
<b>Weight (Hub &amp; RBM)</b>	RBM < 8.8 lbs. (4.0 kg); Hub < 15.5 lbs. (7.0 kg)
<b>Temperature Range</b>	-45°C to +55°C (-49 °F to 131 °F)
<b>Enclosure Protection</b>	IP67
<b>Compliance</b>	EMC: FCC Part 15 Subpart B, C, E; ICES-003 Class B Radio: FCC Part 90z, RSS 197 Safety: UL/CSA 60950-1,-22

The X-1200 system operates in licensed Time Division Duplexing (TDD) bands including 3.65-3.70 GHz, 3.40-3.60 GHz, 2.50-2.69 GHz bands in both Point-to-Point (PTP) and Point-to-Multipoint (PMP) configurations. Additionally, the X-1200, when configured for dual-carrier mode, operates in unlicensed frequency bands including 5.47-5.875 GHz bands. It incorporates Multiple Input Multiple Output (MIMO) technology and operates at high Modulation and Coding Scheme (MCS) rates to provide high capacity. In addition, the product incorporates BLiNQ Networks interference management techniques which include multiple power control algorithms to maximize performance in dense networks.

<sup>2</sup> 8 in future release

The X-1200 system has a small, all-outdoor, zero-footprint form factor that can be easily deployed unobtrusively on towers, poles, building sidewalls or rooftops. It consists of the following modules:

- **Hub Module (HM):** A sector controller which serves as the aggregation point controlling up to 4\* Remote Backhaul Modules (RBMs), featuring an integral Beam Steering Antenna.



**Figure 2 Hub Module**

- **Remote Backhaul Module (RBM):** A subscriber unit that is installed outdoors on customer premises, including public infrastructure assets such as light and utility poles in mobile backhaul applications. RBMs feature an integrated antenna.



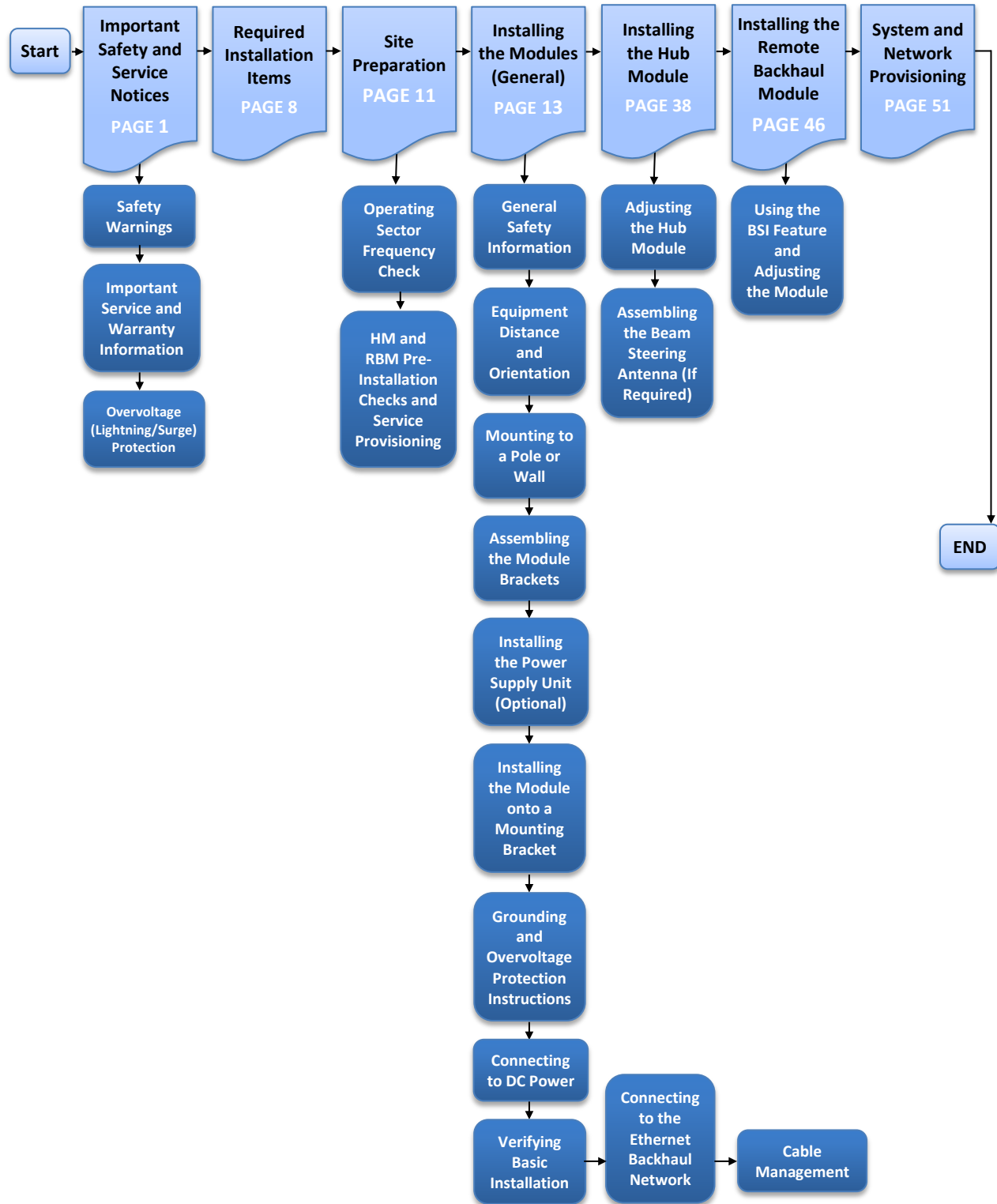
**Figure 3 Remote Backhaul Module**

---

\* 8 in future software release.

### 3 Flowchart: Installation Process Overview

To get started quickly, follow the process below. For more details, click on the chapter/section title.



## 4 Required Installation Items

Table 2 lists the items required to install the X-1200 Hub Module (HM).

Table 3 lists the items required to install the X-1200 Remote Backhaul Module (RBM).

Table 4 lists the tools required to install the X-1200 system modules.

**Table 2 Required Items for Hub Module Installation**

No.	Description	Quantity	Note
1	X-1200 Hub Module (HM) Beam Steering Antenna Kit includes Antenna unit, Down-tilt antenna bracket, screws, nuts and washers for mounting to X-1200 unit, SPI control cable (x1), and RF cables NType to NType (x4)	1	
2	X-1200 Module Mount Kit with Self-Tapping Screw Bolts—Includes module elevation bracket, module azimuth bracket, two pole clamps, and pole/wall mount bracket	1*	Screws not provided for wall/mast side (1/4 in. holes)
3	Coaxial RF Cables: N-type male termination at both ends, outdoor rated	2 or 4*	Nominal 1 m long
4	Outdoor-rated Shielded Ethernet cable, CAT5e or better	< 100 meters	Not provided by BLiNQ Networks
5	Ethernet cable connector and environmental housing with shielded RJ45 connectors	1	Provided by BLiNQ Networks
6	SFP, fiber and connectors (if optional fiber optic Ethernet possibility is to be used)		Not provided by BLiNQ Networks
7	Power Cable: Shielded 18 AWG 2 conductors 90C water resistant, black and white conductor jackets, outdoor rated cable, 5-8 mm thick Power Connector: Weatherized DC connector to fit on power cable	1*	Option of 10m, 20m, 40m terminated cables
8	6-gauge grounding cable	1	Not provided by BLiNQ Networks
9	Power Supply Unit (PSU) Kit includes PSU, PSU bracket and associated hardware for installation.	1*	Optional
10	Lightning/Surge Arrester	1*	Optional
11	Access to NOC Server, Providing FTP, SysLog, SNMP Browser, and DNS Services	1	
12	Basic Portable Personal Computer (PC); with NIC (Ethernet) port required	1	Not Provided by BLiNQ Networks
13	Miscellaneous hardware and software as required: for example, compass, sniffer application, FTP client	as required	Not Provided by BLiNQ Networks

\*Sold as a separate line item by BLiNQ Networks.

**Table 3 Required Items for Remote Backhaul Module Installation**

No.	Description	Quantity	Note
1	X-1200 Remote Backhaul Module (RBM)	1	Per site
2	X-1200 Module Mount Kit with Self-Tapping Screw Bolts—Includes module elevation bracket, module azimuth bracket, two pole clamps, and pole/wall mount bracket	1*	Screws not provided for wall/mast side (1/4 in. holes)
3	Outdoor-rated Shielded Ethernet cable, CAT5e or better	< 100 meters	Not provided by BLiNQ Networks
4	Ethernet cable connector and environmental housing with shielded RJ45 connectors	1	Provided by BLiNQ Networks
5	Power Cable: Shielded 18 AWG 2 conductors 90C water resistant, black and white conductor jackets, outdoor rated cable, 5-8 mm thick Power Connector: Weatherized DC connector to fit on power cable	1*	Option of 10m, 20m, 40m connectorized cables
6	6-gauge grounding cable	1	Not provided by BLiNQ Networks
7	Lightning/Surge Arrester	1*	Optional
8	Access to NOC Server, Providing FTP, SysLog, SNMP Browser, and DNS Services	1	
9	Basic Portable Personal Computer (PC); with NIC (Ethernet) port required	1	Not provided by BLiNQ Networks
10	Miscellaneous hardware and software as required: for example, wrench, compass	as required	Not provided by BLiNQ Networks
11	Power Supply Unit (PSU) Kit includes PSU, PSU bracket and associated hardware	1 each*/RBM	Optional

\*Sold as a separate line item by BLiNQ Networks.

**Table 4 Summary of Required Installation Tools (Not Provided by BLiNQ Networks)**

No.	Description
1	Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
2	Slot head screwdrivers, small and medium size
3	Phillips #2 screwdriver
4	Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft
5	Ratchet wrenches, ½ in. and 7/16 in.
6	Steel straps (for installation on pole diameters 3.5 in./9 cm or larger)
7	Four 5/16 in. or M8 wall mounting bolts, or equivalent, for wall installation (and bolt reinforcement hardware if wall material requires it)
8	Black marker
9	Crimp tool
10	Cable ties
11	Torque screwdriver ¼ head with 5-40inlb range
12	Allen drivers metric 3mm and SAE 3/16" for GND lug and Beam Steering Antenna bracket

No.	Description
13	Metric 7mm nut driver (socket) for the power supply mounting nuts
14	Metric 8mm nut driver (socket) for Beam Steering Antenna studs mounting to bracket



## 5 Site Preparation

To prepare the installation site, perform the following checks prior to installation of an X-1200 Hub Module (HM) or Remote Backhaul Module (RBM).

- Section 5.1, “*Operating Sector Frequency Check*”, page 11
- Section 5.2, “*HM and RBM Pre-Installation Checks and Service Provisioning*”, page 11

### 5.1 Operating Sector Frequency Check

The operating frequency must be determined prior to the installation and be based on a cell site frequency plan. BLiNQ Networks strongly advises that a comprehensive site survey be performed before installation to determine the optimum antenna orientation and identify any potential source of interference.

### 5.2 HM and RBM Pre-Installation Checks and Service Provisioning

This section requires use of the BLiNQ X-1200 WebUI. The X-1200 WebUI is the configuration tool for use with X-1200 HMs and RBMs. It is a standard web application that runs directly on the X-1200 equipment through the default port for HTTP (that is, port 80), and is accessible at URL <http://<IP of the node>>.

For instructions on how to use the X-1200 WebUI, refer to the *X-1200 System User Guide*. The default username and password for access is: **admin**.

Browser support for X-1200 WebUI:

- Mozilla Firefox
- Internet Explorer 9 (IE9)
- WebKit-based browsers, for example:
  - Apple Safari
  - Google Chrome

Operating System (OS) support for X-1200 WebUI:

- Windows
- Mac OS X
- Linux

**Note:** With the exception of IE9, both web browser and OS support for the X-1200 WebUI always refer to the most recent versions.

The default configuration settings on the HM and RBM include:

- Fixed, non-routable local craft IP address: 169.254.1.1
- Management IP address: 192.168.26.2
- Operating Frequency (e.g. 3.65 GHz)
- Channel bandwidth (20 MHz)

- Uplink/downlink TDD ratio on the Hub
- Preamble series index value
- RF transmitter disabled on the HM (not transmitting)

Perform the following pre-installation checks and service provisioning on the HM and RBMs:

1. Verify the modules can be powered up and Ethernet connectivity can be established.
2. Verify and record the Media Access Control (MAC) address of each RBM unit (located on the label on the outside of the unit).
3. Using the X-1200 WebUI for HMs:
  - a. Verify the configuration settings on the HM and update if necessary.
  - b. Verify the active software version on the HM and upgrade if necessary.
  - c. To allow the HM to go into service after installation, provision these HM radio operation parameters through the '*Setup > Radio Interface Page*' either before or after installation:
    - Radio Administrative State (set to 'Enabled')
    - RF Frequency
    - Max. Transmit Power
    - Preamble Phase Index (Optional)
    - Rate Adaption (Optional)
  - d. (Optional) Provision these HM system parameters as needed through the '*Setup > System Page*' either before or after installation:
    - System Identification (including Name, Location, Contact, Description)
    - Ethernet Port Configuration
    - Management Interface IP Address

For more information, refer to the **X-1200 System User Guide**.

4. Using the X-1200 WebUI for RBMs:
  - a. Verify the configuration settings on each RBM and update if necessary.
  - b. Verify the active software version on each RBM and upgrade if necessary.
  - c. To allow the RBM to go into service after installation, provision these RBM radio operation parameters through the '*Setup > Radio Interface Page*' either before or after installation:
    - Radio Administrative State (set to 'Enabled')
  - d. (Optional) Provision these RBM system parameters as needed through the '*Setup > System Page*' either before or after installation:
    - System Identification (including Name, Location, Contact, Description)
    - Ethernet Port Configuration
    - Management Interface IP Address

For more information, refer to the **X-1200 System User Guide**.

## 6 Installing the Modules (General)

As needed, refer to these sections and follow these steps to properly install either the Hub Module (HM) or Remote Backhaul module (RBM):

- Section 6.1, “General Safety Information”, page 13
- Section 6.2, “Equipment Distance and Orientation”, page 14
- Section 6.3, “Mounting to a Pole or Wall”, page 14
  - Section 6.3.1, “Attaching Pole Clamps to Mounting Bracket”, page 16
  - Section 6.3.2, “Mounting with U- or V-Clamps”, page 17
  - Section 6.3.3, “Mounting with Steel Straps”, page 17
  - Section 6.3.4, “Mounting onto a Wall”, page 18
- Section 6.4, “Assembling the Module Brackets”, page 19
  - Section 6.4.1, “Attach Elevation Bracket”, page 19
  - Section 6.4.2, “Attach Azimuth Bracket”, page 21
- Section 6.5, “Installing the Power Supply Unit (Optional)”, page 23
- Section 6.6, “Installing the Module onto a Mounting Bracket”, page 26
- Section 6.7, “Grounding and Overvoltage Protection Instructions”, page 28
- Section 6.8, “Connecting to DC Power”, page 31
- Section 6.9, “Verifying Basic Installation”, page 33
- Section 6.10, “Connecting to the Ethernet Backhaul Network”, page 34
- Section 6.11, “Cable Management”, Page 36

### 6.1 General Safety Information

Before performing any of the tasks in this chapter, read the safety warnings and service notices in Chapter 1, “Important Safety and Service Notices”.

The system requires one person to properly and safely install the X-1200 system modules.



**WARNING!**

- **Installation of the equipment must comply with local and national electrical codes.**
- **Personnel mounting the equipment must understand grounding methods.**

## 6.2 Equipment Distance and Orientation

### 6.2.1 Hub Modules

Locate the Hub Module (HM) with as much distance as possible from other transmitting equipment.

The installer must mount the Beam Steering Antenna on the HM, as it can not be remotely mounted. The HM must also have clear view of the sky for its Global Positioning System (GPS) antenna (located on top of the unit) to work and to synchronize transmissions with other HMs.

When mounting the HM, ensure it is oriented so that the cable connectors/connections point downward and the GPS antenna points upward.

### 6.2.2 Remote Backhaul Modules

When installing multiple Remote Backhaul Modules (RBMs), the distance required between the RBMs depends on the average transmit power in use by the RBMs. Contact your supplier for the recommended distance between RBMs for your particular installation.

When mounting the RBMs, ensure they are oriented so that the power cable connectors point downward.

## 6.3 Mounting to a Pole or Wall

The following sections describe how to attach a mounting bracket to either a pole or wall:

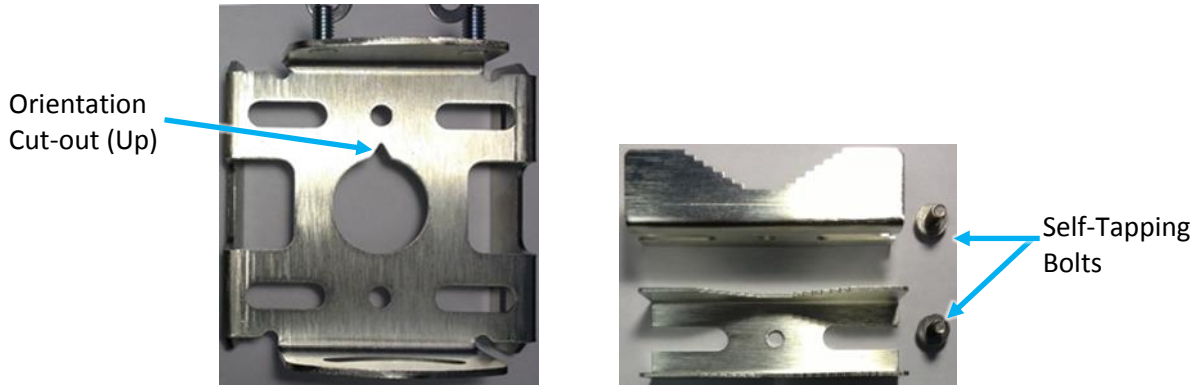
- Section 6.3.1, “Attaching Pole Clamps to Mounting Bracket”; recommended for pole diameters up to 4 in./10 cm.
- Section 6.3.2, “Mounting with U- or V-Clamps”; recommended for pole diameters up to 4 in./10 cm
- Section 6.3.3, “Mounting with Steel Straps”; recommended for pole diameters up to 3.5 in./9 cm or larger
- Section 6.3.4, “Mounting onto a Wall”

### 6.3.1 Attaching Pole Clamps to Mounting Bracket

Use the pole clamps with pole/wall mounting brackets for pole diameters up to 4 in./10 cm. If the pole is larger, see Section 6.3.3, “Mounting with Steel Straps”.

Required parts and tools:

- Two pole clamps, pole/wall mount bracket (Figure 4, “Pole/Wall Mount Bracket”)
- Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft



**Figure 4 Pole/Wall Mount Bracket**

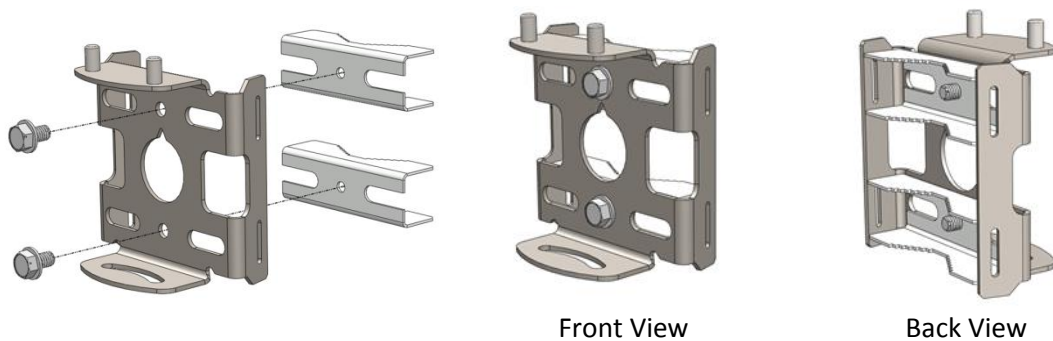
**Table 5 Recommended Torque Values for Self-Tapping Bolts**

Item	Description	Torque	Note
1	Self-tapping bolts (x2)	27.1Nm or 20lbf-ft	—

To attach the two pole clamps to the pole/wall mount bracket, refer to Figure 5 and follow these steps:

1. Place the pole clamps within the top and bottom of the pole/wall mounting bracket, aligning the bolt holes of the clamps with those of the bracket.
2. Use the socket wrench to lightly tighten the self-tapping bolts through the clamp holes into the holes on the back of the bracket (do not over tighten).
3. Use the torque wrench to tighten down the self-tapping bolts and finish the installation of the pole clamps to the pole/wall mount bracket (do not over tighten). See Table 5 for torque values.

**Note:** Pole clamps are not required for pole diameters greater than 4 in./10 cm.



**Figure 5 Attaching Pole Clamps to Pole/Wall Mount Bracket**

## 6.3.2 Mounting with U- or V-Clamps

Use the U- or V-clamps for pole diameters up to 4 in./10 cm. If the pole is larger, see Section 6.3.3, “*Mounting with Steel Straps*”.

Required parts and tools:

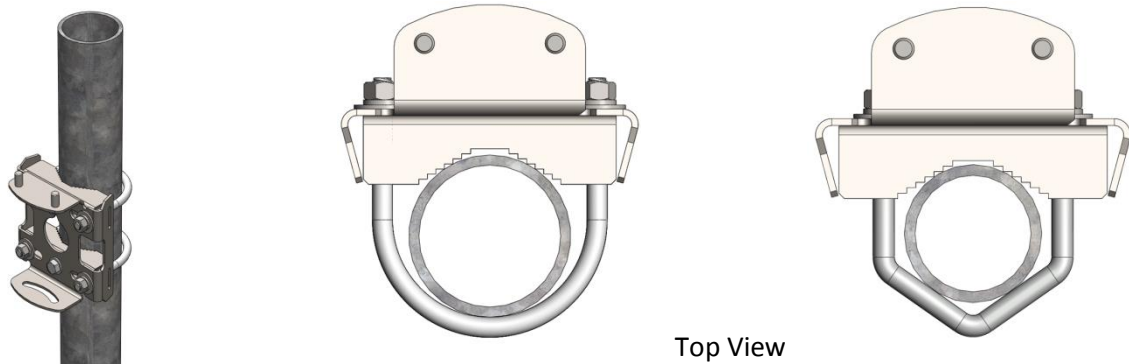
- Pole/wall mount bracket with attached pole clamps; see Section 6.3.1, “*Attaching Pole Clamps to Mounting Bracket*”
- Two U- or V-clamps (use one type or the other; do not mix) and associated hardware, both sized either 1.5 in./4 cm, 2 in./5 cm, 2.5 in./6 cm, 3 in./8 cm, 3.5 in./9 cm, or 4 in./10 cm to match pole diameter at installation site
- Socket wrench with ½ in. socket
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft

**Table 6 Recommended Torque Values for U-Bolt or V-Clamp Bolts**

Item	Description	Torque	Note
1	U- or V-Clamp bolts (x4)	16.3Nm or 12lbf-ft	—

To install the pole/wall mount bracket onto a vertical pole up to 4 in. (10 cm) in diameter using U-clamps or V-clamps, refer to Figure 6, “*Attaching Assembled Pole/Wall Mount Bracket to Pole with U-Clamp or V-Clamp*” and follow these steps:

1. Select a mounting location on the pole and place the pole clamp notches from the assembled pole/wall mounting bracket against the pole. Ensure the orientation cut-out is pointing up (see Figure 4, “*Pole/Wall Mount Bracket*”).
2. Insert one U-bolt or V-bolt through the top of the pole/wall mount bracket. Install the washers and then hand-tighten the nuts.
3. Insert a second U-bolt or V-bolt through the bottom of the pole/wall mount bracket. Install the washers and then hand-tighten the nuts.
4. Position the pole/wall mount bracket on the pole as needed before further tightening the bolts.
5. Use the socket wrench to evenly tighten all four bolts of the pole/wall mount bracket to the pole (do not over tighten).
6. Use the torque wrench to tighten down all four bolts and finish the installation of the pole/wall mount bracket to the pole (do not over tighten). See Table 6, “*Recommended Torque Values for U-Bolt or V-Clamp Bolts*” for torque values for more information.
7. Install the HM or RBM onto the mounted pole/wall mount bracket. See Chapter 7, “*Installing the Hub Module*” or Chapter 8, “*Installing the Remote Backhaul Module*” as applicable.



**Figure 6 Attaching Assembled Pole/Wall Mount Bracket to Pole with U-Clamp or V-Clamp**

### 6.3.3 Mounting with Steel Straps

Use steel straps to mount the modules onto poles with diameters 3.5in./9 cm or larger. If the pole has a smaller diameter, see previous mounting methods.

Required parts and tools:

- Pole/wall mount bracket with attached pole clamps; see Section 6.3.1, “Attaching Pole Clamps to Mounting Bracket”

**Note:** When using straps on poles greater than 4 in./10 cm in diameter, pole clamps are not required for the pole/wall mounting bracket.

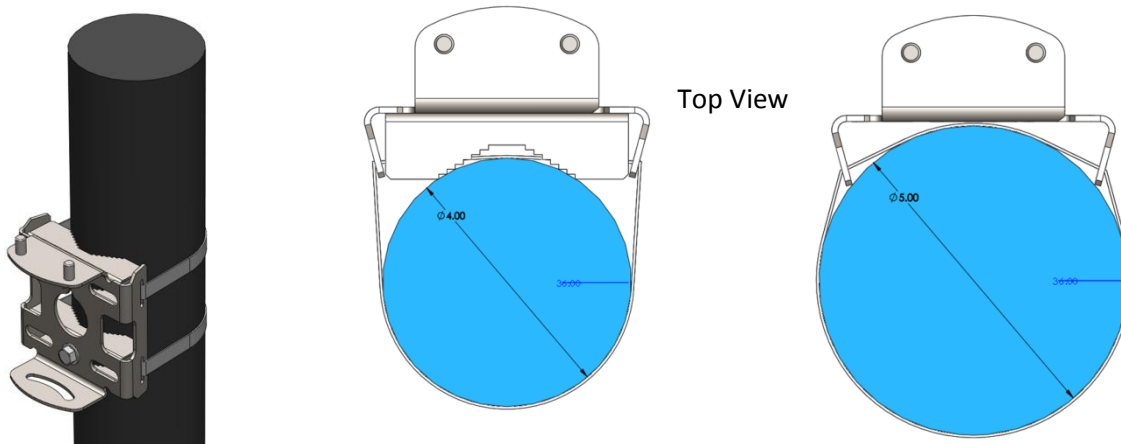
- Customer-provided steel straps and associated hardware
- Slot head screwdriver or Phillips #2 screwdriver

To install the pole/wall mount bracket onto a vertical pole that is 3.5 in./9 cm in diameter or larger using metal straps, refer to Figure 7, “Attaching Assemble Pole/Wall Mount Bracket to Pole with Straps” and follow these steps:

1. Assemble the two steel straps and the assembled pole/wall mounting bracket together by threading the straps through the top and bottom strap slots of the bracket, respectively.
2. Select a mounting location on the pole and place the steel straps with the assembled pole/wall mounting bracket around the pole. Ensure the orientation cut-out is pointing up (see Figure 4, “Pole/Wall Mount Bracket”).
3. Position the pole/wall mounting bracket on the pole as needed and tighten the straps around the pole with a slot head or Phillips #2 screwdriver, as applicable. Ensure the steel straps are as tight as possible.

**Note:** Once the steel straps are tightened to full tension, the pole/wall mounting bracket cannot be adjusted unless the straps are disassembled or cut.

4. Install the HM or RBM onto the mounted pole/wall mount bracket. See Chapter 7, “Installing the Hub Module” or Chapter 8, “Installing the Remote Backhaul Module”, as applicable.



**Figure 7 Attaching Assemble Pole/Wall Mount Bracket to Pole with Straps**

### 6.3.4 Mounting onto a Wall

The pole/wall mounting bracket has four wall-mounting holes that you use to mount the HM or RBM directly onto a wall.

Required parts and tools:

- Pole/wall mount bracket with attached pole clamps; see Section 6.3.1, “Attaching Pole Clamps to Mounting Bracket”
- Four customer-provided 5/16-in. or M8 wall mounting bolts or equivalent
- If the wall material requires it, customer-provided bolt reinforcement hardware (for example, four wall shoe anchor bolts)
- Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft
- Black marker

To install the pole/wall mount bracket onto a wall, refer to Figure 8, “Attaching Assembled Pole/Wall Mount Bracket to Wall” and follow these steps:

1. Identify an area on the wall that meets the safety, space, and environmental requirements for the HM or RBM.
2. Place the pole/wall mounting bracket onto the location on the wall. Mark the locations of the four wall-mounting holes using a black marker.
3. If required, install the bolt reinforcement hardware onto the wall at the four mounting hole locations.

**Note:** The installer should mount the bolt reinforcement hardware to the wall with the correct distance apart so that when the bolts are installed through the mounting bracket wall mount holes they align with the holes in the wall.

4. Install and hand-tighten the four mounting bolts through the pole/wall mounting bracket and into the wall. Ensure the orientation cut-out is pointing up (see Figure 4, “Pole/Wall Mount Bracket”).
5. Use the socket wrench to evenly tighten all four bolts of the pole/wall mount bracket to the wall.



6. Use the torque wrench to tighten down all four bolts to finish the installation of the pole/wall mount bracket to the wall. Base the torque on the third-party hardware bolt specifications and wall material (do not over tighten).
7. Install the HM or RBM onto the mounted pole/wall mount bracket. See Chapter 7, “Installing the Hub Module” or Chapter 8, “Installing the Remote Backhaul Module” as applicable.

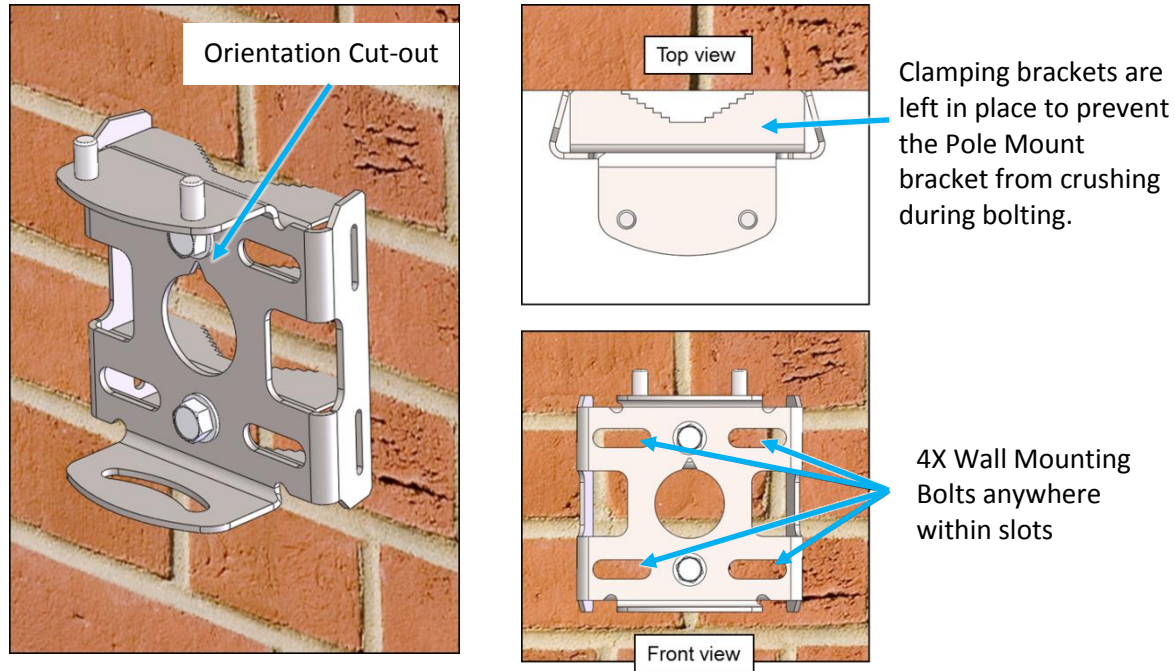


Figure 8 Attaching Assembled Pole/Wall Mount Bracket to Wall

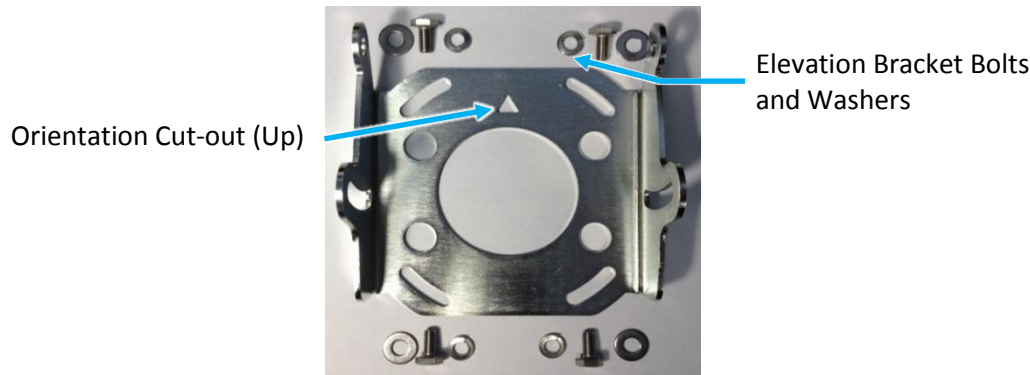
## 6.4 Assembling the Module Brackets

Assemble the HM or RBM brackets **BEFORE** installing the HM or RBM onto an installed pole/wall mount bracket. The mounting brackets offer three degrees of adjustment: elevation up-tilt up to 30 degrees, azimuth up to +/- 25 degrees and theta of up to +/-10%.

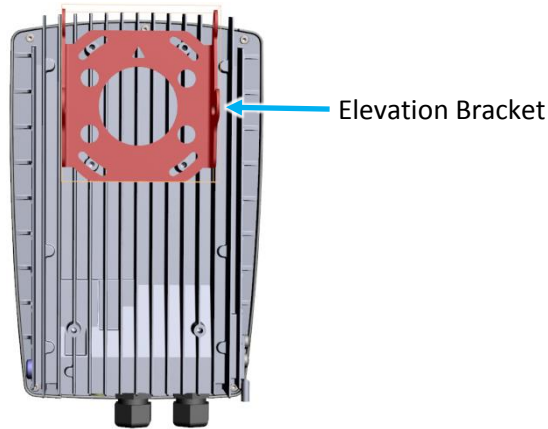
### 6.4.1 Attach Elevation Bracket

Required parts and tools:

- Elevation bracket and associated hardware from X-1200 Module Installation Kit (Figure 9, “Elevation Bracket and Associated Hardware”)
- Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft



**Figure 9 Elevation Bracket and Associated Hardware**

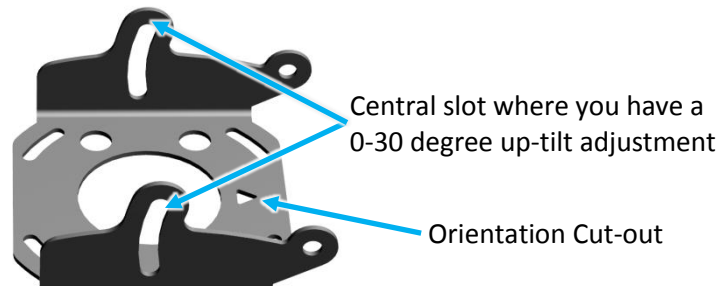


**Figure 10 Elevation Bracket Mounting Position**

**Table 7 Recommended Torque Values for Elevation Bracket Bolts**

Item	Description	Torque	Note
1	Elevation bracket bolts (x4)	10.8Nm or 8lbf-ft	Mount the elevation bracket in the top center on the HM or RBM.

The Elevation bracket allows for an adjustment range of 0-30 degrees up-tilt only. You achieve this by moving the module assembly within two central slots on the bracket and releasing/tightening four side bolts (two at the top and two within the central slots).



To attach the elevation bracket onto the HM or RBM, refer to Figure 11, “Attaching Elevation Bracket to Back of Module” and follow these steps:

1. Place the elevation bracket on the back of the unit, in the top center position, with the orientation cut-out (triangle) pointing up. Align the four bolt holes so that they are centered with the holes on the back of the module enclosure.
2. Place a lock washer and then a washer on the back of each of the four bolts.
3. Use the socket wrench to lightly tighten all four bolts of the elevation bracket to the unit (do not over tighten).
4. Use the torque wrench to evenly tighten down all four bolts and finish the installation of the elevation bracket to the module (do not over tighten). Follow the Torque setting from Table 7, “Recommended Torque Values for Elevation Bracket Bolts”.

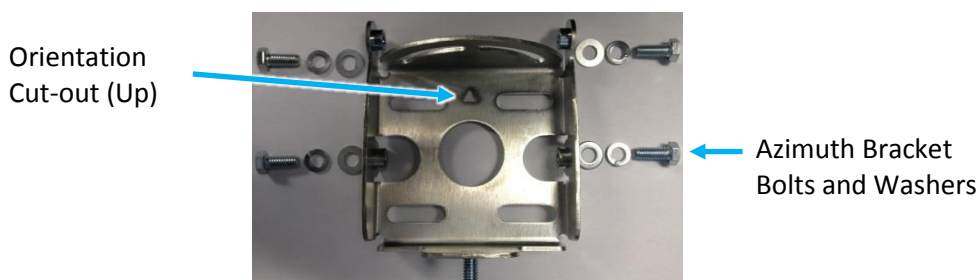


**Figure 11 Attaching Elevation Bracket to Back of Module**

## 6.4.2 Attach Azimuth Bracket

Required parts and tools:

- Azimuth bracket and associated hardware from X-1200 Module Installation Kit (See Figure 12, “Azimuth Bracket and Associated Hardware”)
- Socket wrench with 3/8 in. driver head, with long and short 1/2 in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft



**Figure 12 Azimuth Bracket and Associated Hardware**

**Table 8 Recommended Torque Values for Azimuth Bracket Bolts**

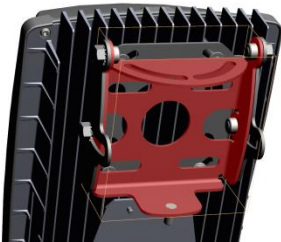
Item	Description	Torque	Note
1	Azimuth bracket bolts (x4)	16.3Nm or 12lbf-ft	—

The Azimuth bracket allows for an adjustment range of +/- 15 degrees from the pole axis. The module is pivoting on a set of two vertical bolts and locked in place by another two.

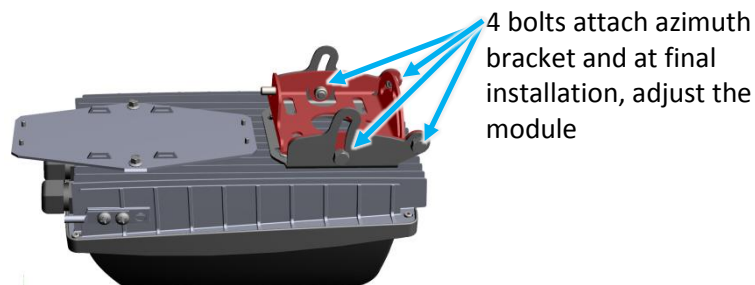
To attach the azimuth bracket onto the HM or RBM, refer to Figure 13, “Attaching Azimuth Bracket to Elevation Bracket on Module” and follow these steps:

1. Place the azimuth bracket within the installed elevation bracket, aligning the two bolt holes on either side with the bolt holes on the sides of the elevation bracket. Ensure that the azimuth bracket orientation cut-out is pointing up.
2. First, place a lock washer and then a flat washer on to each of the four bolts.
3. Thread, by hand, the four bolts through the bolt holes on both sides of the elevation bracket into the bolt holes of the azimuth bracket. Make sure the azimuth bracket sits flat within the elevation bracket while doing this step.
4. Use the socket wrench to lightly tighten all four bolts (do not over tighten).

**NOTE:** During the final installation stages, you loosen these bolts to adjust the elevation of the module. See Section 8.1, “Using the BSI Feature and Adjusting the Module” for the steps on adjusting the module.



5. As a final step in the module installation (after all adjustments to module on the pole), use the torque wrench to tighten down all four bolts and finish the installation of the azimuth bracket to the unit (do not over tighten). See Table 8, “Recommended Torque Values for Azimuth Bracket Bolts” for torque values.

**Figure 13 Attaching Azimuth Bracket to Elevation Bracket on Module**

## 6.5 Installing the Power Supply Unit (Optional)

The installation of the power supply unit (PSU) and the PSU bracket are optional. You only need to install the PSU and PSU bracket, if you do NOT have a direct -48 Vdc power supply. The PSU allows you to convert from another power source (i.e., North America: 120 Volts, European: 220 Volts) to -48 Vdc.

If desired, you can install the PSU onto the PSU bracket before installing the complete PSU assembly onto the module. If you choose this method: always ensure that the AC cable is accessible from the top of the PSU and the DC output cable is at the bottom.

### 6.5.1 Installing the PSU Bracket

To install the PSU, the PSU bracket needs to be installed onto the module.

**Note:** The PSU bracket is symmetrical, and there is no specific mounting orientation.

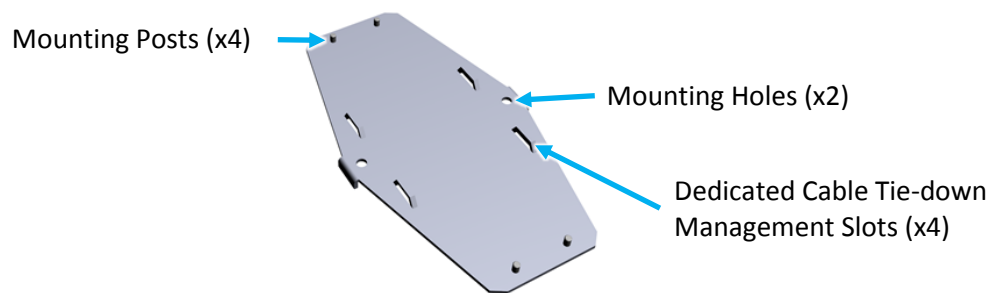


Figure 14 PSU Mounting Bracket

Required parts and tools:

- Power Supply Unit (PSU) bracket and associated hardware from X-1200 Power Supply Unit (PSU) Installation Kit
- Socket wrench with 3/8 in. driver head, with long and short 1/2 in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft
- Cable ties, as needed

Table 9 Recommended Torque Values for PSU Bracket Bolts

Item	Description	Torque	Note
1	Power supply bracket bolts (x2)	10.8Nm or 8lbf-ft	Mount the bracket in the lower two (2) mounting holes on the HM or RBM.

To attach the power supply bracket onto the HM or RBM, refer to Figure 15, “Attaching PSU Bracket to Back of Module” and follow these steps:

1. Place the power supply bracket on the back of the unit, in the lower center position. Align the two bolt holes so that they are centered with the holes on the back of the module enclosure.
2. Place a lock washer on each of the two bolts.
3. Thread, by hand, each of the bolts into the mounting holes. Ensure that the PSU mounting bracket holes and the holes on the module are aligned.
4. Use the socket wrench to lightly tighten the two bolts of the power supply bracket to the unit (do not over tighten).

- Use the torque wrench to evenly tighten down the two bolts and finish the installation of the power supply bracket to the module (do not over tighten). Follow the Torque setting from Table 9, “Recommended Torque Values for PSU Bracket Bolts”.

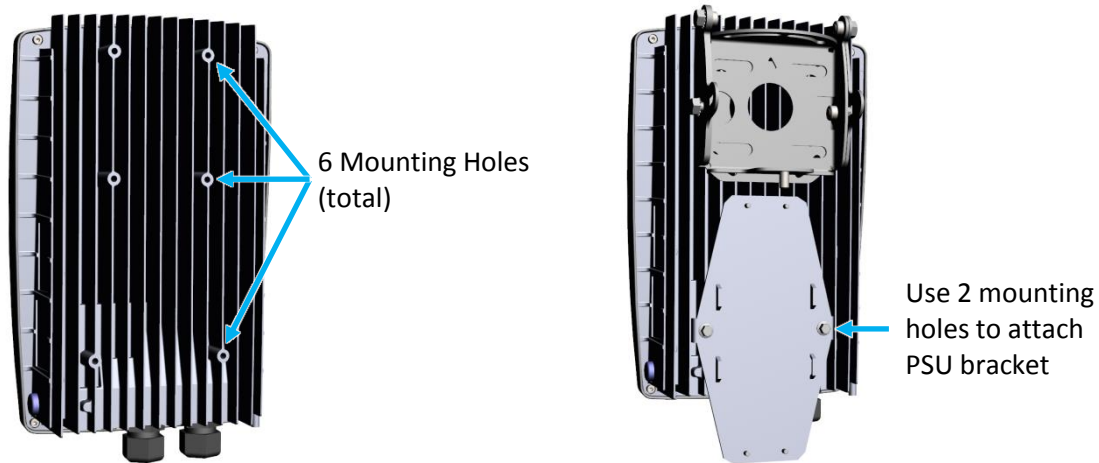


Figure 15 Attaching PSU Bracket to Back of Module

## 6.5.2 Installing the Power Supply Unit

If you do not have a direct -48 Vdc power supply, you must install the -48 Vdc power supply unit (PSU). The PSU allows you to convert from another power source (i.e., North America: 120 Volts) to -48 Vdc. To install the PSU bracket onto the module, see Section 6.5.1, “Installing the PSU Bracket”.



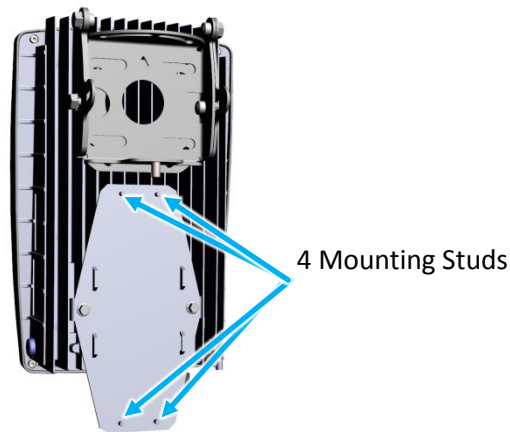
Figure 16 Power Supply Unit (PSU)

Required parts and tools:


- Installed Power Supply Unit (PSU) bracket on module
- Socket wrench ¼ in. driver head with long and short ½ in. and 7/16 in. sockets
- Torque wrench, ¼ in. head with range for 4-60Nm or 3-45lbf-ft
- Cable ties, as needed
- If needed, outdoor weatherproof AC cabling and connectors, as required for your installation (for instance: shielded 18 AWG 2 conductors 90°C water resistant, black and white conductor jackets, outdoor rated cable, 5-8 mm thick with weatherized DC connector to fit on power cable)

**Table 10 Recommended Torque Values for PSU Bolts**

Item	Description	Torque	Note
1	Power supply nuts (M4x4)	2.7Nm or 2lbf-ft	Mount the PSU to the four (4) mounting holes on the PSU bracket.

**Figure 17 PSU Bracket PSU Mounting Studs**

To install the power supply unit:

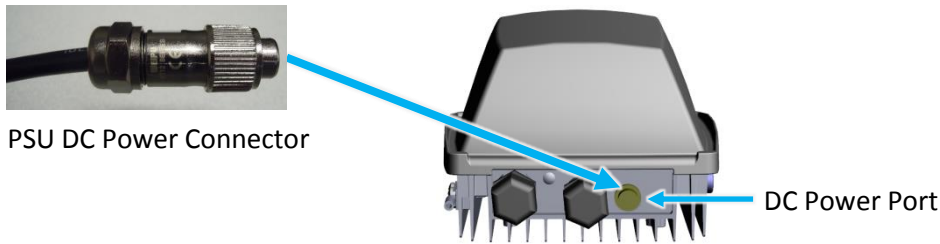
 <b>WARNING!</b>	<ul style="list-style-type: none"> <li>• Always ensure that the power is <b>OFF</b> before installing this device.</li> <li>• Installation of the equipment must comply with local and national electrical codes.</li> </ul>
---	--

1. Place the PSU on top of the four (4) raised studs on the PSU bracket. Position the PSU so that the AC cable access is at the top and the DC output cable access is at the bottom.
2. Place a lock washer on each of the PSU studs, then position and tighten the PSU nuts to the specified torque. Follow the Torque setting from Table 9, “Recommended Torque Values for PSU Bracket Bolts”.
3. Route the AC cable to allow for adjustments when the unit swings up to fine-tune the alignment angle, ensure that the cable provides sufficient movement so that the cable is not tight. Connect the AC cable from the AC power source to the PSU AC cable using the desired connectors/method for your installation.

On PSU:

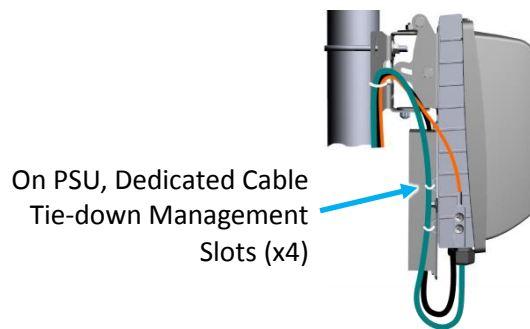
- Connect ACL (Brown) to AC Line (i.e., in USA - Black)
- Connect ACN (Blue) to AC Neutral (i.e., in USA - White)
- Connect Ground (Green/Yellow) to AC Ground

- Using the DC connector on the end of the PSU DC power cable, connect the -48 Vdc power supply cable to the X-1200 module DC power port. Provide a small loop in the DC power cable at the bottom of the X-1200 to allow for movement.



**Figure 18 Power Connection via the PSU**

- With cable ties, use the dedicated cable tie slots on the side of the PSU mounting bracket to neatly collect and contain (dress) the cables from the PSU. If needed, see section 6.11, “Cable Management” for more information.



**Figure 19 Module with PSU Installed.**

## 6.6 Installing the Module onto a Mounting Bracket

Prerequisites:

- Attached elevation and azimuth brackets on back of HM or RBM
- Mounted pole/wall mounting bracket

Required parts and tools:

- Pole/wall mount bracket locknut hardware from X-1200 Module Installation Kit (See Figure 20, “Pole/Wall Mount Bracket Locknut Hardware”)
- Socket wrench with 3/8 in. driver head, with long and short 1/2 in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft



**Figure 20 Pole/Wall Mount Bracket Locknut Hardware**



**Table 11 Recommended Torque Values for Pole/Wall Mount Bracket Locknuts**

Item	Description	Torque	Note
1	Pole/wall mount bracket locknuts (x3)	16.3Nm or 12lbf-ft	—

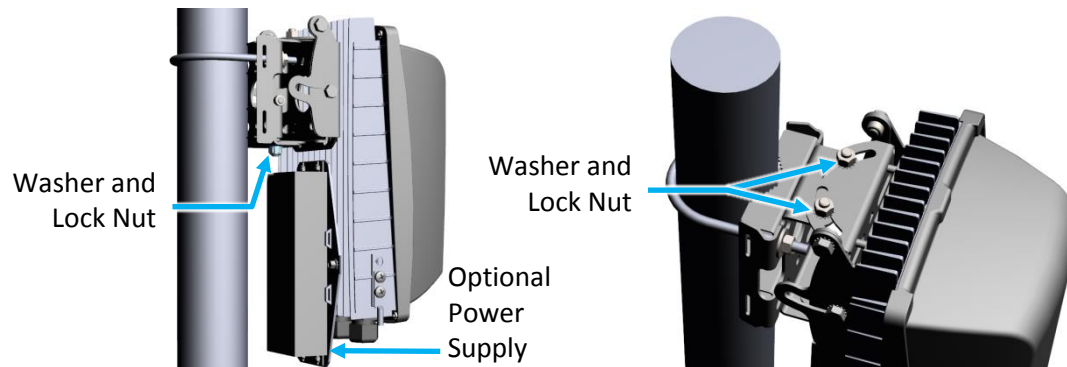
To install the HM or RBM onto the mounted pole/wall mount bracket, refer to Figure 21, “Unit Installed onto the Pole/Wall Mount Bracket” and follow these steps:

**Note:** When installing the HM or RBM, orient it with the chassis cabling openings pointing downward. Never mount the HM or RBM with the bottom facing up or to the side.

1. Carefully fit the azimuth bracket into the pole/wall mount bracket.
2. Place a washer on each bolt protruding through the top of the azimuth bracket from the pole/wall mount bracket. Thread a locknut, by hand, onto the two bolts.
3. Place a washer and then thread a locknut, by hand, onto the one bolt protruding through the bottom of the pole/wall mount bracket from the azimuth bracket.
4. Use the socket wrench to evenly tighten all three locknuts (do not over tighten).

**NOTE:** During final installation, you loosen these bolts to adjust the azimuth of the module. See Section, 8.1 “Using the BSI Feature and Adjusting the Module” for steps on adjusting the module.


5. As a final step in module installation, use the torque wrench to evenly tighten down all three locknuts to finish the installation of the HM or RBM to the pole or wall (do not over tighten). See Table 11, “Recommended Torque Values for Pole/Wall Mount Bracket Locknuts” for torque values.

**Figure 21 Unit Installed onto the Pole/Wall Mount Bracket**

## 6.7 Grounding and Overvoltage Protection Instructions

Ensure that you externally ground the X-1200 system modules. Two (2) grounding screws with a two-hole lug are provided on the side of the module enclosure for this purpose. Connect the ground lug to the main ground to safeguard against possible lightning strikes.

Further, to ensure the survivability of the indoor or outdoor connecting equipment from a lightning strike, BLiNQ Networks recommends either installing the lightning/surge arrester that is sold separately by BLiNQ Networks, or another suitable third-party arrester unit. This helps to provide an equipment site that is properly grounded and protected from electrical surges.

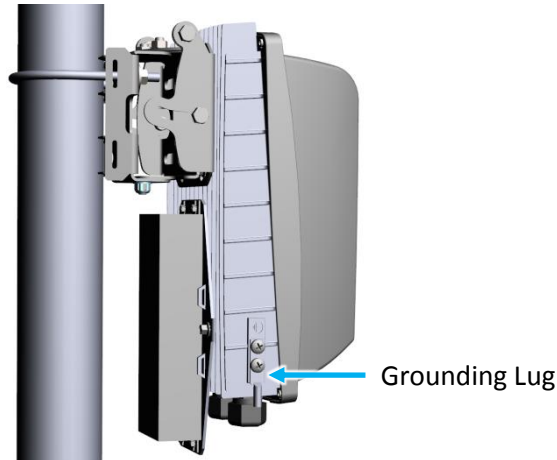
 <b>WARNING!</b>	<ul style="list-style-type: none"><li>• The X-1200 system modules <b>MUST</b> be externally grounded using a customer-supplied ground cable before power is applied. Contact the appropriate electrical inspection authority or a qualified electrician if you are uncertain whether suitable grounding (or shielding from electrical surge) is available.</li><li>• Lightning/surge arresters may only be connected and installed by a qualified electrician (If used)</li><li>• Always ensure that the power is <b>OFF</b> before performing any grounding or overvoltage protection tasks.</li><li>• All country-specific safety regulations, rules, and laws must be observed to provide a properly grounded and overvoltage protected equipment site.</li></ul>
--	--

In all X-1200 equipment installations, after the equipment is mounted, you must provide a properly grounded and shielded environment for the installation site before connecting power or network cables. If used, install the lightning/surge arrester in series with the Ethernet and power cables.

### 6.7.1 Installing the Grounding Cable

Required parts and tools:

- 6-gauge grounding cable
- Phillips #2 screwdriver
- Two (2) PH SEMS screws – ¼-20 x 3/8 in.
- Crimp tool
- Wire stripper



**Figure 22 Module with Grounding Lug**

To ground the unit, follow these general steps:

1. If needed, strip and attach (crimp) the two-hole ground lug of the unit to the grounding cable.
2. Use the Phillips #2 screwdriver to connect the two-hole grounding lug to the unit's grounding screws shown in Figure 22, "Module with Grounding Lug" (do not over tighten).
3. Ensure the other end of the ground wire is connected to a reliable earth ground, such as a grounding rod or an appropriate grounding point on a pole that is grounded.
4. Ensure there is enough slack in the ground cable to allow for unit adjustments later on the pole/wall. Or preferably, wait until adjustments to the module are complete and then attach grounding lug to the unit as a final step in the module installation.

## 6.7.2 Installing the Lightning/Surge Arrestor

To install a lightning/surge arrester (sold separately by BLiNQ Networks), follow these general steps:

1. Mount the arrester close to the entry of the building if the signals are entering a building. Mount the unit with the strain reliefs facing the ground, as shown in Figure 23, "Wiring of Lightning/Surge Arrester (Sold by BLiNQ Networks)".
2. Remove the cover screws using a medium slot head screwdriver and lift off the cover.
3. Thread the incoming Ethernet cable from the data source through one of the strain reliefs on the bottom of the unit. Strip back the cable jacket as needed using wire strippers. Run the Ethernet cable through the copper ground lug on the inside of the Arrester and clamp the Ethernet cable, ensuring there is a good electrical connection of the Ethernet cable shield to the lug.
4. Gently pull the terminal blocks off of the Ethernet pin strip terminals (where present—two are typically provided).
5. Install the Ethernet conductor wires into the top Ethernet pin strip terminals (the bottom terminals are not used), in this order:
  - Blue
  - Blue/White
  - Orange
  - Orange/White

- Green
  - Green/White
  - Brown
  - Brown/White
6. Secure and seat the conductors to the pin strip terminals by gently but firmly pressing them into place with the terminal blocks removed in step 4. Gently pull the terminal blocks off again when done.
  7. Once all the conductors are seated to the pin strip terminals, gently press the terminal blocks into the pin strip terminals of your choice for storage.
  8. Repeat steps 3 through 7 through the other strain relief for the outgoing Ethernet cable running to the X-1200 equipment.  
**Note:** Ensure the left-side and right-side Ethernet conductor wire colors match.
  9. Thread the incoming DC power cable from the power source through one of the strain reliefs on the bottom of the unit.
  10. Using wire strippers, strip back the DC cable jacket about 1 in./25.4 mm to expose the two wires, then strip the insulation about 3/8 in./9.5 mm from each wire.
  11. Insert the Ground Return (RTN) wire into DC+ of the four-position power terminal strip (the top position), and the -48 Vdc wire into DC- of the power terminal strip (the bottom position), and tighten each wire down to the terminal using a small slot head screwdriver.
  12. Repeat steps 9 through 11 through the other strain relief for the outgoing DC power cable running to the X-1200 equipment.
  13. Confirm the left-side and right-side Ethernet conductor wire colors match between the left and right Ethernet pin strip terminals.
  14. Confirm the DC power cable polarity is correct: RTN goes to DC+; -48 Vdc goes to DC-
  15. Tighten the strain reliefs onto the cables (do not over tighten).
  16. Reinstall the cover.
  17. Connect the external ground lug on the unit to a solid Earth ground. The unit must be grounded for the arrester to work properly.

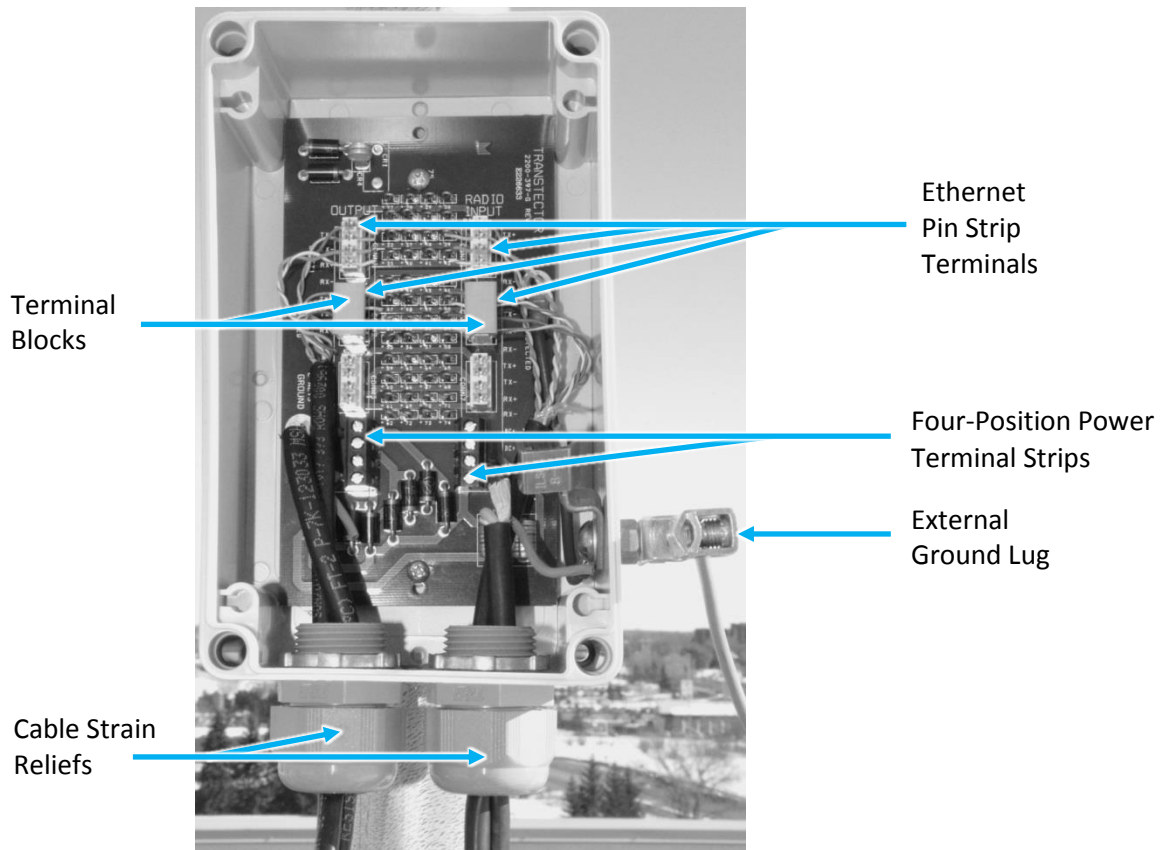


Figure 23 Wiring of Lightning/Surge Arrester (Sold by BLiNQ Networks)

## 6.8 Connecting to DC Power

Before proceeding, if you do not have a direct -48 Vdc power supply, you must install the module power supply unit (PSU). The PSU allows you to convert from another power source (i.e., North America: 120V) to -48 Vdc. See Section 6.5, “Installing the Power Supply Unit (Optional)” for more information.

BLiNQ Networks provides a 10 m (32.9 ft), 20 m (65.7 ft), or 40 m (131.2 ft) DC power cable (as applicable for the installation site) with both the HM and RBM. One end of the cable comes equipped with a DC power connector, while the other end comes terminated with no stripping of either the external sheathing or any of the internal wires. When connecting the HM or RBM to DC power:

- Ensure the input is -48 Vdc and powered from an approved AC/DC power supply or from a DC source separated from AC mains by double or reinforced insulation.
- Ensure that the power can be conveniently removed, if necessary, by disconnecting the DC power connector plug from the back of the unit. This plug should be accessible for servicing the unit.

The HM or RBM is protected against an inadvertent reverse polarity connection. Ensure that the DC power supply is not under-rated and that it is capable of meeting the power requirement of Table 1, “X-1200 System Specifications” under various temperature and solar loading conditions.

**Note:** You may have to cut the cable to the specific cable length needed for your installation.

**WARNING!**

- The X-1200 equipment **must** be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain whether suitable grounding is available.
- Always ensure that the power is OFF before connecting or disconnecting power to the unit.

To connect the HM or RBM to a DC power source, follow these steps:

1. Verify that the equipment is properly grounded as described in the Section 6.7, “*Grounding and Overvoltage Protection Instructions*”.
2. Turn off power to the DC power source at the designated circuits.
3. Align the DC power cable connector with the two-prong key inside of the DC power connector receptacle on the module, then push the cable connector into the connector receptacle and hand tighten the connector screw until fully seated.
4. Connect the other end of the DC power cable to the -48 Vdc supply, ensuring that you comply with the electrical codes for your installation location. For installation, use the white wire to connect to RTN, and use the black wire to connect to the -48 Vdc supply. The termination method you use depends on the power source, for example, a junction box, at your installation site.
5. Verify the power connection cable run is weatherproof. Use a conduit in open locations to further protect the DC power cable run to the installation location against physical damage.
6. Turn on DC power at the designated circuits. The module starts up and loads the operating software.

## 6.9 Verifying Basic Installation

On connection of DC power to the HM or RBM, verify its operational state by checking the LED located on the bottom of the unit.

As the HM or RBM starts up, the LED runs through the states shown in Figure 24, “HM and RBM LED States”.

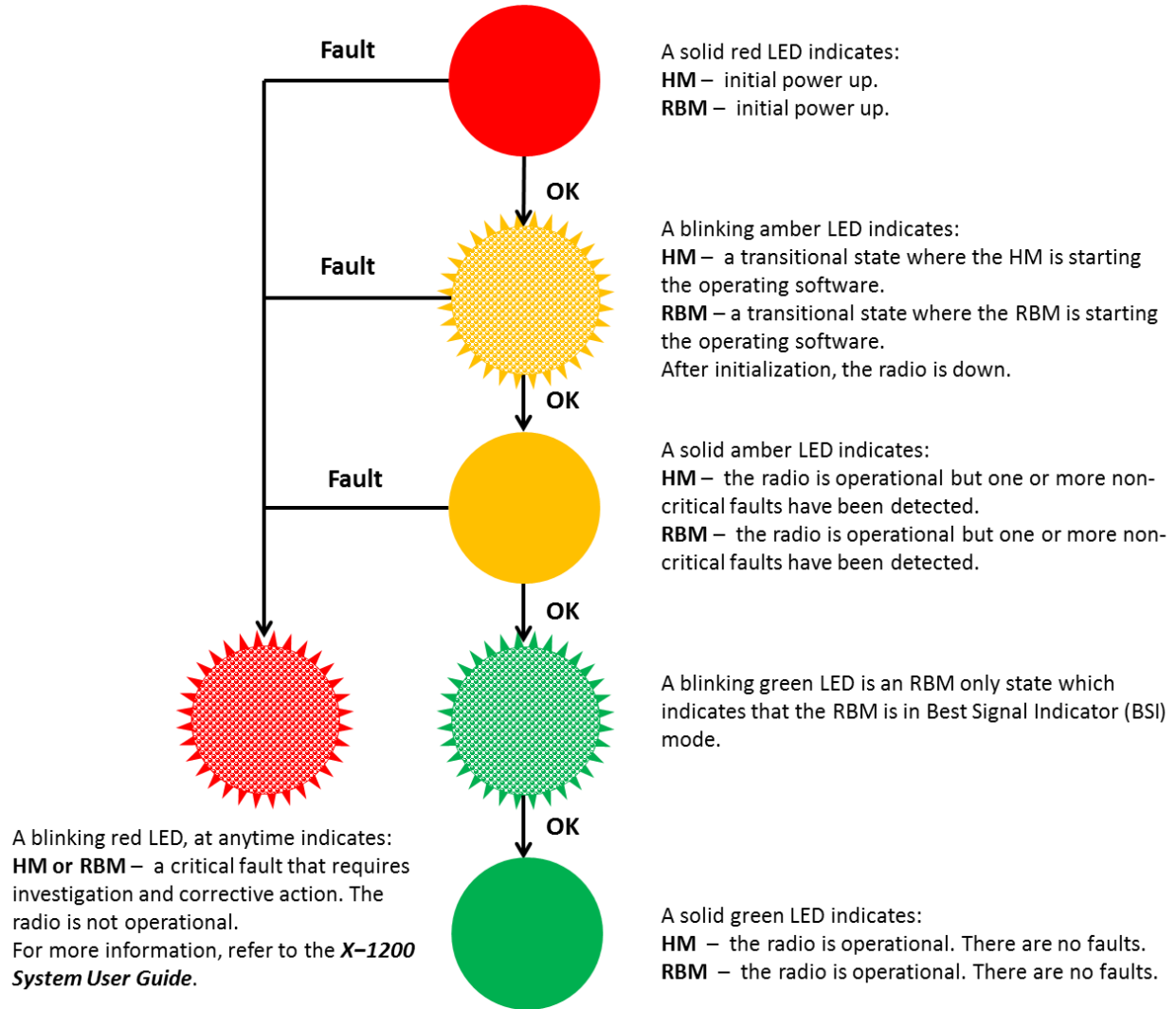


Figure 24 HM and RBM LED States

## 6.10 Connecting to the Ethernet Backhaul Network

Whether using the copper network interface for Ethernet on the HM and RBM, or the optional fiber optical Gigabit network interface for Ethernet on the HM, use of an outdoor-rated cable is recommended for all X-1200 system installations. For example, for the copper Ethernet interface, use a double-shielded cable with metallic RJ45 connectors to properly ground the cable at both ends to the termination points.

BLiNQ Networks supplies the environmental housing required for the RJ45 Ethernet connection at the module. Figure 25, “Ethernet Connector Encased in Environmental Housing” shows the complete copper Ethernet connector assembly encased in the environmental housing.



**Figure 25 Ethernet Connector Encased in Environmental Housing**

### Note:

- Avoid leaving an excessive amount of wire wrapped in a loop at either end of the Ethernet cable run. BLiNQ Networks recommends leaving a maximum of three to four turns of cable to prevent Electrostatic Discharge (ESD) build up on cable.
- Do not run the Ethernet cable close to other cables and machinery with high power (for example, pumps or elevator motors).

### 6.10.1 Connecting to the RJ45 Ethernet Port

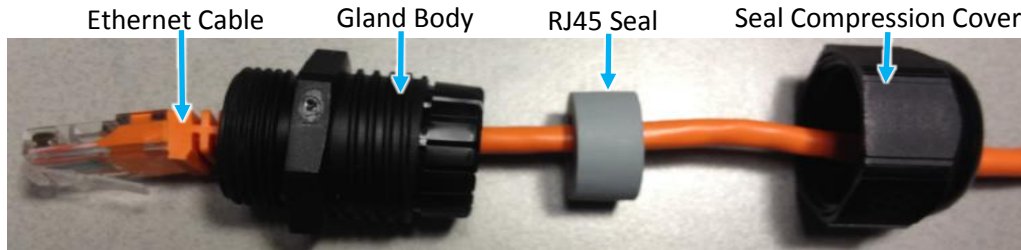
**Table 12 Recommended Torque Value for the RJ45 Ethernet Connection**

Item	Description	Torque	Note
1	RJ45 Gland Connector Body	8Nm or 5.9lbf-ft	Plastic
2	RJ45 Seal Compression Cover	8Nm or 5.9lbf-ft	Plastic

To connect the HM or RBM to the local Ethernet backhaul network using the RJ45 copper Ethernet port, follow these steps:

1. Unscrew the cable gland from the module, if not shipped separately. The cable gland consists of the body (screws into the X-1200 unit (M25 thread)), the RJ45 seal and the seal compression cover.





**Figure 26 Ethernet Connector Assembly - Separated**

2. To properly pass the Ethernet cable and the RJ45 connector through the environmental housing: Insert the RJ45 cable into the seal compression cover, the seal and then the gland body. See Figure 26, “Ethernet Connector Assembly - Separated”.
3. Assemble the connector by first ensuring that the seal is centrally aligned with the gland body and then screwing on the seal compression cover. **Do not tighten yet!** You want the cable to still move easily within the assembly.
4. If needed, remove the cover/cap from the external RJ45 Ethernet connector/port located on the underside of the module (if needed, see Figure 28, “Hub Module Showing All Connectors” on page 38).
5. Plug the Ethernet cable into the external Ethernet RJ45 port on the module.



6. Screw in the gland body assembly into the Ethernet RJ45 well on the module. Tighten the gland body to the torque recommended in Table 12, “Recommended Torque Value for the RJ45 Ethernet Connection”.

7. Now, tighten the seal compression cover around the RJ45 cable. Ensure that the environmental housing makes a good seal over the external Ethernet connector on the module.



8. Tighten the assembly to the torque recommended in Table 12, “Recommended Torque Value for the RJ45 Ethernet Connection”.
9. Verify the Ethernet cable connection run is weatherproof. Use a conduit in open locations to further protect the Ethernet cable run to the installation location against physical damage.

### 6.10.2 Connecting to the SFP Port

To connect the HM or RBM to the local Ethernet backhaul network using the optional fiber optical Gigabit Ethernet interface, follow these steps:

1. Insert an outdoor-rated Small Form-factor Pluggable (SFP) fiber connector into the SFP housing located on the underside of the HM or RBM (For HM, see Figure 28, “Hub Module Showing All Connectors” on page 38 or for RBM, see Figure 33, “Beam Steering Antenna Mounting Bracket” on page 41).
2. Verify the Ethernet cable connection run is weatherproof. Use a conduit in open locations to further protect the Ethernet cable run to the installation location against physical damage.

No further configuration is needed; however, the connection of an SFP fiber connector to the HM disables the RJ45 port.

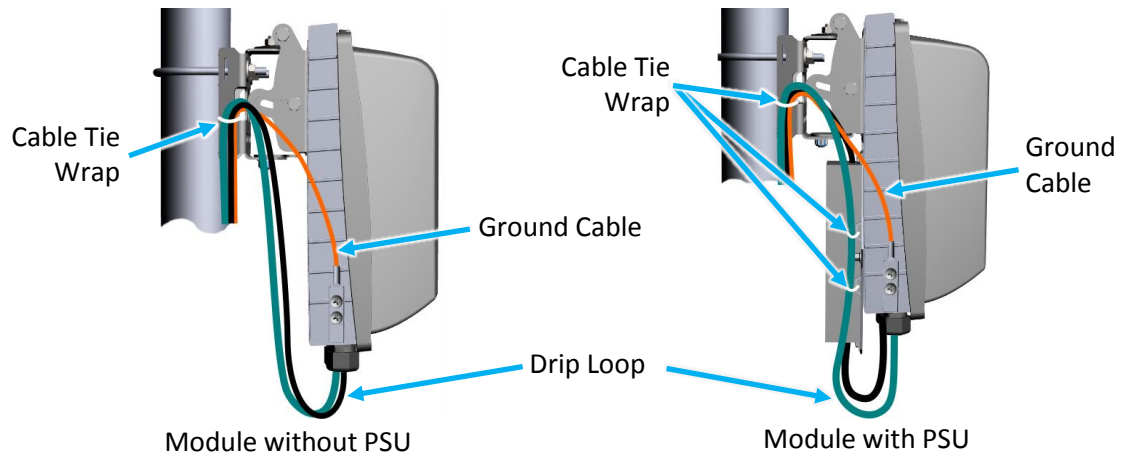
**Note:** The RJ45 Ethernet interface on the HM has priority over the Small Form-factor Pluggable (SFP) Gigabit Ethernet interface. If, for example, an on-site technician connects to the HM locally by the copper interface while the HM is providing network services to its users through the fiber interface, the fiber interface is then disabled and taken out of service. Network service through the fiber interface is restored when the copper interface is disconnected.

## 6.11 Cable Management

For all modules, BLiNQ Networks highly recommends that you manage the cables, in some locations this is referred to as dressing the cable. The following method is a general recommendation; each installation has variations, so depending on the installation, manage the cables as per the policies and procedures suitable for your location.

1. Gather all cables into a bundle to prepare the cable for termination.
2. Ensure all cables are parallel to each other. Straighten and smooth the cables until they form a neat, orderly bundle.
3. Ensure there is some slack in the cables, so that there is no tension on the cable connectors and/or connections.

4. Add a drip loop to the cabling.



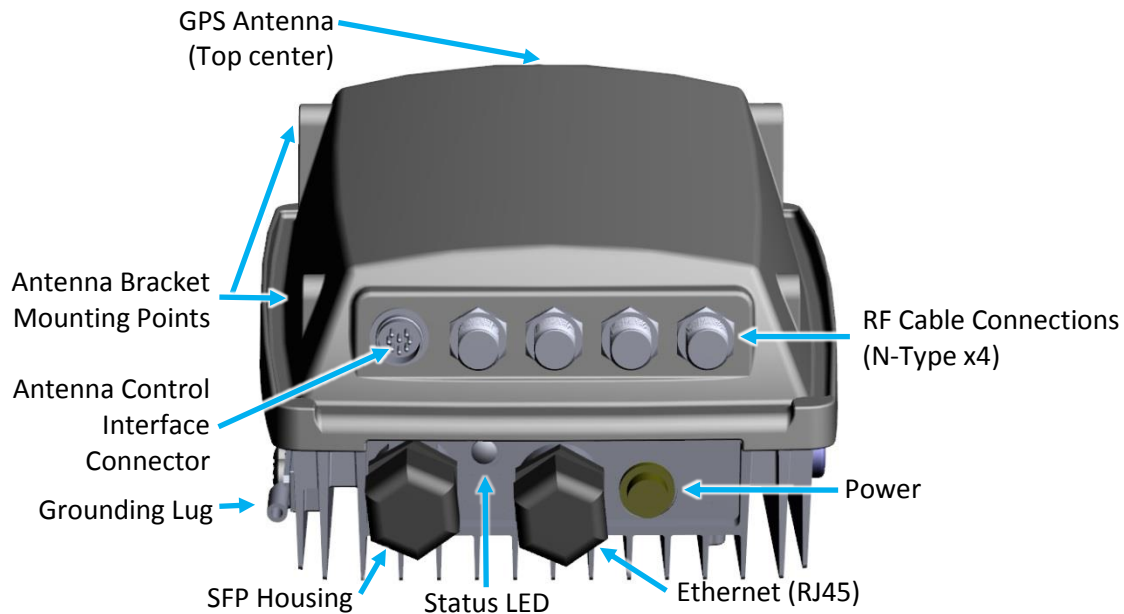
**Figure 27 Module Cable Management**

5. Use cable tie wraps to secure the cables, for example, to an available opening on the mounting bracket or to the dedicated cable management slots on the PSU mount. If needed, evenly space the tie wraps throughout the dressed length. Tighten tie wraps by hand only.

## 7 Installing the Hub Module

Refer to Chapter 6, “**Installing the Modules (General)**” and perform these steps to properly install the Hub Module (HM). Typically, the factory installs most of the components on to the module; however these instructions are for when the module requires field assembly.

Figure 28, “Hub Module Showing All Connectors” shows the HM with all HM connectors indicated. The Radio Frequency (RF) cables run from the HM to the RF Beam Steering Antenna.



**Figure 28** Hub Module Showing All Connectors

### 7.1 Adjusting the Hub Module

Typically, you do not need to adjust the HM, but if needed (i.e., to correctly position an antenna), the mounting brackets offer three degrees of adjustment: elevation up-tilt up to 30 degrees, azimuth up to +/- 25 degrees and theta of up to +/-10 degrees. In addition, the Beam Steering Antenna allows a down-tilt adjustment capability of 0-10 degrees.

Prerequisites:

- Attached elevation and azimuth brackets on back of HM
- Mounted pole/wall mounting bracket

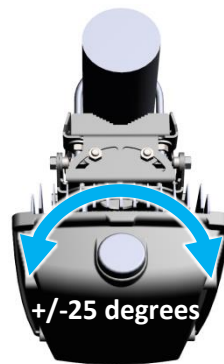
Required parts and tools:

- Black marker
- Ratchet wrenches, ½ in. and 7/16 in.
- Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft

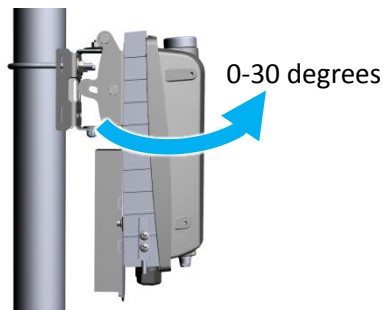
**Table 13 Recommended Torque Values for HM Bracket Bolts**

Item	Description	Torque	Note
1	Pole/wall mount bracket locknuts (x3)	16.3Nm or 12lbf-ft	—
2	Azimuth bracket bolts (x4)	16.3Nm or 12lbf-ft	—
3	Elevation bracket bolts (x4)	10.8Nm or 8lbf-ft	—

- Using a sweeping motion along the horizontal plane, slowly adjust the azimuth of the HM from on its mount, taking in a large angle on either side of the expected direction of the associated RBMs. Mark this position with the black marker, as it is the optimal position for the HM along the horizontal plane.

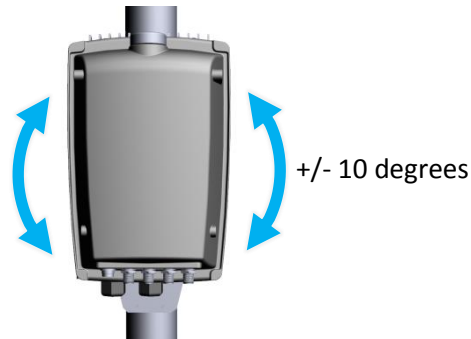
**Figure 29 HM Horizontal Plane Adjustment via Azimuth Bracket**

- Use the ratchet wrench to lightly tighten the bottom locknut in place to the pole/wall mount bracket. Do not over tighten.
- Repeat Step 1 along the vertical plane to obtain the optimal vertical elevation position for the HM. This needs to be done while keeping the optimal horizontal position.

**Figure 30 HM Vertical Plane Adjustment via Elevation Bracket**

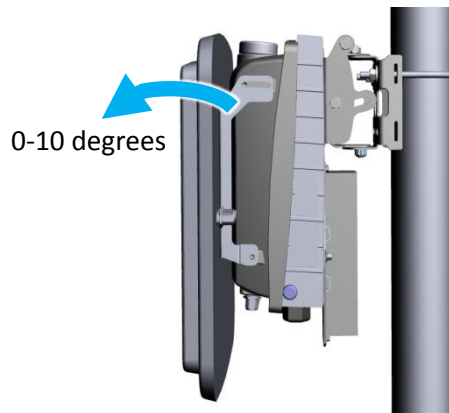
- Use the socket wrench to lightly tighten the two bolts in place on one side of the elevation bracket (do not over tighten).
- Use the ratchet wrench to lightly loosen the bottom locknut on the pole/wall mount bracket, and then repeat Step 1 again along the horizontal plane while keeping the optimal vertical position. This ensures the greatest possible pointing accuracy for the HM.
- Use the ratchet wrench to lightly tighten the bottom locknut in place to the pole/wall mount bracket. Do not over tighten.

7. As a final adjustment to the HM on its mount, gently tilt the unit slightly to the left and then to the right on its elevation bracket axis (theta), if necessary for proper orientation.



**Figure 31 HM Theta Adjustment Via Elevation Bracket Mounting Holes**

8. If the Beam Steering Antenna is installed on the HM, there is also a down-tilt adjustment of 0-10 degrees. Loosen the bolts on the sides of the Beam Steering Antenna mounting bracket. Adjust as required and re-tighten the bolts to the recommended installation torque (see Table 15, “Recommended Torque Values for Antenna Bracket Bolts”).



**Figure 32 HM Down-tilt Adjustment with Antenna Mount**

9. Once you are satisfied that you have found the optimal horizontal and vertical position for the HM, bolt it down to its mount, as follows:

**Note:** Depending on how elevated the HM is, some of the bolts may be hard to torque down using the torque wrench due to limited access to the back of the unit. In those cases, tighten the bolts down by hand.

- a. Use the socket wrench to evenly tighten all three locknuts to the pole/wall mount bracket (do not over tighten), then use a torque wrench to tighten down all three locknuts to finish the installation (do not over tighten). See Table 13, “Recommended Torque Values for HM Bracket Bolts” for torque values.
- b. Use the socket wrench to evenly tighten all four bolts on the azimuth bracket to the elevation bracket (do not over tighten), then use a torque wrench to tighten down all four bolts and finish the installation (do not over tighten). See Table 13, “Recommended Torque Values for HM Bracket Bolts” for torque values.
- c. Use the ratchet wrench to evenly tighten all four bolts on the elevation bracket to the back of the HM (do not over tighten), then use a torque wrench to tighten down all four bolts and finish

the installation (do not over tighten). See Table 13, “Recommended Torque Values for HM Bracket Bolts” for torque values.

10. Use cable ties to dress the cables for neatness and stability. If needed, see section 6.11, “Cable Management” for more information.

## 7.2 Assembling the Beam Steering Antenna (If Required)

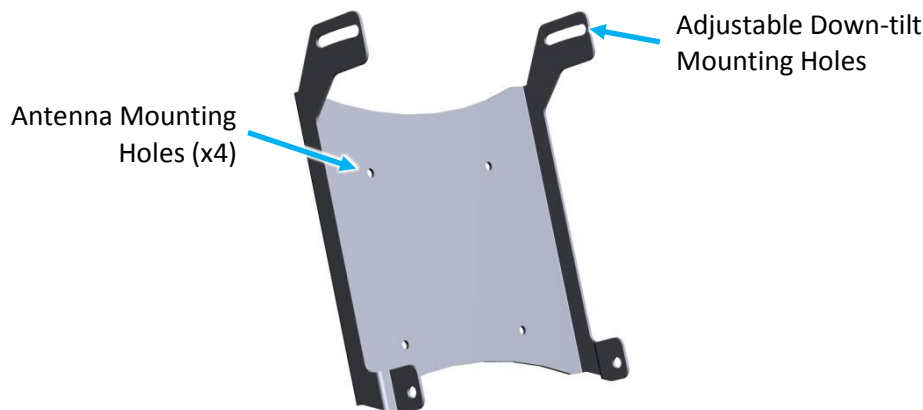
Typically, the factory installs the antenna on to the HM; however these instructions are for when the antenna unit requires field assembly on to the HM. If required, the Beam Steering Antenna, mounting bracket and associated hardware arrives as a kit.

The kit includes:

- Beam Steering Antenna unit
- Down-tilt Hub integral mounting bracket
- Four (4) ¼ in. bolts and washers for mounting bracket to X-1200 HM
- Four (4) locking nuts (to fit flat head M5 X 0.8mm posts) to mount bracket to Beam Steering Antenna
- One (1) x Control cable assembly
- Four (4) x RF cables (N-Type to N-Type)

### 7.2.1 Installing the Bracket on to the Beam Steering Antenna

To make the installation easier, first install the Beam Steering Antenna onto the mounting bracket and then mount the assembled Beam Steering Antenna and bracket onto the HM.



**Figure 33 Beam Steering Antenna Mounting Bracket**

Required parts and tools:

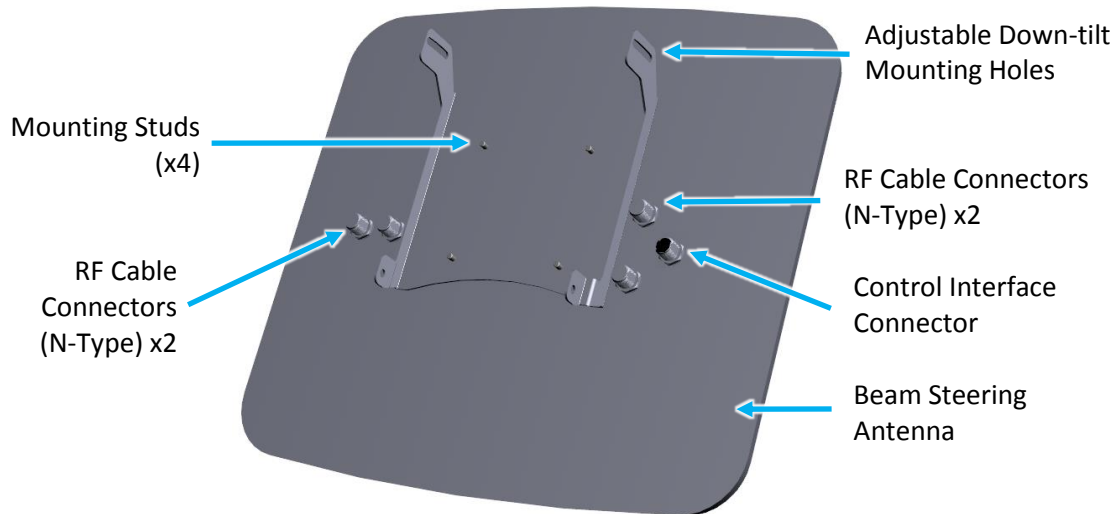
- Beam Steering Antenna kit: Beam Steering Antenna, Beam Steering Antenna mounting bracket, Four (4) locking nuts (to fit flat head M5 X 0.8mm posts)
- Socket wrench with ¼ in. driver head, with long M4 and M5 sockets
- Torque wrench, ¼ in. head with range for 4-60Nm or 3-45lbf-ft

**Table 14 Recommended Torque Values for Antenna Bracket Nuts**

Item	Description	Torque	Note
1	Antenna bracket nuts (x4)	10.8Nm or 8lbf-ft	Mount the antenna bracket on the antenna

To attach the Beam Steering Antenna to the Beam Steering Antenna mounting bracket:

1. Position the antenna bracket on top of the four (4) raised, threaded studs on the back of the Beam Steering Antenna. Position the antenna bracket so that the adjustable holes (down-tilt) are at the top and the single mounting holes are at the bottom of the antenna.



2. Place a lock nut on each of the antenna studs and tighten the nuts to the specified torque. Follow the Torque setting from Table 14, "Recommended Torque Values for Antenna Bracket Nuts".

## 7.2.2 Mounting the Antenna Assembly on to HM

The Beam Steering Antenna mounts onto the outside casing of the Hub Module (HM). There are four (4) dedicated mounting holes, two (2) on each side, of the HM.

Required parts and tools:

- Beam Steering Antenna with mounted Beam Steering Antenna bracket, see Section 7.2.1, "Installing the Bracket on to the "
- Socket wrench with ¼ in. driver head, with long M4 and M5 sockets
- Torque wrench, ¼ in. head with range for 4-60Nm or 3-45lbf-ft
- Four (4) antenna bracket bolts

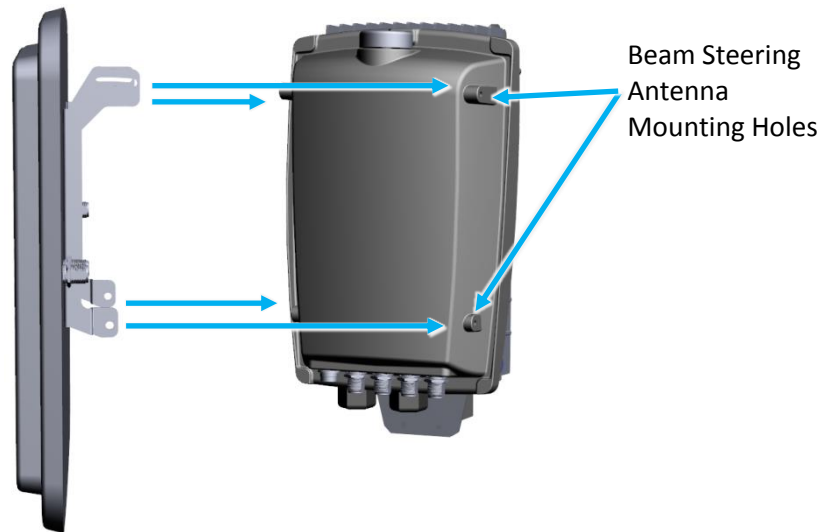
**Table 15 Recommended Torque Values for Antenna Bracket Bolts**

Item	Description	Torque	Note
1	Antenna bracket bolts (x4)	10.8Nm or 8lbf-ft	Mount the antenna bracket on the HM



To attach the Beam Steering Antenna and antenna bracket assembly onto the HM, refer to Figure 34, “Hub Module Antenna Mounting Holes” and follow these steps:

1. Place the antenna bracket assembly on the top of the HM. Align the two bolt holes on each side of the bracket with the two (2) holes on each side of the HM. Ensure that the down-tilt adjustable holes are aligned with the *top* two holes on each side of the HM enclosure.

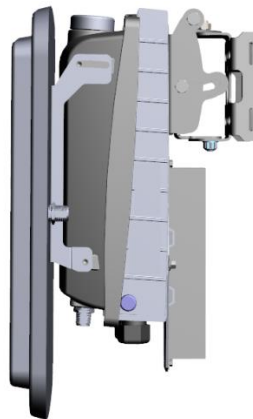


**Figure 34** Hub Module Antenna Mounting Holes

2. Place a lock washer on the back of each of the four (4) bolts.
3. Thread, by hand, each of the bolts into the mounting holes. Ensure that you align the mounting bracket holes and the holes on the module.

**Note:** Keep the top bolts loose until antenna/HM is aligned/tuned.

4. Use the socket wrench to lightly tighten the bolts of the antenna bracket to the unit (do not over tighten).
5. Use the torque wrench to evenly tighten down the bolts and finish the installation of the antenna bracket assembly to the module (do not over tighten). Follow the Torque setting from Table 15, “Recommended Torque Values for Antenna Bracket Bolts”.



**Figure 35** Antenna attached to a Hub Module

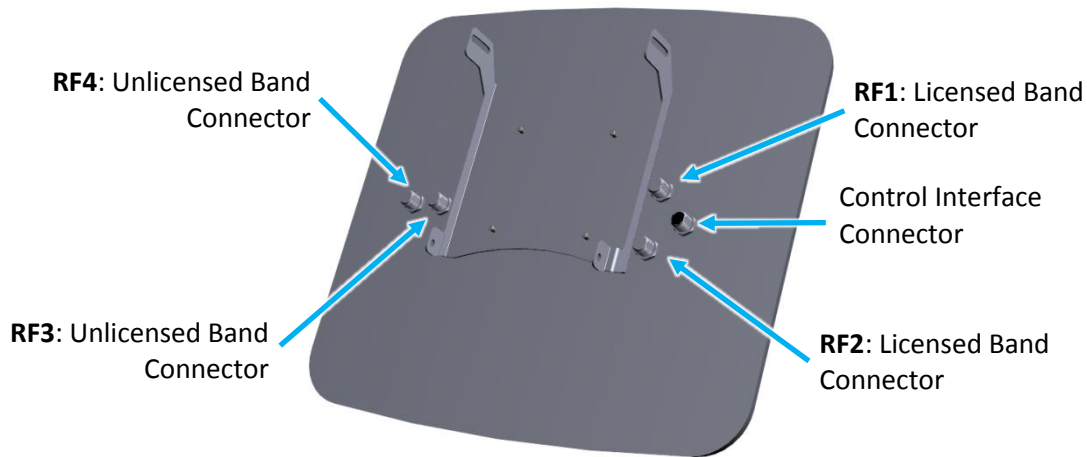
### 7.2.3 Connections for Antenna and Hub

To finalize the installation of the Beam Steering Antenna to the Hub module, connect the associated cables:

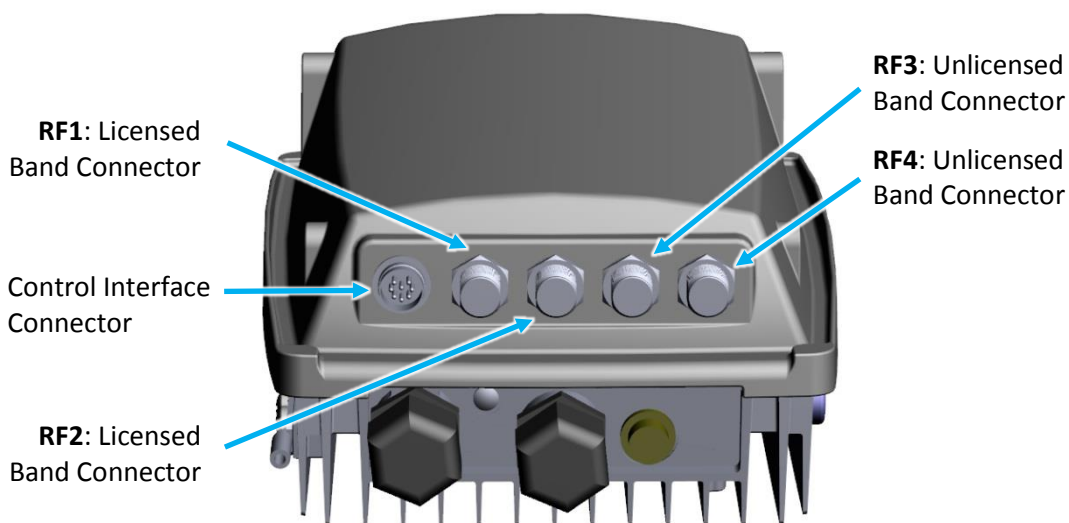
- One (1) x control cable assembly
- Four (4) x RF cables N-Type to N-Type

**Table 16 Recommended Torque Values for Antenna Cable Connections**

Item	Description	Torque	Note
1	Control cable assembly (x1)	0.9Nm or 8lbf-in	Mount the control cable from the HM to the Beam Steering Antenna
2	RF cables N-Type (x4)	0.9Nm or 8lbf-in	Mount the RF cables from the HM to the Beam Steering Antenna



**Figure 36 Beam Steering Antenna RF Connections**



**Figure 37 RF Connections on the Hub Module**

If needed, before starting this procedure, see Figure 36, “Beam Steering Antenna RF Connections” and Figure 37, “RF Connections on the Hub Module” for connector locations. To connect the cables between the Hub Module (HM) and the Beam Steering Antenna, follow these steps:

1. Connect the SPI cable from the Beam Steering Antenna SPI Connector to the X-1200 hub module SPI Connector. Thread the connector from one end of the SPI cable onto the connector on the Beam Steering Antenna. Thread the other end of the SPI cable onto the SPI connector on the Hub Module. Finger tighten the connections.
2. Connect the RF cables from the Beam Steering Antenna to the RF connectors on the X-1200 hub module. You need to attach the RF cables to the corresponding connectors on the HM and the Beam Steering Antenna -- Licensed band or Unlicensed band.
  - RF1: Radio Frequency Licensed Band
  - RF2: Radio Frequency Licensed Band
  - RF3: Radio Frequency Unlicensed Band
  - RF4: Radio Frequency Unlicensed Band

Thread the connector from one end of the RF cable onto the RFx connector on the Beam Steering Antenna. Thread the other end of the RF cable onto the corresponding RFx connector on the Hub Module; for instance, connect RF1 (licensed) on the Beam Steering Antenna with RF1 (licensed) on the HM, RF3 (unlicensed) with the RF3 (unlicensed) on the HM, etc. Finger tighten the connections.

3. Align the Beam Steering Antenna by pointing it geographically toward the target location/signal by using the azimuth, elevation and/or the antenna brackets (if needed, see section 7.1, “Adjusting the Hub Module”). Use a torque wrench to evenly tighten down the bolts and finish the installation of the assembly (do not over tighten). Follow the Torque setting for the bracket(s) that you adjusted:
  - Table 7, “Recommended Torque Values for Elevation Bracket Bolts”
  - Table 8, “Recommended Torque Values for Azimuth Bracket Bolts”
  - Table 15, “Recommended Torque Values for Antenna Bracket Bolts”
4. As required, dress any cabling. If needed, see section 6.11, “Cable Management” for more information.

## 8 Installing the Remote Backhaul Module

Refer to Chapter 6, “Installing the Modules (General)” and perform these steps to properly install the Remote Backhaul Module (RBM).

Figure 38, “RBM Module Showing All Connectors” shows the RBM with all RBM connectors indicated.

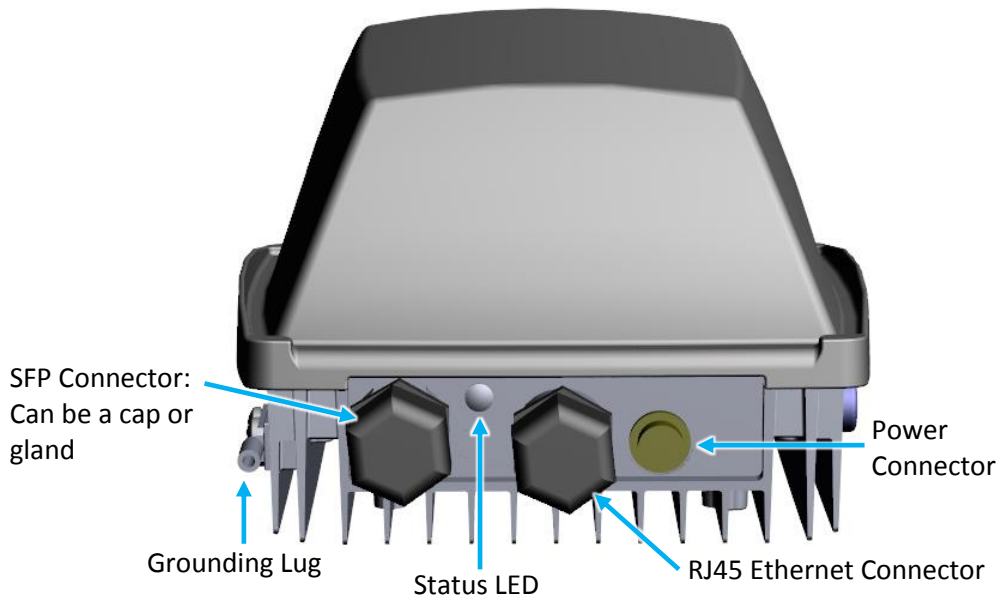


Figure 38 RBM Module Showing All Connectors

### 8.1 Using the BSI Feature and Adjusting the Module

Pointing Mode or Best Signal Indicator (BSI) is an RBM operating mode which allows you, the installer, to easily determine the direction of the best quality RF signal from the desired HM, and point the RBM toward that HM before tightening the RBM down to its mount. You enable and disable the BSI feature through the X-1200 WebUI.

While in BSI mode, the RBM emits a continuous varied-pitch tone to reflect the quality/strength of the RF signal it receives from the HM. When the frequency of the tone from the RBM is louder and higher, this indicates that the RF signal from the HM is of better quality. You move the RBM on its axis and bolt it down to its mount when the loudest and highest frequency tone is heard — indicating the best signal from the HM has been found. You then create a radio link by inserting an Ethernet cable into the Ethernet port on the RBM. This allows the RBM to lock on to the signal and exit BSI mode.

Following is a more detailed list of the RBM’s expected behavior tones when it is in BSI mode:

- On detection of the desired HM, the RBM sounds a continuous tone.
- If the RBM does not steadily sound a continuous tone after 2-3 minutes in a specific direction that indicates it is not able to find the desired HM in that direction.
- When changing the direction, as the received signal quality increases, so will the frequency and volume of the tone and vice versa.

- After synchronization of the best signal, the RBM emits the highest tone when directed towards the strongest signal from the HM. Typically, due to the tone frequency response, the amplitude increases with the tone.

**Note:**

- While the RBM is in BSI mode, it cannot create a radio link; it is not transmitting — only receiving. BSI mode times out automatically after 30 minutes.
- If for some reason, you cannot use the BSI feature, for example, due to high volume noise at the installation site, or due to the outside temperature being -30°C or colder, the RBM may be pointed to the desired HM using general line-of-sight. However, the recommended pointing method under any condition, especially when installing RBMs at Non-Line-of-Sight (NLOS) locations, is to use the BSI feature.

Prerequisites:

- Attached elevation and azimuth brackets on the back of an RBM
- Mounted pole/wall mounting bracket

Required parts and tools:

- Portable computer (to log in and access the X-1200 WebUI)
- Black marker
- Ratchet wrenches, ½ in. and 7/16 in.
- Socket wrench with 3/8 in. driver head, with long and short ½ in. and 7/16 in. sockets
- Torque wrench, 3/8 in. head with range for 4-60Nm or 3-45lbf-ft

**Table 17 Recommended Torque Values for RBM Bracket Bolts**

Item	Description	Torque	Note
1	Pole/wall mount bracket locknuts (x3)	16.3Nm or 12lbf-ft	—
2	Azimuth bracket bolts (x4)	16.3Nm or 12lbf-ft	—
3	Elevation bracket bolts (x4)	10.8Nm or 8lbf-ft	—

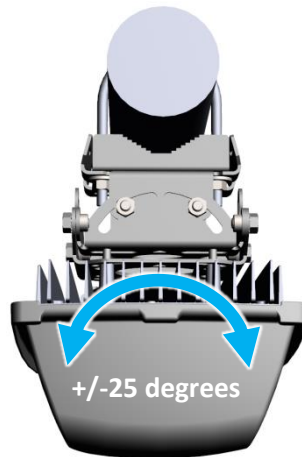
To use the audible tone of the BSI feature when installing RBMs (as feedback to indicate the strongest, best RF signal from the serving HM), follow these steps:

1. Typically, the RBM automatically enters BSI mode on power up, during initial installation, when the Ethernet link/connections are not enabled (Ethernet cable is not plugged in); however, if the RBM does not enter BSI mode, follow steps 2 to 5. Skip to step 6, if the RBM is in BSI mode.
2. Use your computer browser to connect to the local Craft IP address of the unit: **http://169.254.1.1**
3. Log on to the system. The default username and password are admin.
4. When initially configuring the RBM prior to installation, use the X-1200 WebUI to set the '**Pointing Mode (BSI)**' button to '**Enabled**' on the **Setup > Radio Interface Page** so that when the RBM restarts next with no Ethernet cable attached, it enters BSI mode. You are then able to find the optimum position for the RBM by moving it on its mount axis, based on the signal quality from the HM.

**Note:** Once you plug the Ethernet cable into the Ethernet port on the RBM to create the radio link to the Hub, the RBM exits BSI mode, and the WebUI '**Pointing Mode (BSI)**' can be set to '**Disabled**'. This prevents the RBM from entering BSI mode again while up on its mount due to, for example,

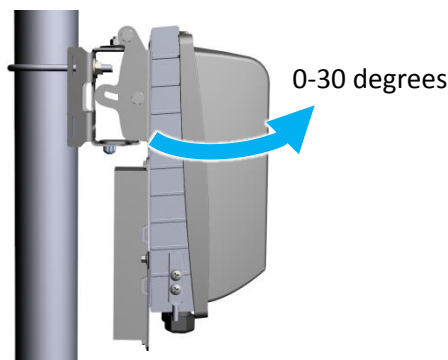
scheduled maintenance or software upgrade activities, that in turn prevents the RBM from seeing its Ethernet connection, causing the RBM to enter BSI mode again.

5. Activate the **Pointing Mode/BSI** feature by powering up or resetting the RBM, making sure that the Ethernet cable (if connected to the RBM) is not connected at the other end. The RBM may emit several beeps before settling down to a continuous tone. This is the audible tone of the Pointing Mode/BSI feature.
6. Using a sweeping motion along the horizontal plane, slowly adjust the azimuth of the RBM from on its mount, taking in a large angle on either side of the expected HM direction (Figure 39, “RBM Horizontal Plane Adjustment via Azimuth Bracket”). The loudest and highest frequency BSI tone indicates the strongest, best RF signal direction from the HM. Mark this position with the black marker, as it is the optimal position for the RBM along the horizontal plane.



**Figure 39 RBM Horizontal Plane Adjustment via Azimuth Bracket**

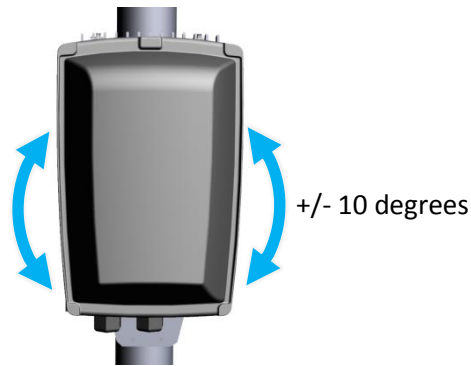
7. Use the ratchet wrench to lightly tighten the bottom locknut in place to the pole/wall mount bracket. Do not over tighten.
8. Repeat Step 6 along the vertical plane to obtain the optimal vertical elevation position for the RBM (Figure 40, “RBM Vertical Plane Adjustment via Elevation Bracket”). This needs to be done while keeping the optimal horizontal position.



**Figure 40 RBM Vertical Plane Adjustment via Elevation Bracket**

9. Use the socket wrench to lightly tighten the two bolts in place on one side of the elevation bracket (do not over tighten).

10. Use the ratchet wrench to lightly loosen the bottom locknut on the pole/wall mount bracket, and then repeat Step 6 again along the horizontal plane while keeping the optimal vertical position. This ensures the greatest possible pointing accuracy for the RBM.
11. Use the ratchet wrench to lightly tighten the bottom locknut in place to the pole/wall mount bracket. Do not over tighten.
12. As a final adjustment to the RBM on its mount, gently tilt the unit slightly to the left and then to the right on its elevation bracket axis (theta), if necessary for proper orientation. Again, the loudest and highest frequency BSI tone indicates the strongest, best RF signal direction from the HM.



**Figure 41 RBM Theta Adjustment Via Elevation Bracket Mounting Holes**

13. Once you are satisfied that you have found the optimal horizontal and vertical position for the RBM, bolt it down to its mount, as follows:
  - Note:** Depending on how elevated the RBM is, some of the bolts may be hard to torque down using the torque wrench due to limited access to the back of the unit. In those cases, tighten the bolts down by hand.
  - a. Use the socket wrench to evenly tighten all three locknuts to the pole/wall mount bracket (do not over tighten), then use a torque wrench to tighten down all three locknuts to finish the installation (do not over tighten). See Table 17, “Recommended Torque Values for RBM Bracket Bolts” for torque values.
  - b. Use the socket wrench to evenly tighten all four bolts on the azimuth bracket to the elevation bracket (do not over tighten), then use a torque wrench to tighten down all four bolts and finish the installation (do not over tighten). See Table 17, “Recommended Torque Values for RBM Bracket Bolts” for torque values.
  - c. Use the ratchet wrench to evenly tighten all four bolts on the elevation bracket to the back of the RBM (do not over tighten), then use a torque wrench to tighten down all four bolts and finish the installation (do not over tighten). See Table 17, “Recommended Torque Values for RBM Bracket Bolts” for torque values.
14. For safety, power down the RBM, terminate the Ethernet cable by connecting both ends; this cancels BSI mode and creates an RF link with the HM. Apply power again, ensuring that you are a minimum of 50 cm (19.7 in.) away from the unit.
15. Use the X-1200 WebUI to set the ‘**Pointing Mode (BSI)**’ button to ‘**Disabled**’ on the **Setup > Radio Interface Page**. If needed, refer to steps 2 and 3 of this procedure.

This prevents the RBM from entering BSI mode again while up on its mount due to, for example, a power outage, scheduled maintenance or software upgrade activities, which in turn prevents the RBM from seeing its Ethernet connection, causing the RBM to enter BSI mode again (if was still set to **Enabled**).



## 9 System and Network Provisioning

Once the mounting and installation of the X-1200 system modules is complete and their operational states have been verified as normal, perform the tasks described in the chapter “*System Provisioning*” of the ***X-1200 System User Guide***, as applicable for your network.

# 10 Appendix

## 10.1 BLiNQ Wireless Devices and RF Safety/Les appareils sans fil BLiNQ et la sécurité RF

**REMARQUE:** La traduction française suit le texte anglais.

All BLiNQ Networks products are evaluated to ensure they conform to the Radio Frequency (RF) energy emission safety limits adopted by the Federal Communications Commission (FCC). These evaluations are conducted using the compliance rules and guidelines adopted by both the FCC and Industry Canada. They are based on the results of the Maximum Permissible Exposure (MPE) studies by the FCC for mobile or fixed devices, which dictate MPE limits for human exposure to RF energy.

Before selling any wireless networking device to the public, BLiNQ Networks submits its devices to the FCC and Industry Canada for MPE (that is, RF emissions) studies and evaluation. These studies must demonstrate that the device meets the accepted regulatory limits for safe RF emissions, or it is not approved for sale by the FCC and thus cannot be sold to the public. This means that when wireless networking devices purchased from BLiNQ Networks are installed and operated as instructed, the RF emissions from the devices is equal to or less than the levels accepted as safe by the FCC and Industry Canada.

When used as intended, BLiNQ wireless networking devices do not pose health risks. Like other devices that emit RF energy (such as computers and microwave ovens), the level of RF emissions from BLiNQ devices is too low to cause harm. Further, BLiNQ wireless networking devices emit far lower levels of RF energy than cellular and cordless telephones, and are almost always used further away from the human body.

To prevent unnecessary exposure to RF energy:

- Always install the X-1200 system so as to provide and maintain a minimum separation distance from all persons.
- When the X-1200 system is operational, avoid standing directly in front of Hub Module (HM) antennas or in front of Remote Backhaul Modules (RBMs) and their internal antennas. RF energy fields may be present when the transmitter is on.
- When the X 1200 system is operational, maintain a distance of at least 50 centimeters (19.7 inches) from the Hub Module (HM) antennas or the Remote Backhaul Modules (RBMs) internal antennas.
- Do not install the X-1200 system in a location where it is possible for people to stand or walk inadvertently in front of an antenna.

### Antenna Statement:

When used with an external antenna, this device has been designated to operate with a SP-4642 Selectable Multi-beam and Sector Antenna manufactured by Plasma Antennas having a maximum gain of 17 dB. Any other antenna having a gain greater than 17 dB is strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

The antenna used for this transmitter must be installed to provide a separation distance of at least 50 cm from all persons and must not be co-located or operating in conjunction with any other antenna or

transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

---

BLiNQ Networks évalue l'ensemble de ses produits afin de s'assurer qu'ils sont conformes à la limite d'émission énergétique sécuritaire de radiofréquence (RF) adoptée par la «Federal Communications Commission» (FCC). BLiNQ Networks effectue ces évaluations en utilisant les règles et lignes directrices adoptées à la fois par le FCC et Industrie Canada. Elles sont basées sur les résultats de l'exposition maximale admissible, études menées par le FCC sur les appareils mobiles ou fixes, qui dictent les limites de l'exposition maximale admissible pour l'exposition humaine aux énergies RF.

Avant de vendre tout appareil de réseau sans fil au public, BLiNQ Networks présente ses appareils au FCC et à Industrie Canada pour l'évaluation de l'exposition maximale admissible. Ces études doivent démontrer que l'appareil est conforme aux limites réglementaires acceptées pour les émissions RF, sinon les appareils ne sont pas approuvés pour la vente par la FCC et ne peuvent donc pas être vendus au public. Cela signifie que lorsque des équipements sans fil, achetés auprès de BLiNQ Networks, sont installés et utilisés conformément aux instructions, les émissions RF provenant des dispositifs sont inférieures ou égales aux niveaux acceptés comme étant sécuritaire par la FCC et Industrie Canada.

Lorsqu'utilisés comme prévu, les périphériques sans fil BLiNQ ne posent pas de risques pour la santé. De la même façon que les autres appareils qui émettent de l'énergie RF (comme les ordinateurs et les fours à micro-ondes), le niveau des émissions RF des dispositifs BLiNQ est trop faible pour causer des dommages. En outre, les dispositifs de réseau sans fil BLiNQ émettent des niveaux beaucoup plus faibles d'énergie RF que les téléphones cellulaires et sans fil, et sont presque toujours utilisés loin du corps humain.

Pour éviter toute exposition inutile à l'énergie RF :

- Installer toujours le système X -1200 afin de fournir et de maintenir une distance minimale de séparation avec toutes les personnes.
- Lorsque le système X -1200 est opérationnel, éviter de se tenir directement devant les antennes du «Hub Module» (HM) ou devant «Remote Backhaul Module» (RBM) et leurs antennes internes. Les champs d'énergie RF peuvent être présents lorsque l'émetteur est en marche.
- Lorsque le système X -1200 est opérationnel, maintenir une distance d'au moins 50 centimètres (19.7 pouces) à partir des antennes du HM ou des antennes internes modules du RBM.
- Ne pas installer le système X -1200 dans un endroit où il est possible pour les gens de se tenir debout ou de marcher en face d'une antenne.

#### **Déclaration d'antenne:**

Lorsqu'il est utilisé avec une antenne externe, ce dispositif a été conçu pour fonctionner avec une antenne SP-4642 fabriqué par Plasma Antennas ayant un gain maximal de 17 dB. L'utilisation de toute autre antenne ayant un gain supérieur à 17 dB est strictement interdit avec ce dispositif. L'impédance requise de l'antenne est de 50 ohms.

L'antenne utilisée pour cet émetteur doit être installée de façon à créer une distance de séparation d'au moins 50 cm de toute personne et ne doit pas être co-localisées ou opérant en conjonction avec une autre antenne ou émetteur. Les utilisateurs et les installateurs doivent avoir reçus des instructions d'installation de l'antenne et des conditions de fonctionnement de l'émetteur pour satisfaire la conformité aux expositions RF.

## 10.2 Equipment Compliance

### 10.2.1 Federal Communications Commission (FCC) Notices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**CAUTION:** Any changes or modifications not expressly approved by BLiNQ Networks could void the user's authority to operate this equipment.

### 10.2.2 Industry Canada Notice

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3 (B)/NMB-3(B)

### 10.2.3 Bonded Network

The X-1200 modules are suitable for installation as part of a Common Bonded Network (CBN).

The Common Bonded Network (CBN) refers to the metallic bond that forms within a building, by deliberate or incidental connections, that offers the means for effective bonding and grounding within the building. Some of the components within a building that form this bond are:

- building steel,
- water pipes,
- cable racks,

- vertical and horizontal equalizer conductors,
- bonding conductors and
- electrical metallic raceways.

Typically, you connect to the CBN via equipment frames which reduces voltage differences to acceptable levels when current flows through these frames, either during fault occurrences in the ac or dc power systems, or when lightning strikes.

## 10.3 Troubleshooting Guide

Table 18, “X-1200 System Troubleshooting Guide” provides helpful hints and solutions for troubleshooting the X-1200 system.

**Table 18 X-1200 System Troubleshooting Guide**

Symptom	Possible Cause	Solution
The downlink Modulation and Coding Scheme (MCS) is low on a Remote Backhaul Module (RBM)	The Received Signal Strength Indication (RSSI) is very high on the RBM (>-35dB)	Reduce the transmitted power of the Hub Module (HM). Change the pointing on the RBM to reduce the received signal.
	The Carrier to Interference plus Noise Ratio (CINR) level is low	Increase the transmitted power of the HM. Change the pointing on the RBM to increase the received signal.
State LED cycles continuously between green and amber	The link is not being formed	Verify that the frequency and preamble index settings are correct.
	If the LED is continuously going between amber and green (within a few seconds), the unit may be defective	Remove and return the unit to BLiNQ Networks. Contact BLiNQ Networks to arrange for a replacement.
RBM not going into Best Signal Indicator (BSI) mode	RBM is powered up, but BSI feature is not activated	Verify that the BSI option is properly enabled. <b>Note:</b> the BSI feature does not become active if an Ethernet connection is present on the RBM.
	HM not transmitting	
	Wrong frequency setting	
No ping responses from X-1200 system	Wrong IP address set	Verify that the IP address, netmask, and gateway address (if used) are correct.
	Dynamic Host Configuration Protocol (DHCP) to an unknown IP address	If DHCP is being used on the RBM, check the assigned IP address from the HM side to confirm it is correct.
	Unit is powering up	Wait until the LED goes green and try to ping again.
	Attempting to ping management IP of the RBM	This IP is only accessible from the HM side of the link and not from the local craft Ethernet (only IP accessible is the craft IP address).
	Personal Computer (PC) does not have an IP address in the same subnet as the X-1200 system	Statically assign an IP address from the same subnet as the X-1200 system to the PC.

Symptom	Possible Cause	Solution
Software upgrade fails	File Transfer Protocol (FTP) issue, for example, invalid credentials, incorrect server IP, directory, or file name	Contact local network administrator for assistance.
	Routing problem, for example, not able to ping the server	
RBM not replying to ping over the air	RBM may be in BSI mode	The BSI feature times out after 30 minutes. Connect to the RBM over the air through the X-1200 WebUI and disable the BSI feature.
	Link is down	From the HM, verify that the RBM is connected. If it is, verify that the IP address assigned to the RBM is correct.
RBM not coming into service on HM	HM not transmitting	The HM is not synchronized to the Global Positioning System (GPS). This process can take up to 45 minutes on initial deployment.
	Wrong frequency	Verify that the HM is using the correct frequency. If possible, verify this also on the RBM.
	Four RBMs already in service on the HM cluster	The HM already has four associated RBMs in service; further RBM requests are rejected.
	RBM Media Access Control (MAC) address does not match the predefined RBM in the RBM list	In the event of the HM being configured to use the individual service flows, the MAC address of the RBM must match one from the HM list. If this is not the case, the RBM does not form a link with the HM.
Networking problem	No ping over the air	Verify that the service flow definitions are correct. They could be disallowing Internet Control Message Protocol (ICMP) packets.
	Nothing connects on the RBM Ethernet port	Verify that the device being pinged is actually in service and connected to the Ethernet port of the RBM.

## 10.4 List of Acronyms

**Table 19 List of Acronyms**

<b>AWG</b>	American Wire Gauge
<b>BE</b>	Best Effort
<b>BSI</b>	Best Signal Indicator
<b>B-SON</b>	Backhaul – Self-Organizing Network
<b>CBN</b>	Common Bonded Network
<b>CINR</b>	Carrier to Interference plus Noise Ratio
<b>COTS</b>	Commercial Off the Shelf
<b>DC</b>	Direct Current
<b>DHCP</b>	Dynamic Host Configuration Protocol
<b>DL</b>	Downlink
<b>DNS</b>	Domain Name System
<b>ESD</b>	Electrostatic Discharge
<b>FCC</b>	Federal Communications Commission
<b>FTP</b>	File Transfer Protocol
<b>GHz</b>	Gigahertz
<b>GBR</b>	Guaranteed Bit Rate
<b>GPS</b>	Global Positioning System
<b>HM</b>	Hub Module
<b>HTTP</b>	Hyper Text Transfer Protocol
<b>ICMP</b>	Internet Control Message Protocol
<b>IE9</b>	Internet Explorer 9
<b>IP</b>	Internet Protocol
<b>lbf-ft</b>	Pounds force per foot
<b>LOS</b>	Line-of-Sight
<b>MAC</b>	Media Access Control
<b>Mbps</b>	Megabits per second
<b>MCS</b>	Modulation and Coding Scheme
<b>MHz</b>	Megahertz
<b>MIMO</b>	Multiple Input Multiple Output
<b>MPE</b>	Maximum Permissible Exposure
<b>NIC</b>	Network Interface Controller (on PC)
<b>nLOS</b>	Near Line-of-Sight
<b>NLOS</b>	Non Line-of-Sight
<b>Nm</b>	Newton Meters
<b>NOC</b>	Network Operations Center
<b>OAM</b>	Operations, Administration & Maintenance

<b>OFDM</b>	Orthogonal Frequency Division Multiplexing
<b>OS</b>	Operating System
<b>PC</b>	Personal Computer
<b>PH</b>	Pan Head
<b>PHY</b>	Physical Layer
<b>PMP</b>	Point-to-Multipoint
<b>PTP</b>	Point-to-Point
<b>PSU</b>	Power Supply Unit
<b>QAM</b>	Quadrature Amplitude Modulation
<b>QoS</b>	Quality of Service
<b>RBM</b>	Remote Backhaul Module
<b>RF</b>	Radio Frequency
<b>RSSI</b>	Received Signal Strength Indication
<b>RTN</b>	Ground Return
<b>SEMS</b>	Preassembled screw and washer
<b>SFP</b>	Small Form-factor Pluggable
<b>SFTP</b>	Secure File Transfer Protocol
<b>SN</b>	Serial Number
<b>SNMP</b>	Simple Network Management Protocol
<b>SPI</b>	Serial Peripheral Interface
<b>TDD</b>	Time Division Duplexing
<b>UL</b>	Uplink
<b>URL</b>	Universal Resource Locator
<b>Vdc</b>	Volts Direct Current



**© Copyright 2012-2014 BLiNQ Networks Inc. All rights reserved.**

CONFIDENTIAL INFORMATION  
RESTRICTED USE AND DUPLICATION

The information contained herein is the property of BLiNQ Networks Inc. and is strictly confidential. Except as expressly authorized in writing by BLiNQ Networks Inc., the holder shall keep all information contained herein confidential, shall disclose it only to its employees with a need to know, and shall protect it, in whole or in part, from disclosure and dissemination to third parties with the same degree of care it uses to protect its own confidential information, but with no less than reasonable care.

Except as expressly authorized in writing by BLiNQ Networks Inc., the holder is granted no rights to use the information contained herein.

BLiNQ and BLiNQ Networks Inc. corporate logo are trademarks of BLiNQ Networks Inc. All other trademarks used in this document are the property of their respective owners. The use of the word partner does not imply a partnership relationship between BLiNQ and any other company.

**Disclaimer**

The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Additionally, BLiNQ Networks makes no representations or warranties, either expressed or implied, regarding the contents of this product. BLiNQ Networks shall not be liable for any misuse regarding this product. The information in this document is subject to change without notice.