GM02 Mesh Node 2.0.0

Hardware Installation and Configuration Guide

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Contents

Preface

This preface provides information on the documentation conventions used in this document and information to contact GXC Technical Support.

Conventions

This section describes the documentation conventions used in this document.

Note, Caution, and Warning Conventions

This document uses the following conventions for note, caution, and warning statements.

NOTE: Note statements present important information or references to information not included in this document.

CAUTION: Caution statements present information on situations that could result in damage to equipment or loss of data.

WARNING: Warning statements present information on situations that could cause hazards including bodily injury.

Typeface Conventions

This document uses the following typeface conventions.

Table 1: Typeface Conventions Used in this Document

Convention	Description
`Courier Typeface`	Text displayed on the terminal screen, such as CLI command output, configuration file contents, command names.
`Bold Courier Typeface`	Text that you should enter on the terminal screen, such as CLI commands.
`<Italic Courier Typeface>`	Variables that you should substitute with values, such as in CLI commands and configuration files.
Bold Lato Typeface	GUI element labels including menu options and field names.
Italic Lato Typeface	Document titles, section titles, file names, directory paths.

Contact GXC Technical Support

Contact GXC Technical Support on *support.onyx@gxc.io*.

Document Overview and Safety Information

The following topics provide overall information about this guide and important safety information.

About this Guide

This guide provides the information you need to install and configure a GXC GM02 Mesh Node. It also includes a general description of the unit, guidelines for using it, an overview of its capabilities and operating instructions.

NOTE: Installation of this device should only be performed by a Certified Professional Installer (CPI) in a fixed outdoor environment per limitations set forth in FCC Part 96 CBRS band, as well as guidelines as summarized by the OnGo Alliance.

Safety Information

For the safety of installation personnel and for the protection of the equipment from damage, please read all safety warnings. If you have any questions concerning the warnings, before installing or powering on the equipment contact GXC.

WARNING: Read the installation instructions before connecting the system to its power source.

WARNING: Equipment installation must comply with local and national electrical codes.

WARNING: This product relies on the existing building or structure for short-circuit (overcurrent) protection. Ensure that the protective device is rated no greater than 20A.

WARNING: Do not operate this wireless network device near unshielded blasting caps or in an explosive environment.

WARNING: In order to comply with the United States Federal Communications Commission (FCC) radio frequency (RF) exposure limits, antennas for a GM02 Mesh Node should be located at a minimum of 20 centimeters (7.9 inches) or more from the body of all persons.

Introduction and Features

GXC's GM02 Mesh Node provides wireless backhaul between a GXC Gateway (donor) Node and a GXC Access Point (AP). This is accomplished through self-interference mitigation techniques that allow for access and backhaul carriers to co-exist in CBRS Band 48. A GXC Mesh Node in conjunction with a Mesh AP provides CBRS coverage for UE utilizing wireless backhaul to the Gateway Node.

Combined with the GXC ONYX Platform for orchestration, management, and SAS registration, the Mesh Node offers coverage extension and rapid deployment where wired infrastructure is unavailable.

Figure 1: GM02 Mesh Node

ONYX Platform Features

The Mesh Node is a part of the GXC ONYX Platform that ties together multiple hardware and software elements to bring a full solution to enterprise.

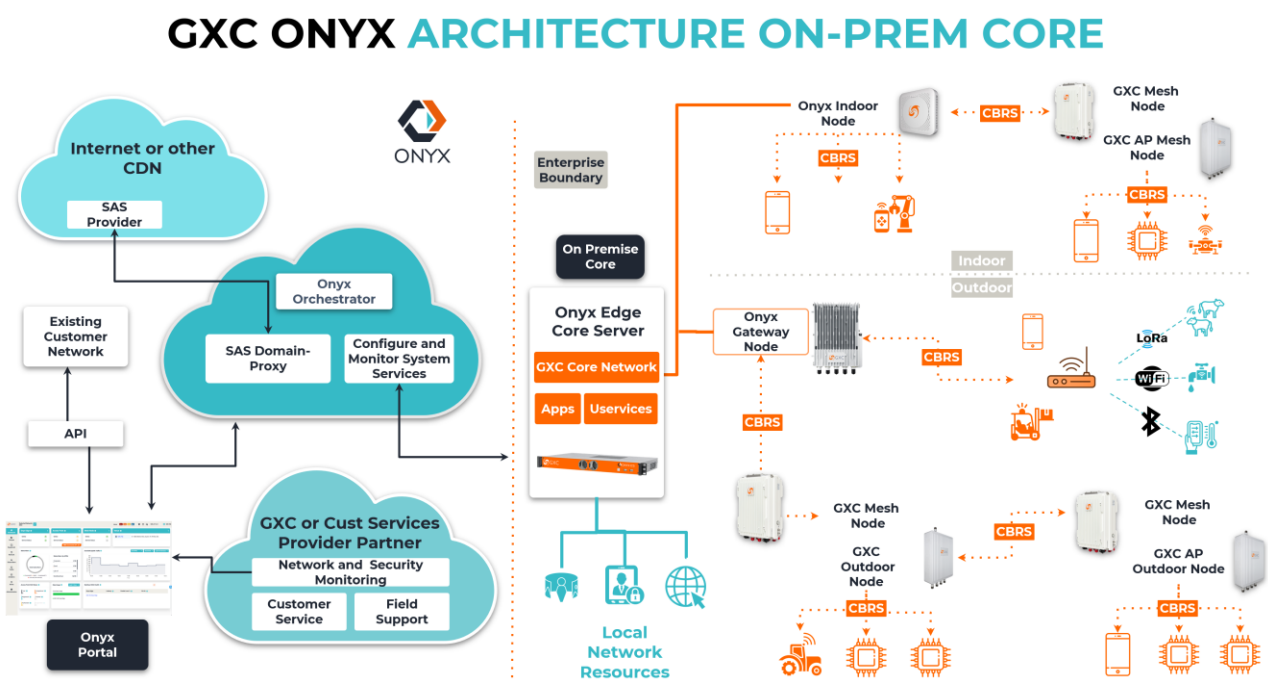
The ONYX Platform provides an enterprise network based on a Cellular Mesh architecture. This private network platform provides high levels of resiliency, flexible deployments, strong coverage in hard-to-reach areas, and a powerful distributed application platform. Mesh nodes are connected via integrated wireless backhaul without the need for fiber or Ethernet cables.

The ONYX Platform features:

- Mesh-based RAN

- Indoor and Outdoor APs
- On-premises core network (available as a hardware appliance, machine image, or edge machine image)
- A robust network management platform tied together with a single pane of glass controller presented as a web-portal

Figure 2: GXC ONYX Platform Architecture



GM02 Mesh Node Features

The GM02 Mesh Node, which operates in the Citizens Broadband Radio Service (CBRS) Band 48, is suitable for private and public deployment and indoor or outdoor applications with an IP66 rated enclosure. It can be wall or pole mounted.

The GM02 Mesh Node's core differentiating technology is its ability to connect APs wirelessly to provide ultra-dense, reliable networks without the need to build upon existing wired infrastructure. It utilizes the same spectrum for backhaul (node-to-node) connectivity, and access (node-to-device) which simplifies radio planning and allows for design portability anywhere in the US.

The GM02 Mesh Node has multiple external antenna options for both access and backhaul allowing for customized deployments – providing coverage where it is most needed. Its low power consumption is suitable for off-grid solar power applications.

The GM02 Mesh Node features GUI-based remote Web management, with local Wi-Fi diagnostic access to simplify installation.

Watchdog Service

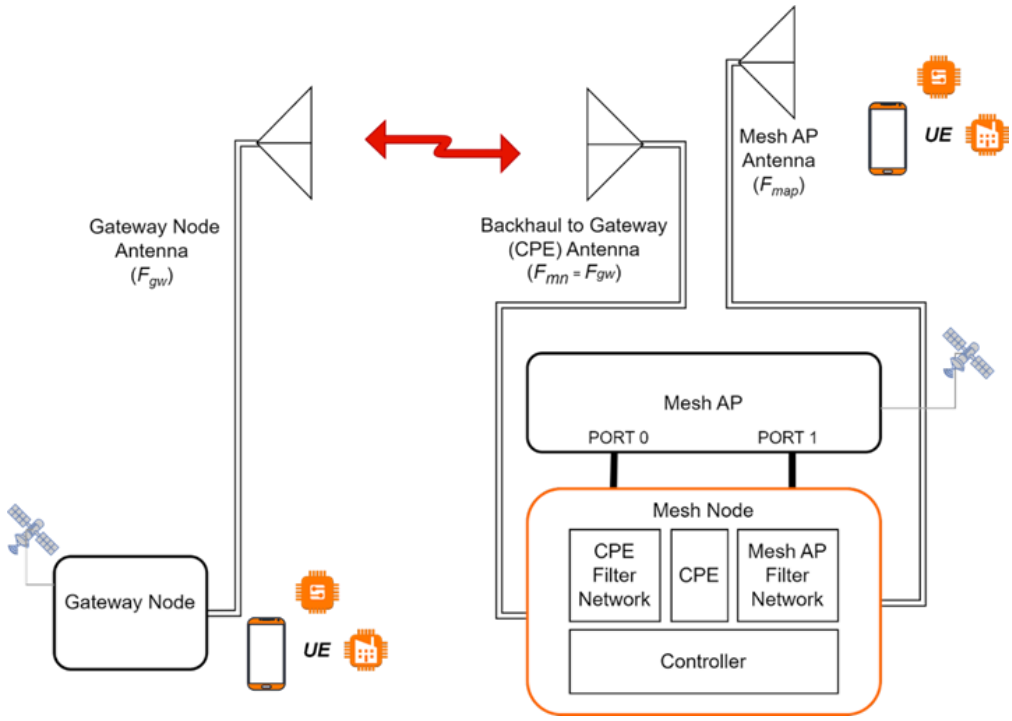
The Watchdog service monitors the Mesh Node's system health. Should critical service failures occur, the Mesh Node undergoes a power cycle, subsequently triggering the ONYX Portal "Watchdog Powercycle" alert, which includes a description of the failure. The Watchdog service ensures the Mesh Node system's reliability and availability.

Installation Preparation

The following topics cover the materials and tools needed to install the GM02 Mesh Node, the operation of the LEDs, the unit's interfaces, and the recommended location and environment required for best performance of the Mesh Node.

It will be required to know the location and beam direction of the Gateway antenna for the Mesh Node CPE antenna. Refer to Figure 3 for the use of antennas required for this installation. For more detailed information refer to the *ONYX Platform Mesh Node Application Note*.

Figure 3 Antennas used for Mesh Node installation



A Mesh Backhaul and Mesh AP antenna will be required for this installation. GXC will have recommended antennas based on your application. It is recommended that these antennas be obtained prior to installation.

NOTE: The Mesh Node is typically mounted on the same pole or wall as the Mesh AP, which can be a high power G501 Outdoor AP or a low power G101 Outdoor AP. Please refer to the *GXC G501 Hardware Installation and Configuration Guide* and *GXC G101 Hardware Installation and Configuration Guide* for detailed installation instructions for those units.

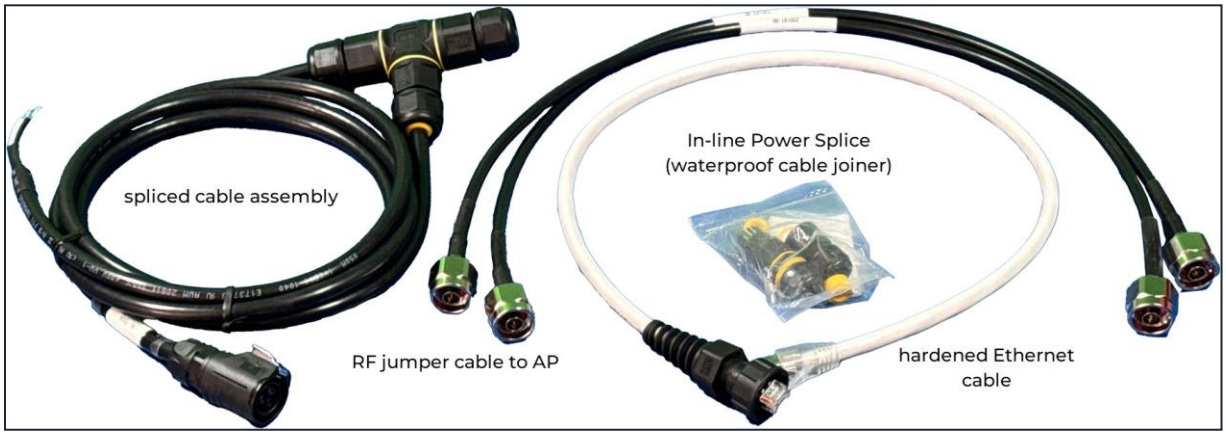
Figure 4: Pole Mounted GM02 Mesh Node & G501 Mesh AP with Antennas

Mesh Node – Accessory Kit

Each GM02 Mesh Node (P/N GXC-MEN-001) includes an Accessory Kit in the shipping box. The Accessory Kit contains the following components:

- Spliced Cable Assembly
- RF jumper cable to AP (x2)
- Weatherproof inline splice/cable joiner
- External Ethernet plug kit

Figure 5: Accessory Kit Components



Mesh Node – Mounting Kit

The Mounting Kit Components shown in the Figure 6 drawing and described in Table 2 are intended to provide identification of the mounting hardware included with the GXC Mesh Node. Verify that the parts illustrated in the drawing and described in the table are included with the Mesh Node Mounting Kit. The Mounting Kit is included by default with the GM02.

Figure 6: Mesh Node Mounting Kit Components

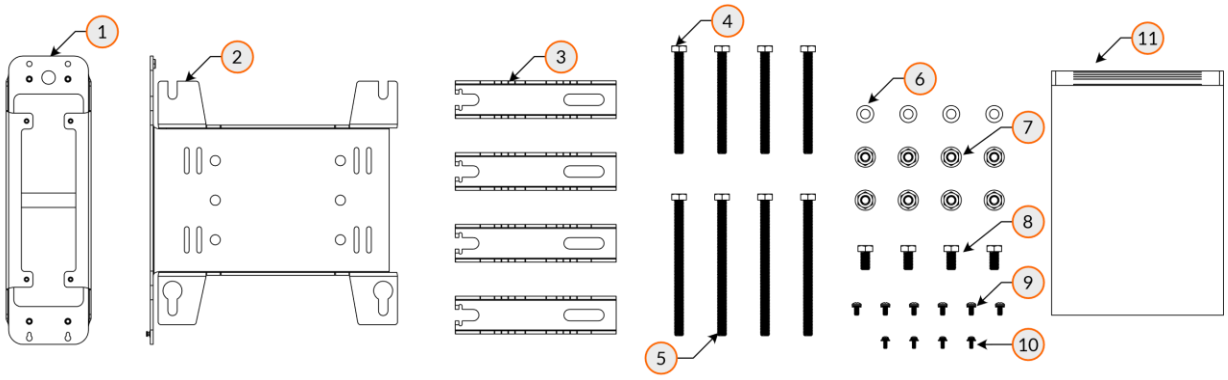


Table 2: Mesh Node Mounting Kit Components

Item	QTY	Part No	Description
1	1	230001-00	Mesh Node PSU/Surge Suppressor Mounting Bracket
2	1	210048-00	Mesh Node Mounting Bracket
3	4	220035-00	Mesh Node Pole Mount Clamps
4	4	230040-00	90mm Long M8-1,25 Stainless Steel Hex Bolts

5	4	230105-00	120mm Long M8-1,25 Stainless Steel Hex Bolts
6	4	220036-00	M8 Stainless Steel Flat Washers
7	8	220038-00	M8-1,25 Stainless Steel Hex Flange Nuts
8	4	220056-00	16mm Long M8-1,25 Stainless Steel Hex Bolts
9	6	210040-00	8mm Long M4-0,7 Pan Head Stainless Steel External Star Sems Screws
10	4	230002-00	8mm Long M3-0,5 Stainless Steel Square-Cone Sems Screws
11	1	N/A	All fasteners and an installation drawing are provided in a reclosable bag

Installation Preparation – LEDs and Interfaces

Figure 7: GM02 LEDs and Table 3: GM02 LEDs describe the Mesh Node's LED status indicators. Figure 8: GM02 Interface Connectors and Table 4: GM02 Interfaces describe the GM02's interfaces.

Figure 7: GM02 LEDs

Table 3: GM02 LEDs

LED	Color	Status	Description
PWR	Green	On	Power is on
		Off	No power
WiFi	Green	On	Wi-Fi Service is running
		Off	Wi-Fi Service is not running
LINK	Green	On	Backhaul is connected
		Off	Backhaul is not connected

Figure 8: GM02 Interface Connectors

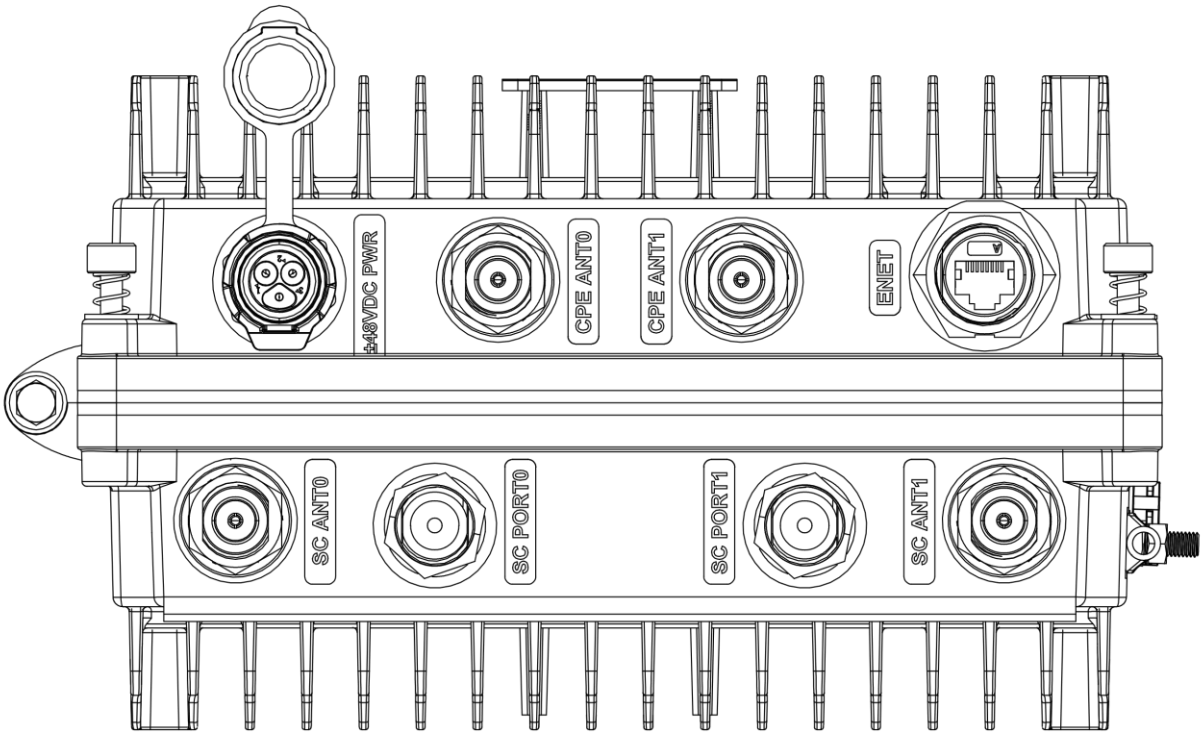


Table 4: GM02 Interfaces

Interface	Connector	Cable Type	Connects to
±48VDC PWR	Female 3-Pin IP67 Latch/Lock Connector	3-Conductor 16 AWG	48VDC Power Supply via Waterproof Cable Joiner
CPE ANT0	Type-N Female	Type-N RF Patch Cable	Backhaul Antenna Input 0
CPE ANT1	Type-N Female	Type-N RF Patch Cable	Backhaul Antenna Input 1
ENET	RJ45	CAT6, 6A, 7 or higher	Access Point ETH Interface

SC ANT0	Type-N Female	Type-N RF Patch Cable	External Cellular Antenna Input 0
SC PORT0	Type-N Female	Type-N RF Patch Cable	Access Point ANT0
SC PORT1	Type-N Female	Type-N RF Patch Cable	Access Point ANT1
SC ANT1	Type-N Female	Type-N RF Patch Cable	External Cellular Antenna Input 1

Installation Preparation – Location and Environment

The GM02 Mesh Node can be installed on a pole or a wall. Because the Mesh Node is always co-located with a G501 or G101 AP, the requirements are the same as for the APs. For the best signal coverage, place the unit in an unobstructed location. In addition to network planning, when determining where to place the GM02 Mesh Node, you need to consider the best location for signal coverage. Avoid locating the Mesh AP and Mesh Node in areas where there may be extreme temperatures, harmful gases, unstable voltages, volatile vibrations, flames, explosives, or electromagnetic interference (e.g., large radar stations, transformer substations). Avoid areas prone to impounded water, soaking, leakage, or condensation. The GM02 environmental specifications are shown in Table 5.

Table 5: Environmental Specifications

Item	Description
Operating Temperature	-40°C to +55°C, -40°F to +131°F
Storage Temperature	-45°C to +70°C, -49°F to +158°F
Relative Humidity	5% to 95% RH
Atmospheric Pressure	70 to 106 kPa

NOTE: Please see the *GXC GM02 Mesh Node Spec Sheet* for current detailed specifications.

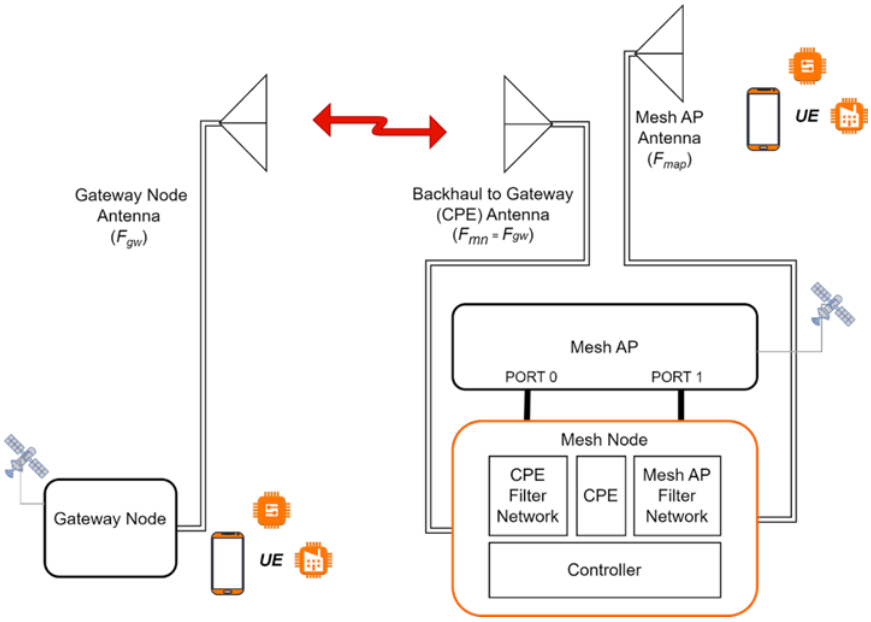
Mesh Filters and Channel Frequency Assignments

The Gateway AP and Mesh AP channel frequencies have a specific relationship that must be considered when making frequency assignments in the ONYX Portal.

Overview of Mesh Node Architecture

A Mesh Node uses a filter network to isolate the Mesh AP's TX/RX frequency from the Mesh Node backhaul TX/RX frequency.

Figure 9: Mesh Node to Gateway Frequency Planning



In **Error! Reference source not found.**, the ONYX Gateway Node (AP) frequency is referred t o as F_{gw}, and the Mesh Node backhaul frequency is referred to as F_{mn}. The Mesh Node backhaul frequency operates at the same frequency as the Gateway Node, so in all cases, $F_{mn} = F_{gw}$. To provide subscriber access, the Mesh Node is directly cabled to an outdoor AP (referred to as the Mesh AP). The Mesh AP is configured to transmit on a different frequency (F_{map}) than the Mesh Node backhaul frequency (F_{mn}).

During the configuration of the SAS parameters in the ONYX Portal, the operator will configure the Gateway AP and Mesh AP for a series of **Preferred Frequencies** (from most to least).

NOTE: When you request channels on the SAS, you should set **Strict Preference** to **TRUE** to ensure that the system does not accept a grant outside of the chosen preferences. The SAS currently supports 10 and 20 MHz bandwidth channels only. This should be considered when choosing the Preferred Frequencies.

The operator should take into consideration the desired bandwidth of 10 or 20 MHz to avoid selecting a frequency that will fall out of the "low or high" pass band ranges shown in Table 6: Backhaul to Mesh Node-AP Frequency Assignments. This process allows for SAS grant flexibility, as channel assignments can change.

NOTE: **Error! Reference source not found.** example lists the Backhaul (Blue) and Mesh AP (Yellow) 10 MHz and 20 MHz channels that could be used when configuring the Gateway and Mesh AP frequencies. When the Backhaul falls into the "Low Band" the Mesh AP should be configured to transmit in the "High Band" and vice versa.

Table 6: Backhaul to Mesh Node-AP Frequency Assignments

		LOW BAND								HIGH BAND							
Backhaul 10MHz Channel Bandwidth	Start	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	Stop
		3550-3560	3560-3570	3570-3580	3580-3590	3590-3600	3600-3610	3610-3620	3620-3630	3630-3640	3640-3650	3650-3660	3660-3670	3670-3680	3680-3690	3690-3700	
Non-Overlapping Center Frequency Channels (MHz)	3550	3555	3565	3575	3585	3595	3605	3615	3625	3635	3645	3655	3665	3675	3685	3695	3700
Mesh AP 10MHz Channel Bandwidth		10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz	
		3550-3560	3560-3570	3570-3580	3580-3590	3590-3600	3600-3610	Not Available 3610-3640			3640-3650	3650-3660	3660-3670	3670-3680	3680-3690	3690-3700	
Non-Overlapping Center Frequency Channels (MHz)		3555	3565	3575	3585	3595	3605				3645*	3655	3665	3675	3685	3695	

*3640-3650 is not available with a backhaul center frequency of 3625 MHz

		LOW BAND				HIGH BAND				
Backhaul 20MHz Channel Bandwidth	Start	20MHz	20MHz	20MHz	20MHz	20MHz	20MHz	20MHz	10MHz	Stop
		3550-3570	3570-3590	3590-3610	3610-3630	3630-3650	3650-3670	3670-3690	3690-3700	
Non-Overlapping Center Frequency Channels (MHz)	3550	3560	3580	3600	3620	3640	3660	3680		3700
Mesh AP 20MHz Channel Bandwidth		20MHz	20MHz	20MHz	10MHz	10MHz	10MHz	20 MHz	20 MHz	20 MHz
		3550-3570	3570-3590	3590-3610	Not Available 3610-3640			3640-3660	3660-3680	3680-3700
Non-Overlapping Center Frequency Channels (MHz)		3560	3580	3600				3650*	3670	3690

*3640-3650 is not available with a backhaul center frequency of 3620 MHz

NOTE: The Frequency Planning Example is a sample frequency plan. The ONYX Portal allows the selection of other center channels based on the selected bandwidth.

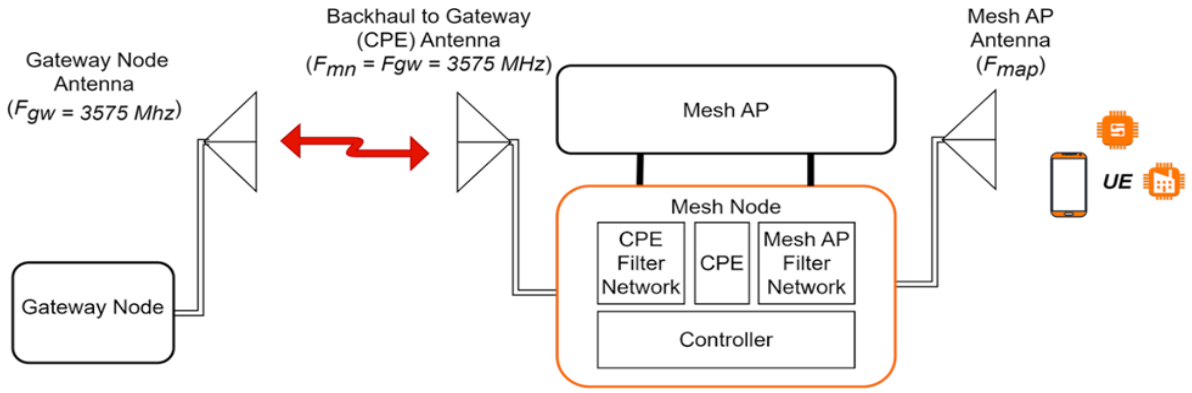
NOTE: When the Gateway AP is configured for Carrier Aggregation (CA), the Preferred Frequencies chosen for both the primary (PCell) and secondary (SCell) cells must fall within the same CPE backhaul filter range (high or low).

Frequency Planning Example

The following example in Figure 10: Mesh Node Frequency Planning Example illustrates the Mesh Node frequency selection concepts for one Mesh Node.

NOTE: Antenna Isolation between the Mesh Node and Mesh AP antennas must be ≥ 50 dB. The Mesh AP should expand coverage radially away from the Gateway AP.

Figure 10: Mesh Node Frequency Planning Example



Given information for Gateway Node in the example in Figure 10:

- Operating BW = 20 MHz
- F_{gw} = 3575 MHz

1. The frequency passband for the Mesh Node can be determined; see the list of frequencies that could be used for the Mesh AP in Table 6: Backhaul to Mesh Node-AP Frequency Assignments**Error! Reference source not found.**.
2. The frequencies that could be used for the Mesh AP if the bandwidth of the channels is changed to BW = 10 MHz can also be determined; see the list of 10 MHz channels in column 3 of Table 6.

In this example, *Fmn = Fgw = 3575 MHz*. Since the Gateway AP is operating with a BW=20 MHz, you can refer to Table 6and see that the Mesh Node backhaul will operate in the filter "low pass band" range of 3570-3590 MHz and the Mesh Node will operate in the "high pass band" of 3640 to 3700 MHz. The operator should then select "**Preferred Frequencies**" for the Mesh AP in the "high pass band".

NOTE: When you request channels on the SAS, you should set **Strict Preference** to **TRUE** to ensure that the system does not accept a grant outside of the chosen preferences.

Examples of frequencies that could be selected in the ONYX Portal for the Mesh AP are summarized in Table 7.

Table 7: Preferred Frequencies Example Solution

Fgw = Fmn (MHz) (Backhaul Frequency, Low Band)	Fmap (MHz) 20 MHz (Mesh AP Center Channels, High Band)	Fmap (MHz) 10 MHz (Mesh AP Center Channels, High Band)	
3575	3650	3645	3675
	3670	3655	3685
	3690	3665	3695

Remember that this example looks at a single Mesh Node example. When more Mesh Nodes and APs are added, RF planning to avoid overlapping channels and SAS considerations will play an important role in frequency planning.

Installation

The following topics include reference instructions for wall and pole mounting to various substrates, and instructions for cabling the unit. The following drawings, images, and instructions only provide typical reference installations and best practices. Adequacy of the final installation and mounting configuration is at the installer's discretion and responsibility.

Unbox the Mesh Node

1. Unbox the GM02 Mesh Node. After opening the packaged unit, the Accessory Kit is enclosed in a smaller box within the foam padding at the top of the enclosed unit.

Figure 11: Unboxing – Accessory and Mounting Bracket boxes

2. Remove the Accessory Kit and Mounting Bracket boxes.
3. The Mesh Node unit is on the bottom layer of the box.

Figure 12: Unboxing – GM02 Mesh Node

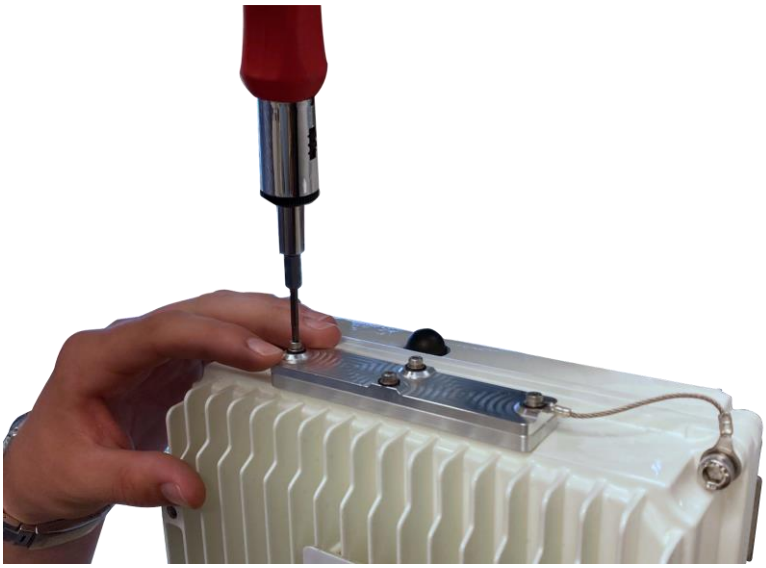
Insert SIM Card(s)

The GM02 Mesh Node supports up to two SIM cards to access network services. The SIM card slots are located on the top of the Mesh Node.

NOTE: The GM02 is typically shipped with one SIM Card preinstalled.

1. To gain access to the GM02's SIM Card slots, begin by fully loosening each of the four M3 Captive Screws in the top access cover using a 2.5mm Allen Driver.

Figure 13: SIM Card Slot Cover Removal



2. Once each of the captive screws has been fully loosened, set the cover to the side of the unit.

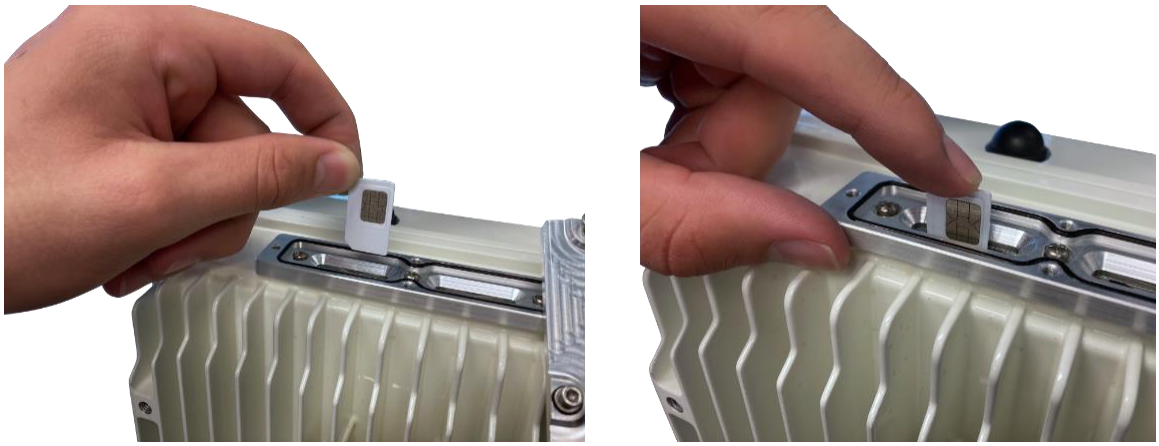
Figure 14: SIM Card Slot Cover Removed

3. Note the labels that identify the SIM 1 slot and the SIM 2 slot on the top of the Mesh Node.

Figure 15: SIM Card Slot Labels

4. Insert standard size SIM Card into SIM Socket 1 in the orientation shown with its contacts facing the front of the unit and the trimmed corner (notch) oriented in the lower-left corner, as shown below. Ensure that card is inserted straight into socket. If significant resistance is felt, remove the SIM card, realign, and insert it into the socket again.

Figure 16: SIM Card Insertion



5. Once the SIM Card is inserted into the SIM Socket, apply straight downward pressure to the card until an audible “click” is heard indicating full insertion of the card.
6. When fully inserted approximately 1/8 inch of the SIM Card will be exposed from the top of the SIM Socket, as shown below.

Figure 17: Fully Inserted SIM Card

7. Replace cover and tighten the four M3 Captive Screws. Torque the M3 Captive Screws to 4 in-lbs. +/- 10% (0.45 N-m +/- 10%). Do not over torque screws.

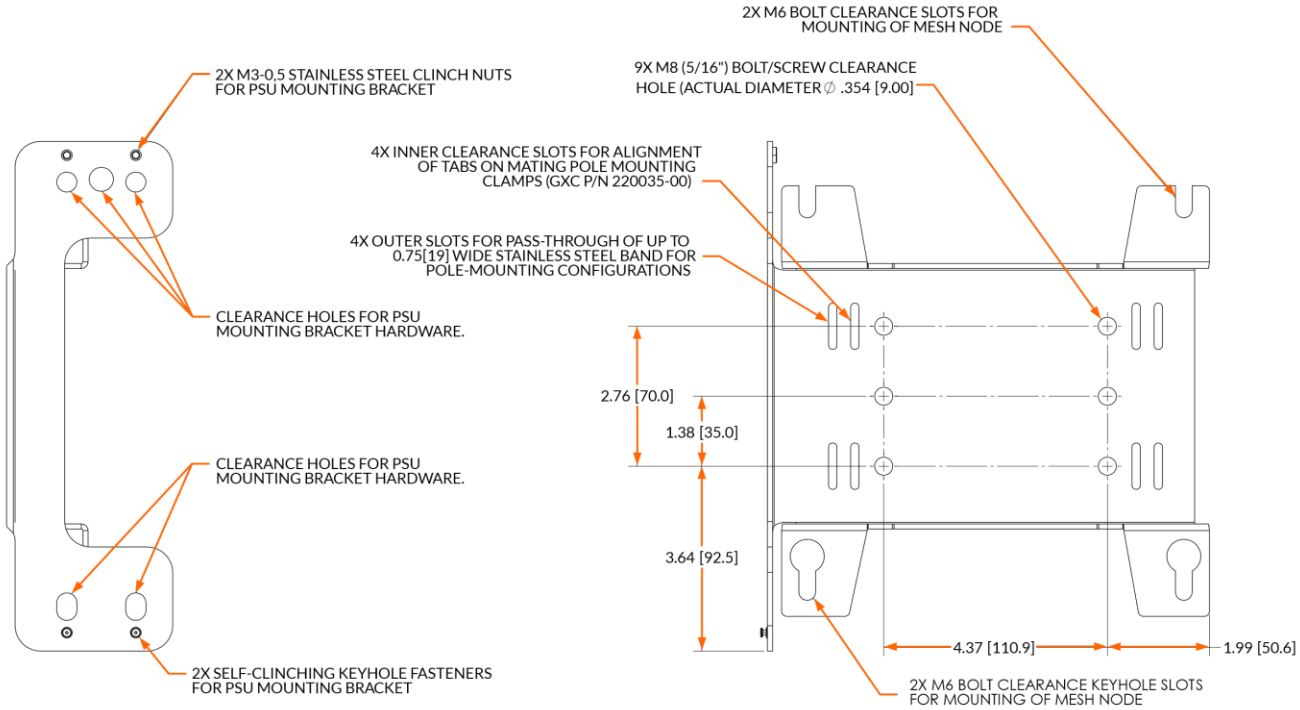
Mount GM02 Mesh Node on Pole or Mast

The following topics describe how to mount the GM02 Mesh Node on a pole or mast. The Mesh Node can be mounted in dual mount configuration with a G501 Outdoor AP sharing the mount or it can be mounted in a stand-alone configuration. The mounting bracket assembly kit supports both dual mounting and stand-alone mounting configurations.

Mounting Bracket Dimensions

The drawing in Figure 18 displays the features and dimensions of the Mesh Node Mounting Bracket (GXC P/N 210048-00), which is used in various mounting configurations. Dimensions are shown in the following format: “Inches [Millimeters]”.

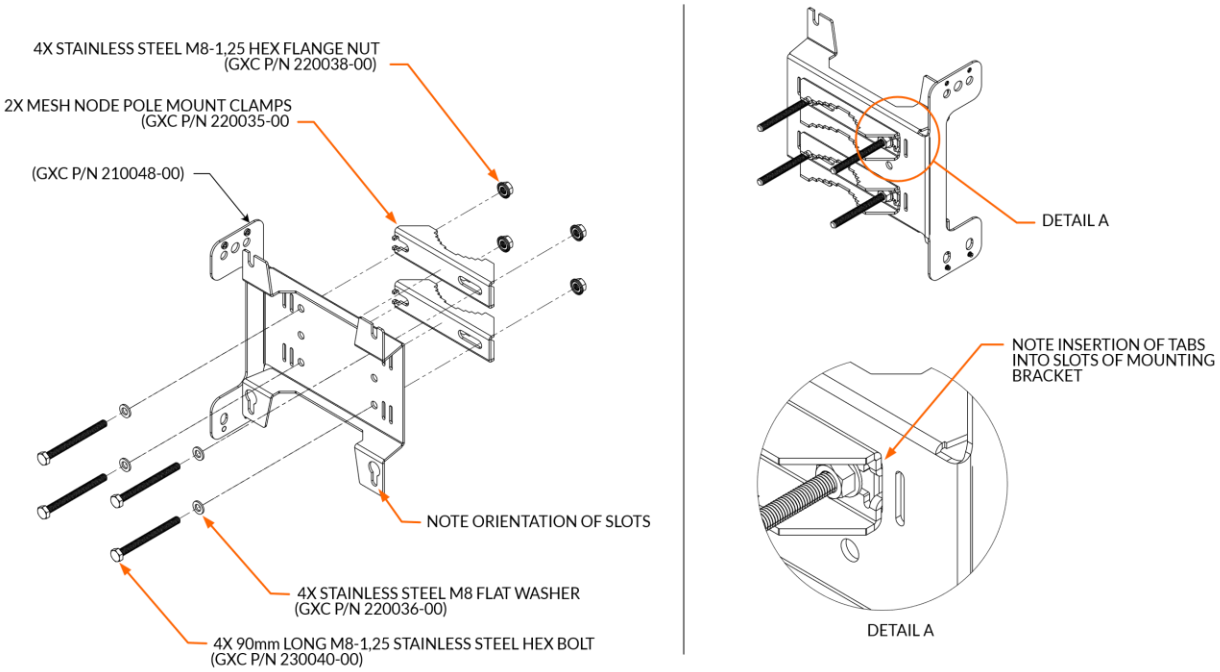
Figure 18: Features and Dimensions of Mounting Bracket Assembly



Mounting Bracket Preassembly

The following preassembly instructions apply to the pole mounting options. Preassembly is not needed when wall mounting the Mesh Node.

Figure 19: Mounting Bracket Preassembly



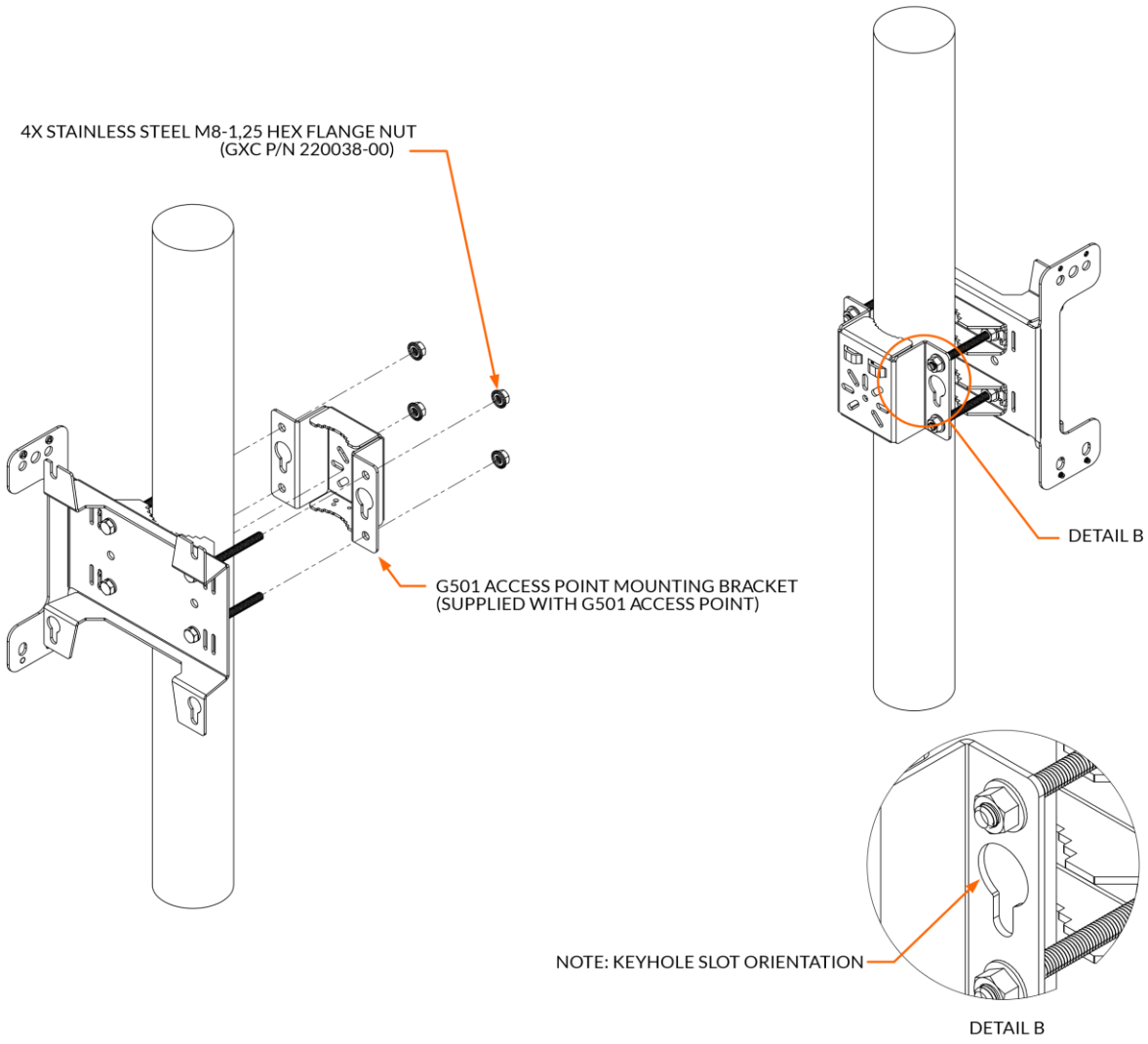
1. Install a stainless steel M8 flat washer over each of the four 90mm long M8 hex bolts.
2. Insert the M8 hex bolts with washers through the clearance holes in the mounting bracket as shown.
3. Install two mounting clamps over the M8 hex bolts as shown, so that the alignment tabs of the clamps insert into the inner slots (adjacent to the clearance holes) in the mounting bracket.
4. Install M8-1,25 hex flange nuts onto each of the M8 hex bolts and tighten them over the mounting clamps; see Detail A.
5. Torque the four M8 nuts to a minimum of 15 ft-lbs. (20 N-m) +/- 10% while supporting the head of the M8 bolt with a wrench.

Assembly for Combined Mesh Node and AP Pole Mounting

The GXC preferred assembly configuration for combined Mesh Node and Mesh AP mounting to a pole with a diameter of 1.5 to 3 inches [38 to 76mm) is described in the following topics.

Combined Mesh Node and AP Bracket Assembly to Pole

Figure 20: Combined Mounting Brackets Assembly on Pole



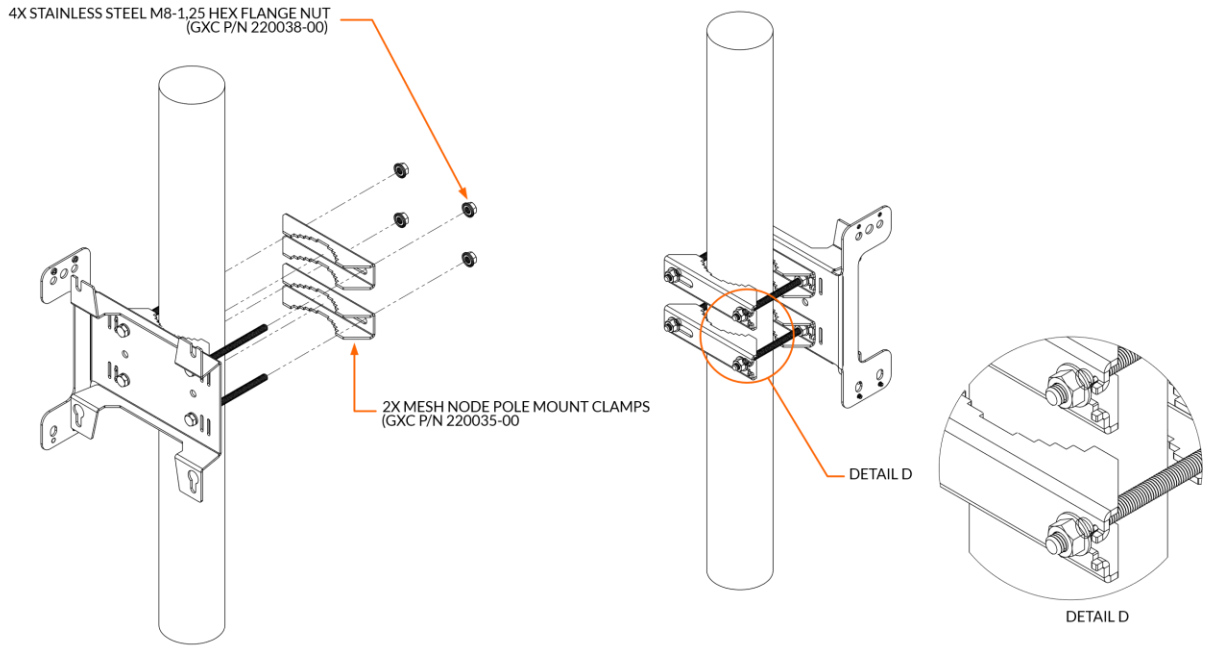
1. Place the previously assembled Mesh Node mounting bracket over the mounting pole or mast at the desired height.
2. While supporting the Mesh Node mounting bracket, install the G501 AP mounting bracket over the 90mm long M8 hex bolts as shown in Figure 20.
3. Install M8-1,25 hex flange nuts onto each of the 90mm M8 hex bolts and tighten to the G501 AP mounting bracket.
4. Torque the four M8 nuts to a minimum of 6 ft-lbs. (8 N-m) using a wrench.

Assembly for Stand-Alone Mesh Node Pole Mounting

The GXC preferred assembly configuration for mounting a Stand-Alone Mesh Node to a pole with a diameter of 1.5 to 3 inches [38 to 76mm) is described in the following topics.

Assembly for Stand-Alone Mounting Bracket to Pole

Figure 21: Stand-Alone Mounting Bracket Assembly



1. Place the previously assembled Mesh Node mounting bracket over the mounting pole or mast at the desired height.
2. While supporting the Mesh Node mounting bracket, install two Mesh Node pole mounting clamps over the 120mm long M8 hex bolts as shown in Figure 21.
3. Install M8-1,25 hex flange nuts onto each of the 120mm M8 hex bolts and tighten to the Mesh Node mounting clamps; See Detail D.
4. Torque the four M8 nuts to a minimum of 6 ft-lbs. (8 N-m).

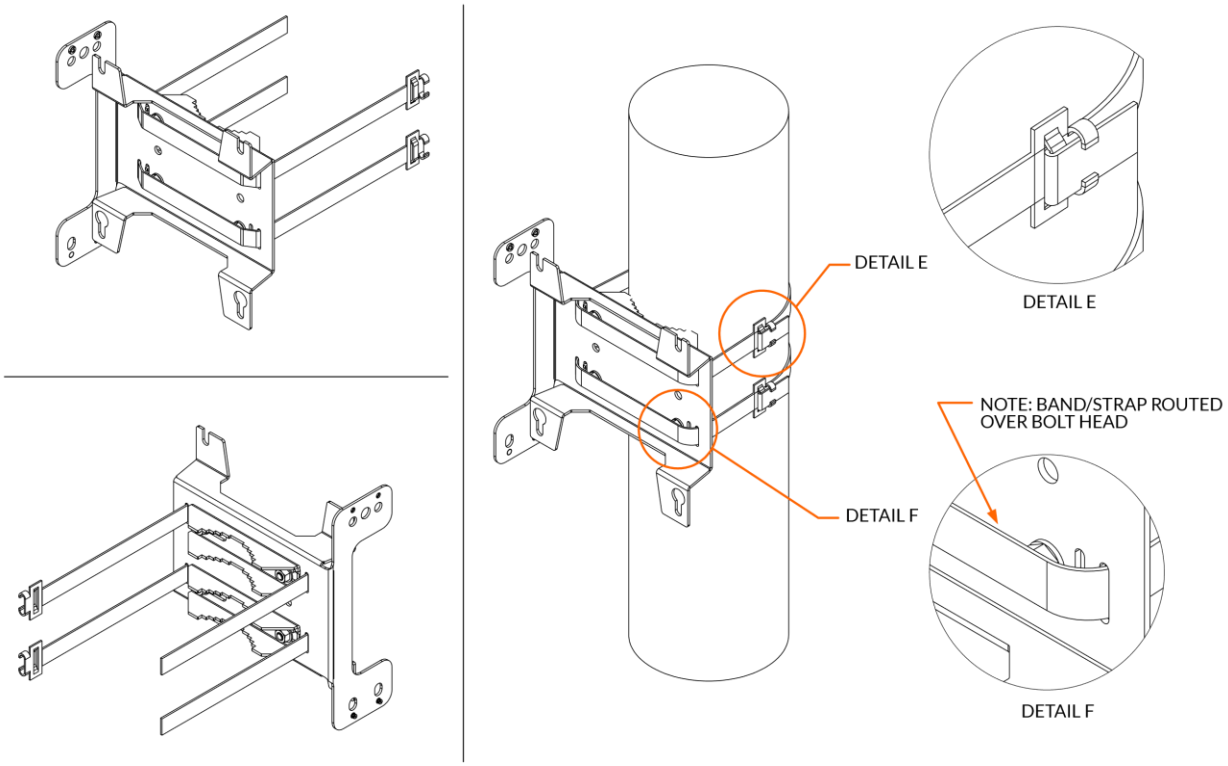
Assembly for Stand-Alone Mesh Node Pole Mounting > 3 inches

The GXC preferred assembly configuration for mounting a Mesh Node to a pole with a diameter greater than 3 inches [75mm) is described in the following topics.

Assembly for Stand-Alone Mounting Bracket to Pole > 3 Inches

NOTE: The strapping system detailed is for reference only! The hardware is NOT included with the mounting kit. The specific strapping system used is the installer's option. It is suggested that the strapping system chosen should be corrosion resistant (e.g., stainless steel) and have a break strength of no less than 600 lbs. (272 kg) in total.

Figure 22: Stand-Alone Mounting Bracket Assembly > 3 Inches

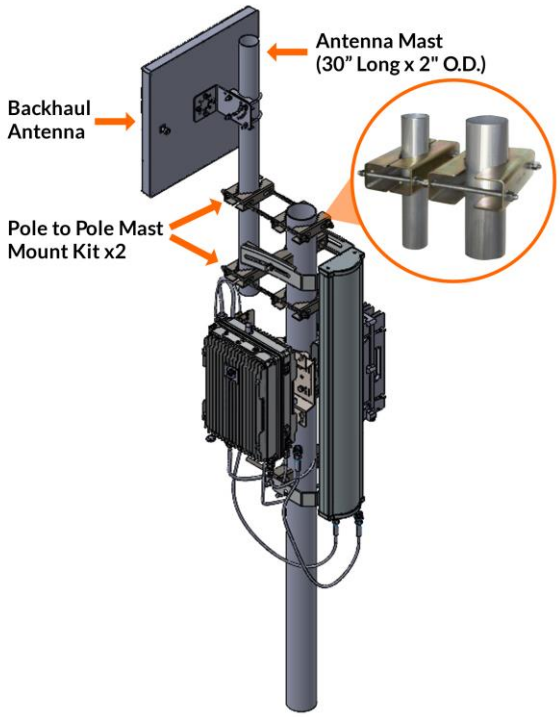
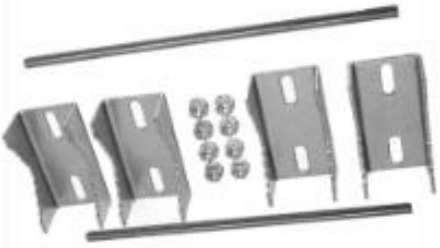


1. Install stainless steel system through the outside slots of the previously assembled mounting bracket and over the bolt heads as shown in Figure 22.

NOTE: The strapping system shown in the drawing has a preassembled buckle. Strapping must be selected or cut to a length that will go around the pole and allow the tag end to reach the buckle or anchor for assembly.

2. Place the bracket assembly against the pole or strut and assemble the strap to the buckle or anchor and tighten using appropriate tools to manufacturer's specifications and secure the tag end of the strap.

Backhaul Antenna Mast (Optional)

In some Mesh Node installations, mounting the backhaul antenna on a separate sub-pole (antenna mast) may facilitate pointing the antenna while providing more space for the other components on the primary mounting pole. Although GXC does not sell a mounting kit for this purpose, the pole-to-pole mast mount kits and antenna masts are available from online retailers. The web links for these products shown below were active at the time that this guide was published. Similar products may be available from other manufacturers.	
3S-HD-PTP-6 Heavy Duty HDG Pole to Pole Mast Mount 1.25" to 4.25" OD (Two required). Each 3S-HD-PTP-6 kit includes (4) HD Alligator Clamps, (2) 12" threaded rods, (8) FLG Nuts. *3starinc.com*	
SKY32817C Galvanized Antenna/Dish Mast (30" Long x 2" O.D) *Skywalker.com*	

Mount GM02 Mesh Node on Wall

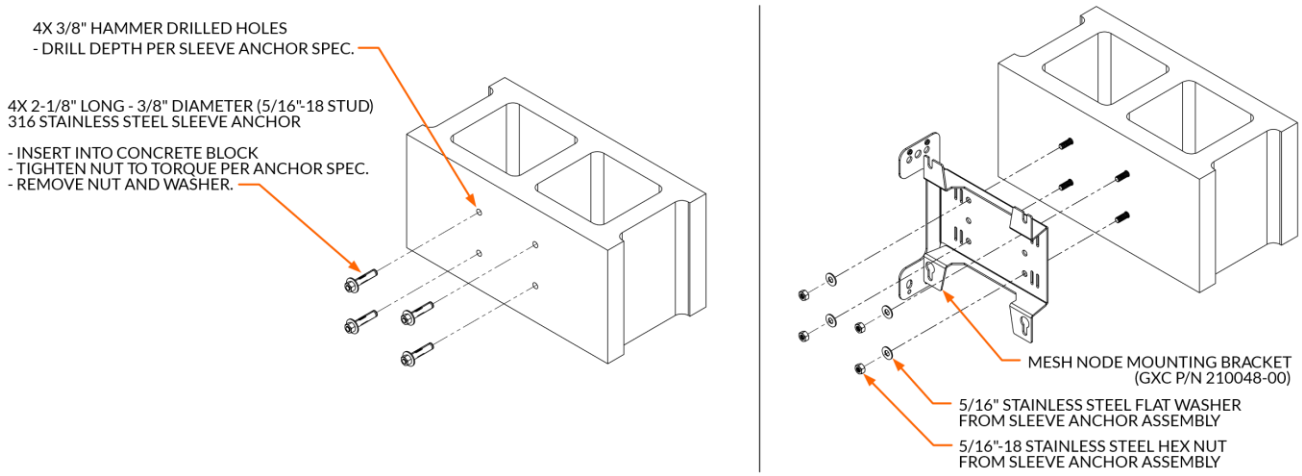
The following topics describe how to mount the GM02 Mesh Node on a wall. The following topics cover mounting the GM02 Bracket to concrete block, solid concrete, and wood/steel framed structural walls.

Assembly for Mounting Mesh Node to Block or Solid Concrete Walls

The GXC assembly configuration for mounting a Mesh Node to a concrete block wall or a solid concrete wall is described in the following topics.

NOTE: When installing the Mesh Node to a concrete wall made of either concrete block or solid concrete, use of a hammer drill with a carbide tip is recommended. Care must be taken to drill and install the necessary fasteners. Concrete blocks are generally hollow and brittle. Both concrete block and concrete can be inconsistent in quality. Holding values depend on the quality of the block and concrete and the mortar placed in the joints between the blocks. Do not install into spalled, cracked, or otherwise questionable quality concrete or concrete block.

Figure 23: Example Assembly for Mounting to Concrete Block



1. Obtain corrosion resistant stainless steel sleeve anchors for mounting the Mesh Node bracket. The fastener (stud/screw) must not exceed 5/16” (8mm). The hardware is not included with the mounting kit.

NOTE: Installer must utilize corrosion resistant stainless-steel hardware. 316 stainless steel is strongly recommended. The hardware is not included with the product.

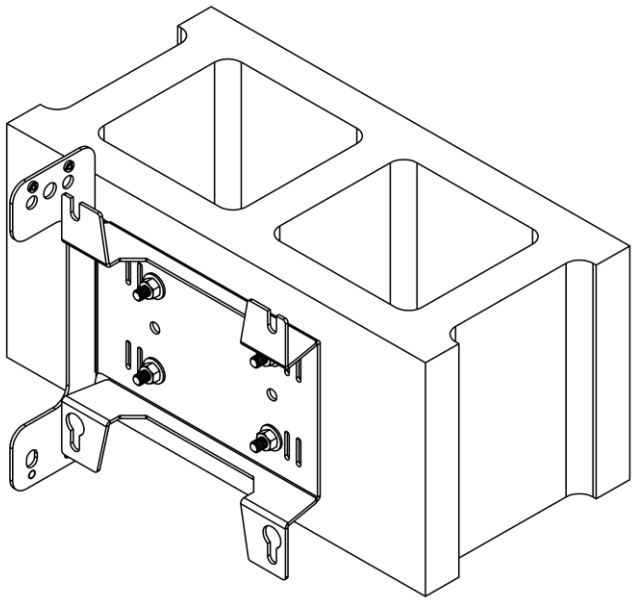
2. Use the mounting hole dimensions shown in Figure 18 to locate and mark the holes for drilling on the selected wall.
3. Using a drill bit with a diameter specified by the fastener or the fastener manufacturer drill four holes in the concrete block using the markings completed in the previous step. Drill to a depth specified by the sleeve anchor fastener specification.
4. Insert the stainless-steel sleeve anchors into the concrete block.

NOTE: Drill bit diameter, drilled hole depth, and fastener installation torque shall be specified by fastener or fastener system manufacturer.

NOTE: Fasteners to provide a minimum pull-out and shear strength of 350 lbs. (158 kg) in total.

5. Tighten the nut for each anchor to the torque specified by the manufacturer.
6. Remove the nut and washer from each sleeve fastener.
7. Place the Mesh Node mounting bracket over the fasteners as shown in Figure 23.
8. Install the fastener washers and nuts and tighten to the fastener manufacturer's specifications.

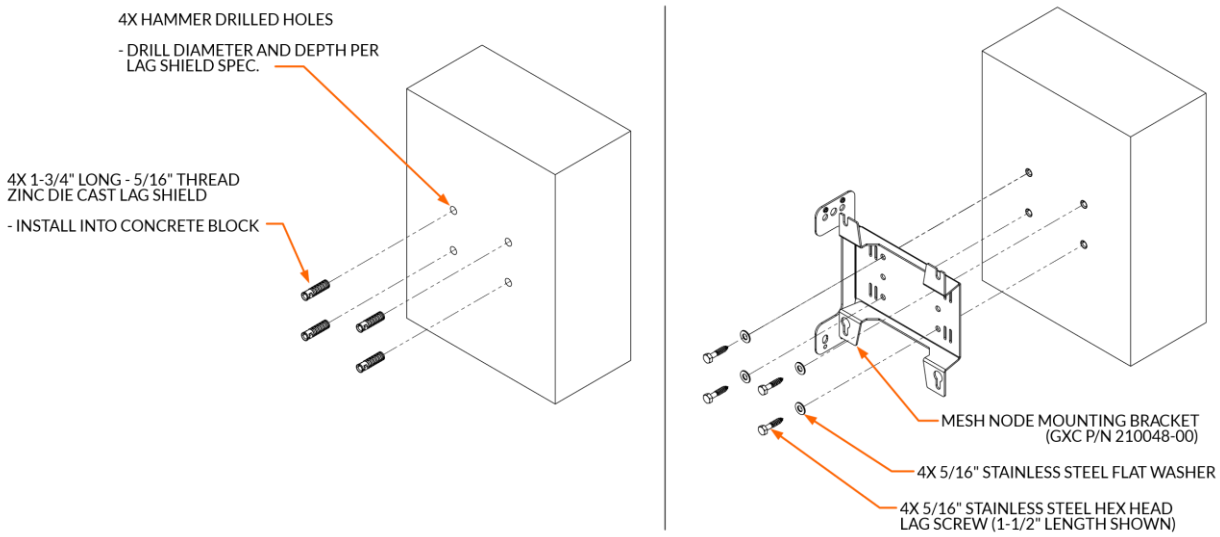
Figure 24: Completed Bracket to Concrete Block Assembly Example



9. Refer to the instructions in the Assembly for Mounting Mesh Node to Block or Solid Concrete Walls instructions for general installation details.

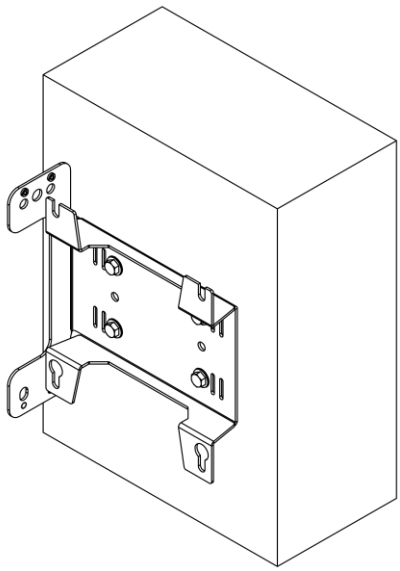
   Figure 25 depicts an example installation into a solid concrete wall using 1-1/2-inch long, 5/16-inch thread corrosion-resistant flat washers fastened into 5/16-inch screw size, 1-3/4" long die cast zinc Lag Shields installed into a concrete wall. The hardware is not included with the product.

Figure 25: Example Installation into a Solid Concrete Wall



10. Torque the hex head lag screws per the Lag Shield specification for concrete substrate.

Figure 26: Completed Bracket to Concrete Wall Assembly Example



Assembly for Mounting Mesh Node to Wood/Steel Framed Walls

The GXC assembly configuration for mounting a Mesh Node to a wood or steel framed wall is described in the following topics.

NOTE: When installing a Mesh Node to a wood or steel framed structural wall, the mounting bracket must either be mounted directly to internal studs with spacing matching the width of the bracket's mounting hole pattern (4.37") or a structural brace shall be utilized made from no less than 2"x 6" nominal lumber spanning no less than two studs.

NOTE: Do not install braces or the mounting bracket to rotting or otherwise compromised framework or sheathing material.

NOTE: If the installation is to be made in an outdoor location and a structural brace will be utilized, the brace shall be made of pressure-treated nominal lumber (ACQ/CCA) or other weather-resistant material capable of supporting no less than 350 lbs. (158 kg) vertical force.

NOTE: Installer shall utilize common building practices to locate the internal studs ensuring that the fasteners used to secure the mounting bracket or structural brace are roughly centered on the internal framework of the wall and use common weather-proofing construction methods.

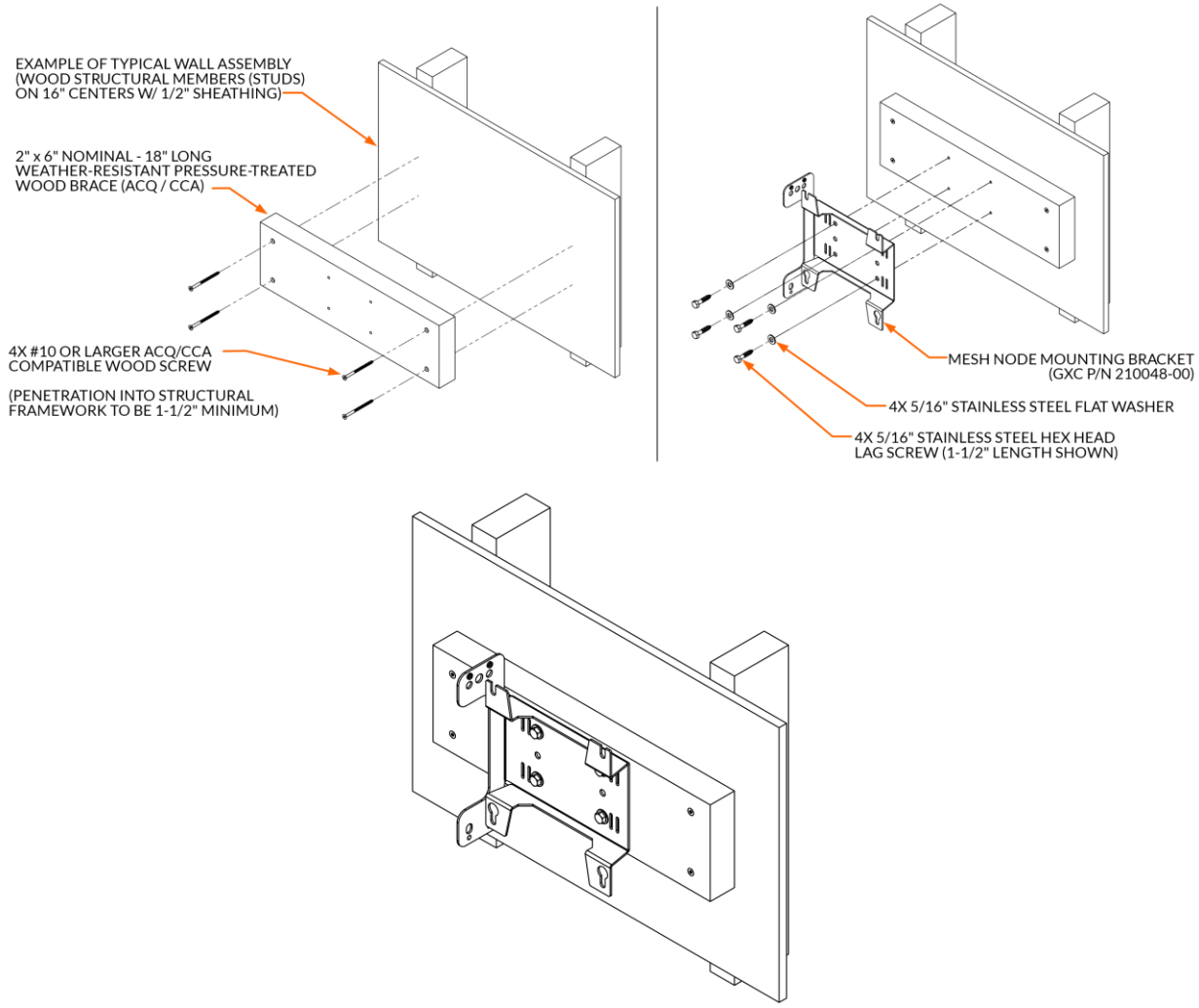
NOTE: If a structural brace is to be utilized, the screws used for mounting the brace to the wall shall use a material and/or finish that protects the fastener from corrosion caused by chemicals utilized in the pressure treatment or manufacture of the brace material.

NOTE: The length of the fasteners used to secure either the structural brace or the mounting bracket to the wall shall be chosen such that penetration into the structural framework (studs) is no less than 1-1/2" (38mm).

1. To mount the Mesh Node mounting bracket, use the mounting holes dimensions shown in Figure 18.
2. Drill the four holes using the drill bit diameter specified by the fastener or the fastener system manufacturer. The fastener must not exceed 5/16" (8mm) diameter.
3. Place the mounting bracket on the wall.
4. Insert the fasteners through flat washers and tighten the fasteners using the torque values specified by the fastener or fastener system manufacturer.

Figure 27 depicts an example installation of the mounting bracket mounted to a wood framed wall using #10 ACG/CCA compatible wood screws and 5/16” lag screws.

Figure 27: Example Installation Wood Framed Wall



Mesh Node to Bracket Mounting

Once the Mesh Node bracket is mounted to a pole or wall, the Mesh Node can be attached to the bracket using its flange bolts.

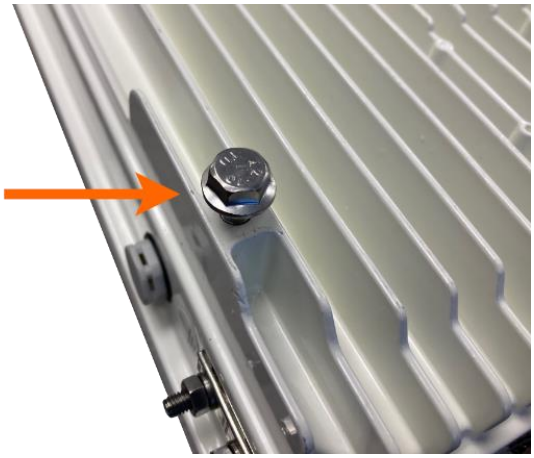
Loosen Flange Bolts

1. Place the Mesh Node face down and confirm that the four M6-1.0 12mm long flange bolts are installed in the back of the unit.

Figure 28: GM02 Flange Bolts

2. Loosen each of the M6 flange bolts to make sure that at least 3/16” (4mm) of gap exists between the casting of the Mesh Node unit and the underside of the washer of the M6 Flange Bolts.

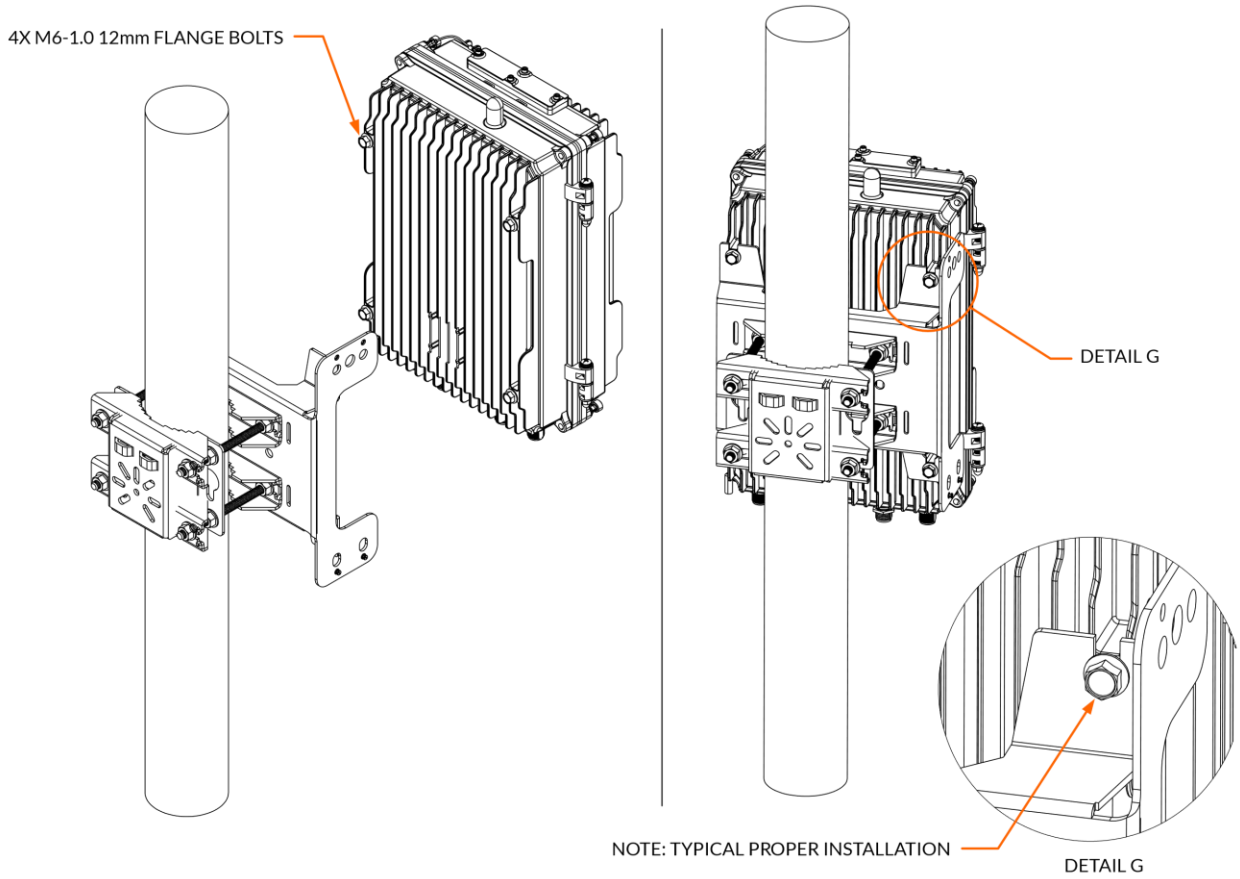
Figure 29: M6 Flange Bolt Gap



Mount Mesh Node on Bracket

1. While supporting the Mesh Node, align the flange bolts with the larger hole in the keyhole slots of the mounting bracket.

Figure 30: GM02 to Bracket Installation

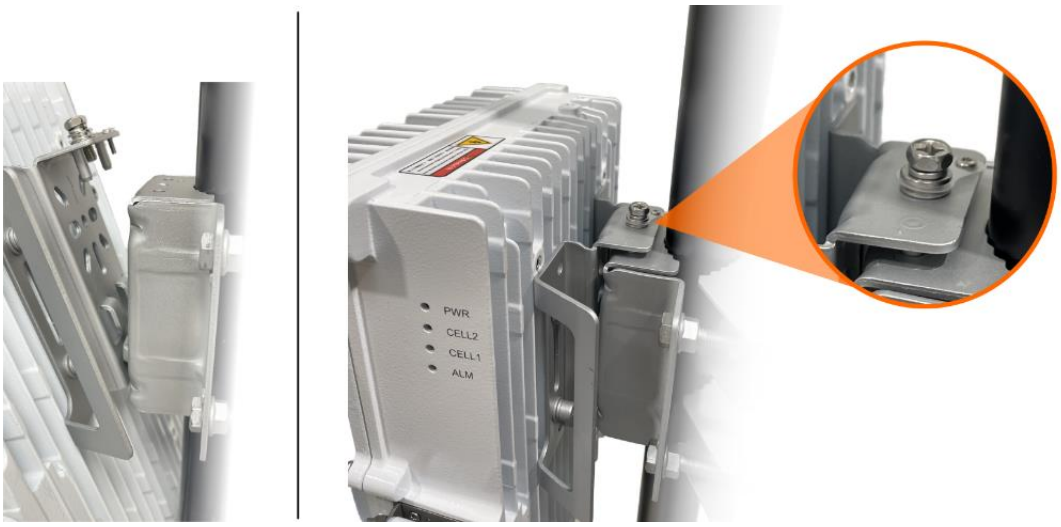


2. Slide the Mesh Node downward to engage the M6 Flange Bolts in the Mounting Bracket; See Detail G.
3. Tighten the four M6 Flange Bolts to a torque of 24 in-lbs. (2.7 Nm) +/- 10%.

Mount Mesh AP on Bracket

1. Using the two pins and the tabs on the AP bracket for alignment, hold the G501 AP above the pole mounting bracket and lower it into place making sure that the bracket tabs align with the slots in the pole mount bracket.

Figure 31: Attach Mesh AP to Bracket



2. Tighten the screw on the top of the bracket using a Phillips (crosshead) screwdriver to complete the mounting procedure.

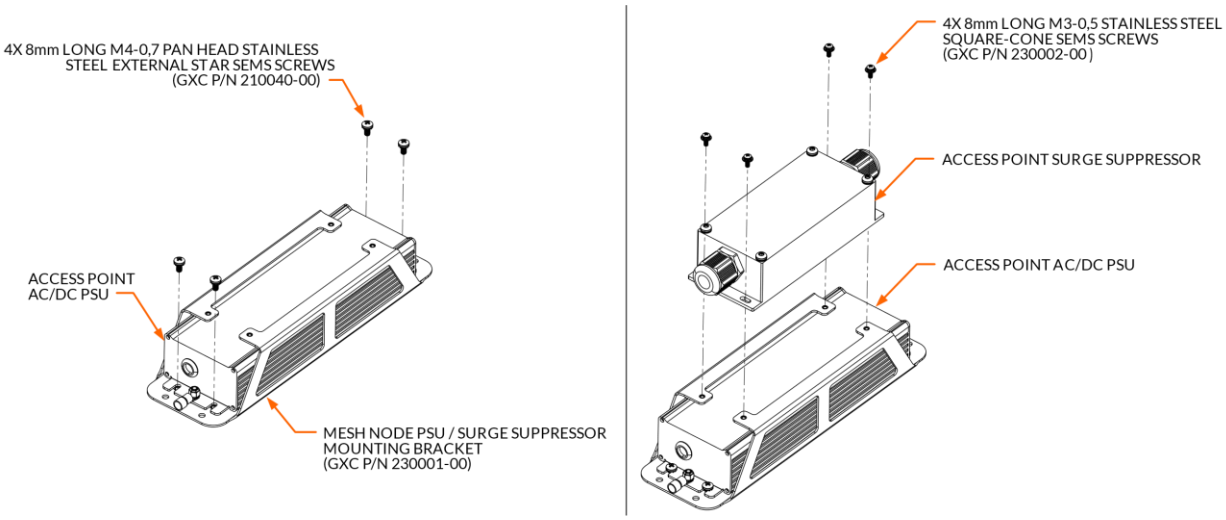
Power Supply and Surge Suppressor Mounting (Optional)

The Mesh Node Accessory Kit includes components to assemble cables for use with the AP's AC/DC PSU so that the Mesh Node and the Mesh AP can share the power supply unit. The PSU and the Surge Suppressor can be mounted to the Mesh Node using the PSU mounting bracket.

Install PSU/Surge Suppressor into PSU Mounting Bracket

Once the modification of the PSU cabling is completed, mount the modified PSU and Surge Suppressor to the Mesh Node PSU/Surge Suppressor mounting bracket as follows:

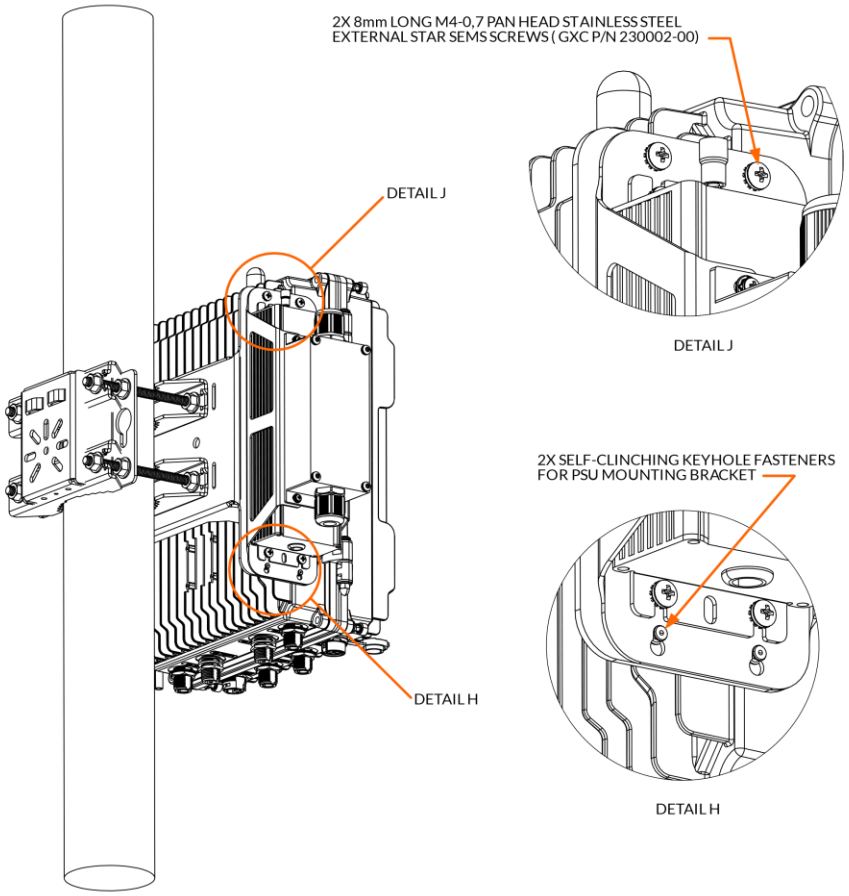
Figure 32: PSU/Surge Suppressor in PSU Bracket



1. Install the AC/DC PSU into the PSU mounting bracket (GXC P/N 230001-00) by inserting the nut securing the ring terminal of the ground wire through the central hole of the PSU bracket and aligning the slots in the PSU with the M4 captive nuts in the PSU mounting bracket as shown in Figure 32.
2. Install four M4 x 8mm long SEMS screws (GXC P/N 210040-00) through the slots of the AC/DC PSU and into the M4 press-fit nuts and torque to 9 in-lbs. (1 N-m) +/- 10%.
3. Install the in-line surge suppressor onto the top of the PSU mounting bracket, orienting the surge suppressor so that the green ground wire is adjacent to the grounding hardware of the AC/DC PSU while aligning the thru hole slots with the M3 captive nuts in the PSU mounting bracket as shown in Figure 32.
4. Install four M3 x 0.5, 8mm long SEMS screws (GXC P/N 220002-00) though the slots in the in-line surge suppressor and into the M3 captive nuts and torque the screws to 5 in-lbs. (.56 N-m) +/-10%.

Install Assembled PSU Bracket to Mesh Node

Figure 33: PSU Bracket to Mesh Node Installation



1. Install the assembled Mesh Node AC/DC PSU onto the Mesh Node mounting bracket by placing the keyhole slots of the PSU mounting bracket over the integrated self-clinching standoffs as shown in Figure 33, Detail H.
2. Install two M4 x 0.7, 8mm long SEMS screws (P/N 210040-00) through the holes of the PSU mounting bracket and torque to 9 in-lbs. (1 N-m) +/- 10% as shown in Figure 33, Detail J.

GM02 Antenna and Mesh AP Antenna

Install the GM02 backhaul antenna and the Mesh AP antenna as required following all local requirements and best practices.

Connect Cables

The following topics cover cable layout requirements, RF cable connections, Ethernet cable connections, power connections, and ground cable connections.

Cable Layout Requirements

Cable layout requirements vary based on the type of cable. The following topics provide general requirements for all cable types, and optical cable specific and grounding cable specific requirements.

General Requirements

- Bending radius of antenna feeder cable: 7/8 in > 9.84 in (250 mm), 4/5 in > 14.96 in (380 mm)
- Bending radius of jumper cable: 1/4 in > 1.38 in (35 mm), 1/2 in (super soft) > 1.97 in (50 mm), 1/2 in (ordinary) > 5 in (127 mm)
- Bending radius of power cable and grounding cable: > triple the diameter of the cable.
- The minimum bend radius of the optical fiber is 20 times the diameter of the optical fiber.
- Bind the cables according to the type of cable; intertwining and crossing are forbidden.
- An identification label should be attached after the cable is laid.

Grounding Cable Requirements

- The grounding cable must connect to the grounding point.
- The grounding cable must be separated from the signal cables to avoid signal interference.

Connect Earth Ground Cable

1. Route an 8 AWG Earth Ground wire to the GM02 Mesh Node unit.
2. Remove the 8mm nuts and washers holding the grounding lug to the unit and remove the grounding lug.

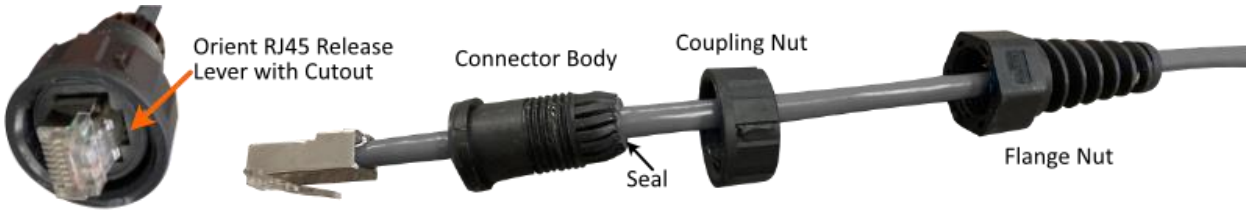
Figure 34: GM02 Grounding Lug

3. Strip the 8 AWG Ground Wire as necessary, insert into wire barrel of Grounding Lug, and double crimp using appropriate tooling.
4. Reinstall grounding lug by placing it over the top of the threaded studs and replacing washers and hex nuts. Tighten the hex nuts to 16 in-lbs. (1.8 N-m) +/-10%.

Connect Ethernet Cable

1. Remove the Field-Installable Ethernet Plug Kit from the GM02 Accessory Kit, open, and remove the four parts (Connector Body, Rubber Seal, Coupling Nut and Gland Nut).
2. Using unterminated Ethernet Cable (Cat 6, Cat6A, Cat7 or higher performing), slide the Gland Nut, Coupling Nut, Seal and Connector Body over unterminated Ethernet Cable.

Figure 35: Ethernet Connector Assembly



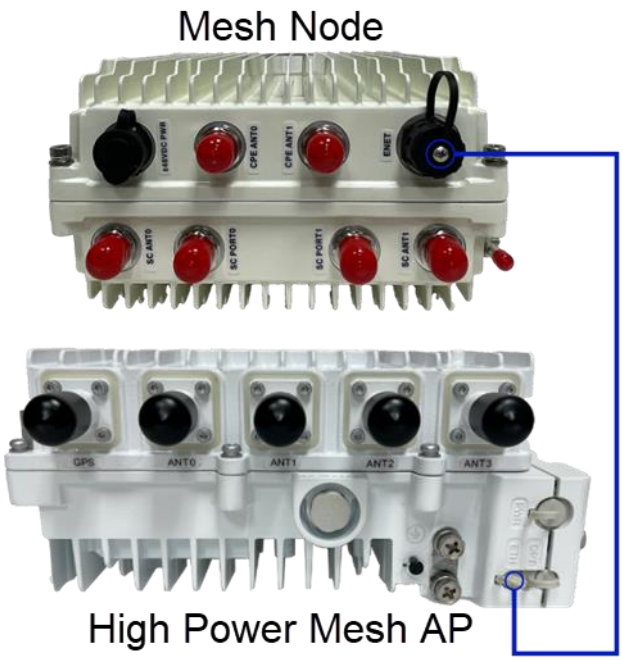
3. Terminate the cable with an appropriate Shielded RJ45 Plug using standard Ethernet cabling installation procedures and tooling.
4. Slide the Connector Body up the Ethernet Cable and insert the rear of the shielded RJ45 Plug into Connector Body orienting the release lever with the cutout in the Connector Body.
5. Slide the Seal up the Ethernet Cable and insert inside the Gland Fingers of the Connector Body installed in the previous step.
6. Slide the Coupling Nut up the Ethernet Cable and over the top of the Connector Body. Rotate Coupling Nut to engage over the flange of the Connector Body.
7. Slide the Gland Nut up the Ethernet Cable and thread onto the Connector Body. Torque the Gland Nut to 7 to 8 in-lbs. (0.8 to 0.9 N-m).
8. Insert the terminated Ethernet Connector (plug) into mating receptacle of the Mesh Node unit. The connector is keyed and will not insert until properly aligned. Rotate the connector until it slides into the receptacle (jack). Do not force the plug into the receptacle. Rotate the Coupling Nut until the bayonets engage and Coupling Nut locks onto the connector body. Verify that plug and receptacle are locked together.

Figure 36: Ethernet Cable Connection to GM02

9. Route the other end of the cable into the Mesh AP wiring cavity and terminate it with an appropriate shielded RJ45 plug.

10. Connect the assembled RJ45 plug to the ETH port of the AP.

Figure 37: GM02 to Mesh AP Ethernet Connection



Connect Power Cables

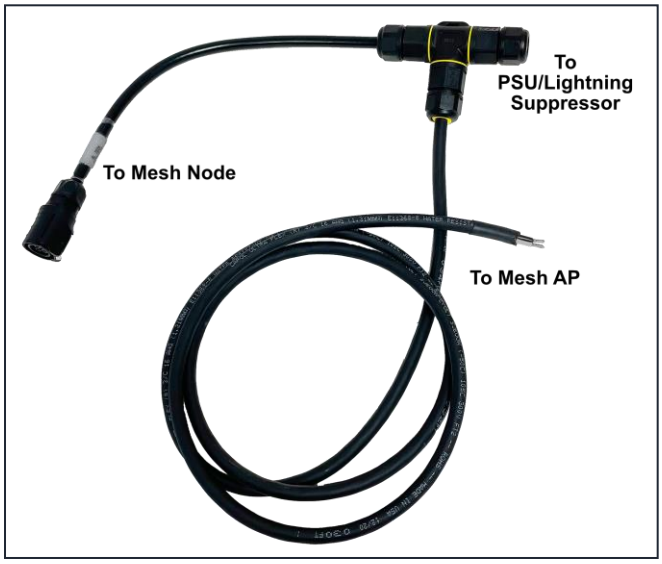
The GM02 Accessory Kit includes components to assemble cables for use in installations where the GM02 and the Mesh AP share a common power supply (Spliced Cable Assembly) and for installations where the GM02 is powered by a separate power source (Inline Splice Cable Joiner).

Spliced Power Cable Assembly

The Spliced Power Cable Assembly allows you to connect both the Mesh Node and Mesh AP to the 48VDC Power Adapter and surge suppressor (lightning protector) that is shipped with the G501 AP or other 48VDC power sources.

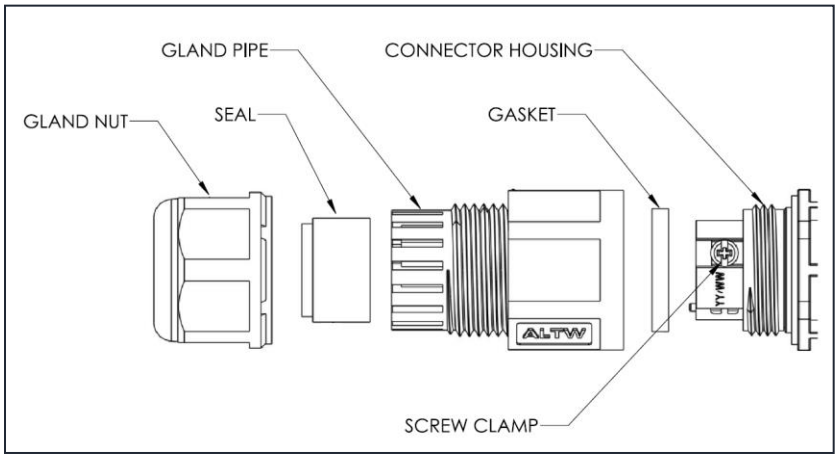
NOTE: If the GM02 is not sharing the AP's PSU, please see the instructions for using the Weathertight Cable Joiner to connect another 48VDC power source to the GM02 in the *Inline Power Splice/Cable Joiner Assembly* topic.

Figure 38: Spliced Cable Assembly



1. Remove the Spliced Cable Assembly from the GM02 Accessory Kit. This cable assembly includes the Tee-Shaped Cable Joiner, GM02 Power Cable, and unterminated Mesh AP Power Cable.
2. Disassemble the unused side of the Tee-Shaped Cable Joiner. Slide the Gland Nut, Seal and Gland Pipe over the wire end of the Lightning Suppressor Cable. Ensure that rubber gasket remains in both ends of the connector body.

Figure 39: Cable Joiner Termination

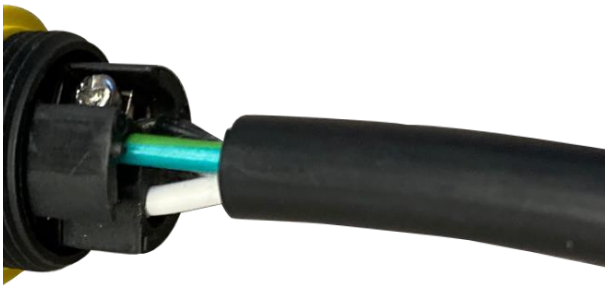


3. Insert the Green Wire of the Lightening Suppressor Cable into the Ground Contact (⏚) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).

Figure 40: Tee-Cable Joiner Wire Contacts

4. Insert the White Wire of the Lightening Suppressor Cable into the Line Contact (L) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).
5. Insert the Black Wire of the Lightening Suppressor Cable into the Neutral Contact (N) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).

Figure 41: Lightening Suppressor Cable Conductors in Tee-Cable Joiner

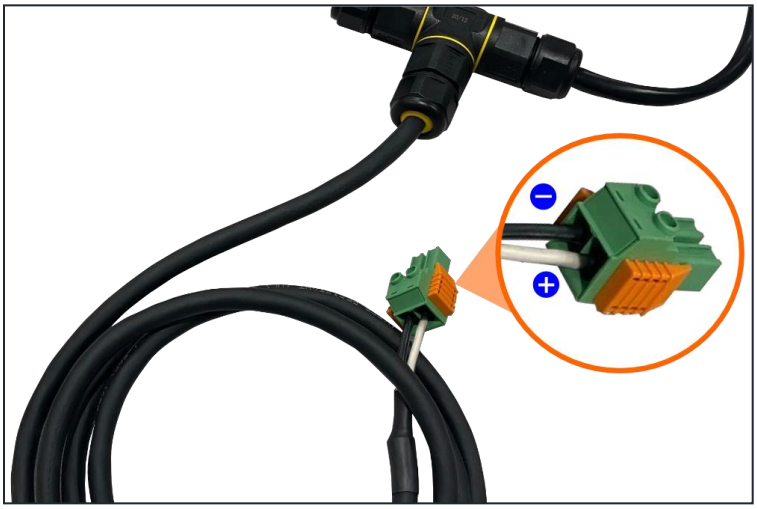


6. Slide the Gland Pipe of the Cable Joiner up the Power Cable and thread onto the Connector Body of the Cable Joiner. Tighten the Gland Pipe to the Connector Body to 7 to 8 in-lbs. (0.8 to 0.9 N-m).
7. Slide the Seal of the Cable Joiner up the Power Cable and insert inside Gland Fingers of Gland Pipe installed in the last step.
8. Slide the Gland Nut of the Cable Joiner up the Power Cable and thread onto the Gland Pipe. Tighten the Gland Nut to 7 to 8 in-lbs. (0.8 to 0.9 N-m).

Figure 42: Tee-Cable Joiner with Lightning Suppressor Cable

9. Assemble the Mesh AP Power Terminal. Insert the white conductor into the + terminal and insert the black conductor into the – terminal and tighten both terminal screws as shown in Figure 43.

Figure 43: AP Power Terminal Assembled

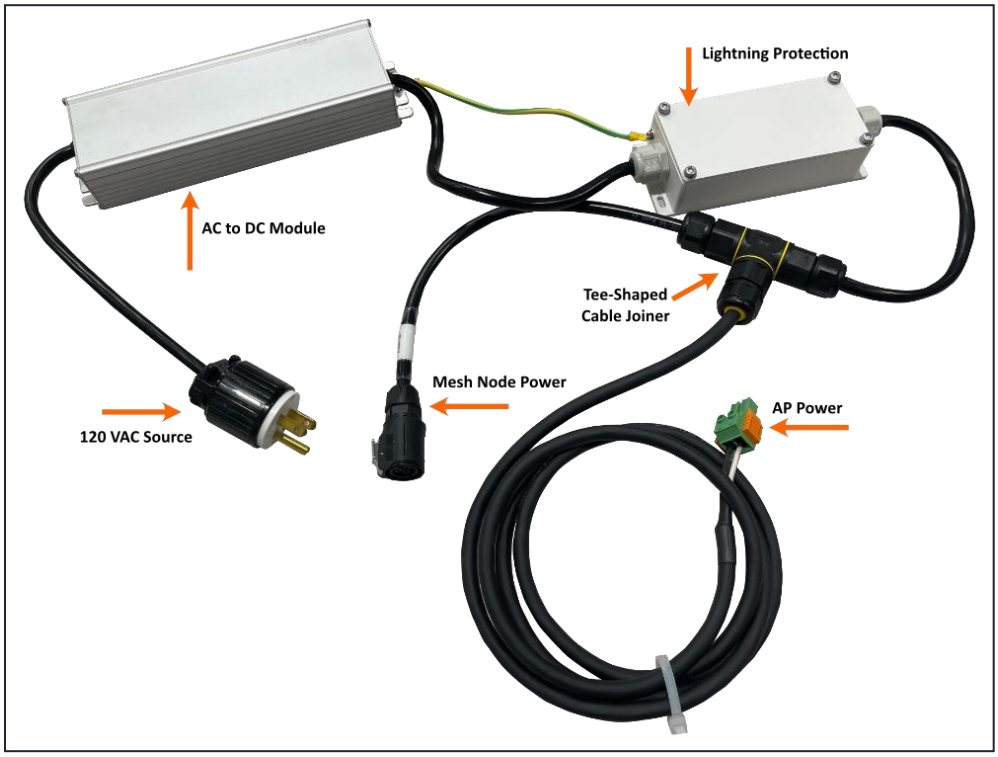


NOTE: The color of the conductors may vary. If the conductors are red/black, insert the red conductor into the + terminal and insert the black conductor into the – terminal. If the conductors are brown/blue, insert the brown conductor into the + terminal and insert the blue conductor into the – terminal.

NOTE: You have the option of routing the unterminated AP Power Cable into the wiring cavity of the AP first and then assembling the AP power terminal to make cable routing easier.

10. If the input cable to the AP Power Supply is not already terminated, install an appropriate AC power plug.

Figure 44: Fully Assembled Splice Cable



WARNING: Ensure that all RF connections are completed before powering up the AP and Mesh Node. The wireless signal transmission power can cause bodily injury and damage to the AP, Mesh Node, and RF power amplifier devices.

11. Insert the GM02 Power Cable Connector (plug) into mating receptacle of the Mesh Node unit by orienting the connector so that the release button is oriented towards the back of the unit. The connector is keyed and will not insert until properly aligned. Do not force plug into receptacle. Push until audible “click” is heard and plug and receptacle are locked together.

Figure 45: Connect Power Cable to GM02

12. Open the G501 AP wiring cavity with a 5mm Allen wrench, route the AP power cable (green connector) through the left-side wire groove, and plug it into the PWR interface.

Figure 46: Mesh AP Wiring Cavity Cabled

13. Close the wiring cavity and tighten the hex screw with a 5mm Allen wrench when the Ethernet and power connections from the GM02 to the AP are completed.

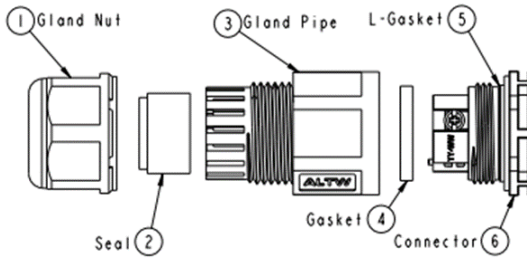
Inline Power Splice/Cable Joiner Assembly

The Spliced Cable Assembly described in the previous topic simplifies the installation and operation of a GM02 Mesh Node when the Mesh Node and the Mesh AP are both powered by a common DC power source such as the AP's power adapter. For installations where the AP and Mesh Node do not share a common power source, an additional Inline Power Splice (Weatherproof Cable Joiner) is included in the Accessory Kit to connect the GM02 Power Cable directly to a DC source. The following instructions describe the installation of that cable joiner.

1. Remove the Spliced Cable Assembly and Inline Splice Cable Joiner from the Accessory Kit.
2. Disassemble the Tee-Shaped Cable Joiner to remove the GM02 Power Cable and set the Tee-Shaped Cable Joiner aside.

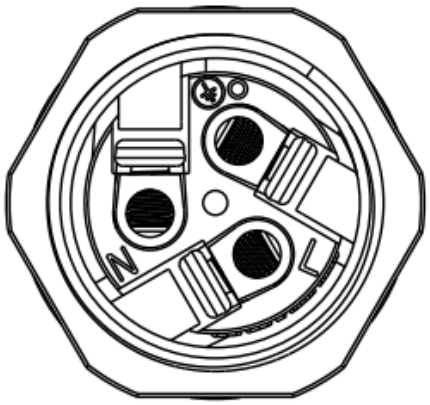
3. Disassemble one side of the Inline Splice Cable Joiner. Slide the Gland Nut, Seal and Gland Pipe over the wire end of the GM02 Power Cable. Ensure that rubber gasket remains in both ends of the Connector Body.

Figure 47: Weathertight Cable Joiner



4. Insert the Green Wire of the Power Cable into the Ground Contact (⏚) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).

Figure 48: Cable Joiner Contacts



5. Insert the White Wire of the Power Cable into the Line Contact (L) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).
6. Insert the Black Wire of the Power Cable into the Neutral Contact (N) of the Connector of the Weathertight Cable Joiner and tighten the cable clamp screw to 1.8 to 3.5 in-lbs. (0.2 to 0.4 N-m).
7. Slide the Gland Pipe of the Cable Joiner up the Power Cable and thread onto the Connector Body of the Cable Joiner. Tighten the Gland Pipe to the Connector Body to 7 to 8 in-lbs. (0.8 to 0.9 N-m).

Figure 49: Cable Joiner Connector

8. Slide the Seal of the Cable Joiner up the Power Cable and insert inside Gland Fingers of Gland Pipe installed in the last step.
9. Slide the Gland Nut of the Cable Joiner up the Power Cable and thread onto the Gland Pipe. Tighten the Gland Nut to 7 to 8 in-lbs. (0.8 to 0.9 N-m).
10. The same termination sequence as documented in Steps 3 to 9 should be applied to the termination of the 48VDC line by the installer. An Earth Ground Wire should be connected to the Ground Contact (⏚), a +48VDC Wire should be connected to the Line Contact (L), and a 0VDC Wire should be connected to the Neutral Contact (N) of the Cable Joiner Connector.
11. Insert the GM02 Power Cable Connector (plug) into mating receptacle of the Mesh Node unit by orienting the connector so that the release button is oriented towards the back of the unit. The connector is keyed and will not insert until properly aligned. Do not force plug into receptacle. Push until audible “click” is heard and plug and receptacle are locked together.

Figure 50: GM02 Power Cable Connector

Connect RF Cables

Figure 51: Mesh Node to G501 AP RF Connections

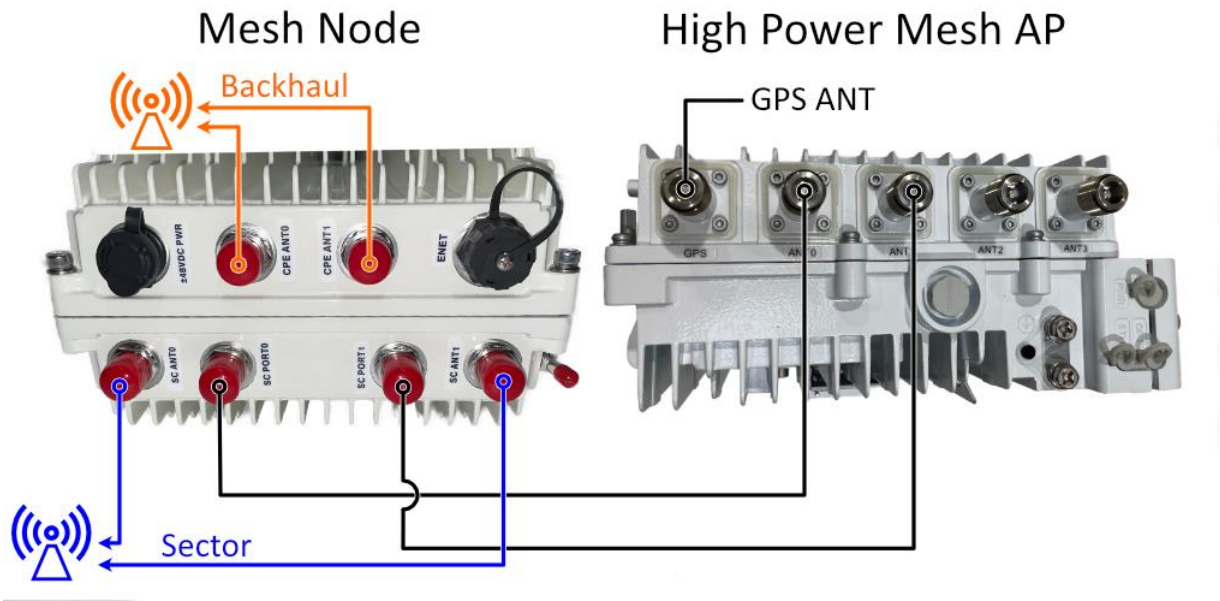
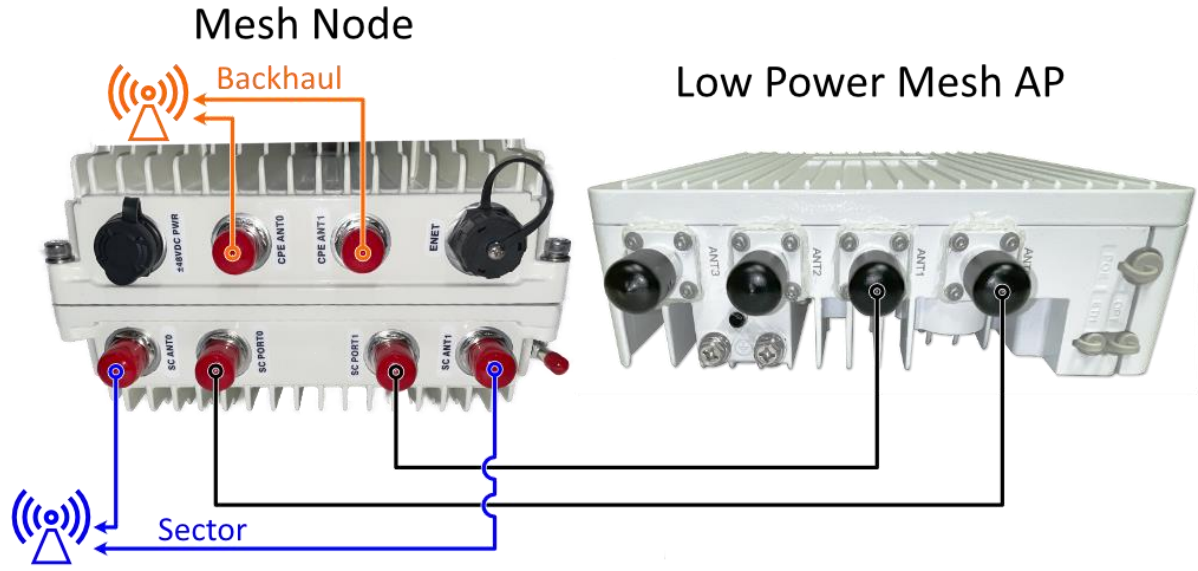


Figure 52: Mesh node to G101 AP RF Connections



1. Remove the protective caps from the Type-N RF Connector Ports labeled “SC PORT0” and “SC PORT1” and connect Type-N Patch Cables from these connectors to the AP’s Ports (e.g. “ANT0” and “ANT1”). Tighten the Type-N Connectors to 12 in-lbs. +/- 10% (1.36 N-m +/- 10%).

Figure 53: Connect SC PORT0 and SC PORT1

2. Remove the protective caps from the GM02 Mesh Node Type-N RF Connector Ports labeled “SC ANT0” and “SC ANT1” and connect Type-N Patch Cables from these connectors to the input ports of the Sector Antenna (antenna providing CBRS cellular coverage for the sector). Tighten Type-N Connectors to 12 in-lbs. +/- 10% (1.36 N-m +/- 10%).

Figure 54: Connect SC ANT0 and SC ANT1

3. Remove the protective caps from GM02 Mesh Node Type-N RF Connector Ports labeled “CPE ANT0” and “CPE ANT1” and connect Type-N Patch Cables from these connectors to the input ports of the Backhaul Antenna. Tighten Type-N Connectors to 12 in-lbs. +/- 10% (1.36 N-m +/- 10%).

Figure 55: Connect CPE ANT0 and CPE ANT1

4. Seal each of the RF Connectors using Cold Shrink, Heat Shrink, Self-Fusing (Butyl) Tape, or similar, wrapping each from the Mesh Node to approximately 1 inch below the ferrule heat shrink of the cable or similar.

Power on to Check LED Status

⚠ WARNING: Ensure the antennas are connected to the ANT ports before powering up the Mesh Node and the Mesh AP. The wireless signal transmission power from the AP can cause bodily injury and damage to the GM02 and RF power amplifier devices.

Power on the Mesh Node and check that the LED indicators are lighting as expected, all three LEDs should be green in normal operation.

Figure 56: Check LEDs

Configure the Mesh Node

The GM02 Mesh Node's user interface allows you to update the GM02 firmware, view SIM Card information, view and download logs, check unit status, and point the backhaul antenna.

To work with the GM02 Mesh Node, we recommend using any of the following web browsers:

- Google Chrome (latest version)
- Mozilla Firefox (latest version)

Log On to the GM02 Mesh Node

To log on to the Mesh Node:

1. Apply power to the Mesh Node. Once the Mesh Node's 2.4 GHz Wi-Fi interface is operational, the Power and Wi-Fi LEDs will be on.
2. Open the Network and Internet settings on the laptop and click the GM02's SSID. The SSID of the Mesh Node's Wi-Fi interface will be "GXCTR0-xxxxxx", where xxxxxx is the MAC address of one of the Mesh Node's Ethernet ports. This MAC address is printed on the GM02's label.

3. Click the SSID to connect to the Mesh Nodes Wi-Fi network and it will prompt you for a password. The default Wi-Fi password at the time this guide was published is "**fishAnchorDish17**".
4. Once you are connected, you can access the Mesh Node's Local Control Interface (LCI). Type "192.168.1.1" in the Address Bar of the browser and press **Enter** to open the LCI Login webpage.

> NOTE: Because the GM02 LCI uses a self-signed security certificate, a Chrome browser will display a "Your connection is not private" warning message and a Firefox browser will display a "Warning: Potential Security Risk Ahead" message. The GM02 LCI is not an actual security risk. In Chrome, click the **Advanced** button, and then click the **Proceed to 192.168.1.1 (unsafe)** link. In Firefox, click the **Advanced** button, and then click the **Accept the Risk and Continue** button.

5. When prompted, enter the Username "**onyx**" and the Password "**shinyStoneBox22**" and click **Login.**

> NOTE: Your session will expire, and you will be automatically logged out of the system after 30 minutes. There is currently no logout option.

Connect using Wired Ethernet

Logging on via Ethernet can be used for debugging the system if access over Wi-Fi is not working or is not desired. In normal operation, the Ethernet port is reserved for connecting the Mesh Node to the Mesh AP.

To access the Mesh Node using the wired Ethernet port do the following:

1. Connect the laptop to the Mesh Node's Ethernet 1 port using an Ethernet cable.
2. Enter the Mesh Node's Ethernet port address "10.0.5.1". The laptop needs to be on the same "10.0.5" Subnet to communicate with the Mesh Node.

Navigate the User Interface

Once you've successfully logged in, links at the top right side of any of the Mesh Node's webpages are used to open the Status, FW Update, Settings, CBRS AP, System, Antenna, and About pages.

Change the Password

The GM02 has a Wi-Fi network password and a Local Control Interface password that can be changed in the **Privacy** section of the Settings page.

Change the Wi-Fi Password

1. Click the **Settings** link at the top right side of any of the Mesh Node's webpages to open the Settings page.
2. In the Privacy section, click the **Change Wi-Fi password** link.
3. Enter the current Wi-Fi password and then click **next**.
4. Enter the new password and then re-enter the password.
5. Click **Confirm** to change the password.

Change the Local Control Interface Password

1. Click the **Settings** link at the top right side of any of the Mesh Node's webpages to open the Settings page.
2. In the **Privacy** section, click the **Change LCI password** link.
3. Enter the current LCI password and then click **next**.
4. Enter the new password and then re-enter the password.
5. Click **Confirm** to change the password.

Reboot the Mesh Node

1. Click the **FW Update** link at the top right side of any of the Mesh Node's webpages to open the Settings page.
2. Click the **Reboot** button located on the lower left side of the page.

Update the Firmware and Bootloader

The GM02 Firmware and Bootloader should be updated after the Mesh Node is installed to ensure that it is running the latest version. The Firmware and Bootloader update files are in tar.gz format.

NOTE: Once the Mesh Node has been updated with the required firmware version via the LCI, future updates should be performed using the ONYX Portal.

Update the Firmware

1. Get the latest firmware from your GXC representative or GXC partner and download it onto the laptop that you will be using to update the GM02.
2. Compare the version number of the firmware tar file and the firmware currently running on the GM02 to determine if an update is required.
    - The firmware version number of the tar file is part of the file name, for example, “tr0_fw_pkg_1.3.544.tar.gz”.
    - The firmware version currently running on the GM02 is displayed at the top right side of the Mesh Node’s Status webpage, for example “1.3.544”.
3. Click the **FW UPDATE** link at the top right side of the web page.
4. Click to select the **Firmware** checkbox and then click **Select File**.
5. Navigate to the location on your laptop where the appropriate firmware tar file is located, click to select it, and then click **UPLOAD**.
6. A progress bar will indicate the status of the upload and **Upload Completed** will appear below the **UPDATE** button once the upload is complete.
7. Once the file is uploaded, click **UPDATE** and a prompt will appear (“System will be automatically rebooted after the update. Are you sure to update?”). Click **Yes** to update or **No** to abort.

   The update process should take several minutes to complete and will automatically reboot the unit when it’s done following a brief countdown.

NOTE: Do not navigate away from this page while the update is in progress because this will stop the firmware update process.

8. After the GM02 reboots, you must manually refresh the browser to get back to the Mesh Node's Status webpage. Check the firmware version number at the top right side of the page to confirm that the GM02 is running the correct firmware version.

Update the Bootloader

1. Get the latest Bootloader tar file from your GXC representative or GXC partner and download it onto the laptop that you will be using to update the GM02.
2. Compare the version number of the Bootloader tar file and the Bootloader currently running on the GM02 to determine if an update is required.
    - The Bootloader version number of the tar file is part of the file name, for example, "tr0_xxxxxx.tar.gz".
    - The Bootloader version currently running on the GM02 is displayed on the System page. Click the **System** link at the top right side of any of the Mesh Node's webpages. The Boot Loader version is shown in the Firmware Version section of the page; for example, "v1".
3. The Bootloader update process is the same as the firmware update process as described in the previous section.

Switch Firmware Version

The Mesh Node's memory has multiple partitions. Initially, the contents of all partitions are identical, and the GM02 system boots from the primary partition.

When the first firmware update occurs, the new image is written to the secondary partition (because the system cannot overwrite the partition from which it booted). The partition with the new firmware update image is set to "Active" and the system reboots. At that point, the "primary" partition becomes the backup system (previous image) and the system will revert to it if the new image fails to reboot.

When the second firmware update occurs, the "Primary" partition is overwritten with the new image, set to "Active" and then system reboots. At this point, the "Secondary" partition becomes the backup. Further updates repeat this cycle.

You have the option to switch between the most recently installed version of the firmware and the previous version. A manual reboot is required after activating a different version of the firmware.

To switch between firmware versions:

1. Click the **System** link at the top right side of any of the Mesh Node's webpages.
2. In the **Firmware Version** section of the page, click the **Activate** button beside the version of the firmware that is not currently running.
3. On the Firmware page, click **Reboot** to manually reboot the GM02.

View Mesh Node Status and Logs

The Status page allows you to view the status and logs for the Mesh Node's Wi-Fi network, Backhaul Link, and Mesh Tunnel. When you login to the Mesh Node, the Status page is the first page that you will see displayed.

View Status

The center column of the Status display provides a status indicator for each of the Mesh Node's systems with green indicating "Normal" or "Active" operation and red indicating that there is an issue with that particular system.

NOTE: It may take a significant amount of time for the ONYX Portal to set up the Mesh Node and add it to the network.

- The Wi-Fi status will always be **Active** (green) if you are connected to the GM02 via Wi-Fi, which is the standard way to connect to the unit. If the Wi-Fi is not working and you have to connect using an Ethernet cable, the status will be Inactive (red).
- The Backhaul Link status will change to Normal (green) once the backhaul antenna is properly pointed and the connection to the ONYX Portal is established.
- The Mesh Tunnel status will be **Active** (green) once the Mesh Tunnel is established with the ONYX Portal.

View Logs and Status Details

1. Click the **Log** button on the Wi-Fi row to view the log file for the Wi-Fi service.
2. Click the **Log** button on the Backhaul Link row to view the log file for the Backhaul Link.
3. Click the **Status** button on the Mesh Tunnel row to view the status details such as service (running or not), wwan-ip address, wwan0-ping status, eth1-ip address and tunnel ping status.

View or Download System Logs

The System logs can be viewed or downloaded on the System page.

1. Click the **System** link at the top right side of any of the Mesh Node's webpages. The logs can be viewed or downloaded in the **System Logs** section of the page.
2. To view the "syslog", and the "mesh_manager.log" without downloading the log file, click the **view log** link adjacent to the file that you wish to view.

NOTE: View log is limited to the most recent entries in the log file. The current limit is set to 10,000 lines. To view the entire log, use the **Download logs** feature.

3. To download the logs, click the **Download logs** button and follow the prompts to save the tar.gz file to your local laptop or desktop computer.

Device Information

The serial number of the Mesh Node and the IMSI of the SIM Card(s) inserted in the Mesh Node's SIM Card slot(s) are shown on the System page. The IMSI is required to add the GM02 to the ONYX Portal.

1. Click the **System** link at the top right side of any of the Mesh Node's LCI webpages.
2. On the System page, locate the serial number and IMSI under the Device Information section of the page.

NOTE: Take note of the IMSI of the SIM Card(s) and the Serial Number of the unit. This information will be needed when you add the GM02 to the ONYX Portal.

Settings

The Settings page allows you to specify the CPE Antenna Gain, select the APN of the Mesh Backhaul, and change the Wi-Fi password and the LCI password. The current settings of the CPE Antenna Gain, and the Mesh Backhaul APN are displayed when the Settings page is opened.

Set the CPE Antenna Gain

It is the responsibility of the installer to confirm that the value in the CPE Antenna Gain field matches the actual gain of the CPE (Customer Premise Equipment) antenna that is being used for the backhaul. The GM02 will reduce the transmit power to the antenna based on this setting.

To enter the antenna gain:

1. Click the **Settings** link at the top right side of any of the Mesh Node's webpages to open the Settings page.
2. Enter the correct gain value in the CPE Antenna Gain field. (The default value is 20dB.)
3. Click the **Save** button.

⚠ CAUTION: It is the installer's responsibility to ensure that the value entered for the CPE Antenna Gain accurately represents the actual gain of the backhaul antenna.

Enter the MeshBackhaul APN

The APN for a GM02 Mesh Node SIM is "MeshBackhaul". The APN is case-sensitive with an uppercase "M" and "B" and all other letters lowercase. This APN must match the "MeshBackhaul" APN specified in the ONYX Portal in order for the Mesh Node to connect to the ONYX Portal.

1. Click the **Settings** link at the top right side of any of the Mesh Node's webpages to open the Settings page.
2. Enter "MeshBackhaul" in the **Mesh Backhaul APN** field.
3. Click the **Save** button.

Open the AP User Interface

The Mesh Node, which is always paired with a Mesh AP, provides an easy method to view or configure the AP's Interface. However, the AP's settings are typically configured using the ONYX Portal.

NOTE: The Mesh AP must be connected to the GM02 via an Ethernet cable and powered up for this feature to work.

To open the AP's user interface:

1. Click the **MESH AP** link at the top right side of any of the Mesh Node's webpages.
2. It is normal for a "Your connection is not private" alert to appear due to the security certificate. If this occurs, click the **Advanced** button.
3. Click the **Proceed to 10.0.5.1 run safe** link to open the Mesh AP's login page.
4. Enter the Username and Password for the AP and click the **Login** button.

View Antenna Information

To view antenna information:

1. Click the **Antenna** link at the top right side of any of the Mesh Node's webpages to open the Antenna page to display the following parameters.
    - **Connection State** – State of the Mesh Node's connection to the ONYX Portal via the Gateway AP.
    - **Connection Status** – Possible status values are:
        - **Normal Service** – The CPE is connecting properly, and the APN and attenuation is set correctly.
        - **Limited Service** – Possible causes include:
            - APN is not set correctly – the CPE found the right network but can't attach.
            - The attenuation is too high – the CPE can't attach to the network.
            - The network settings have been changed so the SIM is no longer provisioned for that network.

- **No Cell** – This means the CPE can't see the signal at all. Possible causes are:
  - The Gateway AP is down, so the CPE has no network to connect to.
  - The backhaul filter is not in the correct state causing it to attenuate the signal so the CPE can't see it.
- **Attaching/Waiting for NW** – The CPE is trying to attach to the network, it started the process.
- **Attempt Update** – The CPE can't attach to the network. The TAU attach is not working.

- **Backhaul Filter** – Filter in use for the backhaul connection.
- **Access Filter** – Filter in use for the Access (CBRS sector coverage) antenna.
- **RSRQ (dB)** – Reference Signal Received Quality. This indicates the quality of the signal from the Gateway AP.
- **SINR (dB)** – Signal to Interference & Noise Ratio of the backhaul signal.

NOTE: The following parameters are displayed separately for the Primary and Secondary carriers when the Gateway AP is operating in Carrier Aggregation Mode.

- **Frequency** – Operating frequency of the Gateway Node (backhaul link).
- **EARFCN** – E-UTRA Absolute Radio Frequency Channel Number of the Gateway Node (backhaul link).
- **RSRP (dBm)** – Reference Signal Received Power for the backhaul link. RSRP is displayed for Antenna 0 port (main) and Antenna 1 port (diversity).
- **RSSI (dB)** – Received Signal Strength Indicator for the backhaul link. RSSI is displayed for Antenna 0 port (main) and Antenna 1 port (diversity).

2. Use the Antenna page to aim the CPE (backhaul) antenna to achieve the best possible RSRQ, SINR, RSRP, and RSSI readings between the Gateway AP and the Mesh Node.

Point the Antenna

The Mesh Node LCI user interface includes a backhaul antenna pointing feature on its Antenna page to assist installers.

To point the antenna:

1. Click the **ANTENNA** link at the top of the Mesh Node's LCI page.
2. Loosen the Mesh Node's CPE (backhaul) antenna mounting bolts and slowly adjust its direction towards the Gateway Node's backhaul antenna to maximize the "Antenna 0" RSRP readings between the Gateway AP and the GM02.
3. When a maximum value is obtained, tighten the antenna's mounting bracket bolts.
4. Verify the remainder of the parameters on the Antenna page are consistent with the frequency plan for your access and backhaul channels.
5. Navigate back to the LCI Status Page and verify that the:
    - Backhaul Link indicates **Connected**
    - Mesh Tunnel indicates **Active**
6. Return to the Subscribers page on the ONYX Portal and confirm that the status of the IMSI has changed to **Connected**.

NOTE: Once energized the Mesh Node will undergo an automated registration with the ONYX Edge through the Gateway Node. You will not be able to register it under this section until its associated SIM card has checked in with the ONYX Edge on the Subscribers page. It may take up to 10 minutes or more for the device to check in with the ONYX Portal.

Add and Manage Mesh Nodes in the ONYX Portal

For detailed information on adding and managing Mesh Nodes in the ONYX Portal interface, refer to *ONYX Portal Operations Guide > Equipment > Manage Mesh Nodes*.

Appendix: Regulatory Compliance

Regulatory Compliance information is stated in the FCC Compliance topic.

FCC Compliance

Part 15

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. Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

⚠ WARNING: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters (7.9 inches) between the radiator and your body.

Title 47 Compliance

The GM02 complies with Title 47, Chapter 1, Subchapter D, Parts 96.39 and 96.45.

Revision History

Date	Updates
2024-07-25	Preliminary

