

Installation Guide for SecureMesh[®] WAN Extender 2 (XTEN-2000)

Document Number: PL-0072A

Revision: Preliminary 1.0

Date: September 18, 2020

TOC

Chapter 1. Safety and compliance	6
Safety information	6
Compliance notices	7
Modification statement	8
Interference statement	8
FCC Class B digital device notice	9
Wireless notice	9
WEEE: Waste Electrical and Electronic Equipment Directive	9
European Union and European Free Trade Association (EU & EFTA) compliance notices	10
Chapter 2. Overview	11
Ethernet cable	11
Kits and accessories	12
Supplies	13
Spare/replacement parts	13
Chapter 3. Prepare for installation	14
Tools	14
Location requirements	14
Grounding requirements	15
Grounding guidelines	15
Grounding checklist	17
Extender components	18
Preparing the extender	19
Optional steps for using a short mounting pipe	22
Preparing the Device Side Cable (DSC)	22
Steps to Prepare the DSC	23
Preparing the surge suppressor	26

Ethernet surge suppressor (CMJ8-PoE-A-C5E)	26
Setting the configuration	37
Extender parameters	38
Chapter 4. Mount the extender	39
Attach the extender to a pole or tower	39
Chapter 5. Commission the extender	43
LED indicators	43
Startup in cold conditions	44
Accessing the CLI using WiFi	47
Steps	48
Chapter 6. Specifications	53
Pinouts	53

Proprietary Notice

Copyright © Trilliant Holdings Inc. 2020. All rights reserved.

This document describes products, software and services ("Products") of Trilliant Holdings Inc., its subsidiaries, affiliates (collectively, "Trilliant"), and/or its licensors. This document is licensed, not sold. Except as set out in the License or other written agreement between Trilliant and your company: (1) the purchase or use of a Product from Trilliant does not convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual property rights of Trilliant or third parties; (2) Trilliant does not assume any responsibility or liability arising out of the use of this document or any Product it describes; and (3) no part of the document may be disclosed in any form to any third party.

Trilliant reserves the right to make changes to this document or to any Products it describes at any time with or without notice.

Use, duplication, or disclosure by the U.S. Government is subject to restrictions of FAR 52.227-14 (g) (2) (6/87) and FAR 52.227-19 (6/87), or DFAR 252.227-7015 (b) (6/95) and DFAR 227.7202-3 (a).

Trilliant®, SecureMesh®, UnitySuite®, and Trilliant SecureReach® are registered trademarks of Trilliant. Any third-party name or mark in this document may be a trademark of its owners.

How to Contact Trilliant

Use the following methods to contact Trilliant:

General Company and Solution Information: <https://trilliant.com/>

Trilliant Headquarters: Tel:+1 919.495.6111

Solution and Customer Support Portal: <https://trilliant.com/support/>

Note: Make all requests for Solution support or RMA processing through the web portal. If you do not have a Support Portal login and password, or need your credentials reset, contact Trilliant Support using the email address below.

E-mail: support@trilliant.com

Use this email address primarily for requesting access to the Support Portal, or for resetting access credentials. This email address is not a primary means of communicating with Customer Support.

Chapter 1. Safety and compliance

This chapter provides safety and compliance information for installers. Before installing the SecureMesh® Extender-2000 (XTEN-2000), read the instructions in this document.

Safety information

The caution statements, warning conventions, and warning messages in this section apply to this product and manual.

Trilliant strongly urges that you always follow all locally-approved safety procedures and safety instructions when working around high voltage lines and equipment.

The instructions in this manual are not intended as a substitute for proper training in or adequate experience with safely operating the described equipment. Only competent technicians who are familiar with this equipment should install or service it. A competent technician:

- Is thoroughly familiar with these instructions
- Is trained in industry-accepted high- and low-voltage safe operating practices and procedures
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment
- Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shields, hardhats, rubber gloves, hot sticks, etc.

The following are important safety instructions. To safely install and operate this equipment, be sure to read, understand, and follow all caution and warning notices and instructions marked on the product or included in the documentation.



Warning: Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.



Warning: The XTEN-2000 is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing safety and operating procedures. Read all instructions before installing the XTEN-2000.



Warning: The XTEN-2000 should be installed and serviced only by personnel familiar with good safety practices when handling high-voltage electrical equipment.

Compliance notices

This device complies with requirements for the United States, Canada, and international requirements, as shown in [Table 1](#).

Table 1: Compliance requirements

Compliance Standard	Description
General	CE Mark
EMC compatibility	FCC Part 15 Subpart B, Class B Industry Canada ICES-003/NMB-003 Class B EN 301 489-1, EN 301 489-17 EN 55032, EN 55035
Radio operation certification	FCC Part 15 Subpart C, Subpart E Industry Canada: RSS-Gen, RSS-247 EN 300 328, EN 301 893, EN 302 502 Various worldwide approvals
FCC and Industry Canada Device IDs	FCC ID: TMB-WAN2000 Industry Canada ID: 6028A-WAN2000
Safety	UL 62368-1, UL 60950-22

Compliance Standard	Description
	CSA-C22.2 No. 62368-1 CSA-C22.2 No. 60950-22 EN 62368-1, EN 60950-22
Climatic	Thermal: IEC 60068-2-1 /-2 /-14 Humidity: IEC 60068-2-30 Salt spray IEC 60068-2-11
Mechanical vibration and shock	IEC 60068-2-6 IEC 60068-2-27
Transportation vibration and drop	ISTA-6
Enclosure	NEMA Type 4X/IP66

Modification statement

Trilliant has not approved any changes or modifications to this device by the user. Any changes or modifications not expressly approved by Trilliant could void the user's authority to operate the equipment.

Trilliant n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tous changements ou modifications qui ne sont pas approuvés par Trilliant peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). 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.

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.

FCC Class B digital device notice

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 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.

Wireless notice

To satisfy FCC and Industry Canada RF Exposure requirements for mobile and base station transmission devices, a separation distance of 1 m (39.4 in) or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended.

Pour satisfaire les requis d'Industrie Canada sur les expositions aux radiofréquences pour les appareils mobiles et les stations de transmission, une distance de 1 m ou plus doit être maintenue entre l'antenne de cet appareil et les personnes durant l'opération. Pour assurer la conformité, les opérations à des distances inférieures ne sont pas recommandées.

WEEE: Waste Electrical and Electronic Equipment Directive



Figure 1: The symbol for used electrical and electronic products

Collection and disposal of old equipment

This symbol on the products, packaging, and/or accompanying documents means that used electrical and electronic products should not be mixed with general household waste.

For proper treatment, recovery, and recycling of old products, please take them to applicable collection points, in accordance with your national legislation and the Directives 2012/19/EU.

By disposing of these products correctly, you will help to save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.

For more information about collection and recycling of old products, please contact your local municipality, your waste disposal service, or the point of sale where you purchased the items.

Information on disposal in other countries outside the European Union

This symbol is only valid in the European Union. If you wish to discard these items, please contact your local authorities or dealer and ask for the correct method of disposal.

European Union and European Free Trade Association (EU & EFTA) compliance notices

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, ICELAND, LICHTENSTEIN, NORWAY, SWITZERLAND

Chapter 2. Overview

This chapter provides information about the kits, accessories, and supplies needed to install the XTEN-2000.

The SecureMesh XTEN-2000 serves as a relay node within the SecureMesh Wide Area Network (WAN) network. It communicates to other nodes using a 5 GHz WAN radio. The radio is connected to an internal array of eight, beam-switched, directional antennas to provide point to point capability with full 360° coverage.

The XTEN-2000 is powered via Power over Ethernet (PoE) through a single, weatherized Ethernet port located on the bottom of the enclosure. The power sourcing equipment (PSE) used to power the XTEN-2000 should be 802.3at compliant and should be capable of delivering 30W. A single client device can connect to the extender through the PSE's data port. Alternatively, client devices can connect through an external IP router or Ethernet switch.



Note: The PSE is not included with the XTEN-2000 and should be purchased separately. Refer to the Trilliant WAN Product Catalog for recommended PSE devices.

Ethernet cable

The Ethernet cable physically located between the PSE and the XTEN-2000 needs to be rated at 550 MHz or higher to fully support 1GbE speeds. An outdoor rated Cat6 or Cat6a network cable is the recommended choice.

The network cable should have:

- 23 AWG sized conductor pairs
- Outer jacket that is UV protected
- Outer shield (F/UTP or S/FTP are the most common types. S/FTP is preferred.)

Recommended Cat6 and Cat6a cables:

- Primus cable (model number C6CMXR-1069BK)
- trueCable (model number 6ESCMXUVBLK)
- Belden cable (model number 7953A)



Note: Always review the associated datasheet to ensure it complies with the necessary installation and operational temperature ranges, bend radius, and safety requirements needed for installation.

The maximum Ethernet cable length between the XTEN-2000 and the associated PSE is 328 ft (100 m).

Trilliant recommends that a surge suppressor is installed between the PSE and the XTEN-2000. The surge suppressor should be mounted adjacent to the XTEN-2000 so that the cable length can be kept short, for example < 6 feet/1.8 m. Refer to [Chapter 3](#) for additional information.

Cables without UV protection are acceptable, but should be installed inside a conduit to limit the exposure to sunlight and moisture.

Recommended non-UV Cat6 and Cat6a cables:

- Comtran, COM-Link series (model number 35930 (blue)/3593 (gray))
- trueCable (model number 6ESCMPBLU (blue))

Kits and accessories

The following table includes parts and model numbers for kits and accessories.

Table 2: Parts and model numbers

Parts	Model Number
Vertical pole mounting bracket	DK-0029A
Mounting pole	HM-0242A
Adjustable leveling bracket	HM-0288A
Ethernet surge suppressor	CMJ8-PoE-A-C5E (Citel)

Supplies

The following supplies are required for installation:

- Self-fusing rubber insulation and sealing tape, such as Scotch® 130C or 2228 Rubber Mastic Tape
- Electrical tape
- Ground wire, 10 AWG or larger, long enough to connect the Extender to the primary ground point on the structure and to earth ground
- Two 0.5" wide (13 mm) hose clamps (used for the Citel surge suppressor)
- Grounding clamp, size to fit the mounting pole
- Cable ties or Velcro wraps
- RTV silicone

Spare/replacement parts

The XTEN-2000 is not field-serviceable.



Warning: If the XTEN-2000 is damaged or a hardware fault or failure occurs, it must be replaced.

Chapter 3. Prepare for installation

This chapter provides information about the steps to prepare the site and the XTEN-2000 for installation.

Tools

Gather the following tools before installing the XTEN-2000:

- Magnetic level, such as McMaster-Carr Magnetic-backed bull's eye level, part number 3329A31.
- Screwdrivers: Phillips head, sizes #2 and #3
- Screwdriver: Flat blade, medium size
- Xacto knife
- Diagonal cutters
- 5/16" socket wrench or nut driver
- 3/8" socket wrench or nut driver
- 7/16" socket wrench or nut driver, or an adjustable open-end wrench
- For the Extender configuration: a test computer with a 2.4 GHz WiFi adapter, a terminal emulation program, a network interface card, and a web browser (a laptop is recommended for convenience).

Location requirements

Select a location that meets the following access guidelines:

- Conforms to all local electrical codes and ordinances.
- Either owned by the utility or where the utility has access rights.
- Able to provide adequate power.
- At least 18 ft (5.5 m) above ground level, although radio performance and coverage typically improve as the height increases.

- If needed, space to use a bucket truck.
- Allows access for normal maintenance.

Select a location that meets the following radio guidelines:

- The radio signals to and from the XTEN-2000 within the Fresnel zone will not be obstructed.
- Nearby structures do not block line-of-sight radio coverage.
- Clear of thick trees or brush at installation and in the foreseeable future. Foliage in the line of sight to other devices can degrade radio performance.
- An unobstructed view of the overhead sky for access to the strongest GPS signals. At startup, the XTEN-2000 searches for a GPS signal. If it cannot detect a signal, it cannot complete startup, establish wireless connections with other SecureMesh WAN devices, or establish time synchronization.

Grounding requirements

Identify the primary ground point for the XTEN-2000 location.



Warning: A proper ground protects both the XTEN-2000 and the equipment connected to it. Ground protection is essential if the Extender is installed on a tall structure or in an area where lightning occurs.

The techniques described here are general guidelines and do not constitute a comprehensive guide covering all installation scenarios. For maximum protection, and if lightning is a threat in your area, consult a specialist in lightning and transient protection who is familiar with your operating environment.

Grounding guidelines

To ensure optimal reliability, properly ground the metal base of the XTEN-2000. Use a 10 AWG or larger wire to connect it to the ground point on the structure. The three most common ground points include the following:

1. The primary ground point or down lead provided by the existing ground system at the site, such as a part of the tower structure or the AC electrical system for the building (see [Figure 2](#)).
2. A 10-foot or longer copper-clad ground rod, driven into the earth. At a tower with multiple legs, there typically is one ground rod at each leg and a ground wire loop that connects the rods.
3. A cold water pipe that is well-connected to earth.

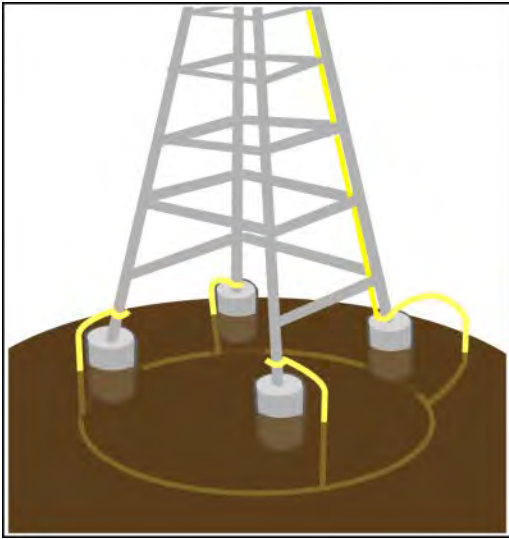


Figure 2: Tower ground system

In all cases, ensure that the connections can retain low resistance and integrity over time and with exposure to the elements. Use an antioxidant compound and wrap all connections with a product such as Scotch® 130C or 2228 Rubber Mastic Tape.

Grounding checklist

To confirm that the XTEN-2000 is adequately protected from power surges and lightning, ensure the following:

Table 3: Grounding checklist

Status	Checklist Item
	Install all lightning and surge suppression devices in accordance with UL 96A installation requirements for lightning protection systems and the NFPA 780 standard for lightning protection.
	Verify that all points of the ground system are tied together with less than 5 Ω resistance between any two points.
	Connect a ground wire from the XTEN-2000 to the ground system on the utility pole, tower, or building.
	When installing outdoor Ethernet cable, use UV protected, STP, Cat6 cable that includes a drain wire. Connect the drain wire and the cable shield to the ground lug inside the surge suppressor. Leave the end of the drain wire at the power source unconnected.
	(Additional requirement): To connect the XTEN-2000 on a roof or tower to the ground system, use a 10 AWG or larger down-lead.
	(Additional requirement): Route the Cat6 cable inside the tower and tie the cable to the tower leg at 4 foot intervals. For increased protection, run the Cat6 cable through metallic conduit installed on the tower.

Extender components

The following figures display the parts contained in the XTEN-2000 accessory kit.



Figure 3: Extender accessory kit contents

Accessory kit parts:

1. Clamp mount and clamp bracket
2. Accessory bag with screws, bolts, nuts and washers
3. Field installable RJ45 connector



Figure 4: Accessory bag with screws, bolts, nuts and washers

Screws, bolts, nuts and washers:

1. 1/4-28 hex head bolts, 1" and 2"
2. 1/4-20 pan head screws, 0.75"
3. 1/4" lock washers and flat washers
4. Ground lug

Preparing the extender

Follow the steps below to configure and prepare the XTEN-2000 prior to installation.



Note: It is recommended that you complete these steps in a lab or workshop before arriving at the permanent installation site.

[Figure 5](#) represents the basic XTEN-2000 configuration and wiring. The following steps describe the attachment of the mounting clamp and surge suppressor and the assembly of the device side cable (DSC).

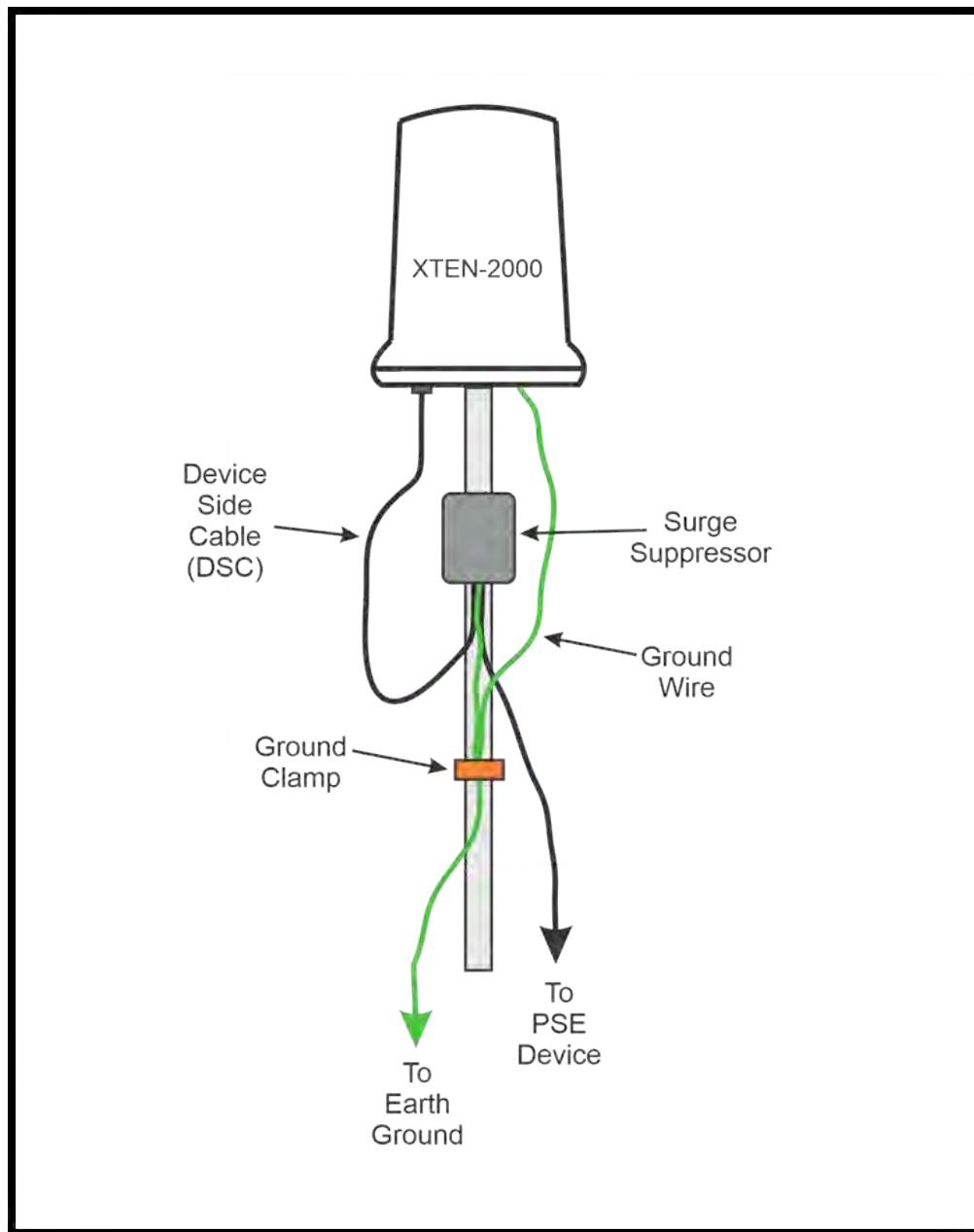


Figure 5: Typical site wiring for XTEN-2000

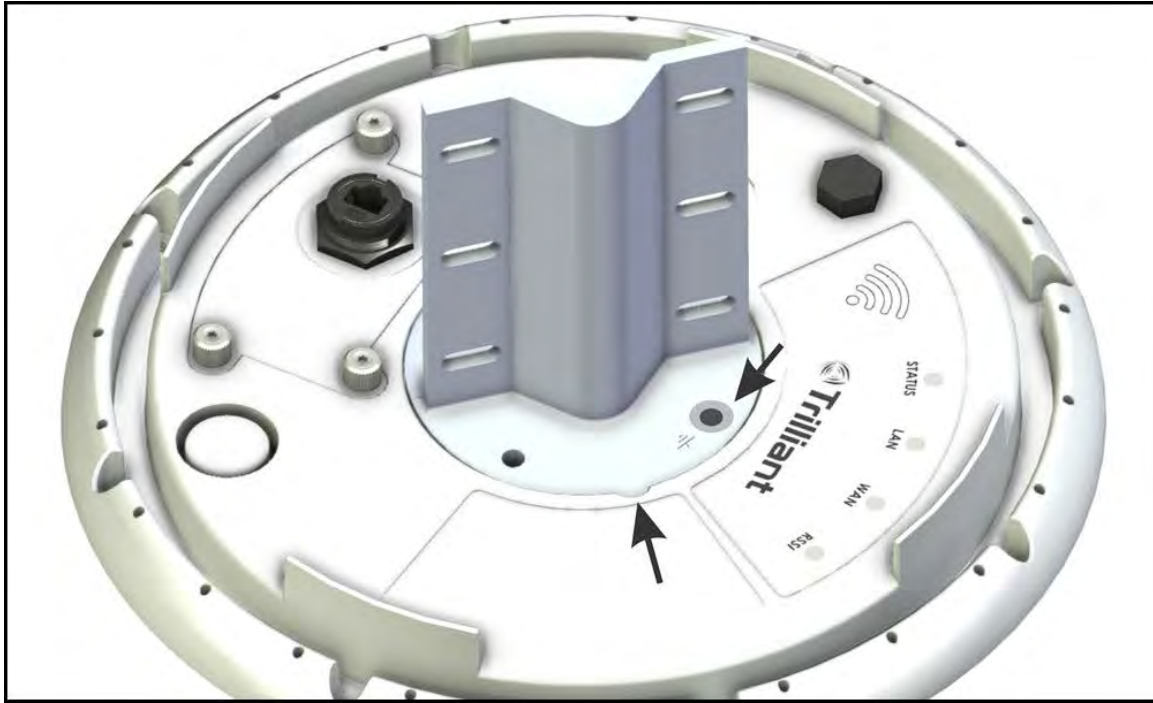


Figure 6: Bottom view of the XTEN-2000 base enclosure

1. Turn the XTEN-2000 upside down to attach the pole clamp mount to the base of the XTEN-2000.
2. Align the rounded point on the clamp mount with the notch on the base of the XTEN-2000 (see [Figure 6](#)).
3. Attach the clamp mount to the base using three of the 1/4-20 x 0.75" screws, 1/4" lock washer, and 1/4" a flat washer. Do not insert a screw and washers into the mounting hole next to the ground symbol.
4. Place the stainless steel clamp mount bracket next to the pole clamp mount, and align the six slots in the clamp with the six threaded inserts in the bracket.
5. Insert a 1/4-28" bolt through each of the slots and partially thread it into the bracket's threaded insert. Use a 1/4" flat and lock wash on each bolt to protect the clamp's painted surface, and to help secure the bolt. Repeat for the remaining five bolts.
6. There are two lengths of 1/4-28" bolts provided in the accessory kit. Use the proper length bolt to match the site's pole diameter.

Optional steps for using a short mounting pipe

Follow these optional steps if you use a short mounting pipe.

1. Insert the short mounting pipe into the clamp mount/bracket assembly.
2. Ensure the pipe sits fully against the bottom of the clamp mount.
3. Hand-tighten the six 1/4-28" bolts so that the stainless steel mounting bracket is parallel to the pole mount clamp, and the spacing on each side is roughly the same.

Preparing the Device Side Cable (DSC)

The Device Side Cable (DSC) is the short Cat6 cable between the XTEN-2000 and the surge suppressor. It is terminated on one end with an Amphenol LTW IP-67 rated circular connector. The circular connector comes with the XTEN-2000 accessory kit. The other end of the DSC is terminated with a shielded RJ45 connector and attaches to the surge suppressor.

The component parts of the Amphenol LTW circular connector are shown below in [Figure 7](#) . The circular connector is designed to accept a standard size RJ45 connector and provide a watertight seal when the coupling nut is tightened.



Figure 7: Components

It is recommended that you build the DSC prior to mounting the XTEN-2000 in the field.

Steps to Prepare the DSC

1. Remove the paper backing on the flat rubber seal and position the seal on the face of the connector body (see [Figure 8](#)).



Note: Ensure the notch in the rubber seal is aligned with the notch in the connector body and that the seal is centered on the face of the connector.

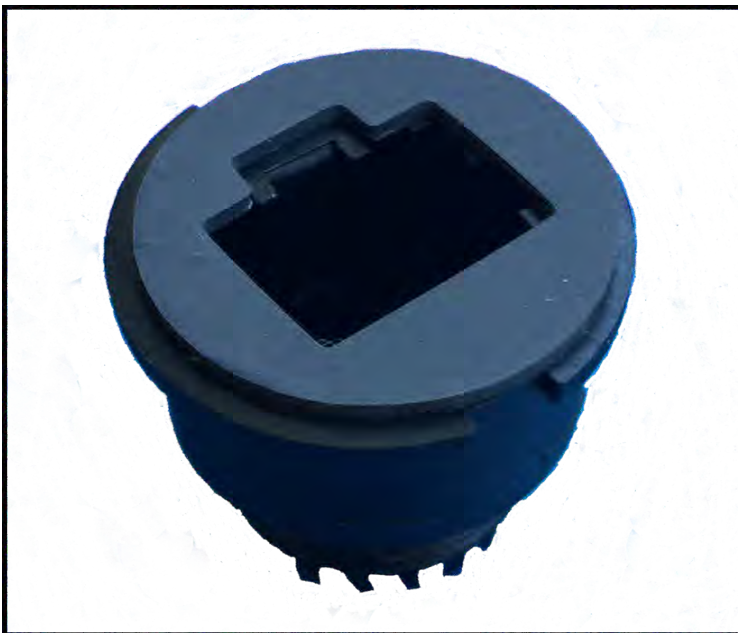


Figure 8: Seal

2. Slide the coupling nut over the connector body.
3. Align the two small ribs in the coupling nut to the two slots in the connector body.
4. Push the coupling nut towards the mating side of the connector body. Once the nut clicks into place, it should turn freely and remain tethered to the connector body.

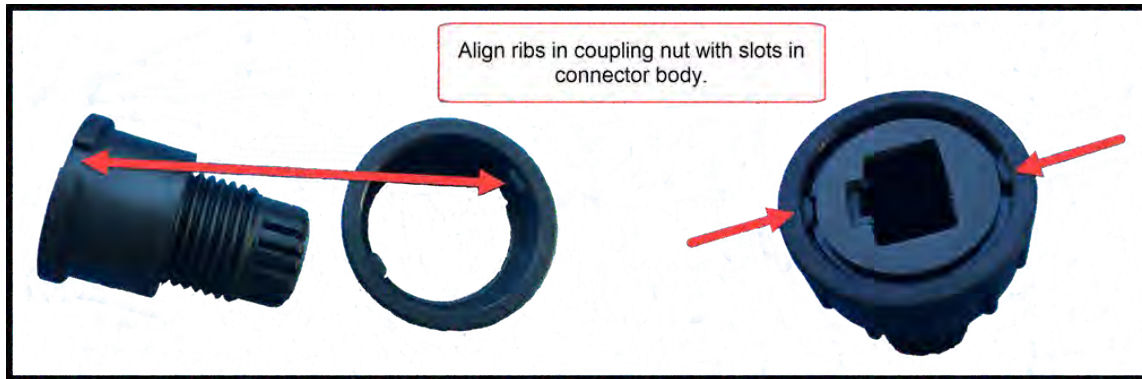


Figure 9: Align the ribs in the coupling nut

5. Feed the Cat6 cable through the strain relief, round rubber seal, and connector body in the order shown in [Figure 9](#).



Figure 10: Proper order of connector body, rubber seal, and strain relief

6. Trim the Cat6 cable to the appropriate length so that it can connect between the XTEN-2000 and the surge suppressor, while forming a drip loop and adequate service loop.
7. Terminate both ends of the Cat6 cable with a Shielded RJ45 connector.



Note: Ensure the RJ45 shield frame is connected to the Cat6's foil shield or drain wire.

8. Slide the round rubber seal down the cable so that it sits fully inside the connector body and underneath the plastic fingers (see [Figure 11](#)).



Figure 11: Rubber seal sits inside connector body

9. Thread the strain relief onto the connector body and tighten a few turns (see [Figure 12](#)).



Note: Do not fully tighten the strain relief at this time.

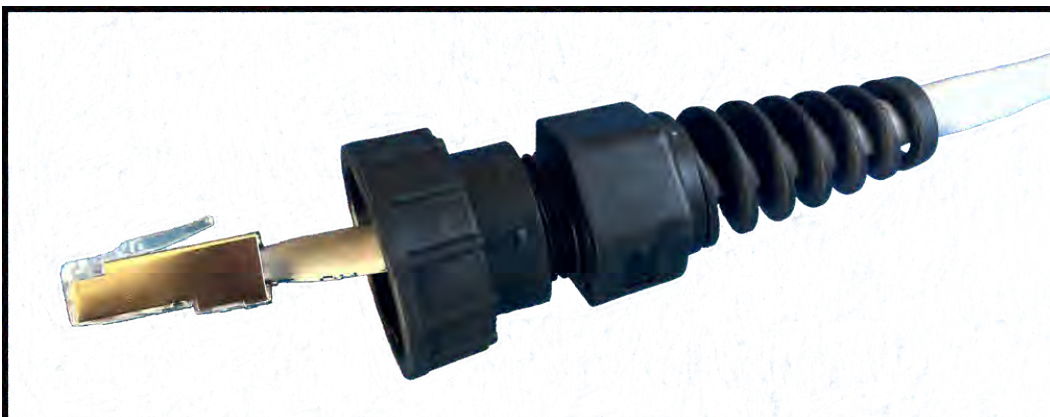


Figure 12: Strain relief on the connector

Preparing the surge suppressor

Although the XTEN-2000 has an integrated surge module, Trilliant recommends installing an external Ethernet surge suppressor as a second level of protection, especially on tower deployments.



Caution: The surge suppressor must support 10/100/1000 Ethernet data rates and PoE Type A power.

Ethernet surge suppressor (CMJ8-PoE-A-C5E)

The following section describes the installation of the Citel CMJ8-POE-A-C5E 10/100/1000 surge suppressor.

Trilliant recommends mounting the surge suppressor below or near the XTEN-2000, and connecting it using a Cat6 shielded cable. The length of the Device Side Cable needs to be kept to a minimum, but long enough to form a drip loop below the surge suppressor. Use UV protected, shielded (F/UTP or S/FTP) Cat6 cable to connect the XTEN-2000 to the surge suppressor and to the PSE. The Cat6 cable needs to have shielded RJ45 jacks on both ends. The connector shield frame of the RJ45 needs to be bonded to the outer shield/drain wire of the Cat6 cable.



Note: The maximum allowable cable length between the XTEN-2000 and the PSE is 328 ft (100 m).

1. Mount the Citel surge suppressor to the vertical mounting pole of the XTEN-2000 using two stainless steel 5/16" or 1/2" wide hose clamps (see [Figure 13](#)). Mount the surge suppressor close to the XTEN-2000 to keep cable runs short.



Figure 13: The citel surge suppressor mounted to the pole

2. Open the Citel surge suppressor by loosening the screw on the door and depressing the side latch.
3. Remove the D shaped, black rubber gasket at the bottom.
4. With a sharp tool such as an Xacto knife, create a small “X” pattern in the gasket (see [Figure 14](#)).

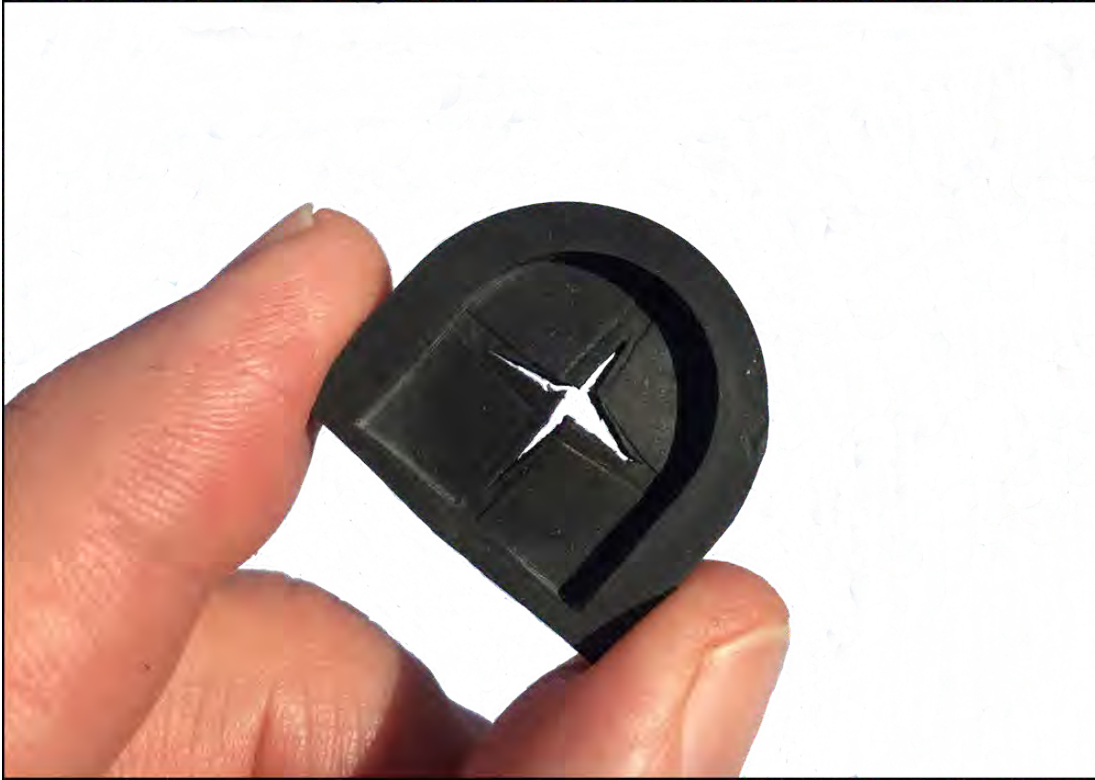


Figure 14: Rubber gasket

5. Connect a 10 AWG ground wire to the surge suppressor's middle ground nut using a 1/4" size crimp-on terminal lug (see [Figure 15](#)).
6. Feed the ground wire through the X that was cut in the black gasket.
7. Slide the black gasket back into place on the surge suppressor. Tighten the nut using a 3/8" nut driver (see [Figure 15](#)).



Figure 15: Ground wire installed on surge suppressor

8. Attach a grounding clamp to the mounting pole below the surge suppressor.
9. Trim the ground wire added in Step 5 to the appropriate length so that it can attach to the grounding clamp.
10. Strip the insulation from the grounding wire and attach to the clamp using the bonding screw (see [Figure 16](#)).



Figure 16: Assembled surge suppressor

11. A second ground wire is required to run from the base of the XTEN-2000 to the same grounding clamp. Trim a second 10 AWG wire to the appropriate length so that it can connect to the base of the XTEN-2000.
12. Attach one end of the ground wire to the grounding clamp.
13. Terminate the XTEN-2000 end of the ground wire with another 1/4" size crimp-on terminal lug or, optionally, strip approximately 3/8" of insulation from the end (see [Figure 17](#)).



Figure 17: Attach the ground wire

14. To attach the ground wire to the XTEN-2000, follow one of the steps below:
 - a. If the ground wire was terminated with a crimp lug, attach the ground wire to the XTEN-2000 at the pole mount clamp using a 1/4-20 screw, 1/4" flat washer, and 1/4" lock washer from the accessory kit.
 - b. If the ground wire end was stripped, attach the ground wire to the XTEN-2000 at the same location and with the same hardware, but use the solderless grounding lug (see [Figure 18](#)).

Note: For the surge suppressor to work properly, there must be a low impedance path from the surge suppressor network to earth ground.



In the case of a wooden or insulated mounting structure, a 10 AWG or larger ground wire needs to be added from the grounding clamp, which forms the common ground node, to earth ground. Consult with a professional engineer if you are unsure about the grounding path.

If the PSE is connected to the XTEN-2000 with a long cable run and/or is inside a building, Trilliant recommends adding a second Ethernet surge suppressor outside the building at the ingress point.

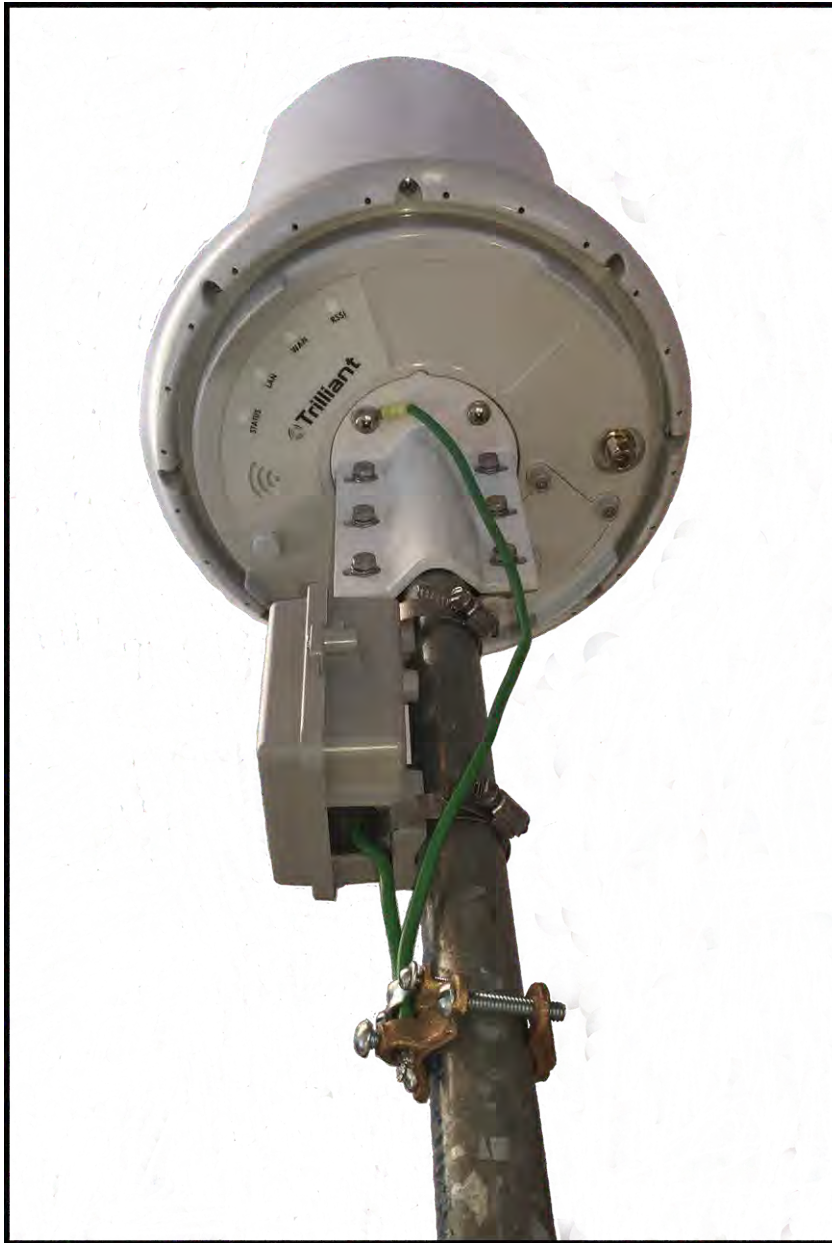


Figure 18: Ground wire attached to base enclosure

15. Identify the RJ45 connector labeled JP2 inside the Citel suppressor. JP2 is the port that connects to the XTEN-2000.
16. Feed the Cat6 DSC's RJ45 connector through the black gasket in the surge suppressor.



Note: It is recommended to remove the gasket in order to insert the RJ45 connector.

17. Mate the RJ45 connector to JP2.
18. Repeat steps 15 and 16 for the Cat6 cable that connects to the PSE. It should connect to JP1.
19. Slide the black gasket back into place.



Note: Ensure both RJ45 connectors are fully mated and latched.

20. Double check that the nut on the surge suppressor's grounding stud is tight.
21. Close the surge suppressor door and tighten the latching screw.
22. Mate the Cat6 DSC to the bulkhead RJ45 connector on the bottom of the XTEN-2000.



Note: Before connecting the DSC, make sure the end of the plastic locking tab on the RJ45 is inside the body of the connector. If the locking tab is not inside, it can snap off when the coupling nut is tightened. Also, ensure the strain relief nut is not tight and that the Cat6 cable is free to move.



Note: Make sure you align the mating halves of the RJ45 connectors before inserting the connector.

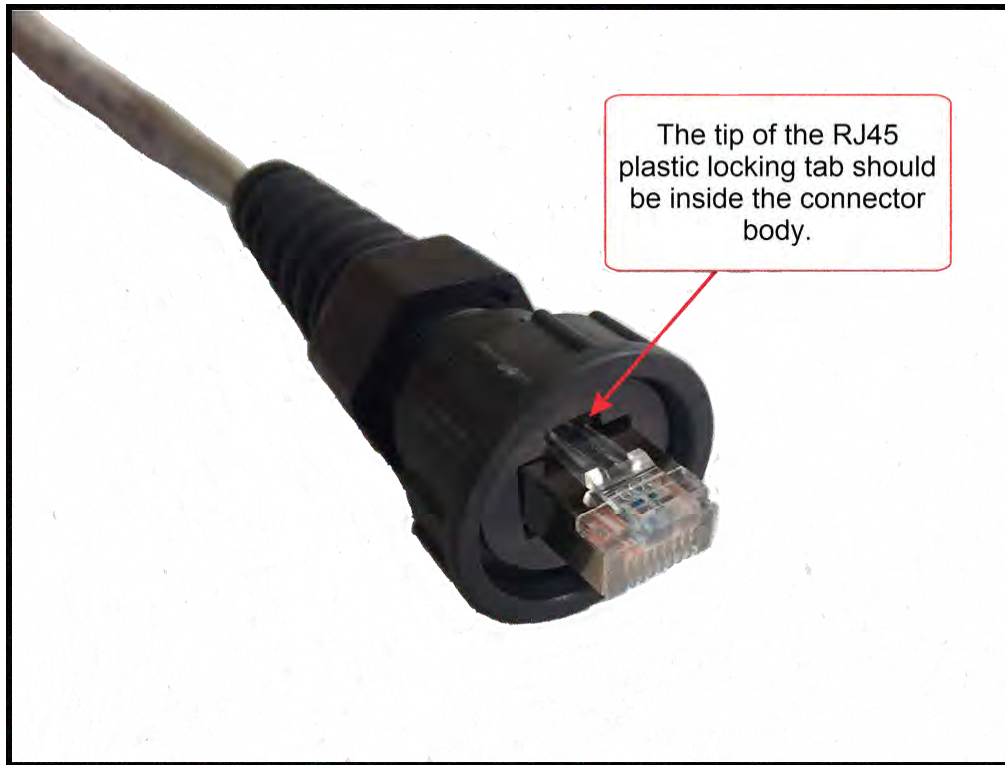


Figure 19: RJ45 locking tab

24. Align the DSC connector with the bulkhead connector of the XTEN-2000, and slide the DSC connector's RJ45 into the mating bulkhead connector on the surge module.

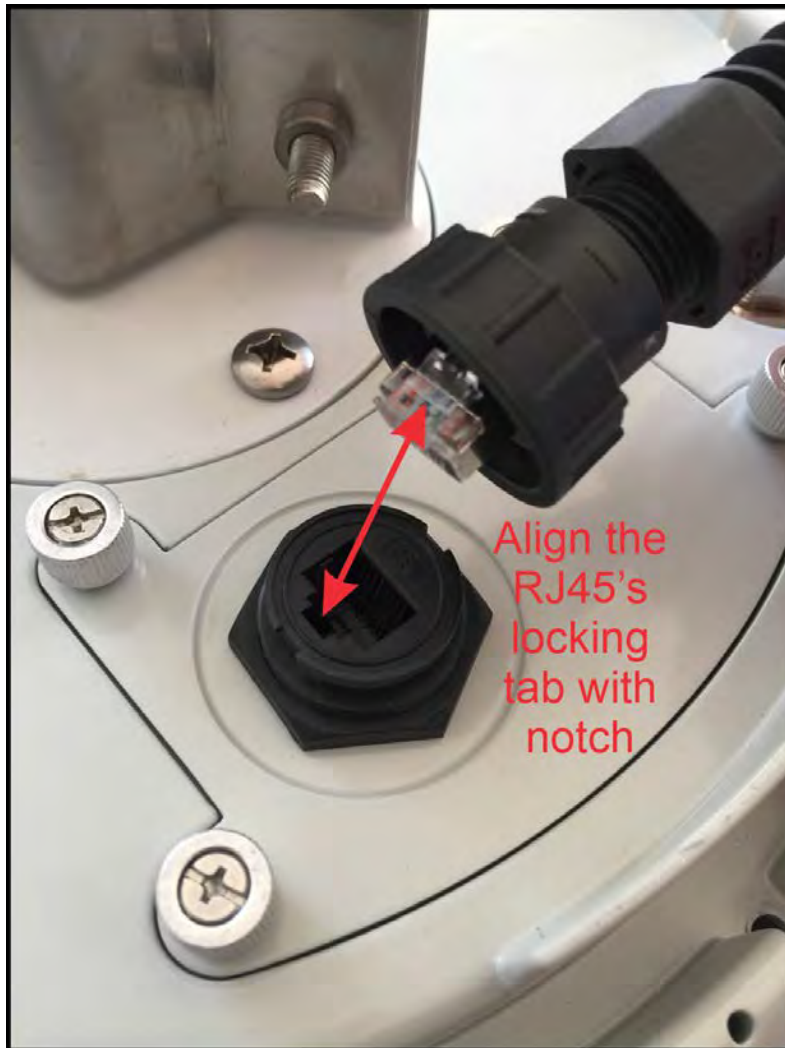


Figure 20: Align the locking tab with the notch

25. Then slide the connector body and coupling nut down to engage with the bulkhead connector. The strain relief should be loose at this point.
26. Turn the coupling nut clockwise to lock the connector in place.
27. After that, tighten the strain relief nut to compress the rubber seal against the cable.



Note: The coupling nut should turn approximately 180 degrees, and stop when fully mated.

28. Also ensure that the surge module's four panel fasteners are secure and fully threaded.

Setting the configuration

Each XTEN-2000 is shipped from the factory with its configuration set to factory default values. Prior to deployment and installation, certain operating parameters may need to be configured. For details on parameters and setting the configuration, see the following applications and manuals:

- Administrator Guide for SecureMesh WAN and NEMS
- Command Line Interface Reference

The XTEN-2000 can be configured using a Telnet connection either through the RJ45 port, or through a wireless link via the internal WiFi radio. The following section outlines the Telnet connection through the RJ45 port. The basic Telnet setup is shown in [Figure 21](#). Use the Cat5 or Cat6 Ethernet cables to connect the PSE to the XTEN-2000 and the test computer.

1. Plug one Ethernet cable into the data port on the PSE. Plug the other end of the cable into the test computer's wired network port.
2. Then plug a second Ethernet cable into the data/power port on the PSE. Plug the other end of the cable into the RJ45 port on the XTEN-2000.
3. Apply input power to the PSE, and wait approximately 120 seconds for the XTEN-2000 to fully boot before attempting to connect via Telnet.

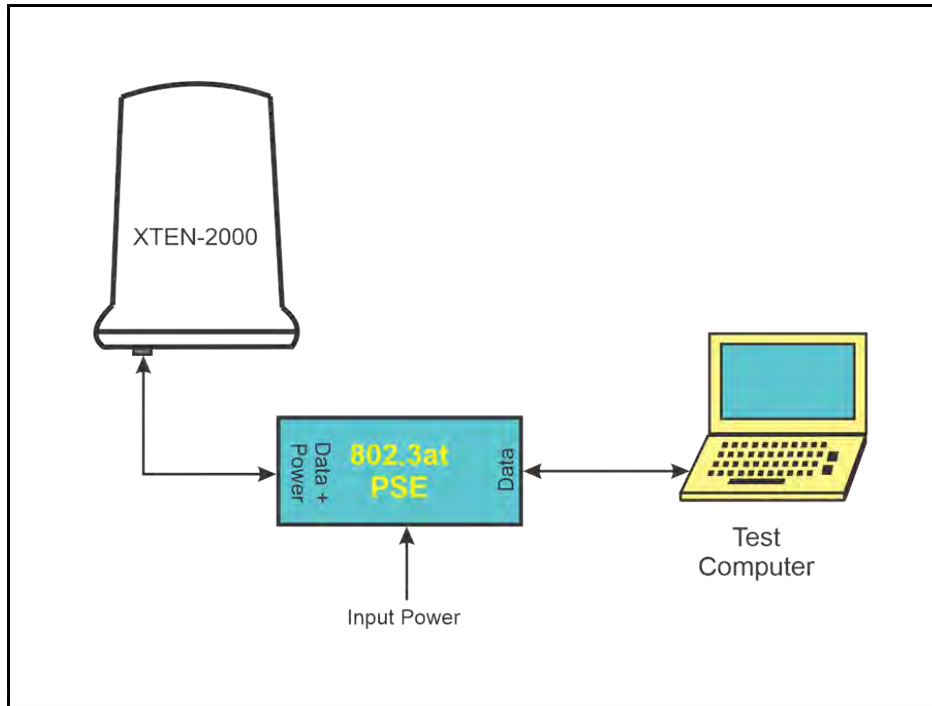


Figure 21: XTEN-2000 power injector and test computer

Extender parameters

1. Using TeraTerm, SecureCRT, or a similar terminal emulator program, establish a Telnet session to the Extender using its configured IP address. The default IP address is 192.168.0.2.
2. When prompted, enter the CLI password. The default password is **public**.
3. Refer to the Command Line Reference (CLI) Guide for a list of parameters that can be configured.

Chapter 4. Mount the extender

This chapter describes the steps to mount the XTEN-2000 on a pole or tower.

Attach the extender to a pole or tower

Prepare the mounting location on the pole or tower, then mount the XTEN-2000 using the following instructions as a general guideline. These steps detail the use of Trilliant part numbers DK-0029A, HM-0242A, and HM-0288A.

1. Mount the extension arm on the utility pole or tower with either bolts or bands (for concrete poles).

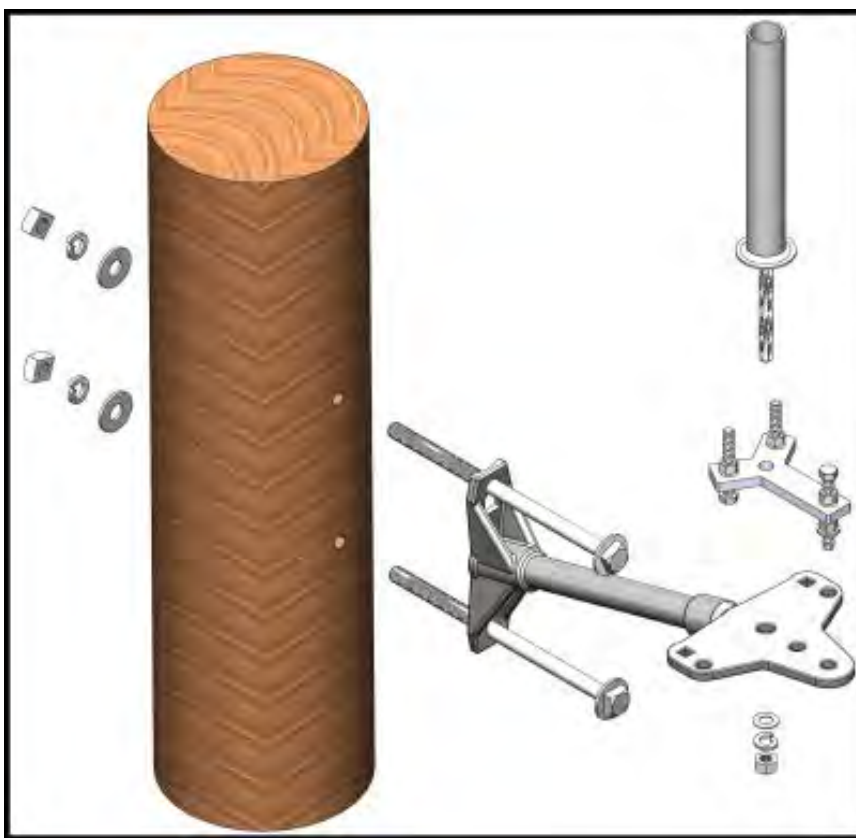


Figure 22: Typical hardware for mounting the XTEN-2000 on a pole or tower

2. Place the Y-shaped, adjustable leveling bracket on the outer end of the extension arm (see [Figure 23](#)).

- At the ends of the “Y,” place the heads of the bolts on the extension arm.
- Place the threaded end of the bolt with the solder nut through the outer-most hole in the extension arm.
- Align the center holes for the mounting pole.



Figure 23: Leveling bracket on the extension arm

3. Place the magnetic level near the center hole on the adjustable leveling bracket.



Figure 24: Magnetic level on adjustable leveling bracket

4. Adjust the three bolts until the bracket is level.
5. Place the vertical mounting pole through both center holes (see [Figure 25](#)).

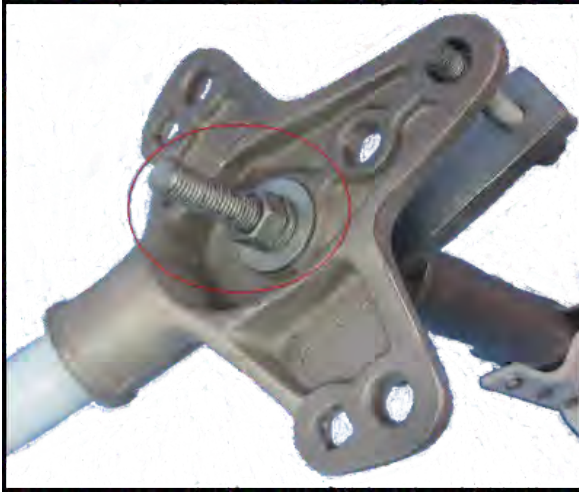


Figure 25: Nut and washers on mounting pole; extension arm, and leveling bracket

6. Secure the XTEN-2000 mounting pole with washers and a nut.
7. Attach the XTEN-2000 to the vertical pole using the pole clamp mount and bracket, and follow the steps in Chapter 3, [Preparing the surge suppressor](#).



Figure 26: Typical installation: XTEN-2000 mounted on pole

Chapter 5. Commission the extender

This chapter provides the steps to connect power to the XTEN-2000 and prepare it for normal operation.

LED indicators

The XTEN-2000 has four multi-colored LEDs on the enclosure base. When the XTEN-2000 is powered up by the PSE, a power-on sequence starts automatically.

The STATUS, LAN, WAN, and RSSI LEDs change color as the XTEN-2000 progress through the boot up sequence. The boot up sequence can take up to 120 seconds.



Figure 27: LED faceplate

When power is first applied, the STATUS, LAN, WAN, and RSSI LEDs are all illuminated white for about one second. Then, one at a time in sequence, the LEDs change from white to blue. After all the LEDs are blue, they change one at a time in sequence to green. Once the XTEN-2000 has fully booted, the STATUS LED should be illuminated in green.



Note: At this time, the LAN, WAN, and RSSI LEDs might be on or off, depending on the functional state of the XTEN-2000.

As the XTEN-2000 searches for a neighboring SecureMesh relay node, the WAN and RSSI LEDs begin to flash, and may change color.

If a client device is connected to the XTEN-2000, and there is a valid Ethernet link, the LAN LED displays in yellow and occasionally blinks. Refer to [Tables 4-7](#) for a full description of LED functionality and device status.

When an active wireless link to another node is established, the WAN LED displays in solid blue. The RSSI LED changes color and blinks, depending on the receive strength level from the neighboring node. Refer to [Table 7](#) for more details.



Note: The default configuration of the XTEN-2000 turns all four LEDs off after 120 minutes. This feature can be disabled by using the **set prov LED** command via the CLI interface.

Startup in cold conditions

In extremely cold conditions, the XTEN-2000 radio module must self-warm before the device can be used. This process may take several minutes, depending on the environment.

While waiting for the unit to warm up, all LEDs will display in solid green except for the WAN LED. The WAN LED should flash from green to yellow. After the radio warms up to the acceptable temperature, the XTEN-2000 will start the normal boot process, and the LEDs change from white to blue and then to green.

Table 4: STATUS function for normal operating mode

Function	Color(s)	LED State	Condition/Status
STATUS	Green or red	Off	Power is off.
		On green	Power is on; normal operation.
		On green WAN LED flashes from green to yellow.	Cold threshold cycling from off to on. Set Cold and Heater Off threshold to these temperatures: Cold threshold (from -10 to -20 °C) Heater off threshold (from 0 to -20 °C)

Table 5: LAN function for normal operating mode

Function	Color(s)	LED State	Condition/Status
LAN	Amber	Off	Ethernet port is not connected.
		On/steady flashing Or amber flash at variable rate proportional to LAN activity.	Ethernet is connected with LAN activity.

Table 6: WAN function for normal operating mode

Function	Color(s)	LED State	Condition/Status
WAN	Blue or red	Off	Disconnected from parent device; offline.
		Flashing blue at 0.33 Hz or once every 3 seconds.	Non-operational state. Acquiring link to parent device.
		Flashing blue at 1 Hz or once every second.	Pre-authorization state.
		Flashing blue at 4 Hz or 4 times every second.	Standby operational state. Acquiring link to parent device.
		On solid blue	Parent device connected. Active link established.
		On red	Provisioning or authorization failure.

Table 7: RSSI function for normal operating mode

Function	Color(s)	LED State	Condition/Status
RSSI	Amber or green	Both amber and green off	No links
		Flashing amber at 1 Hz	LRRSSI is 9 or lower.
		On amber	LRSSI is 10 - 19.
		Flashing green at 1 Hz	LRSSI is 20 - 29.
		On green	LRSSI is 30 or larger.

Accessing the CLI using WiFi

The CLI interface is also provided by an internal WiFi module. The module enables a WiFi connection using a Service Set Identifier/Pre-Shared Key (SSID/PSK). After establishing a connection via WiFi, a Telnet connection can be opened by using a pre-configured IP address as described in the following tables ([Table 8](#), [Table 9](#), [Table 10](#), and [Table 11](#)).

Use the following list of commands to configure the Serial to WiFi parameters manually, to change the active configuration, and or the persistent configuration.



Note: Changing the active configuration will cause the Serial to WiFi module to reset.

Steps

Use the following steps to access the CLI using WiFi.



Note: These steps assume that you are connecting to a XTEN-2000 configured with factory default WiFi settings.

1. From a client WiFi device, search for the SSID of the extender, the factory assigned MAC address. The password/Pre-Shared Key (PSK) is Trilliantxxxxxx, where xxxxxx are the last 6 characters of the MAC address.

Example:

- SSID: 000ADBDA0175
 - PSK: TrilliantDA0175
2. Wait for the WiFi connection to be established.
 3. Use a telnet client, like PuTTY, to connect to the default IP address of 192.168.4.1.
 4. When prompted, enter the CLI password. The default password is **public**.

Table 8: show wifi

Command	Description
<code>show wifi</code>	Shows the current WiFi configuration and status information.
Configuration	Description
Interface	Indicates whether the WiFi interface is enabled or disabled.
SSID	Indicates the string of alphanumeric character that specifies.
PSK	Indicates the string of plain-English passphrase characters that specifies the Pre-Shared Key which must be between 8 and 63 characters long.

Command	Description
IP address	Indicates the IP address to which the Telnet session must be established over the WiFi interface in order to access the CLI of the unit.
Subnet mask	Indicates the IP address mask of the WiFi interface.
Gateway	Indicates the IP address of the gateway of the WiFi interface.
Channel	Indicates the channel of the WiFi interface which is a string of numeric characters in between 1 and 13 inclusively (channels 12 and 13 are region dependent).
Timeout	Indicates the Telnet client timeout in minutes. 0 indicates timeout feature disabled.
Status	Description
User	Indicates whether a user is presently connected to the WiFi interface.
Uptime (in seconds)	Indicates the number of seconds since a present user connected to the WiFi interface.
Firmware version	Indicates the firmware version of the WiFi module.
Synopsis	<code>show wifi [config status]</code>

Table 9: show prov wifi

Command	Description
<code>show prov wifi</code>	Shows the flash WiFi settings.
Configuration	Description
Interface	Indicates whether the WiFi interface is enabled or disabled.
SSID	Indicates the string of alphanumeric character that specifies the Service Set Identifier which can be at most 32 characters long.
PSK	Indicates the string of plain-English passphrase characters that specifies the Pre-Shared Key which must be between 8 and 63 characters long.
IP address	Indicates the IP address to which the Telnet session must be established over the WiFi interface in order to access the CLI of the unit.
Subnet mask	Indicates the IP address mask of the WiFi interface.
Gateway	Indicates the IP address of the gateway of the WIFI interface.
Channel	Indicates the channel of the WiFi interface which is a string of numeric characters in between 1 and 13 inclusively (channels 12 and 13 are region dependent).
Timeout	Indicates the Telnet client timeout in minutes. 0 indicates timeout feature disabled.
Synopsis	<code>show prov wifi</code>

Table 10: set wifi

Command	Description
<code>set wifi</code>	Sets the current WiFi settings. New settings are not stored in flash memory.
Configuration	Description
Interface	Indicates whether the WiFi interface is enabled or disabled.
SSID	Indicates the string of alphanumeric character that specifies the Service Set Identifier which can be at most 32 characters long.
PSK	Indicates the string of plain-English passphrase characters that specifies the Pre-Shared Key which must be between 8 and 63 characters long.
IP address	Indicates the IP address to which the Telnet session must be established over the WiFi interface in order to access the CLI of the unit.
Subnet mask	Indicates the IP address mask of the WiFi interface.
Gateway	Indicates the IP address of the gateway of the WiFi interface.
Channel	Indicates the channel of the WiFi interface which is a string of numeric characters in between 1 and 13 inclusively (channels 12 and 13 are region dependent).
Timeout	Indicates the Telnet client timeout in minutes. 0 indicates timeout feature disabled.
Synopsis	<code>set wifi</code>

Table 11: set prov wifi

Command	Description
<code>set prov wifi</code>	Sets the flash Wifi settings. New settings are stored in flash memory, and require a reboot/power cycle to become active.
Configuration	Description
Interface	Indicates whether the WiFi interface is enabled or disabled.
SSID	Indicates the string of alphanumeric character that specifies the Service Set Identifier which can be at most 32 characters long.
PSK	Indicates the string of plain-English passphrase characters that specifies the Pre-Shared Key which must be between 8 and 63 characters long.
IP address	Indicates the IP address to which the Telnet session must be established over the WiFi interface in order to access the CLI of the unit.
Subnet mask	Indicates the IP address mask of the WiFi interface.
Gateway	Indicates the IP address of the gateway of the WiFi interface.
Channel	Indicates the channel of the WiFi interface which is a string of numeric characters in between 1 and 13 inclusively (channels 12 and 13 are region dependent).
Timeout	Indicates the Telnet client timeout in minutes. 0 indicates timeout feature disabled.
Synopsis	<code>set prov wifi</code>

Chapter 6. Specifications

This chapter provides reference information for the XTEN-2000.

Pinouts

The following table lists the signals and pins for a RJ45 connector.

Table 12: RJ45 pins and/or signals

Pin	Assignment
1	Ethernet data (A+) Power2 (+)
2	Ethernet data (A-) Power2 (+)
3	Ethernet data (B+) Power2 (-)
4	Ethernet data (C+) Power (+)
5	Ethernet data (C-) Power (+)
6	Ethernet data (B-) Power2 (-)
7	Ethernet data (D+) Power (-)
8	Ethernet data (D-) Power (-)