

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

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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-x), read the instructions in this document.



- refer to text in an accompanying 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-x 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-x 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, UKCA Marks
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 WIFI module: FCC ID: 2AC7Z-ESPWROOM02 IC: 21098-ESPWROOM02
Safety	UL 62368-1, UL 60950-22 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 licenseexempt 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, CROATIA, CYPRUS, CZECH REPUBLIC,

DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY,
IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS,
POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN,
ICELAND, LICHTENSTEIN, NORWAY, SWITZERLAND

Chapter 2. Overview

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

The SecureMesh XTEN-2000-x 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.



Note: The XTEN-2000-F is powered via a 48Vdc supply. The power supply should be capable of delivering 30W. The data is transferred through a fiber optic cable which can be connected to a Gigabit Ethernet media converter. The power supply and the media converter are not included and should be purchased separately. Refer to the Trilliant product catalog for more information.

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-B-C5E (Citel)
SecureMesh Power Service Unit	PSU-2000 with fiber optic kit for fiber optic model
Power over Ethernet Injector	Indoor 802.3 at power supply: 521-R0662-01 (MicroSemi : PD-9001GR/AT/AC)

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 Extender is not field-serviceable.



Warning: If the Extender 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-x for installation.

Tools

Gather the following tools before installing the XTEN-2000-x:

- 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
- X-Acto 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.



Note: The 802.3 at PSU (PSU-2000) requires 90-265 Vac 50/60 Hz power.



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.

- 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-x 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-x 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-x location.



Warning: A proper ground protects both the XTEN-2000-x 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-x. 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.

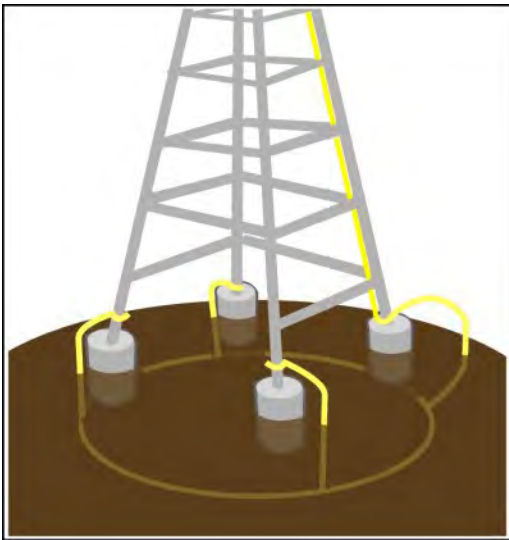


Figure 2: Tower ground system

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-x 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-x to the ground system on the utility pole, tower, or building.
	PoE models only: 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-x on a roof or tower to the ground system, use a 10 AWG or larger down-lead.
	(Additional requirement for PoE models only): 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-x 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 PoE model

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).

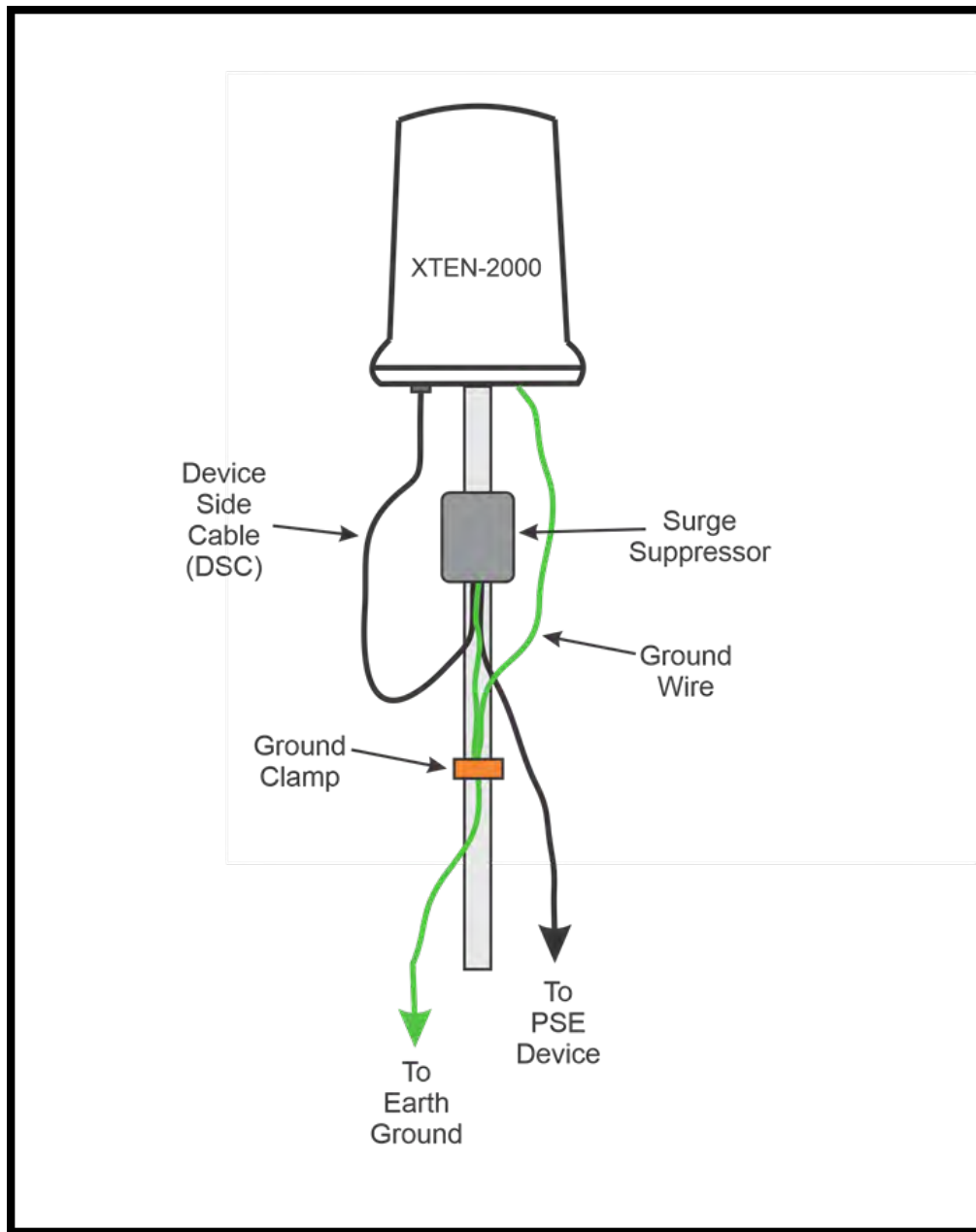


Figure 5: Typical site wiring for XTEN-2000

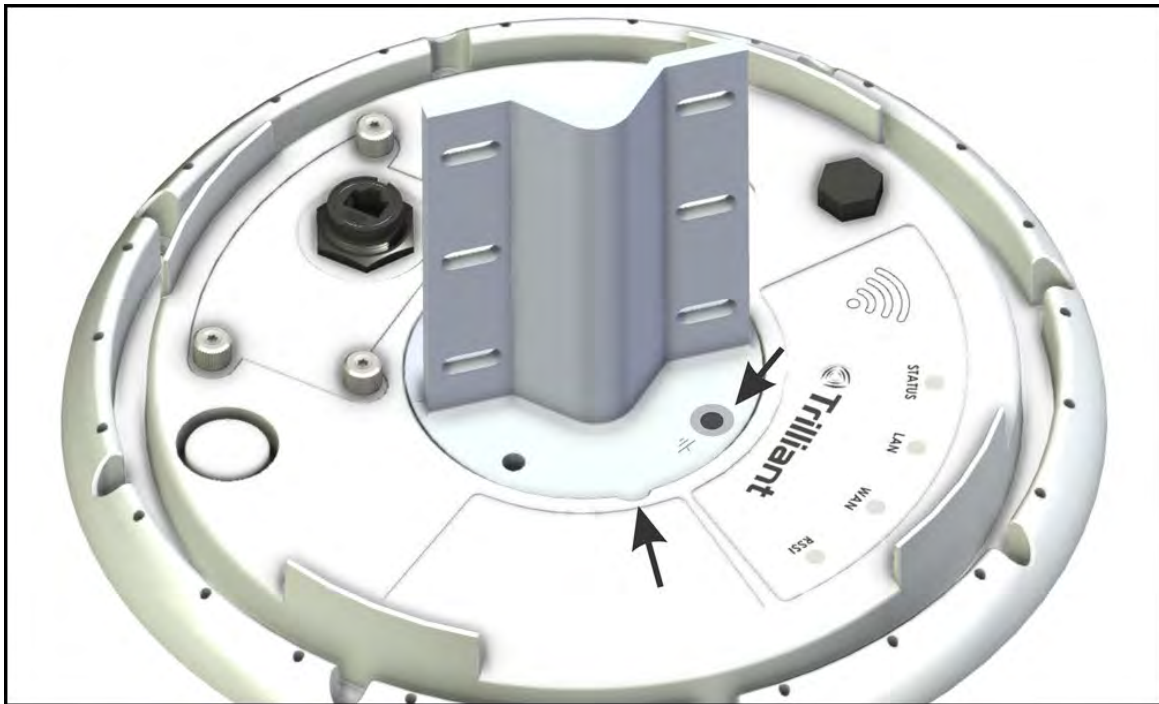


Figure 6: Bottom view of the XTEN-2000 base enclosure

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.

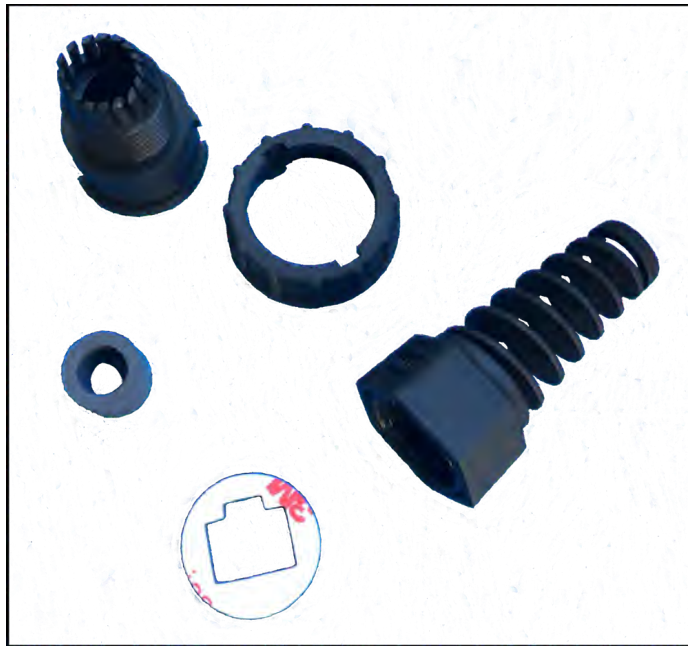


Figure 7: Components

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.

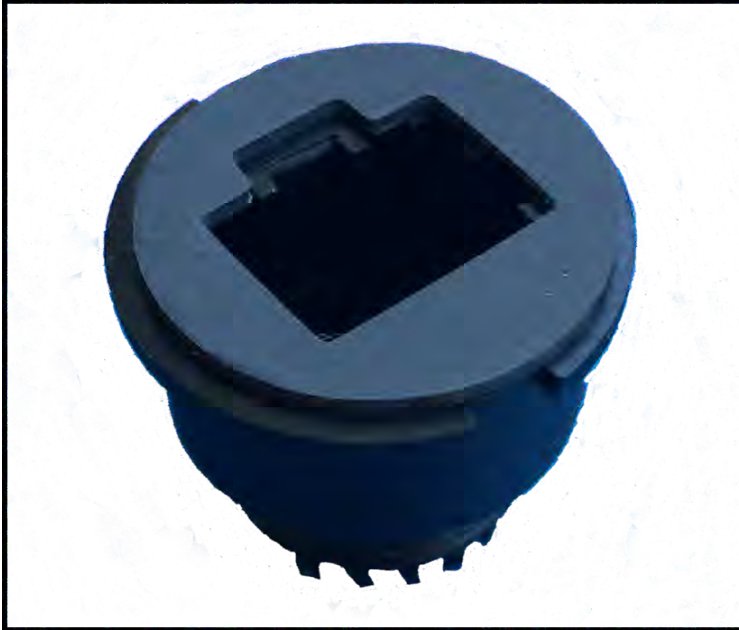


Figure 8: Seal

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.

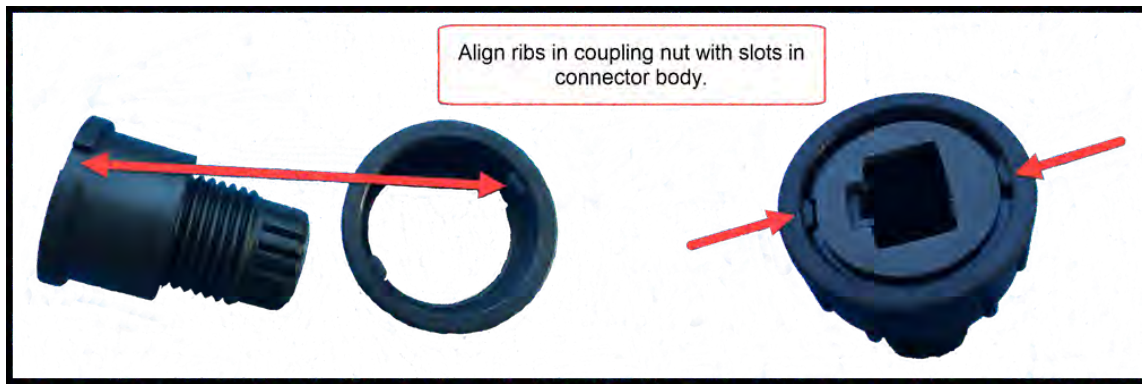


Figure 9: Align the ribs in the coupling nut

5. Feed the Cat6 cable through the strain relief, round rubber seal, and connector body in the order shown in [Figure 10](#).

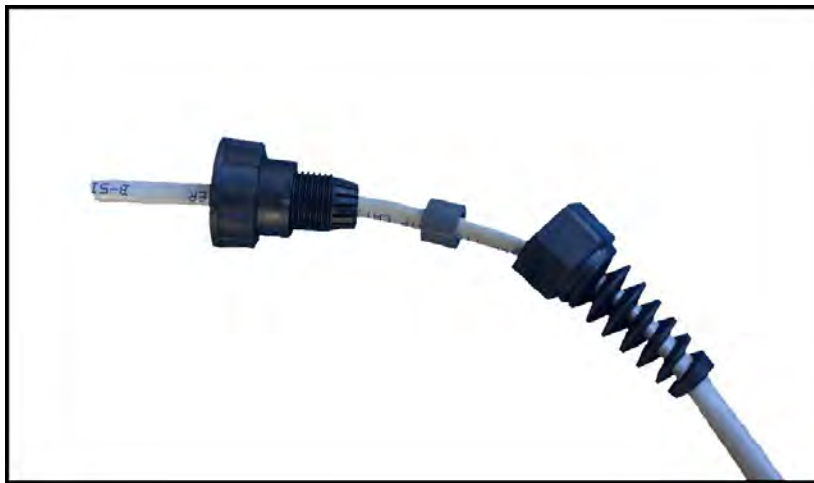


Figure 10: Proper order of connector body, rubber seal, and strain relief

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](#)).

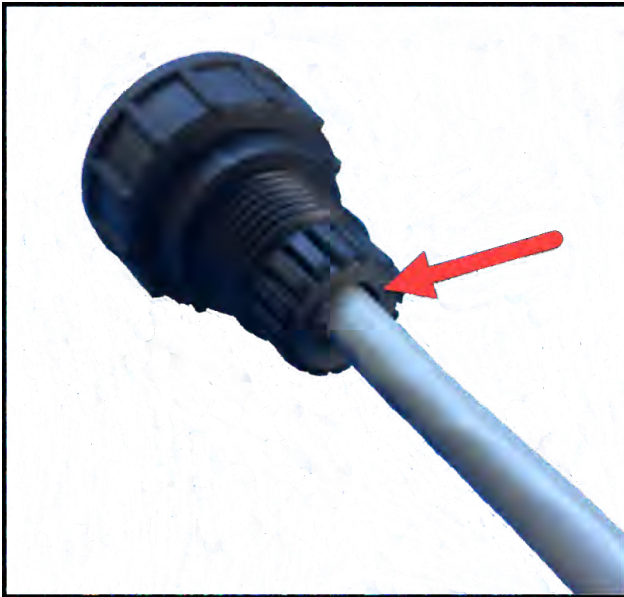


Figure 11: Rubber seal sits inside connector body

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.

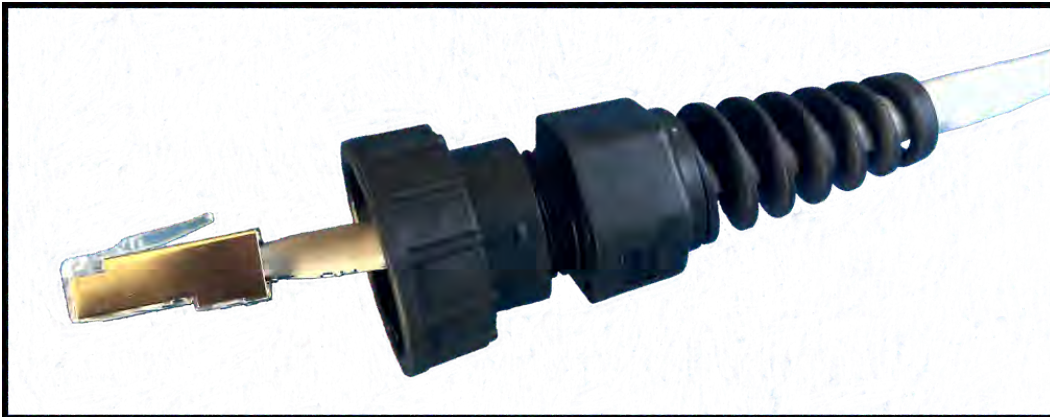


Figure 12: Strain relief on the connector

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-B-C5E)

The following section describes the installation of the Citel CMJ8-POE-B-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 XTEN2000 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 X-Acto knife, create a small “X” pattern in the gasket (see [Figure 14](#)).

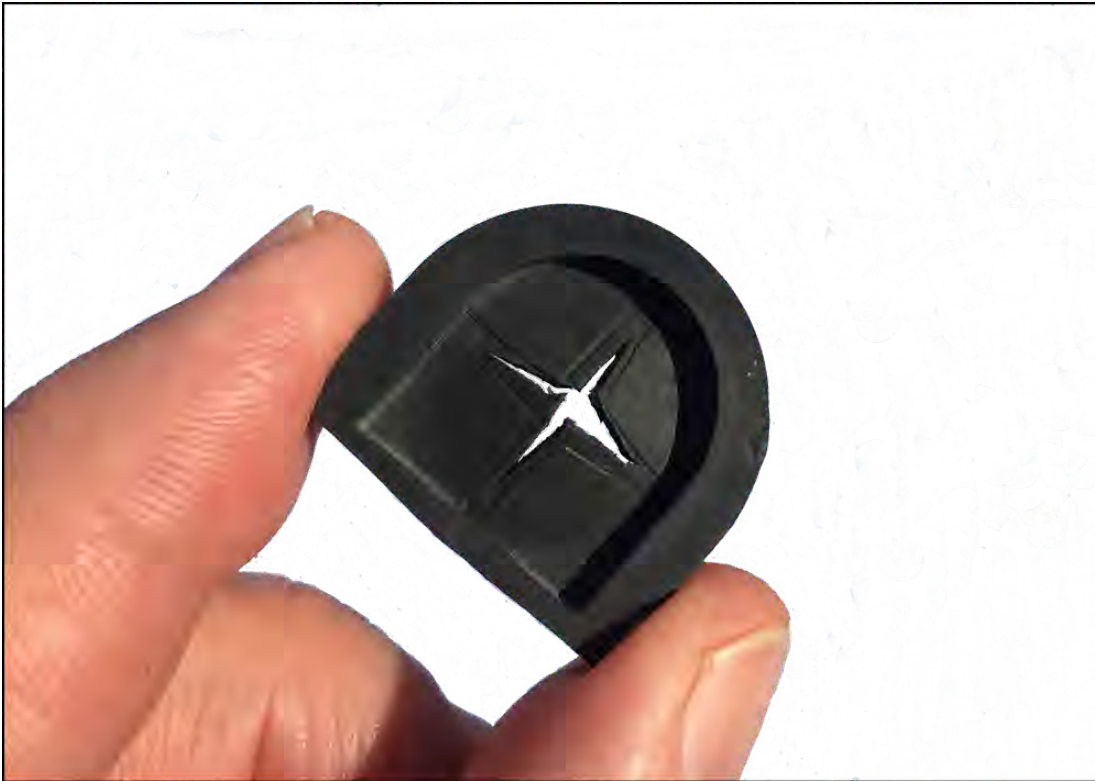


Figure 14: Rubber gasket

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 XTEN2000 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.