RDL-3000

Universal Wireless Transport™ (UWT™) System

Ellipse Wireless Sector Controller Installation Guidelines

Copyright Information

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Revision Log	
Date	Description of Change(s)
30130709	2.2: Updated system components drawing to include new chassis and sector antenna with integrated GPS. 2.3: Removed HD bracket, GPS antenna kit, and sync kit from overview. 4.1.6: Added installation procedure for sector antenna with integrated GPS. 6: Added antenna and mounting bracket compatibility matrix.
20130904	Remove references to legacy synchronization methods.
20130910	Corrected screw sizes on integrated sector antenna mounting brackets.
20131002	4.1.7 Add information about the lightweight mounting bracket. Change 'RDL-3000 SC' to 'Ellipse'.
20131106	3.2 and 4.1.7: All available lightweight mount kits have 400 mm (16 in) cables.
20131121	Correction to dimensions drawing.
20131209	Remove references to RAS-specific ports. Update section 1. Add UHF antenna information.
20140422	Change manual to Ellipse only. Reorganize procedures. Add dimensions.
20140529	Remove configuration information.

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1 Important Notices

1.1 Deployment Information

IMPORTANT: Refer to the RDL-3000 Family User Manual for detailed regulatory information. Refer to this document before deploying and powering RDL-3000 family systems in the field.

1.2 Service & Safety

General Warnings

Redline recommendations for maximum safety include the following:

- Do not operate microwave equipment without first having proper training or knowledge of microwave radio operation.
- Do not operate the microwave equipment without an appropriate antenna port termination, or antenna.
- Check to ensure that the area around the antenna is clear of personnel prior to turning the transmitter on.
- Do not look into or stand in front of an antenna.
- Do not swing or aim an antenna at nearby persons while the equipment is operating.
- Where a structure or rooftop has existing antennas installed, do not proceed with an installation without first determining the RF/µW exposure risk. Where necessary have the relevant transmitters turned off or wear a protective suit for the duration of the installation.

Safety Warnings

- Installation of the system must be contracted to a professional installer.
-  PoE power adapter caution:

> ***Warning to Service Personnel*: *48 VDC***
>
> Customer equipment including personal computers, routers, etc., must be connected only to the INPUT (DATA) port on the PoE unit.
>
> Only the outdoors Ethernet interface cable connecting to the unit can be safely connected to the OUTPUT (DATA & POWER) connector. Connecting customer premises Ethernet equipment directly to the OUTPUT (DATA & POWER) connector on the Power-over-Ethernet power adapter may damage customer equipment.

- Read this manual and follow all operating and safety instructions.
- Keep all product information for future reference.
- The power requirements are indicated on the product-marking label. Do not exceed the described limits.
- The unit must not be located near power lines or other electrical power circuits.
- Disconnect the power before cleaning, or when the unit is not be in-use for an extended period.

- The system must be properly grounded to protect against power surges and accumulated static electricity. The user is responsible for installing this device in accordance with the local electrical codes: correct installation procedures for grounding the unit, mast, lead-in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes.

Warning Symbols

These symbols may be encountered during installation or troubleshooting. These warning symbols mean danger. Bodily injury may result if you are not aware of the safety hazards involved in working with electrical equipment and radio transmitters. Familiarize yourself with standard safety practices before continuing.

WARNING
ELECTRO-MAGNETIC
RADIATION

WARNING
HIGH VOLTAGE

WARNING
HOT SURFACE
DO NOT TOUCH

1.3 Installation Safety

Professional Installation / Installations Professionnel

Redline RDL-3000 systems require professional installation. The user is responsible to ensure all building and safety codes are met and the installation is complete and secure.

The RDL-3000 system shall be installed according to local Electrical Safety Codes.

For Canadian installations, the entire equipment installation must comply with the Canadian Electrical Code. For installations in the United States, the entire equipment installation must be in accordance with Article 810 of the United States National Electrical Code.

Les appareils RDL-3000 de Redline doivent être installés par un personnel professionnel. Le personnel responsable doit s'assurer que l'installation est bien achevée, et qu'elle répond aux exigences de tous les codes de sécurité.

Le RDL-3000 doit être installé conformément aux codes locaux de sécurité électrique.

Pour les installations Canadiennes, l'installation de l'équipement au complet doit se conformer au Code Canadien de l'électricité. Pour les installations aux États-Unis, l'installation de l'équipement au complet doit être en conformité avec l'article 810 du Code des États-Unis National Electrical.

Safety Precautions

Installation and service must be done by personnel having technical training and experience necessary to be aware of hazards during installation and/or service of outdoors RF equipment. The installation and/or service must be done using procedures designed to minimize any danger to technical personnel or any other person.

Use safety devices when working on or around the mast. Be aware of the risk of falling objects. Use provided safety catches when hoisting antennas and radios.

Do not use any components (screws, nuts, etc.) other than those delivered together with the Redline microwave radio equipment or those recommended by Redline.

Electrocution Hazard / Risque D'électrocution

DANGER ***Warning to Service Personnel*: *48 VDC***

This product is intended to be connected to a power source as per IEEE 802.3at (42.5 - 57.0 VDC), which must be electrically isolated from any AC sources and reliably connected to Earth ground. Do not install Redline products near any type of power line. Should the antenna or related hardware come in contact with power lines, severe bodily harm or death could result!

DANGER **Attention au personnel du service: 48V CD**

Ce produit est destiné à être connecté à une source d'énergie selon la norme IEEE 802.3at (42,5 à 57,0 VDC), qui doit être isolé électriquement de toutes les sources de courant alternatif et fiable relié à la masse de la Terre. Ne pas installer les produits Redline près n'importe quel type de ligne électrique. Si votre antenne ou du matériel connexe entrer en contact avec des lignes électriques, des blessures graves ou la mort pourraient en résulter!

Radio Frequency Safety / Sécurité des Fréquences Radio

The installer of this radio equipment must ensure that the antenna is located or pointed such that the antenna does not emit RF fields in excess of the general population limits as defined by:

- FCC CFR 47, Part 2.1091
  http://www.gpo.gov/fdsys/pkg/CFR-2009-title47-vol1/pdf/CFR-2009-title47-vol1-sec2-1091.pdf
- FCC OET Bulletin 65, Radio frequency radiation exposure evaluation for fixed devices
  http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65c.pdf
- Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website:
  http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php
- Santé Canada limite pour la population générale; consulter le Code de sécurité 6, disponible sur le site Web de Santé Canada:
  http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-fra.php .

Personal Safety

WARNING: HOT SURFACE. DO NOT TOUCH.

The radio platform is rated for operation at extreme ambient temperatures. When operating in high temperature conditions, the chassis surface area can be higher than the ambient temperature and personal thermal protection should be employed for any maintenance or inspection activity.

Electrical Safety

The equipment meets the requirements for class I EN 60950-1 (protection against electric shock).

- All external circuits are TNV-1 (as defined in EN 60950-1).

- All equipment must be grounded before the power cable is connected.
- For electrical safety the DC power supply shall have reinforced insulation to the mains supply.

Electrical Safety Compliance / Conformité à la Sécurité Electrique

The RDL-3000 system hardware has been tested for compliance to the electrical safety specifications listed in the following table.

Table 1: Notice: Electrical Safety Specifications	
Class I	EN 60950-1
All External Circuits	TNV-1 as defined in EN 60950-1
All equipment must be grounded	

Le RDL-3000 du matériel a été testé pour la conformité aux normes de sécurité électriques indiquées dans le tableau suivant:

Table 2: Avis: Spécifications de sécurité électrique	
Classe I	EN 60950-1
Tous les circuits externes	TRT-1 tel que défini dans la norme EN 60950-1
Tous les équipements doivent être mis à la terre	

UL Information

- The suitability of the supplied Ethernet cable is subject to the approval of Authority Having Jurisdiction and must comply with the local electrical code.
- The equipment must be properly grounded according with NEC and other local safety code and building code requirements.
- Reminder to all the BWA system installers: Attention to Section 820-40 of the NEC which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as is practical.
- RDL-3000 system must be installed in compliance with relevant articles in National Electrical Code-NEC (and equivalent Canadian Code-CEC) including referenced articles 725, 800 and 810 in NEC.
- RF coaxial cable connecting an antenna to the RDL-3000 system must comply with the local electrical code.
- To meet the over-voltage safety requirements on the telecommunications cables, a minimum 26 AWG telecommunication line cord must be used.

  Pour être en conformance avec les exigences finies de sûreté de sur-tension sur les câbles de télécommunications un fil de télécommunication ayant un calibre minimum de 26 AWG doit être utilisé.

Lightning Protection / Protection Contre la Foudre

When installed, this equipment is to be connected to a Lightning/Surge Protection Device that meets all applicable national safety requirements. Before Ethernet cables enter buildings, voltages shall be clamped down to SELV by approved type primary protectors.

WARNING: The information provide in this user manual consists of general recommendations for installation the system equipment. The wireless equipment must be installed by a qualified professional installer who is knowledgeable of the requirements of installing outdoor radio equipment and follows local and national codes

for electrical grounding and safety. Failure to meet safety requirements and/or use of non-standard practices and procedures may result in personal injury and/or damage to equipment.

The system must be properly grounded to protect against power surges and accumulated static electricity. The user is responsible to install this device in accordance with the local electrical codes: correct installation procedures for grounding the unit, mast, lead-in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes.

All outdoor wireless equipment is susceptible to surge damage from a direct hit or current induced from a near strike. A direct lightning strike may cause serious damage even if recommended guidelines are followed. Installing surge protection and following grounding practices detailed in local and national electrical codes can minimize equipment damage, service outages, and chance of serious injury.

The major reasons for surge damage can be summarized as:

- Poorly grounded antenna sites
- Improperly installed surge protection equipment

A lighting protection system provides a means by which the energy may enter earth without passing through and causing damage to parts of a structure. A good grounding system disperses most of the surge energy from a lightning strike away from the building and equipment. Improperly grounded connections are a source of noise that can cause malfunctions in sensitive equipment. The remaining energy on the Ethernet cable shield and conductors can be directed safely to ground by installing a surge arrestor in series with the cable. A surge protection system does not prevent lightning strikes, but protects equipment by providing a low resistance path for the discharge of energy safely to ground. If surge protection is required for the system, the following general industry practices are provided as a guideline only:

- The AC wall outlet ground for the indoor POE adapter should be connected to the building grounding system.
- Install a surge arrestor in series with the Ethernet cable at the point of entry to the building. The grounding wire should be connected to the same termination point used for the tower or mast.
- Provide direct grounding connections from the RDL-3000 system, the mounting bracket, and the antenna to the common building ground bus. Use the grounding screws provided for terminating the ground wires.

L'installation exige aussi que l'appareil soit branché à un parafoudre qui répond à toutes les normes nationales de sécurité.

1.4 WEEE Product Return Process

In accordance with the WEEE (Waste from Electrical and Electronic Equipment) directive, 2002/96/EC, Redline Communications equipment is marked with the logo shown below. The WEEE directive seeks to increase recycling and re-use of electrical and electronic equipment. This symbol indicates that this product should not be disposed of as part of the local municipal waste program. Contact the local sales representative for additional information.

Figure 1: Notice: WEEE Logo

1.5 Service & Warranty Information

- Refer all repairs to qualified Service personnel. Removing the cover panel or modifying any part of this device will void the factory warranty.
- Locate the serial numbers and record these for future reference. Use the space below to affix serial number stickers. Also, record the MAC address identified on the unit product label.
- Redline does not endorse or support the use of outdoor cable assemblies: i) not supplied by Redline, ii) third-party products that do not meet Redline's cable and connector assembly specifications, or iii) cables not installed and weatherproofed as specified in the RDL-3000 Installation Guidelines manual for each product model. Refer to the Redline Limited Standard Warranty and RedCare Service agreements.
- WEEE Product Return Process

  In accordance with the WEEE (Waste from Electrical and Electronic Equipment) directive, 2002/96/EC, Redline Communications equipment is marked with the logo shown above. The WEEE directive seeks to increase recycling and re-use of electrical and electronic equipment. This symbol indicates that this product should not be disposed of as part of the local municipal waste program. Contact the local sales representative for additional information.

2 System Features

2.1 System Components

The RDL-3000 Ellipse wireless sector controller (subscriber) is designed and manufactured by Redline Communications, a world leader in design and production of outdoor wireless TCP/IP transport for mission critical applications.

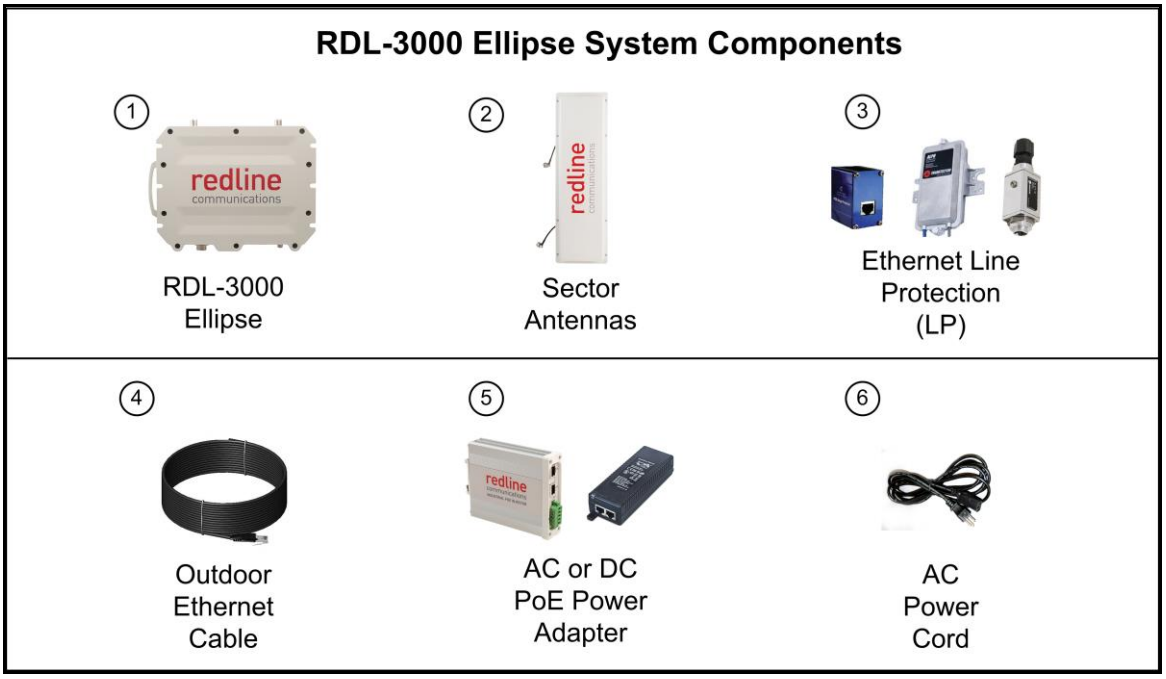

Figure 2: Features: Redline System Components

Table 3: Features: Redline System Components	
#	**Description**
1	RDL-3000 Ellipse base station (sector controller).
2	Flat panel sector antenna (wide beamwidth) with integrated GPS antenna.
3	Line protection (LP) unit. Recommended for lightning protection at cable ingress to building or equipment shed.
4	Cat-5e shielded outdoor Ethernet cable terminated with RJ-45 connector each end. Connects Ellipse system to PoE and PoE to local area network (91 m (300 ft) max.).
5	Power over Ethernet (PoE) power injector (AC or DC)
6	The PoE power cord. AC power cords are available in NA, EU, or UK type. Ordered separately for AC PoE only.

Note: All items must be specified individually as part of each system order.

2.2 Ellipse Wireless Sector controller

The Ellipse wireless sector controller provides the Ethernet and wireless interfaces necessary to provide secure reliable data transport.

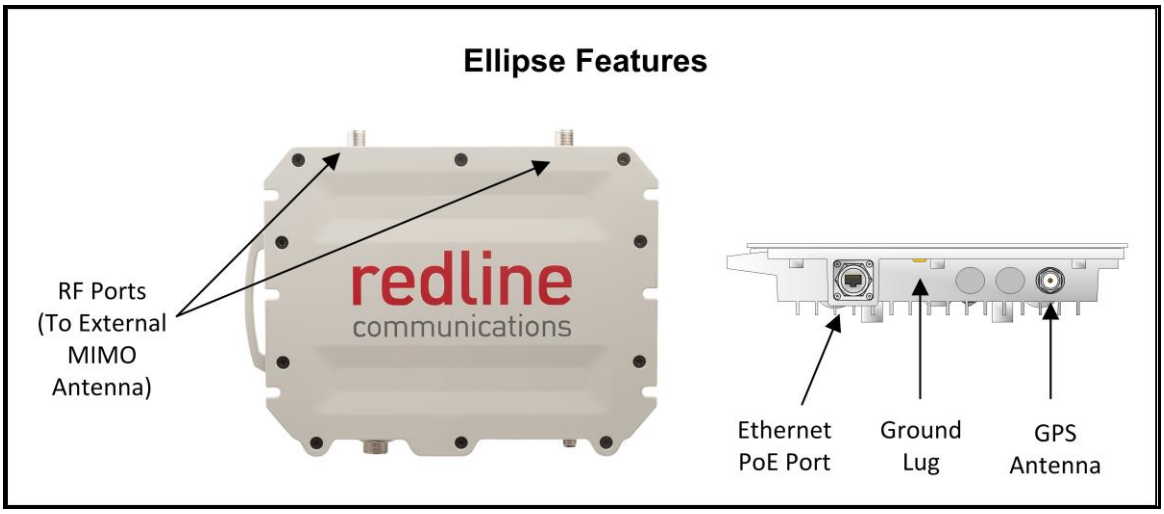

Figure 3: Features: Ellipse Features

RF Ports

The two RF ports (N-type F connectors) conduct RF signals between the Ellipse and the antenna system (ordered separately). The Ellipse can be operated using a SISO (single antenna) or MIMO (multiple antenna) system. RF jumper cables are included with Redline mounting kits.

When deploying SISO systems in a sector it is important to match the polarization used by the sector controller and subscriber.

Table 4: Features: Polarization of Wireless Terminal with Integrated Antenna

RF Port	Operating Frequency		
	2.3 - 2.8 GHz	3.3 - 3.8 GHz	4.9 - 5.8 GHz
RF-1	V-POL	V-POL	H-POL
RF-2	H-POL	H-POL	V-POL

Ethernet Port

The Ethernet port (RJ-45 / F connector) receives DC power and provides Ethernet connectivity with the local network. The Ethernet port connects to the PoE adapter using a weatherproof CAT-5e Ethernet cable.

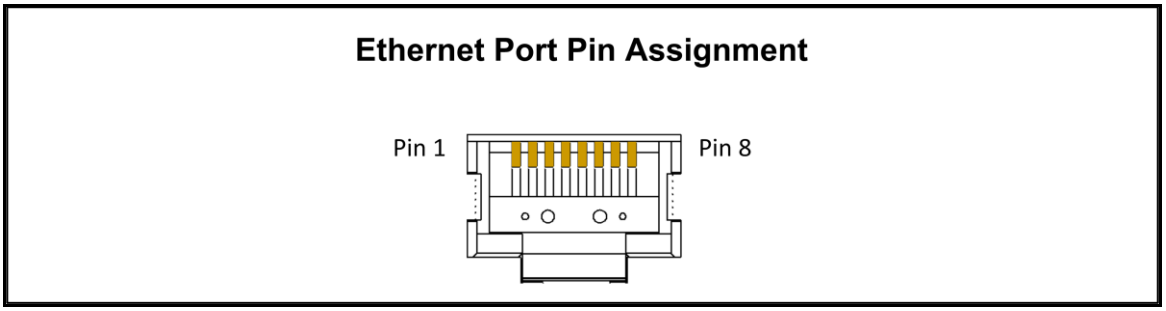

Figure 4: Features: Ellipse PoE Connector Pinout

Table 5: Features: Ethernet Port RJ-45 Pinout (T568B)	
Pin	**Description**
1, 2	Data Pair 1
3, 6	Data Pair 2
4, 5	+Ve (in)
7, 8	-Ve (in)

Notes:

1. The PoE does not amplify the Ethernet signal. The maximum total length of the Ethernet cable is 100 m (330 ft). For example, 91 m (~300 ft) from the Ellipse to the PoE and 9 m (~30 ft) from the PoE to the local network equipment.
2. PoE Interoperability: Type 2: 30 W over two pairs, Alternative B: Pairs 4/5 & 7/8

2.3 Ethernet Port Weatherproof Gland

A weatherproof gland is provided for the Ellipse Ethernet port. The Ellipse Ethernet port must have this gland installed and properly weatherproofed.

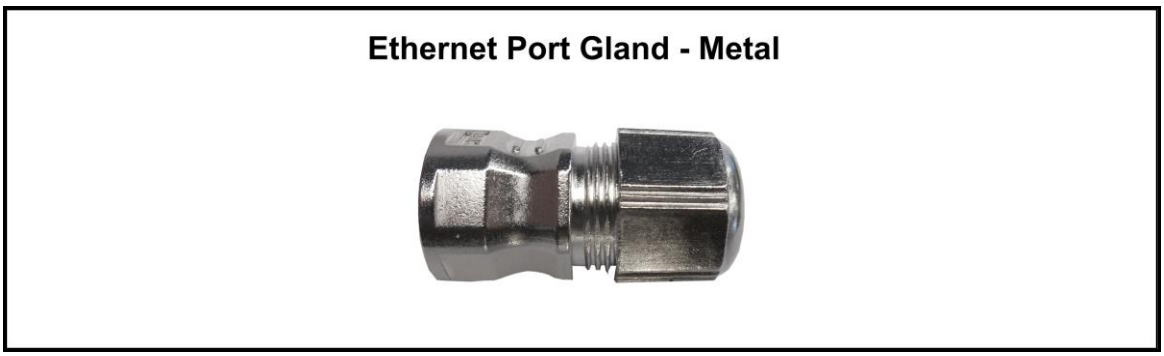

Figure 5: Features: Ethernet Port - Metal Weatherproof Connector Assembly

Ground Lug

A ground-lug ⏚ is provided on the Ellipse chassis. Use this connection to terminate a grounding wire. All Ellipse systems must be properly grounded to protect against power surges and accumulated static electricity.

Ellipse Dimensions

The Ellipse dimensions are: 307 x 245 x 60 mm (12.1 x 9.65 x 2.3 in).

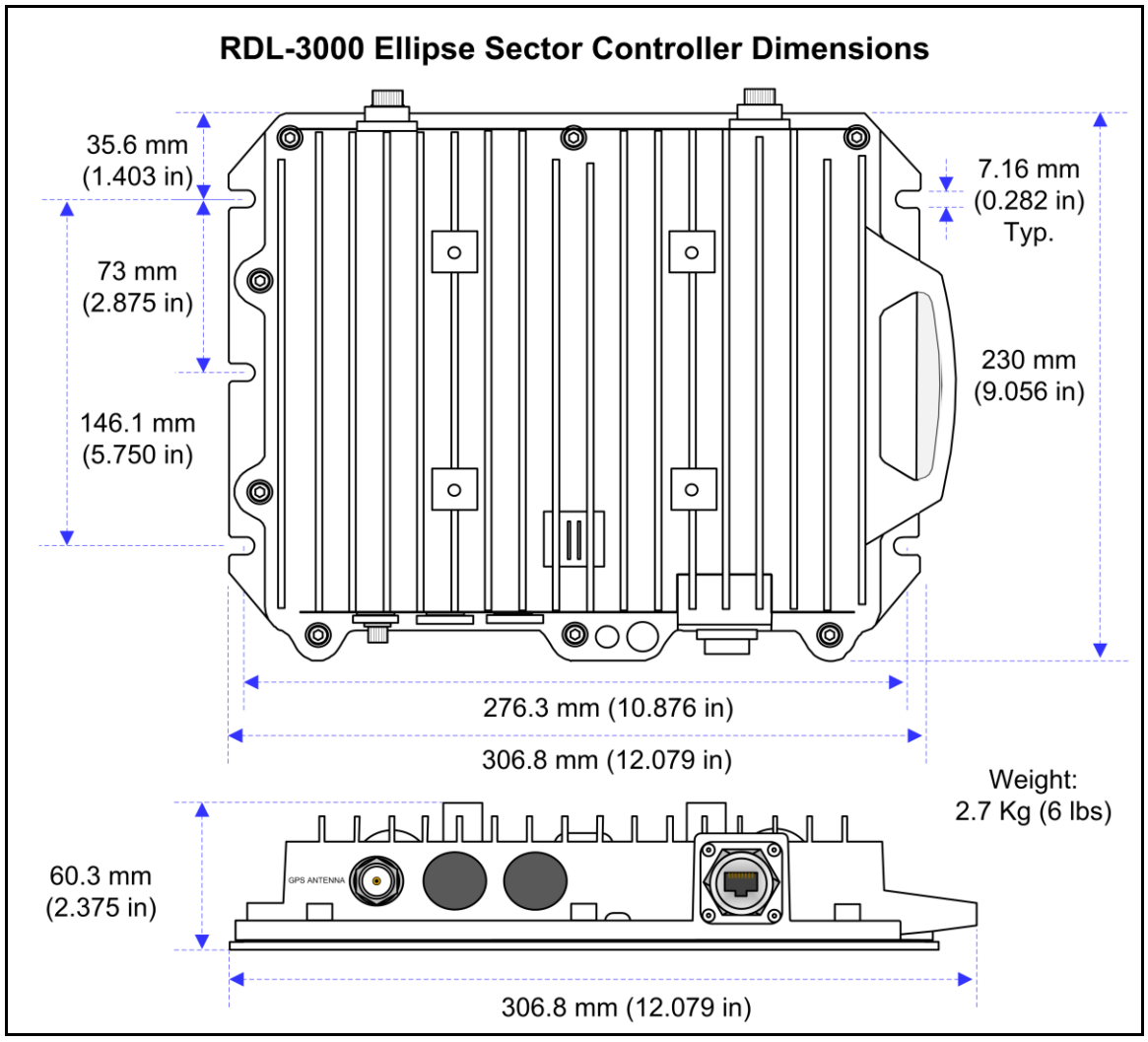

Figure 6: Features: Ellipse Wireless Sector controller Dimensions

2.4 Configuration and Management

The following methods are available to monitor and configure the Ellipse system.

ClearView NMS Application

The Ellipse can be configured and monitored using the SNMP-based Redline ClearView NMS. The Redline Management Suite is a set of applications designed to assist provisioning, monitoring and administration of the Redline components deployed in Radio Access Networks (RANs). Contact your Redline representative or visit the Redline website for further information about the Redline ClearView NMS application.

Telnet (CLI)

Use a standard Telnet client to access all settings and statistics necessary to configure and monitor the operation of the Ellipse. Use the following steps to monitor and configure the Ellipse.

- Using CLI, open a Telnet session to the unit IP address.
- When the command prompt screen appears, login to the Ellipse. The factory default credentials are:

  username: admin

  password: admin

The Telnet session is logged out automatically when no commands are received (idle) for a period of ten minutes. Use the following command to exit immediately from the CLI:

logout [ENTER]

The Ellipse supports two concurrent Telnet sessions. The first admin session opened has full read/write capabilities. If a second session is opened, it has read-only access.

Web Browser (HTTP)

Use a standard Web browser to access all settings and statistics necessary to configure and monitor the operation of the Ellipse. To monitor and configure the Ellipse using HTTP, open a Web browser (Internet Explorer 6 or higher recommended) and enter the unit IP address. For new systems, the default IP address is 192.168.25.2. The following login dialog should be displayed:

The default username is 'admin' and the default password is 'admin'. *There is no logout command on the Web interface.*

3 Site Survey

It is recommended to perform a site survey before installing the Ellipse system. The data accumulated during this process is necessary to understand the operating characteristics and obtain the best performance from the wireless system.

The site survey should identify the optimum location for mounting the wireless sector controller. For maximum performance, there should be a direct line of sight between all communicating wireless systems. A clear line-of-sight (LOS) path requires clearance above natural and man-made objects by at least 60% of the First Fresnel zone. Each antenna should be positioned to provide maximum clearance in the first Fresnel zone of the direct signal path.

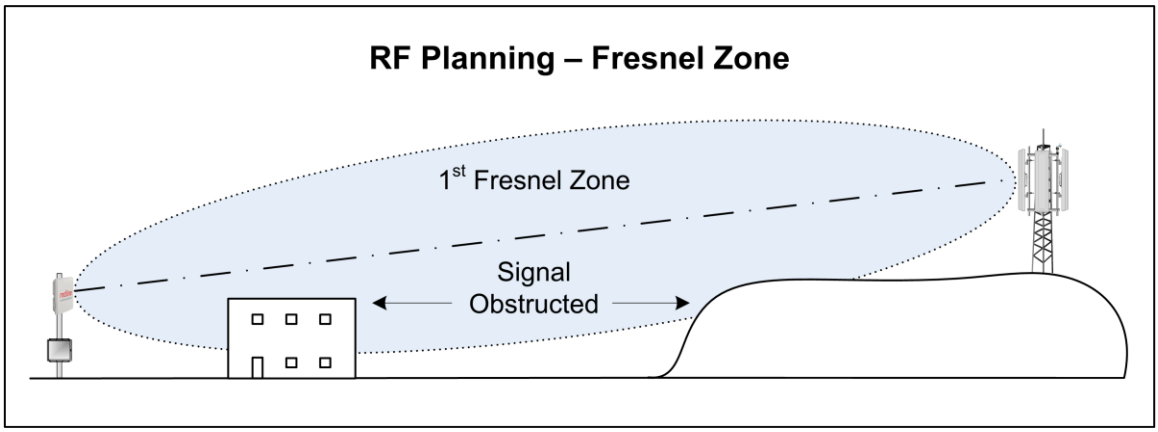

Figure 7: Site Survey: RF Planning Fresnel Zone

The wireless sector controller also functions under optical line-of-sight (OLOS) conditions; where a clear straight line path exists between the two end points, but the first Fresnel zone is not clear of obstacles. If the optical path is completely blocked, it may be possible to establish a non line-of-sight (NLOS) path using RF signal reflections, such as a common reflective structure (e.g., large building) that is LOS for the antennas of communicating units.

For best results:

- Mount the antenna in a location that provides an unobstructed view of the horizon.
- Avoid mounting the antenna close to metal objects that may block/reflect the signal.
- To minimize susceptibility to radio interference, the antenna should generally be located at least 1 m (~3.25 ft) away from any another high frequency system antennas (e.g., microwave, GSM, CDMA, 3G) and should not be mounted within the main beamwidth of any active (radiating) antenna system.

3.1 General Information

The General Information fields uniquely identify each installed system. It is recommended to record this information prior to installation.

Table 6: Site Survey: General Information Settings	
Setting	**Radio Management**
Name	
Details	
Location	
Contact	

3.2 Network Settings

The Ellipse must be assigned a unique IP addresses before it is connected to the base station and the local area network (LAN). When DHCP is enabled, the remaining settings are populated automatically by the DHCP server.

Table 7: Site Survey: Network & Syslog Server Settings	
Setting	**Radio Management**
DHCP Enable	
IP Address	
Subnet Mask	
Default Gateway Address	
Ethernet Mode	

3.3 Radio Management Settings

The following table contains the minimum set of parameters required to configure the wireless interface. Note that these settings are made independently of the Serial Gateway settings using the **Radio Management** selection.

Table 8: Site Survey: Radio Management Settings	
Parameter	**Value**
System Name	
TCP/IP Address	
Channel Size	
RF Freq.	
Tx Power	
Antenna Gain (DFS only)	

Path Profile

The path profile should include the following information:

Table 9: Site Survey: Path Profile Data	
Site Location	
Antenna Height	
Antenna Azimuth	
Antenna Elevation	
Expected RSSI	

RF Interference

Frequency planning is an essential component of installation and it is very important to test for RF interference at every installation site. The system will not achieve full operational capability if there is excessive interference on the same or adjacent RF channel. Use the built-in spectrum sweep feature to determine if a selected RF channel is generally free from interference.

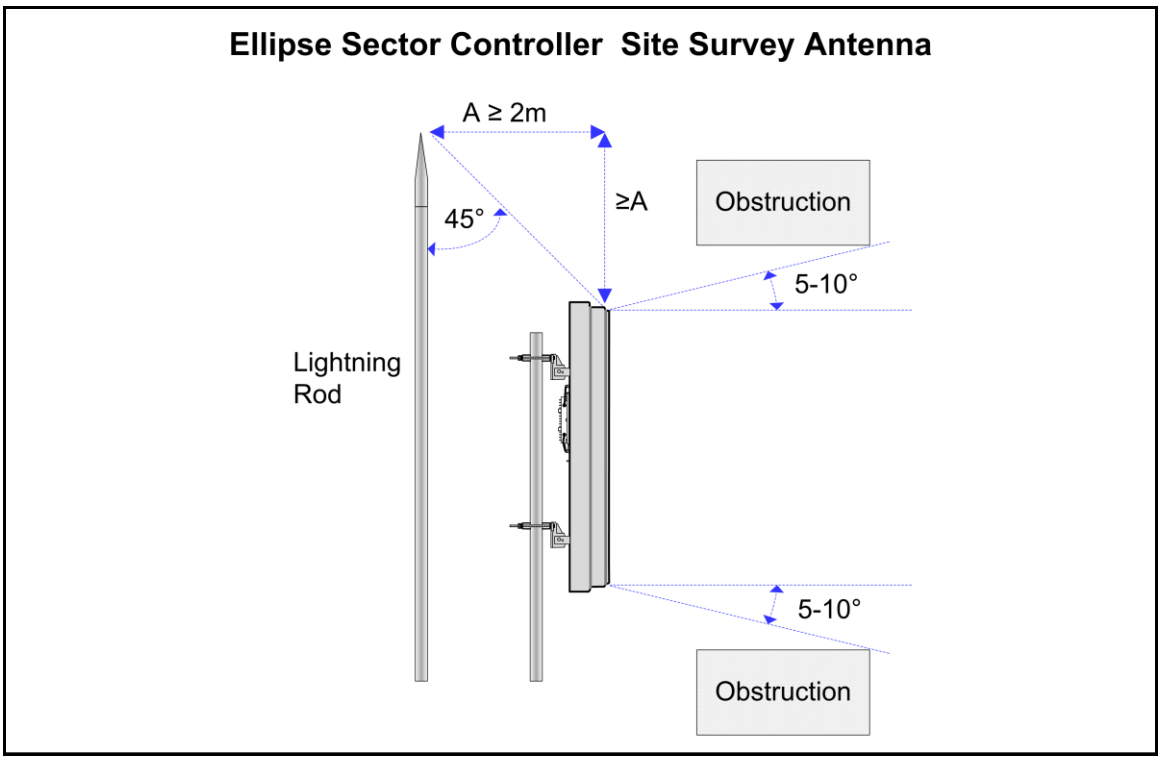

Figure 8: Site Survey: Ellipse Antenna Position

IMPORTANT: Refer to site survey cell plan for details about collocating multiple sector antennas on a tower/mast. Recommended antenna spacing is dependent on frequency.

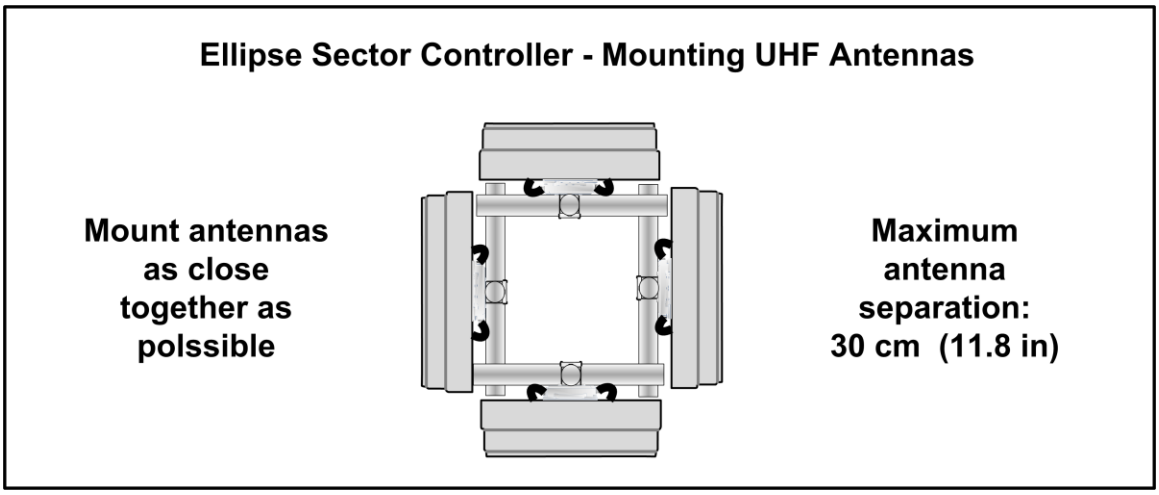

Figure 9: Site Survey: Ellipse Antenna Position

3.4 Site Preparation

General Layout Options

The Ellipse may be mounted on the same mast with an equipment panel box or a separate mast. The equipment box may also be any weatherproof enclosure including a shelter, portable office, utility building etc. The distance from the in-cabinet PoE to the Ellipse sector controller is limited by the 100 m (330 ft) restriction for the total length of the Ethernet cable.

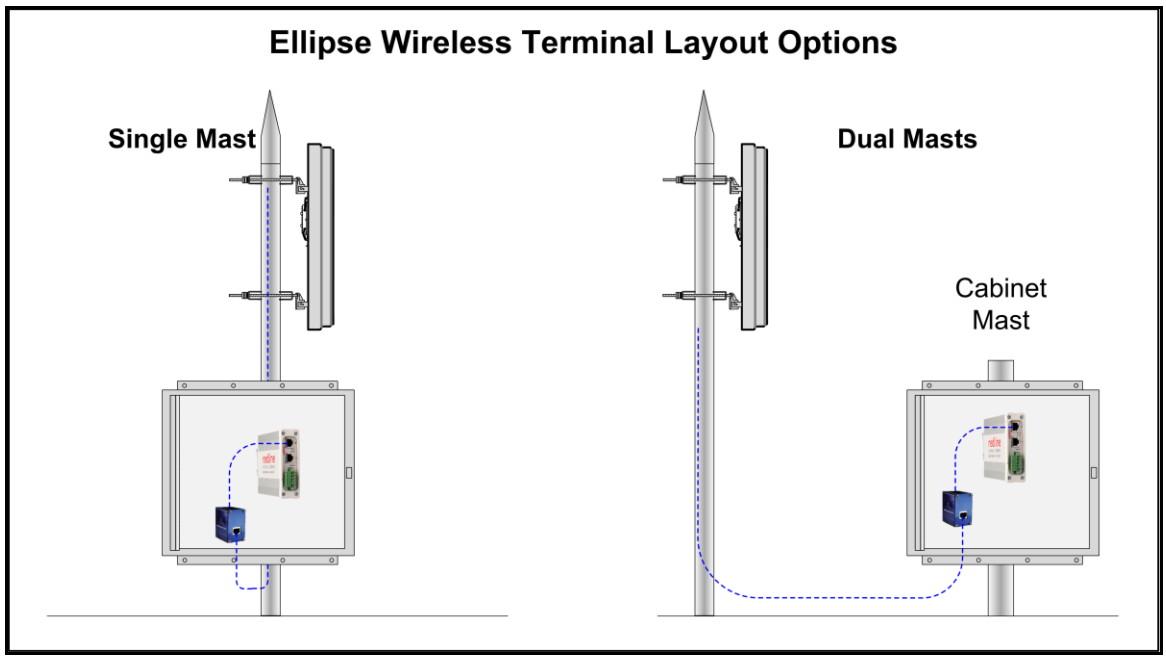

Figure 10: Site Survey: System Layout Options

Material Requirements

The site should be prepared prior to installation of the Ellipse wireless system. The following diagram illustrates the main features of a Ellipse installation.

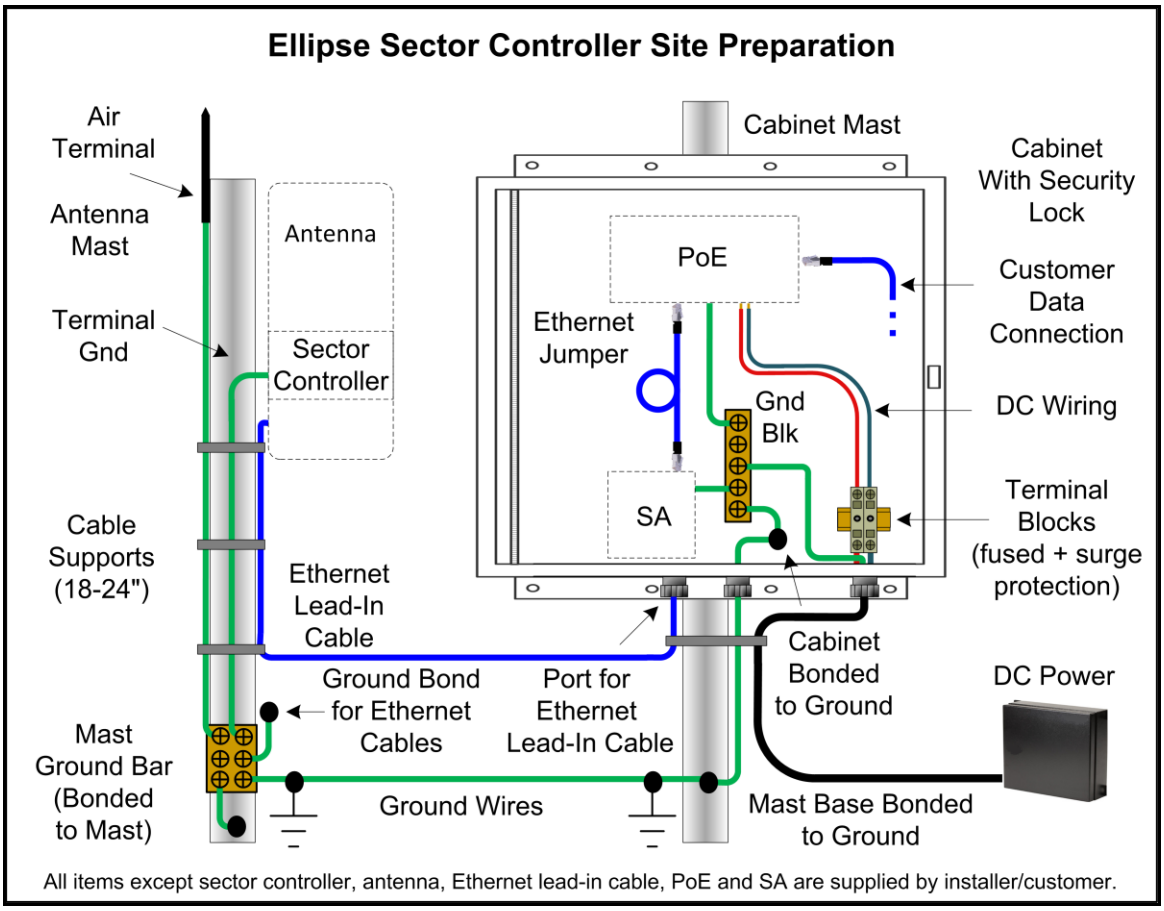

Figure 11: Site Survey: Site Preparation

Important: Diagram is for informational purposes only. Installer may adjust for company standards and Industry Best Practices in effect at site location. Both AC and DC power options are available for the Ellipse system.

Review System Grounding Requirements

Electrical events like lightning strikes and power surges cannot be prevented. Designing and installing a good grounding system can help minimize damage caused by these events. Improper grounding can result in a difference of potential between system components which can lead to injury to personnel, system failure and equipment damage.

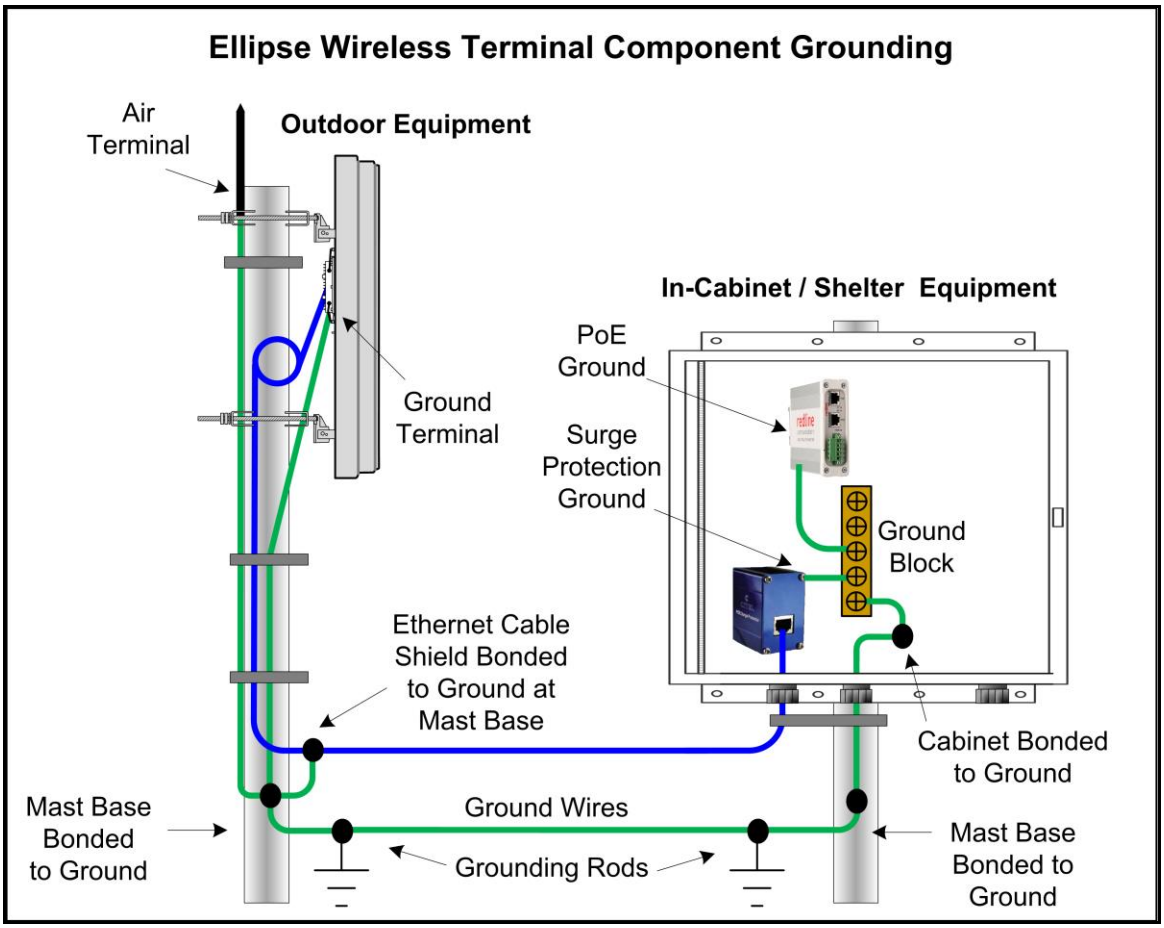

Figure 12: Site Survey: System Grounding

Masts/towers shall have grounding systems installed. All elements of the tower, fence, gates and miscellaneous site metalwork shall be bonded to the earth. In addition, the following areas must be considered in the overall grounding system for the site:

- All ground rods are to be driven a min of 150 mm (0.5 ft) below grade.
- All bends in ground wire to be well rounded curves free of kinks, twists etc.
- Resistance to earth as per the best practices.
- An air sector controller (lightning rod) is to be installed at the top of the mast/tower.
- Mast/tower components must conform to the following standards.
  Lightning Rods: ANSI-TIA-222 F&G CAN/CSA-S37-01 standard.
  Ground Rings: ANSI T1.334-2002, Section 5.3.1 and NFPA 70-2005, Article 250.53.
  Electrolytic Rods: NFPA 70-2005, Article 250.53 and NFPA 780-2004, section 4.13.2.2.
- Ensure all grounding complies with local electrical standards.
- The grounding wire may be secured using the cable hanger stack.

3.5 Environmental Conditions (Cabinet/Shelter)

The equipment cabinet must protect the in-cabinet equipment.

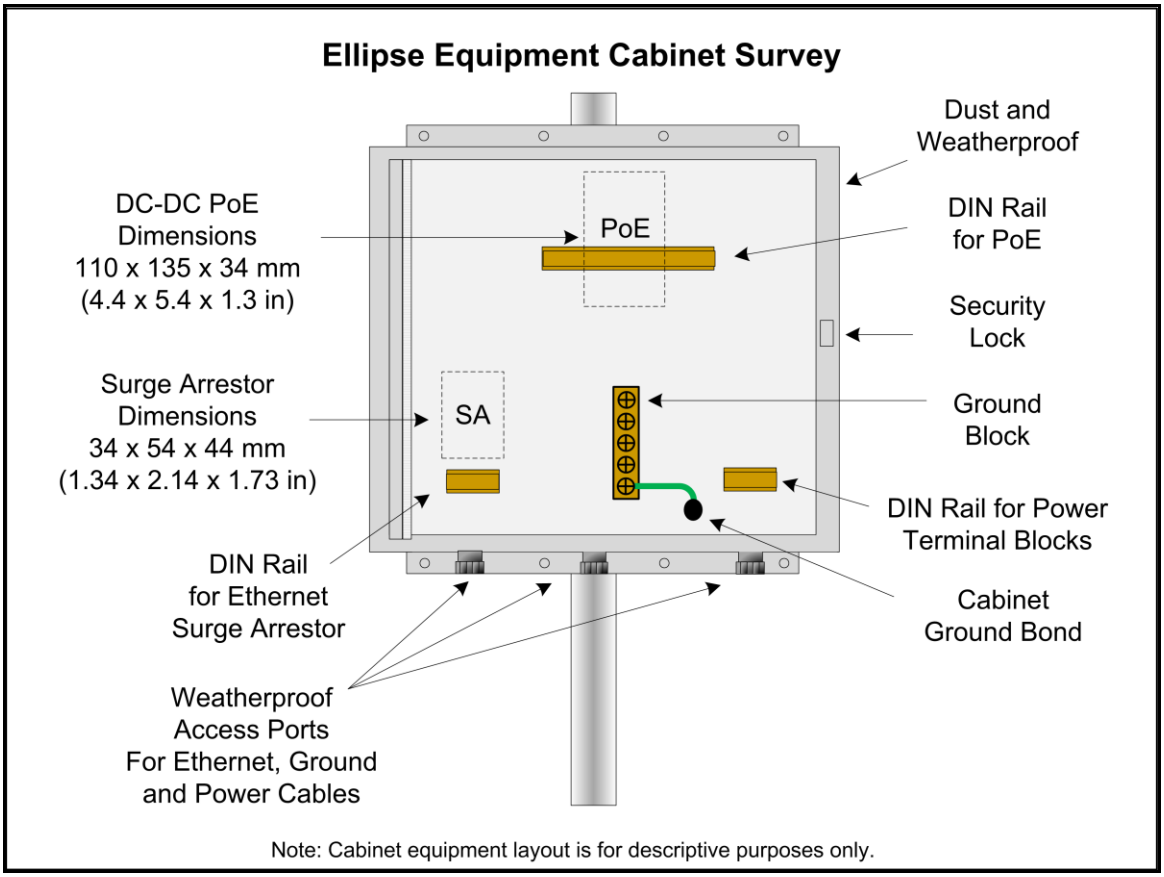

Figure 13: Site Survey: Cabinet Equipment

Table 10: Site Survey: Operating Temperature Range		
Ellipse Ellipse-ER	Outdoor	-40 to 75 °C (-40 to 167 °F)
PoE	In-cabinet	-40 to 75 °C (-40 to 167 °F)
Surge Suppression	In-cabinet	-40 to 85 °C (-40 to 185 °F)

3.6 Ellipse Lead-In Ethernet Connection

An Ethernet lead-in cable is supplied with the Ellipse system. This cable connects the Ellipse Ethernet port to the PoE power injector located in the equipment cabinet. The supplied cable is pre-terminated both ends with shielded RJ-45 connectors.

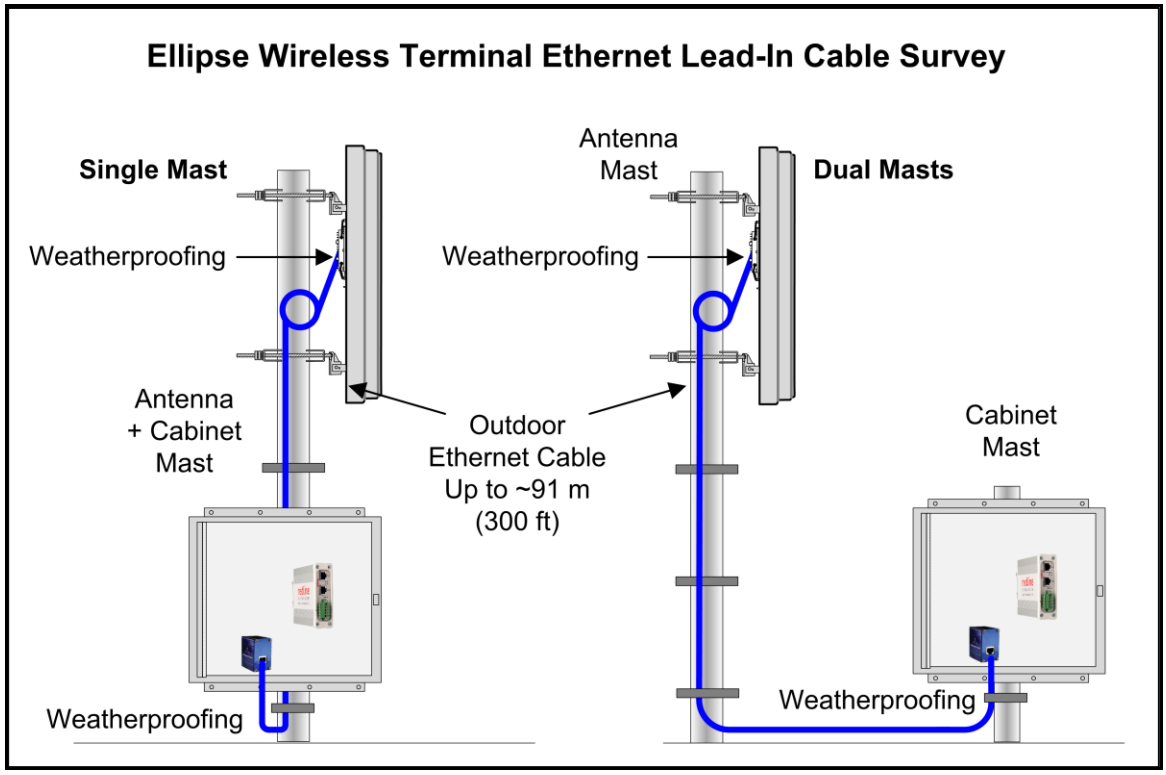

Figure 14: Site Survey: Ellipse Lead-In Ethernet Cable

Cable Length

The maximum recommended total length of the Ethernet cable is 100 m (330 ft) from the wireless sector controller to the network equipment. Cable lengths exceeding this length may affect system performance.

Surge Suppression

The Ellipse wireless sector controller features built-in surge suppression on the Ethernet port.

⚠ CAUTION: The system installer must install the surge/lightning protection at the Ethernet cable ingress to the equipment cabinet.

Weatherproofing

The importance of proper weatherproofing can not be overstressed. The installer must provide weatherproofing materials to be applied at the Ellipse Ethernet port and ingress to the equipment cabinet. A gland is supplied for the Ellipse Ethernet port. The gland must be installed and additional weatherproofing applied to provide adequate protection against the weather.

Cable Supports

It is important to provide strain relief, drip loops and protection against vibration and abrasion caused by the wind, sand etc. The installer must provide suitable cable

supports for the CAT-5 outdoor Ethernet cable, spaced at a recommended maximum of 450 -610 mm (~18 - 24 in).

3.7 Data (Ethernet) Connection

An Ethernet CAT-5 cable must be supplied by the installer to connect the PoE Ethernet port (ETH) to the local network equipment.

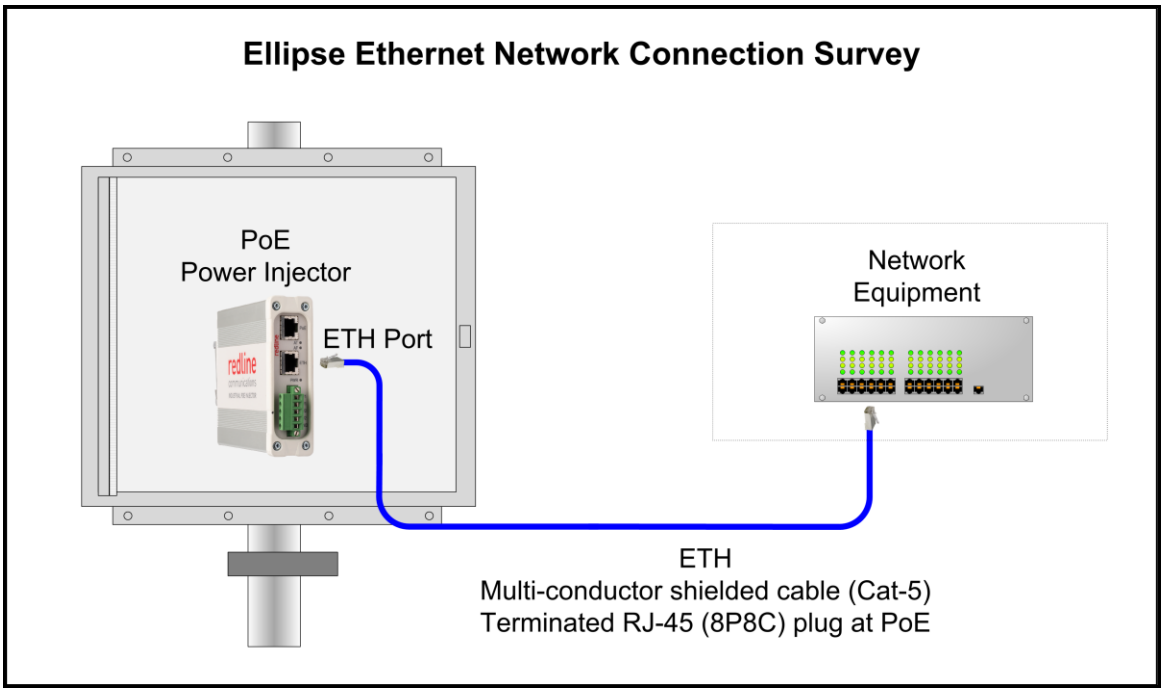

Figure 15: Site Survey: Network Connection Ethernet Cable

Cable Length

The maximum recommended total length of the Ethernet cable is 100 m (330 ft) from the wireless sector controller to the network equipment. Cable lengths exceeding this length may affect system performance.

Surge Suppression

The PoE device includes built-in surge protection adequate for installations where the cable run and network/equipment is within the cabinet or protected by conduit.

⚠ CAUTION: The installer must install additional outdoor-rated surge protection at the ingress to the cabinet if the network connection cable routing includes any exposed outdoors areas susceptible to induced voltages from lightning strikes.

Weatherproofing

The importance of proper weatherproofing can not be overstressed. The installer must provide weatherproofing materials to be applied to all cable ingress ports on the cabinet.

All cable egress ports exposed to the elements must be adequately weatherproofed.

Cable Supports

It is important to provide strain relief, drip loops and protection against vibration and abrasion caused by the wind, sand etc. The installer must provide suitable cable supports for the CAT-5 outdoor Ethernet cable, spaced at a recommended maximum of 450 -610 mm (~18 - 24 in).

3.8 Power Source

The installer must provide a compatible power source for the Ellipse system. The DC supply connections are located on the front panel of the PoE unit. This is a keyed Buchanan 796864-5 (or equiv.) connector (removable screw-type sector controller block). Dual isolated floating power supply inputs are provided to accommodate deployments with backup power (e.g., A + B battery banks). All power inputs include overvoltage and reverse polarity protection.

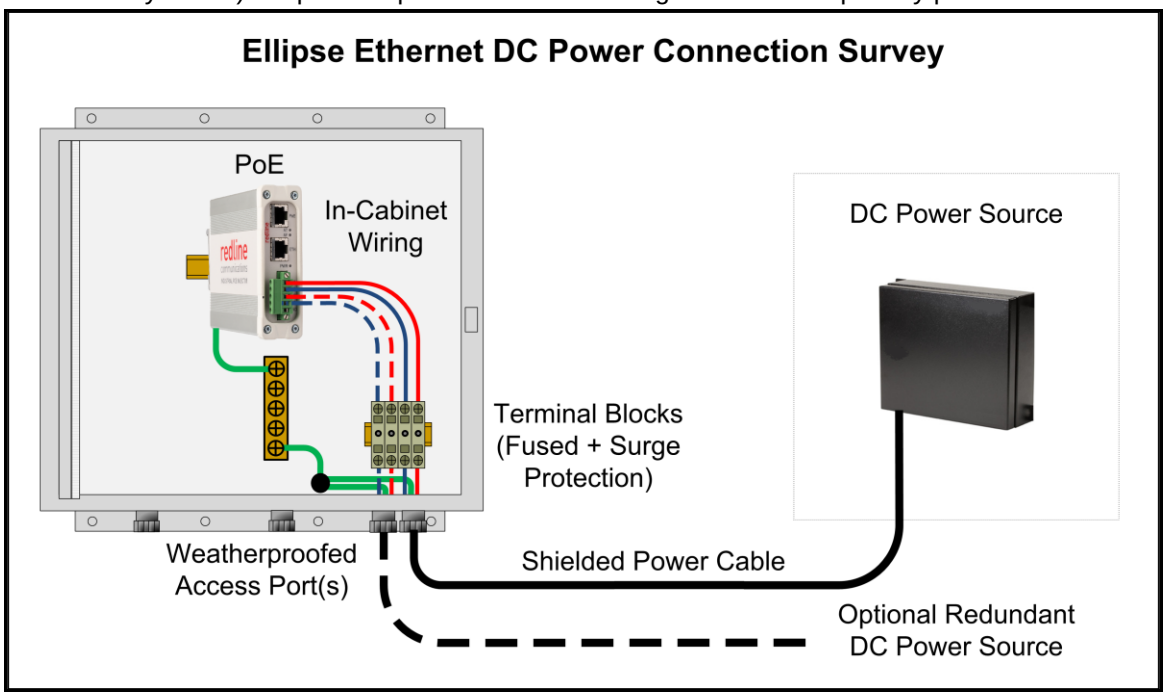

Figure 16: Site Survey: Power Wiring

Isolation

The installer must provide pluggable sector controller blocks in the cabinet to isolate the PoE for installation and servicing.

Surge Suppression

Surge suppression must be provided if the power source is external from the cabinet (e.g., built-in to sector controller blocks).

⚠ CAUTION: System installation must include dedicated outdoor rated surge protection for the power cable ingress into the shelter or cabinet.

Power Requirments

The Ellipse system requires up to 17 W of power. The supply cable may be 12 to 22 AWG.

Table 11: Site Survey: Power Requirements	
Power	< 17 W
Wire Gauge	12-22 AWG

Cable Supports

It is important to provide strain relief, drip loops and protection against vibration and abrasion caused by the wind, sand etc. The installer must provide suitable cable supports for the power cable, spaced at a recommended maximum of 450 -610 mm (~18 - 24 in).

4 Installation Procedures

This section describes installation of the Ellipse wireless sector controller, PoE power injector and surge suppression device. The installer will need to complete the following activities as part of the installation procedure for the Ellipse radio.

4.1 Preparation

1. System installation overview
2. Materials supplied by installer
3. Site Survey

4.2 Configure System Operating Parameters

1. Setup test bench
2. Login with test PC
3. Restore default settings
4. Install Options Key(s)
5. Required Network and RF settings
6. Change Passwords

4. 3 Install Outdoor Equipment

1. Attach sector controller to antenna
2. Connect Ethernet and antenna cables (RF + GPS)
3. Assemble antenna mounting bracket.
4. Mount the sector controller on mast
5. Align antenna

4.4 Install In-Cabinet Equipment

1. Install PoE power injector
2. Install Ethernet surge arrestor

4.1 Preparation

4.1.1 Step 1: System Installation Overview

The following diagram illustrates a completed Ellipse installation. Review this diagram to become familiar with all requirements for a successful installation.

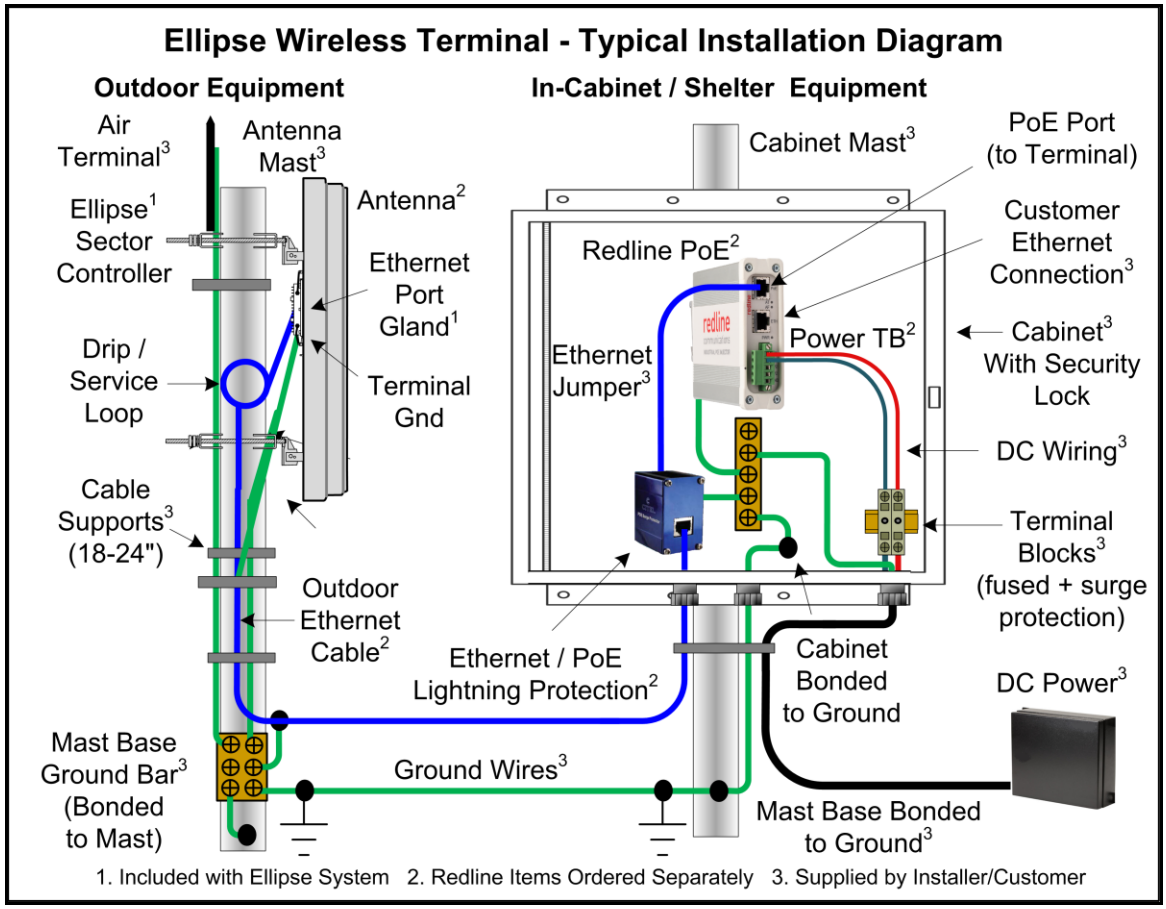

Figure 17: Installation: Ellipse System Installation Example

4.1.2 Step 2: Materials Supplied by Installer

Installation of the Ellipse System equipment requires additional equipment and materials supplied by the installer. The following list is a guideline only, and additional materials may be required based on local conditions at each installation site.

Table 12: Installation: Installer Supplied Materials

1	Cabinet or Rack Space	The equipment cabinet must be rated for adequate protection against ingress of water, dust, etc. and accommodate the size and heating/cooling requirements of the system. Mounting space allocated for the PoE power adapter. Must accommodate 2 m (6') AC power cable or DC power cables a required and routing of Ethernet cable from PoE to local Ethernet network access point. The following features are required: - Ground block for grounding equipment, shielding on conductive cables, and lightning protection devices - DIN mounting rail with adequate spacing for equipment - Weatherproof port glands for the Ethernet and power cables - Security locking device to restrict access - Fused sector controller blocks and surge protection for power input
2	Cabinet Mast*	The cabinet mast must be rated for weight and wind loading of the equipment cabinet and wiring. The mast must be adequately grounded.
3	Antenna Mast*	The antenna mast must be rated for weight and wind loading of the Ellipse sector controller. The mast must be adequately grounded.
4	Ethernet Jumper Cable	A short CAT-5e RJ-45 jumper cable is required to connect from the PoE to the surge arrestor device at the ingress point of the cabinet. Typical length 610 mm (2 ft).
5	Power	The installer must provide 10-60 VDC or 120/240 VAC power to the cabinet (based on site requirements). The DC-DC PoE power injector sector controller block accepts 12-22 AWG wire.
6	Cable Installation Materials	Materials for securing cables to the masts, protecting cables from abrasion, etc. including suggested weatherproofing materials: Scotch 2200 series of vinyl mastic rolls Scotch 130C linerless rubber splicing tape 3M Scotch super 88 electrical tape
7	System Grounding	The site installation must include a master grounding system to be used with all equipment. The wire gage must meet recommended industry standards and include eye sector controllers for secure connection to system equipment.
8	Tools	i) Precision set of screwdrivers, cutter pliers, and other common installation tools. ii) Portable computer for initial Ellipse System configuration. iii) A CAT-5e RJ-45 jumper cable to connect the Ellipse to the PC.

* Note: cabinet and Ellipse system may be mounted on the same mast (based on site survey results).

4.1.3 Step 3: Review Site Survey

Review the Site Survey section of this manual to verify that all installation requirements are complete and all installation materials are available

4.2 Configure Sector Controller Operating Parameters

This section describes the basic configuration for the Ellipse sector controller.

4.2.1 Step 1: Setup Test Bench

Connect the Ellipse and test PC as in the following diagram.

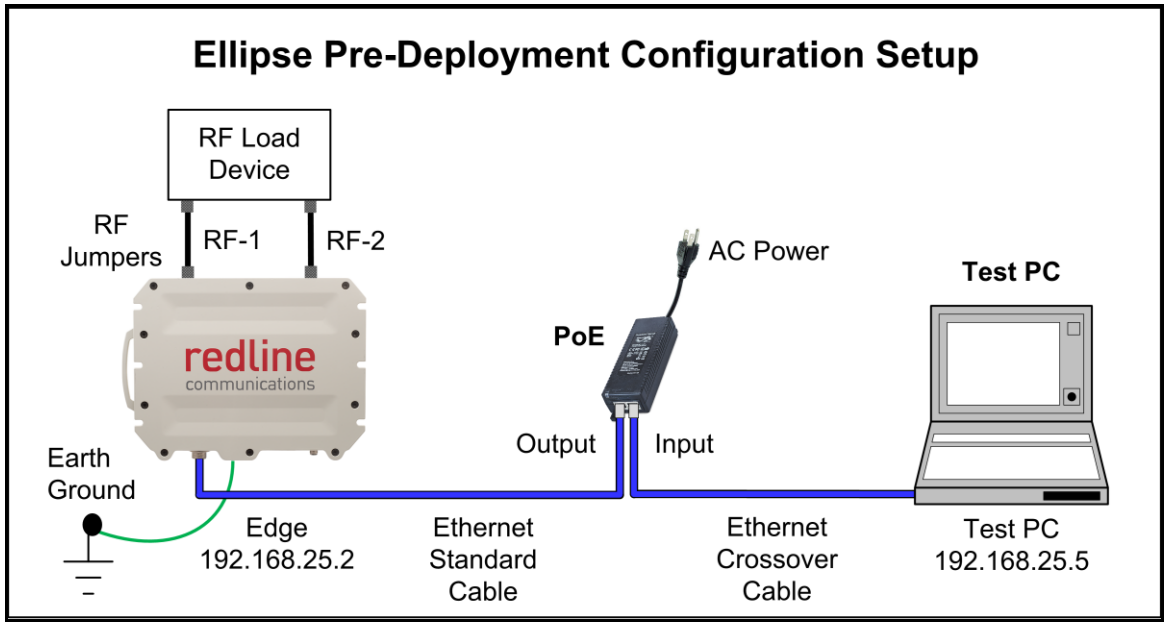

Figure 18: Installation: Basic Wiring Configuration for Web/Telnet Access

4.2.2 Step 2: Login with Test PC

The Ellipse can be configured and monitored using Telnet or a standard Web browser (e.g., Internet Explorer 6.0 or higher). The following procedures require a PC equipped with a Web browser, Ethernet port, and an Ethernet Cat-5e crossover cable for connecting the PC to the PoE power adapter. The test PC and Ellipse IP address must be on the same subnet. For example:

IP address = 192.168.25.5, Net Mask = 255.255.255.0

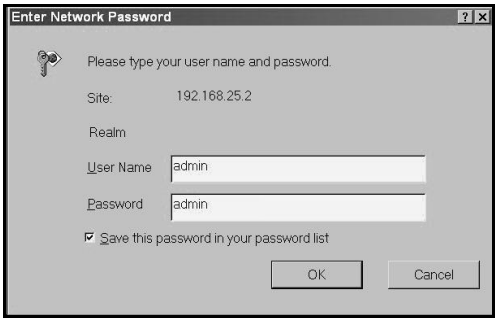

Figure 19: Installation: Configuration - Login Screen

Web Browser

Use the following steps to establish a Web session with the Ellipse.

1. On the PC, open a browser and enter the unit Ellipse IP address in the browser address bar. The factory default IP address is 192.168.25.2.
2. Login to the Ellipse using the assigned username and password. The default username is 'admin', and the default password is 'admin'.

4.2.3 Step 3: Restore Default Settings

When first deploying an Ellipse, it is recommended to perform a factory reset to initialize the system parameters.

Factory Reset

Web:

1. Login to the Ellipse Web interface
2. Click **Configuration->Factory Defaults**

Telnet:

1. Login to the Ellipse Telnet interface
2. Enter the command:

   save defaultconfig

Long Reset

If the IP address, username or password of the Ellipse is unknown, use the 'long reset' procedure to access the Web or Telnet interface: Refer to the RDL-3000 Family Users Guide for a detailed description of this operation.

4.2.4 Step 4: Install Options Key

Options keys (a string of numbers, letters, and dashes) enable Ellipse features including the maximum uncoded burst rate (UBR) and frequency ranges. Options keys are encoded based MAC address, making each key unique to a specific Ellipse. The options key enables specific system parameters and must be entered before the Ellipse is put in-service.

Use the following steps to enter an options key:

1. Use a Web browser to login to the Ellipse. You must login as administrator.
2. Click **Utilities -> Product Options** to display the Product Options screen.
3. Enter a valid permanent or temporary options key in the Options Key 1 field.
4. Click **Activate** to enable the new features (does not require reboot).

Telnet may also be used to install an options key. Refer to the RDL-3000 Family User Manual for a description of the commands.

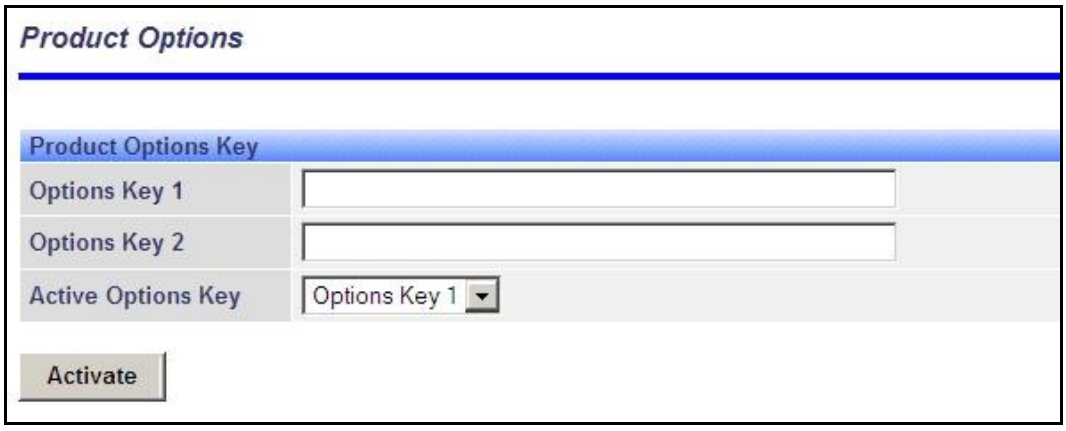

Figure 20: Installation: Configuration - Product Options Screen

Operation with No Options Key

Prior to installing an options key, the Ellipse will only operate in PMP SS mode (sector controller). At a minimum, the operator must obtain and install at least one permanent options key to enable full configuration of the Ellipse.

Table 13: Installation: Operation with No Options Key	
Parameter	**Setting**
Mode	PMP SS (sector controller)
Channel	10 MHz
UBR	3 Mbps
DFS	Permanently enabled
Max PIR	1 Mb/s
VLAN Data	Disabled
VLAN Mgmt	Disabled
Encryption	Disabled
RF Frequency* (MHz)	3300-3800, 3650-3700, 4400-5000, 4940-4990, 5150-5250, 5495-5600, 5650-5725, 5725-5795, 5815-5850

Note: The factory default setting for Auto Scan is 'disabled'.

4.2.5 Step 5: Required Network and Wireless Settings

Review and adjust the following parameters as required. Refer to the site survey information.

Table 14: Installation: Ellipse Parameter Settings				
Step	**Screen**	**Parameter**	**Reference**	**Setting Value**
1	Utilities ->**Product Options**	Options Key	RF Plan	Enable PMP sector controller (SS) mode, RF frequency, etc.
2	Configuration ->**System**	System Name	Net. Plan	Name for sector controller
		IP Address	Net. Plan	IP address for sector controller
3	Configuration ->**Wireless**	System Mode	RF Plan	PMP sector controller
		Channel Width	RF Plan	All sector controllers must use the same setting as the base station.
		RF Freq.	RF Plan	All sector controllers must use the same setting as the base station.
		Tx Power	RF Plan	Refer to RF Plan
		Antenna Gain [1]	RF Plan	See Mfg. Spec. [1]

Notes: 1. DFS enabled systems only.

4.2.6 Step 6: Change Passwords

To ensure system security, the administrator should select the admin account and enter a new password. User accounts should also be created to allow monitoring of the Ellipse without access to configuration settings.

Important: It is difficult to restore access following a lost administrator password. It is recommended to always record the administrator password and store this information in a physically secure location for future reference.

4.3 Install Outdoor Equipment

The Ellipse is supported by a series of MIMO sector antennas with integrated GPS antenna. These antennas also include all required mounting hardware. The sector antenna has flying leads attached for the MIMO RF and GPS antenna.

Note: This is a passive GPS antenna. The GPS Antenna Type must be set to 'passive'. See Configuration->Wireless settings in the Ellipse Family user manual.

4.3.1 Step 1: Attach Sector Controller to Antenna

Part 1: Mounting the Ellipse to the Sector Antenna

1. Place the antenna face down on a working surface that will not damage the radome. For example, on the inside face of the cardboard shipping package.
2. Align the Ellipse as shown in the following diagram. The RF connectors should be on the same side with the V-POL and H-POL antenna leads.

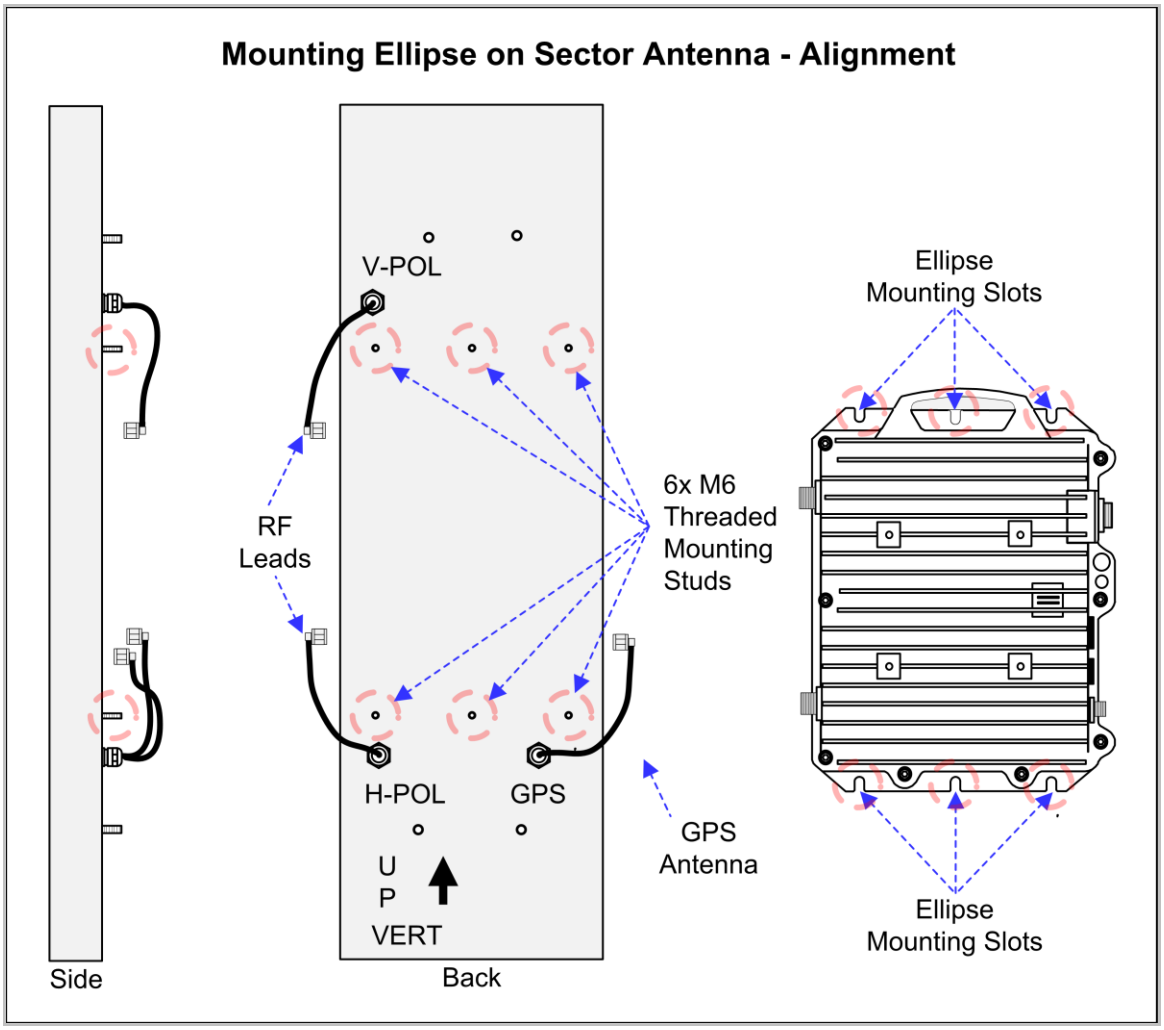

Figure 21: Installation - Aligning the Ellipse and Sector Antenna

3. Place the Ellipse system on the antenna and secure using using the nuts and washers included in the antenna hardware kit.
4. Tighten the nuts to a torque rating of 17 N-m (12.5 ft-lb).

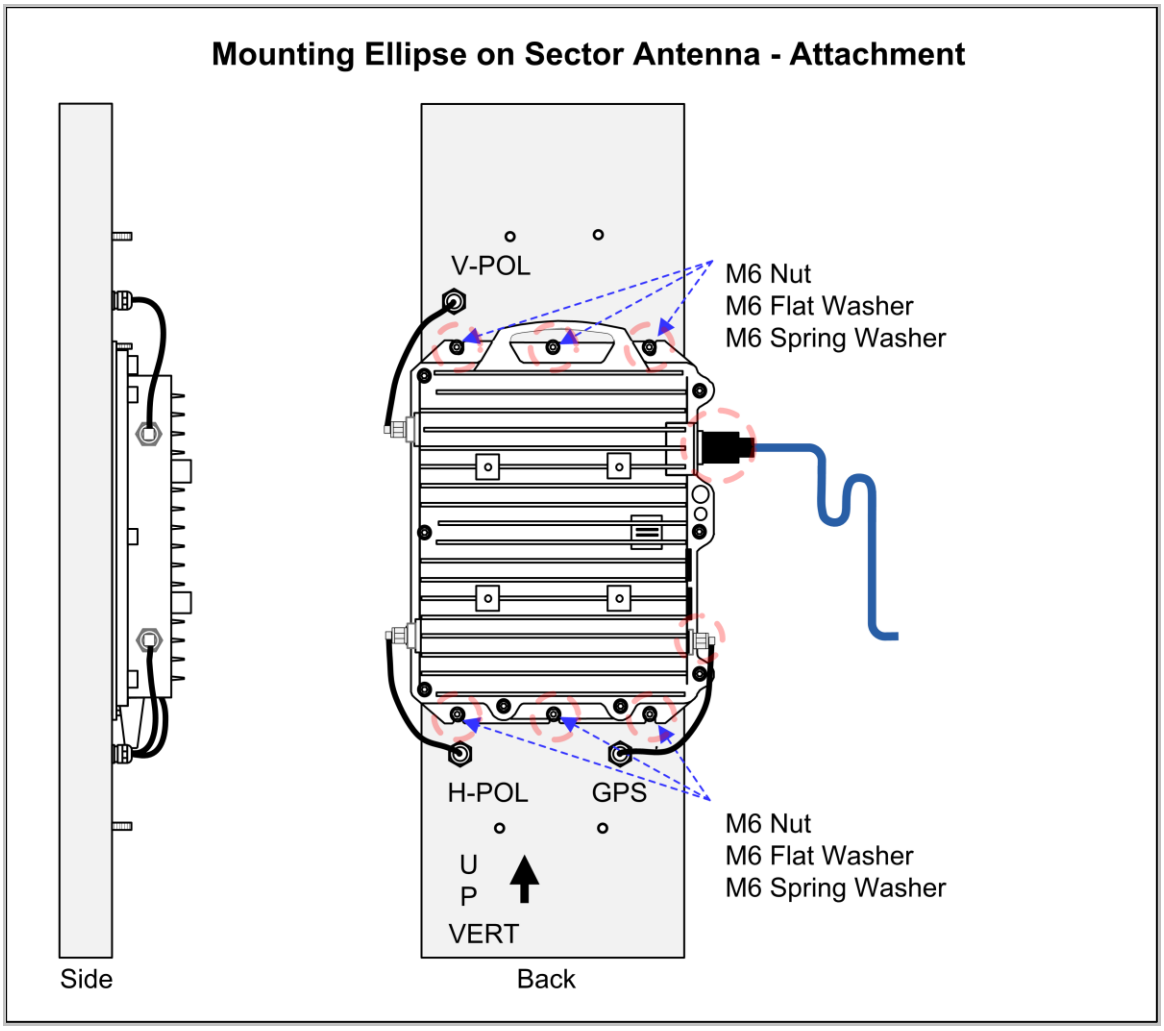

Figure 22: Installation - Mount and Secure Ellipse to Sector Antenna

4.3.2 Step 2: Connect and Weatherproof Ethernet and Antenna Cables

Connect Antenna Cables (2x RF + GPS)

1. Connect the V-POL, H-POL, and GPS leads to the corresponding Ellipse ports.
2. Tighten the connectors to a torque rating of 17 N-m (12.5 ft-lb) or finger-tight plus 1/8th turn only. Using excessive force (over-torque) or the incorrect tools will damage the connectors on the Ellipse and defeat the connector weatherproofing features.

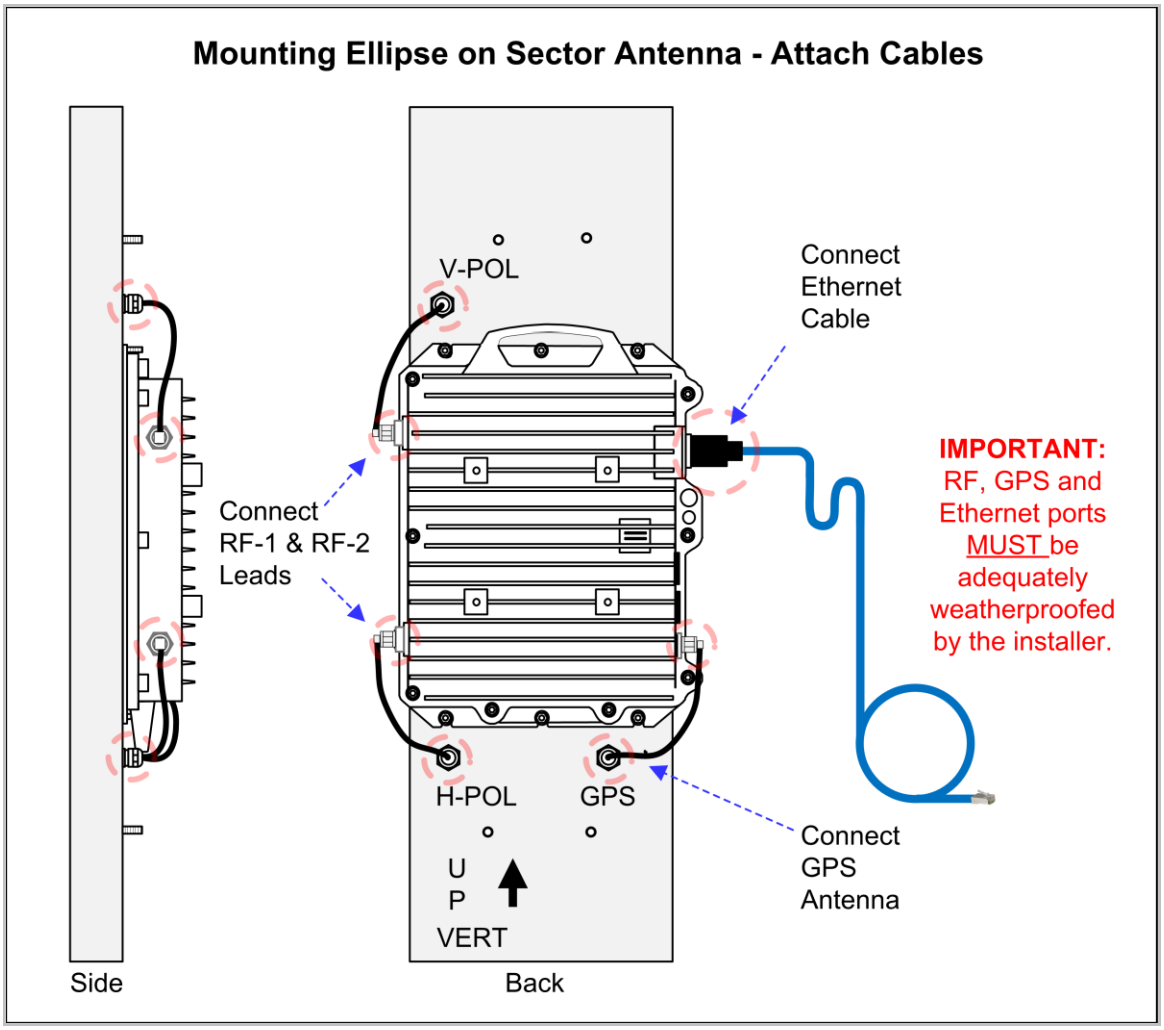

Figure 23: Installation - Weatherproofing the Antenna and Ethernet Cables

Connect Ethernet Cable

The Redline outdoor Ethernet cable is terminated with a non-hooded RJ-45 connector. This connects to the metal RJ-45 connector located on the wireless sector controller enclosure. When connecting the outdoor Ethernet cable to the wireless sector controller, ensure the RJ-45 plug is fully inserted and locked into the socket. Test the locking function by applying a very light pulling pressure (two fingers) on the cable.

The Ethernet port is protected by a weatherproof gland. The Ethernet cable must be threaded through the connector components and the connector and re-assembled. The Ethernet port seal is water-resistant when assembled correctly. Additional weatherproofing must be applied (see following pages).

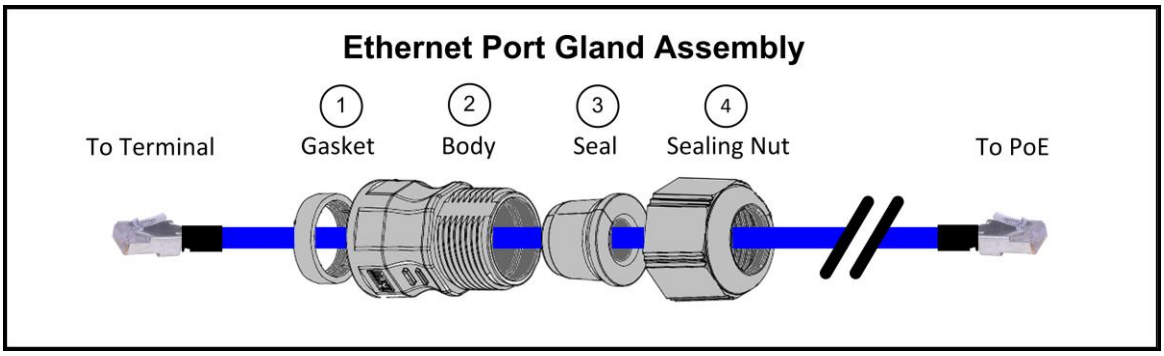

Figure 24: Installation: Ethernet Port Gland Assembly

Use the following steps to connect the Ethernet cable. The connector assembly is provided as a separate item in the shipping container.

1. Remove the connector from the packaging and arrange the individual components in the order displayed in the diagram.
2. Insert the Ethernet cable through the sealing nut (4), seal (3), body (2) and gasket (1).
3. Connect the Ethernet cable connector to the RJ-45 socket. Inserting the RJ-45 plug into the socket should produce an audible 'click' from the locking mechanism.
4. Position the gasket (1) against the Ethernet port.
5. Thread the body (2) onto the Ethernet port. The body must be finger-tight plus 1/2 turn, or approximately 47 N-m (35 ft-lb).
6. Two sizes of split seals (3) are provided to accommodate single and double shielded cables. Choose the seal that fits tightly on the cable without distorting. Slide the split seal along the Ethernet cable until it is tight against the body (2).
7. Thread the sealing nut (4) on to the body. The sealing nut must be finger-tight plus 1/2 turn. This is approximately 47 N-m (35 ft-lb).

Weatherproof Ethernet and Antenna Ports

When the Ethernet and antenna cables are secured, all ports must be weatherproofed.

1. Starting as close as possible to the wireless sector controller body, wrap splicing tape tightly over the bulkhead-end and work towards the Ethernet cable. Stretch and wind the tape back along the Ethernet port nut. Do not leave any gaps in the coverage. It is recommended to apply a minimum of three (3) layers of splicing tape.
2. Mold mastic putty tightly around the bulkhead.
3. Wrap the entire port assembly with three (3) layers of PVC tape.

   Seal both ends of the assembly with cable ties to prevent unravelling of the PVC tape. Do not over-tighten the cable ties, as this may compromise the weather seal.

This completes the weatherproofing procedure.

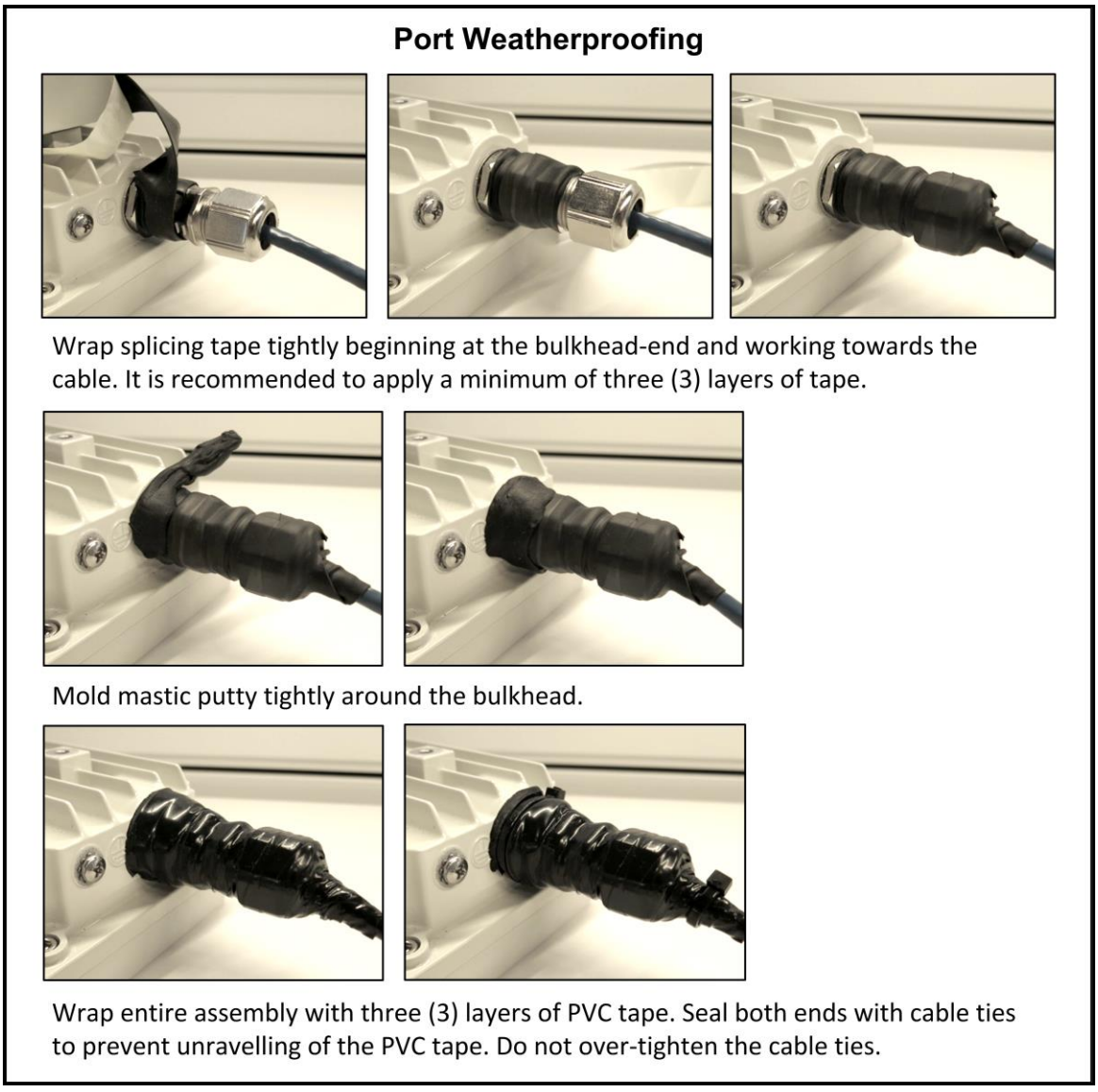

Figure 25: Installation: Weatherproofing Procedures

4.3.3 Step 3: : Assemble Antenna Mounting Bracket

1. Place the antenna face down on a working surface that will not damage the radome.
2. Attach the Tilt Adjustment Bracket (top) and the Tilt Range Selection Bracket (bottom) to the antenna using M8 plain washers, spring washers, and plain nuts. Tighten the nuts to a torque rating of 17 N-m (12.5 ft-lb).

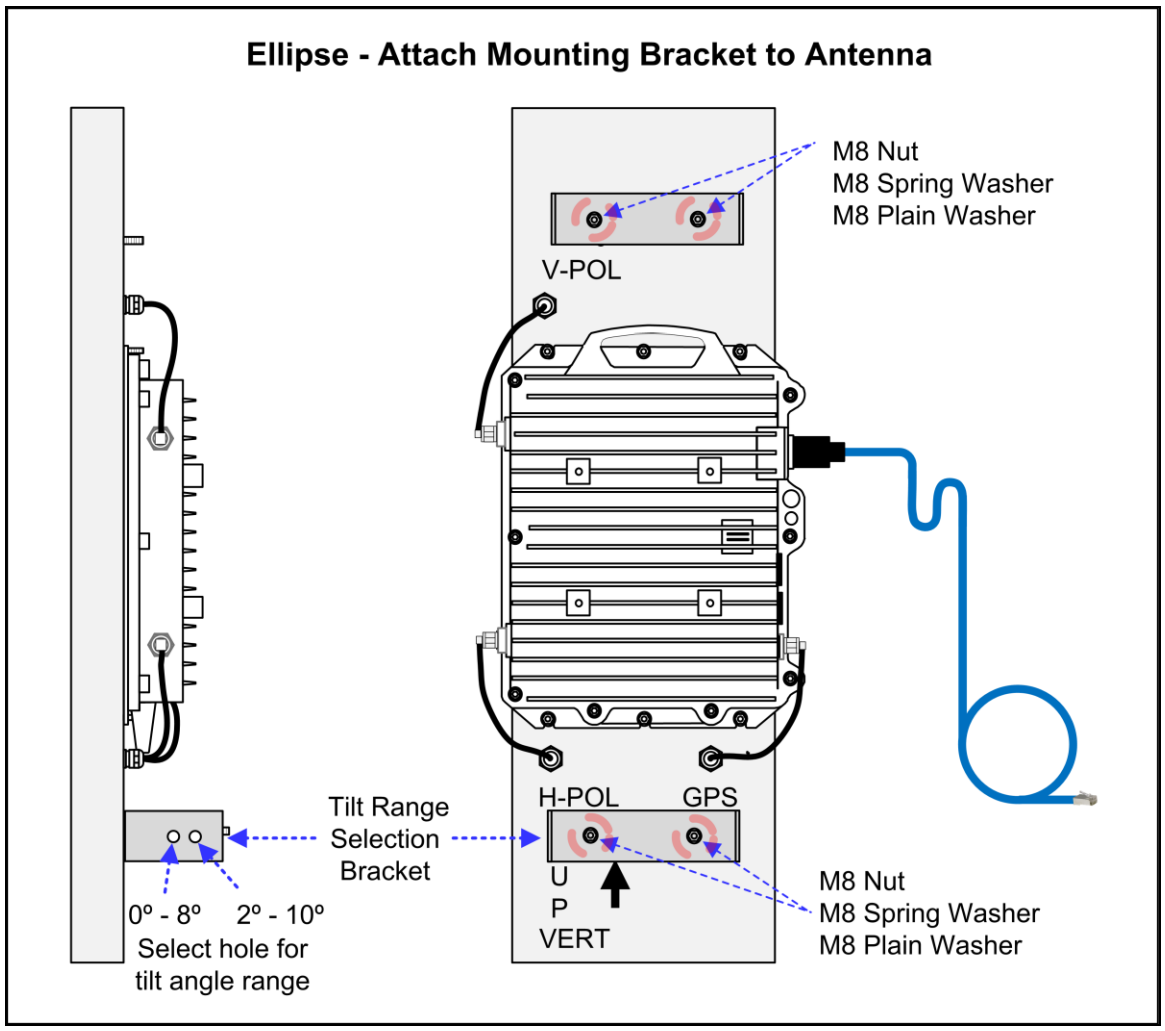

Figure 26: Installation - Integrated Sector Antenna - Tilt Brackets

3. Attach the main clamp to the slider adjustment bracket (upper). Insert the M8 setscrew with plain washer from the outside and secure with an M8 Nyloc. Hand tighten only.
4. When attaching the main clamp to the tilt selection bracket (lower). Insert the M8 setscrew with plain washer from the outside and secure with an M8 Nyloc. Select the hole based on the required tilt range (0-8º or 2-10º). Hand tighten only.

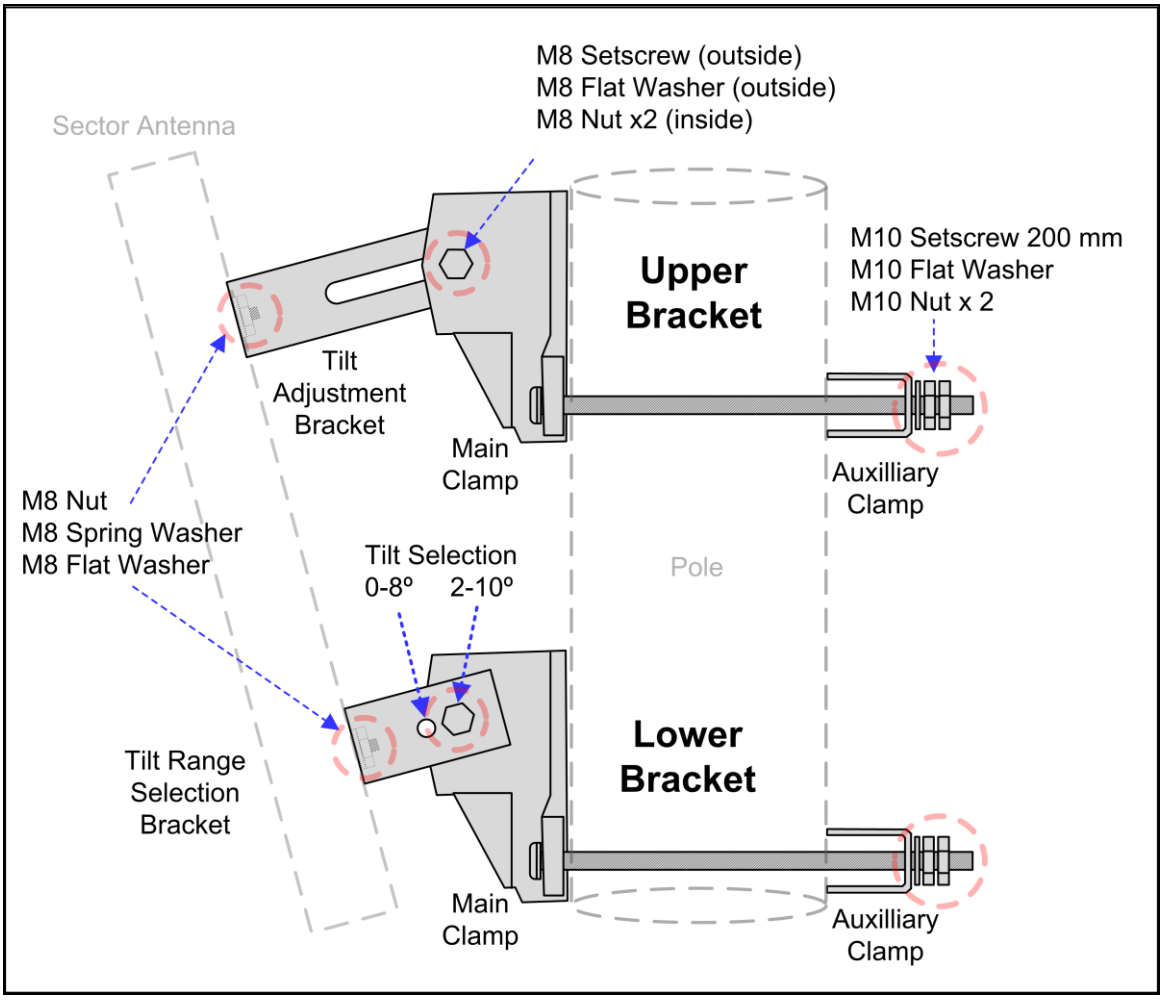

Figure 27: Installation - Integrated Sector Antenna - Tilt Brackets Detail

Table 15: Installation - Integrated Sector Antenna Mounting Kit - Parts List

Description	Quantity	Description	Quantity
Main Pole Clamp	2	M8 x 30 Setscrew	4
Auxiliary Pole Clamp	2	M8 Flat Washer	8
Slider Adjustment Bracket	1	M8 Nut Plain	8
Tilt Selection Bracket	1	M8 Spring Washer	4
M10 x 200 Setscrew	4	M6 Nut Plain	6
M10 Flat Washer	4	M6 Flat Washer	6
M10 Nut	8	M6 Spring Washer	6

4.3.4 Step 4: Mounting the Antenna/Sector Controller on Mast

The following figure shows a correctly installed Ellipse sector controller mounted on a mast. The final mounting height, direction and tilt must conform to the site survey information for this site.

⚠ CAUTION: Do not install the outdoor sector controller equipment during adverse weather conditions when the threat of a lightning strike is possible.

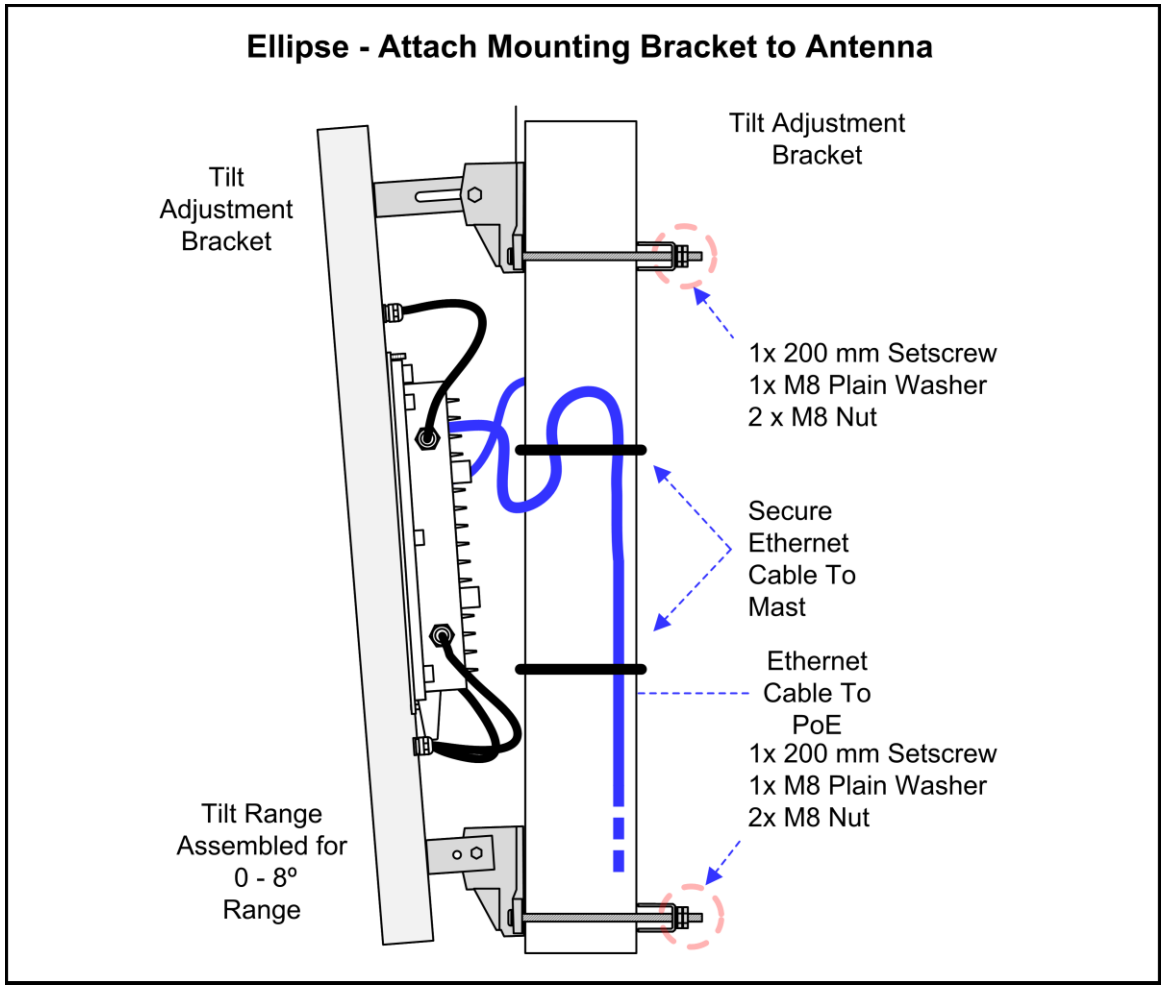

Figure 28: Installation - Integrated Sector Antenna - Mounting on Mast

1. Fit the assembled antenna/Ellipse SC onto the pole. Install the auxiliary clamps using the M10 200 mm setscrews and secure each with a flat washer and nut.
2. Adjust the horizontal aiming as required before tightening the auxiliary brackets. Tighten the nuts on the 200 mm setscrews to 17 N-m (12.5 ft-lbs). Add a second nut to each setscrew and tighten the outer nuts to the same rating (while securing the inner nuts with a wrench).
3. To adjust tilt, position an inclinometer onto the rear of the antenna and adjust the antenna to the required angle. Tighten the Tilt Adjustment Bracket (upper) and the Tilt Range Selection Bracket (lower) nuts to a torque of 17 N-m (12.5 ft-lbs).

Hoist Equipment to Mounting Location

For safety, it is recommended to use a hoisting device to raise the Ellipse to the mounting location on the tower or mast. When at the location, secure the device against

displacement by wind. The device should remain tethered until it is securely mounted to minimize the risk to employees working below this level.

Important: Do not use the Ethernet cable to hoist the sector controller. If the Ethernet cable has been connected and weatherproofed, create the service loop and securely attach cable to the mounting bracket to avoid any strain on the Ethernet port connection during hoisting and installation.

Cable Supports

It is important to provide strain relief, drip loops and protection against vibration and abrasion caused by the wind, sand etc. The installer must provide suitable cable supports for the CAT-5 outdoor Ethernet cable, spaced at a recommended maximum of 450 mm (~18 in).

Cable Ties

If using plastic cable ties -- do not over-tighten.

4.3.5 Step 5: Align Antenna

Antenna alignment is essential to obtain maximum performance from a wireless link. Antenna misalignment results in weaker receive signal strength and it may not be possible to establish the wireless link.

The alignment must be performed in both the azimuth and elevation planes. Before installing the equipment, obtain accurate antenna pointing azimuth and elevation angles for each installation site. This will allow approximate alignment of antennas by using GPS or magnetic compass. Refer to the site survey status.

Note: A metal tower will affect the accuracy of a magnetic compass. There is also a difference between true North and Magnetic North (magnetic declination).

Azimuth Alignment

Use a magnetic or GPS compass to obtain the approximate azimuth direction. The azimuth is aligned by loosening the bolts on the pipe bracket and rotating the antenna around the pole.

Elevation Alignment

Most link budget plans will specify an elevation of zero degrees. The antenna can be set to vertical using a bubble (spirit) level. This method is not accurate for elevation settings of greater than 5 degrees. To adjust the elevation, loosen the appropriate bolts of the mounting bracket.

4.4 Install In-Cabinet Equipment

4.4.1 Step 1: Install PoE Power Injector

Refer to the Site Survey section of this manual.

4.4.2 Step 2: Install Ethernet Surge Arrestor

Refer to the Site Survey section of this manual.

5 Reference

5.1 Power Over Ethernet (PoE) Device

5.1.1 DC-DC PoE

The Power over Ethernet (PoE) power injector provides power to the wireless sector controller using spare conductors on the Ethernet cable. The power input may be 10-30 VDC. All Ethernet conductors are isolated (ETH and PoE) and have surge protection circuitry.

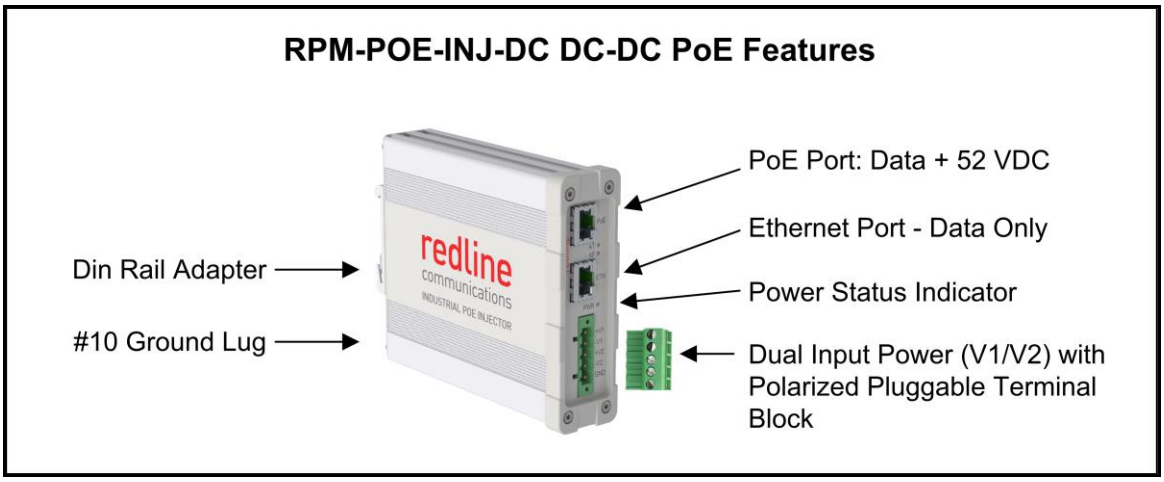

Figure 29: **Reference: DC-DC PoE Features**

Ethernet Port

Connect this port to to the local 10/100Base-T network device. Data signals are passed transparently between this port and the PoE port.

PoE Port

Connect this port to to the cable leading to the wireless sector controller Ethernet port.

⚠CAUTION: System installation must include a dedicated surge protection device for the Ethernet cable at the point of cable ingress into the shelter or cabinet. Refer to the installation section for details.

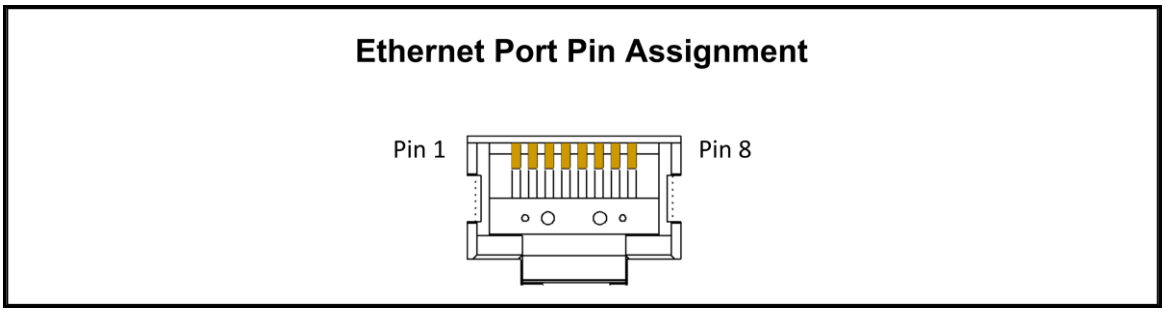

Figure 30: **Reference: POE ETH Port Pin Assignment**

The following table lists the pinout for the PoE and Ethernet ports.

Table 16: Reference: Pinout for POE and ETH Ports		
Pin	**Description**	
	PoE	**ETH**
1, 2	Data Pair 2	Data Pair 2
3, 6	Data Pair 3	Data Pair 3
4, 5	+Ve (out)	N/C
7, 8	-Ve (out)	N/C

LED Indicators

Use the following table to determine the current mode of operation.

Table 17: Reference: DC-DC PoE LED Indicators			
Mode	**AF LED**	**AT LED**	**LED Status Indication**
AF Mode	ON	OFF	AF Mode active (~13W) (e.g., AN-80i)
	Slow Blink	OFF	AF Mode: Over-load or short-circuit.
At Mode	ON	ON	AT Mode active (~25W) (e.g., wireless sector controller)
	Slow Blink	Slow Blink	AT Mode: Over-load or short-circuit.
Non Functional	Fast Blink	OFF	Input voltage out-of-range or PoE over-temperature

DC power Connections

The DC supply connections are located on the front panel. This is a keyed Buchanan 796864-5 (or equiv.) connector accepting 12 to 24 AWG wires. Dual isolated floating power supply inputs are provided to accommodate deployments with backup power (e.g., A + B battery banks). All power inputs include overvoltage and reverse polarity protection.

Table 18: Reference: DC-DC PoE Power Connections	
Feature	**Description**
+V1/-V1	Positive and negative input for primary power supply.
+V2/-V2	Positive and negative input for secondary power supply.
GND	Common system ground. This sector controller is connected directly to the chassis and the ground lug on the back of the PoE.
PWR LED	LED is on when power is detected on either V1 or V2 pairs.
Cable Gauge	Power / Ground: #12 to #24 AWG Chassis Ground: #10 Lug

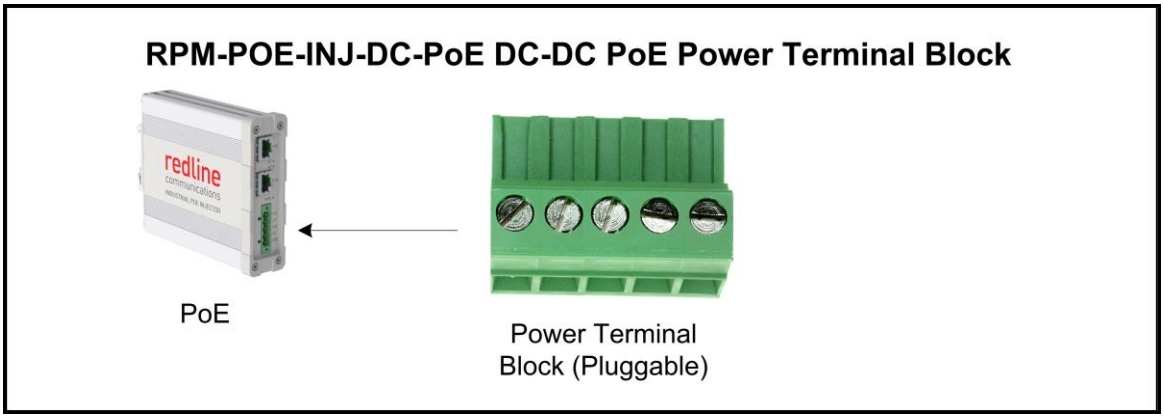

Figure 31: Reference: DC-DC PoE Power Sector controller Block

Ground Lug

A #10 grounding lug is located on the back panel. This is a common ground. The ground lug is connected directly to the PoE chassis and the ground pin (GND) on the input power connector.

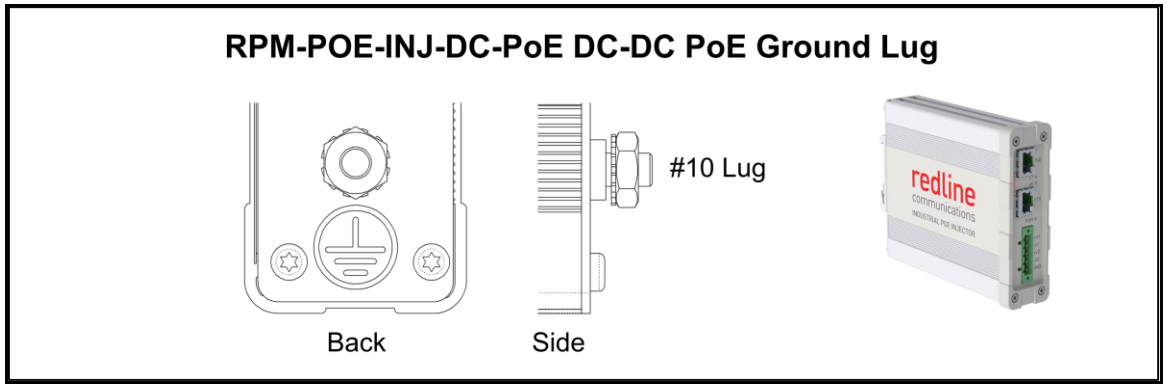

Figure 32: **Reference: DC-DC PoE Ground Lug**

PoE Dimensions

The surge arrestor dimensions (h-d-w) are 110 x 34 x 135 mm (4.4 x 1.3 x 5.4 in).

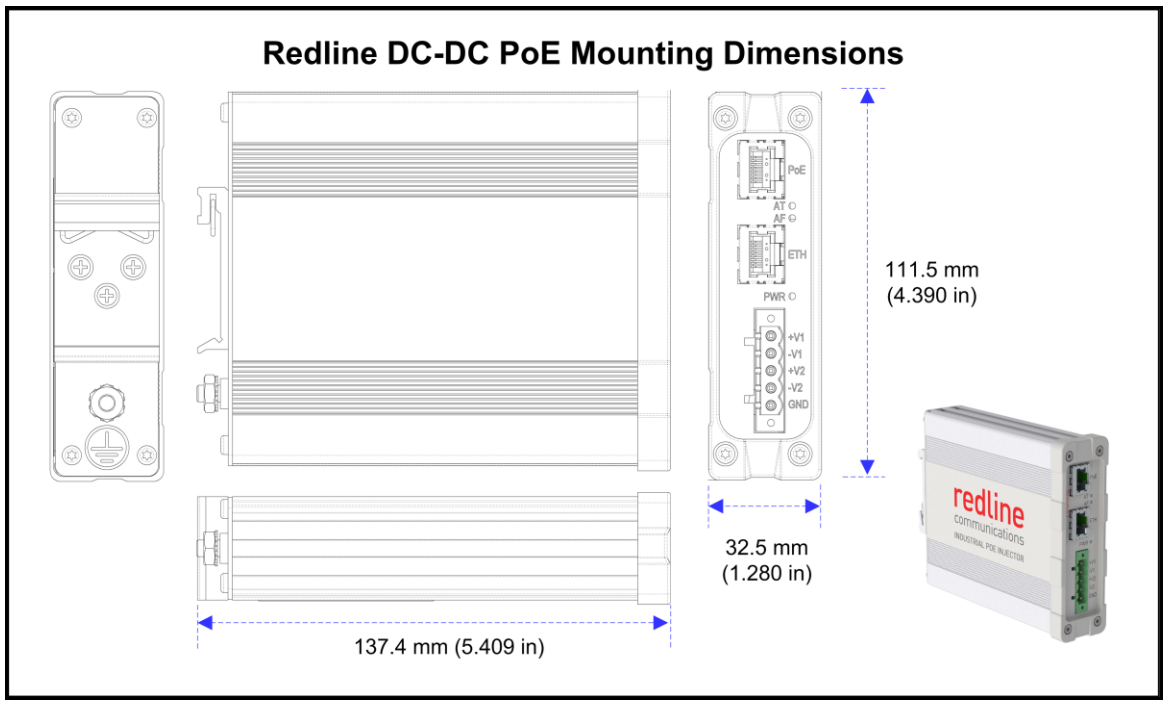

Figure 33: **Reference: DC-DC PoE Mounting Dimensions**

5.1.2 AC-DC PoE

The Power over Ethernet (PoE) power injector provides power to the wireless sector controller using spare conductors on the Ethernet cable. The AC-DC power input may be 90-245 VAC. All Ethernet conductors are isolated (ETH and PoE) and have surge protection circuitry.

The PoE adapter provides operational power for the Ellipse and the Ethernet connection to the wireless interface.

1. Connect the Ethernet outdoor cable from the Ellipse to the OUTPUT (DATA & POWER) port on the PoE power adapter.
2. Connect the test PC or network connection to the INPUT (DATA) port of the PoE power adapter.
3. Connect the PoE power adapter to a compatible power source.

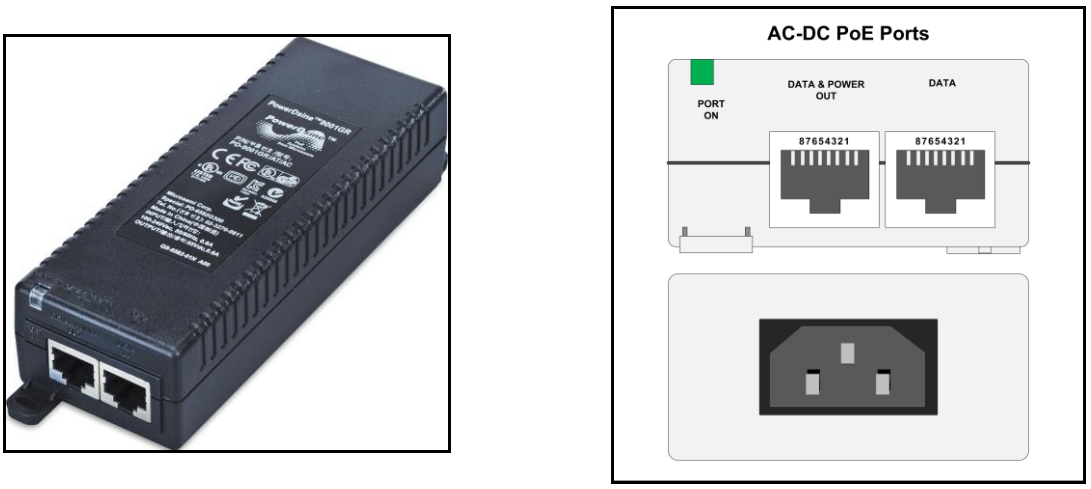

Figure 34: **Reference: AC-DC PoE - Indoor Power Module Pinout**

⚠ WARNING ***to Service Personnel*: *48 VDC***

Customer equipment including personal computers, routers, etc., must be connected only to the INPUT (DATA) port on the PoE unit.

Only the outdoors Ethernet interface cable connecting the Ellipse can be safely connected to the PoE OUTPUT (DATA & POWER) port. Customer premises Ethernet equipment may be damaged if connected directly to the PoE OUTPUT (DATA & POWER) port.

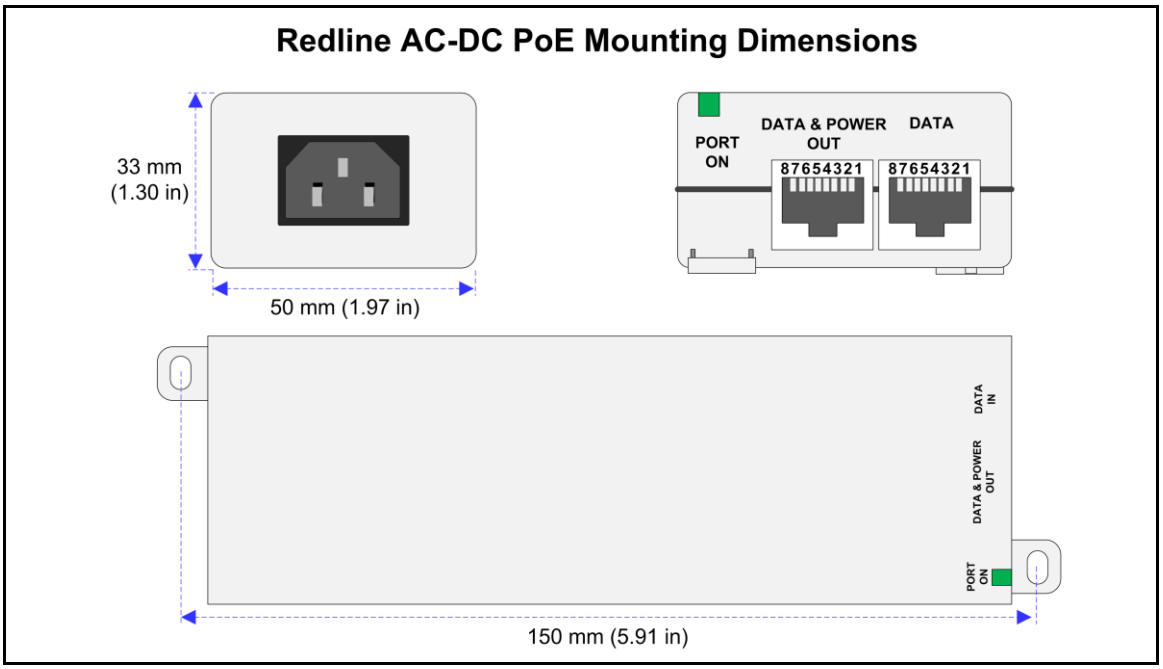

Figure 35: **Reference: AC-DC PoE Mounting Dimensions**

5.2 Ethernet Surge Protection Device

This Ethernet line protector is required to protect the in-cabinet equipment from lightning induced power surges on the Ethernet lead-in cable.

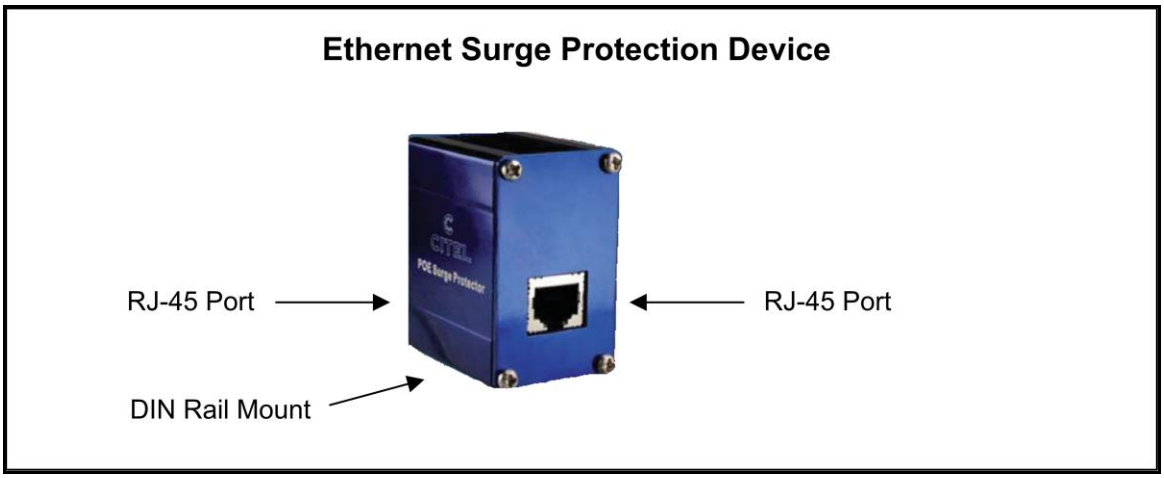

Figure 36: Reference: Ethernet Line Protection Device

Ethernet Port

The protection device includes two RJ-45 / F connectors. The cables may be connected in any orientation. The protection device must be properly grounded to protect against power surges and accumulated static electricity. Connect the grounding wire to the device screw lug, DIN rail clip or mounting flange.

Surge Arrestor Dimensions

The surge arrestor dimensions (h-d-w) are: 44 x 54 x 34 mm (1.33 x 2.13 x 1.73 in).

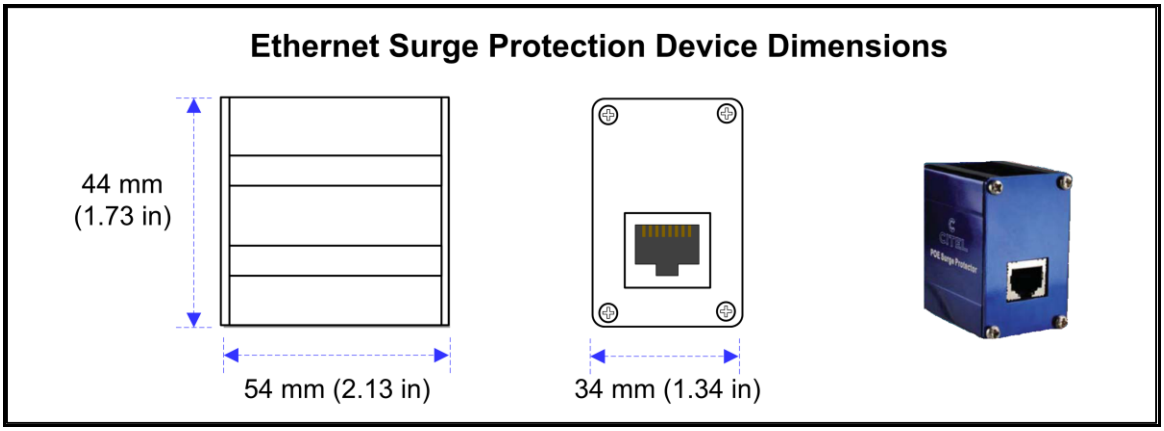

Figure 37: Reference: Ethernet Line Protection Device Dimensions

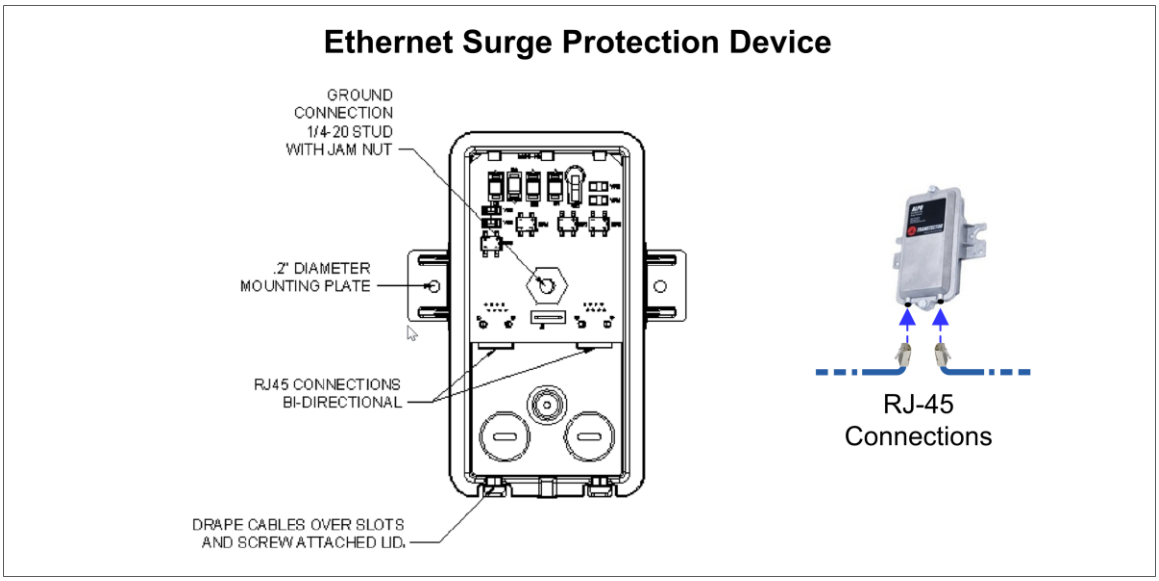

Figure 38: Reference: Ethernet Line Protection Device - Pole Mount

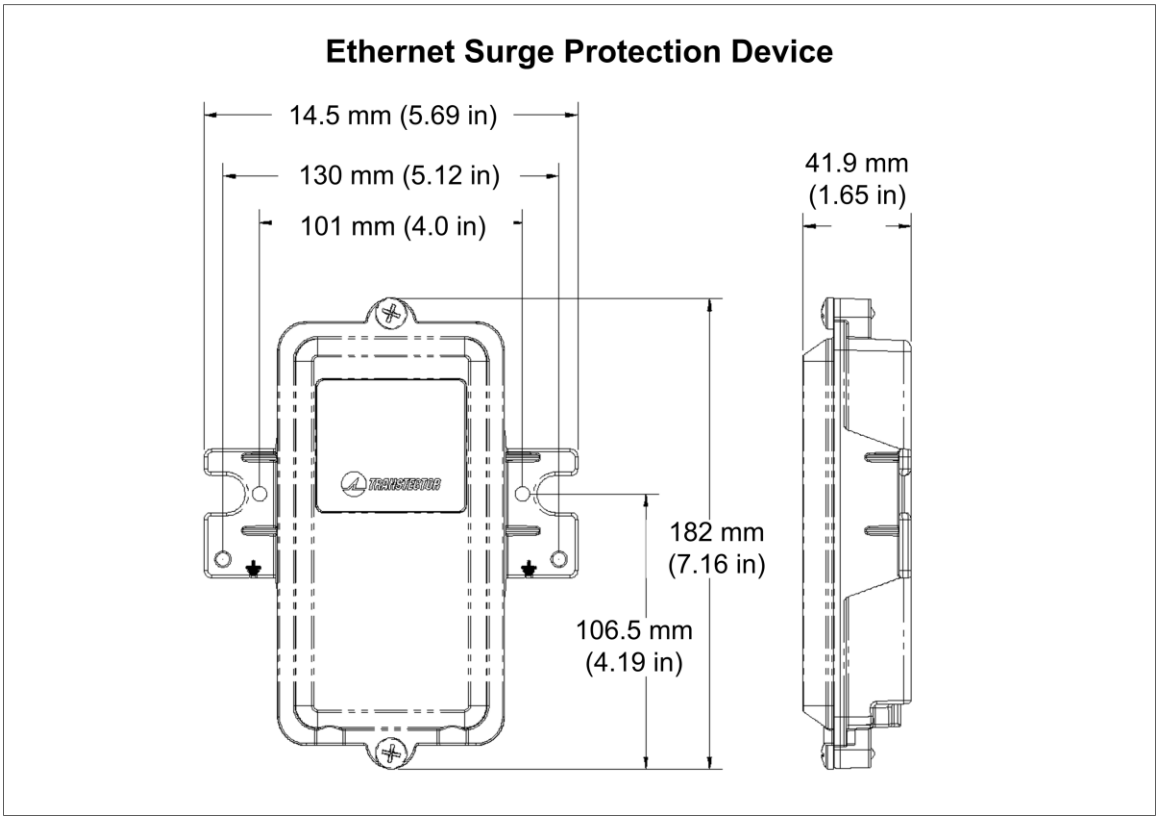

Figure 39: Reference: Ethernet Line Protection Device Dimensions - Pole Mount

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