IONizer 4000 Series
Hardware Installation Guide

Apprion Incorporated

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Revision History

Date	Document Revision	Author(s)
June 08	Version 1	David Cote
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January 09	Version 3	David Cote
February 09	Version 4	David Cote
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Audience

This document describes Apprion™ Incorporated's (Apprion's) IONizer Installation instructions and is intended for the following audiences:

Apprion Employees (Full time and Contract)

This document is a product of the Apprion Engineering team and may be used to help other Apprion employees gain a better understanding of the IONizer installation process.

Apprion Services Group

This document is intended for use by the Apprion Services Group to aid in the installation of IONizer devices.

Apprion's Outsourced Documentation Team

This document is intended to serve as input for other customer/partner-facing documentation that may be produced by Apprion's outsourced documentation team.

This document is Apprion PROPRIETARY AND CONFIDENTIAL.

Conventions

Item	Description
Arial Bold	Menu Instructions (**Device > View Devices**)
	Tab Names (**View Devices**)
	Buttons (**Submit**)
Bold	Field Name (**Device Type**)
	Note
`Courier Type`	Keystroke Entry (`Search Term`)
	Command Line Examples (`activate_config`)
Italic	Names of referenced documents (*ION User Guide*)

How to Use this Guide

This guide provides basic instructions on how to install and wire an IONizer device. You should read ALL chapters for important information before attempting the installation.

Chapter 1
IONizer Device Overview

Introduction

This guide provides information on how to install Apprion™ IONizer devices. The IONizer provides an integrated set of modular hardware and software services that facilitate creation, control and monitoring of secure device networks for the modern plant. The IONizer is a wireless transceiver that serves as the center point of an independent wireless network, or as the connection point between wireless and wired networks. Designed for the industrial applications market, IONizer models are IEEE 802.11a/b/g/i/j compliant depending on the radios installed. This platform is specifically designed to address the wireless connectivity needs of high-security industrial environments.

All IONizer devices are remotely configured and all can take on one or more forms within the network. This means that each IONizer can be configured to suit client requirements.

This guide deals with installation only. Configuration instructions are provided in the *IONizer Reference Guide*.

IONizer 4000 Series Models

IONizers in the 4000 Series are designed for deployment in ordinary locations and may be mounted indoors or outdoors. These devices cannot be deployed in hazardous locations. IONizers can be ordered with one or two radios. In addition, some IONizers in this series contain a WiHART gateway. All models are capable of being powered by 48 VDC PoE or 24 VDC external power.

WARNING: IONizer 4000 Series devices are to be used in ordinary locations only. Installation in an operating atmosphere that is not certified for the device could result in an explosion that could cause death or serious injury.

The IONizers in this series come in different configurations based on Model Number.

IONizer models in this series include:

- IONizer 4000-200 (Single Radio)
- IONizer 4000-220 (Two Radios)
- IONizer 4020-200 (Single Radio, Embedded WiHART)
- IONizer 4020-220 (Two Radios, Embedded WiHART)

All IONizer s use 48V Power over Ethernet (PoE) or 24V external power. The IONizer 4020 is identical to the 4000 but also contains an embedded WiHART gateway.

FCC regulations require that IONizer devices be professionally installed by an installer certified by the National Association of Radio and Telecommunications Engineers or equivalent institution.

Safety Information

The FCC, with its action in Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. When used with approved Apprion antennas, the IONizer 4000 products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper installation of this radio product according to the instructions found in this guide will result in user exposure that is substantially below the FCC recommended limits.

CAUTION: Do not touch or move antenna(s) while the unit is transmitting or receiving.

CAUTION: Do not hold any component containing a radio such that the antenna is very close to, or touching any exposed parts of the body, especially the face and eyes, while transmitting.

CAUTION: Do not operate the radio or attempt to transmit data unless the antenna is connected. Damage could occur.

WARNING: Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type specifically qualified for such use.

WARNING: To comply with FCC RF exposure compliance requirements, the antennas used with the IONizer must be installed with a minimum separation distance of 25.26 cm from all persons, except the 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) which must be installed with a minimum separation distance of 48.97 cm from all persons.

The 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) are to be used for Point-to-Point operation only.

Antennas must not be co-located or operated in conjunction with any other antenna transmitter unless separated by 20 cm or greater.

CAUTION: 5150 – 5250 MHz frequency band is for indoor use only.

CAUTION: High power radar devices are the primary users in the 5250 – 5350 MHz and 5650 – 5850 MHz frequency bands. These radar devices may cause interference and/or damage to LELAN devices.

WARNING: The IONizer 4000 is intended for local (intra-building) connections only and is not designed or evaluated for direct connections to the public telecommunications/cable distribution systems. Cable and Ethernet connections should be made in accordance to the National Electrical Code (NEC). For example, one of the following should be true:

- Cable runs are located in the same building as the unit
- Cable runs through air outside of buildings are less than 140 feet (42 m), and are not routed near power lines
- Cable runs between buildings are buried
- Cable runs between buildings are in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.

These options come from the US National Electrical Code, Sections 800.10, 800.12, 800.31, 800.32, 800.33, and 800.40.

WARNING: Do not open an IONizer when an explosive atmosphere may be present.

CAUTION: Risk of explosion if battery is replaced by an incorrect type. Replace only with Snap-On battery assemblies that are designed for use with the Texas Instrument M4T32-BR12SH6 module. Dispose of used batteries according to the manufacturer's instructions.

Compliance

This equipment has been tested and found to comply with the European Telecommunications Standard ETS 300 328. This standard covers Wideband Data Transmission Systems referred to in CEPT recommendation T/R 10.01. This type of equipment is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instruction guide, may cause harmful interference to radio communications.

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

Chapter 2
Installation Preparation

Overview

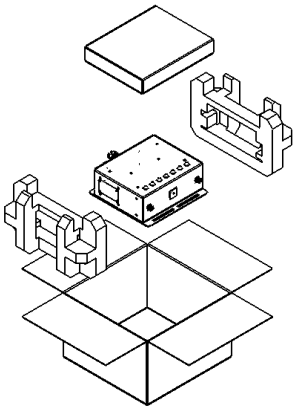
This chapter describes the installation process and what you'll need to successfully mount and connect an IONizer at your site.

Preparation

The IONizers come packaged in specialized shipping containers, each designed for the type of IONizer ordered.

Packaging Content

Contents of the package depend on the IONizer purchased.



4000 Series

- IONizer 4000 or 4020
- Mounting Hardware (2 U-bolts with associated hardware, 4 wall anchor bolts)
- 24V Power Connector
- Manual
- Product Registration and Warranty Cards

Additional orderable accessories include:

- Antenna(s) based on configuration
- Power over Ethernet (PoE) Injector with AC Power Cord
- Multiple length PoE Cable
- Additional Ethernet Cable
- Specialized mounting brackets and hardware

Inspect the unit for any damage or missing items. Contact your Apprion service representative for support.

Ensure that the nameplate on the IONizer your purchased indicates the correct model ordered.

Note: *Models that use this nameplate include: 4000-200, 4000-220, 4020-200, and 4020-220.*

Chapter 3
Installation Guidelines

Overview

The IONizer is intended to be installed as part of a complete wireless design solution. IONizer's can be mounted just about anywhere including high posts to achieve the best results.

This chapter provides basic guidelines that pertain to each device.

Basic Guidelines

- If mounted outdoors, the exposed PoE cable to the IONizer device must not exceed 140 feet (42 meters).

  WARNING: *Installing the IONizer 4000 with a length of exposed PoE or secondary Ethernet cable greater than 140 feet (42 meters) can cause severe damage to the unit or supplementary equipment during a lightning strike.*

- Cable routed through conduit has a maximum length restriction of 300 feet (91 meters).
- To comply with FCC RF exposure compliance requirements, the antennas used with the IONizer must be installed with a minimum separation distance of 25.26 cm from all persons, except the 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) which must be installed with a minimum separation distance of 48.97 cm from all persons.
- The 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) are to be used for Point-to-Point operation only.
- Antennas must not be co-located or operated in conjunction with any other antenna transmitter unless separated by 20 cm or greater.
- Installation must be performed using authorized cables and/or connectors provided with the device or available from the manufacturer/distributor for use with this device.
- Changes or modification no expressly approved by the manufacturer or responsible party for the FCC compliance could void the user's authority to operate this equipment.
- Maintenance is limited to the external enclosure surface and cable connections. At no time should the unit be opened.
- IONizer's mounted outdoors must be grounded with a connection of 1 OHM or less leading from the external grounding stud to earth ground. When mounted indoors, the unit should be grounded to the building's earth ground via a connection to the external grounding stud (if practical). Follow all national, local, and plant electrical codes.

- IONizer's must be properly grounded before making any other power and signal connections.
- Ionizer's must always be grounded in a hazardous location as defined by the NEC or applicable local and country codes.

Chapter 4
Mounting Methods

Overview

This chapter describes various mounting methods. Your actual installation will dictate the actual way your device is mounted.

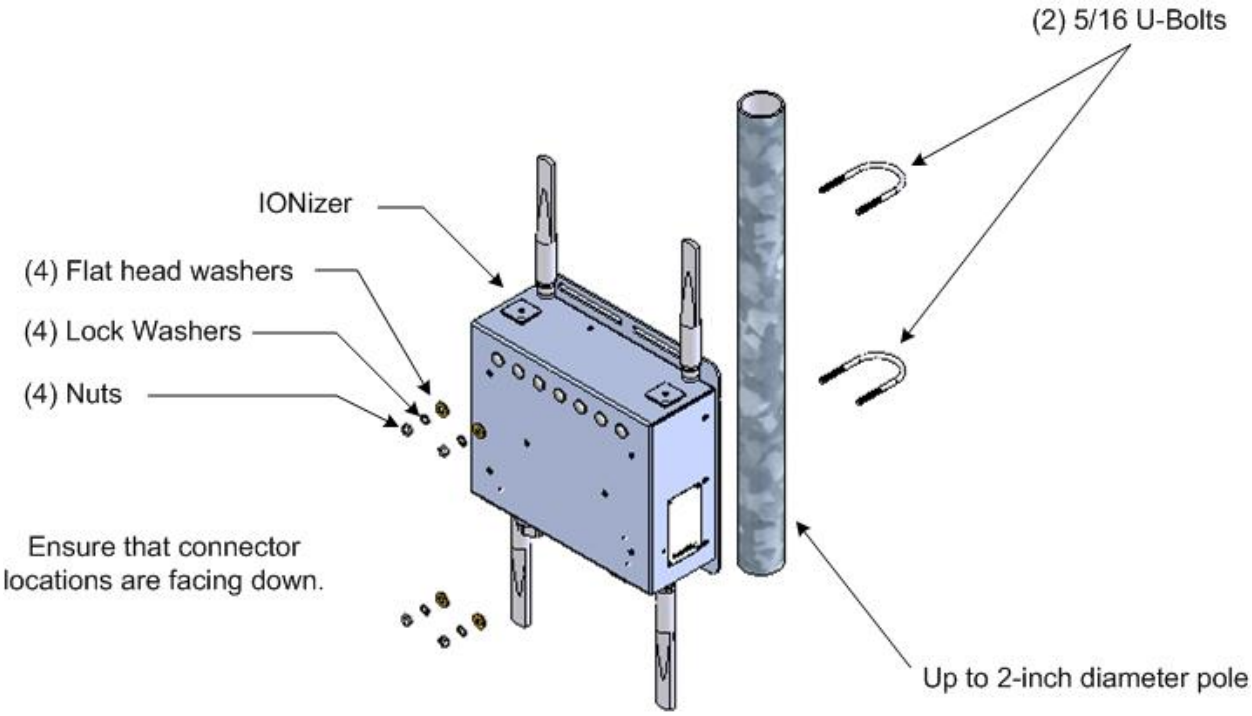
Pole Mounting

Requirements

- 3/8-inch torque wrench
- ½-inch socket head
- (2) 5/16 U-bolts (supplied)
- (4) Split washers (supplied)
- (4) Flat head washers and nuts (supplied)

The IONizer can be mounted on vertical poles up to 2 inches in diameter using the U-bolt hardware provided with the device. The device must be mounted in the correct orientation with device connectors on the bottom facing the ground.

Mounting Diagram



Nut torque range is 25 to 30 inch pounds. Attach antenna cables after the device is mounted.

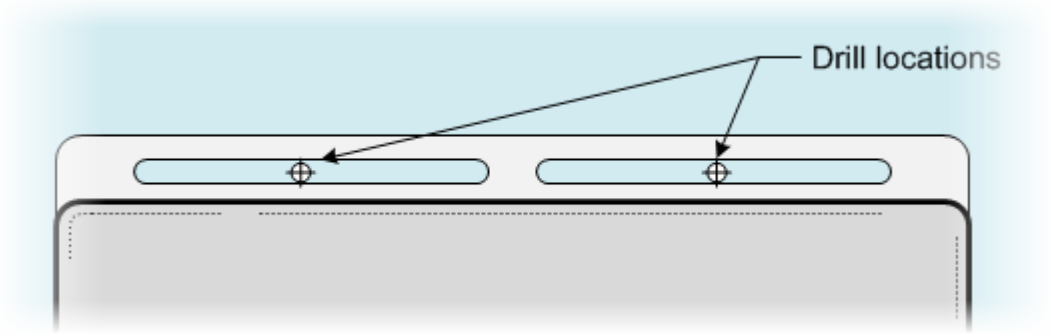
Wall Mounting

Requirements

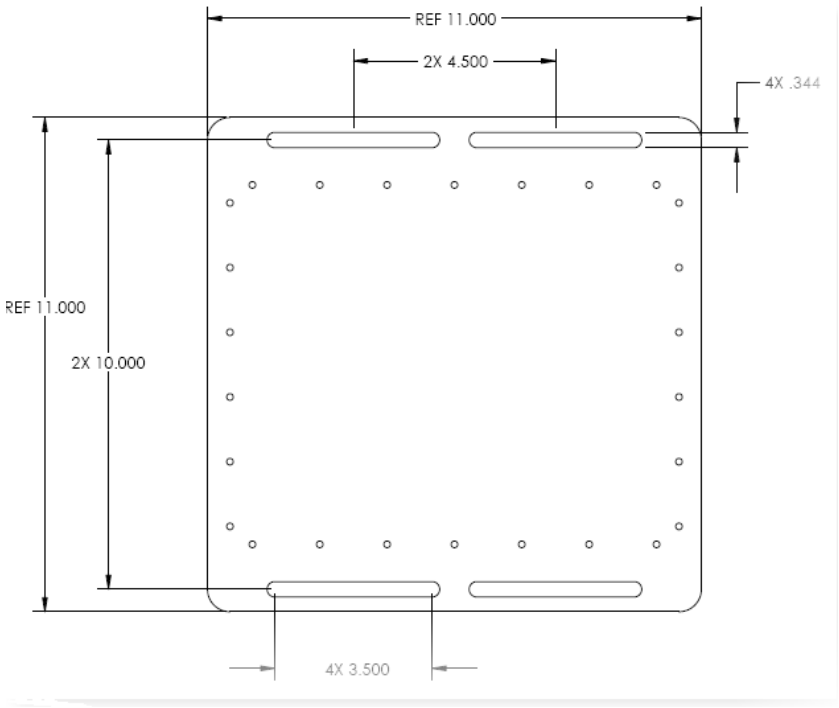
- (4) ¼-inch anchor screws (ELCO ¼-inch x 1-inch or equivalent)
- (4) ¼-inch flat washers
- 3/8-inch power drill
- ¼-inch drill bit
- Phillips head screwdriver

Procedure

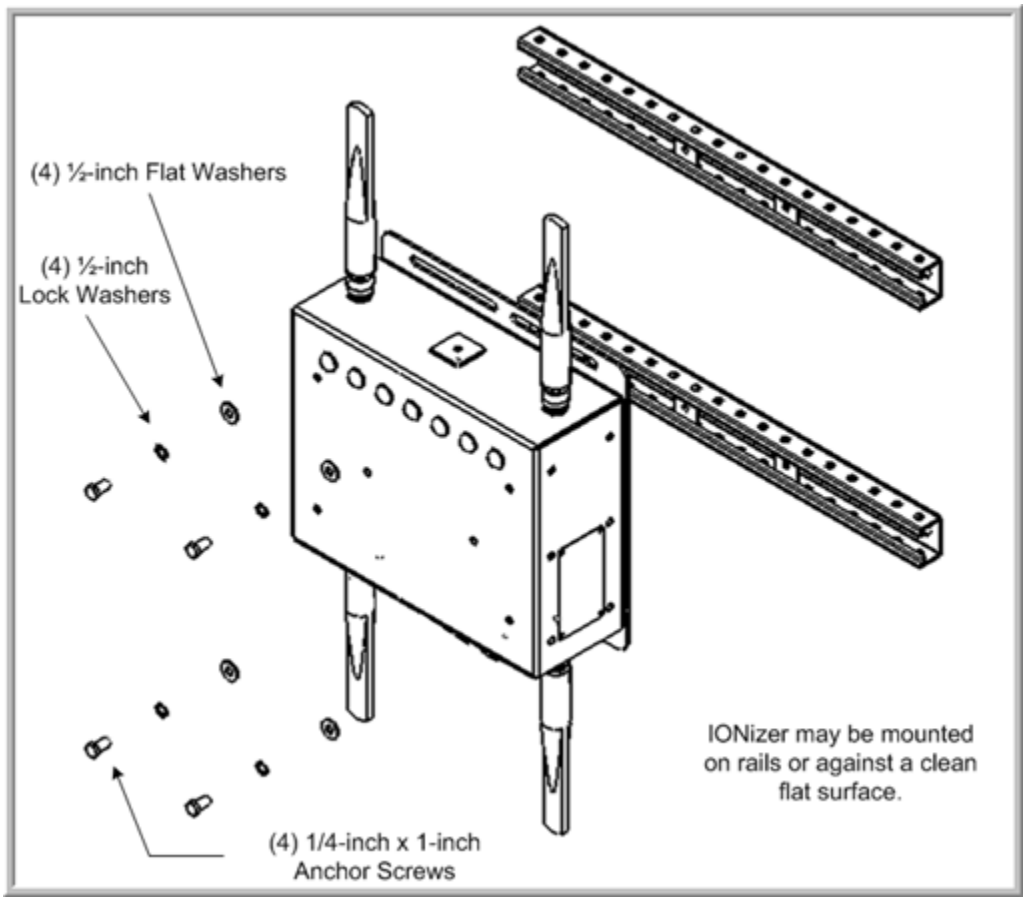
1. Ensure that the surface is clean and free of loose debris.
2. Use the device as a template using the mounting slots to mark screw locations on the mounting surface.



The exact dimensions are displayed in the following diagram:



3. Drill pilot holes using the recommended drill bit size.
4. Mount the device to the surface using the anchor screws and flat washers per manufacturer's instructions. The flat head washers should be between the unit mounting flange and the anchor screw head.
5. You can also mount the IONizer on rails as shown:



6. Seal antenna connections (see instructions).

Sealing Antenna Connections

Antenna connections should be sealed to protect them from exterior harsh environments. Use a self-amalgamating poly isobutylene tape, which over a period of time adheres to itself and forms a single amalgameted rubber molding that conforms to the shape of the item its covering. Once the tape is in place for several hours, the rubber molding is resistant to water and most solvents. It remains stable over a wide temperature range and degrades very slowly in sunlight. The tape can be removed by cutting it away with a sharp knife.

Chapter 5
Grounding and Cabling the IONizer

Overview

This chapter provides the cabling procedures for the IONizer 4000.

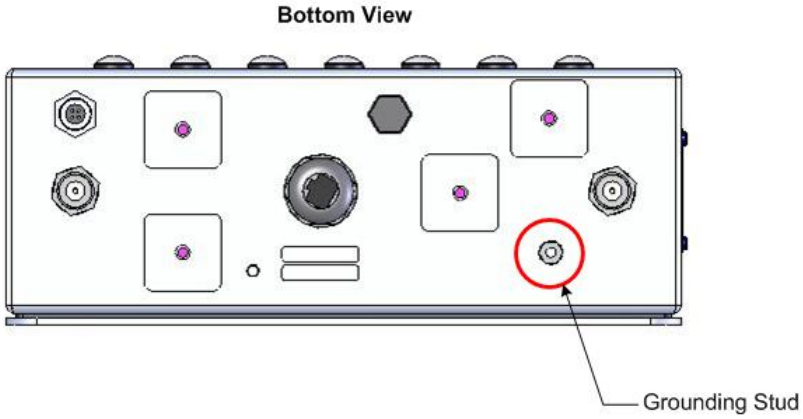
Grounding

All IONizers must be properly grounded before making power and signal connections. Apprion recommends a UL Listed #10 AWG wire that is suitable for this purpose, and a ring tongue terminal, Panduit P/N P10-8R or equivalent. The terminal is to be crimped to the wire using the correct crimping tool as recommended by the terminal manufacturer. The torque rating on the nut is 8 to 10 inch pounds. The wire should be kept as short as possible while using grounding practices that are compliant with local codes and practices.

Note: *Ensure that the connection to a proper earth ground is made by certified and authorized personnel. The ground must conform to all applicable codes and regulations. The materials required to connect to a proper earth ground are defined by local conditions and must be procured locally to ensure that the correct safety environment is achieved.*

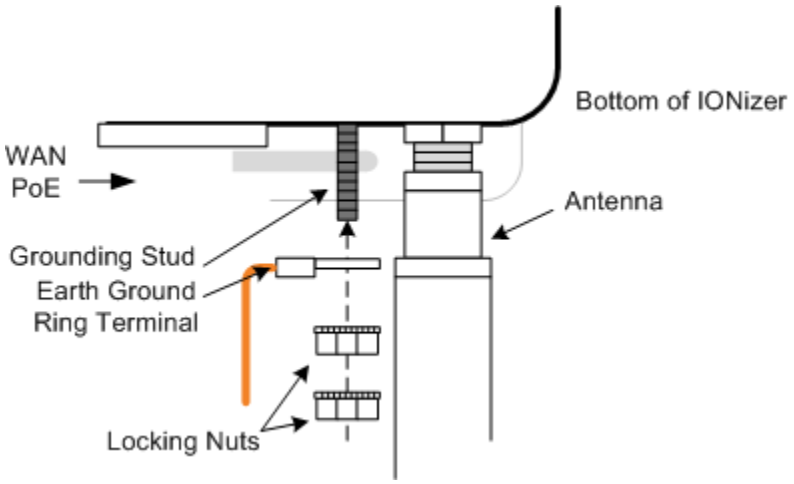
Grounding Procedure

The grounding stud is located on the bottom of the IONizer at the location shown:



Bottom view of IONizer 4020

Attach the earth ground wire (not supplied) to the ring terminal attached to the IONizer's grounding stud. Ensure that the ring terminal is seated against the IONizer's metal case.

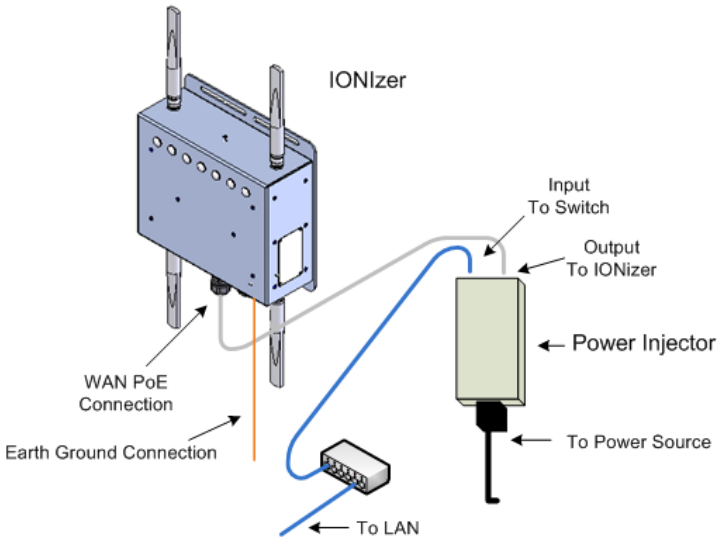


IONizer Cabling

The IONizer can get its power using a 48v PoE for power and Ethernet connection to the network. In addition, a 24V connection is also available. The IONizer can also be connected to a PoE injector or get its power from an Apprion iKIT. This section describes all cabling methods.

Using 48V PoE (All models in series)

This IONizer uses a 48v PoE cable for power and Ethernet connection to the network. Connect cabling between the PoE injector, the IONizer, and the network as shown.

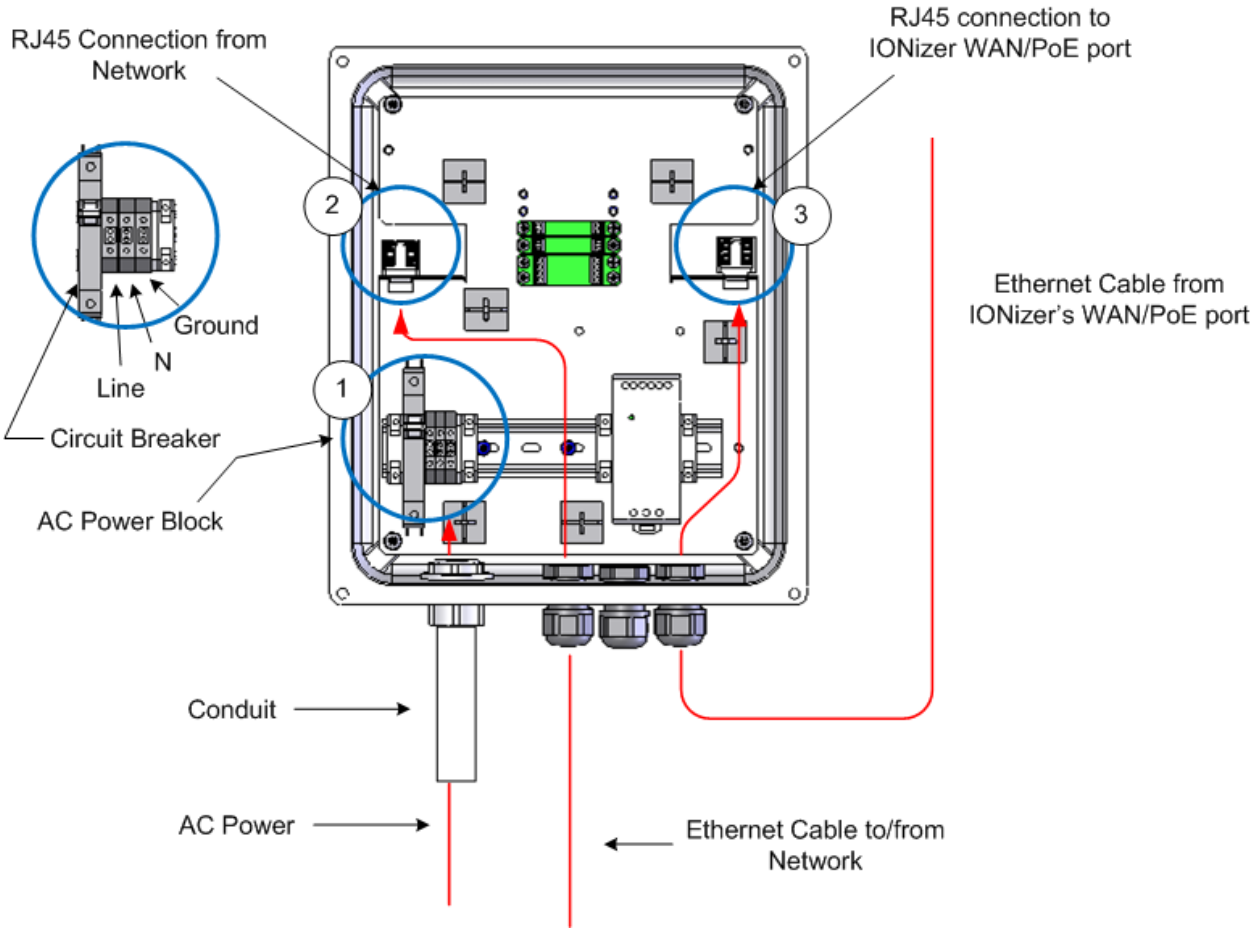


Using 48V PoE from an iKIT

The IONizer can also be connected to different versions of the Apprion iKIT which supply power and Ethernet. The iKIT provides a convenient way to cable an IONizer especially in areas where power and network cabling is a long distance from the IONizer. This method provides PoE but also provides surge

and lightning protection for data and power. See the appropriate *iKIT Installation Guide* for complete iKIT details.

Internal Connections (iKIT 1000 model shown)

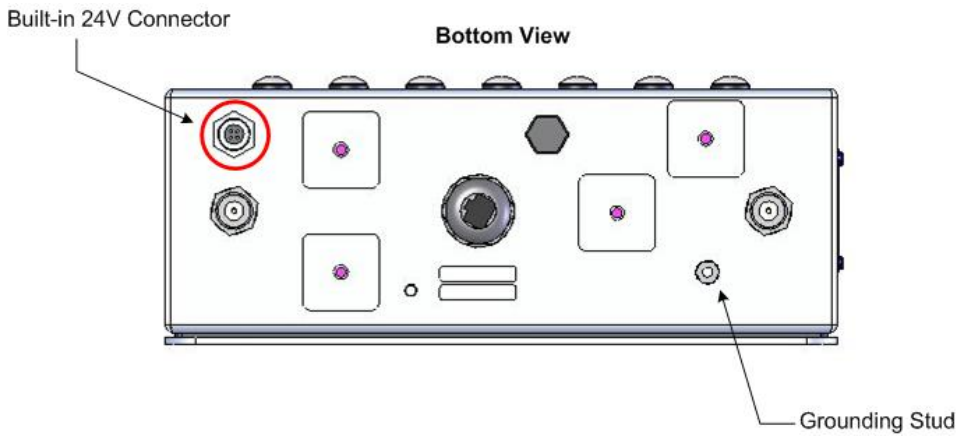


Note: *There are various iKITs available to suit your installation. This diagram shows the base model iKIT.*

Using 24V Input Power

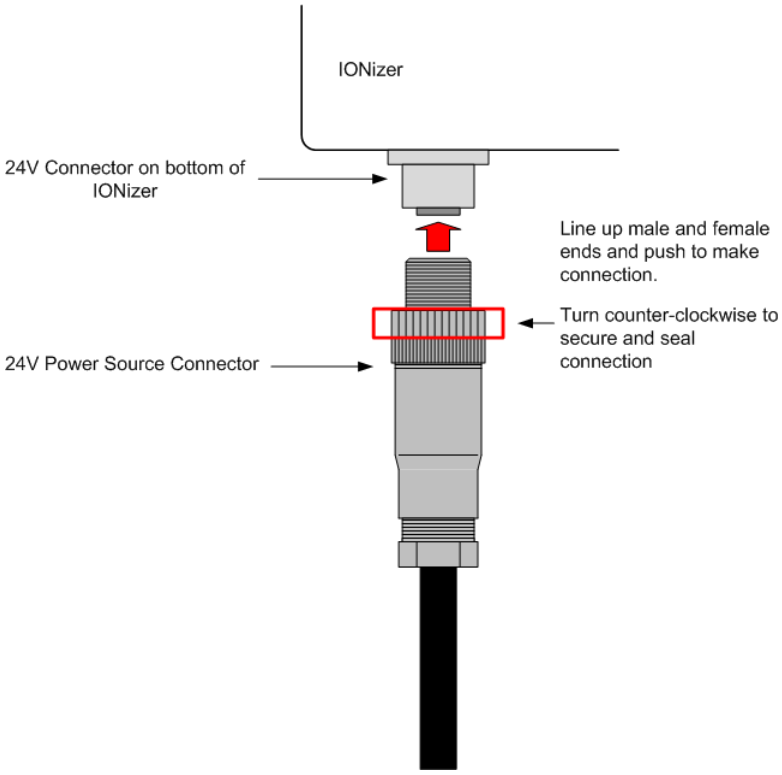
The IONizer allows you to also power the unit with 24V input power. When using 24V power, you will make your Ethernet connections separately.

The bottom of the IONizer has a built-in 24V connector where shown:



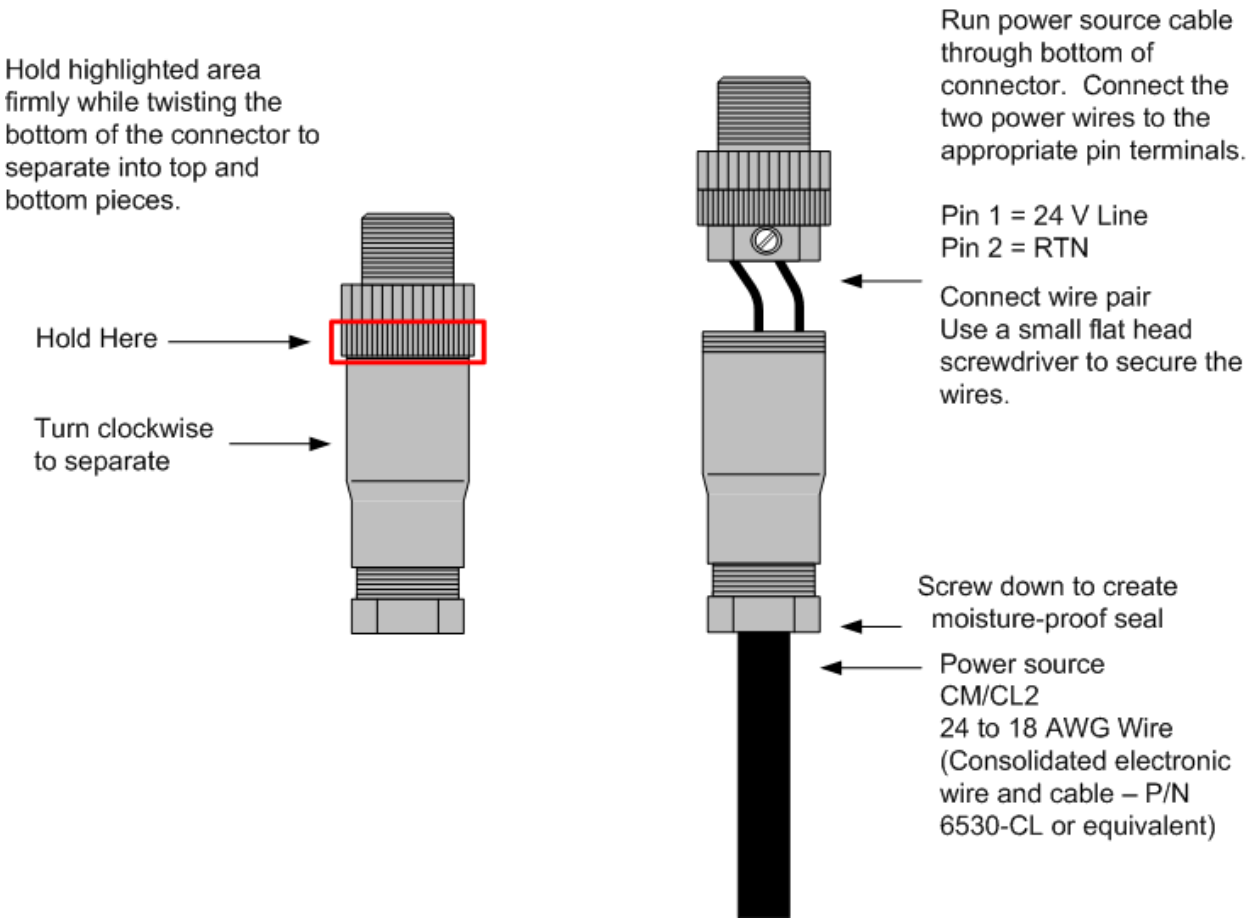
IONizer 4020-XXX Model Shown

A 24V power source connector plug is included with the IONizer. This connector plug is used to connect the 24V power to the IONizer through the built-in connector.



Wiring the Supplied Power Source Connector

If you did not order the 24V Power Source Connector with a power cable, you will have to wire the connector yourself. The following diagram describes this process.

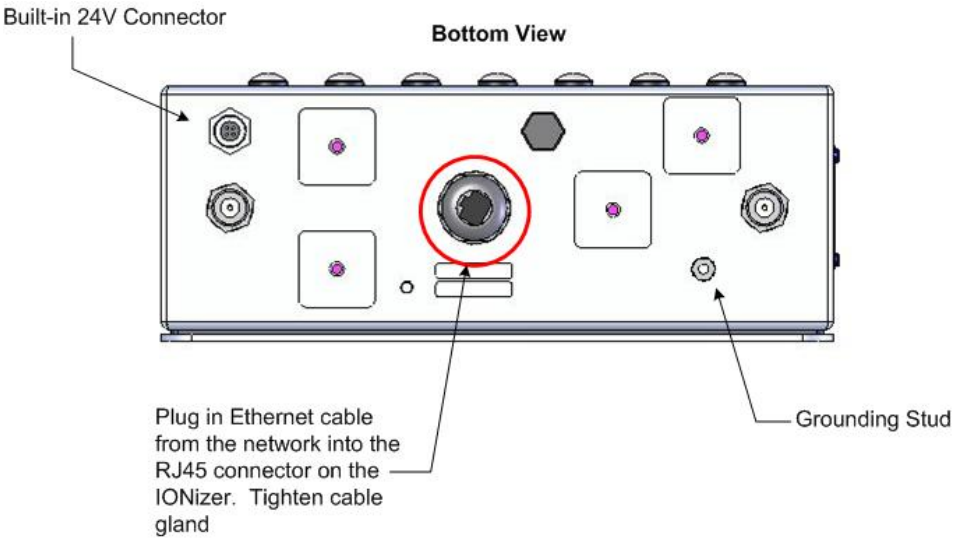


Once completed, reseat the top and bottom pieces of the connector and tighten the sealing nut at the bottom of the connector. Use the procedures above to connect it to the IONizer.

Note: *The Phoenix Connector Kit order number is 1662528*

Connecting the IONizer to the Network

Connect the Ethernet cable from the network to the WAN port on the Ionizer. The Ethernet cable should be run through the supplied cable gland on the IONizer. The WAN port of the IONizer contains an RJ45 connector that allows you to plug in the network cable. Plug in the cable and secure the cable gland to create a moisture-proof seal.



You can also use an iKIT if Ethernet cabling is more convenient or if you want data surge protection. See the *iKIT 1103 Installation Guide* for details. However, in ordinary locations, an iKIT is not required.

Appendix A
Approved Antennas

Basic Antenna Installation Information

- Screw on antennas until hand-tight.
- The IONizer supports various antenna types. Antennas that ship with the units are based on orders
- Unauthorized antennas may cause damage to the device
- To comply with FCC RF exposure compliance requirements, the antennas used with the IONizer must be installed with a minimum separation distance of 25.26 cm from all persons, except the 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) which must be installed with a minimum separation distance of 48.97 cm from all persons.
- The 16 dBi Sector Antenna (Apprion P/N 89-1186-000) and the 19 dBi Directional Antenna (Apprion P/N 89-1187-000) are to be used for Point-to-Point operation only.
- Antennas must not be co-located or operated in conjunction with any other antenna transmitter unless separated by 20 cm or greater.
- Installation must be performed using authorized cables and/or connectors provided with the device or available from the manufacturer/distributor for use with this device.
- Changes or modifications not expressly approved by the manufacturer or responsible party for this FCC compliance could void the user's authority to operate this equipment
- When installing authorized antennas, make sure that the N-Type connector is free of dirt and moisture. The installer should properly ground themselves to minimize the chance of electrostatic discharge or arc.

WARNING: *Potential electrostatic charging hazard.*

CAUTION: *During all servicing and maintenance activities, the antennas must be handled with extreme caution to minimize possible electrostatic discharge (ESD) and arcing events.*

Sealing Antenna Connections

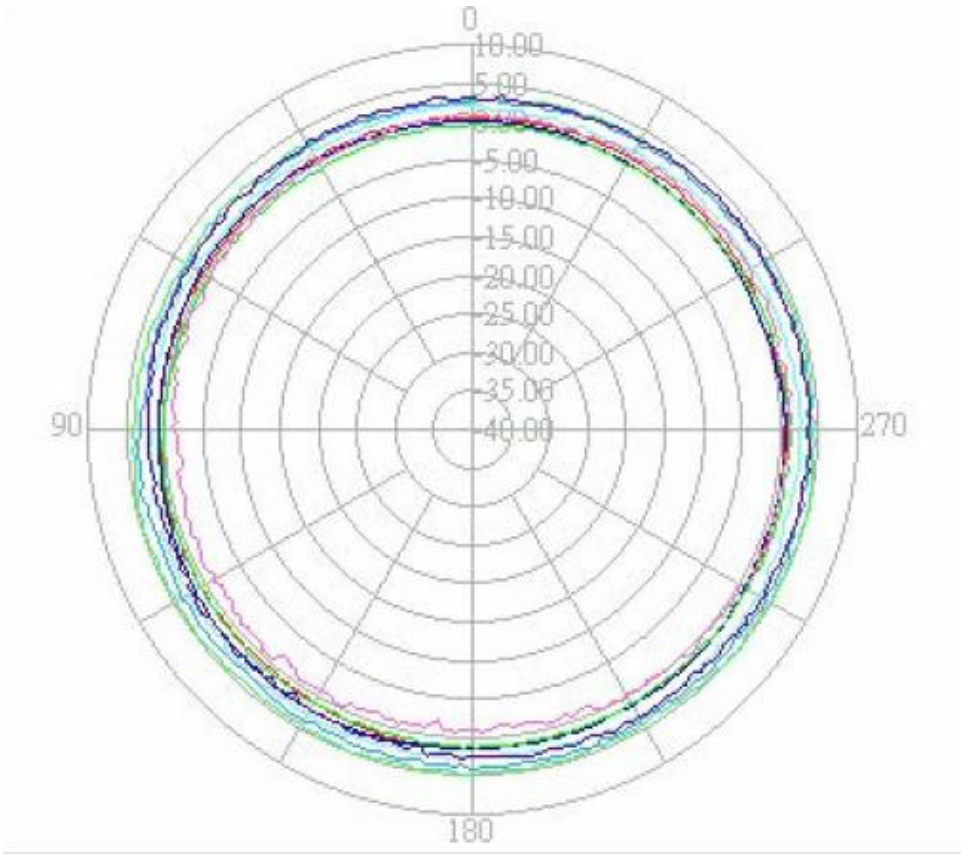
Antenna connections should be sealed to protect them from exterior harsh environments. Use a self-amalgamating poly isobutylene tape, which over a period of time adheres to itself and forms a single amalgameted rubber molding that conforms to the shape of the item its covering. Once the tape is in place for several hours, the rubber molding is resistant to water and most solvents. It remains stable over a wide temperature range and degrades very slowly in sunlight. The tape can be removed by cutting it away with a sharp knife.

Approved Antennas

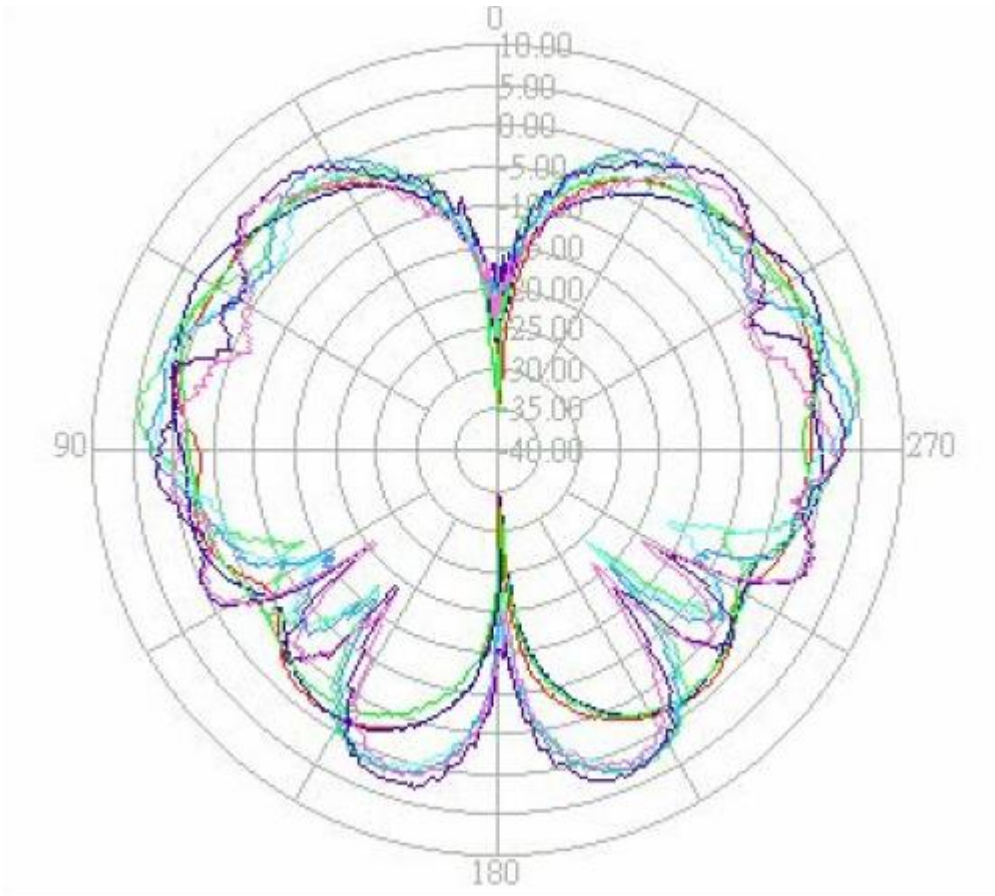
The following sections provide information on Apprion approved antennas for use with IONizer and provides specifications on each.

Omni-Directional Antennas

Dual Band Omni (Standard – 89-1584-000)	
	Typical VSWR: 2.0:1 max.
	Impedance: 50 Ohm
	Polarization: Linear
	Input Power: 10W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -10° C min. to +70° max.
	Connector: Type N Male
	Frequency: 2400 – 5850 MHz
	Gain: 2 dBi at 2400 MHz/4 dBi at 5725 MHz
	Horizontal/Vertical BW: 30° at 2.4GHz, 15° at 5 GHz
	Weight: 0.8 lbs. (0.4kg)
	Dimensions: 7.6” x 0.5” (193mm x 12.7D mm)

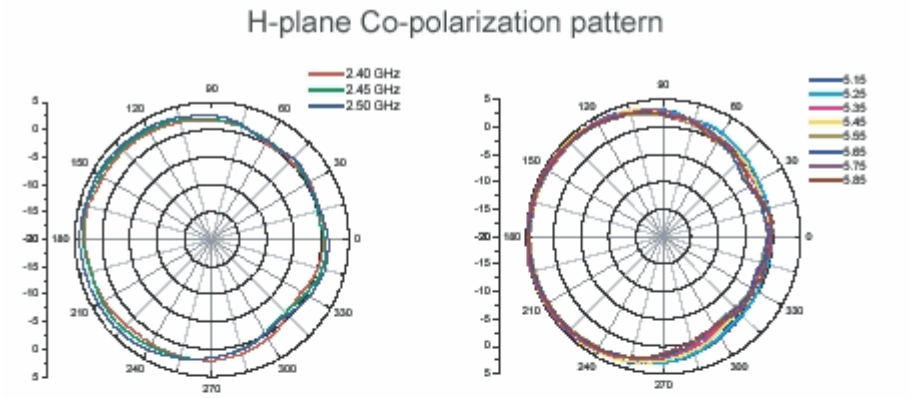


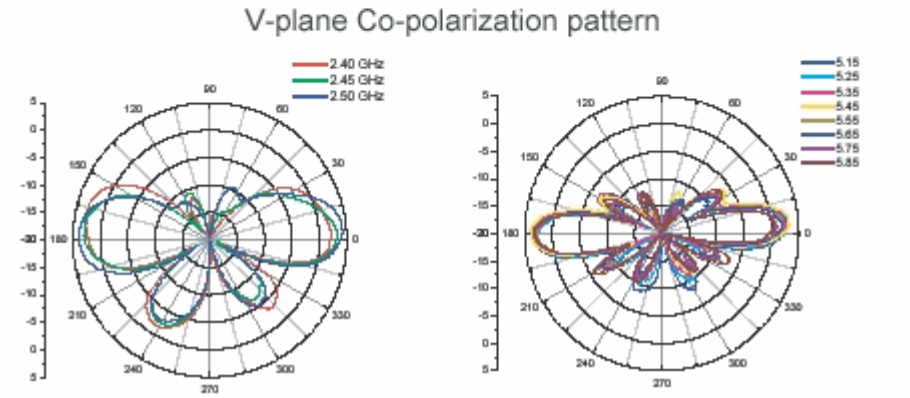
Vertical H-Plane

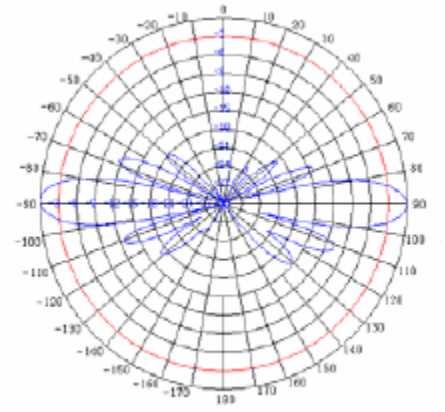


Horizontal E-Plane

Dual Band Omni (Standard – 89-1088-000)	
	Typical VSWR: 2.0:1 max.
	Impedance: 50 Ohm
	Polarization: Vertical/Linear
	Input Power: 2W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -40° C min. to +70° max.
	Connector: Type N Male
	Frequency: 2400 – 2485 MHz
	Gain: 7 dBi at 5150 – 5875 MHz/4.5 dBi at 2400 – 2500 MHz
	Horizontal/Vertical BW: 30° at 2.4GHz, 15° at 5 GHz
	Weight: 0.8 lbs. (0.4kg)
	Dimensions: 27” x 0.6” (685mm x 15mm)

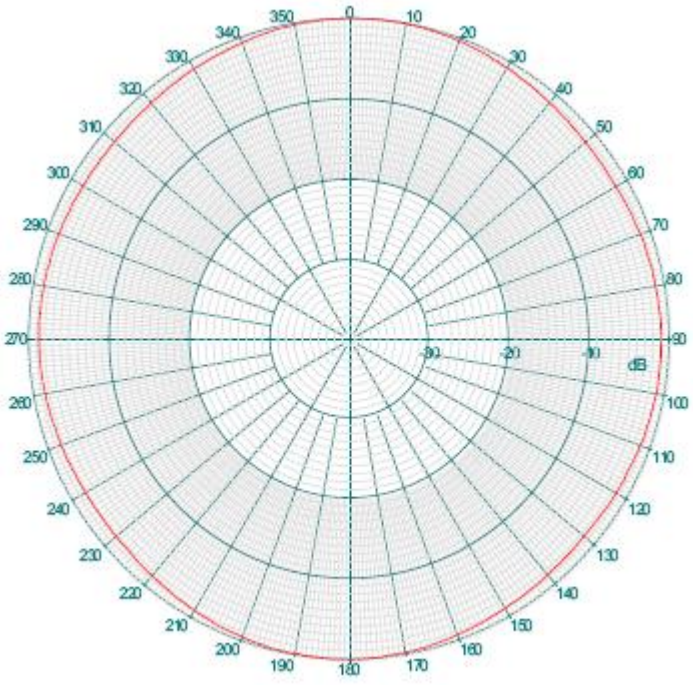




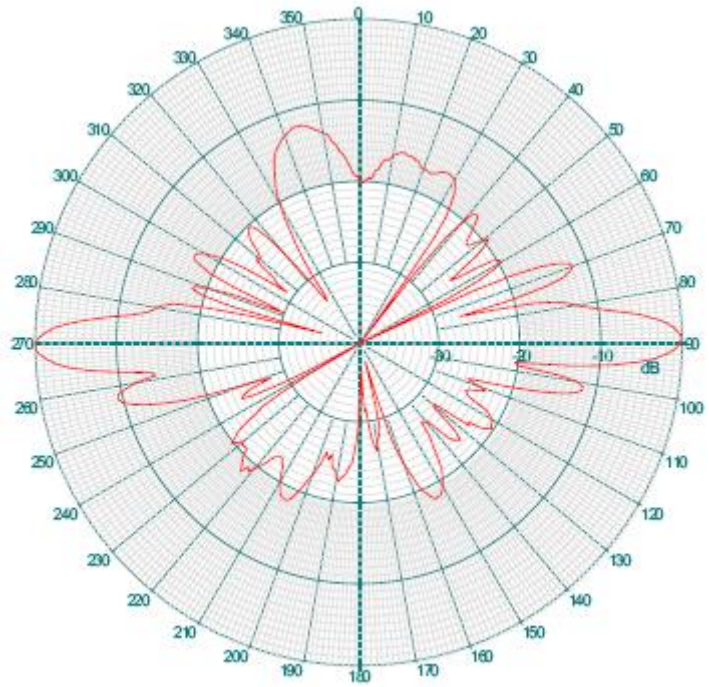
9 dBi Mesh Vertically Polarized Omni (89-1183-000)	
	Typical VSWR: 1.5:1
	Impedance: 50 OHM
	Input Power: 10 W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -40° C min. to +70°C max.
	Connector: Type N Male
	Frequency: 2400 – 2485 MHz
	Gain: 9dBi
	Vertical BW: 14°
	Weight: 0.8 lbs. (0.4kg)
	Dimensions: 27” x 0.6” (690mm x 15mm)
	

10 dBi Mesh Vertically Polarized Omni (89-1184-000)	
	Typical VSWR: 2.0:1
	Impedance: 50 OHM
	Input Power: 10W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -30°C min. to +65°C max.
	Connector: Type N Male
	Frequency: 4900 – 5875 MHz
	Gain: 10 dBi
	3 dB Beamwidth – Elevation: 8°
	3 dB Beamwidth –Azimuth : Omnidirectional
	Weight: 0.4 lbs. (0.18 kg)
	Dimensions: 19.6” x 1.0” (497 x 25.4mm)

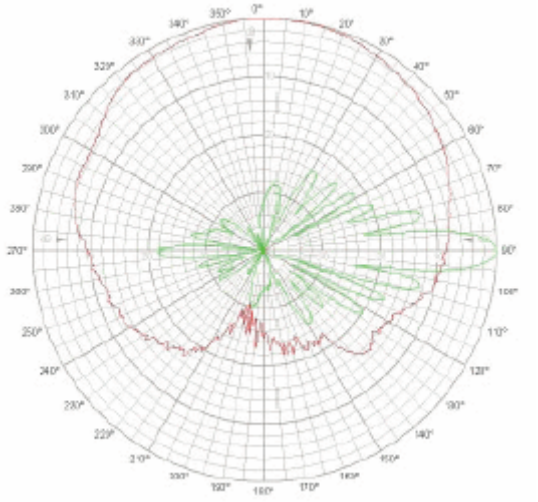
H Plane

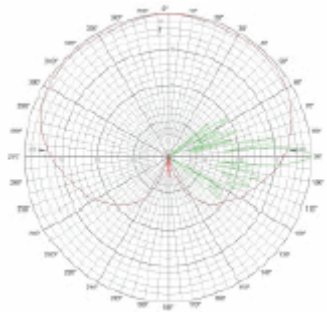


E Plane

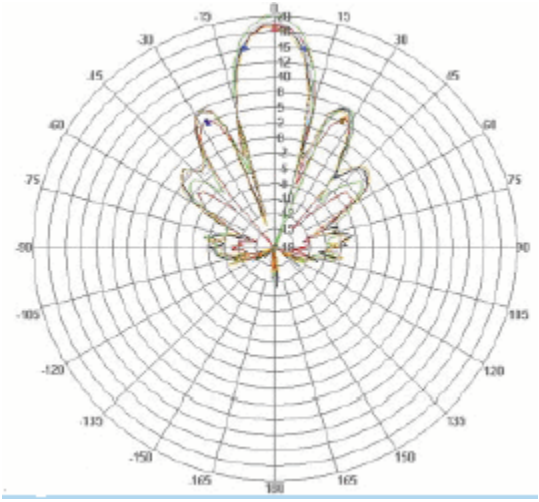


Polarized Antennas

2.5 GHz 120 Degree Wide Band Vertically Polarized Sector Antenna (89-1185-000)	
	Typical VSWR: 1.5:1 Max.
	Impedance: 50 OHM
	Polarization: Vertical/Linear
	Input Power: 50W
	Rated Wind Velocity: 125 mph (56m/sec)
	Operating Temperature: -40°C min. to +70° max.
	Connector: Type N Male
	Frequency: 2300 – 2700 MHz
	Gain: 16 dBi
	Horizontal BW: 120°
	Vertical BW: 9°
	Mechanical Downtilt: 30°
	Weight: 6.65 lbs. (3kg)
	Dimensions: 33.5 x 6.5 x 2.5” (851 x 165 x 64 mm)
	Pole Diameter: 1” (25mm) to 2” (50mm)
	

5.8 GHz 120 Degree Vertically Polarized Sector Antenna (89-1186-000)	
	Typical VSWR: 1.8:1 max.
	Impedance: 50 OHM
	Polarization: Vertical/Linear
	Input Power: 10 W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -40°C min. to +70°C max.
	Connector: Type N Male
	Frequency: 5850 MHz
	Gain: 16 dBi
	Horizontal BW: 120°
	Vertical BW: 6°
	Mechanical Downtilt: 15°
	Weight: 2 lbs. (1.3 kg)
	Dimensions: 24.6 x 2.7 x 1.7” (625 x 69 x 43 mm)
	Pole Diameter: 1.5” (38mm) to 3.5” (89mm)
	

Directional Antennas

5.8 GHz Flat Panel Wide Band Antenna (89-1187-000)	
	Typical VSWR: 1.5:1 max.
	Impedance: 50 OHM
	Polarization: Vertical/Linear
	Input Power: 100W
	Rated Wind Velocity: 125 mph (56 m/sec)
	Operating Temperature: -40°C min. to +70°C max.
	Connector: Type N Male
	Frequency: 5850 MHz
	Gain: 19 dBi
	Horizontal BW: 16°
	Vertical BW: 16°
	Cross Polarization: 35 dB
	Front to Back: 30 dB
	Bracket Tilt: 45°
	Weight: 17.6 oz. (0.5 kg)
	Dimensions: 7.5 x 7.5 x 0.8” (190 x 190 x 20 mm)
	Pole Diameter: 1” (25mm) to 2.5” (64mm)
	

Appendix B
IONizer 4000 Specifications

Specifications

This appendix lists the IONizer hardware specifications.

Platform Specifications	Custom Intel XScale-IXDP465
	533 MHz with DDR1-266 SDRAM
	128 MB RAM/64 MB Flash
	On-chip Programmable Network Process Engine (NPE)
	On-chip Cryptography Unit
	On-chip MII 10/100 Ethernet MACs
	On-chip IEEE 1588 Hardware Assist
	IEEE 802.11 a/b/g mini-PCI Modules (Typical)
	Expansion (12C/SSP/2xHSS/2x921K UARTs/USB2)
Mechanical Size:	**IONizer 4000 Series**
	11.00 inches (279.4mm) x 11.00 inches (279.4mm) x 4.00 inches (101.6mm)
Weight:	**IONizer 4000 Series**
	6 lbs. (2.7 kg) 8 lbs. (3.6 kg shipping weight)
Housing:	**IONizer 4000 Series**
	NEMA Type 4X (IP67) Rated Aluminum Chassis
	Paint: Urethane Powder Coat
	Silicone Rubber Gasket
Operating Temperature Range:	**IONizer 4000 Series:**
	-30C to 60C
Power Specifications:	48 VDC PoE or 24V power connection
	Maximum Power: 24W

Safety Certifications:	CSAus Listed to UL60950-1 (with UL50 considerations for outdoor use) cCSA Certified to CSA C22.2 No. 60950-1 (with CSA C22.2 No. 94 considerations for outdoor use) TUV Mark to EN60950-1 (with IEC60950-22 considerations for outdoor use), and Low Voltage Directive (LVD) under CE Mark
Radio Certifications:	FCC U-NII (Part 15) EN 300 328-2 (w/R&TTE Article 3.2 consideration) EN 301 893 (w/R&TTE Article 3.2 consideration) EN 301 489 (w/R&TTE Article 3.2 consideration)
European Union Directive Info:	EC Declaration of Conformity for all European directives for this product can be found on the Apprion website at www.apprion.com. A hard copy may be obtained by contacting your local sales representative.