

SIEMENS

RUGGEDCOM WIN5158-AC-IS

Installation Guide

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Preface

This guide describes the RUGGEDCOM WIN5158-AC-IS. It describes the major features of the device, installation, commissioning and important technical specifications.

It is intended for use by base station installers and operators, and assumes readers have a working knowledge of WiMAX technologies and procedures. While some safety precautions are reviewed here, it is assumed that installers are trained in safe installation practices. Users unfamiliar with safe installation procedures, WiMAX technologies, and service procedures should not rely on this manual for comprehensive guidance.

Alerts

The following types of alerts are used when necessary to highlight important information.

**DANGER!**

DANGER alerts describe imminently hazardous situations that, if not avoided, will result in death or serious injury.

**WARNING!**

WARNING alerts describe hazardous situations that, if not avoided, may result in serious injury and/or equipment damage.

**CAUTION!**

CAUTION alerts describe hazardous situations that, if not avoided, may result in equipment damage.

**IMPORTANT!**

IMPORTANT alerts provide important information that should be known before performing a procedure or step, or using a feature.

**NOTE**

NOTE alerts provide additional information, such as facts, tips and details.

Related Documents

Other documents that may be of interest include:

- *RUGGEDCOM CPE User Guide*
- *RUGGEDCOM RP100 Installation Guide*
- *RUGGEDCOM RP110 Installation Guide*

Training

Siemens offers a wide range of educational services ranging from in-house training of standard courses on networking, Ethernet switches and routers, to on-site customized courses tailored to the customer's needs, experience and application.

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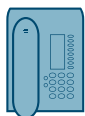
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- Access Siemens' extensive library of support documentation, including FAQs and manuals
- Submit SRs or check on the status of an existing SR
- Contact a local Siemens representative from Sales, Technical Support, Training, etc.
- Ask questions or share knowledge with fellow Siemens customers and the support community

1

Introduction

The RUGGEDCOM WIN5158-AC-IS Outdoor Unit (ODU) Customer Premises Equipment (CPE) device is part of the RUGGEDCOM WIN family, a line of mobile WiMAX broadband wireless access systems based on the IEEE 802.16e mobile WiMAX standard.

The RUGGEDCOM WIN5158-AC-IS is a high-performance, self-learning subscriber. It automatically detects the base station on the best signal available allowing for plug and play installation and maintenance free operation. The automatic switching and monitoring features guarantee on-going operation in changing conditions, which results in low maintenance and considerable operating expense savings.

The device is compliant to the IEEE 802.16e standards to effectively meet the unique requirements of the wireless Metropolitan Area Network (MAN) environment and to deliver broadband access services to a wide range of customers. Specifically designed for point-to-multipoint broadband wireless access applications, the RUGGEDCOM WIN5158-AC-IS provides efficient use of the wireless spectrum, supporting a range of user environments.

The RUGGEDCOM WIN5158-AC-IS Outdoor Unit (ODU) Customer Premises Equipment (CPE) device also complies with the IEEE 802.16-2005 standard for the deployment of point-to-multipoint (PMP) and point-to-point (PTP) network architectures.

The device is a WiMAX Forum IEEE 802.16e Wave 2 (MIMO) certified subscriber. Each subscriber registers and establishes a bi-directional data link with the base station.



NOTE

This device complies with Industry Canada license-exempt RSS standard. Operation is subject to the following two conditions:

- *this device may not cause interference, and*
- *this device must accept any interference, including interference that may cause undesired operation of the device.*

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- *l'appareil ne doit pas produire de brouillage, et*
- *l'utilisateur de l'appareil doit accepter tout brouillage radio électrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

The following sections provide more information about the device:

- [Section 1.1, "Feature Highlights"](#)
- [Section 1.2, "Configuration Ports and Indicator LEDs"](#)
- [Section 1.3, "Antennas"](#)

Section 1.1

Feature Highlights

» Long Range

The device has multiple built-in receivers to improve range and Non-Line-of-Sight (NLoS) performance. The system has the ability to leverage sub-channelization technology to balance links with high-power base stations.

» Robust Design

The device is designed for mission critical applications in harsh environments with very high Mean Time Before Failure.

» Quality of Service

The device gives the user the ability to separate traffic types over the air, and guarantee latency, minimum bandwidth and jitter according to application needs.

The device can be fed directly with 10 to 30 VDC, enabling the unit to be powered from any number of vehicles.

» Flexibility

The device supports both IP convergence sublayer for wireless Internet service providers or Ethernet Convergence Sublayer, ideal for mission critical private networks.

» Radio and Modem Features

- Supported Frequency Bands: 5251, 5151, 7251
- Radio Access Method: IEEE802.16-2005 (16e OFDMA)
- Operation Mode: TDD
- Compatibility: Wave 2 Profile (MIMO)
- Frequency Resolution: 0.25 MHz
- Antenna Support: External RF ports
- Antenna Diversity Support: STC/MRC/MIMO
- FFT/Modulation: 1024/512 FFT points; QPSK, 16 QAM, 64 QAM
- FEC: Convolutional Turbo Code
- Dynamic Range:
 - RX: -100 dBm: -20 dBm
 - TX: -30 dBm: +24 dBm

Section 1.2

Configuration Ports and Indicator LEDs

Connectors and LED indicators are found on the bottom of the device casing.

>> RUGGEDCOM WIN5158-AC-IS

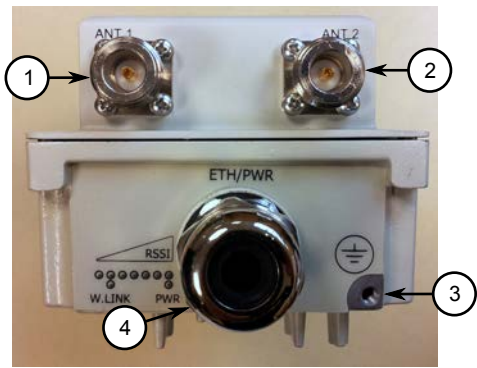


Figure 1: RUGGEDCOM WIN5158-AC-IS Connectors

1. ANT1 2. ANT2 3. Ground 4. ETH/PWR

Name	Description	Connector Type
ETH/PWR	Data and power from PoE injector	RJ-45
ANT1	Antenna 1	N-Type female
ANT2	Antenna 2	N-type female
Ground	Ground	Grounding screw

>> LED Indicators

The LED indicators display the following information:

- RSSI: displays the Received Signal Strength Indicator (RSSI) level
- W.LNK: displays the wireless link indication
- PWR: displays the power status

The following table displays the LED indicators for the device:

LED	Color	Description
WLNK is ON	Green	The device is connected with and receives services from the base station; network entry is complete.
WLNK is BLINKING	Green	The link between the CPE and the base station is down.
PWR is ON	Green	CPE power is on.

LED		Color	Description
RSSI: one LED is ON (least significant)		Green	RSSI < -90
RSSI: two LEDs are ON		Green	-85 < RSSI < -90
RSSI: three LEDs are ON		Green	-80 < RSSI < -85
RSSI: four LEDs are ON		Green	-75 < RSSI < -80
RSSI: five LEDs are ON		Green	-70 < RSSI < -75
RSSI: six LEDs are ON		Green	-65 < RSSI < -70
RSSI: seven LEDs are ON		Older Hardware LEDs 1-7: Green LED 8: Red Latest Hardware LEDs 1-6: Green LED 7: Red	-20 < RSSI < -60
RSSI: only the last LED is ON (most significant)		Red	-20 < RSSI (Saturation)

>> RUGGEDCOM WIN1010 Data Adapter LED Indicators

LEDs on the WIN1010 data adapter indicate the status of the WIN1010 power supply.

Name	Color	Description
PWR	Green	Input power is connected
LAN	Green	LAN link/activity display
WLNK	Green	Wireless link/activity display

Section 1.3

Antennas

The CPE consists of the following modules:

Module	Description
Base-Band board:	Includes the WiMAX 16e MIMO Base-Band SoC and runs the 16e MAC + PHY, user interface, and analog front end interface to the RF module.
Power Supply board with DC/DC power supply:	Converts 48 VDC input to the voltages feeding the Digital and RF modules.
RF board:	Single transmit/dual receive module that modulates the analog WiMAX signal input from the Base-Band modem to the high frequency RF output. Several RF modules exist, each supporting a different frequency band.
Chassis	

Module	Description
Antenna or Antennas:	Dual omni or polarization antennas supporting MIMO schemes.

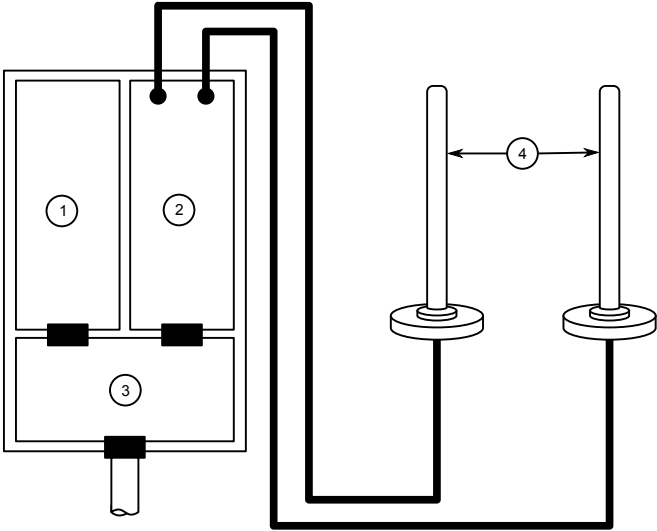


Figure 2: RUGGEDCOM WIN5158-AC-IS CPE Block Diagram: External Antennas
1. Power Supply 2. RF 3. Base-Band 4. Antennas

» Outdoor Grounding System

Verify the antenna or cable system is grounded. The CPE antenna installation must be as per Article 810 of the NEC.



WARNING!
Fire hazard – risk of serious personal injury and/or damage to equipment. To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord between indoor and outdoor units.

Specifically, the requirement the grounding conductor be not less than 10 AWG (Cu). The grounding scheme should either be in accordance with UL 96 and 96A Lightning Protection Components and Installation Requirements for Lightning Protection Systems, or tested in accordance with UL 50 and UL 497.

» Allowed Antenna Types

The following table contains a list of approved 4.9/5.8 Ghz antenna types for the device:



NOTE
Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.
This radio transmitter has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Table: Antenna Types

Type	Manufacturer	Model Number	Gain	Impedance
Omnidirectional	MTI Wireless Edge Ltd.	MT 462008/N/A	9.5 dBi	50 Ω
Omnidirectional	HUBER-SUHNER	SWA-0860/360/4/0/V_2, 1399.17.0099	9.5 dBi	50 Ω

2 Installing the Device

This chapter describes how to install the device, including mounting the device, connecting power, connecting the antenna, and connecting the device to the network.



DANGER!

Electrocution hazard – risk of serious personal injury and/or damage to equipment. Before performing any maintenance tasks, make sure all power to the device has been disconnected and wait approximately two minutes for any remaining energy to dissipate.



DANGER!

Electrocution hazard – risk of death or serious injury. When the base station is installed in an outdoor location, all indoor components (e.g. Ethernet and power supply) should be connected through a lightning protector.

Lightning protection protects people and equipment located indoors from lightning that may strike the base station or its outdoor cables. Therefore, install the lightning protector base station indoors, as close as possible to the point where the cables enter the building. The lightning protector can also be installed outdoors as long as the cables that lead indoors are well protected from lightning between the protector and the building entrance.



WARNING!

Safety hazard – risk of serious personal injury and/or damage to equipment. Installing the RUGGEDCOM WIN5158-AC-IS can pose a serious safety hazard. Be sure to take precautions to avoid the following:

- *Exposure to high voltage lines during installation*
- *Falling when working at heights or with ladders*
- *Injuries from dropping tools*
- *Contact with AC wiring (power system connection)*



IMPORTANT!

Only certified personnel should be permitted to install equipment.



IMPORTANT!

This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

Changes or modifications not expressly approved by Siemens Canada Ltd. could invalidate specifications, test results, and agency approvals, and void the user's authority to operate the equipment.



IMPORTANT!

This product should be installed in a restricted access location where access can only be gained by authorized personnel who have been informed of the restrictions and any precautions that must be taken. Access must only be possible through the use of a tool, lock and key, or other means of security, and controlled by the authority responsible for the location.

**IMPORTANT!**

Install equipment in accordance with the electrical code relevant to the country of installation, such as:

- *the National Electrical Code (NEC), ANSI/NFPA 70*
- *the Canadian Electrical Code (CEC), Part 1, CSA C22.1*
- *the National Electrical Safety Code IEEE C2 (when applicable)*

Unless marked or otherwise identified, the Standard for the Protection of Electronic Computer/Data Processing Equipment, ANSI/NFPA 75, also applies.

**IMPORTANT!**

Outdoor exposed communication lines longer than 40 m (140 ft) must be considered as TNV-1 circuits. The installer must make sure the power supply and network ports are designed for full compliance with the standards for TNV-1 telecommunication networks.

The general procedure for installing the device is as follows:

1. Mount the device to a pole or wall.
2. Install and connect the antenna.
3. Assemble the PoE cable.
4. Connect a RUGGEDCOM WIN1010 adapter.
5. Connect a RUGGEDCOM RP100/RP110.
6. If the device is to be installed in a hazardous location, install the Class I, Division II kit.
7. Make sure the device is grounded.
8. Weatherproof the ends of all cables.
9. Configure the device.

These steps, and other related information, are described in the following sections:

- [Section 2.1, "Mounting the Device"](#)
- [Section 2.2, "Installing the Antenna"](#)
- [Section 2.4, "Connecting the WIN1010 Data Adapter "](#)
- [Section 2.5, "Connecting to a RUGGEDCOM RP100 or RP110 \(AC Only\)"](#)
- [Section 2.6, "Installing the Device in Hazardous Locations"](#)
- [Section 2.7, "Grounding the Device"](#)
- [Section 2.3, "Assembling the PoE Cable"](#)
- [Section 2.8, "Weatherproofing the Device"](#)
- [Section 2.9, "Configuring the CPE"](#)

Section 2.1

Mounting the Device

The RUGGEDCOM WIN5158-AC-IS is designed for maximum mounting and display flexibility. It can be secured to a bracket and then mounted to a pole or to a wall or tower.

**NOTE**

For detailed dimensions of the device, refer to [Chapter 4, Dimension Drawings](#).

The following sections describe the various methods of mounting the device, and how to install the mounting bracket:

- [Section 2.1.1, “Mounting the Device to a Pole”](#)
- [Section 2.1.2, “Mounting the Device to a Wall or Tower”](#)

The RUGGEDCOM WIN5158-AC-IS ODU CPE mounting kit allows for pole or wall mounting.

When choosing the mounting location for the unit, consider the available mounting structures and antenna clearance.

>> Site Survey

Most wireless networks include many CPEs and BSTs installed in various locations in an overlapping radio-cell pattern. It is important to position each CPE at an optimal location considering the assignment of its radio channels. Therefore, a site survey becomes an essential first step before physically deploying the RUGGEDCOM WIN5158-AC-IS solution.

The site survey should include details important to the planning of the CPE deployment in each specific site, including potential mounting points for CPE and antennas, as well as the routing options for data, power and antenna cables.

>> Recommended Site Requirements

It is highly recommended the RUGGEDCOM WIN5158-AC-IS be mounted with as few obstructions as possible between the CPE and the base station. The CPE should be pointed in the direction of the designated server base station. When choosing the ideal location, it is also important to take into consideration the overall area topology.

Section 2.1.1

Mounting the Device to a Pole

The device can be attached to any pipe or pole with a diameter of 44.5 to 254 mm (1.75 to 10 in).

To mount the device to a pole, do the following:

1. Select a mounting location on the pole.
2. Position the mounting bracket against the pole.
3. Secure the clamping bracket to the mounting bracket using screws, spring washers and nuts. Make sure the screws are hand tightened.

**NOTE**

When mounting the device, note the orientation of the clamping bracket in the illustration.

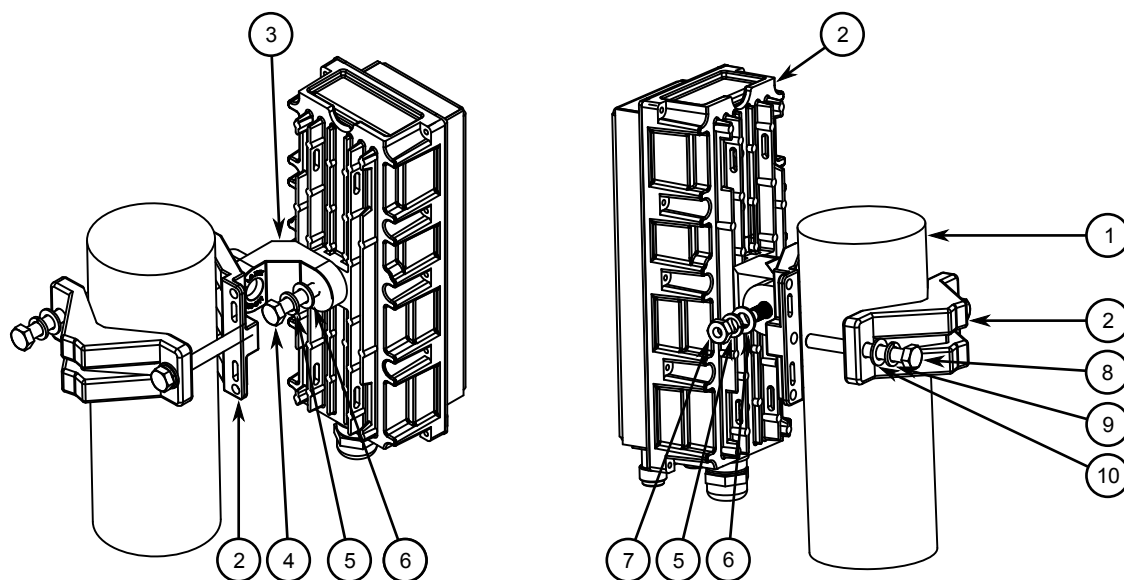


Figure 3: Mounting the Antenna/Enclosure to a Large Pole

1. Pole 2. Clamping Bracket 3. Mounting Bracket 4. M8-25 Hex Screw 5. M8 Flat Washer 6. M8 Spring Washer 7. M8 Nut 8. M8-70 Hex Screw 9. M8 Spring Washer 10. M8 Flat Washer

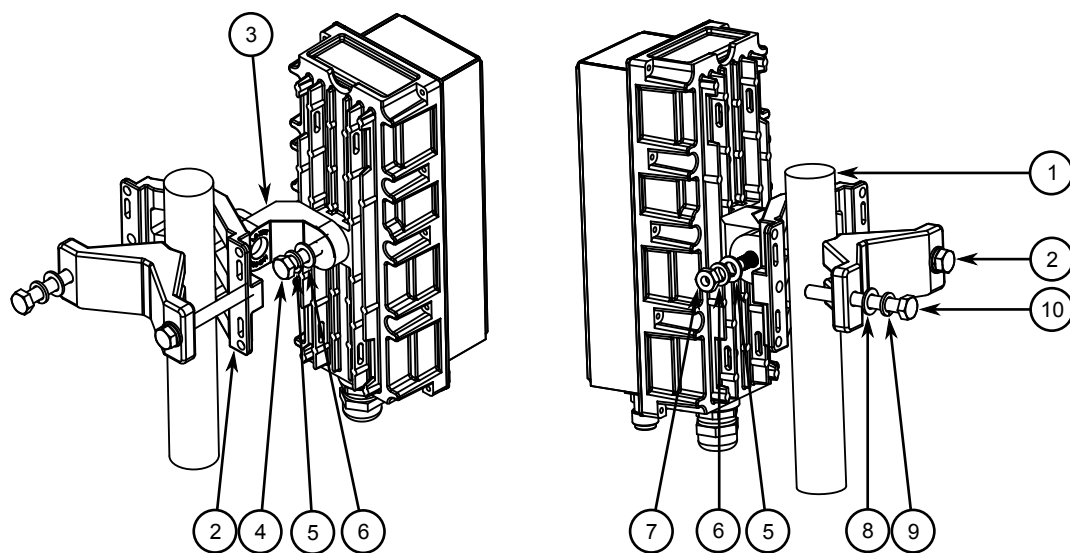


Figure 4: Mounting the Antenna/Enclosure to a Small Pole

1. Pole 2. Clamping Bracket 3. Mounting Bracket 4. M8-25 Hex Screw 5. M8 Flat Washer 6. M8 Spring Washer 7. M8 Nut 8. M8-70 Hex Screw 9. M8 Spring Washer 10. M8 Flat Washer

4. Adjust the position of the device. For more information about aligning the CPE antenna, refer to [Section 2.2, "Installing the Antenna"](#).

5. Tighten the screws connecting the clamping bracket to the mounting bracket. Make sure the screws are torqued to 14 N·m (10 lbf·ft).

Section 2.1.2

Mounting the Device to a Wall or Tower

Attach the device to any wall capable of carrying the device's weight. An outer wall on a roof or other high location to avoid interference from other buildings or trees is preferred.

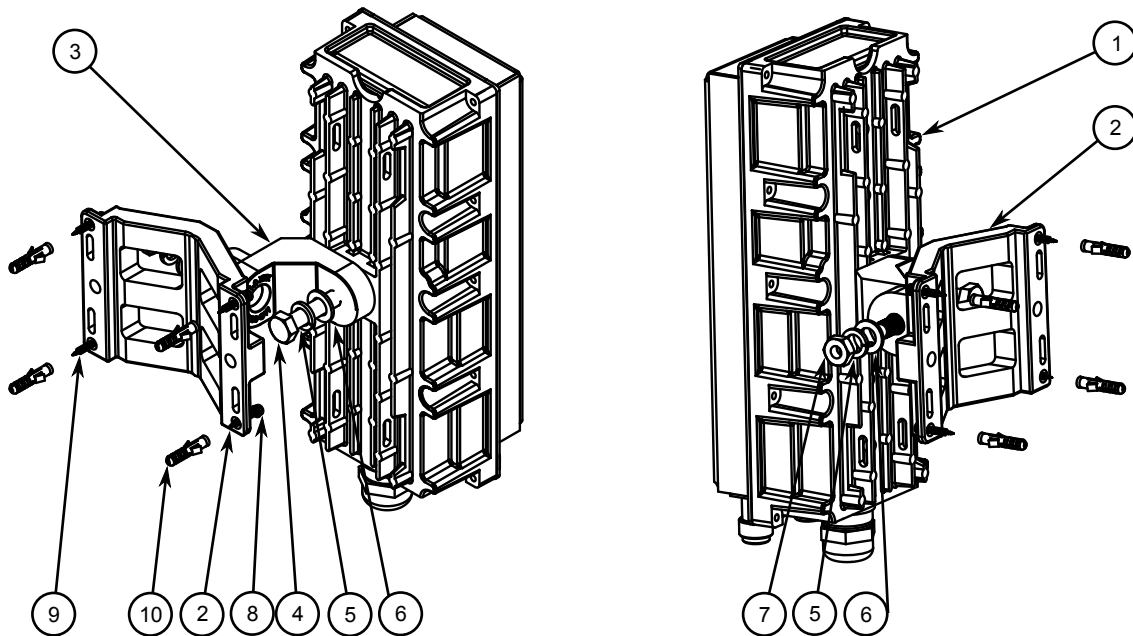


Figure 5: Mounting the Device to a Wall or Tower

1. CPE 2. Mounting Kit 3. Wall Holder/Pole Mount 4. M8-25 Hex Screw 5. M8 Flat Washer 6. Spring Washer 7. M8 Nut 8. M5 Flat Washer 9. Screw for Chipboard 10. Wall Plug (Plastic Anchor)

To mount the device to a wall, do the following:

1. Select a mounting location on the wall.
2. Place the mounting bracket on the wall and mark 4 mounting holes.
3. Drill 4 holes and insert a wall plug into each hole.
4. Secure the mounting bracket to the wall with 4 type NS 1/4" × 1/2" HEX screws, 4 spring washers, and 4 flat washers.
5. Connect the arm bracket to the mounting bracket using a screw, spring washer and washer. Make sure the screw is hand tightened.
6. Connect the device to the arm bracket using a screw, spring washer and washer. Make sure the screw is hand tightened.
7. Adjust the position of the device. For more information about how to align the CPE Antenna, refer to [Section 2.2, "Installing the Antenna"](#).

8. Tighten the screws connecting the arm bracket to the device and mounting bracket. Make sure the screws are torqued to 24 N·m (17.7 ft. lb.).

Section 2.2

Installing the Antenna

To install the antenna, do the following:



WARNING!

Radiation hazard – risk of Radio Frequency (RF) exposure. This base station is compliant with the requirements set forth in CFR 47, section 1.1307, addressing Radio Frequency (RF) exposure from radio frequency base stations, as defined in FCC OET Bulletin 65 [FCC OET Bulletin 65](http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf) [http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf]. The emitted radiation should be as little as possible. To achieve minimum RF exposure, install the base station when it is configured not to transmit and set it to operational mode remotely, rather than having a technician enable transmission on-site. For maintenance of the base station, or other operations which require RF exposure, the exposure should be minimized in time and according to the regulations set by the FCC or the regulations relevant to the country of installation.



IMPORTANT!

During antenna installation, observe the following:

- Always install the antenna at least 0.65 m from people and public areas.
- Antenna must be in a fixed position.
- After it is installed, do not change the antenna position.



NOTE

The device is compliant with the requirements set forth in CFR 47, section 1.1307, addressing Radio Frequency (RF) exposure from radio frequency devices as defined in OET Bulletin 65. The emitted radiation should be as little as possible. To achieve minimum RF exposure, install the device when it is configured not to transmit and set it to operational mode remotely, rather than enabling transmission by the installer on-site. For maintenance of the device, or other operations which require RF exposure, minimize the exposure time according to the regulations set by the FCC or the regulations relevant to the country of installation.



IMPORTANT!

Make sure the front of the antenna is always facing the base station. In some conditions, such as when the line of sight to the base station is impeded, better reception may be achieved using a reflected signal. In this case, direct the antenna towards the reflecting object, rather than towards the base station.

In some cases, the antenna may need to be tilted to make sure the level at which the device receives transmissions from the base station (and vice versa) is not too high. When only the last RSSI LED is on, this indicates saturation and the received signal level is too high. This must be avoided, preferably by tilting the antenna upwards. As a rule of thumb, if the device is located at a distance of less than 300 meters from the base station, it is recommended to tilt the antenna upwards by approximately 10° to 15°.

1. Point the antenna towards the general direction of the designated base station.
2. Verify that power is applied to the device. The PWR LED should be ON.

3. Position the device until the maximum RSSI link quality reading is achieved. A single RSSI LED indicates the device is at minimum synchronized with the base station. For information about the RSSI LED indicators, refer to [Section 1.2, "Configuration Ports and Indicator LEDs"](#).

If the device is not synchronized with the base station, make sure all parameters are configured properly.

If the expected link quality still cannot be achieved, try to improve the reception quality by placing the device at a higher point or in an alternate location.

4. Make sure the antenna is properly grounded according to local standards.

Section 2.3

Assembling the PoE Cable

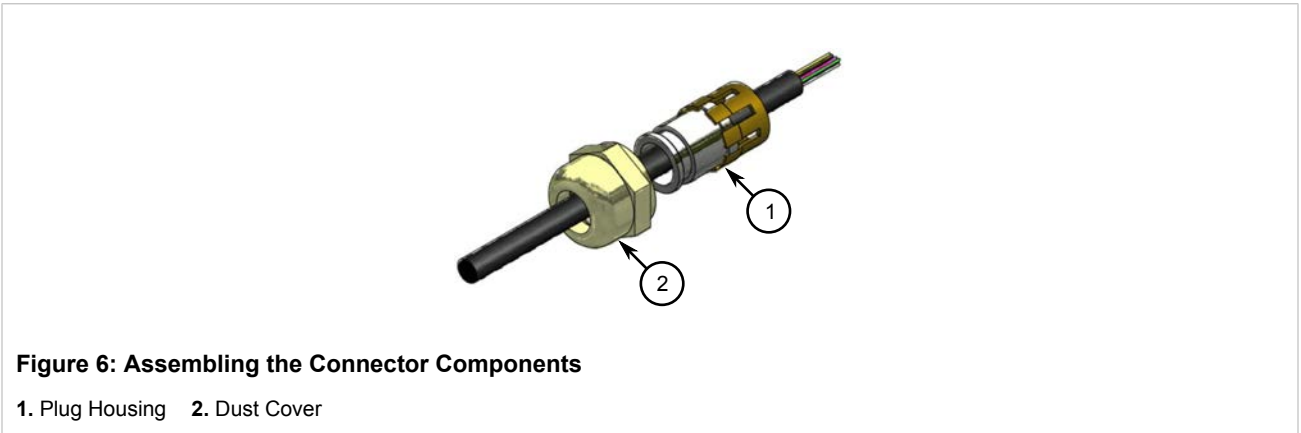
The following describes how to assemble the PoE cable using the supplied connector kit. The ODU CPE uses a shielded male RJ45 connector to provide the data and Power-over-Ethernet (PoE) connection to the device.

The following components and tools are required:

- CPE RJ45 Connector Kit (supplied with the device). Contains an RJ45 connector and loading bar.
- CAT-5e cable of suitable length for your application. For information on cable specifications, refer to [Section 3.5, "IDU to ODU Cable Specifications"](#).
- Standard cable splicing tools, including a standard crimp tool.

To assemble the RJ45 connector, do the following:

1. Slide the connector components on to the wire.



2. Strip the wire jacket 38 mm (1.5 in) from the tip, making sure not to cut the foil or drain wire.

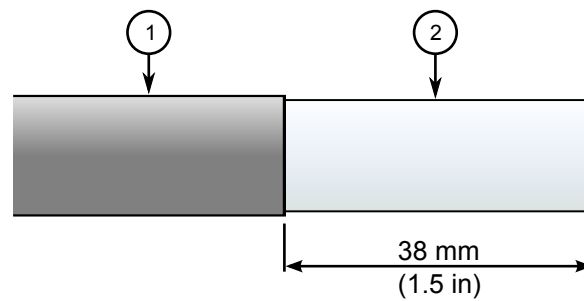


Figure 7: Cutting the Jacket

1. Wire Jacket 2. Foil

3. Fold the foil back over the wire jacket.

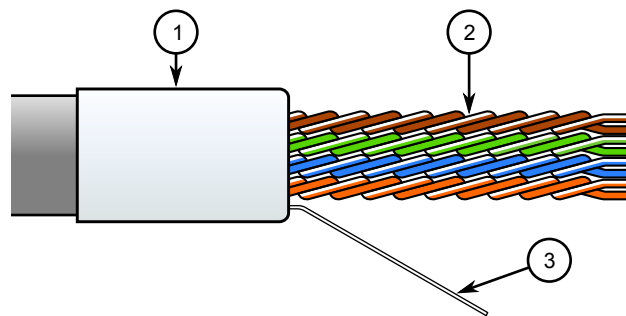


Figure 8: Folding Back the Foil

1. Foil 2. Twisted-Pair Wires 3. Drain Wire

4. Bend the drain wire back over the jacket.

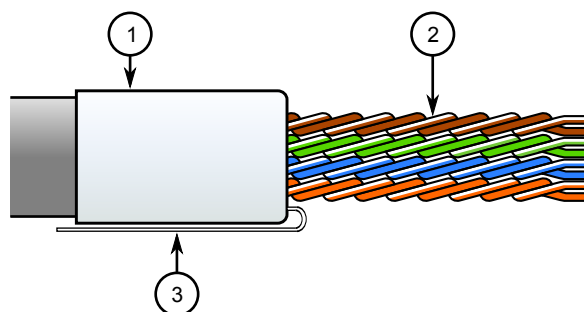


Figure 9: Bending the Drain Wire

1. Foil 2. Drain Wire 3. Twisted-Pair Wires

5. Partially untwist each wire pair, making sure to retain a half twist at the end.

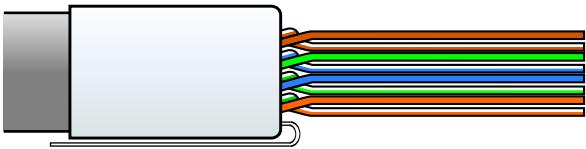


Figure 10: Untwisting the Wire Pairs

6. Arrange the wires according to the following pin-out description:

Figure 11: CAT-5e PoE Cable Pin-Out

1. Pin 1 2. Pin 8

Pin Number	Color	Description
1	White/Orange	ETH Data TP0+
2	Orange	ETH Data TP0-
3	White/Green	ETH Data TP1+
4	Blue	48 V TP2+
5	White/Blue	48 V TP2-
6	Green	ETH Data TP1-
7	White/Brown	RTN (-) TP3+
8	Brown	RTN (-) TP3-

7. Slide the wires into the loading bar and then pull the loading bar down until its face is 16 mm (0.63 in) from the wire jacket. If necessary, use pliers to hold the wires while pulling the loading bar.

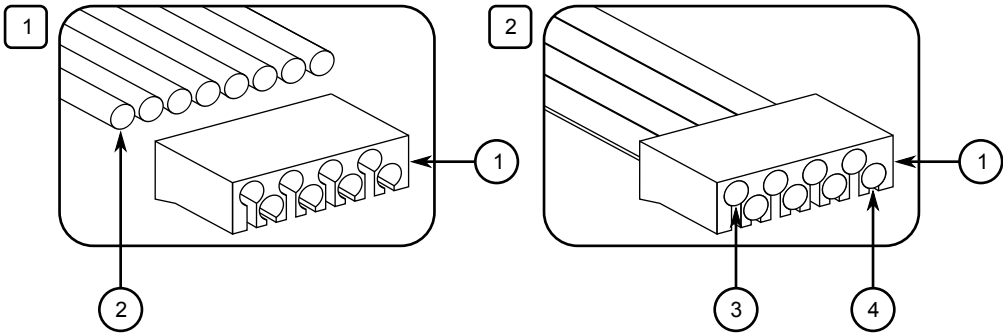
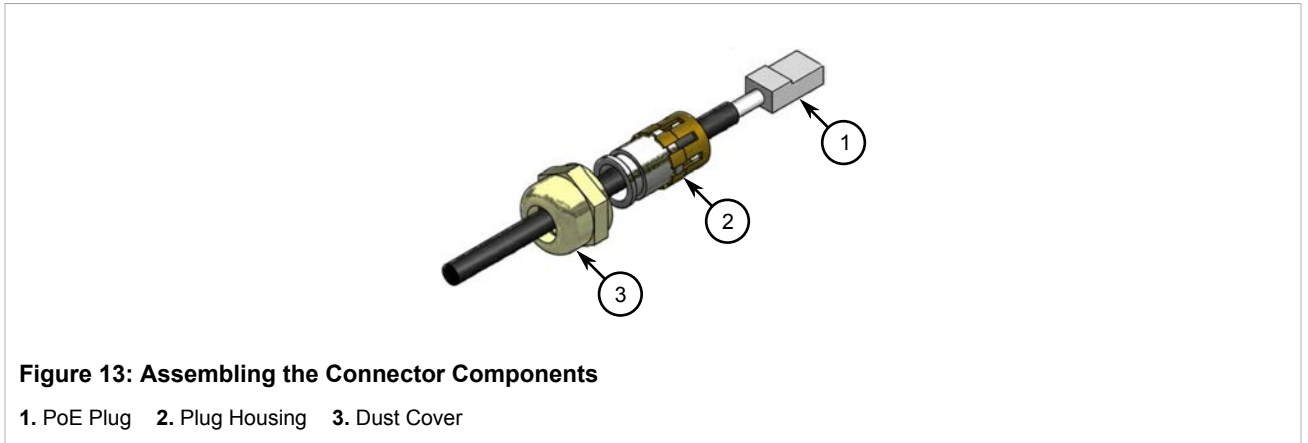


Figure 12:

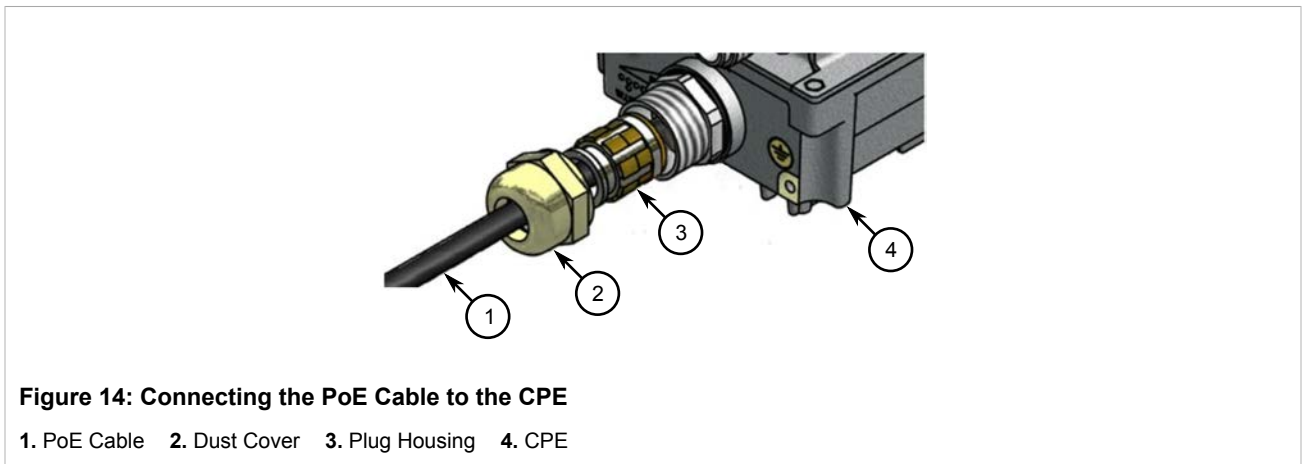
1. Loading Bar 2. Wires 3. Pin 1 4. Pin 8

8. Trim the wires until they are flush with the face of the loading bar.
9. Insert the wires and loading bar into the plug body. Make sure:
- the cable is pushed to the front of the plug body
 - the spine of the strain relief on the plug body covers the drain wire
10. Bend the strain relief until it is flat against the jacket and foil.
11. Crimp the plug and strain relief using a standard crimping tool.

12. Trim away any excess foil or drain wire extruding from the strain relief.
13. Slide the connector components up to the plug body.
14. Insert the modular plug into the plug housing.



15. Align the latch with the LATCH slot.
16. Press the plug into the plug housing until it bottoms out.
17. While maintaining inward pressure on the plug or keeping the dust cover engaged, tighten the compression nut to 0.56 N·m (5 In-lbs).



Section 2.4

Connecting the WIN1010 Data Adapter

The RUGGEDCOM WIN1010 data adapter powers the device and distributes data. The WIN1010 data adapter unit provides RJ45 input connectors that include 10/100Base-T transceivers for connection to an IEEE802.3 (10/100Base-T) compatible device. The unit receives power from 100 to 240VAC using an IEC-320-C14 industry standard connector.



CAUTION!

The power supply AC cord should be 3 wires, 18 AWG minimum, with length less than 4.5 m (14.8 ft), and safety certified according to national rules.

A single output RJ45 connector provides 10/100 Base-T data and power to the outdoor unit over a Category 5e cable. This cable provides for the bi-directional transfer of data and signaling as well as a power feed to the outdoor equipment.



NOTE

The Category 5e Ethernet cable is not included. Refer to [Section 3.5, “IDU to ODU Cable Specifications”](#) for detailed technical specifications.



NOTE

The device should always be connected to a supported Power over Ethernet (PoE) injector.

The WIN5158-AC-IS-AC ODU CPEs are non-standard PoE devices. Do not attempt to use third-party PoE injectors. The use of any other type of connection or application of the device and/or WIN1010 data adapter is not permitted.

Route all power supply cords so that people cannot walk on them or place objects on or against them, which can pinch or damage the cords.

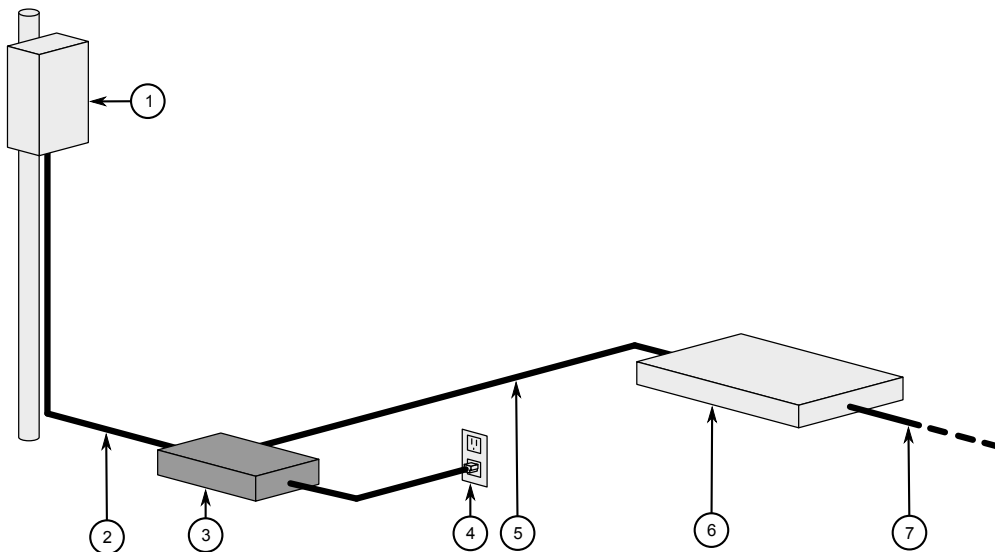


Figure 15: Power over Ethernet Connection Schematic

1. ODU CPE 2. PoE 3. Data Adapter 4. AC Power 5. Ethernet 6. Switch 7. Ethernet



NOTE

Before connecting the WIN1010 data adapter to the 110/220 VAC power source, verify that all system components are properly installed and all cable connectors are securely positioned in the appropriate ports.

To connect power to the device, do the following:

1. Connect a Category 5e cable between the device and the WIN1010 data adapter.
2. Connect a Category 5e cable between the WIN1010 data adapter and a 10/100Base-T port of a switch, router, or PC.
3. Connect the WIN1010 data adapter to the 110/220 VAC power source using the cable.

Section 2.5

Connecting to a RUGGEDCOM RP100 or RP110 (AC Only)

The RUGGEDCOM RP100 and RP110 are optional power injectors that can be ordered to power the RUGGEDCOM WIN5158-AC-IS. The RUGGEDCOM RP100 and RP110 meet a wider temperature and voltage range than the WIN1010.

When the CPE is connected to a RUGGEDCOM RP100 or RP110, make sure there is a solid connection between the lightning protector and the CPE. The following illustration details a typical installation:



NOTE

A shielded cable must be used and connected to local ground at both the RUGGEDCOM WIN5158-AC-IS and CPE.



NOTE

The lightning protector must meet the necessary requirements of IEC/UL/CSA 60950-1. The clamping voltage must also be less than 60 V and the protector must not activate when the voltage is less than 56 V. For more information, contact Siemens Customer Support.



IMPORTANT!

Install the lightning protector and the RUGGEDCOM RP100/RP110 as close as possible.

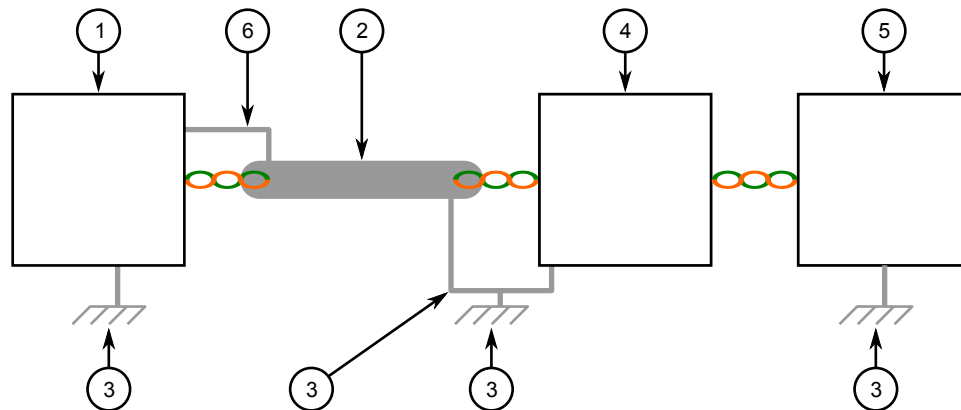


Figure 16: Typical Outdoor Installation

1. RUGGEDCOM WIN5158-AC-IS 2. Shielded Cable 3. Ground Connection 4. Lightning Protector 5. RUGGEDCOM RP100/RP110 6. Drain Wire (Shielded)

For more information about the RUGGEDCOM RP100 or RP110, refer to either the *RUGGEDCOM RP100 Installation Guide* or the *RUGGEDCOM RP110 Installation Guide*.

Section 2.6

Installing the Device in Hazardous Locations

An approved surge suppression unit is required when the base station is installed in a hazardous location. The WIN5158-AC-IS is certified for installation in Class I, Division II Groups A, B, C and D hazardous locations when installed using the Class I, Division II kit (P/N MKIT0090). The Class I, Division II kit contains the following items:

- Lambda power supply unit (model DPP50-48)
- L-COM passive PoE injector (model BT-CAT5-P1)
- DC power cable
- AC open-ended power cable (WIN5158-AC-IS-AC Only)

**WARNING!****EXPLOSION HAZARD**

- *Substitution of components may impair suitability for Class I, Division II*
- *Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous*
- *Use only Lambda DPP50-48 Power Supply in conjunction with the unit*

RISQUE D'EXPLOSION

- *La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division II*
- *Avant de déconnecter l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux*
- *Utilisez l'unité uniquement avec une batterie de la marque Lambda DPP50-48*

To install the base station in a hazardous location, do the following:

1. Connect the DC power cable between the Lambda Power Supply Unit (PSU) and the L-COM passive PoE injector.

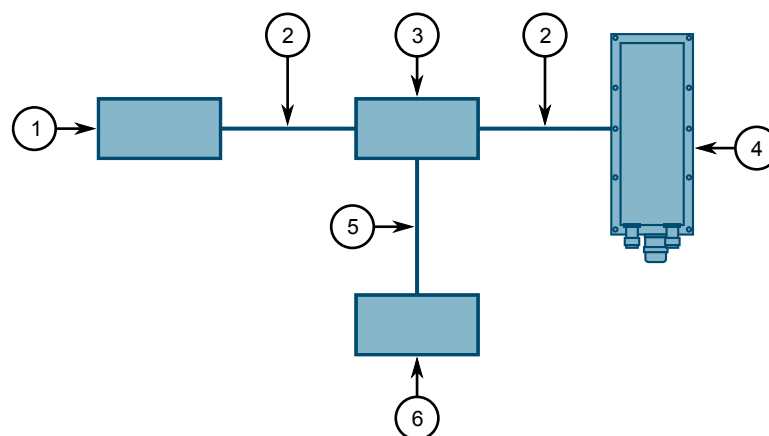


Figure 17: Connecting the CPE in a Hazardous Location

1. Ethernet Switch 2. CAT-5e Cable 3. L-COM Passive PoE Injector 4. RUGGEDCOM WIN5158-AC-IS 5. DC Power Cable
6. Lambda PSU

2. Using a CAT-5e cable, connect the PoE injector to the CPE.
3. Using a CAT-5e cable, connect the Ethernet switch to the PoE injector.



CAUTION!

The AC power cable must consist of 3 wires, be minimum 18 AWG, be less than 4.5 m (14.7 ft) long, and be safety certified according to national rules.

4. Connect the AC open-ended power cable to the Lambda PSU.

Section 2.7

Grounding the Device

When connecting the ground cable to the device, make sure to use a 10 AWG grounding cable and torque the screw to 15 N·m (11 ft. lb.).



DANGER!

Electrocution hazard – risk of death or serious injury. The system must be properly grounded to protect against power surges and accumulated static electricity. It is the installer's responsibility to install this base station in accordance with the local electrical codes.

Section 2.8

Weatherproofing the Device

Most outdoor CPE, antenna or cable problems are caused by coaxial cable connections loosened by vibration, allowing moisture to penetrate the connector interface. Siemens strongly recommends weatherproofing *all* outdoor cable connections to prevent the ingress of water and help secure connections.

Since PoE cables also carry DC current, the need for proper weatherproofing cannot be overstated.

Use electrical tape and a heavy-duty weather, abrasion and UV-resistant rubber splicing or self-amalgamating tape to seal connections.



IMPORTANT!

The warranty is void if the base station is assembled without waterproof sealing or if the sealing is removed from the connections.



IMPORTANT!

PVC tape, silicon seal and glue are not recommended for weatherproofing, as these materials are difficult to apply accurately and are difficult to remove.



IMPORTANT!

This method of weatherproofing must be completed on all external connections. If surge arrestors are used, all associated connections and arrestors must be completely wrapped with splicing tape or self-amalgamating tape.

Rubber mastic or duct sealing putty must also be used to complete the weatherproofing where needed.

To weatherproof an outdoor cable connection, do the following for both ends of the cable:

1. Make sure the connector and cable are free of any foreign substances, such as oil, grease or dirt.

2. Make sure the connection is secure and the cable extends below the connector to provide a path for water to flow away from the base station.
3. Starting as close to the base station as possible, stretch and wind rubber splicing or self-amalgamating tape around the connector and cable. Make sure there are no gaps. Continue wrapping until the tape is 25 mm (1 in) down the cable.



Figure 18: Wrapping the Connector with Rubber Splicing or Self-Amalgamating Tape



NOTE

Where available, use 3M™ Scotch® Super 88 electrical tape.

4. To protect the rubber splicing or self-amalgamating tape from UV damage, stretch and wind two layers of electrical tape around the connector and cable the same way it was done in [Step 3](#).



Figure 19: Wrapping the Connector with Electrical Tape

5. Work rubber mastic or duct sealing putty between the connector and the body of the radio or antenna. Make sure the putty fills any gaps not covered by the tape.



Figure 20: Sealing Gaps with Putty

Section 2.9

Configuring the CPE

Once the CPE is installed and connected to the network, it must be configured. The RUGGEDCOM WIN5158-AC-IS features a Web-based User Interface (UI) for all configuration management. For more information about configuring the base station, refer to the *RUGGEDCOM WIN CPE User Guide* associated with the device and the installed software release.

3 Technical Specifications

The following sections provide important technical specifications related to the device:

- [Section 3.1, “Power Supply Specifications \(AC Only\)”](#)
- [Section 3.2, “Power Consumption”](#)
- [Section 3.3, “Operating Environment”](#)
- [Section 3.4, “Mechanical Specifications”](#)
- [Section 3.5, “IDU to ODU Cable Specifications”](#)

Section 3.1

Power Supply Specifications (AC Only)

Power Supply Type	Model Type	Input	Output
48 VDC	WIN1010	100-240 VAC, 50-60 Hz, 1.5 A	48 VDC, 48 W
52 VDC	RP100	12 VDC, 3.5 A	52 VDC, 25 W
52 VDC	RP100	24 VDC, 2 A	52 VDC, 32 W
52 VDC	RP100	48 VDC, 1 A	52 VDC, 32 W
52 VDC	RP100	100-240 VAC, 50-60 Hz, 0.7 A	52 VDC, 25 W
52 VDC	RP100	125-250 VDC, 0.7 A	52 VDC, 25 W



IMPORTANT!

Use only the supplied WIN1010 power supply.

Section 3.2

Power Consumption

Typical power consumption: 12 W

Section 3.3

Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 75 °C (-40 to 167 °F)	

Parameter	Range	Comments
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 75 °C (-40 to 167 °F)	

Section 3.4

Mechanical Specifications

Parameter	Value
Dimensions	Refer to Chapter 4, Dimension Drawings
Weight	1.5 kg (3.3 lb)
Enclosure	Aluminum
Ingress Protection	IP67

Section 3.5

IDU to ODU Cable Specifications

Special 4×2×24 AWG FTP Cat. 5e Outdoor Double Jacket Data Cable UL (1581 VW 1)

» IDU to ODU Cable

Applications:	Outdoor installations, fixed or portable installations, digital distribution frames in transmission stations, outdoor installations in harsh environments.
General Construction:	Custom made cable designed specially for wireless systems, meeting the requirements of Cat. 5e per ANSI/TIA/EIA-568-B.2 and IEC 61156-5. The cable contains 4 twisted pairs, cabled, foil-tape shielded and jacketed with two special black UV resistant, flame retardant PVC compounds for direct outdoor use in harsh electrical environments. The diameter of the inner core complies with RJ45 connecting hardware allowing direct connection to equipment without patch cords.
Conductor Size:	0.52 mm
Outer Jacket Material:	UV resistant FR-PVC
Outer Diameter:	7.9 mm nominal
Weight:	68.0 kg/km

» IDU to ODU Cable Design and Materials

Conductor Material:	Bare copper
Conductor Size:	24 AWG
Insulation Material:	Solid PO

Insulation O.D.:	1.07 mm
Color Code:	Per TIA/EIA 568-B
Overall Foil Shield:	Yes
Overall Shield Material:	Aluminum/Polyester Foil
Overall Foil Design:	100% Coverage
Overall Drain-wire Material:	Tinned Copper
Overall Drain-wire Size:	24 AWG
Overall Drain-wire Construction:	Stranded
Inner Jacket Material:	UV resistant FR-PVC
Inner Jacket Diameter:	6.1 mm
Total Number of Wires:	8

» IDU to ODU Cable Standards

Flammability Rating:	IEC 60332, UL1581 VW-1
Standards:	IEC 61156, TIA/EIA-568

» IDU to ODU Cable Performance

Frequency Range:	1-100 MHz
Impedance:	100 Ω
DC Resistance:	93 Ω /km nominal
Max. DC Resistance	95 Ω /km @ 20 °C
Capacitance Unbalance:	1.6 pF/m maximum
Velocity of Propagation:	68% nominal
Propagation Delay Skew:	35 ns/100 m maximum
Dielectric Strength:	700 V/minute
Dielectric Strength to Shield:	700 V/minute
Minimum Bend Radius:	70 mm
Operating Temperature Range:	-40 to 70 °C

4 Dimension Drawings



NOTE

All dimensions are in millimeters, unless otherwise stated.

>> Overall Dimensions (WIN5158-AC-IS-AC)

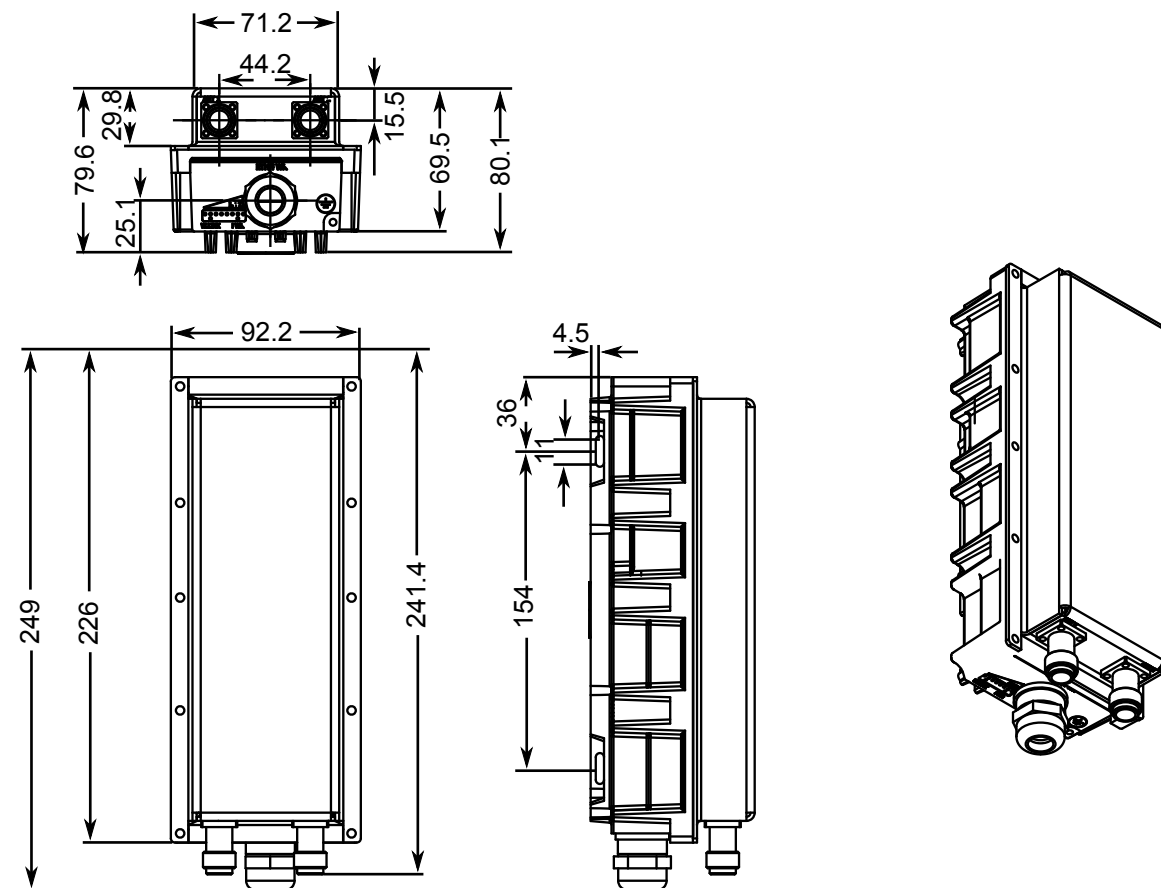


Figure 21: Overall Dimensions (AC)

» Overall Dimensions (WIN5158-AC-IS-DC)

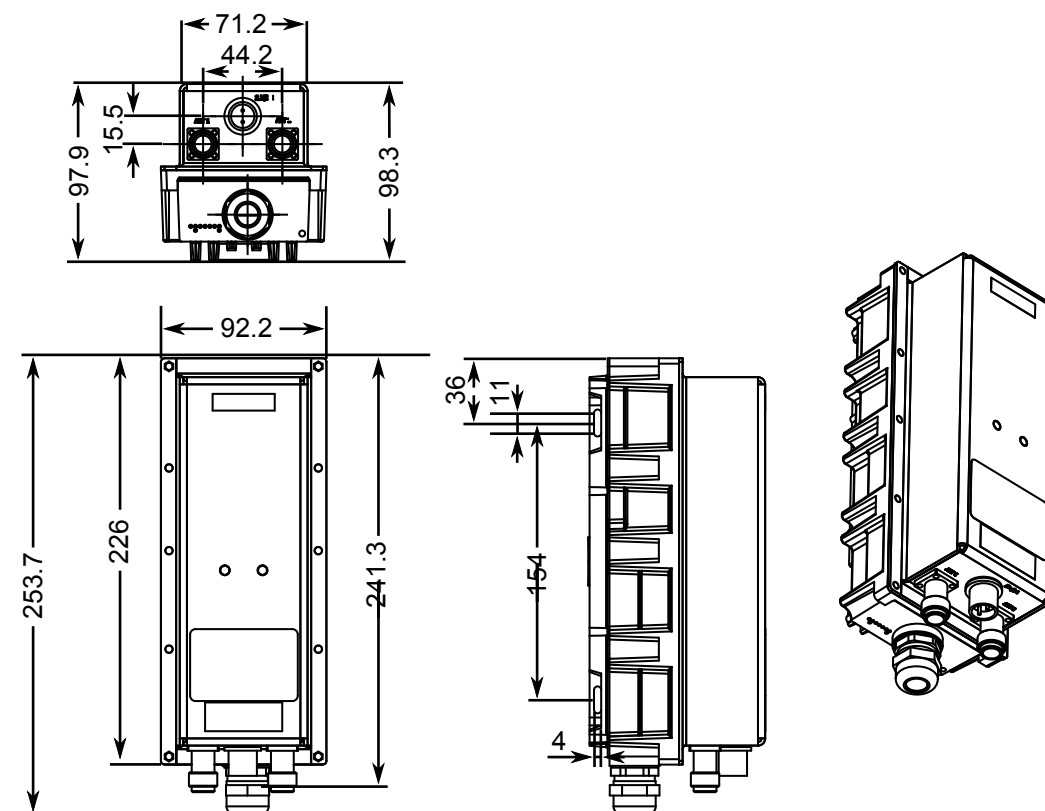


Figure 22: Overall Dimensions (DC)

5 Certification

The RUGGEDCOM WIN5158-AC-IS ODU CPE has been thoroughly tested to guarantee its conformance with recognized standards and has received approval from recognized regulatory agencies.

- [Section 5.1, “Standards Compliance”](#)
- [Section 5.2, “Agency Approvals”](#)
- [Section 5.3, “MIL-STD Ratings”](#)
- [Section 5.4, “IEEE 802.16e Mobile WiMAX Compliance”](#)
- [Section 5.5, “Environmental Type Tests”](#)

Section 5.1

Standards Compliance

The RUGGEDCOM WIN5158-AC-IS complies with the following standards:

- **FCC Compliance**

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference on his own expense.

- **Industry Canada Compliance**

CAN ICES-3 (A) / NMB-3 (A)

- **Other**

EN 50155 (Railway)

Section 5.2

Agency Approvals

The RUGGEDCOM WIN5158-AC-IS has received approval from various agencies.

Agency	Standards	Comments
CSA	CSA C22	Approved
CE	EN 60950-1	Approved
TUV	UL 60950-1	Approved
FCC	FCC Part 15 (Subpart B, Class B)	Approved
FCC	Part 27	Approved

Agency	Standards	Comments
FCC	FCC Part 90	Approved
CE	ETSI EN 301489-1/4, ETSI EN 302 326-1/2/3	Approved
IC	RS197	Approved
IC	SRSP 301.7 issue 2	Approved
ETSI	ETS 300 019	Approved
UL/CSA	Class I Div II, UL 1604, CSA 22.2 No213-M1987	Approved
ATEX	Zone 2 EN60079-0, EN60079-15	Approved
AREMA		Designed to meet and exceed AREMA C&S Manual part 11.5.1 as applicable.

Section 5.3

MIL-STD Ratings

Test	Description	Test Levels
IEC 60068-2-11 MIL-STD-810E	SALT FOG	5% NaCl 35° 48h

Section 5.4

IEEE 802.16e Mobile WiMAX Compliance

The IEEE802.16-2005 specifications describe a Point-to-Multipoint (PMP) broadband wireless access standard for systems. This standard includes descriptions for both the Media Access Control (MAC) and the physical (PHY) layers.

The device is compliant to the IEEE802.16-2005 WiMAX forum Wave 2 profile.

**NOTE**

The RUGGEDCOM WIN1010 WIN product family is designed to comply with a specific revision of the IEEE 802.16e standards, which are subject to amendment.

Section 5.5

Environmental Type Tests

Test	Description	Test Levels
IEC-60068-2-1	LOW TEMP	-40 °C Duration: 16h
IEC-60068-2-2	HIGH TEMP	60 °C

Test	Description	Test Levels
		Duration: 16h
IEC-60068-2-14	TEMP CHANGE	-10 to 45 °C 0.5 °C/min Duration: 2 cycles
IEC 60068-2-30	HUMIDITY (Cycling)	30°C 90-100% Duration: 2 cycles
IEC 60068-2-18 IEC 529 (IP65/IP67)	WATER: Rain (intensity)	0.01m3/min, 90kPa, 30min
IEC-60068-2-64 Class 4M5	RANDOM VIBRATION (4M5)	ASD - 0.04 m ² /s ³ 12 -12 dB /oct Freq. Range 5-10, 10-50, 50-100 Hz 3 Axes Duration: 30min each axes
IEC-60068-2-29 Class 4M5	SHOCK (4M5)	Spectrum: Half sine Duration: 11 ms Accelerator: 50 m/s ² 100 shocks in each direction
IEC-60068-2-1	LOW TEMP	-40 °C Duration: 72h
IEC-60068-2-2	HIGH TEMP	70 °C Duration: 72h
IEC-60068-2-14	TEMP CHANGE	-40 -30 °C 1 °C/min Duration: 5 cycles
IEC 60068-2-30	HUMIDITY (Cycling)	40°C, 90-100% Duration: 2 cycles
IEC 60068-2-18	WATER: Rain	0.01 m ³ /min, 90 kPa Duration: 15 min.
IEC-60068-2-64	RANDOM VIBRATION	ASD - 1 m ² /s ³ -3 dB /oct Freq. Range: 5-20 Hz 20-200 3 Axes Duration: 30min each axes
IEC-60068-2-29	SHOCK	Spectrum: Half sine Duration: 6 ms Accelerator: 180 m/s ² 100 shocks in each direction
IEC-60068-2-32 Nebs: GR63	FREE FALL	Height: 1m One fall on 3 faces, 3 edges and 4 corners
IEC-60068-2-1	LOW TEMP	-25 °C

Test	Description	Test Levels
		Duration: 72h
IEC-60068-2-2	HIGH TEMP	55 °C Duration: 72h
IEC 60068-2-30	HUMIDITY (Cycling)	30°C, 90-100% Duration: 2 cycles
IEC-60068-2-6	SINE VIBRATION	Velocity: 5 mm/s Displacement: 1.5 mm Acceleration: 2 m/s ² Frequency Range: 5-62, 62-200 Hz 3 Axes Duration: 3x5 sweep