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Preface

This guide describes the RUGGEDCOM WIN5151. 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.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER!</td>
<td>DANGER alerts describe imminently hazardous situations that, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td>WARNING!</td>
<td>WARNING alerts describe hazardous situations that, if not avoided, may result in serious injury and/or equipment damage.</td>
</tr>
<tr>
<td>CAUTION!</td>
<td>CAUTION alerts describe hazardous situations that, if not avoided, may result in equipment damage.</td>
</tr>
<tr>
<td>IMPORTANT!</td>
<td>IMPORTANT alerts provide important information that should be known before performing a procedure or step, or using a feature.</td>
</tr>
<tr>
<td>NOTE</td>
<td>NOTE alerts provide additional information, such as facts, tips and details.</td>
</tr>
</tbody>
</table>

Related Documents

Other documents that may be of interest include:

- RUGGEDCOM CPE User Guide
- RUGGEDCOM RP100 Installation Guide
- RUGGEDCOM RP110 Installation Guide
Accessing Documentation

The latest Hardware Installation Guides and Software User Guides for most RUGGEDCOM products are available online at www.siemens.com/ruggedcom.

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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
Chapter 1

Introduction

The RUGGEDCOM WIN5151 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 WIN5151 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 WIN5151 provides efficient use of the wireless spectrum, supporting a range of user environments.

The RUGGEDCOM WIN5151 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.

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.

**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 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.

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:

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLNK is ON</td>
<td>Green</td>
<td>The device is connected with and receives services from the base station; network entry is complete.</td>
</tr>
<tr>
<td>WLNK is BLINKING</td>
<td>Green</td>
<td>The link between the CPE and the base station is down.</td>
</tr>
<tr>
<td>PWR is ON</td>
<td>Green</td>
<td>CPE power is on.</td>
</tr>
<tr>
<td>RSSI: one LED is ON (least significant)</td>
<td>Green</td>
<td>RSSI &lt; -90</td>
</tr>
<tr>
<td>RSSI: two LEDs are ON</td>
<td>Green</td>
<td>-85 &lt; RSSI &lt; -90</td>
</tr>
<tr>
<td>RSSI: three LEDs are ON</td>
<td>Green</td>
<td>-80 &lt; RSSI &lt; -85</td>
</tr>
<tr>
<td>RSSI: four LEDs are ON</td>
<td>Green</td>
<td>-75 &lt; RSSI &lt; -80</td>
</tr>
<tr>
<td>RSSI: five LEDs are ON</td>
<td>Green</td>
<td>-70 &lt; RSSI &lt; -75</td>
</tr>
<tr>
<td>RSSI: six LEDs are ON</td>
<td>Green</td>
<td>-65 &lt; RSSI &lt; -70</td>
</tr>
</tbody>
</table>
LED

<table>
<thead>
<tr>
<th>RSSI: seven LEDs are ON</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older Hardware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEDS 1-7: Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 8: Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latest Hardware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEDs 1-6: Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 7: Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20 &lt; RSSI &lt; -60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RSSI: only the last LED is ON (most significant)</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td></td>
<td>-20 &lt; RSSI (Saturation)</td>
</tr>
</tbody>
</table>

**RUGGEDCOM WIN1010 Data Adapter LED Indicators**

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Green</td>
<td>Input power is connected</td>
</tr>
<tr>
<td>LAN</td>
<td>Green</td>
<td>LAN link/activity display</td>
</tr>
<tr>
<td>WLNK</td>
<td>Green</td>
<td>Wireless link/activity display</td>
</tr>
</tbody>
</table>

**Section 1.3**

**Antennas**

The CPE consists of the following modules:

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base-Band board:</td>
<td>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.</td>
</tr>
<tr>
<td>Power Supply board with DC/DC power supply:</td>
<td>Converts 48 VDC input to the voltages feeding the Digital and RF modules.</td>
</tr>
<tr>
<td>RF board:</td>
<td>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.</td>
</tr>
<tr>
<td>Chassis</td>
<td></td>
</tr>
<tr>
<td>Antenna or Antennas:</td>
<td></td>
</tr>
</tbody>
</table>

**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.
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 WIN5151 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.
Chapter 2
Installing the Device

Section 2.1
Mounting the Device

The RUGGEDCOM WIN5151 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.
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 WIN5151 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 WIN5151 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 WIN5151 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 1: Mounting the Antenna/Enclosure to a Large Pole**

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.

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 [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:

• 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 device 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 device towards the reflecting object, rather than towards the base station.

In some cases, the device 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 device 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 device upwards by approximately 10° to 15°.

1. Verify that power is applied to the device. The PWR LED should be ON.
2. 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.

3. 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 3.4, “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.

![Figure 4: Assembling the Connector Components](image)

   1. Plug Housing  
   2. Dust Cover

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

![Figure 5: Cutting the Jacket](image)

   1. Wire Jacket  
   2. Foil

3. Fold the foil back over the wire jacket.
4. Bend the drain wire back over the jacket.

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

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

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.
Chapter 2
Installing the Device

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.

Figure 11: Assembling the Connector Components
1. PoE Plug   2. Plug Housing   3. Dust Cover

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).

Figure 12: Connecting the PoE Cable to the CPE
1. PoE Cable   2. Dust Cover   3. Plug Housing   4. CPE
NOTE
The Category 5e Ethernet cable is not included. Refer to Section 3.4, “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 WIN5151-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 13: Power over Ethernet Connection Schematic

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

The RUGGEDCOM RP100 and RP110 are optional power injectors that can be ordered to power the RUGGEDCOM WIN5151. 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 WIN5151 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.

![Diagram of typical outdoor installation](image)

**Figure 14: Typical Outdoor Installation**

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 WIN5151 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

**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 Lamba 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 15: Connecting the CPE in a Hazardous Location](image)

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 16: Wrapping the Connector with Rubber Splicing or Self-Amalgamating Tape](image)

**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 17: Wrapping the Connector with Electrical Tape](image)

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.
Section 2.9

Configuring the CPE

Once the CPE is installed and connected to the network, it must be configured. The RUGGEDCOM WIN5151 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.
Chapter 3
Technical Specifications

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

- Section 3.1, “Power Consumption”
- Section 3.2, “Operating Environment”
- Section 3.3, “Mechanical Specifications”
- Section 3.4, “IDU to ODU Cable Specifications”

Section 3.1

Power Consumption

Typical power consumption: 12 W

Section 3.2

Operating Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Operating Temperature</td>
<td>-40 to 75 °C (-40 to 167 °F)</td>
<td></td>
</tr>
<tr>
<td>Ambient Relative Humidity</td>
<td>5% to 95%</td>
<td>Non-condensing</td>
</tr>
<tr>
<td>Ambient Storage Temperature</td>
<td>-40 to 75 °C (-40 to 167 °F)</td>
<td></td>
</tr>
</tbody>
</table>

Section 3.3

Mechanical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Refer to Chapter 4, Dimension Drawings</td>
</tr>
<tr>
<td>Weight</td>
<td>1.5 kg (3.3 lb)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP67</td>
</tr>
</tbody>
</table>
Section 3.4
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

<table>
<thead>
<tr>
<th>Applications</th>
<th>Outdoor installations, fixed or portable installations, digital distribution frames in transmission stations, outdoor installations in harsh environments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Construction:</td>
<td>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.</td>
</tr>
<tr>
<td>Conductor Size:</td>
<td>0.52 mm</td>
</tr>
<tr>
<td>Outer Jacket Material:</td>
<td>UV resistant FR-PVC</td>
</tr>
<tr>
<td>Outer Diameter:</td>
<td>7.9 mm nominal</td>
</tr>
<tr>
<td>Weight:</td>
<td>68.0 kg/km</td>
</tr>
</tbody>
</table>

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

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

All dimensions are in millimeters, unless otherwise stated.
Chapter 5
Certification

The RUGGEDCOM WIN5151 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 WIN5151 complies with the following standards:

- **FCC Compliance**
  This equipment has been tested and found to comply with the limits for a Class A 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 WIN5151 has received approval from various agencies.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Standards</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA</td>
<td>CSA C22</td>
<td>Approved</td>
</tr>
<tr>
<td>CE</td>
<td>EN 60950-1</td>
<td>Approved</td>
</tr>
<tr>
<td>TUV</td>
<td>UL 60950-1</td>
<td>Approved</td>
</tr>
<tr>
<td>CE</td>
<td>ETSI EN 301489-1/4, ETSI EN 302 326-1/2/3</td>
<td>Approved</td>
</tr>
</tbody>
</table>
### MIL-STD Ratings

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Test Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60068-2-11</td>
<td>SALT FOG</td>
<td>5% NaCl 35° 48h</td>
</tr>
<tr>
<td>MIL-STD-810E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.

### Environmental Type Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Test Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC-60068-2-1</td>
<td>LOW TEMP</td>
<td>-40 °C 16h</td>
</tr>
<tr>
<td>IEC-60068-2-2</td>
<td>HIGH TEMP</td>
<td>60 °C 16h</td>
</tr>
<tr>
<td>IEC-60068-2-14</td>
<td>TEMP CHANGE</td>
<td>-10 to 45 °C 0.5 °C/min 2 cycles</td>
</tr>
<tr>
<td>IEC 60068-2-30</td>
<td>HUMIDITY (Cycling)</td>
<td>30°C 90-100% 2 cycles</td>
</tr>
<tr>
<td>IEC 60068-2-18</td>
<td>WATER: Rain (intensity)</td>
<td>0.01m3/min, 90kPa, 30min</td>
</tr>
<tr>
<td>Test</td>
<td>Description</td>
<td>Test Levels</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| IEC 529 (IP65/IP67) | RANDOM VIBRATION (4M5) | ASD - 0.04 m²/s³
 | | | 12 -12 dB /oct |
| | | Freq. Range 5-10, 10-50, 50-100 Hz |
| | | 3 Axes |
| | | Duration: 30min each axes |
| IEC-60068-2-64 Class 4M5 | SHOCK (4M5) | Spectrum: Half sine
<p>| | | Duration: 11 ms |
| | | Accelerator: 50 m/s² |
| | | 100 shocks in each direction |
| IEC-60068-2-29 Class 4M5 | 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 m³/min, 90 kPa |
| | | Duration: 15 min |
| IEC-60068-2-64 | RANDOM VIBRATION | ASD - 1 m²/s³ |
| | | -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/s² |
| | | 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 |
| | | 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 |</p>
<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Test Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Acceleration: 2 m/s²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency Range: 5-62, 62-200 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Axes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 3x5 sweep</td>
</tr>
</tbody>
</table>