



**STARSOLUTIONS**<sup>™</sup>  
ENABLING NETWORKS TO REACH NEW MARKETS

ALL-IP GSM

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# **iCell COMPAC IP-RAN**

## **Outdoor Micro GSM**

# **Installation and Configuration Guide**

Part Number D02713GS Rev A3

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# ABOUT THIS GUIDE

## Introduction

This reference guide provides a high level description of the iCell COMPAC Outdoor Micro.

This chapter lists the guide conventions and related documentation and the order of which initial configuration tasks should be completed, and describes how to contact customer service.

This chapter includes:

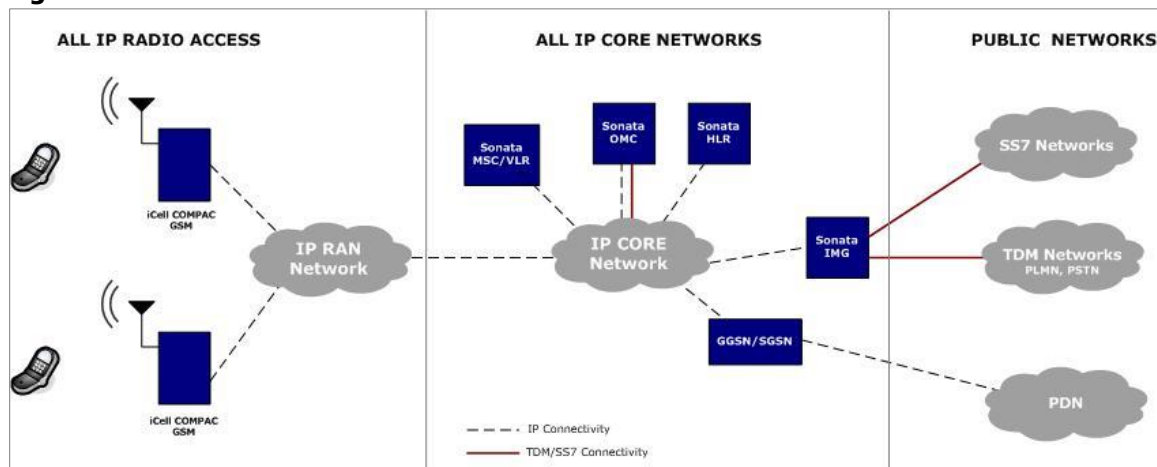
- [Product Overview: All-IP System Architecture](#)
- [Outdoor Micro Functionality](#)
- [MCPA](#)
- [Order of Tasks](#)
- [Conventions](#)
- [Technical Support](#)
- [Warranty Support](#)

## Product Overview: All-IP System Architecture

The Star Solutions iCell COMPAC GSM IP-RAN is a complete outdoor GSM and GPRS enabled base station system. The unit is passively cooled, avoiding the need for fans or air conditioning, and is specifically designed for low power consumption. The iCell COMPAC GSM IP-RAN is a natural fit with alternative energy sources such as solar or wind powered hybrid systems when commercial power is not readily available.

The iCell COMPAC GSM IP-RAN comes with the inherent features common to all of Star Solutions' All-IP mobile network architecture including IP interface to the network, local call routing, support for all transmission networks, including satellite, and significant reduction of backhaul bandwidth. The system architecture is shown in Figure 1

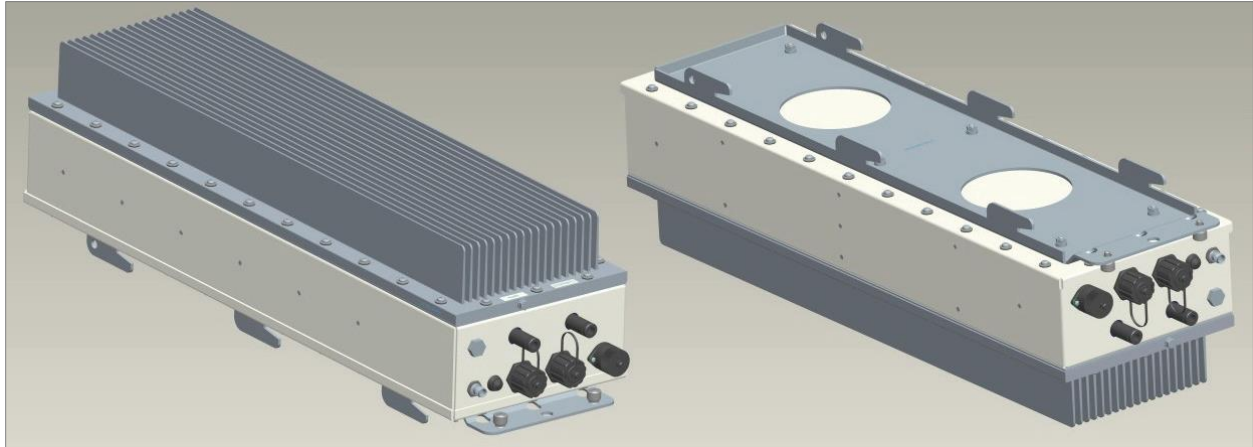
**Figure 1: All-IP GSM Network Architecture**



## Outdoor Micro Functionality

The Outdoor Micro provides an All-IP GSM wireless cell site capable of providing up to 10 watts RF power output. The Outdoor Micro provides single-sector coverage with a two transceivers (TRX) capacity. The Outdoor Micro offers an additional level of integration by supporting an optional Base Station controller (BSC) module. Figure 2 shows the Outdoor Micro's exterior view.

**Figure 2: External View of Outdoor Micro Module**



## Technical Specifications

Table 1 lists the Outdoor Micro's technical specifications.

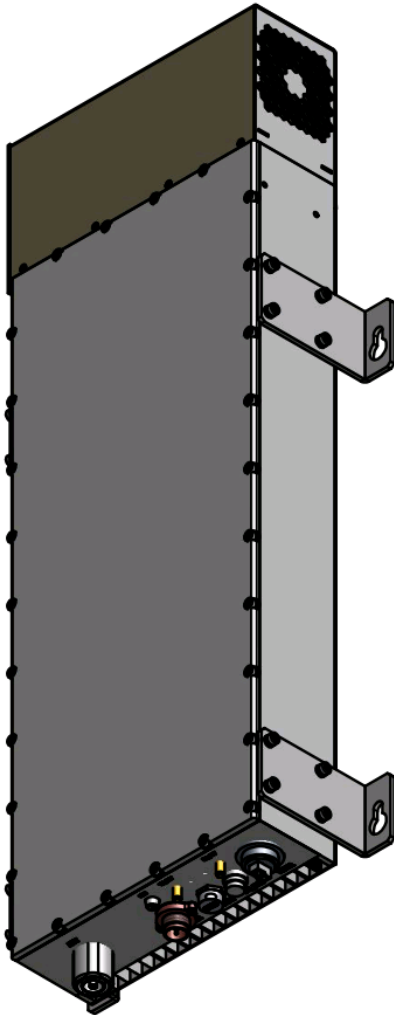
**Table 1: iCell COMPAC Technical Specifications**

<b>Capacity/Performance</b>	
Configuration	Single sector 2TRX
	5 Watts in 2 TRX mode
RF Output Power	10 Watts in single TRX mode
	25 Watts per TRX in 2 TRX mode (requires external MCPA)
<b>Frequency Band</b>	
Supported Bands	850, 900, 1800, 1900 MHz
<b>Hardware</b>	
Dimensions	72.5 cm H x 22 cm W x 18.2 cm D (28.5 x 8.7 x 7.1 inch)
Weight	20 kg
Input Voltage	-48 VDC
Power Consumption	Less than 80 Watts in typical operating conditions
Options	Mounting brackets for pole, wall or floor
<b>Environmental</b>	
Operating Temperature	-40 to + 55°C
Storage Temperature	-40 to + 70°C
Humidity	5-95% non-condensing

## MCPA

The COMPAC outdoor Micro can be integrated with a Multi-Carrier-Power-Amplifier (MCPA) to allow higher transmit power. Figure 3 shows an exterior view of the MCPA. Table 2 provides the MCPA's technical specifications. The MCPA allow maximum power output of 25 Watt per carrier (TRX)

**Figure 3 MCPA External View**



**Table 2 MCPA Technical Specifications**

<b>Hardware</b>	
Dimensions	72 cm H x 25 cm W x 8.4 cm D (28.3 x 9.8 x 3.3 inch)
Weight	10 kg
Input Voltage	48 VDC
Power Consumption	300 Watts in typical operating conditions
Options	Mounting brackets for wall or floor
<b>Environmental</b>	
Operating Temperature	0 to + 40°C



## Order of Tasks

This guide has 6 main sections showing the tasks to be carried out and in what order they are to be done:

- [Prerequisites](#)
- [Site Preparation](#)
- [Installation](#)
- [Interface Connection](#)
- [Configuring the Outdoor Micro](#)
- [Regulatory Notices](#)



**Note:** Release notes are issued with some products. If the information in the release notes differs from the information in this guide, follow the instructions given in the release notes.

## Conventions


This guide may contain notices, figures, screen captures, and certain text conventions.

### Notice Icons

This guide has icons placed throughout this manual to alert you to and highlight particular parts of the text or instructions. Table 3 lists the notice icons used in this guide.

**Table 3: Notice Icon Descriptions**

Icon	Notice Type	Description
	Information Note	Information that contains important features or instructions but is not hazard-related.
	Caution or Warning	<p>Cautions are preceded with the word Caution. This type of caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also alert against unsafe practices and potential program, data, system, or device damage.</p> <p>Warnings are preceded with the word Warning. This type of warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p>
	Caution or Warning due to potential electrical hazard	Cautions due to potential electrical hazards are preceded with the word Caution. This type of caution indicates a potential electrical hazard. This hazard, if not avoided, may result in minor or moderate injury. It may also alert against unsafe practices and potential program, data, system, or device damage.

		Warnings due to potential electrical hazards are preceded with the word Warning. This type of warning indicates a potential electrical hazard. This hazard, if not avoided, could result in death or serious injury.
	ESD	Information that indicates proper grounding precautions are required before handling a product.

## Figures and Screen Captures

This guide provides figures and screen captures as examples. These examples contain sample data. This data may vary from the actual data on an installed system. Table 4 lists text conventions used in this guide.

**Table 4: Text Convention Descriptions**

Convention	Description
Text represented as a screen display	This typeface represents text that appears on a terminal screen, for example login:.
Text represented as a user entry	This typeface represents commands entered by the user, for example, <code>cd \$HOME</code> .
Text represented as <b>menu, sub-menu, tab and field names</b>	<b>This typeface</b> represents all menu, sub-menu, tab, and field names within procedures. For example: On the <b>File</b> menu, click <b>New</b> .
Text represented by <code>&lt;variable&gt;</code>	This typeface represents a required variable. For example: <code>&lt;filename&gt;</code>

## Technical Support

The Star Solutions Product Support Team provides all technical support services necessary for business and professional needs. Our product experts deliver Tier 1, 2 and 3 technical support directly to new and contract-entitled customers including the following services:

- **Basic Support Package:** Non-emergency technical support
- **Premium Support Package:** 24 hours a day, 7 days a week, and 365 days a year Emergency technical support

The Star Solutions Service Guide outlines the specific details for obtaining technical support. The guide is available from a sales account manager. Refer to the Service Guide for services and options specific to individual support plans, including guidelines for problem severity and the technical resolution escalation process.

## Obtaining Technical Assistance

Star Solutions maintains a global presence through its Technical Response and Service Centers. These centers are available for technical telephone support to entitled customers during normal business hours.

Before contacting technical support, please have this information available:

- **Product information**
  - Software and hardware revisions

- Serial numbers
- **Problem description**
  - Symptoms
  - Known causes
- **Trouble locating and clearing attempts**

For information about customer service, including support, training, code releases and updates, contracts, and documentation, contact us at: <http://www.starsolutions.com/support/support-portal/>

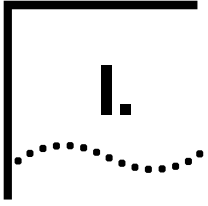
### **Service Centers Operational Hours**

- **North America/CALA Region:** 09:00–18:00 Pacific Time (UTC-8:00)
- **EMEA/Asia Pacific Region:** 09:30–18:30 Indian Standard Time (UTC+5:30)

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### **Warranty Support**

Star Solutions provides its customers warranty support per the terms of the Star Solutions Warranty Statement for their equipment. Customers who require warranty support should contact the Star Solutions Customer Service Center as specified in the customer service guide or at: <http://www.starsolutions.com/support/support-portal/>



# I.

## PRE-INSTALLATION

The chapters in this section covers items you will need to know about the site and the Outdoor Micro before you install and configure the unit.

- [Prerequisites](#)
- [Site Preparation](#)

# 1.

# PREREQUISITES

---

## About this chapter

This chapter describes the prerequisites to installing the Outdoor Micro. It chapter includes:

- [Site Requirements](#)
- [Installer Requirements](#)
- [Network Planning Requirements](#)
- [Password and Username Assignment](#)

---

## Site Requirements

The Outdoor Micro is designed to be pole, wall, or floor mounted.

The network operator is responsible for supplying supporting components, cabling, and the necessary operating environment for the Outdoor Micro. See [Inspecting and Verifying Site Requirements](#) for details.



**Warning:** The network operator is responsible for site grounding and lightning protection. Verify all grounding, power connections and lightning protection to see that it meets or exceeds the local electrical standards.

---

## Installer Requirements

This section includes:

- [Skills and knowledge](#)
- [Supporting Documentation](#)
- [Required Tools and Materials](#)
- [Test Client Hardware](#)

### Skills and knowledge

The installer of this Outdoor Micro must have general electrical circuit and telecommunications knowledge.

### Supporting Documentation

The following documents are required to install, configure and test the Micro Outdoor:

- Outdoor Micro Installation and Initial Configuration Guide (this guide)
- Network Planning Document
- Engineering specifications for the site and network are required for any configuration of parameters after installation and initial configuration. The Network Planning Document also provides the necessary inputs for the Network Planning Requirements section.

## Required Tools and Materials

The tools required for the installation of the Outdoor Micro are listed in below:

- 10mm hex wrench
- ¾ inch hex wrench
- Power drill (rotary impact hammer) and (½ inch) concrete drill bit
- Side cutter or wire cutter
- Tape measure
- Straight edge or chalk line
- Pencil or marker
- Shop Vacuum



**Note:** The tools needed for connecting the wall mount assembly are not listed here. They are the responsibility of the site manager or the installer.

## Test Client Hardware

In order to communicate with the Outdoor Micro, the following tools and cables are required:

**Laptop:** A laptop PC, also called the Test Client, is needed for the installation, configuration, verification and network integration of the Outdoor Micro. The minimum PC requirements are:

- **Processor:** 1.3 GHz
- **Operating System:** Microsoft® Windows® XP Pro/Vista/7
- **Memory:** 512 MB
- **Hard Drive:** 10 GB
- **CD ROM Drive:** 48X
- **USB Port:** Optional
- **Ethernet Port and Card:** 10/100

**Cables:** Several different cables are needed for the installation, configuration, verification and network integration of the Outdoor Micro.

- **Antenna Cables:** Main and diversity N male connectors (10 W output)
- **Power Cables:** 20 to 14 AWG power cabling. See [Making the Power Cable](#).
- **Grounding Cable:** 20 AWG (minimum) with a crimp lug on one end
- **Backhaul Ethernet Cable:** CAT-6 or CAT-5 with 2 RJ-45 connector ends. See [Ethernet Connections](#).

## Network Planning Requirements

This section includes:

- [IP Address Assignment](#)
- [Access Network IP Addressing](#)
- [Password and Username Assignment](#)

### IP Address Assignment

The test client is used to connect the NE's and they must be on the same subnet. The needed IP addressing information is listed in Table 5. Obtain them from the project or site engineer and write them down for future reference.

**Table 5: Required IP Addressing for the Test Client**

Test Client	Value
IP Address 1	
Subnet Mask 1	
Default Gateway 1	

### Access Network IP Addressing

Table 6 lists the IP addressing information required for the Access Network. Obtain them from the project or site engineer and write them down for future reference.

**Table 6: Required IP Addressing**

Test Client	Value
BSC IP Address	
BTS IP Address	
Configuration Center IP Address	

### Password and Username Assignment

The Outdoor Micro has default username and passwords configured. New site-specific usernames and passwords can be assigned during installation and configuration or new usernames and passwords can be configured later by the operator.



**Note:** Changing usernames and passwords is not mandatory, but site-specific values will be required if usernames and passwords are changed.

Table 7 lists the usernames and passwords required to connect. Have the site-specific usernames and passwords ready before installation begins so that login information can be changed to site-specific values.

**Table 7: Login Configuration for Site (http)**

BSS Component	Default Username	Default Password
configcenter	root	tel_os
BTS	admin	admin

## 2. SITE PREPARATION

---

### About This Chapter

This chapter describes how to prepare the site for the installation of the Outdoor Micro.

This chapter includes:

- [Site Planning](#)
- [Site Requirements](#)
- [Inspecting and Verifying Site Requirements](#)

---

### Site Planning

The Outdoor Micro has specific structural, electrical, and telecommunications requirements. When selecting and preparing a site, specific personnel and documents must be available to ensure the device is installed correctly and safely.

Site Planning includes planning for:

- [Required Personnel](#)
- [Required Site-Specific Information](#)
- [Site Planning Checklist](#)
- [Site Plans and Floor Plans](#)

### Required Personnel

For safety, Star Solutions recommends at least two people be assigned to install the Outdoor Micro. Installers should be experienced in the installation and configuration of telecommunications equipment.

### Required Site-Specific Information

When preparing a site for installation of an Outdoor Micro, obtain this site-specific information:

- General site information
- Power information:
  - Grounding data
  - Power-level data
- Environmental documents:
  - Temperature records
  - Humidity tests
- Site wiring lists
- Security alarm system data
- Fire system data



## Site Planning Checklist

The following checklist is provided to assist in the site planning procedure. After completing the required steps, check them off, or refer back to this list, to ensure all site planning requirements are met:

- Reviewing personnel requirements
- Gathering related documentation
- Verifying power
- Verifying the grounding
- Verifying alarms
- Verifying site conditions
- Verifying weather conditions
- Verifying temperature control
- Reviewing standard equipment rack location specifications
- Reviewing equipment mounting guidelines
- Preparing the site for the Outdoor Micro

## Site Plans and Floor Plans

- Generate a site plan and floor plan for equipment layout. The Outdoor Micro should be installed according to the clearances outlined in [Space Clearance Requirements](#).

---

## Site Requirements

This section outlines the requirements for the site where the Outdoor Micro is to be installed:

- [Site Power Requirements](#)
- [Site External Grounding Requirements](#)
- [Other Cable Grounding Requirements](#)
- [Mounting Options](#)
- [Space Clearance Requirements](#)

The required tools, hardware, and network information are outlined [Required Tools and Materials](#).

## Site Power Requirements

- **DC Power:** The DC Outdoor Micro must be supplied with -68 VDC to -40 VDC, nominal voltage is -48 VDC.
- **Waterproofing:** To maintain the product's IP65 rating, the power cable attached to the unit must provide a waterproof connection to the Lightning Protection Unit (LPU).
- **Cable Requirements:** The fitting supplied with the Outdoor Micro accepts a cable diameter in the range of 22 to 27 mm (0.880 to 1.065"). The cable must also be appropriately temperature rated.

## Site External Grounding Requirements

- **Site Grounding Responsibility:** Site grounding is the responsibility of the customer. All grounding and power connections should be made according to local standards.
- **Ground Rods:** Several factors affect external grounding. The most significant factor is the resistance of ground rods, which is directly related to soil resistivity in the immediate vicinity of the rod. The resistivity of the soil determines how many rods are needed and their dimensions.

## Other Cable Grounding Requirements

All other cables such as telephone cables, data cables, and power cables *must* be connected to the single-point ground and must employ impulse/surge suppressors.

Cables between any two cabinets must be shielded and employ a messenger cable. The messenger cable must be bonded to the respective building ground at each corner. The shields must be bonded to the ground at each ring.



**Note:** A messenger cable is made of stranded steel and supports aerial cable between poles.

## Mounting Options

The Outdoor Micro has three different installation kits:

- **Pole Mounting:** The Outdoor Micro supports installation on steel, concrete, or wood poles with diameter from 12 to 30 cm (5 to 12 inches). See [Pole Mounting](#) for details.
- **Wall Mounting:** The Outdoor Micro supports installation on wood, concrete, masonry, grout-filled-block, and hollow-block walls. See [Wall Mounting](#) for details.
- **Floor Mounting:** The Outdoor Micro supports installation on various floor types. See [Floor Mounting](#) for details.

## Space Clearance Requirements

The Outdoor Micro requires space around the unit to allow for proper routing of the cables as well as viability for the GPS antenna.

- **Vertical Clearance:** The Outdoor Micro requires a minimum clearance for cable connections at the bottom of the cabinet. Cables for the antennas have differing turn radiuses which affect the required vertical clearance.
- **Area Clearance:** The Outdoor Micro requires sufficient area clearance to provide adequate space for the bending radius necessary for the required RF cables.
- **GPS Antenna Clearance:** The GPS antenna installed on the top of the Outdoor Micro mounting assembly requires unobstructed upward visibility for satellite acquisition. Do not install any solid metal constructions above the Outdoor Micro.

---

## Inspecting and Verifying Site Requirements

Inspect the physical location where the Outdoor Micro is to be installed, and verify the location meets the minimum requirements outlined in this section.



**Note:** If site conditions do not comply with the instructions in this manual, contact the site manager, facility representative or other responsible individuals at once. Do not proceed with the installation until the site conditions are satisfied.

This section includes:

- [Installer Safety Precautions](#)
- [Fire Protection for Indoor Installation](#)
- [Verifying Site Conditions](#)

### Installer Safety Precautions

The installer must take appropriate safety precautions as specified by local standards. These include:

- Providing on-site fire extinguishers. See [Fire Protection for Indoor Installations](#).
- Use of appropriate safety equipment and clothing
- Insuring on-site first aid support is available
- Where possible, work under a buddy system to insure someone is available to help in case of an emergency

### Fire Protection for Indoor Installations



**Notes:**

- Fire protection applies only to indoor installations.
- If there is no fire suppression equipment installed, contact the site manager or facility representative before starting.
- Have at least two 5-lb. ABC class portable fire extinguishers on the premises before starting installation.

Install fixed fire suppression equipment. Possible types are:

- Halon gas system
- Carbon dioxide (CO<sub>2</sub>) system
- Sprinkler system (Star Solutions recommends using "dry pipe" sprinkler systems that remove all power to a room before filling the overhead sprinklers with water.)

### Verifying Site Conditions

The site must be clean and free of obstructions.



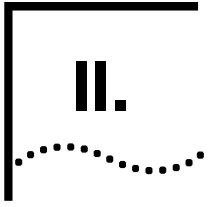
**Warnings:**

- External cabling must be supported by appropriate cable racks not attached to the Outdoor Micro. Otherwise, the weight of the cabling may reduce the ability of the system to withstand Zone 4 Seismic activity.

- Installation of ancillary equipment (power supplies, cable racks, batteries, etc.) is the responsibility of the installer.

Verify that:

- The outdoor temperature is within the specified limits for the equipment (see [Technical Specifications](#)).
- There are no obstructions.
- Any dust and/or water in the area is cleared away.
- Do not place components or other equipment directly on the ground.
- During inclement weather conditions, use adequate protection, such as a tent, to protect the equipment from precipitation or windblown debris.



## II.

# INSTALLATION

The chapters in this section covers items you will need to know about the site and the Outdoor Micro before you install and configure the unit.

- [Outdoor Micro Installation](#)
- [Interface Connections](#)
- [Configuring the Outdoor Micro](#)

# 3.

# OUTDOOR MICRO INSTALLATION

---

## About this chapter

This chapter describes how to install the Outdoor Micro. It chapter includes:

- [Unpacking the Shipment](#)
- [Installation Notes](#)
- [Mounting Options for the Outdoor Micro](#)
- [Pole Mounting Instructions](#)
- [Wall Mounting Instructions](#)
- [Floor Mounting Instructions](#)
- [Mounting the MCPA](#)
- [Making the Power Cable](#)
- [Assembling the Ethernet Cable](#)

---

## Unpacking the Shipment

Inspect the packing container immediately on arrival at the installation site to verify that no damage has occurred during shipment.



### Cautions:

- If any damage is observed, notify the shipper **at once** to start the insurance claim process. Do not open or unpack the container until an insurance adjuster has inspected the containers for exterior damage. If possible, take photographs for your records.
- **Do not** open the Outdoor Micro casing. No user serviceable parts are located inside. Servicing is to be done only by Star Solutions-qualified service personnel.
- Do not discard the shipping carton. Use it to package the Outdoor Micro to Star Solutions for repair or replacement.

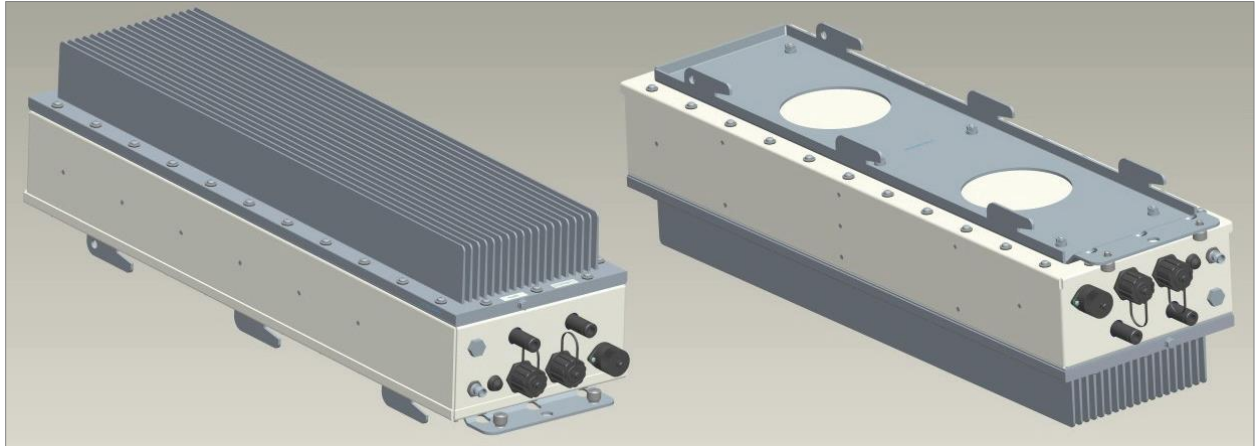
If the container appears to be in satisfactory condition, open it and carefully unpack the equipment. Verify the contents and quantities against the packing list. The Shipped Component List in this section lists the components shipped with the Outdoor Micro.

Shipped Component List:

- **Outdoor Micro Unit:** 1
- **Connector Kit:** 1
- **Ferrite Bead (260 Ohm @ 100 MHz):** 2
- **Mounting Kit:** 1

The Outdoor Micro Module is shown in Figure 4.

**Figure 4: External View of Outdoor Micro Module**



---

### Installation Notes

Prior to configuring the Outdoor Micro, verify the following:

- All connectors that are not connected are terminated.
- The shielding of all coaxial connections is grounded.

---

### Mounting Options for the Outdoor Micro

The Outdoor Micro can be:

- [Pole Mounted](#)
- [Wall Mounted](#)
- [Floor Mounted](#)



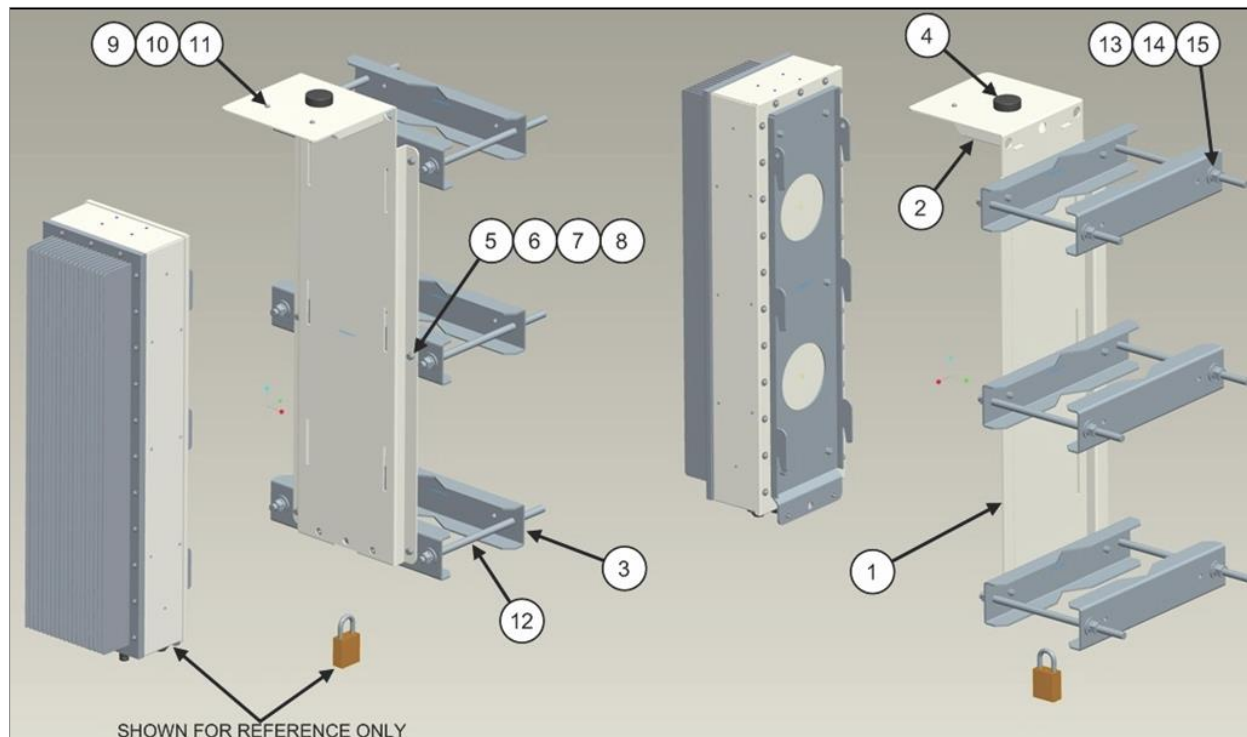
#### Warnings:

- Disconnect all power going to or coming from the Outdoor Micro before removing or installing it.
- Do not open the Outdoor Micro casing. No user serviceable parts are located inside. Servicing is to be done only by Star Solutions-qualified service personnel.
- The Outdoor Micro mounting kit comes with the GPS antenna and cable guard pre-installed. Care must be taken to ensure that the GPS antenna cable is not damaged during installation.

## Pole Mounting Instructions

Figure 4 shows the Outdoor Micro accessories required for pole mounting. The component numbers in Figure 5 refer to the components listed in Table 8.

**Figure 5: Outdoor Micro Pole Mounting Kit**



**Table 8: Outdoor Micro Pole Mounting Kit Description**

Index	Description	Quantity
1	Mounting Plate	1
2	Cable Guard	1
3	Pole Mount Bracket	6
4	GPS Active Antenna with RG174 Cable, 1.2m	1
5	Bolt, Hex HD, M6x20	6
6	Nut, Hex, M6	6
7	Washer, Flat, M6	12
8	Washer, Lock, M6	12
9	Screw, Pan HD, Phillips, M4x10	2
10	Washer, Lock, M4	2
11	Washer, Flat, M4	2
12	Threaded Rod, LG, 1/2- 13x18"	3
13	Nut, Hex, 1/2"-13	12
14	Washer, Flat, 1/2"	12
15	Washer, Lock, 1/2"	12



## Pole Mounting the Outdoor Micro

1. Using a metal-cutting hacksaw, adjust the threaded rods (12) to the required length.



**Note:** The locking washer should always be in between the screw, bolt or nut and the flat washer.

2. Install the brackets (3) on the mounting plate (1) with the:
  - Bolt (5)
  - Two washers (7)
  - Two washers (8)
  - Nut (6)
3. Insert the six threaded rods (12) into bracket holes and secure them with the:
  - Nut (13)
  - Washer (14)
  - Washer (15)
4. Lift the mounting plate and bracket assembly to the required height on the pole.
5. Attach the remaining three brackets to the rods using the:
  - Nut (13)
  - Washer (14)
  - Washer (15)
6. Tighten the nuts (13) on the rods to secure the assembly on the pole.

**Notes:**



- Tightening torque for 1/2-13 nuts on the threaded rods is subjective. Do not over-tighten nuts. Over-tightened the brackets will bend.
- Ensure the nuts are tightened evenly on the brackets such that all the brackets are kept parallel to each other.

7. Mount the Outdoor Micro to the pole mounted assembly by sliding the hooks on the back of the device into the slots on the mounting panel.
8. Tighten the two screw fasteners on the bottom of the Outdoor Micro to connect the device to the mounting plate.
9. Connect the GPS antenna cable to the TNC connector on the bottom of the Outdoor Micro.



**Note:** The GPS antenna cable should pass between the mounting plate and the brackets attached to the mounting plate.

10. Install a padlock through the holes on the bottoms of the Outdoor Micro and mounting plate so that the Outdoor Micro can only be removed by authorized personnel.

## Wall Mounting

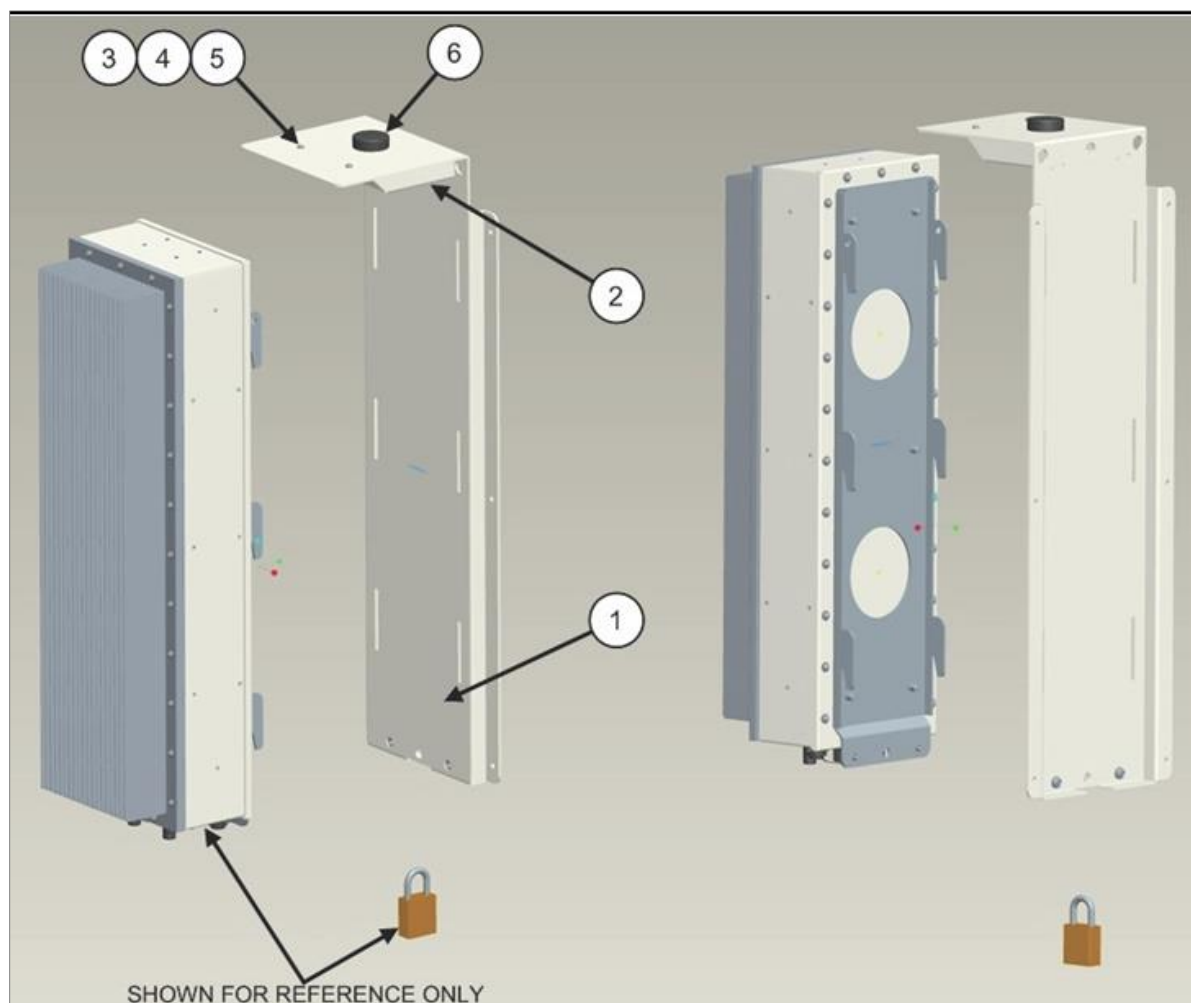
Figure 6 shows the Outdoor Micro accessories required for wall-mounting installation. The component numbers in Figure 6 refer to the components listed in Table 9.



### Warnings:

- The wall mounting kit does not contain hardware for connecting the mounting plate to a wall.
- It is the responsibility of the installer to ensure that the mounting location is secure and that the wall and any other equipment the Outdoor Micro is attached to is able to support the weight of the Outdoor Micro, and if used, the MCPA.
- Failure to securely mount the Outdoor Micro on a sufficiently strong wall could result in the device falling from the wall, causing possible damage to the device and possible injury to any persons in its close proximity.

**Figure 6: Outdoor Micro Wall Mounting**



**Table 9: Outdoor Micro Wall Mounting Kit Description**

Index	Description	Quantity
1	Mounting Plate	1
2	Cable Guard	1
3	Screw, Pan HD, Philips, M4x10	2
4	Washer, Flat, M4	2
5	Washer, Lock, M4	2
6	GPS Active Antenna with RG174 Cable, 1.2m	1

**Wall Mounting the Outdoor Micro**

1. Determine an appropriate location for mounting the mounting plate (2) on a wall and mark the location of the six drilling holes using the mounting plate as a template.
2. Drill the six mounting holes.



**Note:** The locking washer should always be in between the screw, bolt, or nut and the flat washer.

3. Attach the mounting plate (1) to the wall, taking care to ensure that the GPS cable is comfortably between the wall and mounting plate.
4. Mount the Outdoor Micro to the wall mounted mounting plate by sliding the hooks on the device into the slots on the mounting panel.
5. Tighten the two screw fasteners on the bottom of the Outdoor Micro to connect the device to the mounting plate.
6. Connect the GPS Antenna cable to the TNC connector on the bottom of the Outdoor Micro.
7. Install a padlock through the holes on the bottoms of the Outdoor Micro and mounting plate to ensure that the Outdoor Micro can only be removed by authorized personnel.

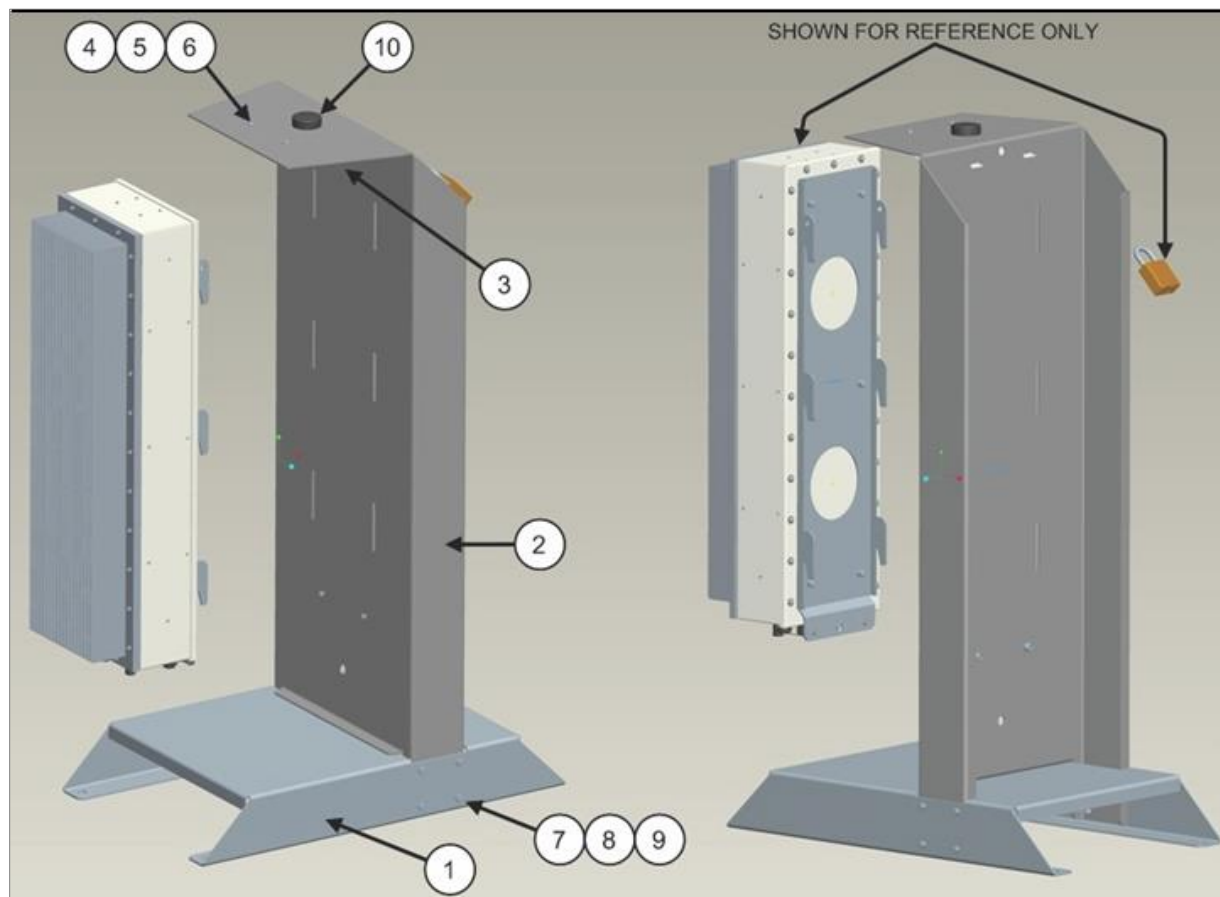
## Floor Mounting

Figure 7 shows the Outdoor Micro accessories required for floor-mounting installation. The floor mount base provides four holes for securing the mounting assembly to the floor. The component numbers in Figure 7 refer to the components listed in Table 10.



**Note:** It is strongly recommended that the mounting assembly be secured to the floor and that the floor is strong enough to support the weight of both the base and the Outdoor Micro and, if used, the MCPA.

**Figure 7: Outdoor Micro Floor Mounting**



**Table 10: Outdoor Micro Floor Mounting Kit Description**

Index	Description	Quantity
1	Floor Mount Base	1
2	Floor Mount Support	1
3	Cable Guard	1
4	Screw, Pan HD, Philips, M4x10	2
5	Washer, Flat, M4	2
6	Washer, Lock, M4	2
7	Bolt, Hex, M6 x 20	8
8	Washer, Flat, M6	8
9	Washer, Lock, M6	8
10	GPS Active Antenna with RG174 Cable, 1.2m	1

## Floor Mounting the Outdoor Micro

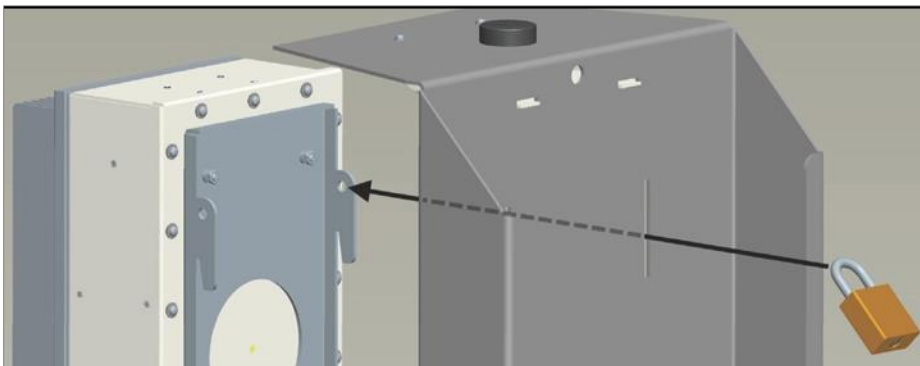
1. Determine an appropriate location for the Outdoor Micro.
2. Secure the floor mount base to the floor.



**Note:** The locking washer should always be in between the screw, bolt, or nut and the flat washer.

3. The locking washer should always be in between the screw, bolt, or nut and the flat washer.
4. Connect the floor mount support (2) to the floor mount base (1) using the:
  - Bolt (7)
  - Washer (8)
  - Washer (9)
5. Mount the Outdoor Micro to the floor mount assembly by sliding the hooks on the device into the slots on the floor mount support.
6. Tighten the two screw fasteners on the bottom of the Outdoor Micro to connect the device to the mounting plate.
7. Connect the GPS Antenna cable to the TNC connector on the bottom of the Outdoor Micro.
8. Figure 8 shows how to install a padlock through the hole in one of the hooks on the device to ensure that the Outdoor Micro can only be removed by authorized personnel.

**Figure 8: Installing a Padlock on a Floor Mounted Outdoor Micro**



---

## Mounting the MCPA

The MCPA can be either wall mounted or placed on the rear side of the COMPAC Outdoor Micro floor mount.

### Wall Mounting the MCPA



#### Warnings:

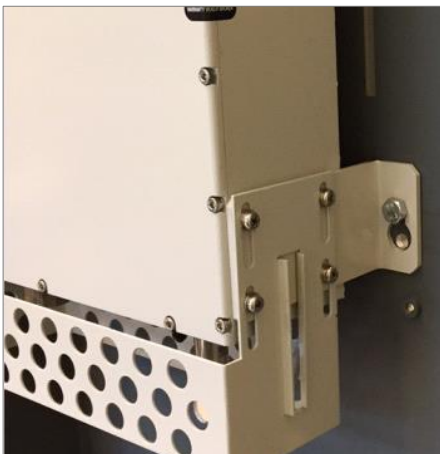
- It is the responsibility of the installer to ensure that the mounting location is secure and that the wall and any other equipment the MCPA is attached to is able to support the weight of the MCPA.
- Failure to securely mount the MCPA on a sufficiently strong wall could result in the device falling from the wall, causing possible damage to the device and possible injury to any persons in its close proximity.

1. Using the MCPA mounting brackets as a template, drill 4 holes in the wall.
2. Install 4 screws into the holes, leaving about 1/8 inch gap between the wall and the screw heads.
3. Attach the MCPA's mounting brackets to the screws.

### Mounting the MCPA on the Rear of the COMPAC Outdoor Micro Floor Mount

1. Assemble the floor mount bracket as given in [Floor Mounting](#).
2. Install 4 screws into the floor mount holes, leaving about 1/8 inch gap between the mount and the screw heads.
3. Attach the MCPA's four mounting brackets to the screws as shown in (1) below.
4. Attach four screws to the four mounting brackets as shown in (2) below to secure the MCPA to the mount.

**1: Attaching the MCPA to the screws**



**2: Attaching the Second Screw to the Mounting Bracket**



## Making the Power Cable

The power cable connector is included with the Outdoor Micro. The power cable must be made by the device installer or system operator.

Figure 9 shows one of the provided power connectors that will be provided by Star Solutions based on if the unit is AC or DC powered.

**Figure 9: AC and DC Power Connectors**

**AC and DC Power Connectors: Side View**



**Making AC and DC Power Connectors: From Left to Right**



## Making the AC power cable


1. Make sure the power cable is the correct:
  - Length
  - Gauge
2. Strip the ends of the cable wires.



**Note:** The stripped portion of the wire should not be more than 4mm (0.25 inch) in length.

3. Loosen the clip on the cable clamp with a small flathead screwdriver.
4. Feed the cable through the connector body and then through the cable clamp.
5. Loosen the crimp contact screws on crimp contacts 1, 2, and 4.
6. Insert the wires into the crimp contacts and tighten the crimp contact screws. See Table 11 for the proper connections.

**Table 11: AC Power Connector Pin Description****AC Power Connector Inside View****AC Power Connector Pin Out**

Contact Label	Connection
1	Line 1 Live
2	Neutral
3	No Connection
	Ground

7. Snap the cable clamp onto the connector end and tighten the clip.
8. Screw the connector body onto the connector head.

**Making the DC Power Cable**


1. Feed the cable through the:
  - Connector end
  - First rubber washer
  - Connector body
  - Second washer

As shown left to right in Figure 9.

2. Solder the wires on to the gold plated pins contacts 1, 2, and 3. See Table 12 for the proper connections.



**Table 12: DC Power Connector Pin Description****DC Power Connector Inside View****DC Power Connector Pin Out**

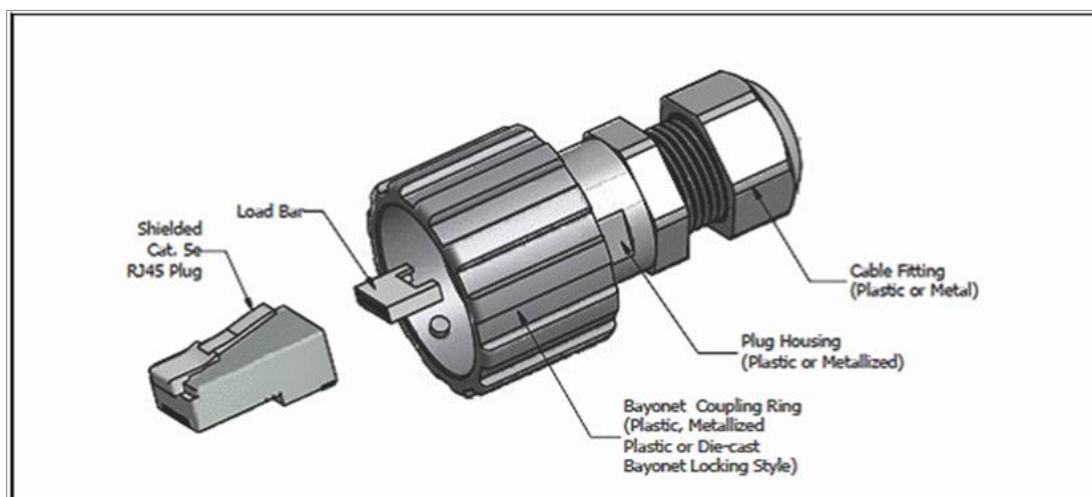
Contact Label	Connection
1	-48 VDC
2	-48 VDC Return
	Ground

3. Pull the cable through the connector body to ensure no slack.
4. Tighten the cable into the connector body to the connector head.
5. Screw the connector body onto the connector end.

**Assembling the Ethernet Cable**

A plastic waterproof RJ45 plug kit for the Ethernet cable is included with the Outdoor Micro. The Ethernet cable must be assembled by the device installer or system operator using this plug kit.

Figure 10 and Figure 11 show the RJ-45 Plug Kit

**Figure 10: RJ-45 Plug Components**

**Figure 11: RJ-45 Plug Assembly**

RJ-45 Plug



RJ-45 Plug Assembly

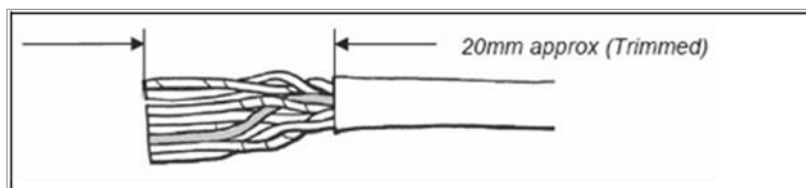
**To assemble the RJ45 plug kit:**

1. Insert the Ethernet cable into the RJ45 plug housing assembly.
2. Strip the Ethernet cable jacket to approximately 25mm (1 inch).

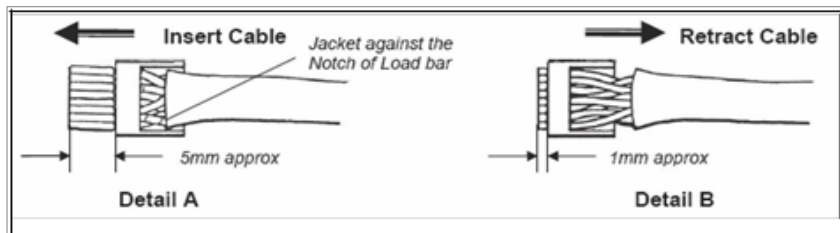
Ensure the conductor pair is untwisted and aligned side-by-side according to EIA/TIA T568A or T568B.

3. Trim the conductor tips.

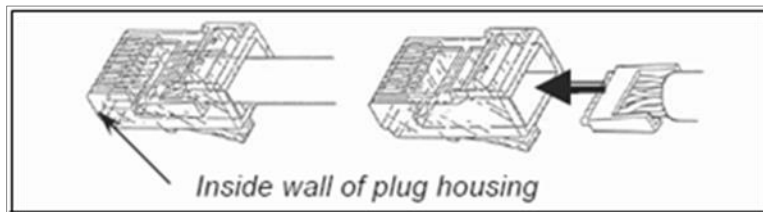
Do not remove the insulation from the individual conductors as shown in the drawing below.



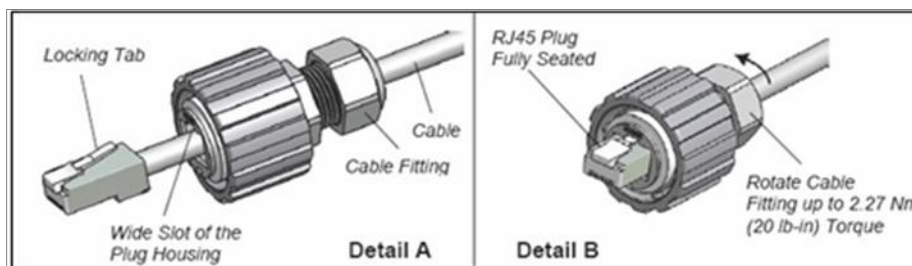
4. Insert the wires into the appropriate positions of the load bar and slide the cable to a point where the cable jacket hits the notch of the load bar.
5. Trim the remaining wire ends to approximately 5mm as shown in Detail A of the drawing below.



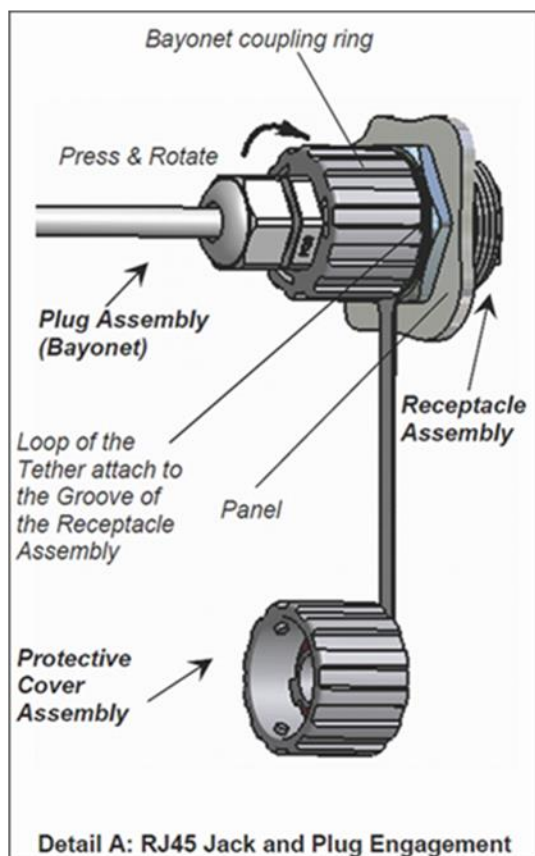
6. Retract the cable, leaving about 1mm length of wire tips as shown in Detail B of the drawing above.
7. Insert the wired load bar into the RJ45 plug until the wire tips are seated against the inside wall of the plug housing as shown in the drawing below.



8. Terminate the cable and RJ45 plug with a termination tool such as the CONEC 8P8C modular plug termination tool.
9. Depress the locking tab of the RJ45 plug and align it with the wide slot of the plug housing as shown in Detail A of the drawing below.



10. Gently pull the cable until the plug is fully seated.
11. Hold the plug in position and rotate the cable fitting until tightened to a torque of 2.27 Nm (20 lb-in). See Detail B of the drawing above.
12. To engage the RJ45 jack plug with the receptacle on the COMPAC Outdoor Micro.
13. Align the 3 protrusion keys of the assembled plug / plug housing coupling with the 3 bayonet channels of the receptacle as shown in the drawing below.



14. Press the coupling ring and rotate until the 3 keys click into the bayonet channels.

# 4.

# INTERFACE CONNECTIONS

---

## About this chapter

This chapter covers

- [Grounding](#)
- [RF Connections](#)
- [Ethernet Connections](#)
- [GPS Antenna Connection](#)
- [Power Connection](#)
- [Reset Button](#)
- [Status LED](#)
- [MCPA Interface Connections](#)



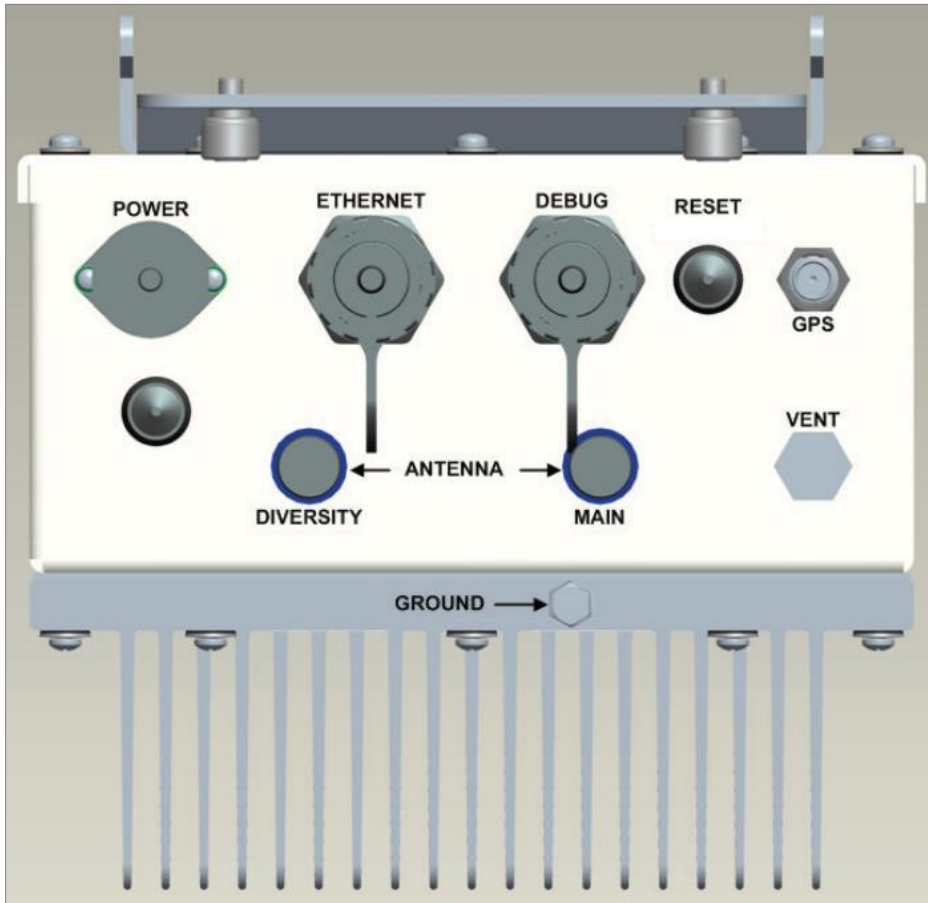
**Note:** Prior to beginning, verify that the external AC power cable is disconnected.



**Note:** All connectors that are not connected must be terminated. The shielding of all coaxial connections must be grounded.

Figure 12 shows the Outdoor Micro’s connection interface

**Figure 12: Outdoor Micro Connection Interface**



**Table 13: Outdoor Micro Interface Connections**

Connection	Type	Notes
Power	20-14 AWG	Power Switch
Ethernet	RJ-45	ETH transmission connection
Debug	RJ-45	Debug port
GPS	TNC	Connection from the GPS antenna
Main Antenna	Type N	Main antenna connection (TX/RX)
Diversity Antenna	Not Used	-----

---

## Grounding

The Outdoor Micro is grounded using the ground nut on the bottom of the unit. See Figure 12.

### To ground the Outdoor Micro:

1. Loosen the ground nut on the Outdoor Micro.
2. Connect the ground wire to the ground nut and tighten the nut.



**Warning:** The ground wire should connect to a ground rod or other grounding source and should be independent of the power cable ground.

---

## RF Connections

The Radio Frequency (RF) cables connect from the Main system antenna to the Main type N antenna connector on the bottom of the Outdoor Micro. See Figure 12.

The network operator is responsible for mounting and providing lightning protection for the antennas.



**Caution:** To avoid possible damage to the RF Connectors, do not exceed 4 in-lbs of torque.

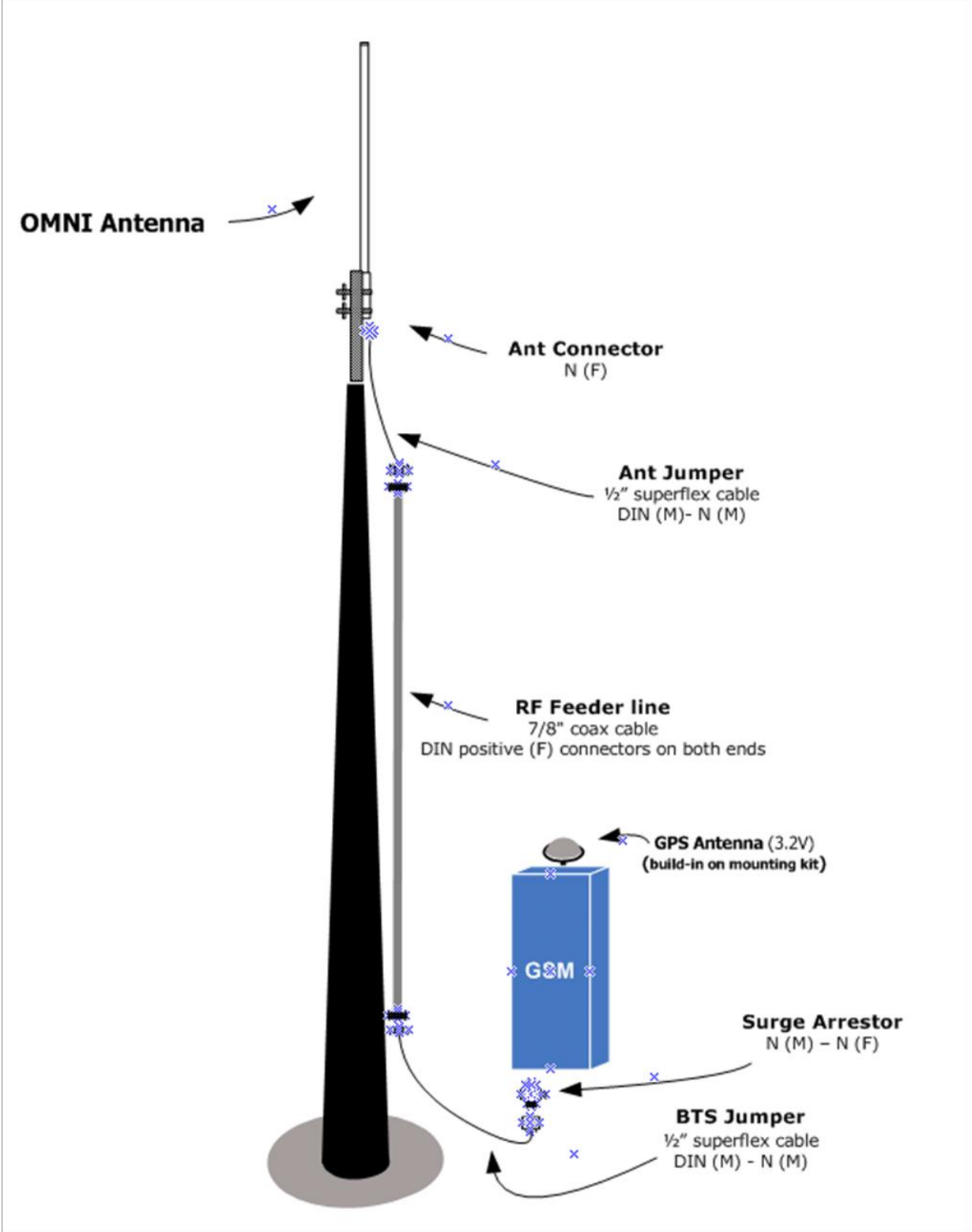
### To connect the RF cables:

1. Make sure that the power cable is disconnected.
2. Connect the surge arrestor to the main antenna connection prior to the antenna cable as shown in Figure 13.
3. Connect the main antenna cable to the other end of main surge arrestor.
4. Screw the male type N connector of the main antenna cable into the female type N connector on the connection interface. The connection should be tightened by hand or, if necessary, pliers or a torque wrench can be used.



**Caution:** Weatherproofing material must be installed on the antenna connection to ensure that the connection is sealed.

Figure 13: RF Antenna Cable Connection Drawing





## Ethernet Connections

This section includes:

- [Ethernet Connection](#)
- [Debug Connection](#)

Debug and Ethernet cables must be fitted with the Ethernet cable end connectors provided in the connector kit.

### Ethernet Connection

The Ethernet port is used to connect the Outdoor Micro to the network. See Figure 12.

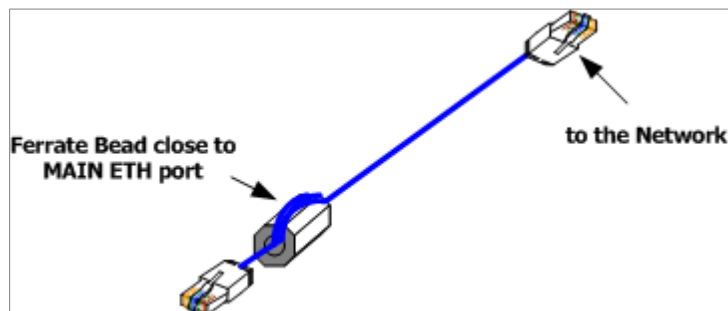


**Note:** Use the Ferrite Bead on the ETH cable when connecting the Outdoor Micro to the network.

#### To connect to the Ethernet port:

1. Remove the termination cap from the Ethernet port.
2. Loop the Ethernet cable around Ferrite Bead, close to one of the plugs, two or three times as shown in Figure 14.

**Figure 14 Ferrite Bead Installation On The Outdoor Micro ETH Cable**



3. Connect the Ethernet cable to the Ethernet port.

## Debug Connection

The Debug port is used for on-site troubleshooting and configuration of the Outdoor Micro. See Figure 12.



**Note:** Use the Ferrite Bead on the ETH cable when connecting the Outdoor Micro to the network.

### To connect to the debug Ethernet port:

1. Remove the termination cap from the Debug port.
2. Loop the Ethernet cable around Ferrite Bead, close to one of the plugs, two or three times as shown in Figure 14.
3. Connect the debug cable to the Debug port.
4. When troubleshooting and configuration is complete, remove the debug cable and replace the termination cap on the Debug port.



**Note:** The Debug port should only be used to debug the Outdoor Micro. If any other connections must be made to the Debug port, contact [Technical Support](#).



**Caution:** Unsupported connections to the Debug port can cause the Outdoor Micro to malfunction, resulting in the potential loss of data.

---

## GPS Antenna Connection

The GPS antenna provided comes with a 1.2m long RG174 Cable. If a longer cable is used, calculations must be done to ensure that the cable length complies with the signal amplification provided by the antenna.

The GPS antenna is connected by screwing the TNC connector onto the TNC port. See Figure 12.



**Note:** Weatherproofing material must be installed on the GPS antenna connection to ensure that the connection is sealed.

## Power Connection

The Outdoor Micro has no power switch. It is on whenever it is connected to a power source.

A breaker switch must be installed between the power source and the Outdoor Micro. The selection and installation of the breaker is the responsibility of the installer or network operator.



**Caution:** Power connections must be performed by qualified personnel only.

### To connect power to the Outdoor Micro:

1. Ensure the breaker switch is installed and turned off.
2. Remove the termination cap from the Power port.
3. Connect the power cable to the power port and tighten the connector cap.

The Outdoor Micro can then be powered on by turning on the breaker.

## Reset Button

The reset button is used to reset the Outdoor Micro by pushing it down for one second.



**Warning:** The reset button should not be pressed during power up. Doing so can cause the Outdoor Micro to malfunction, resulting in the potential loss of data.

## Status LED

The Outdoor Micro has a single external status LED that displays the state of the unit. This allows for the user to determine the state of the system before other communication methods, such as an IP connection, have been established.

Table 14 lists the relationship between the LED behavior and the system status.

**Table 14: Status LED Behaviours**

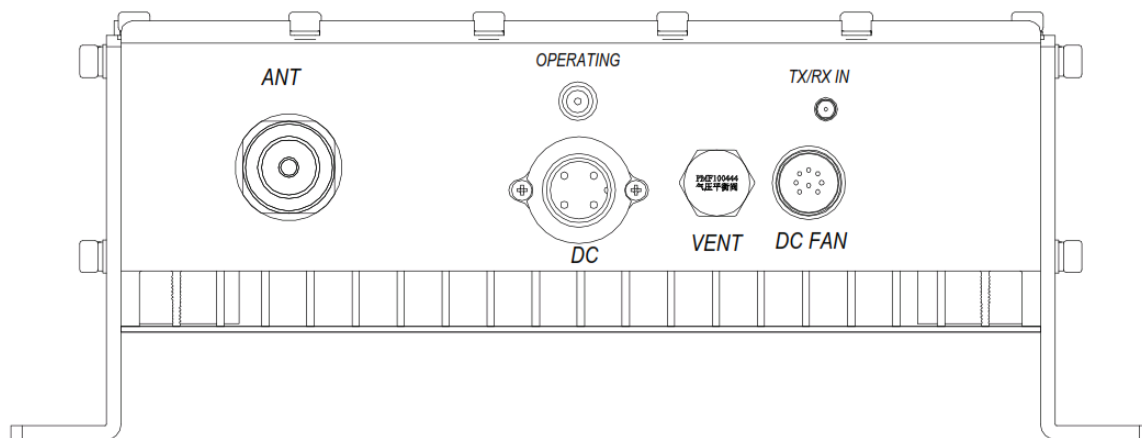
LED Behavior	System State	Service Provided
Off	Not powered.	No
Solid Red	Preprovisioned—Indicates connectivity to the core network and the Outdoor Micro is to be provisioned. Contact Managed Services.	No
Slow Flashing Red	The Outdoor Micro's VPN connection is not up. The LED alternates between Off and Red every second.	No
Fast Flashing Red	The Outdoor Micro has no backhaul (no IP on the Ethernet connection). The LED alternates between Off and Red four times a second.	No
Solid Orange	The Outdoor Micro encountered an error contacting or working with ConfigCenter.	No
Slow Flashing Between Orange and Red	The Outdoor Micro's GPS has no lock. The LED alternates between Orange and Red every second.	No

Fast Flashing Between Orange and Red	The Outdoor Micro's Auxiliary Interface is down (CDMA or second TRX, depending on hardware options). The LED alternates between Orange and Red four times a second.	No
Solid Green	All waveforms are functioning. Primary GSM TRX, or primary GSM TRX and CDMA (depending on the hardware options).	Yes
Slow Flashing Green	Indicates the Outdoor Micro waveforms are initializing. It is trying to connect to ConfigCenter, performing a firmware update, or snapshot activation. The LED alternates between Off and Green every second.	Yes
Fast Flashing Green	One or more waveforms or TRX are not functioning. The LED alternates between Off and Green four times a second.	Yes

### MCPA Interface Connections

The MCPA's connectors are located on the bottom of the unit and are shown in Figure 15.

**Figure 15: MCPA Connection Interface**

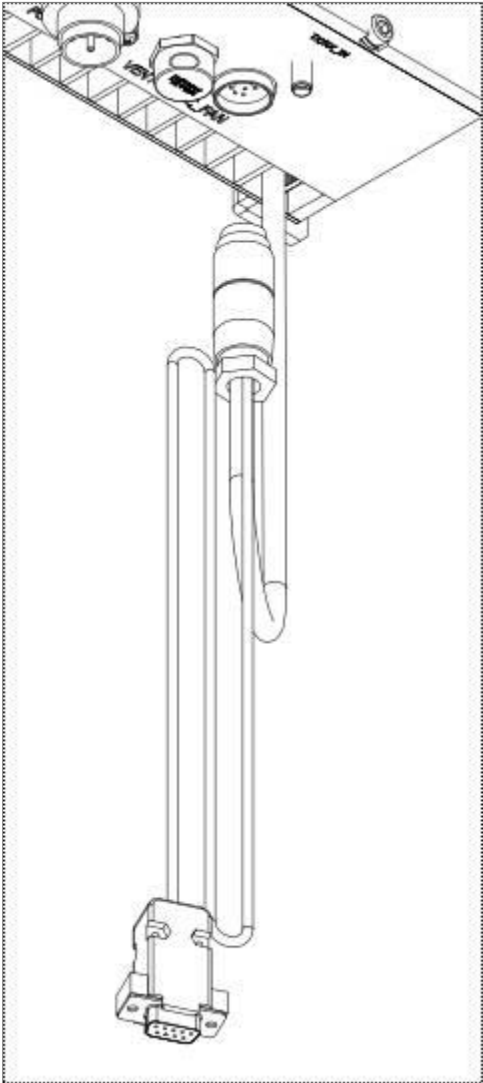


**Table 15: MCPA Connection Interface Description**

Connection	Type	Notes
ANT	DIN Female	RF Antenna connection (TX/RX)
DC	DC Connector	48VDC Power connector (see <a href="#">MCPA Power connector wiring</a> )
DC_FAN		Power to fans
OPERATING	LED	Green: PA operational Red: PA with alarm ; interrupted operation
TX/RX_IN	SMA Female	RF input from COMPAC Micro
Serial connector	DIN-9	RS-232 alarm interface (see Figure 16)

The serial connector is attached as shown in Figure 16.

**Figure 16 MCPA Serial Connector Attachment**



**MCPA Power connector wiring:**

- **Black wire:** DC 0V (-48V Return)
- **White wire:** DC -48V

## 5. OUTDOOR MICRO IP CONFIGURATION

### About this Chapter

This chapter provides the information needed to initially configure the Outdoor Micro. It includes:

- [Outdoor Micro IP Configuration Procedure](#)
- [Password Management Policy](#)

The Outdoor Micro comes factory-equipped with fixed default parameters. This chapter covers how to change to addresses that are routable on the operator network.

Table 16 lists the factory-equipped default settings for the Outdoor Micro.

**Table 16: Outdoor Micro Default Factory IP Settings**

Setting	Value
BTS IP Address	169.254.250.111
Net Mask	XXX.XXX.XXX.XXX
Boothost IP	XXX.XXX.XXX.XXX

### Outdoor Micro IP Configuration Procedure

This section includes:

- [Performing a Default Ping Test](#)
- [Changing the Outdoor Micro IP Configuration](#)

#### Performing a Default Ping Test

Before beginning the configuration process, ping each of the network elements in the Outdoor Micro.

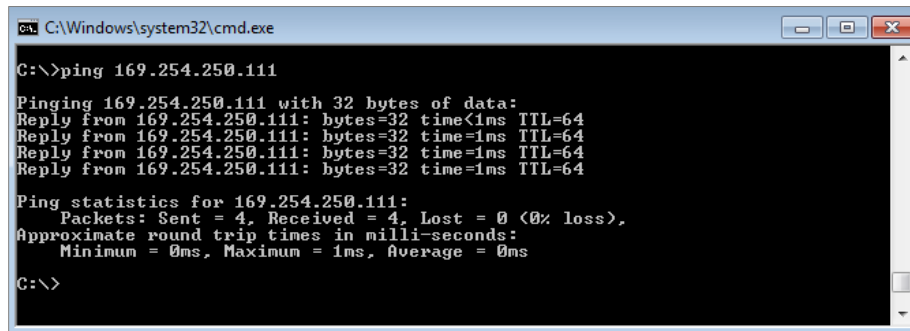


**Note:** The workstation used to configure the Outdoor Micro must be able to reach the 169.254.250.x network. For individual workstation IP configuration procedures, see the workstation operating system documentation.

#### To perform a ping test:

1. From the workstation, launch a command line interface.
2. Ping the BTS by entering: **ping 169.254.250.111**

A successful ping test appears as shown in Figure 17.

**Figure 17: Successful Ping Test**


```

C:\Windows\system32\cmd.exe

C:\>ping 169.254.250.111

Pinging 169.254.250.111 with 32 bytes of data:
Reply from 169.254.250.111: bytes=32 time<1ms TTL=64
Reply from 169.254.250.111: bytes=32 time=1ms TTL=64
Reply from 169.254.250.111: bytes=32 time=1ms TTL=64
Reply from 169.254.250.111: bytes=32 time=1ms TTL=64

Ping statistics for 169.254.250.111:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>

```

3. If the ping test was:
  - **Unsuccessful:** resolve any connectivity problems and perform the ping test again until it is successful.
  - **Successful:** go to [Changing the Outdoor Micro IP Configuration](#).

### Changing the Outdoor Micro IP Configuration

The default factory settings are changed from the Control Page, a Graphical User Interface (GUI) that configures the Outdoor Micro from workstations sharing a local network connection. It is shown in Figure 18.

**Figure 18: Outdoor Micro Control Page**

**[IBS2 Cell \(SSI-ibs-00d0cc08154d\)](#)**

**Control**

Serial Number:	NTQ0114430
Ethernet Address:	00:d0:cc:08:15:4d
Release Version:	Development
Firmware Build:	VanuIBS2-2.13.1.0 (2015-03-30T22:34:45Z)
System Uptime:	63853 seconds
System Time:	2015-04-07 10:12:40 +0000
Session:	<input type="button" value="Logout"/>

- View system log: [last 25 lines](#); [last 50 lines](#); [last 100 lines](#); [full log](#)
- Download compressed system log: [syslog.gz](#)
- [List Crash Reports](#)
- [Network Configuration](#)
- [VPN Configuration Options](#)
- [RF Clock Calibration](#)
- VSWR Measurement Not Supported
- [Change Password](#)
- [Firmware Update](#)
- [Reset Options](#)



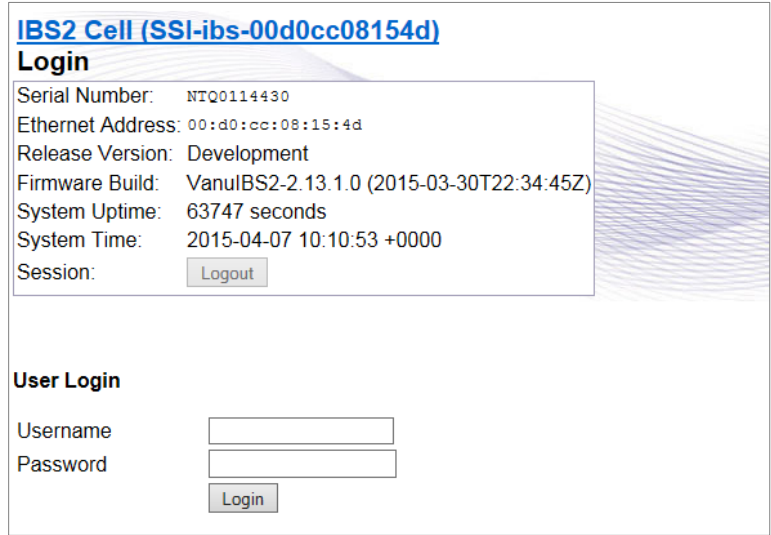
**Note:** The Control Page is compatible only with the Internet Explorer browser.

### To change the Outdoor Micro IP Configuration:

1. Open a web browser.
2. In the web browser’s address bar, enter the BTS IP Address: **192.254.250.111**

The log in page appears as shown in Figure 19.

**Figure 19: Log In Page**



3. Login as <default username><default password>.

**Note:** If you are logging into the Outdoor Micro for the first time the default:



- Username is **admin**
- Password is **admin**

See [Password Management Policy](#) for more information on passwords.

After the very first log into a unit, the screen shown in Figure 20 appears to prompt you to change the password to one of your choosing. Also see [Password Management Policy](#).



**Figure 20: Change Password Screen**

Serial Number: NTQ0114430  
 Ethernet Address: 00:d0:cc:08:15:4d  
 Release Version: 3.13.1  
 Firmware Build: VanuBS2-2.13.1.0 (2015-03-03T09:19:15Z)  
 System Uptime: 1779 seconds  
 System Time: 1970-01-01 00:29:38 +0000  
 Session:

Error: admin has default password

Change user password and password policy.

The Restrictive password policy requires a password of at least 8 characters containing at least one each of: uppercase, lowercase, numeric, and special characters.

Username: **admin**

Password Policy:  Restrictive  Permissive

Current Password:

New Password:

Confirm Password:

After changing the password, the control page reappears as shown in Figure 21.

**Figure 21: Control Page**

**IBS2 Cell (SSI-ibs-00d0cc08154d)**

**Control**

Serial Number: NTQ0114430  
 Ethernet Address: 00:d0:cc:08:15:4d  
 Release Version: Development  
 Firmware Build: VanuBS2-2.13.1.0 (2015-03-30T22:34:45Z)  
 System Uptime: 63853 seconds  
 System Time: 2015-04-07 10:12:40 +0000  
 Session:

- View system log: [last 25 lines](#); [last 50 lines](#); [last 100 lines](#); [full log](#)
- Download compressed system log: [syslog.gz](#)
- [List Crash Reports](#)
- [Network Configuration](#)
- [VPN Configuration Options](#)
- [RF Clock Calibration](#)
- VSWR Measurement Not Supported
- [Change Password](#)
- [Firmware Update](#)
- [Reset Options](#)

4. On the control page, click **Network Configuration**.

The Network Configuration page appears as shown in Figure 22.

**Figure 22: Network Configuration Page**

**IBS2 Cell (SSI-ibs-00d0cc08154d)**  
**Network Configuration**

Serial Number: NTQ0114430  
 Ethernet Address: 00:d0:cc:08:15:4d  
 Release Version: Development  
 Firmware Build: VanulBS2-2.13.1.0 (2015-03-30T22:34:45Z)  
 System Uptime: 63787 seconds  
 System Time: 2015-04-07 10:11:33 +0000  
 Session:

Test IP Address:

---

Hostname:   
 Local Timezone:    
 Use DHCP:   
 IP Address/Prefix:   
 Gateway IP Address:   
 ConfigCenter IP Address:   
 NTP Server IP Address:   
 Default Timeservers: pool.ntp.org

5. Enter the following information into the control page fields:

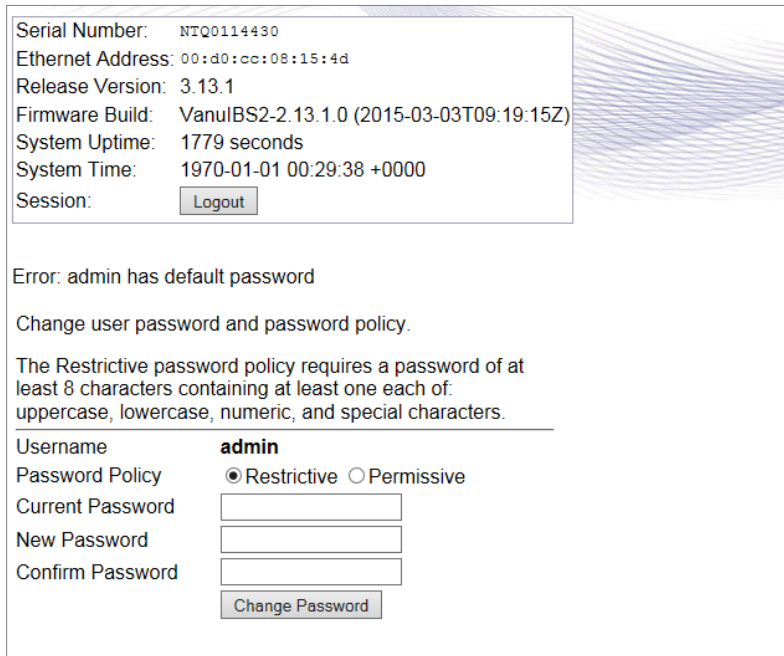
Field	Description
Host Name	The host name
Local Time Zone	From the drop down list, select the local time zone
Use DHCP	Select disable DHCP
IP Address/Prefix	The unit's IP address and prefix
Gateway IP Address	The gateway IP address
ConfigCenter IP Address	The ConfigCenter IP address

6. Click **Apply Changes**.
7. Disconnect the installer laptop from the Outdoor Micro.

## Password Management Policy

The change password screen is shown in Figure 23. You can access it at any time from the main screen (Figure 18) by clicking **Change Password**.

**Figure 23: Change Password Screen**



Serial Number: NTQ0114430  
 Ethernet Address: 00:d0:cc:08:15:4d  
 Release Version: 3.13.1  
 Firmware Build: VanulBS2-2.13.1.0 (2015-03-03T09:19:15Z)  
 System Uptime: 1779 seconds  
 System Time: 1970-01-01 00:29:38 +0000  
 Session:

Error: admin has default password

Change user password and password policy.

The Restrictive password policy requires a password of at least 8 characters containing at least one each of: uppercase, lowercase, numeric, and special characters.

---

Username **admin**

Password Policy  Restrictive  Permissive

Current Password

New Password

Confirm Password

The following list provides the password requirements. The password must contain the following:

- Upper case character (A, B, C, D, etc.)
- Lower case character (a, b, c, d, etc.)
- Special character (&, %, #, !, etc.)
- Numerical character (1, 2, 3, 4, etc.)
- At least eight characters long

For example, Star@123 is a valid password.

### Notes:



- The account locks out for 60 minutes when you enter the wrong password 5 consecutive times.
- The last five passwords may not be reused. The password history is enforced.

# A

# REGULATORY NOTICES

## RF Maximum Permissible Exposure (MPE) Exhibit Requirements

FCC Part 1, Section 1.1307 states the following:

- Part 22 Subpart H devices are excluded from routine environmental evaluation when the operating total power level of all channels is less than 1640 Watts EIRP.
- Part 24 Subpart E (Broadband PCS) devices are excluded from routine environmental evaluation when the operating total power level of all channels is less than 3280Watts EIRP.

No antenna is supplied with this unit. The installer must not exceed the antenna gain limitations related to total power requirements in order to be excluded from routine environmental evaluation.

To comply with the Maximum Permissible Exposure (MPE) requirements for general population that are specified under FCC Part 1 - Section 1.1310 - Table 1, the maximum power density resulting from the composite Effective Isotropic Radiated Power (EIRP) from the antenna connected to this equipment must be limited to the maximum permissible exposure as stated below:

- **Power density limit for Band Class 0** =  $f/1500 = 0.58 \text{ mW/cm}^2$
- **Power density limit for Band Class 1** =  $1 \text{ mW/cm}^2$

This value can be achieved by multiple combinations of RF output, antenna gain, and distance from the antenna when energized.

The minimum safe distances from a radiating structure in order to be excluded from routine environmental evaluation are:

- **For Band Class 0** (TX: 869–894 MHz RX: 824–849 MHz)  $d$  (safe distance) = 4.7 m
- **For Band Class 1** (TX: 1930 1990 MHz RX: 1850 1910 MHz)  $d$  (safe distance) = 5.1 m

The MPE is expressed as follows:

- **Power Density Pd (mW/cm<sup>2</sup>)** =  $\text{EIRP}/[4*\text{Pi}*d^2]$

Where

- **d** = distance from the antenna expressed in cm.
- **EIRP expressed in mW** =  $10[\text{TX Power (dBm)} + \text{Ant Gain(dBi)}]/10$
- **TX Power (dBm)** =  $10*\log[\text{Tx Power (mW)}]$

As an example with the transmitter running at 5 watts output into an antenna with a gain of 10 dBi, the minimum safe distance from the antenna to ensure exposure would be:

63 cm to remain below 1 mW/cm<sup>2</sup> for the 1900 PCS band, and

83 cm to remain below 0.58 mW/cm<sup>2</sup> for the 800 Cellular band.

When installing the antenna, the above relationship should be used to ensure the combination of power, antenna gain, and distance is such that the maximum permissible power density is not exceeded. Different combinations of output power and antenna gain will result in different minimum safe distances.



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