



# **E1000 Series LTE Base Station**

## **Safety and Installation Instructions**

# Acelleran E1000 Series Safety and Installation Instructions

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## Introduction

This document contains safety and installation instructions for the Accelleran E1000 Series LTE Base Station (eNodeB), shown in Figure 1.



*Figure 1 - E1000 Series LTE Base Station*

The E1000 series includes several different models, each designed for use on a different frequency band or set of bands. For example, model E1010 operates on LTE band 42, E1011 operates on LTE band 43, E1012 operates on LTE band 48. In the rest of this document, the name E10xx is used to mean any model in the E1000 series.

The remainder of this document applies to all E1000 series models, except that in the Technical Description section there is a sub-section for each individual model giving its frequency bands and maximum transmit power.

Detailed guidance on configuring the E10xx and monitoring its status and performance can be found in documentation available separately from Accelleran.

# Alcatel-Lucent E1000 Series Safety and Installation Instructions

## Intended Use

The product is intended for use as a base station (eNodeB) in an LTE network. It is designed to be installed outdoors but may also be installed indoors. It is not to be sold to, installed by or operated by the general public.

## Safety

### General

The product must only be used for its intended purpose.

The product and antennas must be installed, serviced and replaced only by trained and qualified personnel who are familiar with safe working practices, local building and safety codes and, where applicable, are licensed by the appropriate regulatory authorities.

The product must be securely fixed to a suitable structure such as a wall, a building or a tower designed for the purpose. If a mounting pole is used, it must be securely fixed to the building or tower before the product is fixed to it.

The product must be fixed in position using fixings that can safely bear the weight of the product (including antennas if connected directly to the product).

The product must be installed in a position where there is minimal risk of a person accidentally colliding with it or its antennas.

LTE antennas must be installed in a position such that the distance from them to any person will always be at least 20 cm while the product is transmitting.

The product must be securely fixed in position before power is applied.

If installed outdoors, the product must be protected against lightning strike by connecting it to earth using a suitable conductor.

Since E1012/CBRS is a Category A device the product can only be installed outdoors below 6m height AGL or indoors.

The supplied Power over Ethernet Plus (PoE+) injector must be installed in an indoor environment or in a weather-proof enclosure.

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## Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**FCC Caution:** Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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

### IMPORTANT NOTE:

#### **FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

# **Accelleran E1000 Series Safety and Installation Instructions**

## **Professional installation instruction**

The product will be distributed through controlled distribution channel and installed by trained professional and will not be sold directly to the general public through retail store.

### **1. Installation personnel**

This product is designed for specific application and needs to be installed by qualified personnel who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

### **2. Installation location**

The product shall be installed at a location where the radiating antenna can be kept 20 cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

### **3. External antenna**

Use only the antennas which have been approved by Gemtek, Accelleran. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC limit and is prohibited.

### **4. Installation procedure**

Please refer to guidelines below for the detail.

### **5. Warning**

Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in relevant rules. The violation of the rule could lead to serious federal penalty.

# **Arellan E1000 Series Safety and Installation Instructions**

## **Power Supply**

The product must be powered using a PoE+ injector conforming to the Type 2 PSE defined in IEEE 802.3at, such as that supplied with the product.

The PoE+ injector must be connected to the product using Cat 5e or better cabling.

The supplied PoE+ injector requires an input voltage of 100-240 VAC at 50-60 Hz, and draws a current of up to 0.8 A.

## **Radio Spectrum**

The product must only be operated as authorized by the national regulatory authority for radio spectrum in the country in which it is installed

## Technical Specification

### All E1000 Series Models

The Accelleran E10xx is an outdoor, LTE, single cell, single carrier, base station (eNodeB) with the following main features:

- 3GPP Local Area Base Station class
- LTE radio conforms to 3GPP Release 11 specification
- S1 and Uu interfaces conform to 3GPP Release 9 specifications
- Channel bandwidths: 5, 10, 15, 20 MHz
- 2x2 MIMO
- Integrated GNSS system (GPS/GLONASS/BDS) for frequency and timing synchronisation
- GNSS receive frequency: GPS: 1575.42MHz / GLONASS: 1605.375MHz / BDS: 1561.098MHz
- IP67
- 2 x Type N female LTE antenna connector
- 1 x RJ45 Ethernet/PoE+ socket
- 1 x Type N female GNSS antenna connector
- Power supply: Power over Ethernet Plus (56 VDC, 0.536 A)
- LED indicators: Power, User, LTE, Network, Sync
- Weight: ~2.8 kg
- Operating temperature: -40 °C to +50 °C
- Storage temperature: -40 °C to +70 °C
- Operating humidity: 10 to 85 %
- Storage humidity: 5 to 90 %

### Model E1010

- Operating band: LTE TDD Band 42 (3400 to 3600 MHz)
- Maximum transmit power: 250 mW (24 dBm) per antenna connector

### Model E1011

- Operating band: LTE TDD Band 43 (3600 to 3800 MHz)
- Maximum transmit power: 200 mW (23 dBm) per antenna connector

### Model E1012

- Operating band: LTE TDD Band 48/CBRS (3550 to 3700 MHz)
- Maximum EIRP with supplied antenna:
  - 10 MHz: 0.804 Watt (29.05 dBm)
  - 20 MHz: 1.563 Watt (31.94 dBm)



## Technical Description

### End to End Connectivity

The overall end to end connectivity is shown in Figure 2. The EPC, OAM, optional SAS, gateways and backhaul may be supplied by the customer – details vary according to customer requirements.

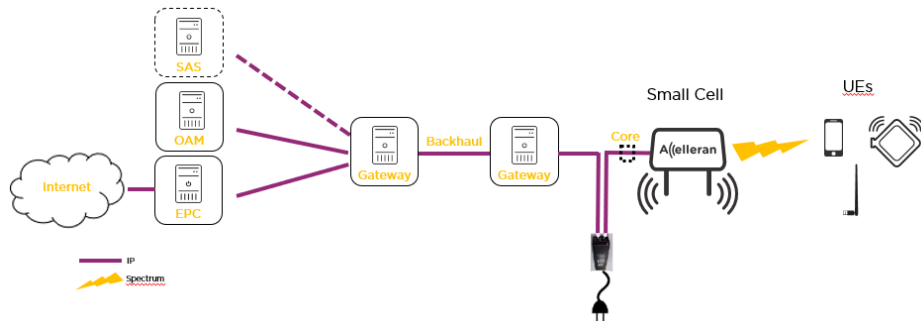


Figure 2: End to end connectivity

### External Ports

The E10xx has two LTE antenna ports, an Ethernet/PoE+ port (as shown in Figure 3) and a GNSS antenna port (as shown in Figure 4).

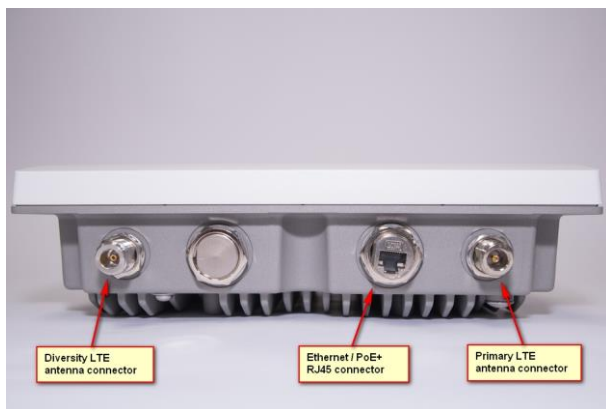


Figure 3: LTE antenna ports and Ethernet/PoE+ port

The LTE antenna ports on the E10xx are fitted with 50-ohm Type N female

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connectors. Depending on the antenna type chosen, the LTE antennas can be screwed directly onto the connectors (via a Type N male to N male connector if the antenna has a Type N female connector) or can be connected via coaxial cable fitted with a Type N male connector.

Ethernet connectivity and 56 VDC power supply is achieved through the RJ45 Ethernet/PoE+ port.

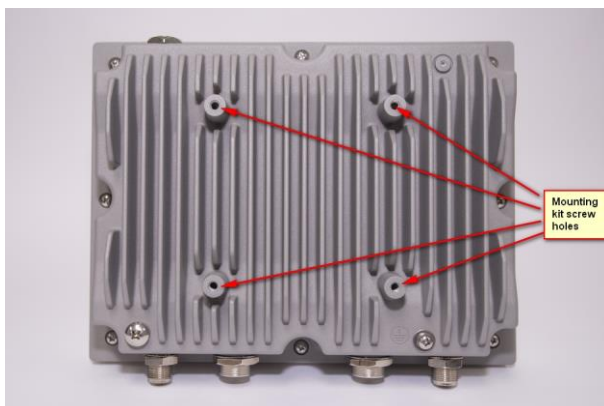


Figure 4: GNSS antenna port

The GNSS antenna port is fitted with a 50-ohm Type N female connector.

## Mounting Points

The mounting kit screw holes are located on the rear of the E10xx as shown in Figure 5. The centres are on a 100 mm x 100 mm grid, threads are M5 (coarse pitch) depth 12.5 mm.



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## Lightning protection earthing point

The lightning protection earthing point is located on the back of the E10xx as shown in Figure 6.



Figure 6 - Lightning protection earthing point

## LTE Antennas

LTE antennas are not included with the E1010 or E1011 products. Customers may use any omni-directional antenna that meets the following specification:

- gain in the operational frequency range  $\leq 5.3$  dBi
- VSWR  $\leq 1.5$
- Impedance: 50  $\Omega$

LTE antennas may be included with the E1012/CBRS product. The included omni-directional antenna meets the following specification:

- gain in the operational frequency range  $\leq 6$  dBi
- VSWR  $\leq 1.5$
- Impedance: 50  $\Omega$

Customers wishing to use antennas outside this specification should contact Accelleran.

## Accessories

The E10xx is supplied with the following accessories (shown in Figure 7) which are necessary for its installation and operation:

- GNSS antenna with 1.5 m cable and Type N male connector
- Power over Ethernet Plus (PoE+) injector

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- Mains cable for PoE+ injector
- Ethernet cable (1.5 m) for connecting the PoE+ injector to the backhaul equipment
- IP67 seal for RJ45 connector, with manufacturer's instructions



*Figure 7 - Supplied accessories*

Note: The precise make and model of GNSS antenna and PoE+ injector, and the type of mains plug supplied may vary from those shown in Figure 7.

Note2: E1012/CBRS includes also a clamp core for EMI suppression.

## Installation

The E10xx is designed to be installed outdoors but may also be installed indoors. A pole mounting kit is supplied. If the E10xx is to be fixed to an interior wall, an off the shelf VESA MIS-D 100 mounting bracket or similar may be used (not supplied).

### Installing the E10xx on a mounting pole

The E10xx should be mounted with the GNSS antenna connector at the top.

A standard kit is included for mounting the E10xx onto a pole. The components of the mounting kit are shown in Figure 8.

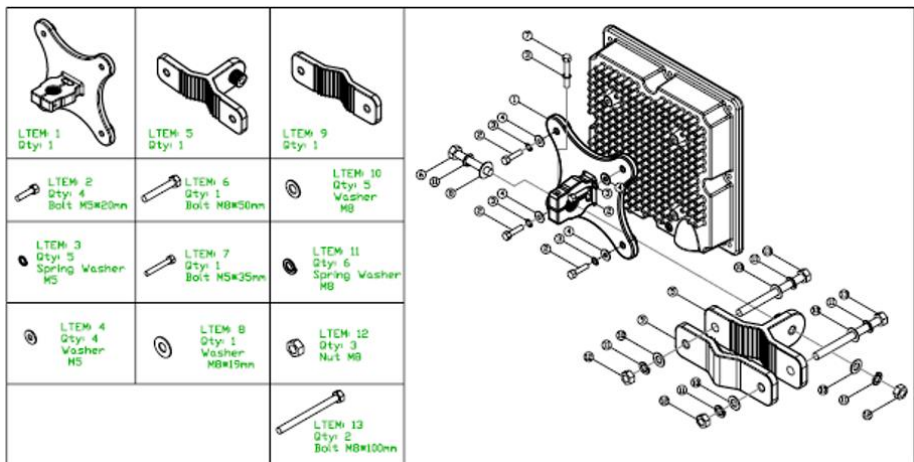


Figure 8: Components of the supplied mounting kit

The mounting procedure is shown in Figure 9.

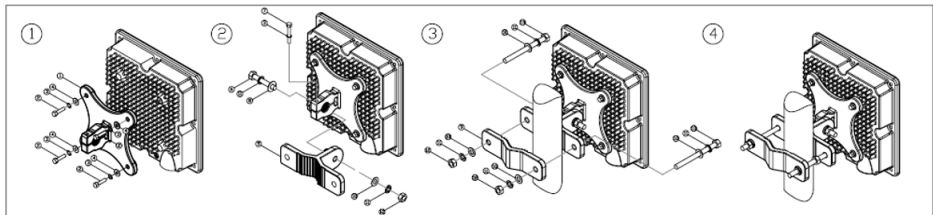


Figure 9: Mounting procedure

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The E10xx with the mounting kit attached is shown in Figure 10.

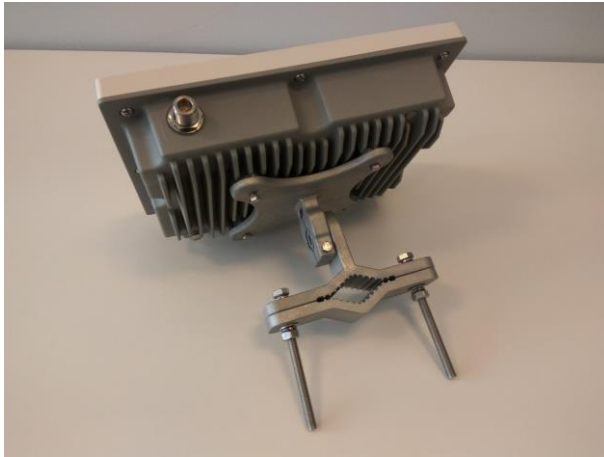


Figure 10: E10xx with mounting kit

## Grounding the E10xx

Once the E10xx has been installed in its final position, it must be properly grounded using a conductor of at least 6 mm<sup>2</sup> cross section (10 AWG) in order to protect it from lightning damage.



- 1** Insert the wire in the channel
- 2** Crimp the tabs around the wire

Figure 11: Earth connection

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1. Connect a ground lug (not supplied) to one end of the grounding conductor (not supplied) as shown in Figure 11.
2. Remove the grounding screw of the E10xx (see Figure 11). Insert the screw through the grounding lug and screw it back firmly into the E10xx.
3. Connect the other end of the grounding conductor to earth. If there is no suitable earth point already in place, use a grounding rod as shown in Figure 12.
  - a. Place a grounding rod (not supplied) to allow for the shortest possible path from the rod to the E10xx.
  - b. Drive the grounding rod into the ground to a depth of at least 20 cm below the surface.
  - c. Attach a grounding clamp (not supplied) to the grounding rod. You will use this clamp to attach the grounding cable.
  - d. Attach the grounding conductor to the clamp on the grounding rod.
  - e. Secure the grounding cable to a rigid structure using appropriate fixings at intervals along its length.

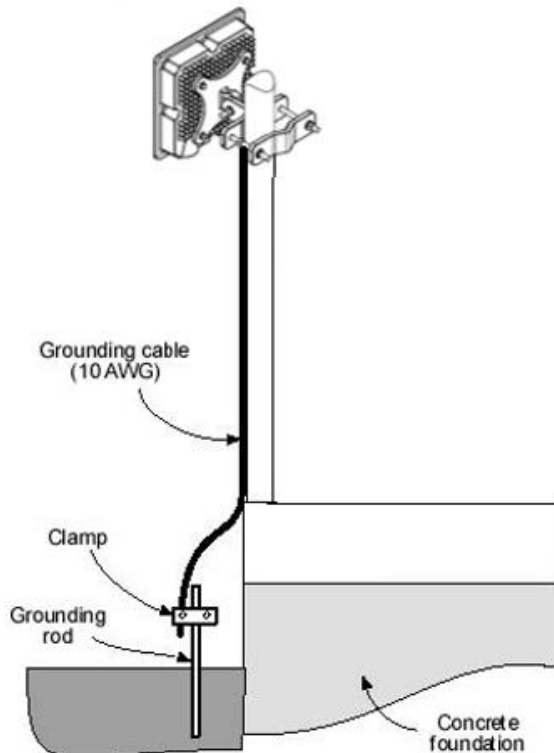


Figure 12: Ground connection diagram

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## Install the LTE antennas

Antennas that are equipped with a Type N male connector may be fitted directly to the connectors on the E10xx. Alternatively, antennas may be mounted separately from the E10xx using their own mounting kit and connected to the E10xx using coaxial cables terminated in Type N male connectors.

For 2x2 MIMO operation, two LTE antennas are required. If separate antennas are used, you should consider mounting them independently of the E10xx so that their spatial separation is not limited by the spacing of the connectors on the E10xx.

For SISO operation, only one LTE antenna is required, and this must be connected to the primary antenna connector shown in Figure 3. The diversity antenna connector must be fitted with a protective cap and sealed.

## Install the GNSS antenna

The E10xx has embedded GNSS functionality for frequency and timing synchronization. It is supplied with an all-weather GNSS antenna with a permanently connected cable which is terminated with a Type N male connector as shown in Figure 13. The antenna has an internal 1-inch diameter, 14 threads per inch, screw thread for fitting onto the end of a pole with a matching external screw thread. The coaxial cable can be routed within the pole or outside it. The antenna must be in a good position to receive GNSS signals.



*Figure 13 - GNSS antenna*



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## Seal the RF connectors

If installed outdoors, the LTE and GNSS antenna connectors must be sealed using 3M (or similar) vinyl electrical tape and butyl mastic tape (not supplied) to prevent moisture ingress.

## Connect the backhaul and power

The E10xx is supplied with a suitable PoE+ injector, as shown in Figure 14.



Figure 14: PoE+ injector inputs and output sockets

The PoE+ injector requires a 100-240 VAC, 50-60Hz, supply. It draws less than 1A.

Once the E10xx has been secured in its final position and (if outdoors) the grounding cable has been connected, connect the backhaul and power to the E10xx. The E10xx may be connected to the backhaul via an existing PoE+ enabled Ethernet switch if one is available; otherwise install the supplied PoE+ injector as follows.

1. Place the PoE+ injector in an indoor location (or in a weather-proof enclosure) that has mains power available. Do not connect the PoE+ injector to the mains yet.
2. Connect the supplied (or longer equivalent) Ethernet cable from the equipment that locally terminates the backhaul to the DATA IN RJ45 socket on the PoE+ injector (which may be marked “IN” or similar).
3. Connect a second Ethernet cable (not supplied) which must be Cat 5e or better, to the DATA & POWER OUT RJ45 socket on the PoE+ injector (which may be marked “OUT” or similar).
4. Route the second Ethernet cable to the E10xx, ensuring that enough slack is allowed for to avoid straining the cable. In the E1012/CBRS variant attach the supplied clamp core onto the cable.

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5. Fit the sealing RJ45 connector to the free end of the second Ethernet cable and connect it to the RJ45 socket on the E10xx as per the sealing connector manufacturer's instructions.
6. Secure the Ethernet cables as necessary so that they do not hang loose.
7. Finally, connect the PoE+ injector to the AC mains supply.

## Check LED indicators

The LED indicators on the front of the E10xx are shown in Figure 15.



Figure 15: LED Indicators

### Power indicator

- ⓘ When power is first applied, the Power indicator may show a changing red/green pattern for a couple of seconds and then goes steady green. If the Power indicator remains off, check the power supply.

### Network indicator

- ⓘ The Network indicator shows steady green when there is an Ethernet connection from the E10xx to another device and there is no activity on the connection. The indicator flickers when there is activity on the connection. If the Power indicator is on, but the Network indicator remains off, check that the data input side of the PoE+ injector is

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connected properly to the equipment that provides the E10xx with its backhaul connection.

## Sync indicator

**Sync** Following power up, the Sync indicator remains off until the integrated GNSS function is activated. Once the GNSS function has been activated, the Sync indicator blinks slowly until enough satellites have been acquired for a timing lock. Once lock has been achieved and the E10xx has a good synchronisation source, the Sync indicator shows steady green. The process of acquiring satellites can take of the order of 20 minutes in the worst case. If the Sync indicator does not show steady green after 30 minutes, ensure that the GNSS antenna has a clear view of the sky and check its RF connection to the E10xx.

## User indicator

**User** When power is applied, the User indicator remains off until the E10xx checks the value of the OAM parameter *AdminState*. If *AdminState* is *Locked* the User indicator blinks slowly. The cell will not come on air until *AdminState* has been set to *Unlocked*. Setting *AdminState* to *Unlocked* may require a user action at the OAM workstation, or the OAM system may be programmed to set it automatically. When *AdminState* is *Unlocked*, the User indicator shows steady green.

## LTE Indicator

**lte** When power is applied, the LTE indicator initially remains off. It starts blinking slowly (green) when the E10xx is ready to bring the cell on air (i.e. start transmitting and receiving) but cannot yet do so, either because the E10xx is waiting for a signal from the OAM system to allow it to do so, because it is waiting for a connection to the EPC to be established or in the case of the E1012/CBRS waiting for an authorised grant from the SAS. When the cell does come on air, the LED shows steady green.