



# Alcatel-Lucent 9768

Compact Metro Radio Outdoor

Hardware Installation

3MN-CMRO-B66-IMOP

Issue 1 | December 2015

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# About this document

## Purpose

The purpose of this document is to provide hardware installation instructions for the Alcatel-Lucent 9768 Compact Metro Radio Outdoor product.

## What's new

The reissue reasons are:

Issue number	Issue date	Reason for reissue
1	December 2015	Standard

## Intended audience

The audience for this document is Hardware Installation personnel relating to the Alcatel-Lucent 9768 Compact Metro Radio Outdoor (9768 CMRO).

## Supported systems

This document applies to the following LTE FDD Alcatel-Lucent 9768 Compact Metro Radio Outdoor B66 (AWS1-3) 2x5W v2 model.

## How to use this document

Start with the first chapter and work through the manual to the end. Once you have done this, you will have carried out the hardware installation completely and in the proper sequence.

Listed are terminology and naming conventions that may appear in the 9768 CMRO documentation.

**Table 1 Terminology**

<p>The full product name, Alcatel-Lucent 9768 Compact Metro Radio Outdoor B66 (AWS1-3) 2x5W v2, is also referred to as:</p> <ul style="list-style-type: none"> <li>• Alcatel-Lucent 9768 CMRO</li> <li>• 9768 CMRO</li> </ul>
<p>The full product name, Alcatel-Lucent 7705 Service Aggregation Router-Optical (SAR-O), is also referred to as:</p> <ul style="list-style-type: none"> <li>• Alcatel-Lucent 7705 SAR-O</li> <li>• 7705 SAR-O</li> </ul>
<p>The full product name, Alcatel-Lucent 5620 Service Aware Manager (SAM), is also referred to as:</p> <ul style="list-style-type: none"> <li>• Alcatel-Lucent 5620 SAM</li> <li>• 5620 SAM</li> </ul>
<p>The terms eNodeB Network Element Manager (NEM), eNodeB NEM, and NEM are used to describe the eNodeB local maintenance applications.</p>

## Safety information

For your safety, this document contains safety statements. Safety statements are given at points where risks of damage to personnel, equipment, and operation may exist. Failure to follow the directions in a safety statement may result in serious consequences.

## Conventions used

The following typographical conventions are used in this manual:

Appearance	Description
<i>emphasis</i>	Text that is emphasized
<i>document titles</i>	Titles of books or other documents
<i>file or directory names</i>	The names of files or directories
<b>graphical user interface text</b>	Text that is displayed in a graphical user interface or in a hardware label
<b>keyboard keys</b>	The name of a key on the keyboard
<b>system input</b>	Text that the user types as input to a system Command names and text that the user types or selects as input to a system

Appearance	Description
system output	Text that a system displays or prints
<i>variables</i>	A value or command-line parameter that the user provides
[ ]	Text or a value that is optional
{ <b>value1</b>   <b>value2</b> } { <i>variable1</i>   <i>variable2</i> }	A choice of values or variables from which one value or variable is used
< <i>delimited text</i> >	Specifies: <ul style="list-style-type: none"> <li>Text that is time-dependent (such as release, version, date, or time stamp) displayed in file and directory names</li> <li>A value that the user supplies</li> </ul> <p><b>Examples:</b></p> <p>“The ATM and IP rules files are stored in the &lt;<i>User-home-directory</i>&gt; \&lt;<i>WPS-version</i>&gt; \ <i>data\user\ samples\rules</i> directory.”</p> <p>“The list of parameters you must fill in is provided in a template zip file: <i>wps-lte-templates-&lt;version&gt;.zip</i>”</p>
>	Indicates access to a function through a menu sequence. The “ > ” (greater than) symbol is used to represent the succession of menus or commands selected from the graphical user interface (GUI) or a PC or Citrix server menu or task bar item. <sup>1</sup>
+	The + (plus) symbol is used to form key combinations that are pressed simultaneously, such as <b>SHIFT+ALT+L</b> .
>	Use the “ > ” (greater than) symbol to form key combinations that are pressed and then released in sequence, such as <b>ESC&gt;ALT&gt;A</b> . <sup>2</sup>

**Notes:**

1. Spaces *are included* on either side of the “ > ” (greater than) symbol when used to represent the succession of menus or commands from the graphical user interface (GUI) or a PC menu or task bar item.
2. Spaces *are not included* on either side of the “ > ” symbol when used to represent keyboard key combination that are pressed and then released in sequence.

**Related information**

Not applicable.

**How to order**

Not applicable.

**How to comment**

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# 1 Safety statements

## Overview

### Purpose

This chapter provides general information on the structure of safety instructions and summarizes general safety requirements.

### General safety and residual risk

The equipment has been developed in line with state-of-the-art technology and conforms with current national and international safety requirements.

The equipment is considered safe during normal operation when safe working practices are complied with. However, hazards may arise if procedures are not followed correctly or safe working practices are not complied with.

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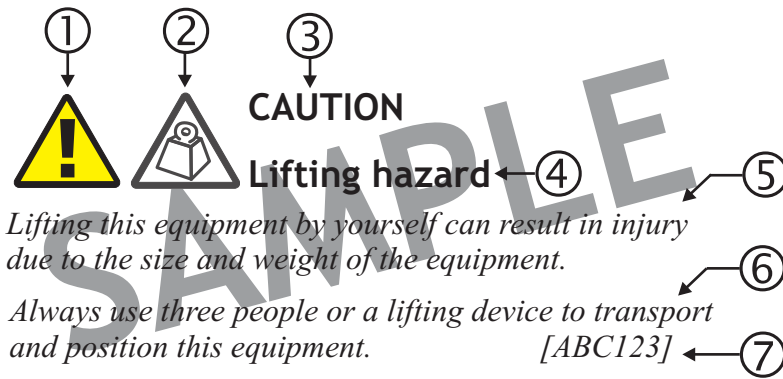
# Structure of safety statements

## Overview

This topic describes the components of safety statements that appear in this document.

## General structure

Safety statements include the following structural elements:



Item	Structure element	Purpose
1	Safety alert symbol	Indicates the potential for personal injury (optional)
2	Safety symbol	Indicates hazard type (optional)
3	Signal word	Indicates the severity of the hazard
4	Hazard type	Describes the source of the risk of damage or injury
5	Safety message	Consequences if protective measures fail
6	Avoidance message	Protective measures to take to avoid the hazard
7	Identifier	The reference ID of the safety statement (optional)

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**Signal words**

The signal words identify the hazard severity levels as follows:

<b>Signal word</b>	<b>Meaning</b>
DANGER	Indicates an extremely hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazardous situation not related to personal injury.

---

## General safety considerations

### Shock hazards



*Some parts of all electrical installations are energized. Failure to follow safe work practices and the safety warnings may lead to bodily injury and property damage.*

*For this reason, only trained and qualified personnel (electrical workers as defined in IEC 60215 or EN 60215 + A1 or in the National Electrical Code or in ANSI/NFPA No. 10) may install or service the installation.*



*There is a danger of electric shock if the grounding system is inadequate.*

*You must comply with the grounding requirements for the grounding system.*

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## Safety

### General precautions for installation procedures



#### WARNING

**Failure to observe these safety precautions may result in personal injury or damage to equipment.**

- *Read and understand all instructions.*
- *Follow all warnings and instructions marked on this product.*
- *Installation and maintenance procedures must be followed and performed by trained personnel only.*
- *The equipment must be provided with a readily accessible disconnect device as part of site preparation.*
- *Grounding and circuit continuity is vital for safe operation of the equipment. Never operate the equipment with grounding/bonding conductor disconnected.*
- *Install only equipment identified in the product's installation manual. Use of other equipment may result in an improper connection which could lead to fire or injury.*
- *Use caution when installing or modifying telecommunications equipment.*
- *Before servicing, disconnect power input to reduce the risk of energy hazards.*
- *For continued protection against risk of fire, all fuses used in this product must be replaced only with fuses of the same type and rating.*
- *Never install telecommunications equipment during a lightning storm or when conditions are wet.*
- *Never touch uninsulated wiring or terminals carrying direct current or ringing current, and never leave this wiring exposed. Protect and tape uninsulated wiring and terminals to avoid risk of fire, electrical shock, and injury to personnel.*
- *Never spill liquids of any kind on the product.*
- *To reduce the risk of an electrical shock, do not disassemble the product. Opening and removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.*
- *for PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device must be incorporated external to the equipment.*

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## Safety - specific hazards

### Danger



*Working in severe weather can result in personal injury or death and damage to the equipment.*

*Never install or perform maintenance during severe weather (high winds, lightning, blizzards, hurricane etc.).*



*Use of unspecified cleaning agents can result in personal injury.*

*Use only specified cleaning agents. Never use flammable solvents.*

*Always ensure that there is adequate ventilation in the work area and wear the appropriate personal protective equipment.*

### Warning



*Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.*

*Do not view directly into the laser beam with optical instruments such as a fiber microscope because viewing of laser emission in excess of Class 1 limits significantly increases the risk of eye damage.*

*Never look into the end of an exposed fiber or an open connector as long as the optical source is switched on.*

*Ensure that the optical source is switched off before disconnecting optical fiber connectors.*



*Some parts of all electrical installations are energized. Failure to observe this fact and the safety warnings may lead to bodily injury and property damage.*

*For this reason, only trained and qualified personnel (electrical workers as defined in IEC 60215 + A1 or EN 60215) may install or service the installation.*



*The power supply lines to the equipment are energized. Contact with parts carrying current can cause serious injury, possibly including death, even hours after the event.*

*Turn off and lock out the system power at the disconnect device before working on or servicing the equipment.*



*Falls can occur when working at heights resulting in serious personal injury or death.*

*To prevent a fall when working at heights (ladder, scaffold, manlift, roof etc.) follow safe work practices and wear appropriate fall protection equipment.*

## Caution



*RF exposure in excess of applicable limits can result in personal injury.*

*Metro Cells are designed and installed in order that they are compliant with the exposure guidelines laid down by 47 CFR 1.1307 -1.1310.*

*For all staff that are required to work in close proximity to the equipment, for example maintenance personnel, contact with the antenna should be avoided. No such persons shall stay in front of the product at a distance of less than 8 cm.*

*No other persons shall stay in front of the product at a distance of less than 22 cm.*



*DOUBLE POLE/NEUTRAL FUSING*

*A fuse is used in the neutral of single-phase equipment either permanently connected or provided with a non-reversible plug. After operation of the fuse, parts of the equipment that remain energized might represent a hazard during servicing.*

*Failure to observe this fact and the safety warnings may lead to bodily injury and property damage.*



*The surfaces of the CMRO can become hot enough to cause burns on unprotected skin. On the product label, the universal symbol for Hot Surface (shown here) emphasizes this hazard.*

*Before handling the unit, wait until its surfaces have cooled and, where the following conditions apply, ensure that it is mounted out of the public's reach.*

*For installations in ambient temperatures exceeding 46° C, surface temperature may exceed 70° C. In these situations, this equipment is intended for installation where access is restricted to only qualified service personnel.*



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**Notices****NOTICE****ESD hazard**

*Semiconductor devices can be damaged by electrostatic discharges (ESD)*

*The following rules must be complied with when handling any module containing semiconductor components:*

- *Wear conductive or antistatic working clothes (for example, coat made of 100% cotton).*
- *Wear a grounded wrist strap.*
- *Wear shoes with conductive soles on a conductive floor surface or conductive work mat.*
- *Leave the modules in their original packaging until ready for use.*
- *Make sure there is no difference in potential between yourself, the workplace, and the packaging before removing, unpacking, or packing a module.*
- *Whenever handling ESD-sensitive components, do not touch any connection pins or tracks.*
- *Place modules removed from the equipment on a conductive surface.*
- *Test or handle the module only with grounded tools on grounded equipment.*
- *Handle defective modules exactly like new ones to avoid causing further damage.*

**NOTICE****Condensation**

*Sudden changes in the weather may lead to the formation of condensation on components. Operating the unit when condensation moisture is present can destroy the unit.*

*Units which show signs of condensation must be dried before installation.*

**NOTICE****Tools**

*Tools left in the working area can cause short circuits during operation which can lead to the destruction of units.*

*Make sure after finishing your work that no tools, testing equipment, flashlights, etc., have been left in or on the equipment.*

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## Product safety

### Equipment safety

Safety information for this equipment can be found on various Caution, Warning, Danger, information labels or instructions affixed to or included with the product or included within this document. Informational and cautionary labels may appear near the item they address or may be grouped in a single location on the equipment. Warnings are typically adjacent to the hazard that is noted on the label. The instructions, cautions and warnings found on these labels must be understood and observed by all personnel involved with the equipment installation and maintenance.

# 2 Hardware architecture and functionality

## Overview

### Purpose

This chapter provides a high-level overview of the Alcatel-Lucent 9768 Compact Metro Radio Outdoor (9768 CMRO) product and functionality.

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## Functional description

### Overview

The Alcatel-Lucent 9768 Compact Metro Radio Outdoor product is a next-generation Metro Radio Outdoor product that:

- provides 10x the output power at half the size when compared with the Alcatel-Lucent 9768 Metro Radio Outdoor (9768 MRO)
- enables mobile service providers (MSPs) to deliver cost-effective capacity to urban hotspots, for example, stadiums, campuses, train stations, bus stops, and other urban environments
- provides affordable coverage to rural locations
- is designed to be deployed as an overlay in an existing macro coverage area to provide increased coverage in public open spaces.



9768 CMRO  
with Solar Shield



9768 CMRO  
without Solar Shield

### Product features and capabilities

The product features and capabilities in this release are:

- Supports band 66 (B66) with a reduced high-end (WRHE) of 2180 MHz and a 10-MHz guard band instead of a 2200 MHz high-end
- Supports LTE FDD
- Supports the following LTE carriers:
  - 5 MHz
  - 10 MHz

- 
- 15 MHz
  - 20 MHz
  - Supports the AWS-1 frequency range (AWS-4 frequency range is not supported)  
**Note:** The 9768 CMRO is hardware ready to support the entire AWS-1/3 frequency range. In the LR15.1.L release, only AWS-1 is fully supported.
  - Supports UL of 1710 MHz to 1780 MHz (70 MHz), and DL of 2110 MHz to 2180 MHz (70 MHz)
  - 2x5 W total power at antenna connector
  - Standard 2x2 MIMO configurations, 2-Tx, and 2-Rx diversity
  - Supports plug-and-play (PnP) to connect automatically to the network
  - Supports CPRI fronthaul and daisy chaining of up to four 9768 CMROs
  - CSA, FCC, and IP65 certifications

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## Physical description

### Overview

The Alcatel-Lucent 9768 Compact Metro Radio Outdoor is housed in an Alcatel-Lucent designed metallic case, adhering to NEMA Type-4 enclosure standard. The product is designed to be deployed close to users, usually in outdoor environments, such as on light poles or building walls, with a vertical profile that hides cable connectors and mounting kit for a smooth integration into the surrounding environment.

The 9768 CMRO product is shown in the following figure.

**Figure 2-1 Alcatel-Lucent 9768 CMRO**



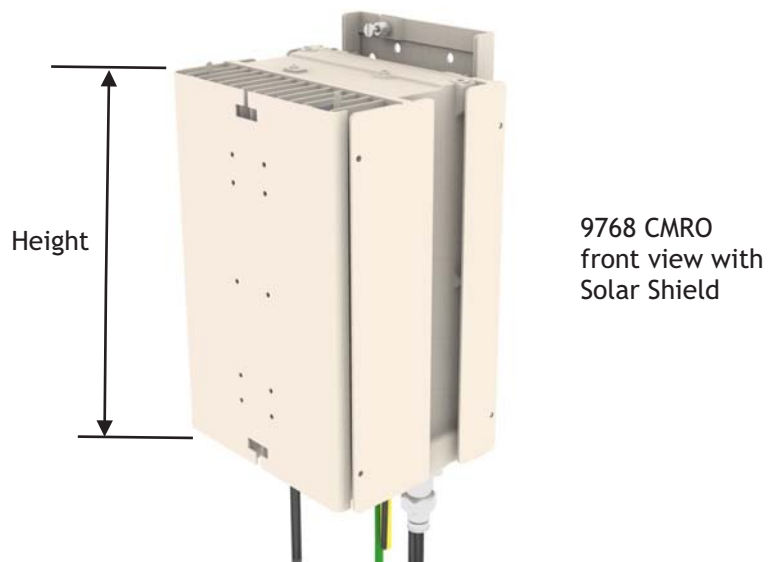
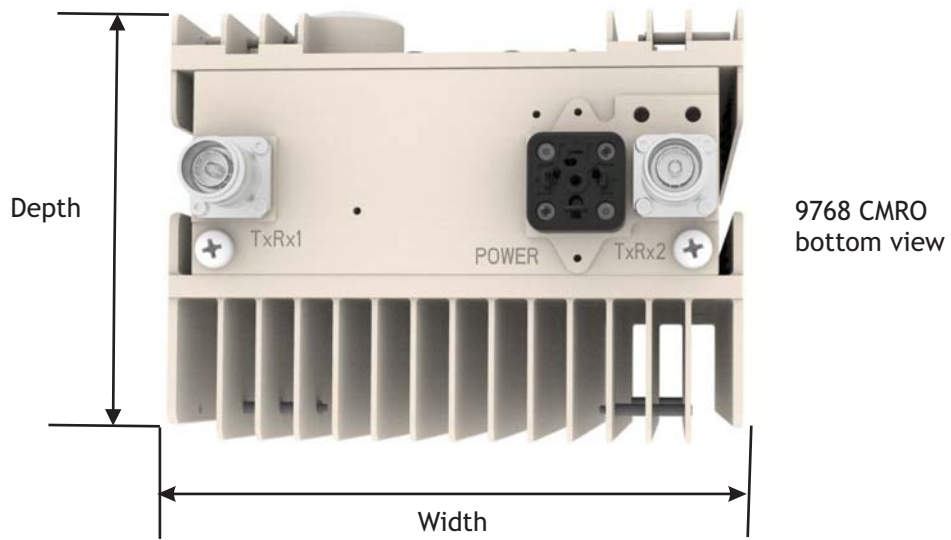
9768 CMRO  
(Front view with  
Solar Shield)



9768 CMRO  
(Rear view)

### Weights and dimensions

The physical dimensions of the Alcatel-Lucent 9768 CMRO are:



**Table 2-1 9768 CMRO**

Width	180 mm (7.1 in)
Height	265 mm (10.4 in)
Depth	135 mm (5.3 in), including Solar Shield
Volume	6.5 L
Weight	6.8 kg (15 lb)

---

**Environmental and regulatory specifications**
**Table 2-2 Certifications and standards**

Safety	CSA
Radio	FCC
Environmental	IP65

**Table 2-3 Environmental parameters**

Temperature range	- 40°C to +50°C (+55°C with Solar Shield)
Relative humidity	5% to 100%

**Main units**

The 9768 CMRO consists of four main units, which are responsible for radio, RF filtering, fronthaul, and power supply functions.

Unit	Function
MOAD2 board	SFP modules and power forwarding: <ul style="list-style-type: none"> <li>Two CPRI SFP ports</li> <li>5.3-V to 3.3-V power convertor</li> </ul>
Radio board	Radio: <ul style="list-style-type: none"> <li>LTE Band 66</li> <li>Two mini-DIN 4.3-10 external RF antenna connectors</li> </ul>
RF filter	RF antenna filter that supports: <ul style="list-style-type: none"> <li>B66 (WRHE) UL frequency range from 1710 MHz to 1780 MHz</li> <li>B66 (WRHE) DL frequency range from 2110 MHz to 2180 MHz</li> </ul>
Power Supply Unit (PSU)	<ul style="list-style-type: none"> <li>PSU AC variant - Internal power module unit provides AC-to-DC conversion (5.3-V output) to the MOAD2 board.</li> <li>PSU DC variant - Internal power module unit provides DC-to-DC conversion (5.3-V output) to the MOAD2 board.</li> </ul> <p>The MOAD2 board distributes 5.3-V output and provides secondary DC-to-DC conversion to generate all other (lower) voltages needed within the board.</p>



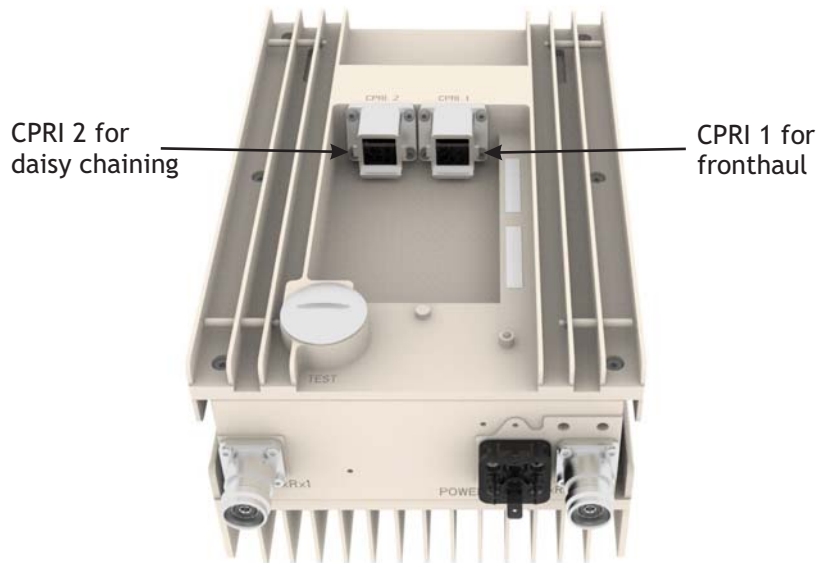
Connection interfaces

The following figure shows the connection interfaces of the 9768 CMRO.

Figure 2-2 Alcatel-Lucent 9768 CMRO connection interfaces



9768 CMRO (bottom view)



9768 CMRO (rear view)

Connection location	Description
9768 CMRO (bottom)	Power supply connector (AC or DC) Two mini-DIN 4.3-10 RF antenna connectors Grounding point
9768 CMRO (rear)	Two CPRI SFP ports; “CPRI 1” and “CPRI 2” “CPRI 1” is used to connect to the BBU or to daisy-chain with another 9768 CMRO and “CPRI 2” is used to daisy chain to the next 9768 CMRO

## Power supply

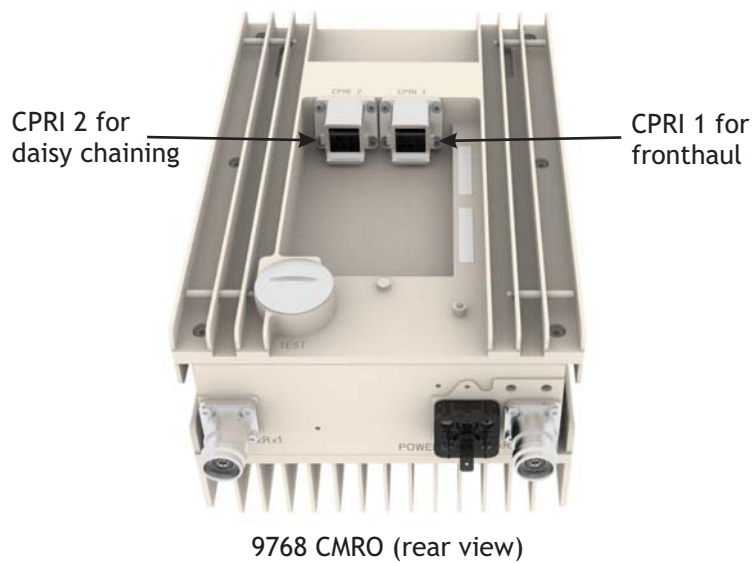
The Alcatel-Lucent 9768 CMRO product supports either AC or DC external power input.

9768 CMRO	Power supply details
AC variant	AC power supply that operates from a single phase, three-wire voltage source in the 95 to 265 Volt range.  The AC power is surge protected internally, and conforms to IEC 60364-1 and GR-1089-Core, Issue 6, Section 4.6.2, Table 4-2 Surge Test #20.  Fully configured and operating at maximum levels, the product consumes 100 W. Typical power consumption is 85 W.
DC variant	-48-V DC power supply that operates over the voltage range from -40-V DC to -57-V DC.  The DC power is surge protected internally, and conforms to GR-1089, Issue 6, Appendix B for Port Type 8a.  Fully configured and operating at maximum levels, the product consumes 100 W. Typical power consumption is 85 W.

## Fronthaul interface

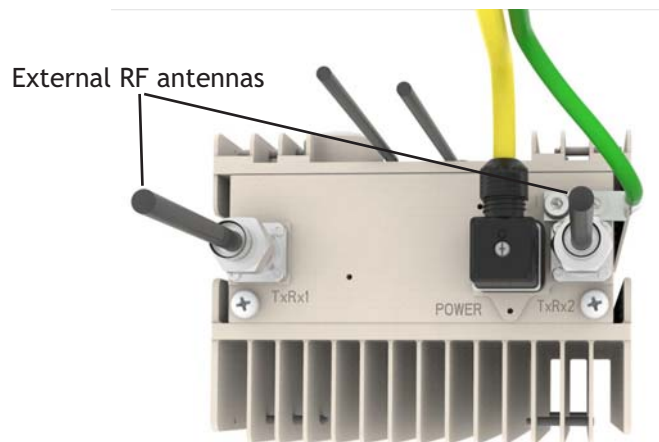
The fronthaul interface is at the back of the 9768 CMRO supporting two optical CPRI SFP ports:

- The “CPRI 1” SFP port (CPRI input port) is used to connect to the BBU or to the daisy chaining port of another 9768 CMRO.
- The “CPRI 2” SFP port (Daisy chaining output port) is used for daisy chaining to another 9768 CMRO.



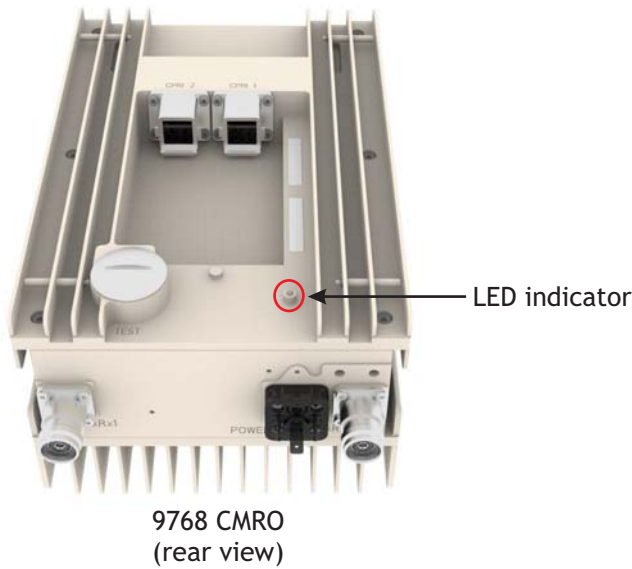
### RF antenna

The Alcatel-Lucent 9768 CMRO supports two external antenna connectors (type mini-DIN) at the bottom of the enclosure supporting external RF antennas. The external RF antennas are customer supplied.



### Status indicators

The 9768 CMRO supports a single multi-color LED which is located on the rear lower portion of the casing. The LED is not intended for use during normal operation of the equipment. However, it can provide a visual status of the unit during initial installation and commissioning.



### Product labeling

The Alcatel-Lucent 9768 CMRO product label provides the following information:

- Model name
- Part number
- Serial number
- Power input range
- Environmental marking (WEEE/RoHS) applicable to the device

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## Supported installation options

### Overview

The following section describes the supported installation options for the Alcatel-Lucent 9768 CMRO product. The supported installation options include:

- Standard installation options for 9768 CMRO (pole and wall-mount installation).
- Daisy chain installation options, where up to four 9768 CMROs can be daisy-chained together and share the same fronthaul port.

### Standard installation options

The standard installation options include pole (light poles, lamp posts, and so on) and wall-mount (building walls) installations.

**Figure 2-3 9768 CMRO pole and wall-mount installation**



Pole-mount installation



Wall-mount installation

### Daisy chain installation options

In a daisy chain installation option, up to four 9768 CMROs can be daisy chained together, where they share the same fronthaul port, thus reducing the investment cost needed to connect the 9768 CMROs to the fronthaul network and aggregating the uplink and downlink traffic.

Daisy chaining of 9768 CMRO units is supported only with macro eNodeB BBUs (not with 976x Metro Cells). The following table provides the supported 9768 CMRO daisy chaining configurations for a BBU hardware configuration and CPRI rate:

CPRI rate/BBU HW configuration	CPRI rate 3	CPRI rate 5	CPRI rate 7
<b>eCCM2-HR + bCEM P1.1</b>	Up to four 9768 CMROs can be daisy chained at 5 MHz, 10 MHz, 15 MHz or 20 MHz carrier bandwidth		
<b>eCCM2 + bCEM P1.1</b>	<ul style="list-style-type: none"> <li>Up to four 9768 CMROs can be daisy chained at 5 MHz or 10 MHz carrier bandwidth</li> <li>Up to two 9768 CMROs can be daisy chained at 15 MHz or 20 MHz carrier bandwidth</li> </ul>	Not supported	
<b>bCAM2 + bCEM2</b>	Up to four 9768 CMROs can be daisy chained at 5 MHz, 10 MHz, 15 MHz or 20 MHz carrier bandwidth		

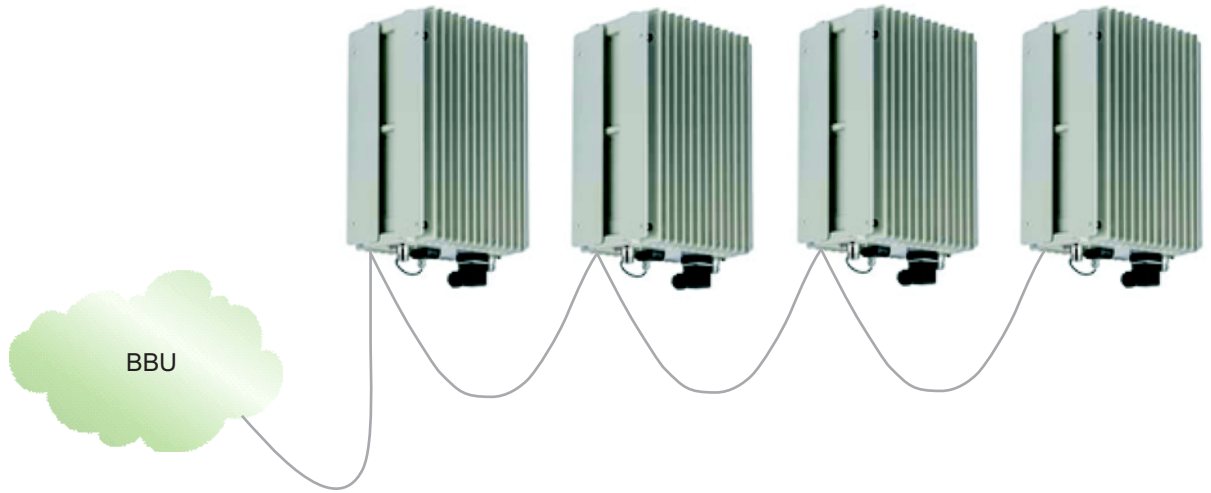
**Note:** Mixed BBU configurations do not support daisy chaining.

The BBU and all of the RFMs on the daisy chain, including 9768 CMROs, auto-negotiate to use the same CPRI rate when the system starts. CPRI line rates along a daisy chain are uniform and determined by the rate on the first segment. If the BBU wants to change the CPRI line rate for the daisy chain, each RFM starts its master interface only if the slave interface is up and uses only the line rate of the slave interface.

The daisy-chained 9768 CMROs can be co-located or separated by some distance. The actual distance depends on the BBU, SFP, and fiber optic cable configuration used for the daisy chain. Refer to, “[Hardware and ancillary items](#)” (p. 2-14) for supported SFPs and fiber optic cable types and lengths.

The 9768 CMRO supports two optical CPRI SFP ports at the back; one for fronthaul (“CPRI 1” port) and the other for daisy chaining (“CPRI 2” port).

Figure 2-4 9768 CMRO daisy chaining installation example



## Hardware and ancillary items

### Overview

The following section lists the Alcatel-Lucent 9768 CMRO base hardware equipment, the installation kits, and ancillary items that can be ordered from Alcatel-Lucent.

### 9768 CMRO base items

The product packaging contains the following base items:

- 9768 CMRO
- 9768 CMRO mounting frame
- 9768 CMRO basic installation kit

### Ancillary items

The following tables list the ancillary items that are available for order from Alcatel-Lucent in support of the defined equipment installation and configuration options.

#### Required installation items

The following table lists the installation items required and available for order from Alcatel-Lucent in support of the equipment installation options. Each item must be ordered separately.

**Table 2-4 Pole-mount installation**

Item	Description	Use
9768 CMRO base items	9768 CMRO 9768 CMRO mounting frame 9768 CMRO basic installation kit	Mandatory
Tool for metal band	Standard BAND-IT <sup>®</sup> Banding Tool (CR00169), including operating instructions	Mandatory for pole-mount only Tighten the bracket metal band around the pole
Bracket metal band kit	Stainless steel bands Band buckles (Ear-Lokt)	Mandatory Attach the 9768 CMRO or vertical tilt bracket to a pole (diameter 50 mm to 300 mm) using stainless steel bands.

**Table 2-5 Wall-mount installation**

Installation kit	Description	Use
9768 CMRO base items	9768 CMRO 9768 CMRO mounting frame 9768 CMRO basic installation kit	Mandatory



## Power

Item	Description	Use
Cable assembly (AC) for NAR market	3x16AWG Power connector assembled with the power cable. Available in four lengths: 2 m, 4.5 m, 9 m and 12 m	Mandatory for 9768 CMRO module with AC power Applicable to NAR market only
Cable assembly (DC) for NAR market	3x16AWG Power connector assembled with the power cable. Available in four lengths: 2 m, 4.5 m, 9 m and 12 m	Required for 9768 CMRO module with DC power Applicable to NAR market only
Power connector (AC) for non-NAR market	AC power connector	Mandatory for 9768 CMRO module with AC power Applicable to non-NAR market only
Power connector (DC) for non-NAR market	DC power connector	Mandatory for 9768 CMRO module with DC power Applicable to non-NAR market only
Power cable for non-NAR market	Power cable IN/OUT 3x1,5-mm <sup>2</sup> Available in 100 m roll or per meter	Mandatory for 9768 CMRO module with both AC or DC power Applicable to non-NAR market only

## Grounding cable

Item	Description	Use
Ground cable for NAR market	Ground cable Y/G, NAR 8AWG LSZH Available in any length (in meters)	Mandatory Applicable to NAR market only
Ground cable for non-NAR market	Ground cable Y/G 10 mm <sup>2</sup> in 100 m roll	Mandatory Applicable to non-NAR market only

## SFP modules

Item	Description	Use
SFP module	SFP CPRI Rate 3-7 - 1310 nm - SMDF (1 km, 4 km)	Optical fronthaul, Daisy chaining
SFP module	SFP CPRI Rate 3-7 - 1310 nm - SMDF (10 km)	Optical fronthaul, Daisy chaining

**OCTIS connector**

Item	Description	Use
OCTIS plug kit for SFP transceiver	OCTIS connector	Mandatory One each for fronthaul and daisy chaining ports Protects SFP and cabling from environmental damage.

**External RF antenna**

Item	Description	Use
External RF antenna	External RF antenna for the 9768 CMRO.	Mandatory To be supplied by the customer.

**Fiber optic cable for fronthaul**

Item	Description	Use
Fiber Optic cable	SMDF LC-LC 2SM 1-m	Mandatory Single mode fiber duplex. 67-mm/250-mm Breakout, Outer diameter: 5-7-mm, OFNR-LS Use for Single Mode link (select cable length)
Fiber Optic cable	SMDF LC-LC 2SM 2.5-m	
Fiber Optic cable	SMDF LC-LC 2SM 5-m	
Fiber Optic cable	SMDF LC-LC 2SM 15-m	
Fiber Optic cable	SMDF LC-LC 2SM 30-m	
Fiber Optic cable	SMDF LC-LC 2SM 50-m	
Fiber Optic cable	SMDF LC-LC 2SM 70-m	
Fiber Optic cable	SMDF LC-LC 2SM 85-m	
Fiber Optic cable	SMDF LC-LC 2SM 100-m	
Fiber Optic cable	SMDF LC-LC 2SM 150-m	
Fiber Optic cable	SMDF LC-LC 2SM 200-m	
Fiber Optic cable	SMDF LC-LC 2SM 250-m	
Fiber Optic cable	SMDF LC-LC 2SM 300-m	

### Fiber optic cable for daisy chaining

Item	Description	Use
Fiber Optic cable	SMDF LC-LC 2SM 1-m	Optional Single mode fiber duplex. 67-mm/67-mm Breakout, Outer diameter: 5-7-mm, OFNR-LS Use for Single Mode link (select cable length)
Fiber Optic cable	SMDF LC-LC 2SM 2.5-m	
Fiber Optic cable	SMDF LC-LC 2SM 5-m	
Fiber Optic cable	SMDF LC-LC 2SM 15-m	
Fiber Optic cable	SMDF LC-LC 2SM 30-m	
Fiber Optic cable	SMDF LC-LC 2SM 50-m	
Fiber Optic cable	SMDF LC-LC 2SM 70-m	
Fiber Optic cable	SMDF LC-LC 2SM 85-m	
Fiber Optic cable	SMDF LC-LC 2SM 100-m	
Fiber Optic cable	SMDF LC-LC 2SM 150-m	
Fiber Optic cable	SMDF LC-LC 2SM 200-m	
Fiber Optic cable	SMDF LC-LC 2SM 250-m	
Fiber Optic cable	SMDF LC-LC 2SM 300-m	

### Solar Shield

Item	Description	Use
Solar Shield	Solar Shield for 9768 CMRO	Mandatory unless the 9768 CMRO is installed indoors or protected in an enclosure.



# 3 Installation

## Overview

### Purpose

This chapter provides the instructions for mounting the Alcatel-Lucent 9768 Compact Metro Radio Outdoor onto either a pole or wall.

### Contents

<b>Install the 9768 CMRO on a pole or a wall</b>	<b>3-2</b>
Pre-installation information	3-3
Installation clearances	3-5
Procedure 3-1: Pole mount the 9768 CMRO	3-6
Procedure 3-2: Wall-mount the 9768 CMRO	3-11

---

# Install the 9768 CMRO on a pole or a wall

## Overview

### Purpose

This section provides pre-installation checks for required tools and materials, installation clearances as well as procedures to be performed before installing the Alcatel-Lucent 9768 Compact Metro Radio Outdoor product.

### Contents

<a href="#">Pre-installation information</a>	3-3
<a href="#">Installation clearances</a>	3-5
<a href="#">Procedure 3-1: Pole mount the 9768 CMRO</a>	3-6
<a href="#">Procedure 3-2: Wall-mount the 9768 CMRO</a>	3-11

## Pre-installation information

### Verify site preparation

The following site preparation requirements should be checked and met before the installation of the equipment can begin:

- Ensure that equipment is planned to be installed as high as possible to avoid obstructions.
- Consider nearby sources of interference. Also check possibility of future obstructions.
- Ensure that adequate clearance is provided for service access.
- Ground, power, and fronthaul cabling has been routed and is in place.
- Ensure all site-specific fixing materials (screws, washers, wall plugs) for pole or wall mounting the equipment are available.

### Product delivery contents

Unpack and examine the product packaging contents. If you notice any damage, or missing items as listed in the Packing List, immediately notify the carrier that delivered the unit and contact your Alcatel-Lucent representative.

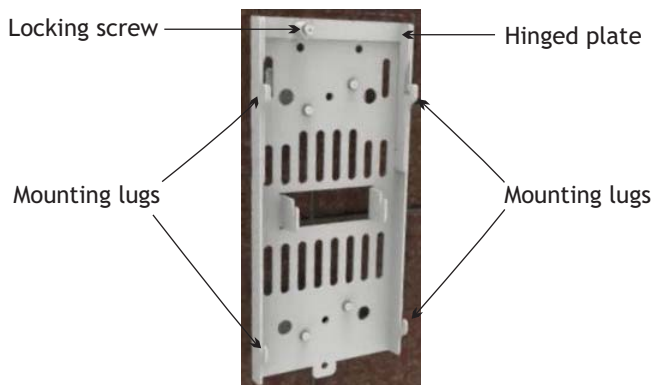
The product packaging contains the following items:

- The Alcatel-Lucent 9768 Compact Metro Radio Outdoor

### Installation materials

In addition to the standard product deliverable ensure the appropriate mounting brackets, installation kits, and ancillary items are available to support the product mounting options.

**Figure 3-1 Mounting bracket**



**Table 3-1 Recommended wall anchor materials**

Surface structure	Recommended anchor materials	Recommended screw torque
Wood	Screw Hex T M8x70 stainless steel (x4) Washer plain M8x16x1.6 stainless steel (x4)	7.0 N.m (62.0 lb.in).
Concrete	Screw CHC M6x80 stainless steel (x4) Washer plain M6x12x1.6mm stainless steel (x4) Washer spring M6x12x1.2mm stainless steel (x4) Plug expansion Rawlnut M6x50 (x4)	7.0 N.m (62.0 lb.in).

**Tools required for installation**

The following tools are used during installation:

- Drill (pneumatic hammer) and assorted drill bits
- Pliers
- Adjustable spanners
- M17 socket wrench
- Screwdrivers (power and/or manual):
  - Phillips (flat blade)
  - Torx (T-25 and T-40)
- HRS (Hirose) HT206/TM21p-88p crimping tool (for RJ45 cable)
- Data cable tester for shielded RJ45 (optional)
- Measuring tape
- Digital compass (to aid establishing product orientation)
- Marker, to mark wall mounting holes
- Vacuum cleaner or equivalent (required for clearing debris from wall mounting holes)
- Spirit level
- Hammer
- PIB (self-amalgamating) tape and 3M Super 33+ vinyl tape
- Ear protectors and safety goggles or glasses
- Assorted cable ties (various lengths)
- Heavy duty tape
- Adjustable straps



## Installation clearances

### Minimum installation clearances

The following provides the minimum wall mount clearances recommended around the Alcatel-Lucent 9768 Compact Metro Radio Outdoor.

**Figure 3-2 9768 CMRO installation clearances**



Compact Metro Radio Outdoor	Clearances mm (inches)	Comment
Sides (left and right)	400 mm (15.75 inch)	Access to secure the solar shield cover.
Top	400 mm (15.75 inch)	Access to cable connections and cable bending radius. To aid natural air convection.
Bottom	400 mm (15.75 inch)	To aid natural air convection.
Front	460 mm (18.11 inch)	Access to secure the solar shield cover.
Rear	20 mm (0.79 inch)	For the wall mounting space. To aid natural air convection.

---

## Procedure 3-1: Pole mount the 9768 CMRO

### Purpose

This topic describes the procedures to be followed when installing the 9768 CMRO onto a pole using pole bands.

### Prerequisites

A site survey has been conducted and a location for the device has been selected that is both central to the public space and elevated in order to maximize coverage. Before installation begins, ensure the following:

- Ensure adequate clearance is provided for service access.
- Ground cable has been routed and the site grounding system is in place.
- Fronthaul cable has been routed and is in place.
- Any site-specific fixing materials are available (for example, bolts, washers and wall plug materials).

**Attention:** The 9768 CMRO must be mounted with the appropriate mounting hardware suitable for the various supporting structures, building materials and construction methods. Following a site survey, it is the responsibility of the customer to ensure that:

- The installation support structure is adequate and compliant with ICC IBC (2012): International Building Code, and all other national and local codes.
- The appropriate mounting hardware and any necessary recommended supporting anchor fixings are used.

### Mounting requirements and materials

The 9768 CMRO can be easily mounted onto a wooden or metal pole. Refer to the following for the installation kits, anchor materials, and tools for the installation type:

- For pole-mount refer to, [Table 2-4, “Pole-mount installation” \(p. 2-14\)](#) .
- For a list of standard tools required to support the installation, see [“Tools required for installation” \(p. 3-4\)](#).

### Before you begin

- Record the 9768 CMRO 18-digit serial number before mounting onto a pole.
- Ensure that the optic fiber cable and SFPs are inspected and cleaned.

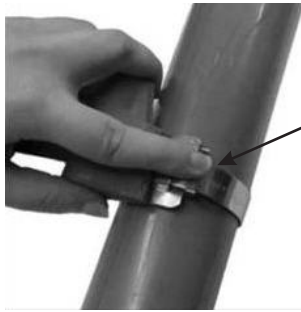
Pole mount the 9768 CMRO



*Falls can occur when working at heights resulting in serious personal injury or death.  
To prevent a fall when working at heights (ladder, scaffold, manlift, roof and so on.)  
follow safe work practices and wear appropriate fall protection equipment.*

Perform the following procedure to pole-mount the 9768 CMRO using standard pole bands.

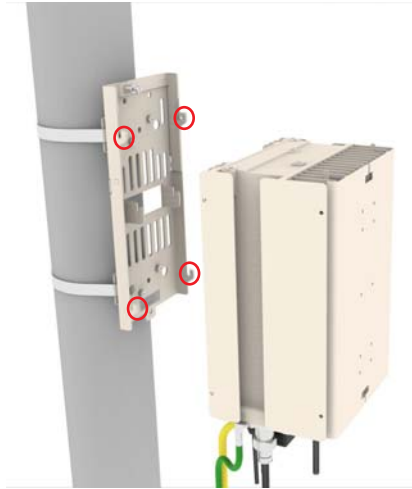
- 1 Assemble the OCTIS connector with the fiber optic cable. Refer to the installation instructions provided with the OCTIS connector.
- 2 Connect the OCTIS connector with the fiber optic to the 9768 CMRO CPRI ports.
- 3 Refer to the equipment orientation plan and, at the selected installation point on the pole, mark the upper and lower position of the pole bands. Using digital compass, determine the planned left or right orientation of the 9768 CMRO mounting bracket around the pole and mark the center line of the left or right orientation on the pole.
- 4 Using the supplied stainless steel pole bands insert and thread the open band ends into the upper and lower slots on the reverse side of the mounting bracket.
- 5 At the marked installation point on the pole place the bands around the pole at the determined height. Carry-out any required adjustment of the mounting bracket around the pole so that it is pointing in the desired direction.
- 6 Ensure that the mounting bracket is in the correct position and orientation.
- 7 Secure the band around the pole with **two loops**. Manually tighten the band around the pole.
- 8 Slowly tighten the band further to the pole using the BAND-IT<sup>®</sup> tool, while placing your finger at the band buckle bridge to feel the movement of the band through the buckle.



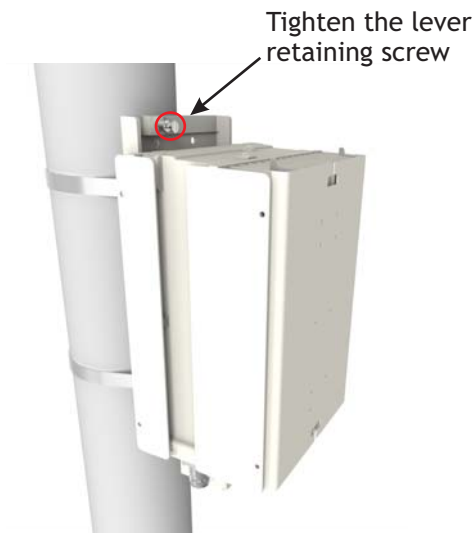
Place your finger at the buckle bridge to feel the movement of the metal band

**Note:** Refer to *BAND-IT® C00169 Hand Tool Operation Instructions*, PO5886 or watch the [YouTube™ video](https://www.youtube.com/watch?v=3nLfRYjlnKU) (<https://www.youtube.com/watch?v=3nLfRYjlnKU>) on how to use the BAND-IT® tool.

- 9 Once the band stops moving through the buckle, immediately stop tightening the band.  
**Attention:** Excessive tightening of the band around the pole can damage the pole.
- 10 Check whether the banding is secure, there is no movement of the bracket around the pole and that the banding stubs (cut ends) are flattened down with a hammer.
- 11 To attach the 9768 CMRO to the mounting bracket open the mounting frame lever by pulling the lever outwards.
- 12 Align the mounting points on the reverse side of the 9768 CMRO with the mounting lugs on the bracket. Attach the 9768 CMRO to the bracket by sliding the 9768 CMRO forwards and downwards onto the bracket mounting lugs.



- 13 Secure the 9768 CMRO onto the mounting frame by tightening the lever retaining screw.



- 14 Finally, check the 9768 CMRO is correctly locked into position and there is no movement of the module on the mounting frame.
- 15 Route the ground cable from the ground system to the 9768 CMRO and Connect the ground lug to the grounding point on the 9768 CMRO using the supplied M6 screws, lock washers, and flat washers. Use antioxidant at the grounding pads.

- 16 Connect the external RF antennas to the mini-DIN 4.3-10 RF antenna connectors on the bottom of the 9768 CMRO. Refer to the RF antenna mounting instructions included with the RF antenna kit for the steps to mount the antennas.
- 17 If required, assemble the AC or DC power connector with the power cable. If the power connector is already assembled with the power cable, skip this step.
- 18 Plug the power connector on the power cord into the power connector on the bottom of the 9768 CMRO unit.
- 19 Verify that mounted equipment is secure and that no unintentional mechanical alteration has occurred to either the equipment itself or the installation infrastructure.
- 20 Ensure that all the exterior connections are secure.
- 21 Finally, inspect the site for loose tools, materials, and parts. Remove all such loose tools, materials, and parts.

END OF STEPS

### Standard pole-mount examples

The following figure depicts a 9768 CMRO standard pole mount using pole bands.



---

## Procedure 3-2: Wall-mount the 9768 CMRO

### Purpose

This topic describes the procedures to be followed when installing the 9768 CMRO onto a wall or solid flat surface

### Prerequisites

A site survey has been conducted and a location for the device has been selected that is both central to the public space and elevated in order to maximize coverage. Before installation begins, ensure the following:

- Ensure that adequate clearance is provided for service access.
- Ground cable has been routed and the site grounding system is in place.
- Fronthaul cable has been routed and is in place.
- All site-specific fixing materials are available (for example, bolts, washers, and wall plug materials).

**Attention:** The 9768 CMRO must be mounted with the appropriate mounting hardware suitable for the various supporting structures, building materials and construction methods. Following a site survey, it is the responsibility of the customer to ensure that:

- The installation support structure is adequate and compliant with ICC IBC (2012): International Building Code, and all other national and local codes.
- The appropriate mounting hardware and any necessary recommended supporting anchor fixings are used.

### Mounting requirements and materials

The 9768 CMRO can be easily mounted onto solid concrete or wooden flat surface. Refer to the following for the installation kits, anchor materials, and tools for the installation type:

- For wall mount, refer to [Table 2-5, “Wall-mount installation” \(p. 2-14\)](#) .
- For a list of standard tools required to support the installation, see [“Tools required for installation” \(p. 3-4\)](#).

### Before you begin

- Record the 9768 CMRO 18 digit serial number before mounting onto a wall or flat surface.
- Ensure that the optic fiber cable and SFPs are inspected and cleaned.

**Wall-mount the 9768 CMRO****WARNING****Fall hazard**

*Falls can occur when working at heights resulting in serious personal injury or death.*

*To prevent a fall when working at heights (ladder, scaffold, manlift, roof and so on) follow safe work practices and wear appropriate fall protection equipment.*

**NOTICE****Equipment damage hazard**

*Damaged connectors may lead to operational issues.*

*The 976x Metro product must be transported by holding its body and not by any connectors or pre-attached cables.*

Perform the following procedure to wall-mount the 9768 CMRO to a wall or flat surface.

- 1 Assemble the OCTIS connector with the fiber optic cable. Refer to the installation instructions provided with the OCTIS connector.
- 2 Connect the OCTIS connector with the fiber optic to the 9768 CMRO CPRI ports.
- 3 At the selected installation location, mark the points on the wall for the mounting bracket anchor holes. See the following drill hole pattern for reference:
- 4 Check the horizontal marked position of the holes with a spirit level.
- 5 Drill two upper holes and two lower holes at the marked points to the appropriate depth. Insert screw anchor plugs into the drilled holes and, using a hammer, tap home until the plugs are flush with the wall.
- 6 Align the mounting bracket bolt holes with the drilled wall anchor holes. Screw in the upper and lower bolts into the wall fixings to the appropriate depth so that the mounting bracket is securely attached to the wall.



- 7 To attach the 9768 CMRO to the mounting bracket open the mounting frame lever by pulling the lever outwards.
- 8 Align the mounting points on the reverse side of the 9768 CMRO with the mounting lugs on the bracket. Attach the 9768 CMRO to the bracket by sliding the 9768 CMRO forwards and downwards onto the bracket mounting lugs.
- 9 Secure the 9768 CMRO onto the mounting frame by tightening the lever retaining screw.
- 10 Finally, check the 9768 CMRO is correctly locked into position and there is no movement of the module on the mounting frame.
- 11 Route the ground cable from the ground system to the 9768 CMRO and Connect the ground lug to the grounding point on the 9768 CMRO using the supplied M6 screws, lock washers, and flat washers. Use antioxidant at the grounding pads.
- 12 Connect the external RF antennas to the mini-DIN 4.3-10 RF antenna connectors on the bottom of the 9768 CMRO. Refer to the RF antenna mounting instructions included with the RF antenna kit for the steps to mount the antennas.
- 13 If required, assemble the AC or DC power connector with the power cable. If the power connector is already assembled with the power cable, skip this step.
- 14 Plug the power connector on the power cord into the power connector on the bottom of the 9768 CMRO unit.
- 15 Verify that mounted equipment is secure and that no unintentional mechanical alteration has occurred to either the equipment itself or the installation infrastructure.
- 16 Ensure that all the exterior connections are secure.

- 
- 
- 17 Finally, inspect the site for loose tools, materials, and parts. Remove all such loose tools, materials, and parts.

END OF STEPS

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**Standard wall mount example**

The following figure depicts a standard 9768 CMRO wall-mount installation.



# Appendix A: LED State Description

## Overview

### Purpose

This appendix describes the LED status and descriptions for the Alcatel-Lucent 9768 Compact Metro Radio Outdoor (9768 CMRO).

### Contents

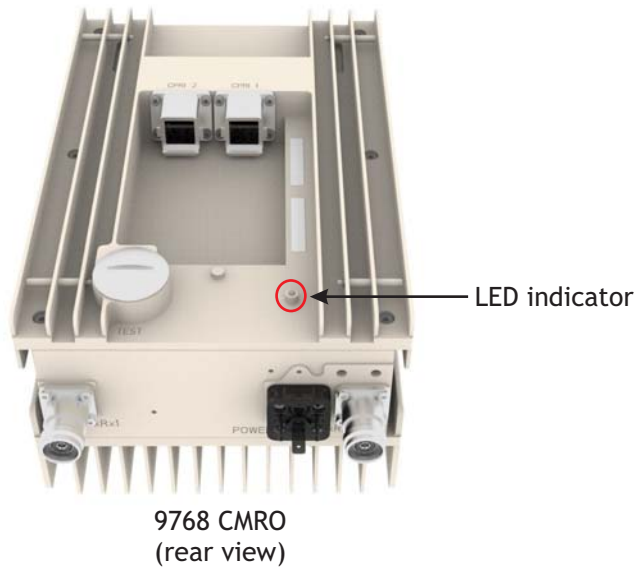
<a href="#">LED Status for 9768 CMRO</a>	<a href="#">A-2</a>
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# LED Status for 9768 CMRO

## Overview

This topic describes the LED status and descriptions for the 9768 CMRO.

**Figure A-1 LED indicator**



## LED interpretation table

On the back lower portion of the Alcatel-Lucent 9768 Compact Metro Radio Outdoor, a single visible LED provides local diagnostic indications. Note: LEDs can be used for debugging purposes during installation and commissioning. They are not intended for use during normal operation of the equipment.

**Table A-1 LED interpretations**

LED	Status	LED description
Off	No power supplied	No AC, no DC power (dead unit).
Red	Initial power On	The unit is initializing.
Flash red	External power supply failure	AC or DC input power feed is out of range.
Flash yellow	Software download	The unit is downloading software and RF transmission is off, but is currently operational.
Solid red	Non-recoverable critical failure	A critical hardware failure prevents either the transmit path or the active receive paths (or all paths) from functioning.

**Table A-1 LED interpretations (continued)**

LED	Status	LED description
Flash red	Recoverable critical failure	The unit is not currently operational due to hardware fault, but should recover (for example, Under-Temperature Warm-Up or Over-Temperature Critical Shut-down).
Solid yellow	Slave CPRI link failure	The slave CPRI link has failed.
Solid red	Non-critical non-recoverable failure	Non-critical fault (other than antenna) detected, fault is not recoverable, transmission is still on.
Flash red	Non-critical recoverable failure	Non-critical fault (other than antenna) detected, fault is recoverable, transmission is still on.
Solid green	Normal operation	No critical failures or faults, transmission is enabled.
Flash green	Stand-by	No critical failures or faults, the transmitter is disabled.
<b>Statuses for which no LED illuminates</b>		
no LED	External Antenna failure	An equipped antenna has a VSWR fault.
no LED	Background software download	A background software download is in progress, RF is currently enabled.



# Appendix B: Product conformance statements

## Overview

### Purpose

This section presents the product conformance statements that apply to the Alcatel-Lucent 9768 Metro Radio Outdoor product.

The statements that are required are determined primarily by national or multi-national regulations. However, in some regions, contract terms determine which statements are required.

The presence of the statement indicates that the product does comply with that statement wherever it is required to do so.

### Contents

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Eco-environmental statements	B-8
<b>Canadian compliance</b>	<b>B-9</b>
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# United States compliance

## Introduction

### Purpose

The statements that follow are the product conformance statements that apply to the Alcatel-Lucent 9768 Metro Radio Outdoor Product when deployed in the United States.

### Contents

<a href="#">Federal Communications Commission</a>	<a href="#">B-3</a>
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# Federal Communications Commission

## Federal Communications Commission

**Important!** Changes or modifications not expressly approved by Alcatel-Lucent, Inc. could void the user's authority to operate the 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.

## FCC Part 15 Class B

**Note:** 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 particular 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 or more 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 Part 68

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. At the upper-right-hand corner inside the cabinet assembly of this equipment is a label that contains, among other information, a product identifier in the format of AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

FIC	04DU9-1SN.
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SOC	6.0N
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The T1 network interface on this equipment is hardwired to a punchdown block, which meets the FCC specifications.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. However, if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

FCC regulations prohibit the connection of customer-provided equipment to central office implemented systems. Connection to party lines is subject to tariffs; users should contact their state public utility commission, public service commission, or corporation commission for information.

If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

If trouble is experienced with this equipment repair or warranty information may be obtained by contacting:

Technical Support Services, within the United States: +1 630 224 4762, prompt 2

---

## Product safety conformance statements

### Product safety conformance

The Alcatel-Lucent 9768 Metro Radio Outdoor is Safety Certified ITE by CSA International.

This Certification is marked on the equipment main nameplate label. Should the local Authority Having Jurisdiction (AHJ) require prior or additional verification of this Certification, a Product Certificate of Compliance can be obtained from the specific Certification Body by the Business/Product Unit Applicant for the product or by contacting:

Technical Support Services, within the United States: +1 630 224 4762, prompt 2

Any modifications to this equipment are not permitted without review and official written authorization from the specific Certification Body. Unauthorized changes may violate the Product Safety Certification. Modifications or changes authorized by official CN/CNN are assumed to have received prior approval from this Lab.

### Indoor applications

This equipment is intended for installation in restricted access locations where access is controlled or where access can only be gained by service personnel with a key or tool. Access to this equipment is restricted to qualified service personnel only.

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## Antenna exposure statements

### Antenna exposure

Antenna installations for the Alcatel-Lucent 9768 Metro Radio Outdoor product will be performed in accordance with all applicable manufacturer's recommendations, and national laws and regulations. To ensure correct antenna installation, the antenna installer will perform all necessary calculations and/or field measurements to evaluate compliance with applicable national laws or regulations regarding exposure to electromagnetic fields. The supplier of radio equipment, the supplier of antenna equipment and the integrator and builder of the site must provide sufficient information so that the limits of the exclusion zones can be determined. Any changes to the antenna or other equipment in the transmit path may require re-evaluation of the exposures to electromagnetic fields.

Pursuant to 47 CFR Part 1, Subpart I, subject to the provisions of section 1.1307, all installations must be evaluated for requirements contained in Table 1, "Limits for maximum permissible exposure," in section 1.1310.

## FDA/IEC optical transmitter product compliance statements

### FDA/IEC optical transmitter product compliance

Alcatel-Lucent declares that this equipment complies with the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) regulations 21 CFR 1040.10 and 1040.11. It is a Class I/1 laser optical fiber communication systems "product" under the FDA.

This Product is designed to ensure that personnel operating the product are not endangered by laser radiation during normal operation and fault conditions. This product does not present a risk of eye injury because it is fully enclosed and does not contain embedded lasers greater than Class I/1 unless otherwise noted.

### Laser warning



*Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.*

*Do not view directly into the laser beam with optical instruments such as a fiber microscope because viewing of laser emission in excess of Class 1 limits significantly increases the risk of eye damage.*

*Never look into the end of an exposed fiber or an open connector as long as the optical source is switched on.*

*Ensure that the optical source is switched off before disconnecting optical fiber connectors.*

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## Eco-environmental statements

### Packaging collection and recovery requirements

Countries, states, localities, or other jurisdictions may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, contact the Alcatel-Lucent Environment, Health and Safety organization or Alcatel-Lucent Hazardous Waste Center technical support at (888) 539-2783.

For installations not performed by Alcatel-Lucent, please contact the Alcatel-Lucent Customer Support Center at:

Technical Support Services, within the United States: +1 630 224 4762, prompt 2

### Material content compliance

The following notification applies to Alcatel-Lucent products distributed for sale, resale, or use.

This product, part, or both may include a lithium-manganese dioxide battery, which contains very small amounts of a perchlorate substance. Special handling may apply.

For California:

Perchlorate Material - special handling may apply.

See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>.

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# Canadian compliance

## Introduction

### Purpose

The statements that follow are the product conformance statement that apply to the Alcatel-Lucent 9768 Compact Metro Radio Outdoor when deployed in Canada.

### Contents

<a href="#">Industry Canada</a>	<a href="#">B-10</a>
<a href="#">Product safety and exposure</a>	<a href="#">B-11</a>
<a href="#">Antenna exposure statements</a>	<a href="#">B-12</a>
<a href="#">IEC optical transmitter product compliance statements</a>	<a href="#">B-13</a>
<a href="#">Eco-environmental statements</a>	<a href="#">B-14</a>

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## Industry Canada

### EMC approval

**ICES-003:** Interference-Causing Equipment Standard Digital Apparatus

The Alcatel-Lucent Metro Radio product complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



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## Product safety and exposure

### Product safety conformance

This equipment is safety certified to C22.2 No. 60950-1 for Canada by a laboratory accredited by the Standards Council of Canada (SCC), such as CSA, UL, or others. The product bears this certification mark of this certification laboratory on its main nameplate label. Should the local authority having jurisdiction (AHJ) require prior or additional verification of this certification, a product certificate of compliance can be obtained from the specific certification laboratory by the business/product unit Applicant for the product. Any modifications to this equipment are not permitted without review and written official authorization from the specific certification laboratory. Unauthorized changes may violate the product safety certification. Modifications or changes authorized by official CN/CNN are assumed to have received prior approval from this Lab.

### Human exposure

Pursuant to Health Canada Safety Code 6, Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, all installations must be evaluated against the Maximum Exposure Limits as described in Health Canada 99-EHD-237.

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## Antenna exposure statements

### Antenna exposure

Antenna installations for this equipment shall be performed in accordance with all applicable manufacturer's recommendations, and national laws and regulations. To ensure correct antenna installation, the antenna installer shall perform all necessary calculations and/or field measurements to evaluate compliance with applicable national laws or regulations regarding exposure to electromagnetic fields.

The supplier of radio equipment, the supplier of antenna equipment and the integrator and builder of the site must provide sufficient information so that the limits of the exclusion zones can be determined. Any changes to the antenna or other equipment in the transmit path may require re-evaluation of the exposures to electromagnetic fields.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 1.8 m from all persons.

Les antennes utilisées pour cet émetteur doivent être installées de façon à respecter une distance de sécurité d'au moins 1.8 m.

# IEC optical transmitter product compliance statements

## IEC optical transmitter product compliance

Alcatel-Lucent declares that this equipment complies with the International Electrotechnical Commission (IEC) standards IEC 60825-1 Edition 2.0 (2007) and IEC 60825-2 Edition 3.1 (2007). It is a Class I/1 laser optical fiber communication systems “product” under the IEC classifications.

This product is designed to ensure that personnel operating the product are not endangered by laser radiation during normal operation and fault conditions. This product does not present a risk of eye injury because it is fully enclosed and does not contain embedded lasers greater than Class I/1 unless otherwise noted.

### Laser warning



*Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.*

*Do not view directly into the laser beam with optical instruments such as a fiber microscope because viewing of laser emission in excess of Class 1 limits significantly increases the risk of eye damage.*

*Never look into the end of an exposed fiber or an open connector as long as the optical source is switched on.*

*Ensure that the optical source is switched off before disconnecting optical fiber connectors.*

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## Eco-environmental statements

### Packaging collection and recovery requirements

Countries, states, localities, or other jurisdictions may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, contact the Alcatel-Lucent Environment, Health and Safety organization or Alcatel-Lucent Hazardous Waste Center technical support at (888) 539-2783.

For installations not performed by Alcatel-Lucent, please contact the Alcatel-Lucent Customer Support Center at:

Technical Support Services, within Canada: +1 630 224 4672, prompt 2

# Glossary

This glossary provides a quick reference to the terms, acronyms, and abbreviations commonly used in the Alcatel-Lucent Metro product documentation.

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## Numerics

### 3G

Third Generation

### 3GPP

3rd Generation Partnership Project

A collaboration between groups of telecommunications associations for the promotion and standardization of high-speed cellular services.

### 5620 SAM

5620 Service Aware Manager

### 9952 WPS

9952 Wireless Provisioning System

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## A

### A (Ampere)

Base SI unit of electrical current.

SI is the International System of Units (abbreviated SI from French: Le Système international d'units).

### A-GPS

Assisted Global Positioning System

### AAA

Authentication, Authorization, and Accounting

### AC

Access Class

### AC (Alternating Current)

Continuously variable current, rising to a maximum in one direction, falling to zero, then reversing direction and repeating the cycle in the other direction.

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**AC convenience outlet**

Sites must be equipped with at least two duplex outlets for installation and maintenance procedures. The outlets are required to power test equipment and installation tools.

**ACF (AC Fail)**

The AC Fail (ACF) alarm indicates that AC input to one or more rectifiers in the power plant is absent or outside of the operating range of the equipment

**ACLR**

Adjacent Channel Leakage power Ratio

**AHJ**

The agency or authority having jurisdiction. Article 100 of the National Electrical Code (NEC) for the United States defines AHJ with greater specificity, stating that it *may be a federal, state, local government, or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department or health department, building official or electrical inspector, or others having statutory authority. In some circumstances, the property owner or his/her agent assumes the roles, and at government installations, the commanding officer or departmental official may be the AHJ.*

**Ambient temperature**

The temperature of air or other media in a designated area, particularly the area

**ANR**

Automatic Neighbor Relation

**ANSI (American National Standards Institute)**

An organization chartered to accredit standards developed by a wide variety of industry groups, without influence from any one company or organization. Does not develop standards, but reviews and implements standards developed by other organizations. ANSI is a member of the International Standards Organization (ISO).

**Antenna**

An elevated device for radiating or receiving radio waves. It changes electrical currents into electromagnetic waves, and conversely, electromagnetic waves into electrical currents.

**AP**

Access Point

**AP (Application Processor)**

Network element located at the MSC which provides the radio control logic for managing calls. The AP is a general-purpose computer that can host a number of RCS virtual machines.

**AWG (American Wire Gauge)**

American standard for classifying wire diameter.

**B backhaul**

The portion of the network connecting the base band unit (BBU) to the mobile core network.

**Backup**

Facility used to replace an element which has failed.

**Base station**

The equipment that provides the air interface that allows mobile terminals to communicate with the telecommunications network.

**BBU**

BaseBand Unit

**BD (Battery on Discharge, first stage)**

The Batteries on Discharge (BD) alarm indicates the power system output voltage has decreased below the “batteries on discharge” threshold set point. The “batteries on discharge” threshold is set for 50.0 V (for -48-VDC systems) or 25.0 V (for +24-VDC systems).

**BD-2 (Battery on Discharge-2)**

The Batteries on Discharge (BD-2) alarm indicates the power system output voltage has decreased below the “batteries on a second discharge” threshold set point. The “batteries on a second discharge” threshold is set for 44.0 V (for -48-VDC systems) or 22.0 V (for +24-VDC systems).

**BOCA**

Building Officials and Code Administrators

**Bonding**

Permanent connection of metallic parts to form an electrically conductive path that assures electrical continuity and has the capability to safely conduct any current likely to be imposed.

**Branch circuit**

The circuit conductors between the final overcurrent device protecting the circuit and the outlet.

**Breaker, circuit**

A cut-out device which breaks a circuit when preset limits of current are exceeded.

**Buried cable**

A communication cable manufactured or produced for the purpose of burial in direct contact with the earth.

**Buried ring ground**

A buried, bare, tinned, solid copper cable encircling the site building and/or tower foundation.

**Bus bar**

One or more conductors that serves as a common connection for a group of related devices.

**Busy hour**

The uninterrupted period of 60-min for which the average intensity of traffic is at maximum.

**BW**

Bandwidth

## C

**Cable run**

Referring to cable routing.

**Cable sweep**

(See Sweep)

**CAN/CSA**

Canadian Standards Association. See <http://www.csa.ca> (<http://www.csa.ca>).

**CDRH**

Center for Devices and Radiological Health

**CE**

Conformité Européene

A CE Marking on a product is a declaration from the manufacturer that the product complies with the essential requirements of the relevant European health, safety, and environmental protection legislation.

**Cell site**

An installation located within a cell that houses the equipment needed to set up and complete calls on a cellular telephone.

**CFR**

Code of Federal Regulations.

Among these regulations, Title 47, “Telecommunication,” conveys the rules of the FCC companies operating networks in the USA. See also **FCC**.

**CIC (Customer Information Center)**

Source for locating and obtaining delivery of Alcatel-Lucent customer documents.

**Circuit**

1. The complete path between two terminals over which one-way or two-way communications may be provided. 2. An electronic path between two or more points, capable of providing a number of channels. 3. A number of conductors connected together for the purpose of carrying an electrical current. 4. An electronic closed-loop path among two or more points used for signal transfer. 5. A number of electrical components, such as resistors, inductances, capacitors, transistors, and power sources connected together in one or more closed loops.

**CISPR**

The [special] international committee on radio interference. Its publication CISPR 22, Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement addresses any device that emits RF outside the scope of its intended purpose.

**CLI**

Command Line Interface



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**CMAS**

Commercial Mobile Alert System

**CMS**

Certificate Management System

**CN/CNN**

Arcane term for changes notices that affect Alcatel-Lucent products.

**Coaxial cable**

A cable with one or more coaxial pairs under one outer sheath. The cable consists of a center conductor surrounded by an insulating material and a concentric outer conductor.

**Configuration**

An arrangement of functional units according to their nature, number, and chief characteristics.

**Controlled environment**

An indoor location in which temperature, humidity, and ventilation are maintained at specific levels.

**Core**

A subset of generic requirements published by Telcordia Technologies. See also GR. The Core requirements that affect the Metro product (Radio/Cell) concern spurious emissions, surges from lightning, and resistance to wind, wind-driven rain, salt fog, and extreme ambient temperature.

**CPC**

Circular Plastic Connector

**CPRI**

Common Public Radio Interface

**CS**

Circuit Switched

**CSA**

Convergent Security Asset

**CSA (Canadian Standards Association)**

An independent, non-government, not-for-profit association for the development, by consensus, of Canadian standards and product certifications.

**CSC (Cell Site Configuration)**

Sheets provided in this document for documenting cell site configuration, conditions, and other pertinent information for reference during product deployment, and future additions.

## D

**d2U**

digital 2U-height box.

The BBU system supporting two controller and two modems. See also BBU.

**dB (decibel)**

A unit which expresses the ratio of two voltages, currents, or powers. Decibel (dB) is used to specify transmission loss, gain, or relative level. Decibel (dB) equal to 20 times the common logarithm of the ratio of two voltages or two currents, or 10 times the common logarithm of the ratio of two powers.

**dB<sub>i</sub> (decibels (dB) relative to isotropic)**

Decibels relative to an isotropic antenna gain at radio frequencies.

Antenna gain is defined as the ratio of the power produced by the antenna from a far-field source on the antenna's beam axis to the power produced by a hypothetical lossless isotropic antenna, which is equally sensitive to signals from all directions. Usually this ratio is expressed in decibels, and these units are referred to as "decibels-isotropic" (dBi).

**DC (Direct Current)**

Current flow in one direction.

**DFS**

Dynamic Frequency Selection

**DHCP**

Dynamic Host Configuration Protocol

**Diversity**

A method of radio transmission and/or reception, which counteracts the effects of fading by combining several signals all bearing the same information.

**DL**

Downlink

**DNS**

Domain Name System

**DoS**

Denial of Service

**Down conductor**

A vertical conductor of low impedance that connects the cell site grounding electrode system to the grounding electrode system.

**Driven ground rod**

A copper-clad steel or stainless steel rod, a minimum of 2.4 m (8 f) long and 5/8-in diameter.

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**DRX**  
Discontinuous Reception

**DSCP**  
Differentiated Services Code Point

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**E**     **E1**  
A four-wire voice and data trunking facility that carries 30 duplex channels in 64-kbps time slices. E1 facilities are commonly used in countries outside of North America.

**Earthquake zone**  
Seismic ratings ranging from zone 1 (relatively low central office operational shock and vibration levels) to the most severe zone 4 levels. Equipment must be able to withstand earthquake zone requirements under both operational and non-operational conditions.

**ECID**  
Enhanced Cell ID

**EEC directive**  
A law enacted by the European Union for enforcement by its Common Market. The terms of such a law have been used as a point of reference against which to compare the intentional RF emissions of the MRO.

**EIRP**  
Effective Isotropic Radiated Power

**Electrolytic ground electrode (rods)**  
A low resistance grounding rod (pipe) using low resistivity materials.

**EMS**  
Element Management System

**ESD**  
Electrostatic discharge.  
A hazard that electronic equipment such as the Metro Cell or Metro Radio can suffer by way of exposure to static electricity or proximity to something that has no connection to ground.

**ETSI**  
European Telecommunications Standards Institute

**EU**  
European Union

**Exothermic weld**  
A method of making electrical connections of copper to copper or copper to steel using high temperature fusion. The molten copper flows over conductors in a mold, melting, and welding them together.

**F**     **FA (Fuse Alarm)**  
The fuse alarm (FA) indicates that the power system battery and load protection fuse opens.

**Facility**  
Any element of physical telephone equipment needed to provide service, such as cables, switching systems, and microwave radio transmission systems.

**FCC (Federal Communications Commission)**  
A group founded in 1934 to regulate all types of communications in the United States.

**FDA**  
Food and Drug Administration

**FDD**  
Frequency Division Duplex

**Float**  
To operate a power load on a main-driven rectifier in parallel with a low impedance storage battery, which is kept fully charged by the rectifier and is itself only called upon to provide power during temporary and short-duration peaks for which the rectifier output is insufficient.

**FM**  
Fault Management

**FQDN**  
Fully Qualified Domain Name

**Frequency**  
For a periodic wave, such as alternating current, the number of complete cycles per unit of time. The unit of frequency is cycles per second, or hertz.

**fronthaul**  
The common public radio interface (CPRI) connection between a standalone remote radio head (for example: 9768 MRO, 9768 CMRO) and the base band unit (BBU).

**FRU**  
Field Replaceable Unit

**Full AXS**  
Cable connector used for CPRI connection to the Metro product (Radio/Cell).

**Fuse**  
An overcurrent protective device that has as its critical component a metal wire or strip that melts when heated by a prescribed (design) amperage, creating an open in the circuit of which it is a part, protecting the circuit from an overcurrent condition.

## G

## GA

General Availability

## Gain

The ratio of output current, voltage, or power to input current, voltage, or power, respectively. Gain is measured in dB. If the ratio is less than unity, the gain, expressed in dB, will be negative, in which case there is a loss between input and output.

**Garmin 45XLS**

A handheld GPS receiver that can be used to verify GPS reception at a cell site. It has a removable antenna and provides +5 VDC on the center pin of the RF connection to power external active antennas. If poor GPS reception is suspected, the Garmin 45XLS can be used to verify that the GPS antenna and cable system is working acceptably. It also verifies whether the GPS antenna location is acceptable.

**GE (Gig-E, GBE)**

Gigabit Ethernet

**GFCI (Ground Fault Circuit Interrupter)**

A device intended for protection of personnel that functions to de-energize a circuit or portion thereof within an established period when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

## GHz

GigaHertz

**GLONASS**

GLONASS is an acronym, which stands for Globalnaya Navigazionnaya Sputnikovaya Sistema, or Global Navigation Satellite System. GLONASS is a satellite navigation system operated by the Russia.

**GNSS**

Global Navigation Satellite System

**GPON**

Gigabit Passive Optical Network

**GPRS**

General Packet Radio Services

**GPS (Global Positioning System)**

A system of 24 satellites that provides, among other things, accurate timing information to the cell sites.

## GR

Generic requirements published by Telcordia Technologies. See also **Core**.

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**Ground**

A conducting connection between equipment or an electrical circuit and earth, or conductive body that is used in place of earth

**Grounding conductor**

A conductor used to connect equipment or a grounded electrical circuit to the grounding electrode system.

**Grounding electrode system**

The conductive objects that are intentionally bonded to furnish connection to earth (that is, buried ring ground with ground rods, electrically continuous buried metallic water pipe, electrolytic ground electrode, and so on).

**GTP**

GPRS Tunneling Protocol

**GUI**

Graphical User Interface

**Guy**

Steel wire or rope used to hold a pole upright.

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**H Handoff**

An automatic transfer of a cellular telephone call from one cell to another, maintaining call quality as the mobile user moves through the coverage area.

**HDM**

Home Device Manager

**Heat dissipation**

The heat generated by cabinets during operation.

**HPBW**

Half Power Beamwidth

**HSDPA**

High-Speed Downlink Packet Access

**HSPA**

High-Speed Packet Access

**HSUPA**

High-Speed Uplink Packet Access

**HTTP**

Hypertext Transfer Protocol

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**HV**

High Voltage

**HVAC (Heating, Ventilation, Air Conditioning)****Hz (hertz)**

A unit of frequency of a periodic process equal to one cycle per second.

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**I****I<sup>2</sup>C**

Inter-integrated Circuit

**ICNIRP**

International Commission for Non-Ionizing Radiation Protection

**IEC**

International Electrotechnical Commission. The Metro products comply with numerous standards that this independent body has propagated.

**IEEE**

Institute of Electrical and Electronics Engineers

**Indoor site**

Installation site in a controlled environment, allowing the use of indoor cabinets.

**INTR (Intrusion Alarm)**

The Intrusion (INTR) alarm indicates a door or access panel to the power system is open.

**IP**

Internet Protocol

**IPsec**

Internet Protocol Security

**IPx5**

The subset of the standard IEC 60529 to which the Metro product (Radio/Cell) conforms in its resistance to intrusion by water. Conformance to this subset means that the Metro product (Radio/Cell) withstands a 3-min test of 12.5 L/min at 30 kN/m<sup>2</sup> from 3 meters away.

**IRC**

Interference Rejection Combining

**ISM**

Industrial, Scientific, and Medical

**IT**

In an IT earthing system, the electrical distribution system has no connection to earth at all, or it has only a high impedance connection. In such systems, an insulation monitoring device is used to

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monitor the impedance.

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**L****LAN**

Local Area Network

**LC**

A small connector that terminates a fiber optic cable and snaps into its mate.

**LED**

light emitting diode

**LMT**

Local Maintenance Terminal

**Load**

The power consumed by a device or circuit in performing its function.

**Loss**

The diminution measured in dB, of signal level in a communications medium. The power measured in watts, consumed by a circuit or component. The energy dissipated without accomplishing useful work or purpose.

**IR / LR (lightRadio™)**

The Alcatel-Lucent lightRadio™ family of wireless products.

**LTE**

Long Term Evolution

**LV**

Low Voltage

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**M****MAC (address)**

Media Access Control Address

A MAC address is a hardware identification number that uniquely identifies each device on a network.

**MAC (protocol)**

Medium Access Control Protocol

The media access control (MAC) data communication protocol is a sublayer of the data link layer. MAC protocol provides addressing and channel access control mechanisms that make it possible for multiple terminals or network nodes to communicate within a multiple access network that incorporates a shared medium, for example, Ethernet.

**MCI**

Metro Cell Indoor

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<b>MCO</b>	Metro Cell Outdoor
<b>MFBI</b>	Multiple Frequency Band Indicators
<b>MGB (Main Ground Bus)</b>	A copper bus bar used to provide the electrical interfaces for connection of the isolated ground plane to the integrated ground system.
<b>MHz (Megahertz)</b>	Reference of radio frequency spectrum of one-million cycles.
<b>MIMO</b>	multiple input, multiple output An antenna technology for wireless communications in which multiple antennas are used at both the source (transmitter) and the destination (receiver).
<b>MME</b>	Mobility Management Entity
<b>MOP (Method of Procedure)</b>	Cell site walk-through where site preparation activities are verified prior to installing the 9412 eNodeB Compact equipment.
<b>MRO</b>	Metro Radio Outdoor
<b>MSC (Mobile Switching Center)</b>	In an automatic cellular mobile system, the interface between the radio system and the public switched telephone network. The MSC performs all signaling functions that are necessary to establish calls to and from mobile stations.
<b>MSP</b>	Mobile Service Provider
<b>MSP</b>	mobile service provider
<b>MTBF</b>	Mean Time Between Failure
<b>mW</b>	milliWatt

## N

**NAR**

North American Region

**NEC (National Electric Code)**

Standard that governs the use of electric wire, cable, and fixtures, and electrical and optical communication cable installed in buildings.

**NEM**

Network Element Manager

**NEMA**

National Electrical Manufacturers Association. The Metro product (Radio/Cell) qualifies as a NEMA 250-2008 standard Type 4 enclosure with respect to intrusion of dust and wind-driven rain.

**Network**

A set of terminals, the communications link that joins them, and the protocols that allow them to function together and communicate with each other.

**NFPA (National Fire Protection Association)**

Standards and code writing organization made up of volunteer industrial and institutional subject-matter-expert committees.

**NG-SEC**

Next Generation Security

**NIU (Network Interface Unit)**

A device that performs interface functions, such as code conversion, protocol conversion, and buffering, required for communications to and from a network. The device is used primarily within a local area network to allow a number of independent devices, with varying protocols, to communicate with each other. An NIU converts each device protocol into a common transmission protocol. The transmission protocol can be chosen to accommodate directly a number of the devices used within the network without the need for protocol conversion for those devices by the NIU.

**Nominal**

Specified value or intended value independent to any uncertainty in its realization. In a device that realizes a physical quantity, it is the value of such a quantity specified by the manufacturer.

**Non-Alcatel-Lucent power**

3rd- party power systems, or power systems other than Alcatel-Lucent.

**NSP**

Network Services Platform

Glossary

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- O**
- OAM (OA&M)**  
Operations, Administration, and Maintenance
  - OFDM**  
Orthogonal frequency-division multiplexing, the multi-carrier modulation scheme that overcomes many commonly experienced wireless communications problems, such as multipath and signal attenuation.
  - OLCS**  
Online Customer Support
  - OOT**  
Out Of Time alignment
  - OPS**  
On-Path Support
  - OSP**  
Outside Plant
  - OSS**  
Operation Support System
  - OTDOA**  
Observed Time Difference Of Arrival
- 

- P**
- P-GW**  
Packet Data Network Gateway
  - Pair cable**  
Cable made up of one or more separately insulated wire pairs, none of which is arranged with another quads.
  - PCI**  
Physical Cell ID
  - PD**  
Powered Device
  - PDCP**  
Packet Data Convergence Protocol, which provides security to both the air interface and the fiber optic interface of the MRO by compressing and decompressing the IP headers, as specified in the UMTS protocol stack.

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**PDU**

Power Distribution Unit

**Phase**

The number of separate voltage waves in commercial alternating current, designated as "single phase", "three-phase", and so on.

**Pigtail**

A short length of electrical conductor permanently affixed to a component, used to connect the component to another.

**PM**

Performance Management

**PMJ**

Conditions that affect service of the power system and/or require immediate attention are classified as major alarms and designated as Power Major (PMJ) alarms.

**PMN**

Conditions requiring service, but having no immediate affect on the power system output are classified as minor alarms and designated as Power Minor (PMN) alarms.

**PnP**

Plug and Play

**PoE**

Power over Ethernet

**PVC (Polyvinyl Chloride)**

A thermoplastic made of polymers, which is tough, nonflammable, and water resistant and is used as an insulation.

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**Q****QAM**

Quadrature Amplitude Modulation

**QoE**

Quality Of Experience

**QoS**

quality of service

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**R****Radiall**

The proprietary name of an enterprise that produces components for device interconnections. These components include the R2CT weatherized connector kit by which the Metro Radio installer retrofits the LC fiber optic connector on the fronthaul cable to the SFP port module of the

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Metro Radio. The proper name of this company is Radiall USA, Inc. See also SFP.

**RAN**

Radio Access Network

**RDC**

Residual Current Device

**Receive-only**

Pertaining to a device or a mode of operation capable of receiving messages, but not transmitting messages.

**RF**

Radio Frequency

**RFOA**

Ready for First Office Application

**RMS (Root Mean Square)**

Effective value of an alternative wave. For AC, RMS is numerically equal to DC value of the current with the same heating affect.

**RoHS**

Restriction of Hazardous Substances regulation

**RoW**

Rest of World

**RRH**

Remote RF head consisting of a radio, a receive filter, a transmit amplifier, and a CPRI link to a BBU. The MRO is an RRH. See also BBU and CPRI.

**Rx / RX**

Receive

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**S S-GW**

Serving Gateway

**SAR (Specific Absorption Rate)**

A measure of the rate at which energy is absorbed by the body when exposed to radio frequency energy.

**SCMS**

Small Cell Management System

**Sector**

The coverage area within the degree of directionality of the antennas.

**SeGW**

Security Gateway

**Service provider**

Customer who purchases switching and Site equipment from system vendors, which, in turn, is provided to end-user subscribers through resellers and distribution channels.

**SFP (Small Form-Factor Pluggable)**

A compact, hot-pluggable transceiver that interfaces a network device motherboard to a fiber-optic or copper networking cable to support telecommunication and data communications.

**SGMII**

Serial Gigabit Media Independent Interface

**Shield**

A housing, screen, sheath, or cover that substantially reduces the coupling of electric, magnetic, or electromagnetic fields into or out of circuits or transmission lines.

**Short-term**

No more than 96 consecutive hours or 15 days per year.

**SIMO**

Single input, multiple output. Its transmitter function uses a one antenna, and its receiver function uses two. This scheme reduces the instance of multipath and fading, in particular. Antonyms are MISO (multiple input, single output) and MIMO (multiple input, multiple output).

**Single-phase**

A circuit in which there is only one sinusoidal voltage variation.

**Site**

An installation that houses the equipment needed to set up and complete calls on a cellular telephone.

**Site preparation**

To perform the requirements necessary at the site before installation can begin.

**SLA**

Service Level Agreement

**SMG**

System Management Solution

**SON**

Self-Organizing Network

**Specific site**

The spot where the Metro product is installed in the venue. See also **Venue**.

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**SSID**

Service Set Identifier

**Stranded**

Wires twisted together to form a strong flexible cable.

**Surge protector**

Protective device used to limit surge voltages by discharging or bypassing any unwanted surge current that may enter a building or equipment.

**SW**

Software

**Sweep**

To vary the frequency of a signal over a whole band as a means of checking the response of equipment under test.

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**T****T1**

A four-wire voice and data trunking facility that carries 24 duplex channels over 56-kbps time slots.

**TCO**

Total Cost of Ownership

**THHN (Thermoplastic high-heat resistant nylon-coated)****Three-phase**

An alternating current supply with three sinusoidal voltages differing in phase by 120°.

**THWN (Thermoplastic heat and water resistant nylon-coated)****TN**

In a TN earthing system, one of the points in the generator or transformer is connected with earth, usually the star point in a three-phase system. The body of the electrical device is connected with earth by means of this earth connection at the transformer.

**TPC**

Transmit Power Control

**TRDU (Transmit Receive Duplex Unit)****TT**

In a TT earthing system, the protective earth connection of the consumer is provided by a local connection to earth, independent of any earth connection at the generator.

**Twisted pair cable**

Cable made up of one or more separately insulated twisted-wire pairs, none of which is arranged with another to form quads.

**Tx / TX**

Transmit

**TYP (Typical)****U U-NII**

Unlicensed National Information Infrastructure

**UBC**

Uniform Building Code

**UE**

User Equipment

**UL**

Uplink

**UL® (Underwriters Laboratories)**

Laboratories that test and approve materials and equipment against predetermined performance standards.

**UMTS**

Universal Mobile Telecommunications System

**UV (Ultraviolet)**

The portion of the electromagnetic spectrum in which the longest wavelength is just below the visible spectrum, extending from approximately 4 nm to approximately 400 nm. Some authorities place the lower limit of UV at values between 1 nm and 40 nm, 1-nm being the upper wavelength limit of X-rays. The 400-nm limit is the lowest visible wavelength, that is, the highest visible frequency, violet.

**V V (Volt)**

The derived SI unit of electrical potential difference. It is the difference in potential between two points of a conducting wire carrying a constant current of 1 A when the power dissipated between these two points is equal to 1 W.

**Vac (Volts Alternating Current)****V<sub>CC</sub>**

An electronics designation that refers to voltage from a power supply connected to the "collector" terminal of a bipolar transistor. Double letters "cc" refer to power supply voltages.



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**VDC (Volts Direct Current)****Venue**

The general area, such as a stadium, enterprise campus, or airport terminal.

**VLAN**

Virtual Local Area Networks

**VoLTE**

Voice over LTE

**VPN**

Virtual Private Network

**Vrms (Volts Root Mean Square)****VSWR (Voltage Standing Wave Ratio)**

In a transmission line, the ratio of maximum to minimum voltage in a standing wave pattern. The VSWR is a measure of impedance mismatch between the transmission line and its load. The higher the VSWR, the greater the mismatch. The minimum VSWR, that is, that which corresponds to a perfect impedance match, is unity.

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**W W (watts)**

The derived SI unit of power. It is equivalent to 1 j/s or 1 volt-ampere.

**W-CDMA / WCDMA**

Wideband Code Division Multiple Access

**Walk-through**

A critical examination of a design or product undertaken to ensure that it is of adequate quality.

**Waveform**

The characteristic shape of a periodic wave, determined by the frequencies present and their amplitudes and relative phases.

**WEEE**

Waste Electrical and Electronic Equipment regulation

**Wi-Fi**

Wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards. Wi-Fi is a registered trademark of the Wi-Fi Alliance.

**WICL**

Wireless Internet Command Language

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**WLAN**

Wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards. Wi-Fi is a registered trademark of the Wi-Fi Alliance.

**WMM (9471 WMM)**

The Alcatel-Lucent 9471 Wireless Mobility Manager (WMM) is the Serving GPRS Support Node and Mobility Management Entity (SGSN/MME) in the converged wireless packet core network. It performs mobility and session management signaling and packet data switching for GSM, WCDMA, and LTE access networks.

**WMM®**

Wi-Fi Multimedia™ (WMM®) is a Wi-Fi Alliance® interoperability certification, based on the IEEE 802.11e standard, providing basic QoS features to 802.11 networks. WMM, is a registered trademark of the Wi-Fi Alliance.

**WMS**

Wireless Management System

**WPS**

Wireless Provisioning System

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**X x-pol**

Cross polarization

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