

Section 2.1033(C)(3)

**USERS MANUAL**

## **USERS MANUAL**

### SECTION 2.1033(c) (3)

A copy of the installation and operating instructions to be furnished the user. A draft copy of the instructions may be submitted if the actual document is not available. The actual document shall be furnished to FCC when it becomes available.

RESPONSE: A copy of

(1) Light Radio Metro outdoor Installation Manual

is attached.



# Alcatel-Lucent 9768

lightRadio™ Metro Radio Outdoor V1.0 B13

Installation  
3MN-01751-0002-RJZZA  
September 2012

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# About this document

## Purpose

This document describes how to install the Alcatel-Lucent 9768 lightRadio™ Metro Radio Outdoor V1.0 B13 (9768 MRO) product.

## Supported systems

This document assumes that a continuous stream of connected devices already delivers secure connectivity to the public network from one or more reachable places in the venue. With this assumption, the scope of the document is only the 9768 MRO and what is required to connect it to the network, meet its power needs, and ensure that it can be placed into reliable service.

## 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.

# 1 Safety

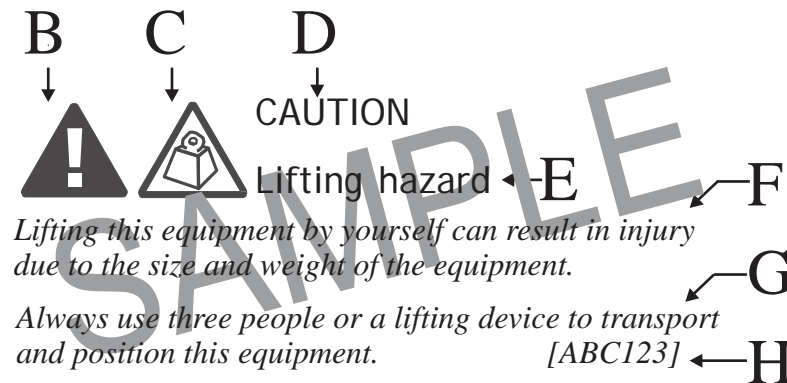
## Structure of safety statements

### 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

Item	Structure element	Purpose
7	Identifier	The reference ID of the safety statement (optional)

## Signal words

The signal words identify the hazard severity levels as follows:

Signal word	Meaning
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.*

## Specific safety hazards

### Human irradiation by RF transmissions

The Federal Communications Commission (FCC) establishes and from time to time revises guidelines for human exposure to RF electromagnetic fields in the USA. Its Office of Engineering and Technology then publishes these guidelines in bulletins to allow companies, such as Alcatel-Lucent, who develop products that transmit non-ionizing RF waves to calculate safe human exposure distances, based on a corresponding amount of time spent within those distances.

### Safe separation distance

The product complies with *RF* exposure limits of FCC Part 1.1310 Table 1 (B) Limits for General Population/Uncontrolled Exposure

The equipment must be installed and operated with a minimum separation distance as stated in the following power levels and operational modes.

**Table 1-1 RF safe distance for different power levels**

Power input to antenna	RF safe distance from antenna for SISO mode	RF safe distance from cabinet RADOM for SISO mode	RF safe distance from antenna for 2x2 MIMO mode	RF safe distance from cabinet RADOM for 2x2 MIMO mode
1000 mW	8.8" (22.34 cm)	8.3" (21 cm)	12.4" (31.6 cm)	11.9" (30.3 cm)
500 mW	6.2" (15.8 cm)	5.7" (14.5 cm)	8.8" (22.34 cm)	8.3" (21 cm)

At greater distances from the 9768 MRO, any duration of exposure is considered safe.

# 2 Metro Radio Outdoor features

## Functional features

### Air interface and carrier band

The 9768 MRO is a dual transmit/dual receive path radio supporting frequency division duplex (FDD) LTE air interface. The 9768 MRO is ideally suited to support dense metro hot spots, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

**Note:** 9768 MRO also supports a single Tx antenna (SIMO).

### Antenna characteristics

The 9768 MRO comprises an integrated dual polarized Tx/Rx panel antenna.

- Frequency of operation 746 MHz - 787 MHz

---

## Power

### Power system

The 9768 MRO requires a single phase, three-wire power source to provide nominal **120-V AC/ 208-V AC** (measured at the input), line to neutral.

The following table summarizes the color codes:

Table 2-1 AC power system wiring color codes

Color	Function
Black	Line
White	Neutral
Green	Ground / Protective earth (PE)

### Power factor

The minimum power factor (ratio of working power to apparent power) is 0.92. Although this value is above the typical power factor penalty threshold, it is unlikely to have a true impact on rates for power consumption.

### AC frequency from source

The power supply of the 9768 MRO demands frequency of 47 Hz to 63 Hz from the voltage source, at any allowable level of voltage.



## Physical properties

### Form factor

The form factor of the 9768 MRO is as shown in [Figure 2-1, “Form factor”](#) (p. 2-3).

Figure 2-1 Form factor



### Dimensions

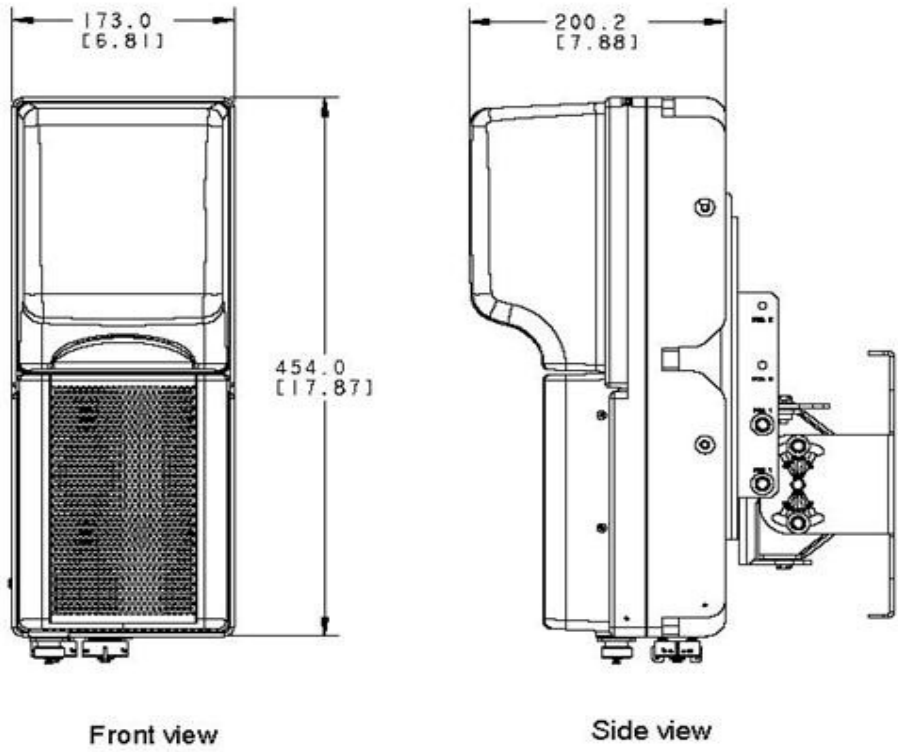
The approximate dimensions of the 9768 MRO without its mounting hardware are as follows:

- 17.9 inches (454 mm) high
- 6.8 inches (173 mm) wide
- 7.9 inches (200 mm) deep
- 13 inches (332 mm) deep with its wall-mount bracket

### Drill hole pattern

Following is an image providing a front view and side view of the drill hole pattern:

Figure 2-3 Front view and side view of the drill hole pattern



Measurements are in mm [inches].

## 3 Installing an 9768 MRO

Table 3-1 List of major components and subassemblies

CC	Description
109791186	9768 MRO B13 (700U)
849172283	Antenna, KS24844
849168794	Filter, KS24799 L5
201376472	Amplifier, BNJ888, CDY-B13 P1.1
201376480	Radio, BNJ887, NG3e-B13 P1.1
1AF24959AAAA	Power Supply Unit, LCC250-12U-4P-401 (w/ Class A conducted emissions chokes)
1AF26285AAAA	Power Supply Unit, LCC250-12U-4P-402 (w/ Class B conducted emissions chokes)

## Procedure 3-1: Installing the 9768 MRO onto a wall or pole

### Overview

This procedure includes guidelines for fastening the bracket, making the data connection, making the power connection, and rough-tuning the aim. It does not extend to bringing the 9768 MRO into operation, reading the status of the connected 9768 MRO, and optimizing its RF communications.

The 9768 MRO is designed to be installed with the right-side up orientation, as shown in the following image:

Figure 3-1 Example of 9768 MRO orientation, right-side up



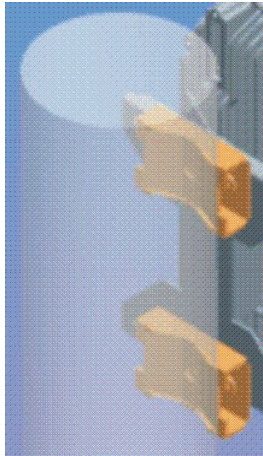
### Installing the 9768 MRO

Perform the following steps:

- 1 If this is a pole-mount installation, attach the standard RRH pole-mount hardware to the pole.

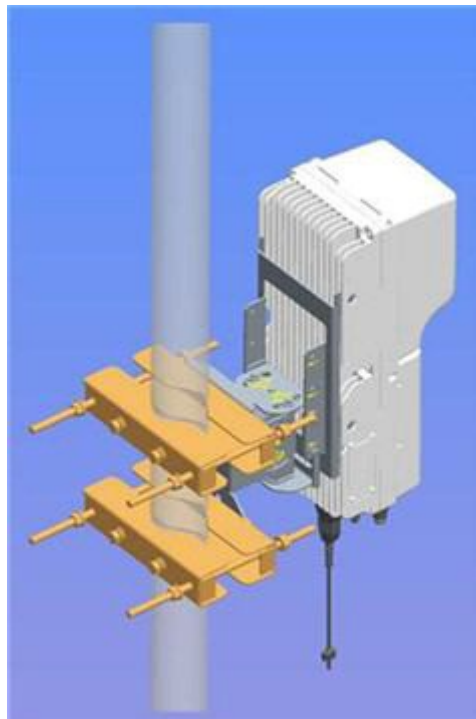
The following image shows a pole with a wider diameter (152 mm - 380 mm).

Figure 3-2 Pole-mount bracket attachment to a wide pole



The following image shows a pole with a low diameter (50 mm - 152 mm). A separate pole-mount kit is available for poles measuring between 50 mm - 152 mm.

Figure 3-3 Pole-mount bracket attachment to a small pole

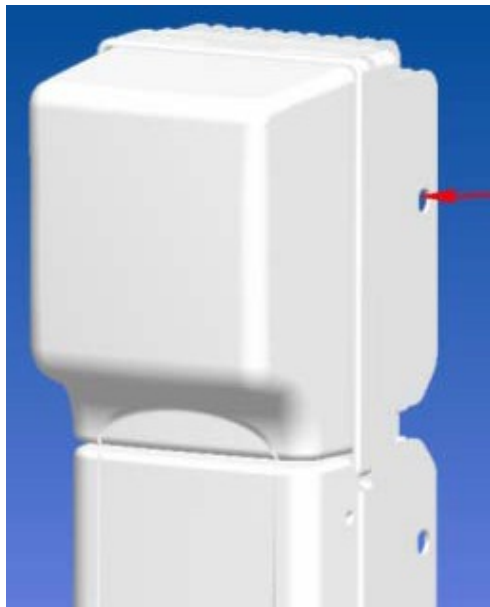


- 2 Attach the wall-mount bracket
  - to the pole-mount bracket, if this is a pole-mount installation, using M10 hardware provided with the pole mount kit.
  - to the venue wall or façade, if this is a wall-mount installation, using M10 or 3/8 hardware.

Figure 3-4 Wall-mount bracket to pole-mount bracket



Figure 3-5 Upper screws for attachment to wall-mount bracket



- 3 Push the 9768 MRO into the wall-mount bracket so that the top ears of the bracket slide

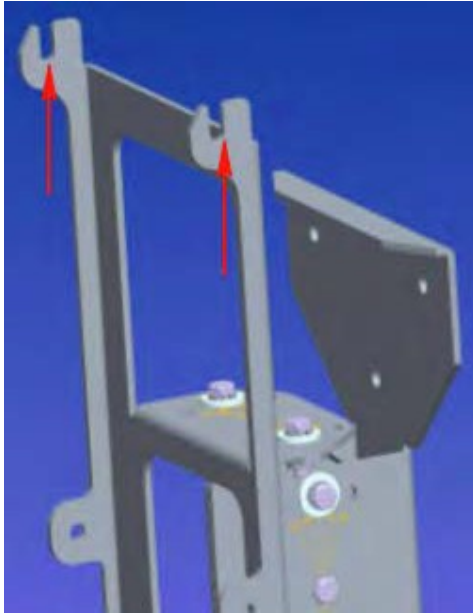
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into the slots that run along the sides of the back of the 9768 MRO.

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- 4 Slide the 9768 MRO downward until the tops of the slots in the mounting bracket ears meet the screws that you threaded into the side flanges of the 9768 MRO.

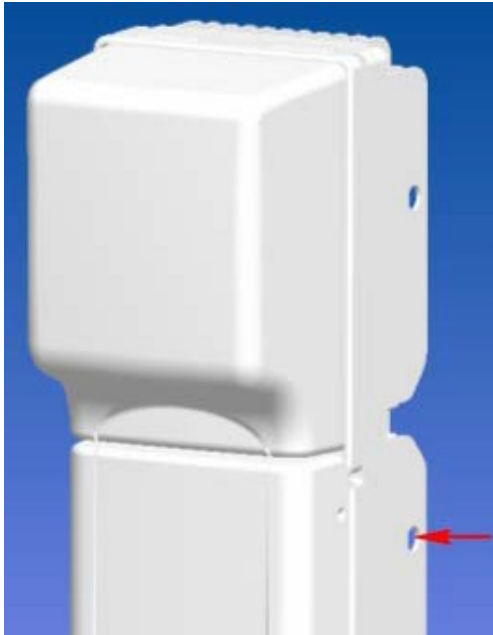
Figure 3-6 Bracket ears of the wall-mount bracket



- 5 Thread an M6x20 TR30 screw through each of the lower side flange holes
- 6 Tighten all four mounting screws.



**Figure 3-7 Lower screws for attachment to wall-mount bracket**



END OF STEPS

Powering up the device

Perform the following steps:

- 1 Test the power from the outlet of the junction box.
- 2 If power to the junction box has been shut off, turn it on.
- 3 Attach the customer-supplied waterproof plug (suitable for the supply voltage, 120-V AC, 208-V AC or 240-V AC) to the far end.
- 4 Plug the power cord into the junction box outlet.
- 5 Begin observing and noting the changes that occur in the LED indications of the 9768 MRO.
- 6 When a steady-lit green indication has been achieved, inform the commissioning and integration team that the replacement has been successfully completed.

END OF STEPS

# Appendix A: Product conformance statements

## RoHS compliance

### Statement of compliance

This product complies with EU RoHS Directive “6 of 6”, including the China version (Ref E3).

## General safety

### Statement of compliance

This product complies with CAN/CSA-C22.2 No.60950-1-07/UL-60950-1, Second Edition, *Information Technology Equipment – Safety*, Part 1: General Requirements. This covers safety requirements in the USA.

## Emissions

### Intentional radiator, statement of compliance

This product meets FCC Part 1.1310, Part 2 and FCC Part 27 requirements.

This product complies with EEC Directive 89/336/EEC for radiated emissions, which references FCC Part 15 Subpart B.

### Unintentional radiator, statement of compliance

This product complies with FCC Part 15 Subpart B, Class B radiated and power line conducted emissions limit.

This product complies with CISPR 22 for radiated emissions, Class B. This standard addresses unintentional radiators.

## Radiated interference

### Statement of compliance

In accordance with FCC rules 15. 19 this product is labeled as follows “This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference”.

This product complies with FCC Part 15 Subpart B, Class B radiated and power line conducted emissions limit.

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.

## AC power supply conformance

### IEC standard, statement of compliance

The AC power supply of this product complies with IEC 60364-1.

### Telcordia standard, statement of compliance

The AC power supply of this product complies with Telcordia GR-1089 Section 7.

# Appendix B: Other statements

## Product safety

### Safety conformance statement

The 9768 MRO is safety certified by **[Placeholder]**.

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 at (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.

## Collection and recovery

### Eco-environmental statement

**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.



# Glossary

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## A 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.*

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## B BBU

Baseband unit, the digital signal processor that connects the MRO to the network and provides the timing and logic for periodic sync signals. In this context, the BBU is the master, and the MRO is the slave. Thus, the fiber optic cable from the BBU should be connected to the *slave* port of the MRO.

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## C CAN/CSA

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

### CE Mark

The official logo that substantiates the manufacturer whose product bears it has complied with all EEC directives that apply. See also EEC directive.

### 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.

### CPRI

Common Public Radio Interface. Alcatel-Lucent was one of several major companies who participated in defining the specification for this interface between the radio (the MRO in this case) and the radio equipment controller (the BBU in this case). See also BBU.

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## D d2U

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

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**E**      **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**  
The equivalent isotropically radiated power. The density of the peak power of a radio in the direction of its greatest amount of gain. This is typically expressed in dBm, a measure relative to power out per mW.

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

---

**F**      **FCC**  
Federal Communications Commission. Its Wireless Communications Service (WCS) bureau regulates, among other services, commercial services in the upper 700-MHz frequency band in the USA.

**FDD**  
Frequency-division duplexing, a radio indexing system whose transmit and receive signals are on differing carrier frequencies.

**FRU**  
Field-replaceable unit, a designation connoting that the part can be removed in favor of a new one when diagnostic exercises seem to have isolated a fault to the part. The overall implication is that, if those exercises point to either no particular part, then the entire unit should be replaced. In the case of the MRO, the only FRUs are the SFP port modules (see also SFPs) and the whole MRO itself.

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

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**I**      **IEC**  
International Electrotechnical Commission. The MRO complies with numerous standards that this independent body has propagated.

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

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## Glossary

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**IR**

A member of the Alcatel-Lucent lightRadio™ family of wireless products. The MRO belongs to this family.

**LTE**

3GPP Long Term Evolution wireless standard for high-speed data devices. Evolution implies that the air interface has evolved from GSM/UMTS standards to an OFDM-based air interface that realizes peak rates of 300 Mbps downlink and 75 Mbps uplink at less than 5 ms latency. See also 3GPP and OFDM.

---

**O OFDM**

Orthogonal frequency-division multiplexing, the multi-carrier modulation scheme that overcomes many commonly experienced wireless communications problems, such as multipath and signal attenuation.

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**P 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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**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 MRO installer retrofits the LC fiber optic connector on the backhaul cable to the SFP port module of the MRO. The proper name of this company is Radiall USA, Inc. See also SFP.

**RoHS**

The Restriction of Hazardous Substances Directive, a law enacted by the European Union for enforcement by its Common Market in order to restrict six particular materials in electrical and electronic products. These materials are the elements lead, mercury, and cambium, and three compounds. More broadly, the standard QC 080000 propagates RoHS specifications throughout the world and thus impacts the choice of regions, nations, and states and provinces selected to regulate the same substances. The MRO is fully compliant with the RoHS directive.

**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.

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**S SFP**

A small form-factor pluggable module, which serves as the connector in the MRO for the fiber

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optic  
interfac  
e to the  
BBU.  
This  
module  
is an  
FRU.  
See also  
BBU  
and  
FRU.

**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).

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**W**

**W-CDMA**

Wideband code division multiplex air interface, used by UMTS-FDD. See also FDD.



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