EXHIBIT 4

Section 2.1033 (c)(3) INSTALLATION AND OPERATING INSTRUCTIONS

A copy of the installation and operating instructions to be furnished to 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 the FCC when it becomes available.

Response

A copy of Alcatel-Lucent **B25 RRH 4X30** Hardware Installation manual is attached to this exhibit.

Alcatel-Lucent

B25 RRH4x30

Site Preparation Guidelines

3MN-02023-0001-RJZZA

Issue 0.02 | January 2015

Alcatel·Lucent

DRAFT

Mandatory customer information

Product conformance statements can be found in Appendix D, “Product conformance statements”.

Contents

DRAFT

List of figures

DRAFT

About this document

Purpose

This document covers the basic site preparation guidelines that should be used to plan an Alcatel-Lucent Band 25 (B25) Remote Radio Head (RRH) 4x30 [Alcatel-Lucent B25 RRH4x30, part number 3JR53349AA] site. Specific tasks are outlined that should be completed at the job site before an installation can begin.

Intended audience

This document is intended for customers preparing a Alcatel-Lucent B25 RRH4x30 site.

Supported systems

The Alcatel-Lucent B25 RRH4x30 is intended to support Long Term Evolution (LTE) frequency division duplex (FDD) technology. This document applies to the LTE Release LR14.1.L and later releases.

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 paragraphs describe the conventions used in this document.

Illustrations

The illustrations shown in this document are drawings and schematics. They do not contain all details and exceptions, but are rather intended to highlight main points. Dimensions are shown in millimeters with equivalent inches in parenthesis. As an example, 680.0 (26.77) equals 680 millimeters (mm) or 26.77 inches. Tolerances shall be held to ±1.52 (0.06) and are not cumulative.

Measurement information

In this document, all parts are described as they are shipped. Metric parts are specified in metric units. Imperial system parts are specified in Imperial units.

Lengths and other measurements are given in metric units, with Imperial system units given as equivalents for use in non-metric markets.

For manufactured parts, the following system of conventions is used:

- Metric sizes of nuts, bolts, flat washers, and lock washers are identified by an uppercase letter M followed immediately by a size in millimeters (example: M10).
- Imperial fractional sizes of nuts, bolts, anchor bolts, and washers are identified by a number followed immediately by a double apostrophe (example: 3/8″). In the case of lengths measured in feet, “2 feet” is used rather than “2"’ so that the single apostrophe is not overlooked.

Wire gauges are specified in metric units. Equivalent sizes in the American Wire Gauge (AWG) system are given in the following table.

Important! The measurement in millimeters in the following table is the *cross-sectional area* of the wire.

The following table is from CEI/IEC 60947-1:2004, *Table 1, Standard cross-sections of round copper conductors and approximate relationship between mm^2 and AWG/kcmil sizes* for reference. Additional wire sizes are included in this document as appropriate for the topic.

ISO rated cross-sectional area (mm^2)	AWG/kcmil size
0.2	24
0.34	22
0.5	20
0.75	18
1	-
1.5	16
2.5	14
4	12
6	10
10	8
16	6
25	4
35	2
-	1

ISO rated cross-sectional area (mm^2)	AWG/kcmil size
50	0 (1/0)
70	00 (2/0)
95	000 (3/0)
-	0000 (4/0)
120	250 kcmil
150	300 kcmil
185	350 kcmil
–	400 kcmil
240	500 kcmil
300	600 kcmil
NOTE: The dash, when it appears, counts as a size when considering connecting capacity (see 7.1.7.2 in the standard).	

Terminology

In this document, the "Alcatel-Lucent Band 25 Remote Radio Head 4x30" product is also referred to by its abbreviated name, "Alcatel-Lucent B25 RRH4x30", and its shortened name, "B25 RRH4x30"

Related information

Base station planners and site preparation personnel must have the appropriate reference material, and all applicable local, regional and national code documentation.

A password-protected web site is available where customers can obtain the most recent information about Wireless products. That web site is the documentation downloads area of the Alcatel-Lucent customer support web site. You can access that site at the following URL:

https://wireless.support.alcatel-lucent.com/amps/rls_info/rls_doc/index.html

Alcatel-Lucent documents

The following documents are referenced in this document or include additional information relevant to the Alcatel-Lucent B25 RRH4x30.

Installation personnel should have access to the following Alcatel-Lucent documents:

- *Alcatel-Lucent B25 RRH4x30 Installation Guide,* 3MN-02023-0002-RJZZA
- *Alcatel-Lucent B25 RRH4x30 Technical Description,* 3MN-02023-0003-DEZZA

- *Alcatel-Lucent LTE FDD Remote Radio Head (RRH) Maintenance Guide - AT&T Only,* 9YZ-04152-0009-REZZA
- *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115

Other documents

The following other documents are recommended.

- *Standard for Installation of Lightning Protection Systems,* NFPA 780
- *Recommended Practices on Surge Voltages in Low Voltage AC Power Circuits,* IEEE C62.41 (latest edition)
- NEBS™ *Requirements: Physical Protection,* GR-63-CORE
- *Generic Requirements for Electronic Equipment Cabinets, Telcordia,* GR-487-CORE

Related training

Safety training in the following areas is required for personnel installing Alcatel-Lucent products and associated equipment:

- Hazard Communication
- Lift Safety
- Hoist Safety
- Lock Out/Tag Out
- Accident/Incident Reporting

Other related training is available for:

- Integration into the base station site
- Operation, administration, and maintenance (OA&M)

Site preparation checklists

Important! All site preparation activities, as well as adherence to the guidelines, should be verified prior to the installation of the base station equipment.

Various checklists and punch list sheets have been provided in Appendix A, “Site preparation checklists” of this document to aid customers and Alcatel-Lucent personnel during a base station site Method of Procedure (MOP) walk-through prior to the equipment installation.

Utilization of the checklists helps ensure a quality installation and provides a base station site history file for later reference. The punch list sheets are used to track completion of any outstanding site preparation items, and to aid in the project management of installation resources.

Base station configuration sheets

Configuration sheets are provided in Appendix B, “Site information” of this document to aid the Customer, Equipment Engineering, and Wireless Project Management during the various stages of product deployment. The configuration sheets are used to document the base station equipment configuration, conditions, and other pertinent information for reference during product deployment, and future additions. The configuration sheets should be completed during the equipment engineering phase. Reference to this information during MOP walk-through assists with completion of the site preparation checklists.

Document support

For support in using this or any other Alcatel-Lucent document, contact Alcatel-Lucent at the following telephone numbers.

From United States

- If you are using a landline, a cellular phone or VoIP, dial this number: **1-888-582-3688**

From other countries

- If you are using a cellular phone or VoIP, dial this number: **+1-630-224-2485**
- If you are using a landline (phone without a plus [+] character), replace the plus sign with your country's exit code. Dial this number: *Exit code for the country of origin*: **1-630-224-2485. See the country-specific exit codes listed** here.

These numbers apply for document support only. Please see the section “Technical support” for details about product hardware, software, and technical support.

Technical support

For technical support, contact your local Alcatel-Lucent customer support team. See the Alcatel-Lucent Support web site (http://www.alcatel-lucent.com/support/) for contact information.

How to order

To order Alcatel-Lucent documents, contact your local sales representative or use Online Customer Support (OLCS) (http://support.alcatel-lucent.com).

How to comment

Note to reviewers: The following "How to comment" text will appear in the final document when it is published. However, the feedback method described below is for use only on final documents. Please send your review comments to the author using the process you were given when you received this draft document.

To comment on this document, go to the Online Comment Form (http://infodoc.alcatel-lucent.com/comments/) or e-mail your comments to the Comments Hotline (comments@alcatel-lucent.com).

1 Safety

Overview

Purpose

This chapter presents the safety precautions that apply to the product. In regions such as North America and the European Union, 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

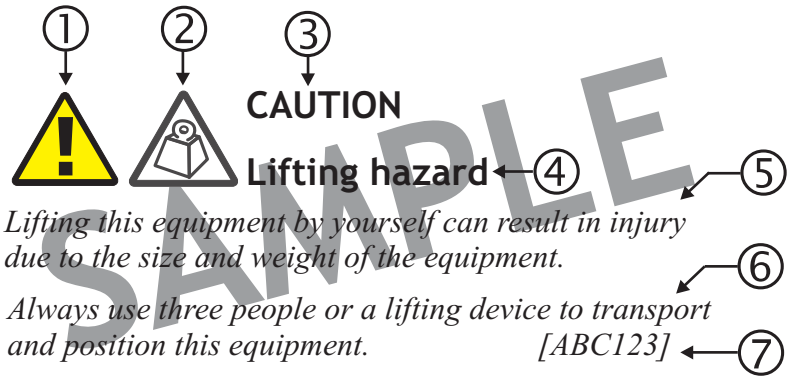
Structure of safety statements

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)

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.

Safety label

Within this document, the safety label typically includes additional information such as the hazard type, a description of the damage that can be caused, and the steps that should be taken to avoid the hazard.

Basic safety aspects

Overview

This topic covers basic safety aspects relating to the Alcatel-Lucent B25 RRH4x30 with which you must be familiar prior to installing or using the product.

General safety requirements

To reduce the risk of personal injury or damage to equipment, ensure that you read, understand, and follow the following general safety requirements prior to installing or using the Alcatel-Lucent B25 RRH4x30.

- Ensure that transport, storage, installation. and operation of the system are conducted only under specified permissible conditions. See the accompanying documentation and information on the system.
- Ensure that installation, configuration, and disassembly of the system are conducted only by *suitably* qualified personnel and with reference to the appropriate documentation. Due to the complexity of the system, personnel require special training.
- Identify potential hazards *prior to* starting the installation.
- Ensure that the system is operated only by trained and authorized users. The user must operate the system only after having read and understood the chapter on safety and the parts of the documentation relevant to operation. For complex systems, additional training is recommended. Any obligatory training for operating and service personnel must be completed and documented.
- Follow all instructions marked on the product, including both general instructions and the stated methods for avoiding hazards.
- Do not operate the system unless all appropriate safety measures, precautions, and instructions have been taken or followed. Any faults and errors that might affect safety must be reported immediately by the user to appropriate personnel responsible for safety.
- Operate the system only under the environmental conditions and with the connections described in the documentation.
- Modifications to any part of the system, including software, should be conducted only by trained and qualified personnel and only in a manner as authorized by Alcatel-Lucent. Alcatel-Lucent disclaims liability for any damages arising from unauthorized modifications, and unauthorized modifications may lead to a voiding of any and all warranties.
- Ensure that only components that are recommended by the manufacturer and are listed in the procurement documents are used.
- Avoid use of non-system software. The use or installation of non-system software can adversely affect the normal functioning of the system.

- Use only tested and virus-free data carriers (such as CD-ROMs, DVD-ROMs, USB memory sticks, SD cards, or SSD drives).
- Ensure that the removal or disabling of safety facilities, the clearance of faults, and the maintenance of equipment are carried out only by trained and qualified personnel and in conjunction with the appropriate documentation. Use only approved measuring and test equipment.
- Ensure that calibrations, special tests after repairs, and regular safety checks are conducted, documented, and archived.
- Use only specified chemicals or materials.
- Consult material safety data sheets (MSDSs) or the equivalent information when working with hazardous chemicals.
- Follow all applicable hazardous waste, electronic scrap, and take-back disposal procedures.

Personal safety

Observe the following safety instructions, which are of particular importance for your safety:

- Be familiar with evacuation plans and emergency telephone numbers.
- Ensure that first-aid kits are available.
- Wear appropriate personal protective equipment (PPE) such as safety glasses, hard hats, gloves and fall protection.
- Never wear jewelry (rings, bracelets, watches, and so on) when working on or near energized equipment.

Summary of equipment safety instructions

Observe the following safety instructions, which are of particular importance for the equipment:

- 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.
- Install only the equipment identified in the installation guide provided with the equipment. Use of the wrong installation guide may result in improper connection of circuitry, leading to fire or injury to persons.
- For information on proper cabinet mounting instructions consult the installation guide provided with the equipment.
- Operate the equipment only from the type of power source indicated on the marking label.
- Ensure that the equipment is provided with a readily accessible disconnect device as part of the building installation.

- Switch off all power supplies to the equipment before adding or removing power connections.
- Installation must include an independent frame ground to the building ground. Refer to the installation guide provided with the product.
- Ensure that the DC supply system is located within the same premises as the equipment.
- Ensure that the equipment grounding is connected directly to the DC supply system grounding electrode conductor or to a bonding jumper from a grounding terminal bar, or bus, to which the DC supply system grounding electrode conductor is connected.
- Ensure that the equipment is located in the immediate area (such as adjacent cabinets) as all other equipment connected to the grounded conductor of a common DC supply circuit. The DC system must not be grounded elsewhere.
- Ensure that no switching or disconnection devices are located in the equipment grounding conductor connected to the DC source grounding electrode conductor.

Safety - General precautions for installation procedures

Overview

The following general precautions must be observed for installation procedures.

WARNING

Personal injury hazard

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

To avoid personal injury or damage to equipment, observe the following instructions:

- *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.*
- *Never operate the equipment with grounding/bonding conductor disconnected. Grounding and circuit continuity is vital for safe operation of the equipment.*
- *The equipment must be provided with a readily accessible disconnect device as part of site preparation.*
- *This equipment is intended for installation in restricted access locations where access is controlled or where access can only be gained by service personnel.*

Safety - Specific hazards

Overview

This topic reviews specific hazards for installation.

DANGER

Laser hazard

This equipment operates with invisible laser radiation. Laser radiation can cause considerable injuries to the eyes.

Never look into the end of an exposed fiber or into an open optical connector when the optical source is switched on. Always observe the laser warning instructions.

DANGER

Electric-shock hazard

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.).

DANGER

Noxious-substance hazard

Use of unspecified cleaning agents can result in personal injury.

Use only specified cleaning agents. Never use flammable solvents.

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

DANGER

Lightning strike hazard

Lightning strikes are possible during stormy weather, and could result in death or severe injury.

Do not work on the installation itself or on the power supply lines or antenna feeders of an antenna during stormy weather.

WARNING

Electric-shock hazard

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. 70) may install or service the installation.

CAUTION

Laser hazard

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.

CAUTION

Lifting hazard

Lifting this equipment by yourself can result in injury due to the size and weight of the equipment.

Always use at least two people or a lifting device to move or position this equipment.

CAUTION

RF hazard

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

Alcatel-Lucent B25 RRH4x30s are designed and installed in order that they are compliant with the exposure guidelines laid down by 47 CFR 1.1307 to 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 operating product's antenna at a distance of less than 2.5 m and 0.6 m on each side of the antenna.

No other persons shall stay in front of the operating product's antenna at a distance of less than 8.5 m and 3 m on each side of the antenna.

Workers equipped with personal medical electronic devices, such as pacemakers and hearing aids, shall consult the manufacturer's instructions and consult their occupational health practitioner.

NOTICE

Tools hazard

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.

NOTICE

Corrosive-substance hazard

Cleaning plastic containers and lids with abrasive and aggressive cleaning agents may cause permanent damage.

Do not use solvents, paraffin, abrasive or aggressive cleaning fluids, abrasive or aggressive antiseptic agents or abrasive or aggressive materials.

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 Alcatel-Lucent B25 RRH4x30, its internal assemblies 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.

DRAFT

2 Product overview

Overview

Purpose

This chapter provides an overview of the Alcatel-Lucent B25 RRH4x30.

Contents

Functional description

Overview

The Alcatel-Lucent B25 RRH4x30 is an RRH supporting 2 Tx/4 Tx Multiple-Input, Multiple-Output (MIMO) and 4-way Rx diversity. The Alcatel-Lucent B25 RRH4x30 supports the 3GPP Release 9 bands 2 and 25 with operating bandwidths of 1850 MHz to 1915 MHz (uplink) and 1930 MHz to 1995 MHz (downlink).

Note: The 1850 MHz to 1915 MHz and 1930 MHz to 1995 MHz bands are also known as the Broadband Personal Communications Service band, or "PCS" in the United States.

Product attributes

The following list provides the product attributes for the Alcatel-Lucent B25 RRH4x30:

- Outdoor product
- Convection cooling (no fans)
- Mounting options include:
  - Pole (with mounting bracket and optional pole mounting hardware)
  - Wall (with mounting bracket and optional wall mounting hardware)
- Equipped with aesthetic solar shield
- Operating in 1.9 GHz band (PCS, 3GPP bands 2 and 25) with carrier bandwidth of 3, 5, 10, 15 or 20 MHz
  - Band 2 and carrier bandwidth of 5, 10 and 15 MHz supported in the initial release (LR14.1.L)
  - Band 25 and carrier bandwidth of 3 and 20 MHz will be supported in a future release
- Supports 2 Tx or 4 Tx MIMO transmit configuration (selectable by software)
  - 2 Tx MIMO transmit configuration supported in the initial release (LR14.1.L)
  - 4 TX MIMO transmit configuration will be supported in a future release
- Transmit power:
  - 2 Tx at 60 W each supported in the initial release (LR14.1.L)
  - 4 Tx at 30 W each will be supported in a future release

  Note: Maximum RF transmit power at any one time is 120 W.
- Supports Antenna Interface Standards Group (AISG) 2.0 antenna line devices (ALDs) [such as Remote Electrical Tilt (RET) or tower mounted amplifier (TMA)] through RS-485 or RF ports

- External interfaces (all located on the bottom side) include:
  - –48-V DC connector
  - Two Common Public Radio Interfaces (CPRI) ports

    Supports CPRI Rate 3 through 5 and is hardware ready for CPRI Rate 7
  - One AISG output port for external RET control
  - One external user alarm port for connection of up to four user alarms
  - Maintenance interface includes an externally visible multicolor alarm status LED
  - Four RF antenna ports
  - Four RF Rx monitor (RxMON) ports
  - Four RF Tx monitor (TxMON) ports
  - Chassis ground (protective earth (PE) ground)

Physical description

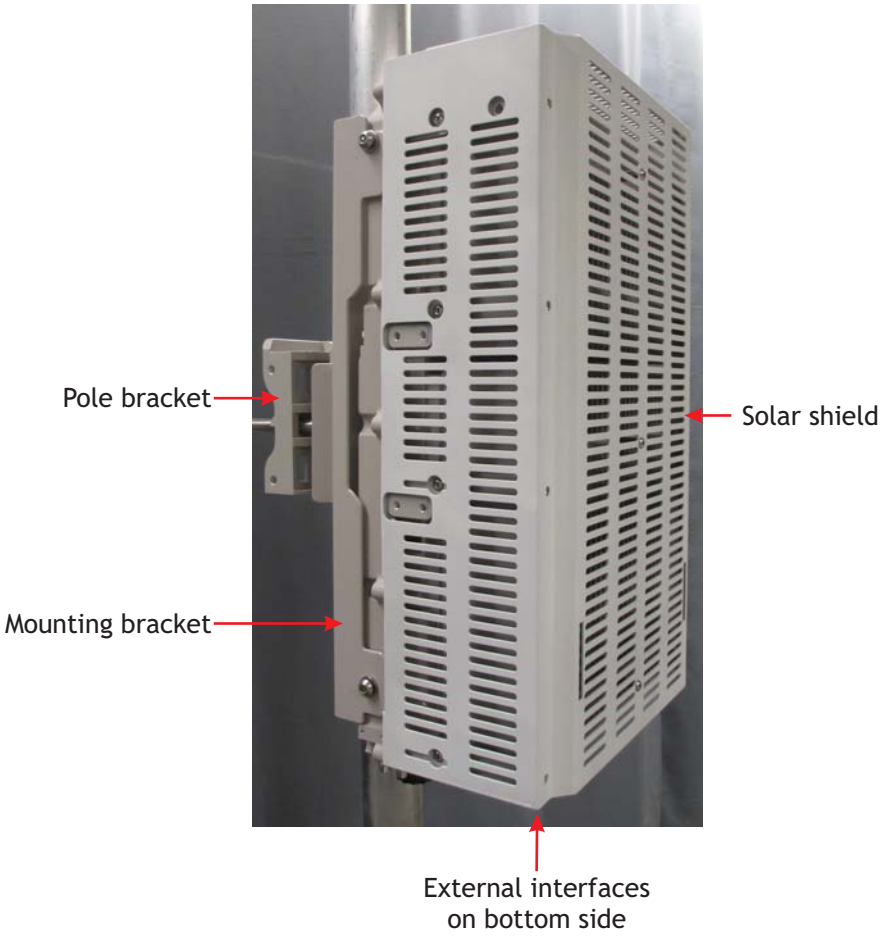
Overview

This topic provides a physical description of the Alcatel-Lucent B25 RRH4x30.

External view

The following figure shows the external view of the Alcatel-Lucent B25 RRH4x30:

Figure 2-1 Alcatel-Lucent B25 RRH4x30 external view



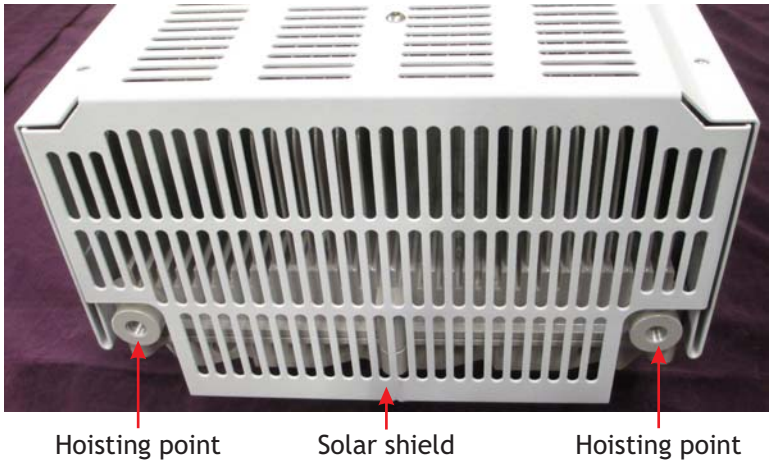
Note: The Alcatel-Lucent B25 RRH4x30 must be installed as shown, vertically oriented with the RF ports at the bottom. Upside down and horizontal mounting are not allowed.

Top view

The hoisting points are available on the top of the Alcatel-Lucent B25 RRH4x30.

The following figure shows the top view of the Alcatel-Lucent B25 RRH4x30:

Figure 2-2 Alcatel-Lucent B25 RRH4x30 top view



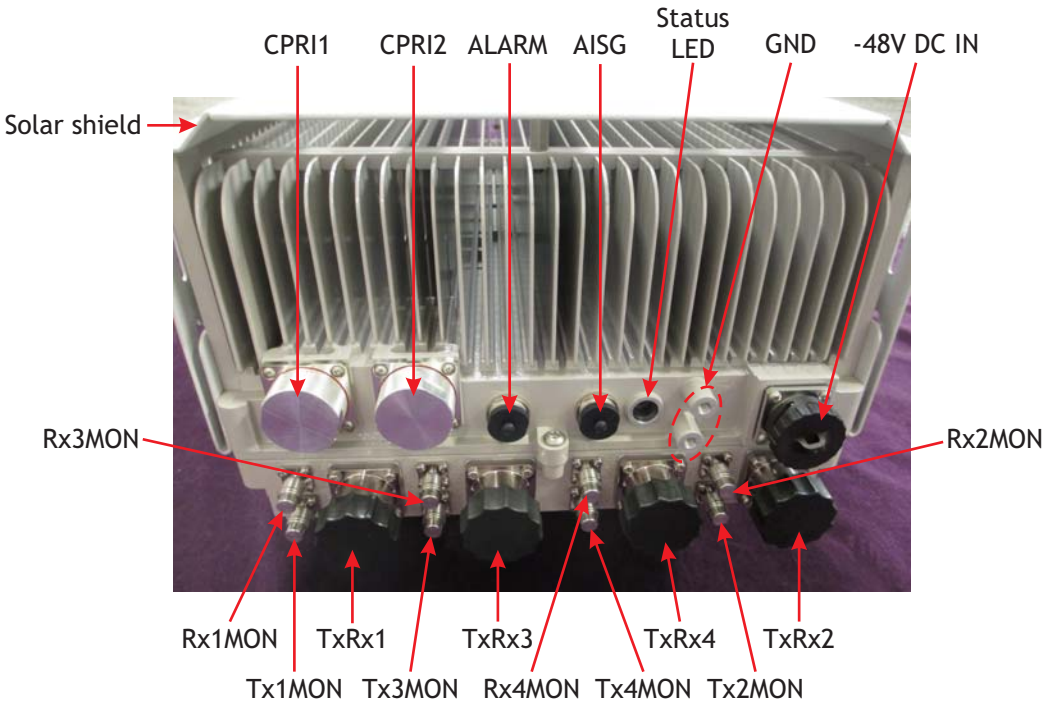
Note: Mounting bracket not shown in this figure.

Bottom view

All external customer-accessible interfaces are available on the bottom of the Alcatel-Lucent B25 RRH4x30.

The following figure shows the bottom view of the Alcatel-Lucent B25 RRH4x30:

Figure 2-3 Alcatel-Lucent B25 RRH4x30 bottom view (without solar shield)



Note: Mounting bracket not shown in this figure.

Weights and dimensions

Overview

This topic provides the Alcatel-Lucent B25 RRH4x30 weights and dimensions.

Alcatel-Lucent B25 RRH4x30 weights and dimensions

The following table provides the weight and dimensions for the Alcatel-Lucent B25 RRH4x30.

Description/Parameter	Specification[1], [2]
Height	538.5 mm (21.2 inches)
Width	304 mm (11.97 inches)
Depth	182.4 mm (7.18 inches)
Weight (without mounting hardware)	24 kg (52.9 lbs)

Notes:

1. All specifications provided are with the solar shield installed.
2. Dimensions do not include connectors or other small protrusions.

Miscellaneous hardware weights

The following table provides approximate weights for other miscellaneous hardware.

Item	Weight — kg (lbs)
Shipping box and packaging	? (?)
Carrying handle	0.1 (0.3)
Mounting bracket (used for wall and pole mounting)	2.3 (5.1)
Wall mounting kit	2.2 (4.8)
Pole mounting brackets: • Small pole mount kit • Large pole mount kit	 • 3.9 (8.6) • 2.4 (5.3)
User alarm cable	15 m (50 ft) = 1.29 (2.85) 30 m (100 ft) = 2.59 (5.7)
RF antenna cable	1.22 m (4 ft) = 0.38 (0.84) 3.66 m (12 ft) = 0.93 (2.04) 9.8 m (32 ft) = 2.29 (5.04)

Item	Weight — kg (lbs)
AISG cable	1 m (3.28 ft) = 0.09 (0.19) 5 m (16.4 ft) = 0.43 (0.95) 10 m (32.81 ft) = 0.86 (1.9) 25 m (82.02 ft) = 2.15 (4.75) 40 m (131.23 ft) = 3.45 (7.6) 50 m (164.04 ft) = 4.31 (9.5) 80 m (262.47 ft) = 6.89 (15.2)
Single mode dual fiber (SMDF) or multi mode dual fiber (MMDF) optical cable	5 m (16.4 ft) = 0.12 (0.27) 10 m (32.8 ft) = 0.24 (0.53) 15 m (50 ft) = 0.36 (0.80) 30 m (100 ft) = 0.73 (1.6) 50 m (164.04 ft) = 1.2 (2.65) 70 m (229.66 ft) = 1.68 (3.71) 85 m (278.87 ft) = 2.05 (4.51) 100 m (328.08 ft) = 2.40 (5.3) 150 m (492.12 ft) = 3.63 (8) 200 m (656.17 ft) = 4.81 (10.6) 250 m (820.21 ft) = 6.01 (13.25) 300 m (984.25 ft) = 7.26 (16)

3 External interfaces

Overview

Purpose

This chapter provides information for the external interfaces available on the Alcatel-Lucent B25 RRH4x30.

Contents

Location

Overview

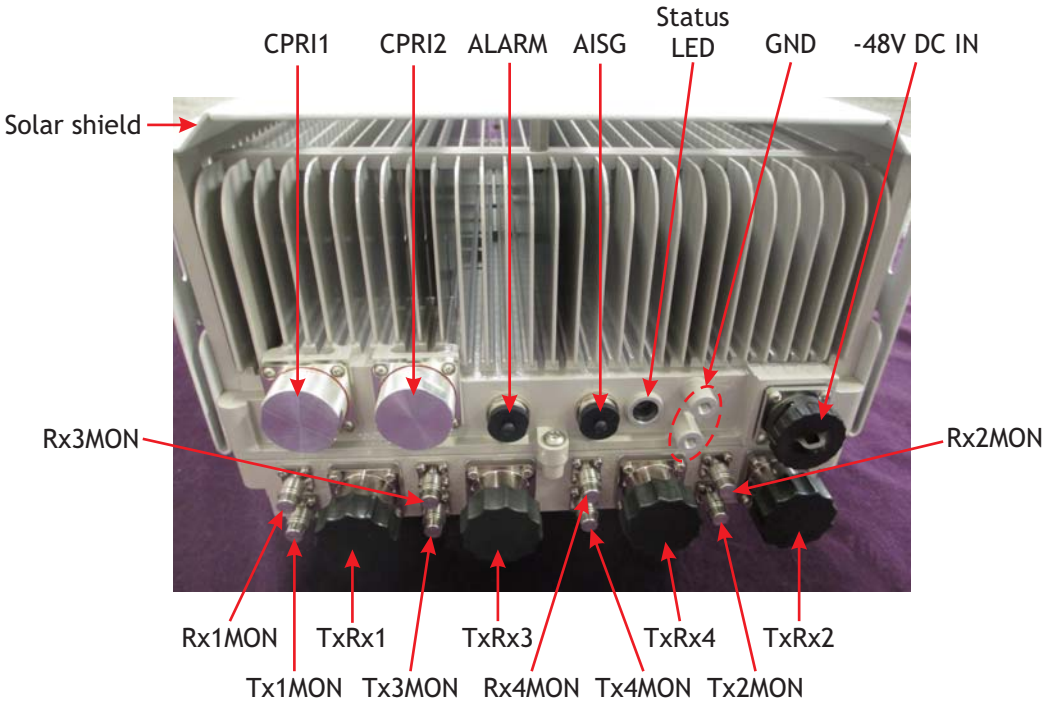
The following external interfaces are available on the bottom of the Alcatel-Lucent B25 RRH4x30:

- –48-V DC connector
- Primary (CPRI1) and secondary (CPRI2) optical ports (two total)
- One AISG output port
- One external user alarm ports
- Four RF transmit/receive (Tx/Rx) antenna ports
- Four RF receive monitor (RxMON) ports
- Four RF transmit monitor (TxMON) ports
- Chassis ground (protective earth (PE) ground)
- Alarm status LED

Physical location

The following figures show the location of the external interfaces on the Alcatel-Lucent B25 RRH4x30:

Figure 3-1 Alcatel-Lucent B25 RRH4x30 bottom side external interfaces



Note: Mounting bracket not shown in this figure.

Description

Purpose

The following paragraphs describe the external interfaces available on the Alcatel-Lucent B25 RRH4x30.

For the location of the external interfaces, see Figure 3-1, “Alcatel-Lucent B25 RRH4x30 bottom side external interfaces” (p. 3-2).

Power interface

There is one surge-protected –48-V DC connector on the bottom of the Alcatel-Lucent B25 RRH4x30.

The two-wire –48-V DC receptacle on the Alcatel-Lucent B25 RRH4x30 is Alcatel-Lucent part number (APN) 1AB435110001. The corresponding plug for the power cable is APN 1AB435070001.

The customer must provide the power cable and all required materials to route it to the Alcatel-Lucent B25 RRH4x30.

Important! To comply with the **FCC Part 15 Regulations**, a special accessory (ferrite) is required on the DC power cable. Alcatel-Lucent will provide the ferrite with the Alcatel-Lucent B25 RRH4x30. It is the responsibility of the installer to install the required ferrite supplied with the Alcatel-Lucent B25 RRH4x30.

The following table lists the ferrites approved for use with the Alcatel-Lucent B25 RRH4x30.

Ferrite APN	Outside diameter (OD)	Inside diameter (ID)	Proximity to DC connector[2]
1AB093970037	38.60 mm	18.35 mm	Adjacent
1AB093970027	56.40 mm	25.65 mm	30 mm

Notes:

1. The ferrite required depends on the outside diameter (OD) of the DC power cable.
2. Once installed, the ferrite must be secured in close proximity (as defined in the table) to the DC connector on the power cable.

CPRI interface

There are two CPRI interface ports (labeled CPRI1 and CPRI2) on the bottom of the Alcatel-Lucent B25 RRH4x30. Connections are made between these ports and an Alcatel-Lucent 9926 Base Band Unit (BBU) [Alcatel-Lucent 9926 BBU]. The CPRI1 (primary) port is connected to the Alcatel-Lucent 9926 BBU and the CPRI2 (secondary) port is reserved for future use.

The ports support CPRI Rate 3 through 5 and are hardware ready to support CPRI Rate 7.

The CPRI port connectors are SFP sockets.

Note: SFP optical transceivers and Radiall 2 Connectors to Transceiver (R2CT) weatherized connectors are not provided with the Alcatel-Lucent B25 RRH4x30. They must be ordered separately and are required for installation.

AISG interface

There is one surge-protected AISG output port on the bottom of the Alcatel-Lucent B25 RRH4x30.

The AISG output connector is an 8-pin circular DIN sockets (female pins).

Alarms interface

There is one surge-protected user alarm port on the bottom of the Alcatel-Lucent B25 RRH4x30. The user alarms port can support up to four external user alarms.

The user alarm port connectors are 8-pin circular DIN sockets.

RF antenna interface

There are four RF TxRx ports on the bottom of the Alcatel-Lucent B25 RRH4x30. Connections are made between these ports and an antenna or antennas.

The RF port connectors are 7/16 DIN coaxial sockets.

Note: Unused RF port connectors must have a 10 W load terminator installed, which are not provided with the Alcatel-Lucent B25 RRH4x30. If needed, they must be ordered separately.

Receive monitor (RxMON) interface

There are four RF RxMON ports on the bottom of the Alcatel-Lucent B25 RRH4x30. Connections are made between these ports and antenna receive monitoring equipment.

The RxMON port connectors are QMA coaxial sockets.

Transmit monitor (TxMON) interface

There are four RF TxMON ports on the bottom of the Alcatel-Lucent B25 RRH4x30. Connections are made between these ports and antenna transmit monitoring equipment.

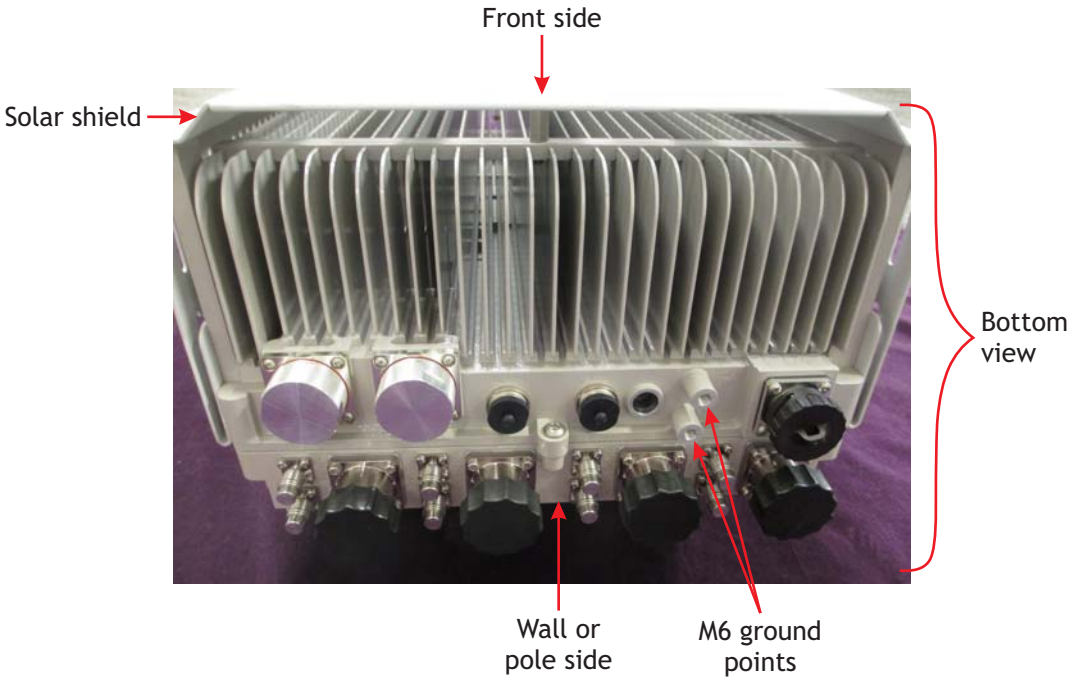
The TxMON port connectors are QMA coaxial sockets.

Ground interface

The Alcatel-Lucent B25 RRH4x30 is to be grounded via one two-hole lug. The B25 RRH4x30 has one bare metal grounding location on the bottom of the B25 RRH4x30 with two M6 tapped holes. The M6 holes are 19 mm apart and intended for use with a two-hole lug. A two-hole lug and M6 mounting screws are provided in the Warrantee Eligibility System (WES) kit (part number 301022679, also known as the ground lug kit), which must be ordered separately. The RRH outdoor grounding kit (301080628) includes a 35 mm^2 (2 AWG) ground wire, C-tap, and hardware for this connection. The RRH outdoor grounding kit is also required and must be ordered separately.

The following figure shows the location of the grounding points on the bottom of the Alcatel-Lucent B25 RRH4x30:

Figure 3-2 Alcatel-Lucent B25 RRH4x30 grounding points



Maintenance interface

There is one multicolor alarm status LED visible on the bottom of the Alcatel-Lucent B25 RRH4x30 that serves as the maintenance interface.

4 Environmental and mounting requirements

Overview

Purpose

This chapter provides the environmental and mounting requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the environmental and mounting requirements specified in this chapter.

Contents

Environmental requirements

Overview

The Alcatel-Lucent B25 RRH4x30 can only be mounted on a wall or a pole (64 mm to 115 mm (2.5 in to 4.5 in) diameter pipe). Other mounting options are currently not available. The Alcatel-Lucent B25 RRH4x30 requires certain clearance, thermal, and mechanical provisions described in this chapter.

Operating environment

The Alcatel-Lucent B25 RRH4x30 is weather-hardened, which enables it to operate in environments within the conditions described in the following table.

Condition	Specification
Operating temperature	−40°C (−40°F) to +55°C (+131°F)
Relative humidity	Except for low temperature and high temperature, 5 to 100% (condensing and high absolute humidity of 36 g/m^3)
Operating altitude	–61 m (–200 ft) to 3960 m (13,000 ft), referenced to sea level
Extended operating altitude	For altitudes between 1829 m (6000 ft) and 3960 m (13,000 ft), the maximum operating ambient temperature may be derated by 1°C for each 300 m interval above 1829 m (no temperature derating below 1829 m).
Ingress protection	IP65
Enclosure rating	NEMA Type 4
Wind driven rain	GR-487-CORE tested with MIL-STD 810G method 506.5, rainfall rate 15 cm/hour and wind 33 meter/sec
Wind speed	Rated: 150 km/hour (93 mi/h) Maximum (survival): 240 km/h (150 mi/h)
Wind load (at 150 km/h or 93 mi/h)	Frontal: less than 200 N Lateral: less than 150 N
Earthquake	Zone 4
Touchable exterior surfaces	Surface temperatures not to exceed 70°C
Corrosion resistance	Temperature Cycling/Humidity requirements per GR-487-CORE Salt Fog per GR-487-CORE, Section 3.40

Condition	Specification
Shock requirements	Refer to GR-63-CORE, Section 4.3
Storage and transportation requirements	Refer to GR-63-CORE, Section 4.1.1

Heat dissipation (maximum)

The following table provides the maximum heat dissipation for the Alcatel-Lucent B25 RRH4x30:

RRH configuration	Estimated DC heat dissipation (max.)
2 Tx/4 Rx	530 W
4 Tx/4 Rx	530 W

External clearances

Minimum clearances

The following table provides the minimum clearances recommended around the Alcatel-Lucent B25 RRH4x30.

Side	Minimum clearance[1] — mm (inches)	Comments
Front	1000 (39.4)	Installation access
Rear[2]	50 (2)	Air flow
Right	210 (8.2)	Air flow
Left	210 (8.2)	Air flow
Top	300 (11.8)	Air flow
Bottom	400 (15.7)	Cable routing

Notes:

1. Minimum clearance values are not cumulative. For example, if two RRHs are installed side by side (adjacent to each other) on a wall, the minimum distance between them must be 210 mm (not 420 mm).
2. Measured from the mounting surface to the tips of the cooling fins on the back of the Alcatel-Lucent B25 RRH4x30. For wall mounting, the rear clearance is defined by the mounting bracket and wall mounting hardware.

Mounting options

Mounting options

The Alcatel-Lucent B25 RRH4x30 can only be mounted on a wall or a pole. Other mounting options are currently not available.

The following sections describe the two options for mounting the Alcatel-Lucent B25 RRH4x30:

- Pole (with mounting bracket and optional pole mounting hardware)
- Wall (with mounting bracket and optional wall mounting hardware)

  Note: Mounting bracket part number 3JR53491AA is required for pole and wall mounting. It is not included with the Alcatel-Lucent B25 RRH4x30 and must be ordered separately.

  Important! The Alcatel-Lucent B25 RRH4x30 must be installed vertically oriented with the RF ports at the bottom. Upside down and horizontal mounting are not allowed.

Pole mount requirements

Overview

The Alcatel-Lucent B25 RRH4x30 can be mounted on poles of the following diameters using the appropriate kit:

- Small pole (52 mm to 152 mm diameter)
- Large pole (152 mm to 380 mm diameter)

Note: The mounting bracket and pole mounting hardware are not included with the Alcatel-Lucent B25 RRH4x30 and must be ordered separately.

Important! The Alcatel-Lucent B25 RRH4x30 must be installed vertically oriented with the RF ports at the bottom. Upside down and horizontal mounting are not allowed.

WARNING

Personnel injury or equipment damage

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

Before any hardware installation occurs, carefully read Chapter 1, "Safety".

Important! Various building materials and construction methods dictate that the Alcatel-Lucent B25 RRH4x30 be fastened to the pole with appropriate mounting hardware. It is the responsibility of the customer to provide any necessary support material and structures to ensure that the installation will be in compliance with the International Building Code and all local codes.

Required tools

The following tools are required and must be available on site when installing the Alcatel-Lucent B25 RRH4x30:

- Crane or hoisting device
  - Used to lift the Alcatel-Lucent B25 RRH4x30 to its installation position on the pole
- Hoisting rings or M10 eye bolts (provided by the customer)
  - Used to lift the Alcatel-Lucent B25 RRH4x30 to its installation position on the pole
  - If desired, M10 eye bolts can be ordered from Alcatel-Lucent (part number 300780434)

- Carrying handle (optional)
  - Used to manually move the Alcatel-Lucent B25 RRH4x30 once it has been removed from the shipping box
  - Carrying handle kit (part number 3BK28932AA) includes handle and mounting screws and must be ordered separately if needed

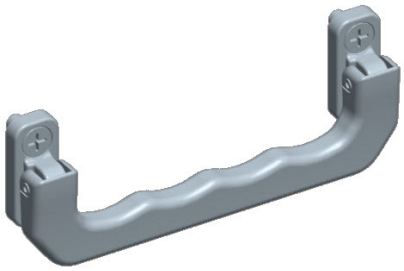
These tools are reusable and one set of these tools can be used for several Alcatel-Lucent B25 RRH4x30 installations.

Carrying handle

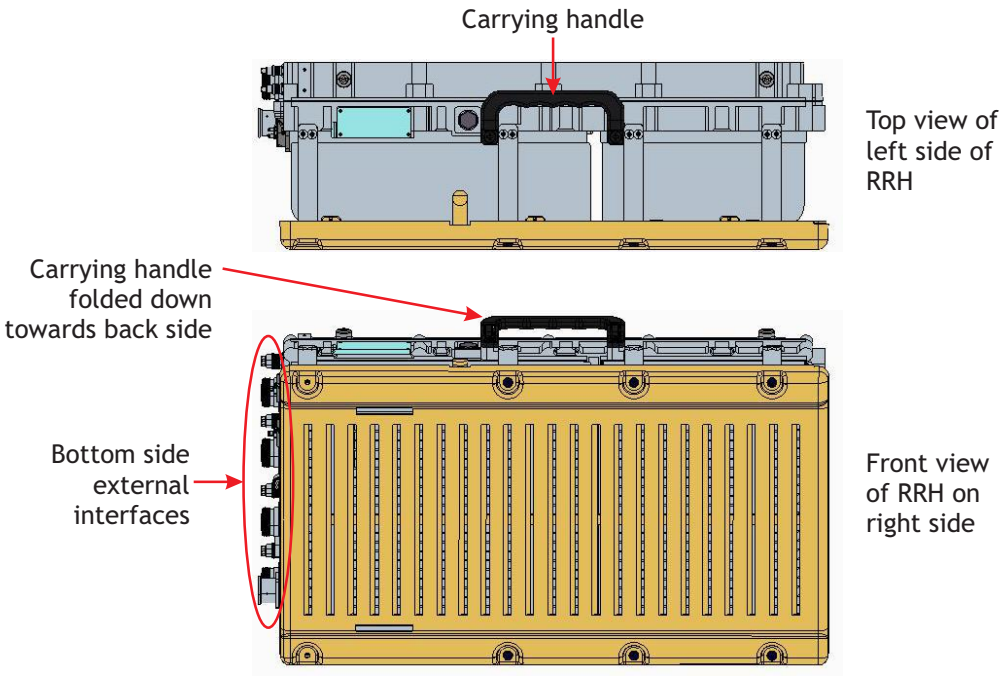
The carrying handle is used to manually move the Alcatel-Lucent B25 RRH4x30. The carrying handle is optional and must be ordered separately if needed. The carrying handle must be removed before hoisting the Alcatel-Lucent B25 RRH4x30 with hoisting rings or mounting the Alcatel-Lucent B25 RRH4x30.

Important! The carrying handle is used for manual transport (hand-carrying) only. The carrying handle must not be used for hoisting.

The following figure shows the carrying handle (part number 3BK28932AA, includes handle and mounting screws).



The following figure provides a representative view of the carrying handle attached to the Alcatel-Lucent B25 RRH4x30.



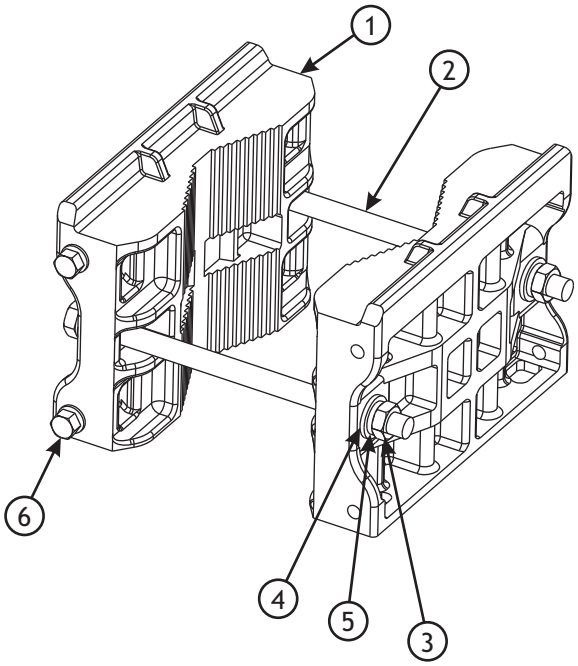
Attention: For all product-specific figures in this document, the colors depicted in the figures are for identification purposes only. The final product colors may be different.

Small pole mount kit

There is no advanced site preparation required for using the small pole mount kit other than to ensure that the intended pole is of adequate structural integrity to support the Alcatel-Lucent B25 RRH4x30 and that the pole is within the diameter range of 52 mm to 152 mm.

The small pole mount kit (3JR58710AA) includes two pole brackets and necessary assembly hardware. A spare mounting bracket kit is available for ordering and is only required if the existing mounting bracket is broken or damaged on site and requires replacement on site.

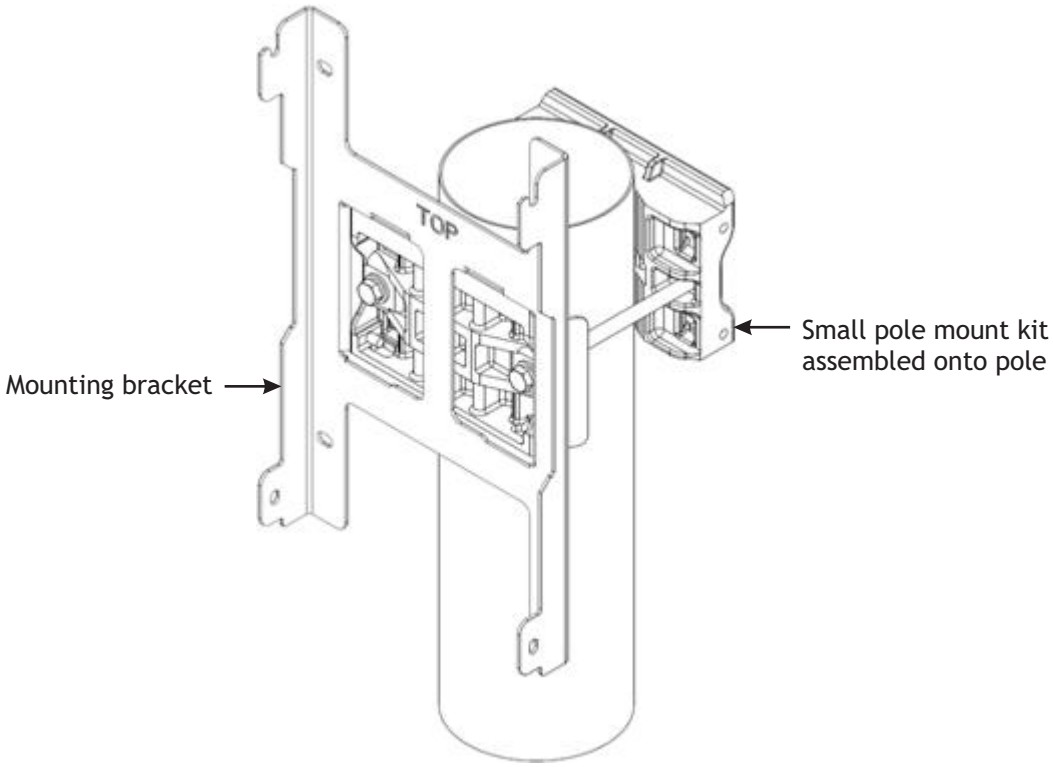
The following figure shows the small pole mount kit.



Legend:

Item	Qty.	Description
1	2	Pole bracket
2	2	Bolt, hex head, M12 × 1.75 mm x 200 mm
3	2	Nut, hex head, M12
4	2	Washer, plain, M12
5	2	Washer, spring lock washer, M12
6	4	Screw, hex washer head, M8 × 25 mm

The following figure shows the small pole mount kit assembled onto a pole with the Alcatel-Lucent B25 RRH4x30 mounting bracket attached.

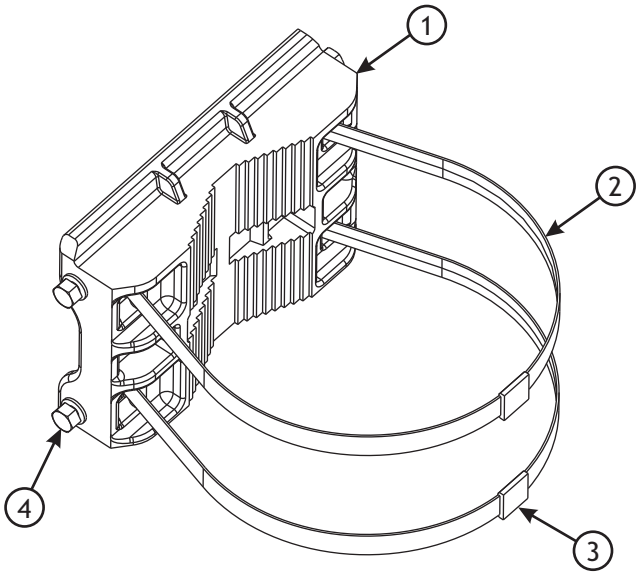


Large pole mount kit

There is no advanced site preparation required for using the large pole mount kit other than to ensure that the intended pole is of adequate structural integrity to support the Alcatel-Lucent B25 RRH4x30 and that the pole is within the diameter range of 152 mm to 380 mm.

The large pole mount kit (3JR58711AA) includes two sets of pole bands, one pole bracket, and necessary assembly hardware. A spare mounting bracket kit is available for ordering and is only required if the existing mounting bracket is broken or damaged on site and requires replacement on site.

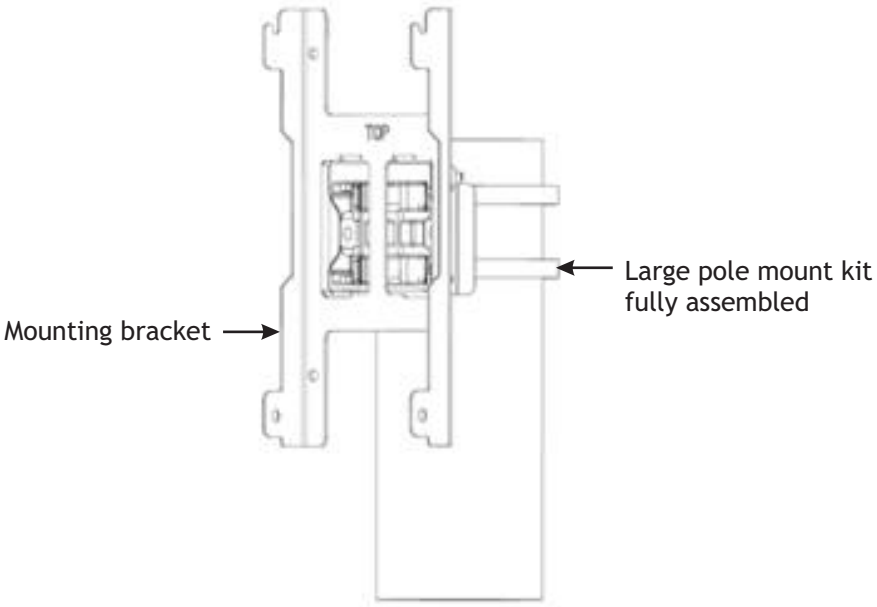
The following figure shows the large pole-mount kit.



Legend:

Item	Qty.	Description
1	1	Pole bracket
2	2	Metal band kit, 1 × 1.5 m, 3/4 inch
3	2	Bolt clamp
4	4	Screw, hex washer head, M8 × 25 mm

The following figure shows the large pole mount kit assembled onto a pole with the Alcatel-Lucent B25 RRH4x30 mounting bracket attached.



Wall mount requirements

Overview

This section describes site requirements for RRH installation on a wall.

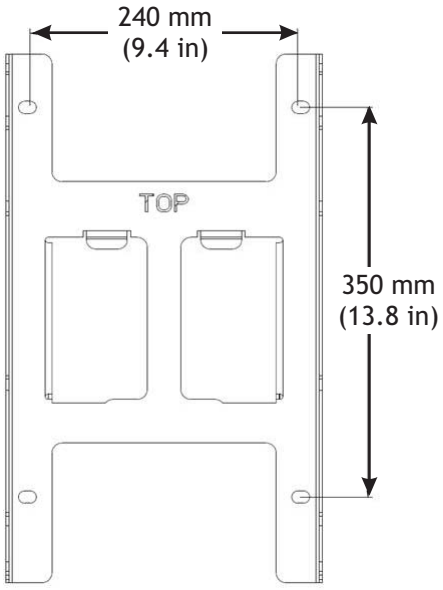
Required tools

All tools identified in "Required tools" (p. 4-6) must be available on site when installing the Alcatel-Lucent B25 RRH4x30 on a wall.

Note: The mounting bracket and wall mounting hardware are not included with the Alcatel-Lucent B25 RRH4x30 and must be ordered separately. An offset pole or pipe is not required.

Alcatel-Lucent B25 RRH4x30 mounting bracket

The following figure shows an Alcatel-Lucent B25 RRH4x30 mounting bracket (3JR53491AA).

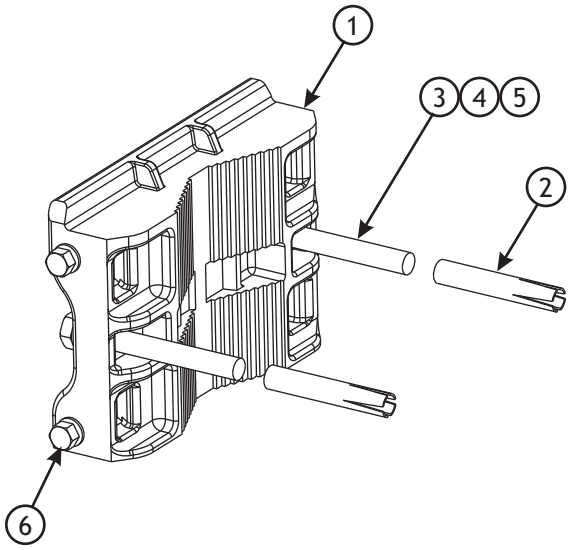


Note: All dimensions show are in millimeters with the inch equivalent dimensions shown in parenthesis.

Wall mount bracket

The wall mount kit (3JR58716AA) includes one pole bracket and necessary assembly hardware. A spare mounting bracket kit is available for ordering and is only required if the existing mounting bracket is broken or damaged on site and requires replacement on site.

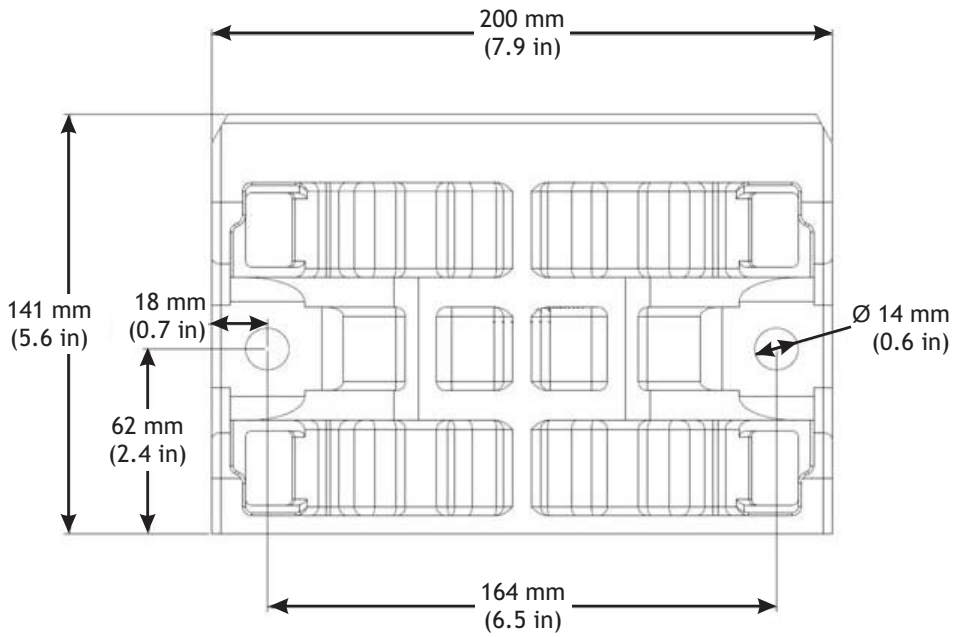
The following figure shows the wall mount kit.



Legend:

Item	Qty.	Description
1	1	Pole bracket
2	2	Plug, expansion steel, M12 × 75 mm x 200 mm
3	2	Screw, hex head, M12 × 100 mm
4	4	Washer, plain, M12
5	4	Washer, spring lock washer, M12
6	4	Screw, hex washer head, M8 × 25 mm

The following figure shows a pole bracket for the Alcatel-Lucent B25 RRH4x30.



Note: All dimensions show are in millimeters with the inch equivalent dimensions shown in brackets.

Wall mount options

WARNING

Equipment damage hazard

Damage to equipment may result.

Prior to drilling holes in a wall, consult with the customer as to the location of gas, water, and electrical pipes or conduits to minimize accidental hazard and equipment damage. Also consult with the building engineer as to local code requirements and wall loading information.

WARNING

Personnel injury or equipment damage

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

Before any hardware installation occurs, carefully read Chapter 1, "Safety".

Important! Various building materials and construction methods dictate that the Alcatel-Lucent B25 RRH4x30 be fastened to the wall with appropriate mounting hardware. It is the responsibility of the customer to provide any necessary support material and structures to ensure that the installation will be in compliance with the International Building Code and all local codes.

The Alcatel-Lucent B25 RRH4x30 can be mounted in one of two ways on a wall:

- Directly to the wall
- Indirectly using a *Unistrut*® system

Important! The Alcatel-Lucent B25 RRH4x30 must be installed vertically oriented with the RF ports at the bottom. Upside down and horizontal mounting are not allowed.

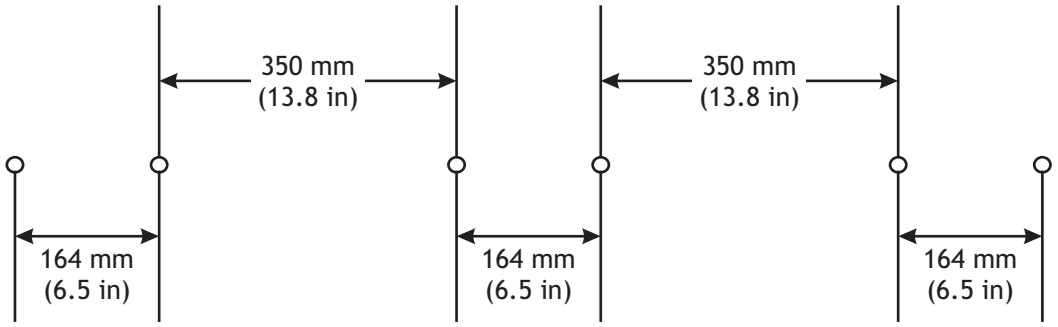
The following requirements must be met for mounting an Alcatel-Lucent B25 RRH4x30 on a wall

1. Ensure the wall is of adequate structural integrity to support the total load of all Alcatel-Lucent B25 RRH4x30s mounted on the wall.
2. It is recommended that the wall thickness be at least 100 mm.
3. The Alcatel-Lucent B25 RRH4x30 can be installed on the wall at a desired height determined by the customer provided that the minimum clearances are met (see "Minimum clearances" (p. 4-4)).

Directly to wall

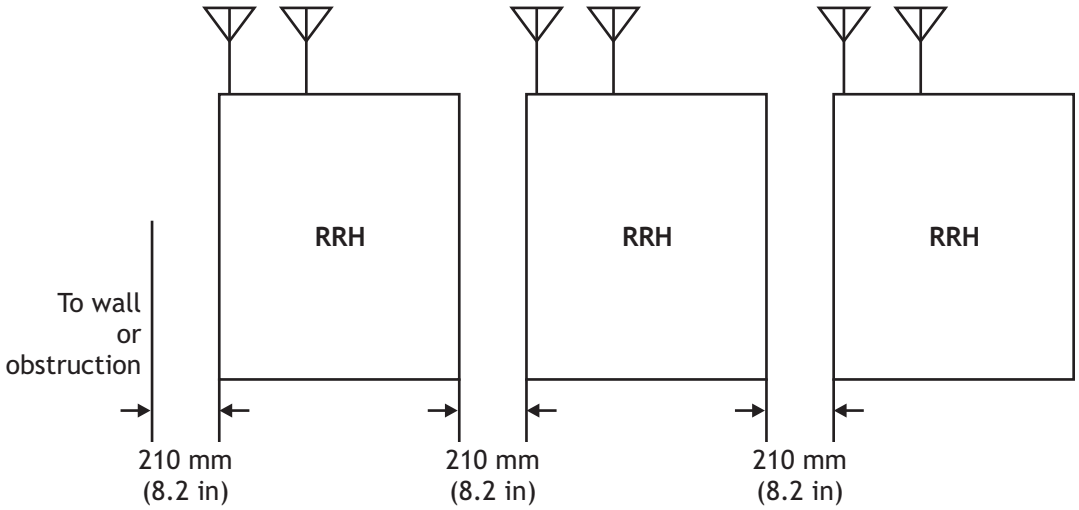
Mounting the Alcatel-Lucent B25 RRH4x30 directly to a wall requires a mounting bracket (3JR53491AA) and wall mount kit (3JR58716AA). The mounting bracket and wall mount kit are not included with the Alcatel-Lucent B25 RRH4x30 and must be ordered separately.

The following figure depicts the typical hole pattern for the required minimum clearances between adjacent wall mounted Alcatel-Lucent B25 RRH4x30s.



Note: Each pole bracket has two mounting holes 164 mm (6.5 in) apart, center to center.

This hole pattern provides the minimum 210 mm separation distance between adjacent Alcatel-Lucent B25 RRH4x30s as shown in the following figure.



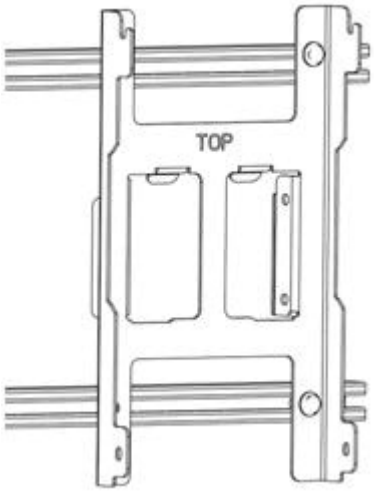
Indirectly to wall using *Unistrut®*

Mounting the Alcatel-Lucent B25 RRH4x30 directly to a wall requires a mounting bracket (3JR53491AA) and appropriate Unistrut hardware. The mounting bracket is not included with the Alcatel-Lucent B25 RRH4x30 and must be ordered separately. The customer is responsible for providing the appropriate Unistrut hardware.

The following list of Unistrut hardware is required for mounting the Alcatel-Lucent B25 RRH4x30 indirectly to a wall.

- 1.625" x 1.625" Unistrut or equivalent struts (2)
- M12 (1/2") spring nuts from the same manufacturer as the struts (4 for each Alcatel-Lucent B25 RRH4x30)
- M12 × 25 mm (1/2" × 1") long hex-head bolts (4 for each Alcatel-Lucent B25 RRH4x30)
- M12 (1/2") lock washers (4 for each Alcatel-Lucent B25 RRH4x30).
- M12 x 100 mm (4") long *Power-Stud™* (formerly called *Rawl-Stud®*) or equivalent anchor bolts for solid concrete walls (4)
- M12 (1/2") nuts (4)
- M12 (1/2") flat washers (8)

The following figure shows a Alcatel-Lucent B25 RRH4x30 mounting bracket attached to appropriate Unistrut hardware.



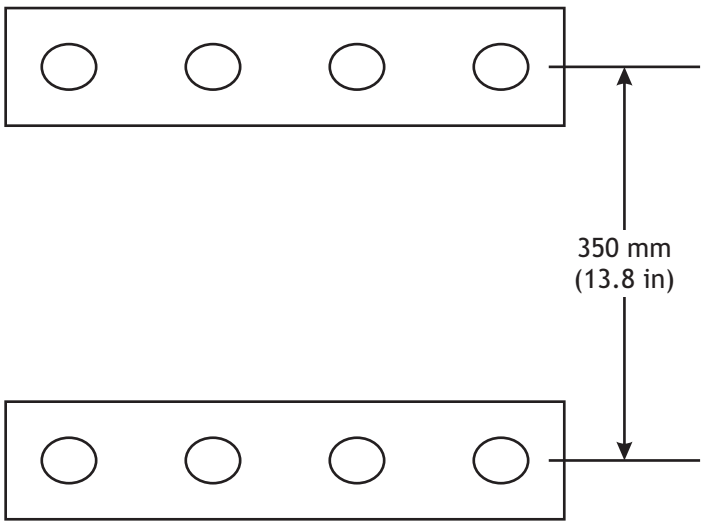
Unistrut installation procedure

Proceed as follows to install the Unistrut hardware.

1 Determine the layout of the struts that will support the Alcatel-Lucent B25 RRH4x30.

2 Place the top strut on the wall and make sure that the strut is level. Use the holes at the ends of the strut as a template to mark the positions of the holes to be drilled in the wall.

3 Place the bottom strut against the wall 350 mm (13.8 inches), measured center to center, from the top strut. Use the holes in the strut as a template to mark the positions of the holes to be drilled in the wall. See the figure below.



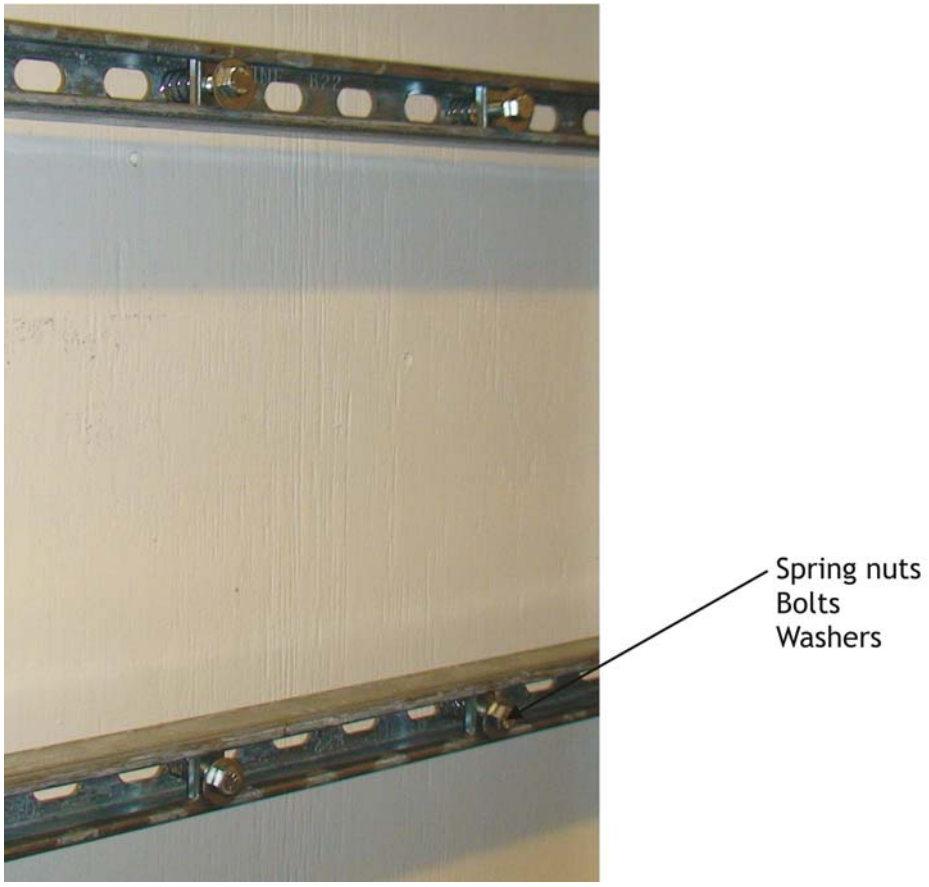
4 Drill holes in the wall at the marked positions using an appropriate concrete drill bit for selected anchor.

5 To install the top strut, place the top strut against the wall. Drive the anchor bolts into the holes of the strut until nut and washer are flush with the strut.

6 Tighten the nut to proper torque requirement.

7 Repeat Steps 5 and 6 to install the bottom strut.

8 Install a pair of M12 (1/2") spring nuts, bolts and flat washers in each Unistrut to be used during installation of the Alcatel-Lucent B25 RRH4x30.



END OF STEPS

5 Grounding requirements

Overview

Purpose

This chapter provides the grounding requirements for the Alcatel-Lucent B25 RRH4x30 and the installation site.

The installation site must meet the grounding requirements specified in this chapter.

Contents

Grounding and surge protection requirements

Grounding requirements

WARNING

Electric-shock hazard

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

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

The installation site must be grounded with an integrated (multi-point) grounding system. The equipment is susceptible to lightning surges due to its association with towers and antennas. Therefore, it is imperative that the site be properly grounded and that a low impedance path to earth (10 ohms or less) is provided. The grounding conductors must be as straight and short as possible. No sharp bends or loops are permitted in grounding conductors.

Refer to *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115, for detailed grounding requirements.

> **Note:** The figures included below show typical grounding schemes. However, for detailed requirements, refer to document 401-200-115

The equipment warranty can be voided if the guidelines detailed in the National Electric Code (NFPA 70), the Canadian Electrical Code, Part I (CSA C22.1), or the local electrical code in effect, as well as the *Standard for Installation of Lightning Protection Systems,* NFPA 780, and document 401-200-115 are not followed.

> **Important!** All grounding system material (cable, connectors, buses, and so forth) must be of high quality materials that resist deterioration and require little or no maintenance.

Outdoor grounding system

Grounding electrode system requirements

The installation site must be equipped with a grounding electrode system (that is, buried ring ground, copper clad rod, electrolytic rods, metallic water pipe, and so on). The site grounding, including all Alcatel-Lucent B25 RRH4x30 antennas and antenna cable shields, must be bonded to the grounding electrode system.

The grounding electrode system shall be installed as part of site preparation with a sufficient number of pigtails. Electrically conductive materials in the vicinity that are likely to become energized must be connected together and to the grounding electrode system in a manner that establishes an effective ground-fault current path.

Buried ground conductors must be, at a minimum, 35 mm^2 (#2 AWG) bare, solid, tinned copper wire. Exterior ground conductors must be, at a minimum, 35 mm^2 (#2 AWG) either solid, bare, tinned copper or stranded, insulated (outdoor insulation to be sunlight-resistant) copper cable.

Exothermic weld

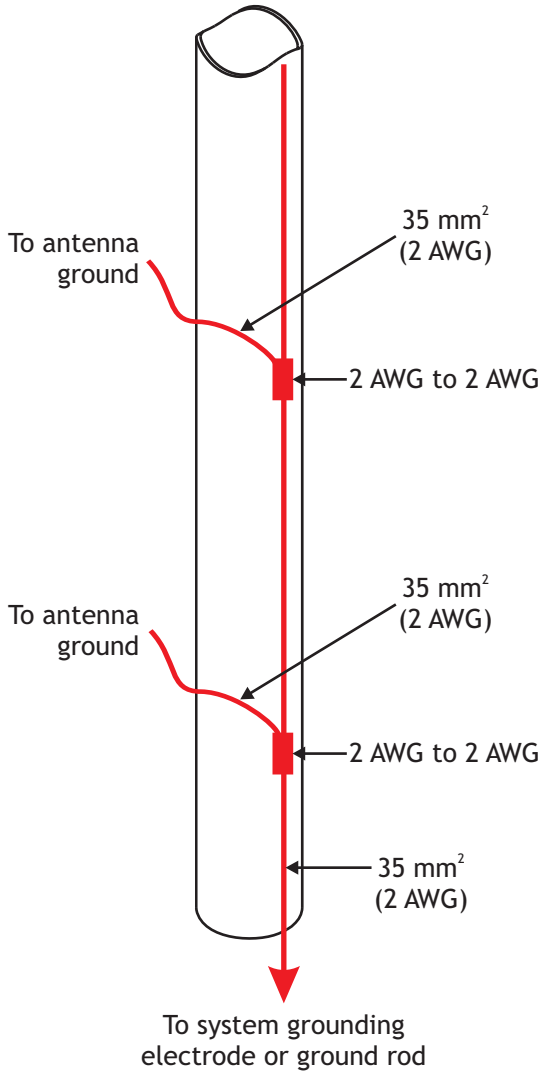
Exothermic weld is recommended for grounding connections where practical. All below-grade connections must be exothermically welded. Compression type, two-hole (0.75-inch center) lugs or double crimp “C” taps are acceptable for above-ground connections. The contact area where connections are made shall be prepared to a bare bright finish, and be coated with an anti-oxidation material before connections are made.

Grounding for pole mount configuration

When a Alcatel-Lucent B25 RRH4x30 is mounted to a pole, the site must provide a ground wire for the B25 RRH4x30. The pole must also be adequately grounded as needed. For outdoor applications #2 AWG wire is required and for indoor applications #6 AWG wire is required.

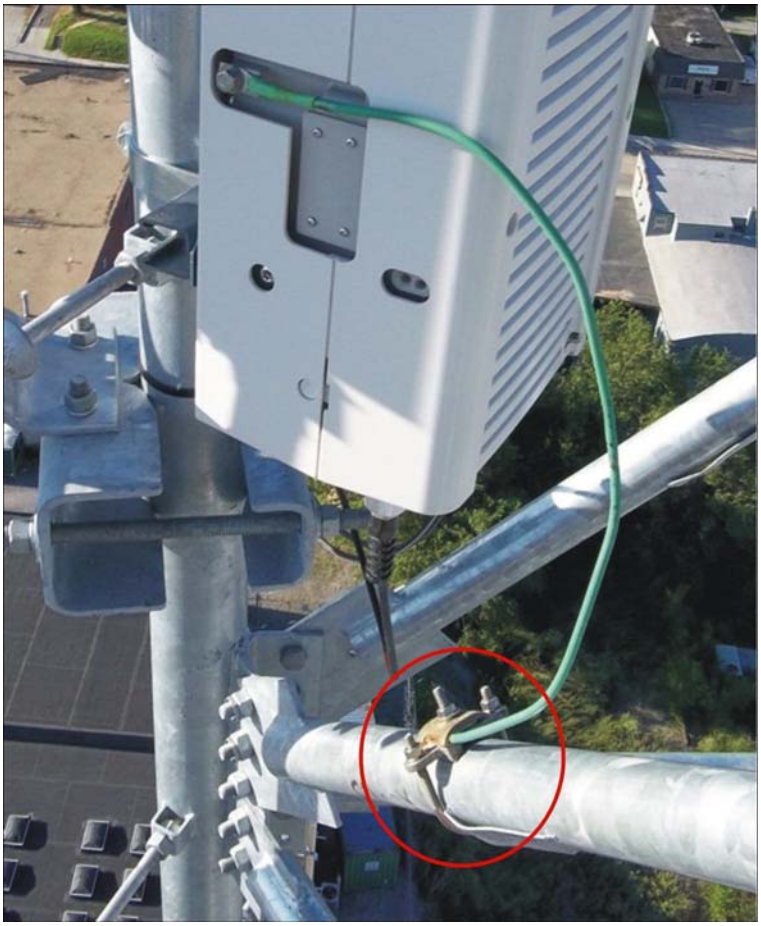
Note: Ground lugs are provided with the ground lug kit (part number 301022679) and #2 AWG ground wire, C-tap, and hardware are provided in the RRH outdoor grounding kit (part number 301080628).

The following figure shows an example of pole mount grounding.



Pole mount grounding (metal)

The clamp shown in the following picture is recommended when grounding the Alcatel-Lucent B25 RRH4x30 to a metal pole. The site shall provide clamp hardware and ground wire.



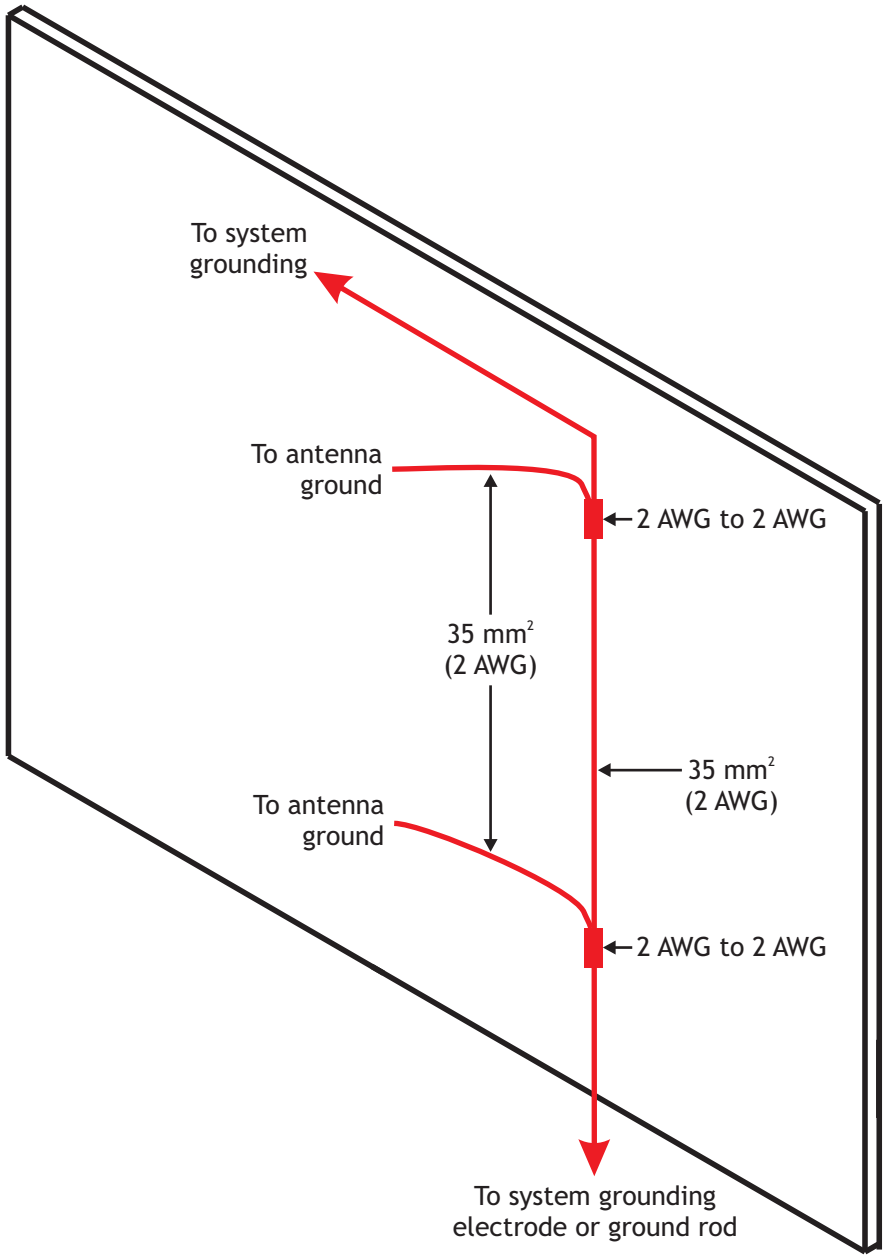
Note: This picture is provided as an example only to show a ground connection between a metal pole and a pole-mounted product. The product in this picture *is not* the Alcatel-Lucent B25 RRH4x30.

Grounding for wall mount configuration

When a Alcatel-Lucent B25 RRH4x30 is mounted to the wall, the site must provide a ground wire directly to the Alcatel-Lucent B25 RRH4x30. For outdoor applications #2 AWG wire is required and for indoor applications #6 AWG wire is required.

Note: Ground lugs are provided with the ground lug kit (part number 301022679) and #2 AWG ground wire, C-tap, and hardware are provided in the RRH outdoor grounding kit (part number 301080628).

The following figure shows an example of wall mount grounding.



6 Antenna interface

Overview

Purpose

This chapter provides the antenna interface requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the grounding requirements specified in this chapter.

Contents

General antenna cable requirements

General requirements

The customer is responsible for providing the materials and arranging for the construction of the entire RF path from the antennas to the RRH. The jumper cable (that is, the cable connecting from the RRH to the heavier antenna cable), is typically installed at the time that the RRH is installed. This includes any required grounding, surge protection, and additional equipment in the RF path. It also includes any necessary support structures from the antennas to the location of the base station. All cable runs must be appropriately supported in accordance with the connector and cable manufacturer's instructions. The appropriate type, length, and number of antenna cables should be available at the site for the start of the installation. Grounding of the antenna cable outer shield must be performed in accordance with the ground kit manufacturer's instructions.

RF antenna requirements

RF antenna connections

The Alcatel-Lucent B25 RRH4x30 has four RF antenna connectors on the bottom of the unit. The RF antenna connectors are 7/16 DIN coaxial socket connectors.

RF configurations

The Alcatel-Lucent B25 RRH4x30 supports the 3GPP Release 9 bands 2 and 25 with operating bandwidths of 1850 MHz to 1915 MHz (uplink) and 1930 MHz to 1995 MHz (downlink)

RF antenna cable requirements

Each Alcatel-Lucent B25 RRH4x30 can support a maximum of four RF antennas for a one-sector configuration with transmit/receive diversity. The RF antenna cable must satisfy the following requirements:

- The antenna cables are to be protected by a cable duct or protective cable pipes if required by local safety code.
- Alcatel-Lucent RF antenna cables are provided with a DIN 7/16 plug termination at one end and a loose DIN 7/16 plug for the other end. The cable should be cut to the correct size based on site requirements.
- All antenna cable runs must be appropriately supported in accordance with the connector and cable manufacturer's instructions.
- Antenna and cable sweeps must be performed prior to the start of the installation.
- The customer has the option to use an Alcatel-Lucent provided antenna cable (sometimes referred to as jumper cables).

RF antenna cable lengths

The Alcatel-Lucent antenna cable lengths are listed below.

Cable lengths (NAR market)

The following antenna cable lengths are available for the NAR market:

- 1.22 m (4 ft)
- 3.66 m (12 ft)
- 9.8 m (32 ft)

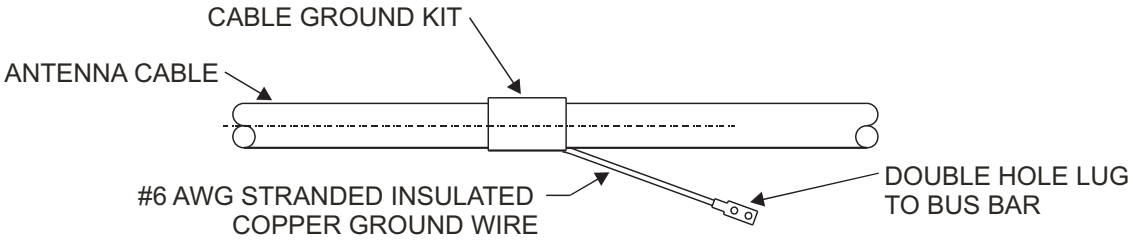
Note: If the distance between the RRH and the antenna is longer than the RF antenna cables provided by Alcatel-Lucent, and/or if the customer selects the optional surge suppressor, then the customer will provide the additional cables which must have a DIN 7/16 plug termination at one end, and a DIN 7/16 socket termination at the opposite end. All customer provided DIN 7/16 connectors must be at least IP67 rated.

Antenna cable grounding and optional surge suppression

Overview

The following paragraphs specify the requirements for grounding of the RF antenna cables and the addition of optional surge suppression. For more information on antenna grounding, refer to *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

The following diagram shows a typical method for connecting an antenna jumper cable.



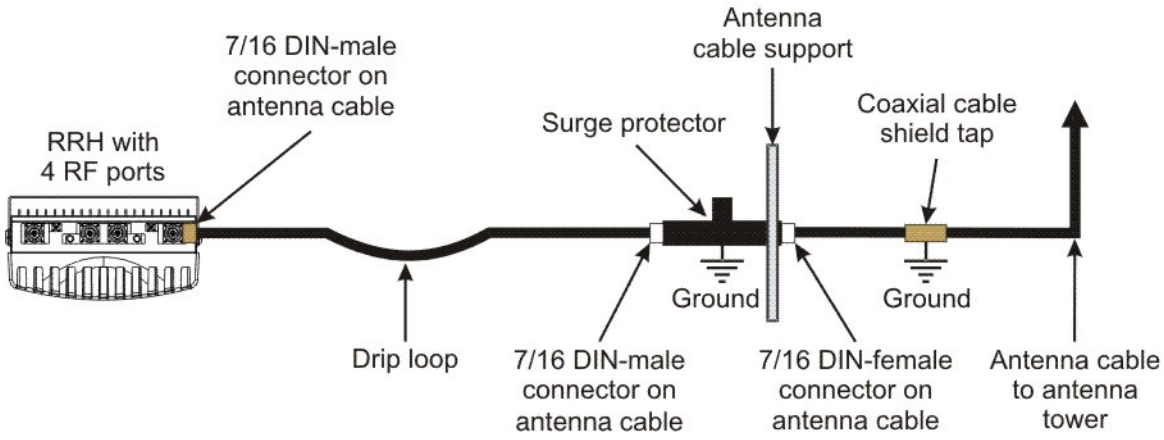
Optional surge suppression requirements

The RF path of the Alcatel-Lucent B25 RRH4x30 is equipped with an internal surge protector; external surge suppression is optional and may be installed between each antenna coaxial cable and jumper cable. They can be obtained from Alcatel-Lucent (KS24577, L-9A for RF), or an Alcatel-Lucent-approved equivalent can be used. The surge protectors must be bonded to a nearby ground bus bar that is connected directly to the grounding electrode system.

Important! All surge protectors must be at least IP67 rated. (IP67 rating requirement, as defined by IEC 60529, calls for total protection against dust and protection against submersion in water.)

Outdoor requirements (long cable runs)

The following diagram shows an overview of the RF antenna connections for long cable runs.

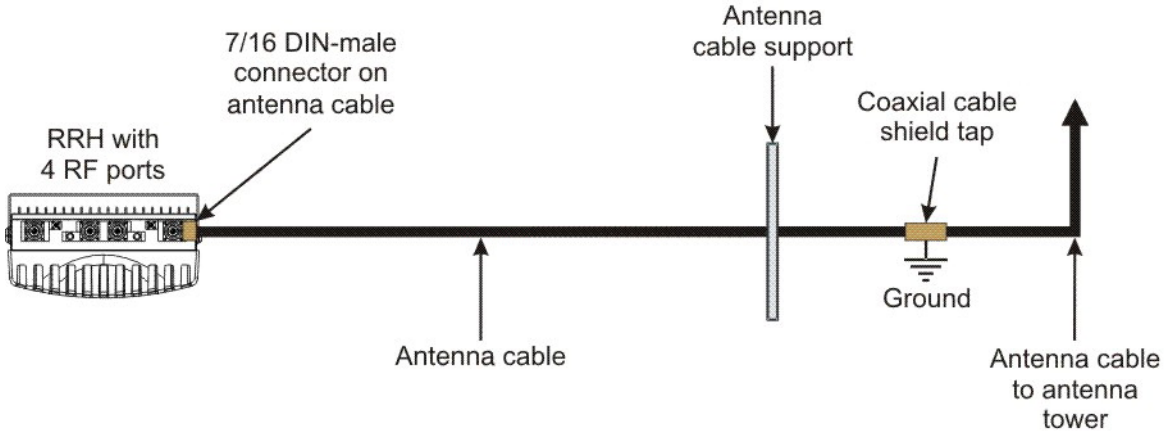


The following list specifies outdoor requirements for long cable runs:

- If cable length between the RRH and the antenna is comprised of a jumper and any other length of antenna cable, then the cable must be grounded at the antenna, and at the transition point between the two cables. Additionally the cable span must be grounded every 30 meters.
- External surge suppression between the cable segments and/or directly to the Alcatel-Lucent B25 RRH4x30 is optional.

Outdoor requirements (short cable runs)

The following diagram shows an overview of the RF antenna connections for short cable runs.



The following list specifies outdoor requirements for short antenna cable runs:

- If the cable length between the RRH and the antenna is 32 ft or less, then grounding of the antenna cable is optional.
- External surge suppression is also optional and can be mounted directly to the Alcatel-Lucent B25 RRH4x30.

  Note: If an AISG Bias Tee device will be installed and surge protection is desired, then only a hybrid surge protector is required on the path with the Bias Tee.

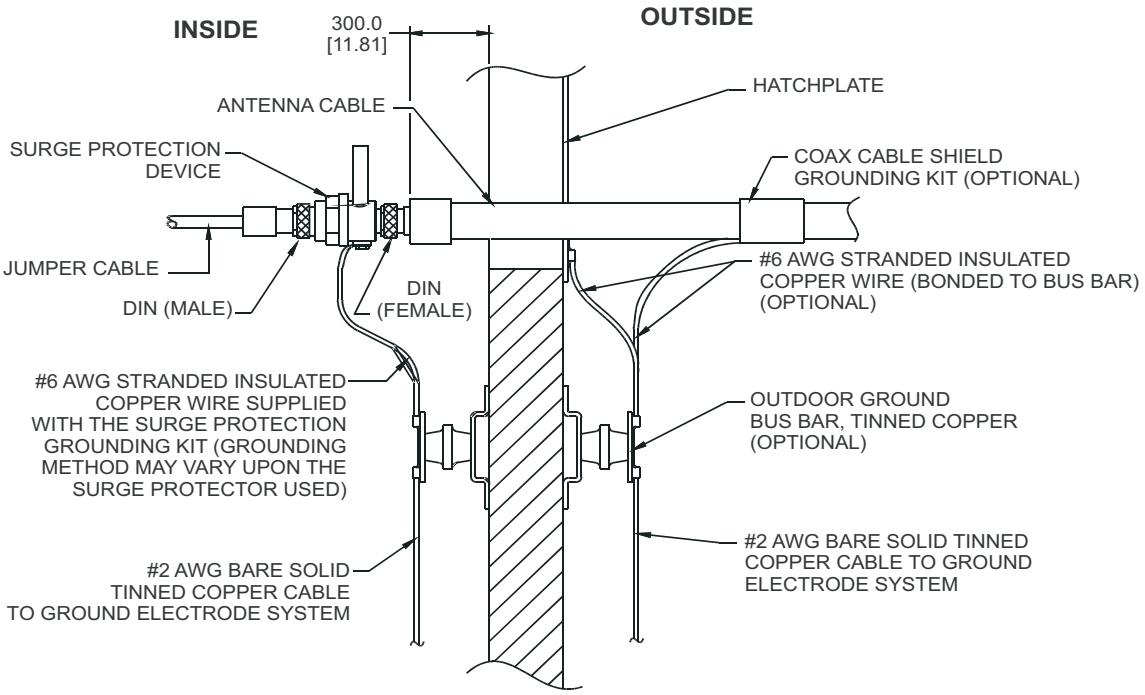
Indoor requirements

The following list indoor requirements for the antenna cable runs.

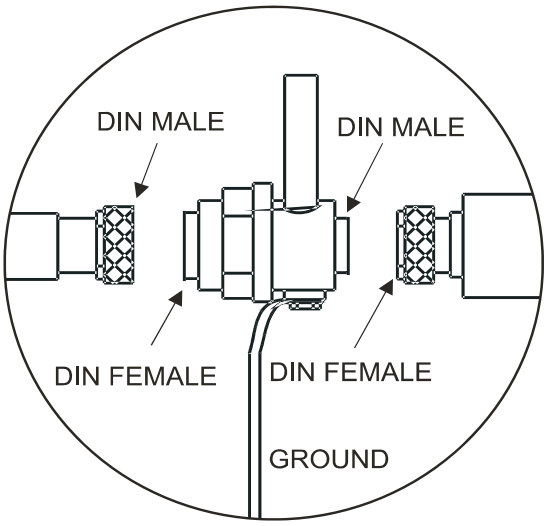
- The cable must be grounded at the antenna, at any transition points between cables outside of the building, and at the entrance to the building; additionally the cable span must be grounded every 30 meters.
- External surge suppression at the hatchplate is recommended. Refer to the figure below.

  Note: If an AISG Bias Tee device will be installed and surge protection is desired, then only a hybrid surge protector is required on the path with the Bias Tee.

The following diagram shows a typical surge protector installation and grounding.



SURGE PROTECTOR DETAIL



7 CPRI Interface

Overview

Purpose

This chapter provides the CPRI interface requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the CPRI interface requirements specified in this chapter.

Contents

Common Public Radio Interface (CPRI) configuration

CPRI connection options

Fiber optic cables and any fiber splice/management boxes are typically installed during the base station installation and are routed to the location of the baseband equipment.

The Common Public Radio Interface (CPRI) of the Alcatel-Lucent B25 RRH4x30 can be connected in two different ways to the Alcatel-Lucent 9926 BBU:

- Star configuration
- Daisy chain configuration (future)

Note: Alcatel-Lucent fiber lengths are offered in lengths between 5 m and 300 m. If additional length is required, then a fiber splice/management box is required and must be provided by the customer.

Fiber optic requirements

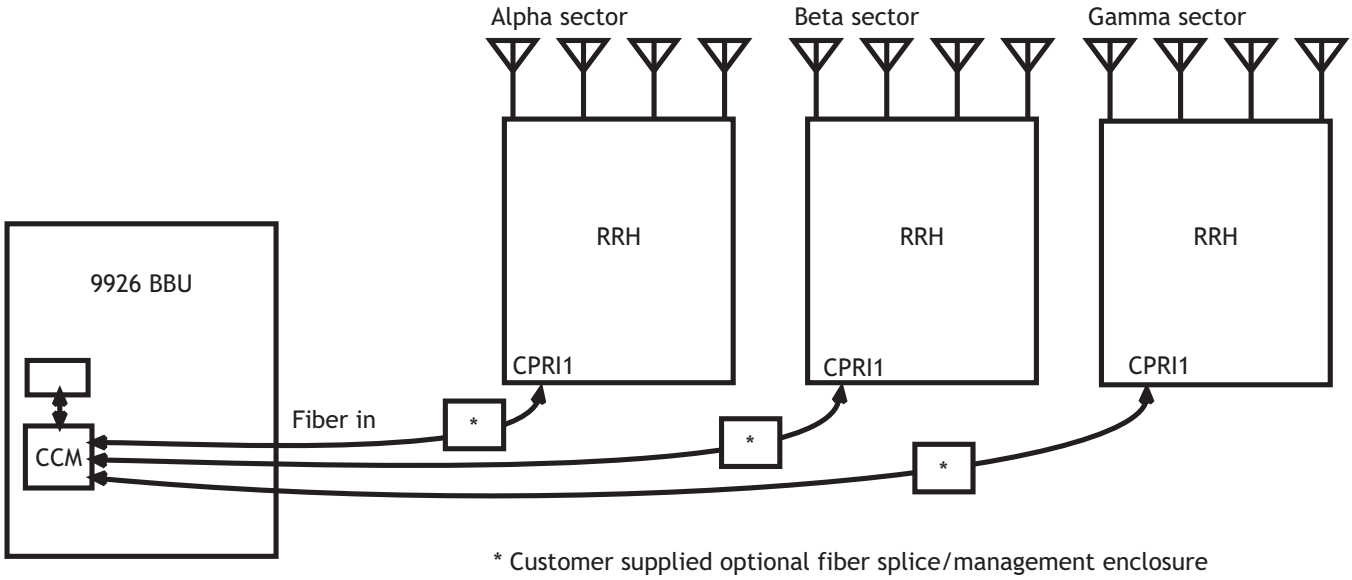
Alcatel-Lucent offers fiber optic cables in lengths between 5 m and 300 m (16.4 ft to 984.25 ft) with an outside diameter of 7 mm (0.28 in). These cables are outdoor/indoor rated and are available as single mode dual fiber (SMDF) or multi mode dual fiber (MMDF) cables. The fiber optic cables have LC connectors on both ends. The LC connectors are waterproofed by the SFP connector (R2CT weatherized connector) that is installed at the CPRI-cable to Alcatel-Lucent B25 RRH4x30 connection point. Cables are connected to the B25 RRH4x30 through SFP transceivers.

Note: Only SMDF or MMDF optical cables and corresponding SMDF or MMDF SFP optical transceivers can be used with the B25 RRH4x30.

The SMDF or MMDF optical cables, SFP optical transceivers, and R2CT weatherized connectors are not provided with the Alcatel-Lucent B25 RRH4x30. They must be ordered separately and are required for installation.

Star configuration

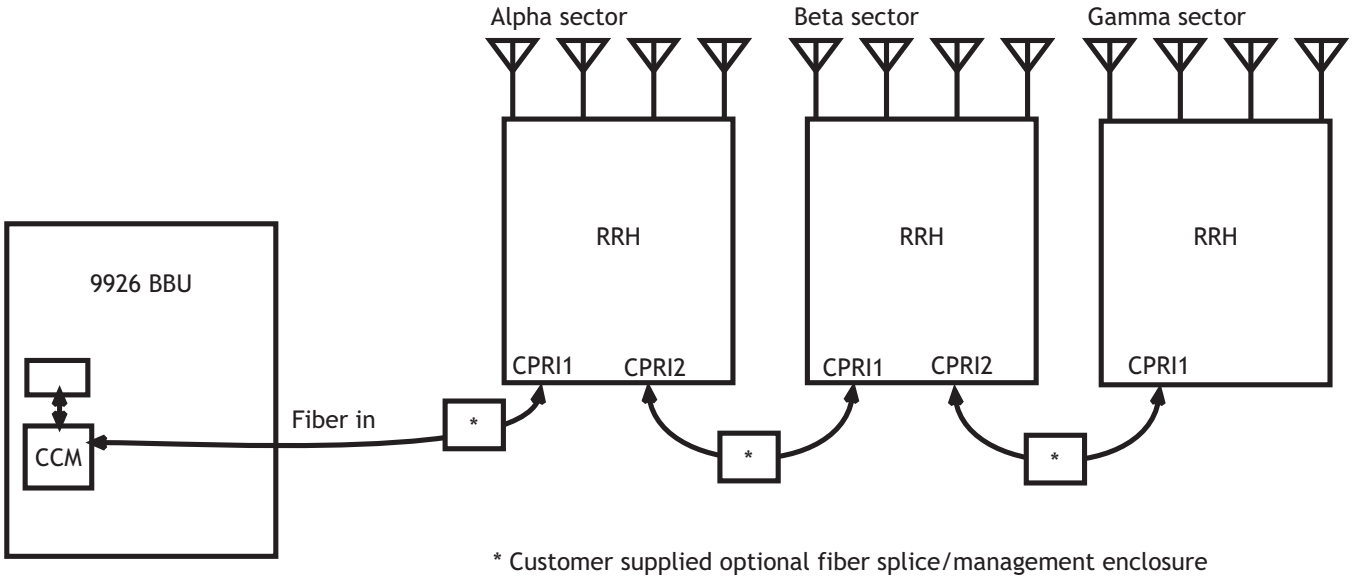
The star configuration is shown below and consists of connecting each Alcatel-Lucent B25 RRH4x30 directly to the Alcatel-Lucent 9926 BBU. One CPRI cable is connected between each B25 RRH4x30 and the Alcatel-Lucent 9926 BBU.



* Customer supplied optional fiber splice/management enclosure

Daisy chain configuration (future)

The daisy chain configuration is shown below and consists of connecting the first Alcatel-Lucent B25 RRH4x30 directly to the Alcatel-Lucent 9926 BBU; the remaining B25 RRH4x30s are daisy chained from the first B25 RRH4x30.



* Customer supplied optional fiber splice/management enclosure

Note: The CPRI daisy chain configuration is not supported in the initial release (LR14.1.L). The CPRI daisy chain configuration will be supported in a future release.

8 Alarms interface

Overview

Purpose

This chapter provides the alarms interface requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the alarms interface requirements specified in this chapter.

Contents

User alarm requirements

Overview

The Alcatel-Lucent B25 RRH4x30 supports up to four dry contact user alarms over one connector. The customer's user alarms must be dry contact form C. The B25 RRH4x30 can recognize an alarm state as being either open or closed (customer programmable), with closed as the default. The user alarm connector can support up to 4 user alarms (2 pins each).

The alarm cables offered by Alcatel-Lucent are 15 m (50 ft) or 30 m (100 ft) long, and consist of 4 twisted pairs of 24 AWG solid conductors and a 8-pin plug connector for the Alcatel-Lucent B25 RRH4x30 end. The other end needs to be terminated at the punch down block (provided by the customer). The user alarm ports are equipped with surge protection.

User alarms wire colors and punch down positions

The following table lists wire color-coding and punch down information for the Alcatel-Lucent B25 RRH4x30 user alarms:

Connector	Pin #	Wire color	Designation	Comments
ALARM	1	White/Brown	User_ALM_4_P	
	2	Green	User_ALM_3_RTN	
	3	White/Blue	User_ALM_1_P	
	4	Orange	User_ALM_2_RTN	
	5	White/Orange	User_ALM_2_P	
	6	Brown	User_ALM_4_RTN	
	7	White/Green	User_ALM_3_P	
	8	Blue	User_ALM_1_RTN	

9 AISG interface

Overview

Purpose

This chapter provides the AISG interface requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the AISG interface requirements specified in this chapter.

Contents

AISG cable requirements

Standard AISG cable

The standard AISG cable consists of an 8-pin circular DIN connector (AISG v2.0) that connects directly to the Alcatel-Lucent B25 RRH4x30. The AISG cables can be obtained from Alcatel-Lucent in lengths of 1 m to 80 m.

AISG daisy chain configuration

The Alcatel-Lucent B25 RRH4x30 has one AISG output port. An *AISG daisy chain* configuration can be created by connecting the Alcatel-Lucent B25 RRH4x30 AISG output port to another external AISG device.

AISG configurations

The figures in the following paragraphs show typical examples of AISG configurations. Actual customer deployment may vary depending on requirements.

The components of the AISG solution offered by Alcatel-Lucent include some or all of the following:

- Smart Bias Tee (top and bottom)
- Smart Bias Tee ground kit
- AISG surge protector
- AISG cables
- AISG cable ground kit
- RF surge protection (for indoor applications)

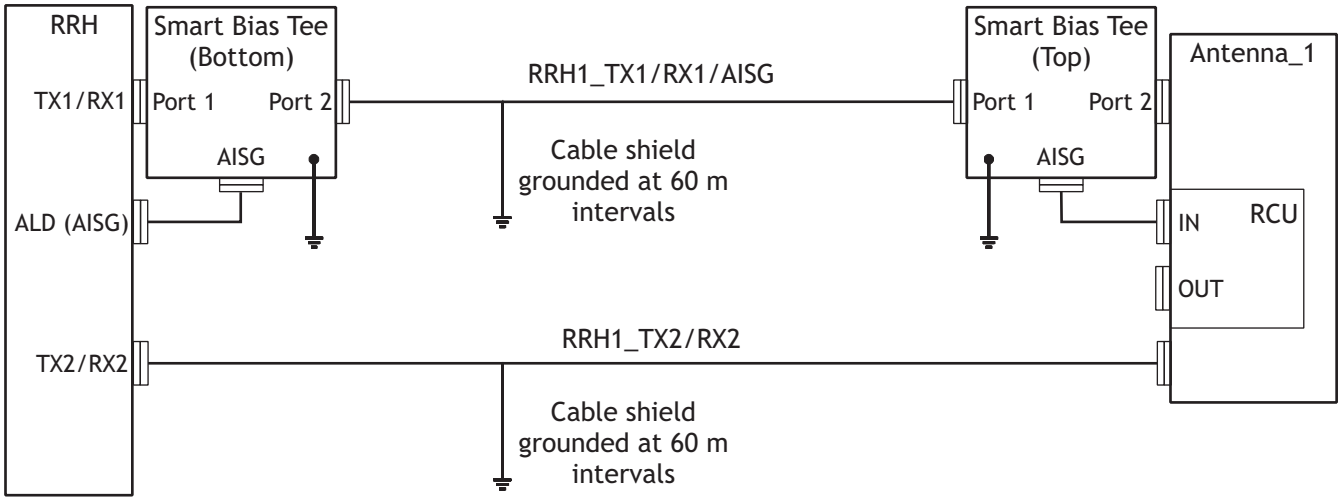
For outdoor AISG cable home run solutions, the AISG cable must be grounded every 60 m (200 ft). For indoor AISG cable home run solutions, the AISG cable must be grounded at the hatchplate and every 60 m (for the outdoor portion of the run). All Smart Bias Tees must be grounded. All RF cable grounding and surge suppression rules must be followed as previously specified in this document.

Important! The Alcatel-Lucent B25 RRH4x30 has an integrated Bias Tee on each duplexed RF port (TxRx1 and TxRx2) used in 2 Tx mode. Thus in the following example AISG configurations, an external Smart Bias Tee is not required for the TxRx1 and TxRx2 ports on the Alcatel-Lucent B25 RRH4x30.

Typical outdoor AISG using Smart Bias Tee solution

The following figure shows a typical outdoor AISG configuration using a Smart Bias Tee solution:

RRH outdoor
Smart Bias Tee configuration



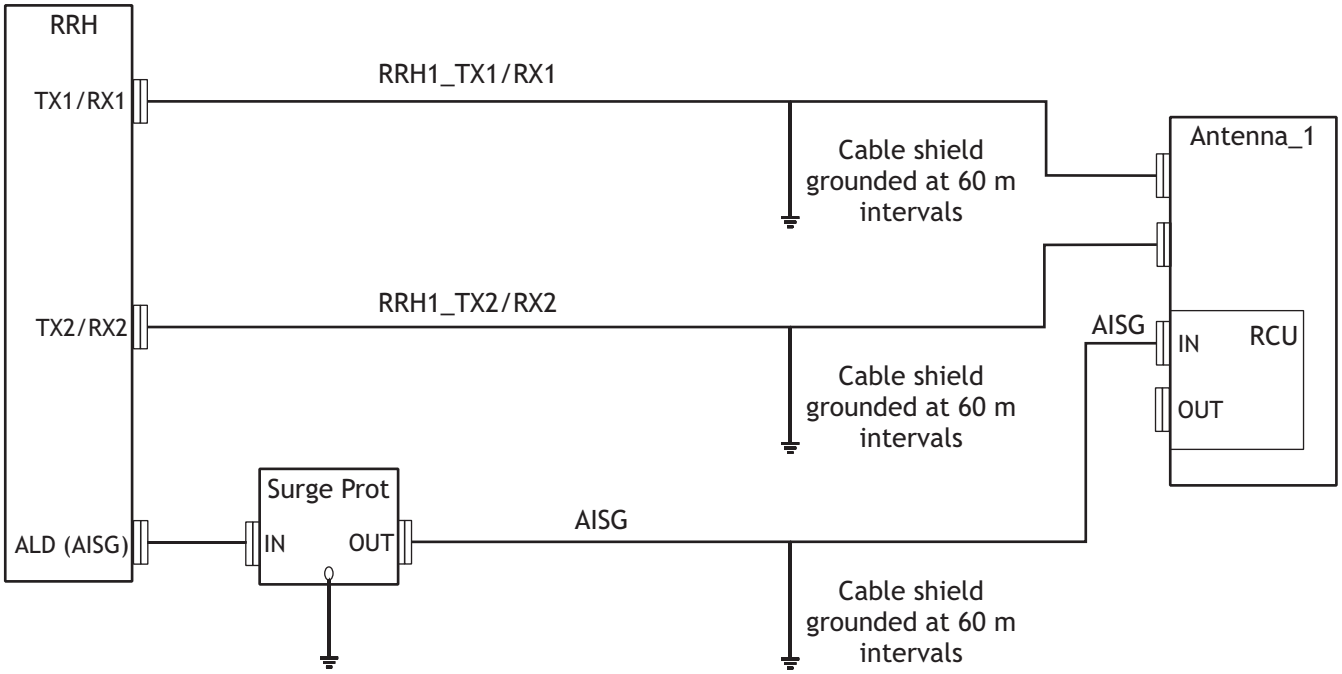
Important! Smart Bias Tee is not required for the TxRx1 and TxRx2 ports on the Alcatel-Lucent B25 RRH4x30.

Note: An RF jumper cable may be added between the RRH Tx1/Rx1 port and Smart Bias Tee as required.

Typical outdoor AISG using home run solution

The following figure shows a typical outdoor AISG configuration using a home run solution:

RRH outdoor
AISG home run configuration

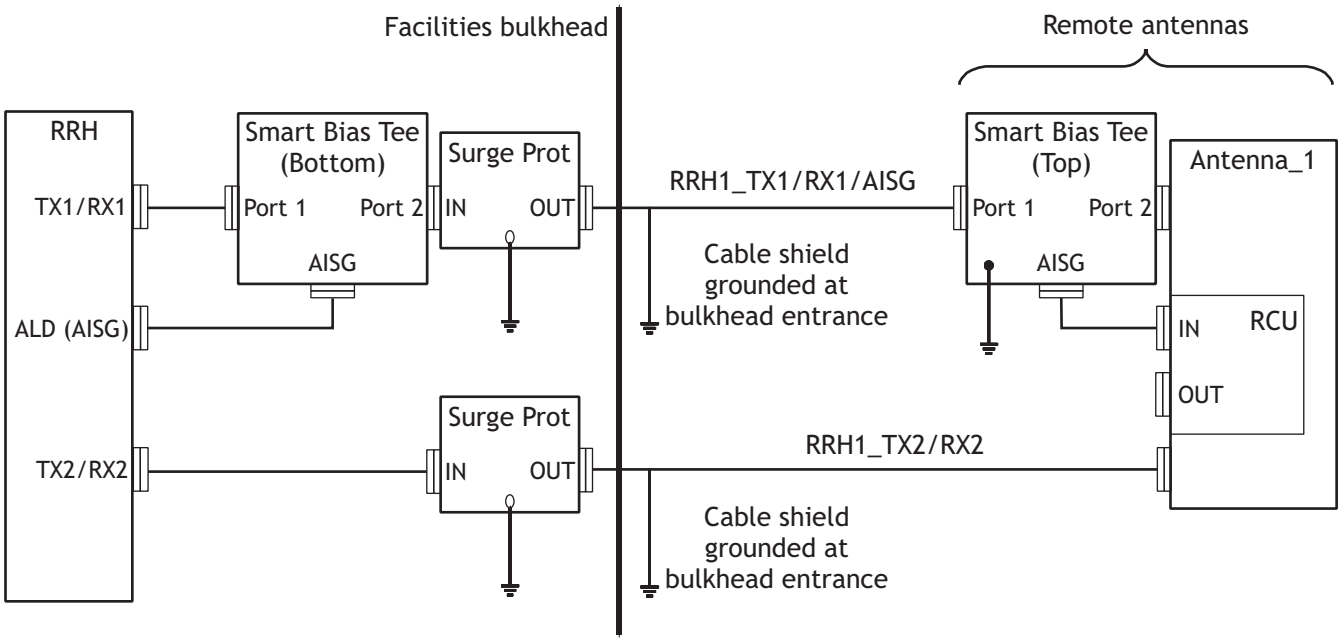


Note: For long AISG cable runs, the AISG cables must be grounded every 60 m (200 ft). The surge protector must be located within 4.5 m (15 ft) of the RRH.

Typical indoor AISG Smart Bias Tee solution

The following figure shows a typical indoor AISG configuration using a Smart Bias Tee solution:

RRH indoor
Smart Bias Tee configuration

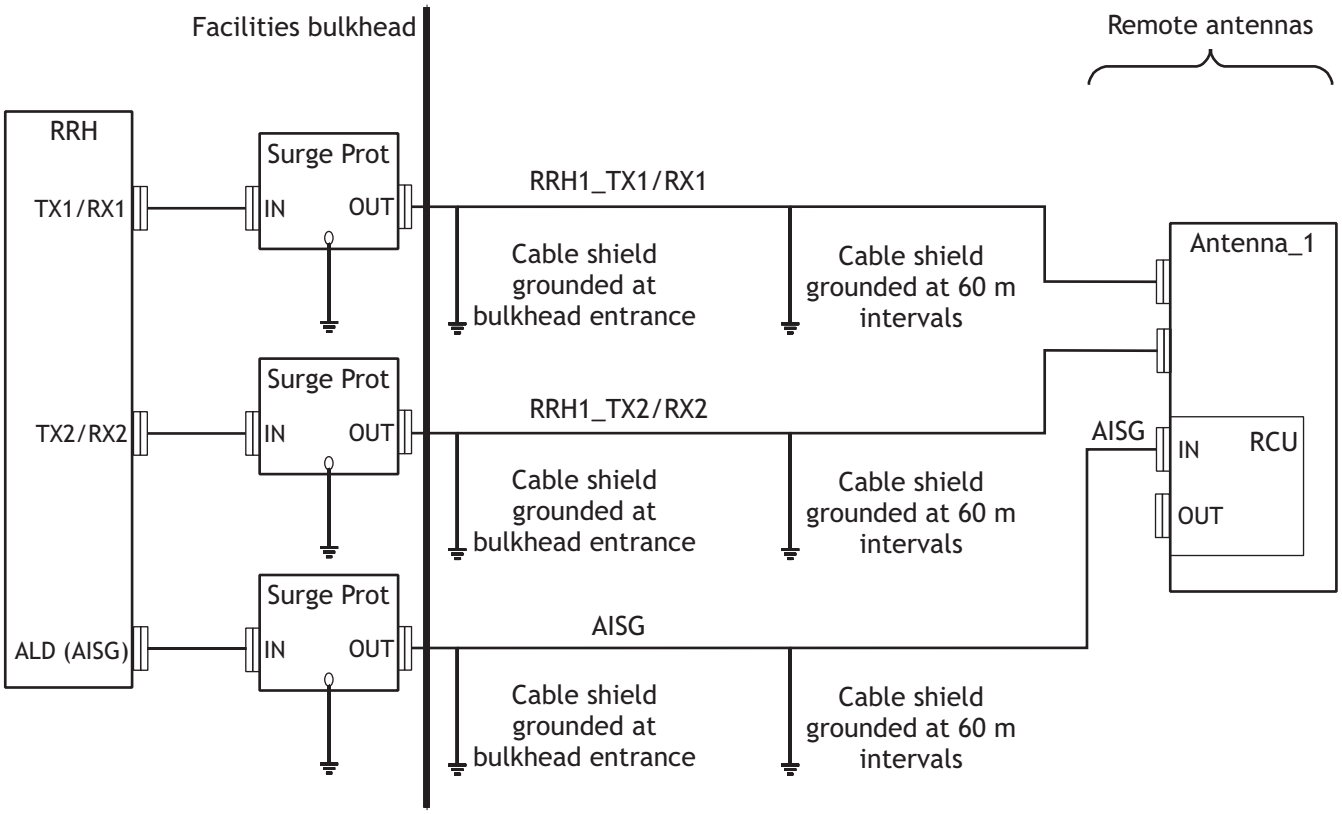


Important! Smart Bias Tee is not required for the TxRx1 and TxRx2 ports on the Alcatel-Lucent B25 RRH4x30.

Typical indoor AISG home run solution

The following figure shows a typical indoor AISG configuration using a home run solution:

RRH indoor
AISG home run configuration



Note: If applicable, outdoor AISG cable runs must be grounded at the facilities bulkhead and every 60 m (200 ft).

10 Power interface

Overview

Purpose

This chapter provides the power interface requirements for the Alcatel-Lucent B25 RRH4x30.

The installation site must meet the power interface requirements specified in this chapter.

Contents

Power requirements

Power options

The following section provides the power interface options for the Alcatel-Lucent B25 RRH4x30. Power may be supplied from various sources including an Alcatel-Lucent 9412 AC baseband cabinet, a –48-V DC power plant, or any other DC power source meeting the requirements defined in this document.

Electrical rating

The electrical rating of the Alcatel-Lucent B25 RRH4x30 is marked on the unit label of the product as follows.

Product	DC
B25 RRH4x30	-48V 17A SELV Source

It is required that the Alcatel-Lucent B25 RRH4x30 is protected by a circuit breaker located between the power supply and the B25 RRH4x30. The recommended size of the circuit breaker is 25 A.

Power consumption (estimated)

The following table provides the power consumption for the Alcatel-Lucent B25 RRH4x30:

Configuration	Watts (Typ.)	Watts (Max.)
2 × 60 W	600 (at 100% RF load and DC input = –48-V DC)	650
4 × 30 W	600 (at 100% RF load and DC input = –48-V DC)	650

DC input terminal

The Alcatel-Lucent B25 RRH4x30 DC connector (located at the bottom of the B25 RRH4x30) requires a corresponding socket connector, APN 1AB435070001. The DC socket connector (plug) accepts conductors up to 10 mm^2 (8 AWG) maximum with a cable jacket outside diameter of 18 mm (0.7 in) maximum.

The customer must provide the power cable and all required materials to route it to the Alcatel-Lucent B25 RRH4x30. For information on power feeder conductor sizing refer to Appendix C, “Electrical power requirements for –48-V DC power systems”.

Important! To comply with the **FCC Part 15 Regulations**, a special accessory (ferrite) is required on the DC power cable. Alcatel-Lucent will provide the ferrite with the Alcatel-Lucent B25 RRH4x30. It is the responsibility of the installer to install the required ferrite supplied with the Alcatel-Lucent B25 RRH4x30.

The following table lists the ferrites approved for use with the Alcatel-Lucent B25 RRH4x30.

Ferrite APN	Outside diameter (OD)	Inside diameter (ID)	Proximity to DC connector[2]
1AB093970037	38.60 mm	18.35 mm	Adjacent
1AB093970027	56.40 mm	25.65 mm	30 mm

Notes:

1. The ferrite required depends on the outside diameter (OD) of the DC power cable.
2. Once installed, the ferrite must be secured in close proximity (as defined in the table) to the DC connector on the power cable.

Surge suppression

The DC interface of the Alcatel-Lucent B25 RRH4x30 is equipped with internal surge suppression. Additional external surge suppression is optional.

DC power system requirements

For DC power requirements, refer to Appendix C, “Electrical power requirements for –48-V DC power systems”

Appendix A: Site preparation checklists

Overview

Purpose

This appendix is used by authorized personnel to verify completion of base station site preparation activities prior to installation of base station equipment.

Included in this appendix are master sheets, from which a copy should be made for each site preparation performed.

Contents

SP-GEN base station site general information

Complete the following information about the base station site.

- Base Station Site Name: _____
- Base Station Site Address: _____
- Base Station Site Access Contact Name: _____
- MTA Name: _____
- Base Station Site #: _____
- Contact Phone #: _____

SP-1 site preparation general checklist

The following items must be completed prior to the installation of the base station site equipment. Circle the correct letter for the corresponding item descriptions.

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is the work site free of recognized environmental, health and safety (EH&S) hazards?	Y	N	N/A	
2.	Are base station site environmental conditions within equipment specified operating range?	Y	N	N/A	
3.	Has the required space been provided around equipment [that is, maintenance access, cabinet(s), heat dissipation, safety]?	Y	N	N/A	
4.	Has a Method of Procedure (MOP) been developed with the installation supervisor?	Y	N	N/A	
5.	Is base station translations information available?	Y	N	N/A	
6.	Has installer base station site equipment parameter sheet been completed and reviewed with the installation supervisor?	Y	N	N/A	
7.	Are user alarm facilities available and active?	Y	N	N/A	
8.	Is adequate primary surge protection provided for the user alarms?	Y	N	N/A	
9.	Have the user alarm cables been installed and terminated in the alarm interface?	Y	N	N/A	
10.	Has all equipment been ordered and has delivery to site been scheduled?	Y	N	N/A	
11.	Have all necessary arrangements been made for access to the site?	Y	N	N/A	
12.	Have all necessary arrangements been made to get equipment onto the site (crane, etc.)?	Y	N	N/A	
13.	Are proper conduits and fittings available to route interface cables to the antenna?	Y	N	N/A	

Completed by: _____

Date: _____

SP-2 site preparation power source checklist

The following items must be completed prior to the installation of the base station site equipment. Circle the correct letter for the corresponding item descriptions.

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is DC service available?	Y	N	N/A	
2.	Have DC service and conduits been approved by local code?	Y	N	N/A	
3.	Is DC service equipped with surge protection at service entry point?	Y	N	N/A	
4.	Is DC power source appropriate for equipment being installed?	Y	N	N/A	
5.	Does DC service have proper circuit breaker rating(s) and labeling?	Y	N	N/A	
6.	Is DC circuit breaker(s) available and labeled for power system?	Y	N	N/A	
7.	Is DC circuit breaker(s) available and labeled for listed ancillary equipment?	Y	N	N/A	
	A.	Y	N	N/A	
	B.	Y	N	N/A	
	C.	Y	N	N/A	
8.	Do tower lighting, intrusion lighting, etc. feeds have proper lightning protection?	Y	N	N/A	

SP-3 site preparation protective earth (PE) grounding checklist

The following items must be completed prior to the installation of the base station site equipment. Circle the correct letter for the corresponding description items.

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is soil resistivity and site resistance test on file?	Y	N	N/A	
2.	Has connection been provided to grounding electrode system? If yes, circle all that apply: 1. Via a buried ring ground and driven rod(s) 2. Via a buried metallic and electrically continuous water pipe 3. Via driven ground rod(s) and/or plate(s) 4. Via electrolytic ground rod(s) 5. Via grounded building steel 6. Via grounded grid or radial	Y	N	N/A	
3.	Is lighting mast(s) or air terminal(s) provided and bonded?	Y	N	N/A	
4.	Is antenna support structure(s) grounded?	Y	N	N/A	
5.	Is antenna tower bonded to grounding electrode system?	Y	N	N/A	
6.	Are guy wires bonded to grounding electrode system?	Y	N	N/A	
7.	Are antenna cable shields grounded at both ends?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
8.	If tower is greater than 60 meters (200 feet) high, are antenna cable shields grounded at midpoint and both ends?	Y	N	N/A	
9.	Is ice bridge bonded at both ends and at 7.62-meter (25-foot) intervals?	Y	N	N/A	
10.	Are all ground connections in compliance with Alcatel-Lucent requirements (exothermic weld, compression type with 2-hole lugs; properly secured; antioxidant used on contact surface area)?	Y	N	N/A	
11.	Are all grounding conductors routed as straight as possible with no loops or sharp bends?	Y	N	N/A	
12.	Is antenna support structure grounded?	Y	N	N/A	
13.	Are metallic conduits bonded at both ends and at 7.62-meter (25-foot) intervals?	Y	N	N/A	
14.	Are all fence corner posts and gate posts properly grounded (including fence fabric and barbed wire, as applicable)?	Y	N	N/A	
15.	Are all metallic objects in the vicinity bonded to the grounding system?	Y	N	N/A	
16.	Is AC/DC power supply equipped with a surge protection device and is the device properly connected to the ground system?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
17.	Is tower light system (if installed) equipped with a surge protection device and is the device properly connected to the ground system?	Y	N	N/A	
18.	Are the RF and GPS surge protection devices properly connected to the ground system?	Y	N	N/A	
19.	Are all grounding connections properly cleaned with No-Oxide?	Y	N	N/A	

Completed by: _____

Date: _____

SP-4 site preparation RF antenna checklist

The following items must be completed prior to the installation of the RF antenna base station site equipment. Circle the correct letter for the corresponding item descriptions.

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is tower properly installed and secured?	Y	N	N/A	
2.	Is sufficient clearance and access available for a crane or other hoisting device to install the antenna on the tower?	Y	N	N/A	
3.	Are all antenna cable runs installed?	Y	N	N/A	
4.	Are all antenna cable runs properly terminated with 7/16 DIN socket connectors on the equipment side?	Y	N	N/A	
5.	Are all cable connections torqued to the appropriate value?	Y	N	N/A	
6.	Are the RF and GPS antenna cables equipped with surge protection devices?	Y	N	N/A	
7.	Are all external cables UV rated?	Y	N	N/A	
8.	Are antenna cable runs' demarcation points in proper location?	Y	N	N/A	
9.	Are antenna cable runs marked and in proper sequence per applicable equipment drawings?	Y	N	N/A	
10.	Are appropriate type, length and number of antenna cable jumpers available?	Y	N	N/A	
11.	Are appropriate drip loops provided for antenna cable runs at turns and demarcation point?	Y	N	N/A	
12.	Have antenna and cable sweeps been performed?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
13.	Are antennas properly installed and secured?	Y	N	N/A	
14.	Are all antennas the proper type?	Y	N	N/A	
15.	Are all antennas at proper azimuth? (0, 120 or 240 degrees)	Y	N	N/A	
16.	Are antennas at proper height?	Y	N	N/A	
17.	Are antennas at proper mechanical tilt?	Y	N	N/A	
18.	Have diversity antennas been properly separated?	Y	N	N/A	
19.	Are antenna hatchplate and cable boots properly installed?	Y	N	N/A	

Completed by: _____

Date: _____

SP-5 site preparation punch list sheet

The following punch list is used to track any outstanding site preparation items.

Item #	Comment/Description	Severity (1/2/3)	Corrective action required	
			(Y/N)	Completed date

Severity level definitions:

The following lists the severity level definitions.

1. Equipment installation cannot occur until outage is rectified and will void warranty or potentially cause personal injury.
2. Equipment installation can occur but issue must be rectified prior to handoff to customer or service turn-up so that the warranty is not voided.
3. Equipment installation, handoff to customer, or service turn-up can occur but not per Alcatel-Lucent recommendations.

Inspection checklist completion sign-off (complete below)

Was the punch list continuation sheet on the next page used? Yes or No

Inspector's Name: _____

Inspector's Signature: _____Date: _____

SP-6 site preparation punch list sheet

The following punch list is used to track any outstanding site preparation items.

Item #	Comment/Description	Severity (1/2/3)	Corrective action required	
			(Y/N)	Completed date

Appendix B: Site information

Overview

Purpose

This appendix is used by Customer Project Management to document base station site configuration information.

Contents

BSSC-1 base station site configuration information

General base station information

Complete the following base station site information:

Base station site	Information (provided by inspector)
Name	
Address	
Contact name	
MTA name	
Base Station Site #	
Contact Phone & Pager #	

Installation type

Check all that apply:

- Indoor
- Outdoor
- Controlled environment
- Uncontrolled environment
- Concrete pad
- Rooftop
- Other (specify): _____

Base station sub-structure

Check all that apply:

- Concrete
- Wood floor
- Raised floor
- Non-Penetrating
- I-beam
- C-beam
- Platform

Earthquake zone rating

Check one:

- Zone 1
- Zone 2
- Zone 3
- Zone 4

Base station equipment

Complete the information for the installed equipment:

Equipment type	Serial #	# of sector	Duplex/Triplex
B25 RRH4x30			
B25 RRH4x30			
B25 RRH4x30			

Antennas

Complete the following (if required):

Channel # (1-1999) _____

# of Carriers (1-9) _____

GPS Antenna KS/Model _____

PCS Freq. Block (A-F) _____

GPS Cable Length (feet) _____

GPS Antenna Gain (dB) _____

Antenna Type (N-N or N-DIN) _____

Quantity of Antenna Jumper Cables (1-15) _____

Other base station site equipment

Complete the following:

Equipment description	Yes (Y)	No (N)	N/A
Antenna Tower?	Y	N	N/A
FAA Lighting?	Y	N	N/A
Tower Light Alarm?	Y	N	N/A

Equipment description	Yes (Y)	No (N)	N/A
Ice Bridge? Covering: (check one) _____Cables Only _____Cables and Equipment	Y	N	
Cable Tray or Ladder Racks? Type of Ladder: (check one) _____5' Ladders _____12' Ladders _____ Other: _____	Y	N	N/A
Antenna Cable Hatch Plate? Number of Entry Holes _____	Y	N	N/A
Facilities Ancillary Equipment? Power Source: (check one) _____AC _____DC Voltage: (check one) _____DC _____rms	Y	N	N/A
AC Service: Size (amps) _____ Voltage (v) _____ Phase (1 or 3) _____			
Non-Alcatel-Lucent Power Plant? **Note:** If YES, the customer is responsible for the power plant's configuration.	Y	N	
Earthquake Bracing Required?	Y	N	
Tx/Rx Antenna? (mounting location) _____Tower _____Steel Structure _____Building _____Antenna Support Structure	Y	N	N/A

Equipment description	Yes (Y)	No (N)	N/A
Base Station Site Grounding? If YES, select all that apply: _____Buried ring ground and driven rods _____Buried metallic and electrically continuous water pipe _____Down conductors (Quantity: _____) _____Electrolytic ground rod(s) (Quantity: _____) _____Driven ground rod(s) (Quantity: _____) _____Grounded building steel _____Ground grid _____Ground radial(s) (Quantity: _____)	Y	N	
Collocated non-PCS equipment? Existing grounding system: _____Single Point _____Integrated	Y	N	
Ground Bus? If YES, quantity: _____	Y	N	

Appendix C: Electrical power requirements for –48-V DC power systems

Overview

Purpose

The purpose of this appendix is to provide power requirements for the B25 RRH4x30, in case a 3rd party power system is used.

Important! All AC wiring and over-current protection must be installed in accordance with the National Electric Code (NFPA-70) and local electrical codes. An appropriate earth ground connection is required before commercial AC service can be connected to any equipment at the site.

Contents

Power requirements (general)

Scope

This section specifies the DC power and power system alarm interface requirements for the Alcatel-Lucent B25 RRH4x30 equipment; specifically DC power, DC feeder quantity, recommended DC feeder wire gauge, and DC feeder circuit breaker type/rating. Some additional information is included on power feeder connections and alarm connections to the B25 RRH4x30.

This section provides information on the quality and characteristics of the DC power to be supplied to the Alcatel-Lucent B25 RRH4x30. The power systems must provide uninterrupted DC power to the B25 RRH4x30. The power system must be designed to support a fully configured site as required. This section is intended for use by a customer specifying a power system other than the standard Alcatel-Lucent power systems.

By meeting these requirements, the Alcatel-Lucent equipment referenced in this section should meet the electrical and RF performance specifications of the customer supplied equipment.

Standard reference documents

Alcatel-Lucent strongly recommends power systems meet all applicable requirements specified in the following documents. The appropriate requirements must be selected from the latest version of the documents listed in the table below, based on the “country of use.” In addition, adherence to all additional requirements mandated by the “country of use” is the customer's responsibility. The power system must meet the specified Underwriters Laboratories (UL) and FCC requirement documents in order for the equipment to maintain its UL and FCC compliance. The references listed in the table may be obtained from the issuing agency or their authorized distributors.

Source	Document # Issue #	Title
FCC	FCC	*FCC Rules & Regulations Title 47, Code of Federal Regulations Part 15, Class B*
IEC	IEC-61000-4-5	*International Standard. Electromagnetic Compatibility (EMC). Testing & Measurement Techniques*
IEEE	IEEE/ ANSIC62.34	*IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arrestors)*
NFPA	NFPA-70	*National Electrical Code*
Telcordia	GR-063-CORE10	*Network Equipment-Building System (NEBS) General Equipment Requirements*

Source	Document # Issue #	Title
Telcordia	GR-001089-CORE1	*Electrical Safety-Generic-Criteria for Network Telecommunications Equipment GR-001089- CORE*
CSA	CSA C22.2 #95012	*Standard for Safety of Information Technology Equipment, Including Business Equipment*
UL	UL-507	*Standard for RRHs and Boxes*
IEC	IEC 60950	*Safety of Information Technology Equipment, Including Electrical Business Equipment*
IEC	IEC 60529	*Degrees of Protection Provided by Enclosures*

Power system requirements

General

This section specifies the mechanical, electrical, and environmental requirements the power system must meet. The following requirements apply to indoor or outdoor power systems only.

Alcatel-Lucent strongly recommends that the power system meet the same environmental, safety, and regulatory requirements as the Alcatel-Lucent equipment to maintain its safety and regulatory certification.

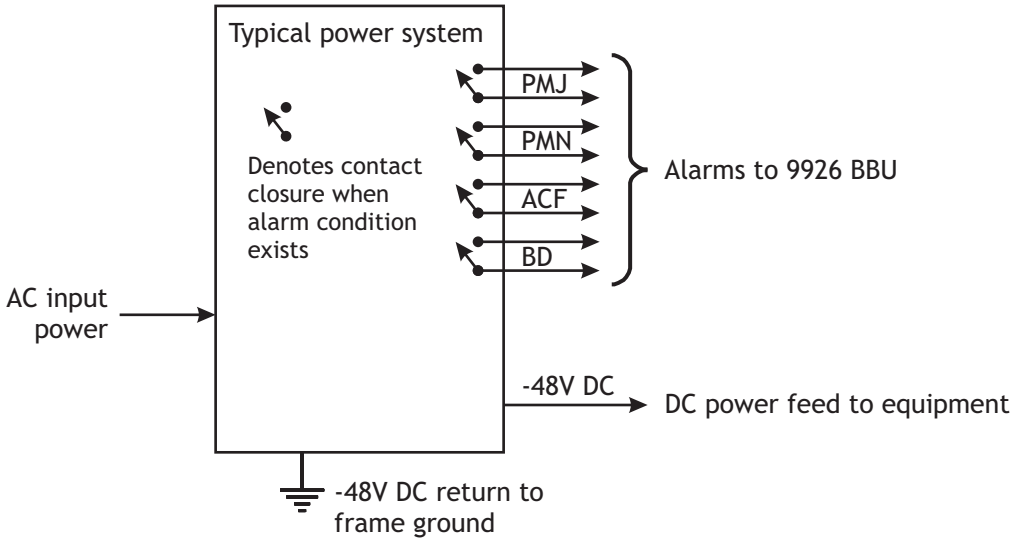
B25 RRH4x30 interface requirements

The following table provides the interface requirements required to connect the Alcatel-Lucent B25 RRH4x30 to a 3rd party power system.

Interface	Requirement
Mechanical interface	The customer is responsible for specifying all the mechanical requirements for the power system such as dimensions, weights, anchoring, grounding, cabling, cable interfaces, and installation features.
B25 RRH4x30 interfaces	All the power system electrical interfaces are located at the bottom of the B25 RRH4x30. For dimensions of the B25 RRH4x30, refer to Chapter 3, "External interfaces" of this document. **Important!** Under no circumstances must any modification (e.g. drilling) be made to an B25 RRH4x30 unless the modification is covered by an Alcatel-Lucent "Change Notice."
Electrical interface requirements	The electrical interfaces between the power system and the B25 RRH4x30 consist of DC power and power system alarms. All B25 RRH4x30s receive DC power independently from the power system. All power system alarms interface with the B25 RRH4x30.

Typical rectifier power system

The following diagram shows the electrical interfaces of a typical power system.



Legend:
PMJ: Power major alarm
PMN: Power minor alarm
ACF: AC fail
BD: Batteries on discharge, first stage

DC Power requirements

-48-V DC input requirements

The nominal –48-V DC power supplied to the Alcatel-Lucent B25 RRH4x30 shall meet the requirements specified in this section. The DC power system shall be capable of providing constant power to the equipment over the entire range of environmental conditions for the “country of use.”

The Alcatel-Lucent B25 RRH4x30 has one –48-V DC input feed rated at 17 A at –48-V DC.

DC input power requirements

The DC power system shall be capable of providing constant DC power to the required equipment configurations at the maximum power level. The typical power level is the DC power consumption expected while the site is operating with "busy hour" traffic and ambient temperature between 20° to 25° Celsius. The Alcatel-Lucent B25 RRH4x30 has constant power load characteristics.

DC feeders and connection interface

Each Alcatel-Lucent B25 RRH4x30 requires one DC feed. The DC socket connector (plug) accepts 8 AWG (max.). Alternate wire gauges may be used for the DC feeders, but shall be sized to limit the round trip voltage drop between the power system output terminals and the B25 RRH4x30 input terminals to less than 4 V. A current level equal to 80% of the circuit breaker current rating specified shall be used for this calculation.

The customer must provide the power cable and all required materials to route it to the Alcatel-Lucent B25 RRH4x30.

Important! To comply with the **FCC Part 15 Regulations**, a special accessory (ferrite) is required on the DC power cable. Alcatel-Lucent will provide the ferrite with the Alcatel-Lucent B25 RRH4x30. It is the responsibility of the installer to install the required ferrite supplied with the Alcatel-Lucent B25 RRH4x30.

The following table lists the ferrites approved for use with the Alcatel-Lucent B25 RRH4x30.

Ferrite APN	Outside diameter (OD)	Inside diameter (ID)	Proximity to DC connector[2]
1AB093970037	38.60 mm	18.35 mm	Adjacent
1AB093970027	56.40 mm	25.65 mm	30 mm

Notes:

1. The ferrite required depends on the outside diameter (OD) of the DC power cable.
2. Once installed, the ferrite must be secured in close proximity (as defined in the table) to the DC connector on the power cable.

The wire used for the DC feeders shall be rated for the environmental condition in which it is used and shall be rated and sized according to the applicable sections of the National Electrical Code (NFPA 70) or the Canadian Electrical Code, Part 1 (CSA C22.1) for NAR markets, or the local electrical code in use. Ensure that the most current versions of the previously mentioned documents are used. The circuit breaker characteristics shall be equivalent to Airpax Inc., model LEL/LML, circuit breakers with type 51, DC trip delay curve characteristics.

DC input surge requirements

The DC input interface of the Alcatel-Lucent B25 RRH4x30 is equipped with electrolytic capacitors to reduce noise, ripple, and the effect of transients. The capacitors can draw a high inrush current when power is first applied to the B25 RRH4x30.

DC input	Inrush current (Amps)	Time (Milliseconds)
–48-V DC	600 to 1200	up to 1

The circuit breakers providing DC power to the Alcatel-Lucent B25 RRH4x30 must be able to withstand this high inrush current. The Airpax Inc., model LEL/LML, circuit breakers with type 51, DC trip delay curve characteristics is rated to withstand the inrush current.

Overload trip characteristics

The following table provides the overload trip characteristic for the Airpax circuit breaker with type 51 delay characteristics. If an alternate circuit breaker is used, it must have equivalent overload trip characteristics.

Airpax model LEL/LML type 51 Overload Trip Time (Seconds)								
Rating	100%	125%	150%	200%	400%	600%	800%	1000%
Time (sec.)	No trip	0.5 to 6.5	0.3 to 3	0.1 to 1.2	0.3 to 0.5	0.011 to 0.25	0.004 to 0.1	0.004 to 0.08

DC input voltage range

The normal DC input voltage range (measured at Alcatel-Lucent B25 RRH4x30 input location), the set point of float voltage for the battery and the maximum float voltage set points for the B25 RRH4x30 are provided in the following table.

B25 RRH4x30	Normal input voltage range[1] (volts DC)	Set point of float voltage (volts DC)	Maximum float voltage (volts DC)
–48-V DC	–40.5 to –57	–54.48	–57

Notes:

1. Operating range with all performance met, including startup voltage conditions. The B25 RRH4x30 has an extended input voltage range of –38 to –57 volts DC at full performance except for power consumption relaxation. Startup is not guaranteed when the input voltage is above –40.5 volts DC.

Default voltage

If a failure occurs with the DC power system controller, the DC power system output voltage shall remain within the range specified in the table above.

DC voltage regulation

The DC voltage shall be regulated to within ±0.5% of the voltage set in the table above under all conditions of line, load and temperature.

DC soft start

The DC voltage at input of the Alcatel-Lucent B25 RRH4x30s shall not overshoot more than 3.5% of the set voltage in the table above for a period of more than 100 milliseconds, under any conditions.

Ripple and noise

The following table provides ripple and noise requirements. This requirement applies, with or without batteries connected to the system, however the system is not intended to operate without batteries.

B25 RRH4x30	Ripple voltage mV pp (0 to 100 MHz)	Ripple voltage mV pp (mV rms)	DC system noise mV (psophometric)
–48-V DC	Not to exceed 250	100	Less than 2

Transient load response

For any step-load demand change of 10% to 90%, or 90% to 10%, on the DC power system, the DC input voltage to the Alcatel-Lucent B25 RRH4x30 shall remain within 5.0% and return to the 0.5% regulation band within 300 milliseconds.

Backup power requirements

In the event of a commercial power failure, Alcatel-Lucent recommends the DC power provided to the Alcatel-Lucent B25 RRH4x30 be backed up for a minimum of 60 minutes. The DC power to the equipment shall not be interrupted during the transition from normal operation to backup operation and vice versa.

High voltage shutdown

The DC power source may shut down if the output voltage reaches the following values:

Nominal voltage	Maximum voltage range (Volts DC)	Maximum voltage for up to one second
–48-V DC	–56.2 to –60	–60

Notes:

1. The DC power system shall not provide sustained voltage to the Alcatel-Lucent B25 RRH4x30 at the maximum voltage values, for more than one second, as shown in the table above.
2. If a power system failure occurs which causes loss of regulation resulting in voltage levels given in the table above stated as the “maximum voltage range,” the power system shall shutdown or clamp its output voltage below –56.2-V DC (for –48-V DC systems) until the problem is corrected.

Transient surge protection

The DC power system shall be designed to prevent surge transients at its input passing through to the output and causing voltage transient in excess of –60 volts (for –48-V DC systems) to the Alcatel-Lucent B25 RRH4x30. Adequate transient surge protection must be provided by the customer to limit surge voltages to less than –60 volts (for –48-V DC systems). If external surge protection is required to meet this limit, it should be installed near the DC input terminal of the Alcatel-Lucent B25 RRH4x30.

DC power grounding

The –48-V DC return conductors shall be bonded to the frame ground system at the output of the DC power system. For proper site grounding of the equipment, refer to Alcatel-Lucent's *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

Appendix D: Product conformance statements

Overview

Purpose

This section presents the product conformance statements that apply to the Alcatel-Lucent B25 RRH4x30.

In regions such as North America and the European Union, 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

United States

Introduction

The statements that follow are the product conformance statements that apply to the Alcatel-Lucent B25 RRH4x30 when deployed in the United States.

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.

RF approval

This equipment complies with Part 2, Subpart J - Equipment Authorization Procedures, of the FCC Rules.

This equipment complies with Part 24 – Personal Communications Services, Subpart E - Broadband PCS.

Product safety conformance

This equipment is safety certified for the United States of America by a Nationally Recognized Test Laboratory (NRTL) accredited by the US Department of Labor, Occupational Safety and Health Administration (OSHA), such as Underwriters Laboratory (UL), Canadian Standards Association (CSA), 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 or by contacting Alcatel-Lucent technical support.

For technical support, contact your local Alcatel-Lucent customer support team. See the Alcatel-Lucent Support web site (http://www.alcatel-lucent.com/support/) for contact information.

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.

Antenna exposure

Antenna installations for the Alcatel-Lucent B25 RRH4x30 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.

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.

RF exposure guidelines for antenna placement

1. Antennas should be placed sufficiently away from possible human RF exposure in order to meet FCC guidelines.
2. When placing the antennas, please be aware of FCC *47 CFR* sections 1.1307 to 1.1310 and FCC guidelines for public safety (for example, OET Bulletin No. 56, *Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields* and OET Bulletin 65, *Evaluating Compliance With FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields*).
3. FCC requirements mandate maximum power density at location of possible exposure to be below 1 mW/cm^2 (10 W/m^2) at downlink frequencies (1930 MHz to 1995 MHz) for general population/uncontrolled exposure and 5 mW/cm^2 (50 W/m^2) at downlink frequencies (1930 MHz to 1995 MHz) for occupational/controlled exposure. Exposure is averaged over a 30 minute time period for general population/uncontrolled exposure and over a 6 minute time period for occupational/controlled exposure.

Example of RF exposure assessments

RF exposure is assessed based on calculation methods defined in international standards, such as IEC 62232. Compliance assessment based on the equivalent isotropically radiated power (EIRP) provide a conservative estimate of the compliance distance in the direction of the main lobe of the antenna. Other methods, for example synthetic model calculations, provide more accurate values in the near field of antennas as well as compliance distances on each side of the antenna.

The EIRP is calculated based on the relationship between power density and EIRP as follows:

$S = EIRP \div (4\pi R^2)$

Where:

S is the power density in mW/cm^2

R is the distance to the center of radiation of the antenna in cm

EIRP is in mW and EIRP = (Power input to the antenna in mW) × (Numerical gain of the antenna)

Given the Alcatel-Lucent B25 RRH4x30 frequency of operation is 1930 MHz to 1995 MHz, then from Table 1 in Section 1.1310 the power density limit for general population/uncontrolled exposure is 1 mW/cm^2 and the power density limit for occupational/controlled exposure is 5 mW/cm^2.

Therefore,

For the range of possible antenna and general population/uncontrolled exposure operating parameters:

RF safe distance for 120 W total MIMO power with 15 dBi antenna and no cable loss = 5.7 m in the main lobe.

RF safe distance for 120 W power with 6 dBi antenna = 2.0 m in the main lobe.

For a 19 dBi antenna, with 65° horizontal beamwidth, 6° vertical beamwidth, and 6° downtilt, using synthetic model simulations, the minimum safe distance for general population/uncontrolled exposure is 8.5 m in the direction of the main lobe and 3 m on each side of the antenna.

For the range of possible antenna and occupational/controlled exposure operating parameters:

RF safe distance for 120 W total MIMO power with 15 dBi antenna and no cable loss = 2.6 m in the main lobe

RF safe distance for 120 W power to the antenna with 6 dBi antenna = 0.9 m in the main lobe.

For a 19 dBi antenna, with 65° horizontal beamwidth, 6° vertical beamwidth, and 6° downtilt, using synthetic model simulations, the minimum safe distance to the antenna for occupational/controlled exposure is 2.5 m in the direction of the main lobe and 0.6 m on each side of the antenna.

Note: Losses of all components between the antenna transmit port and the antenna should be included in EIRP calculations. The RF output power of the Alcatel-Lucent B25 RRH4x30 may have to be lowered in indoor applications based on antenna distance to human exposure and total EIRP. Final calculations should be performed by the installing activity for the specific antenna used.

FDA optical transmitter product compliance

Alcatel-Lucent declares that Alcatel-Lucent B25 RRH4x30 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.

CAUTION

Laser hazard

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.

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.

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 www.dtsc.ca.gov/hazardouswaste/perchlorate/.

Appendix E: Abbreviations

Overview

Purpose

This appendix provides a list of the abbreviations used in this document and the expansions for each abbreviation.

Contents

Abbreviation expansions

0-9

3GPP Third Generation Partnership Project

A

AA active antenna

AHJ authority having jurisdiction

AISG Antenna Interface Standards Group

ALD antenna line device

ANSI American National Standards Institute

APN Alcatel-Lucent part number

AWG American Wire Gauge

B

B30 Band 30

BBU base band unit

BSSC Base Station Site Configuration

BTS Base Transceiver Station

C

CDRH Center for Devices and Radiological Health

CE Conformité Européenne (European Conformity)

CEI Commission Electrotechnique Internationale

CENELEC European Committee for Electrotechnical Standardization

CFR Code of Federal Regulations

CN Change Notice

CNN Change Notification Number

CPRI Common Public Radio Interface

CSA Canadian Standards Association

D

DIN Deutsches Institut für Normung (German Institute for Standardization)

E

EH&S environmental, health and safety

EIRP equivalent isotropically radiated power

EMC electromagnetic compatibility

eNodeB (eNB) evolved NodeB — LTE base station or BTS

ESD electrostatic discharge

ETS European Telecommunication Standard

EU European Union

F

FCC Federal Communications Commission

FDA Food and Drug Administration

FDD frequency division duplex

G

GPS Global Positioning System

I

ID inside diameter

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

IP# ingress protection (when used with a number, for example “IP65”)

ISO International Standards Organization

L

LTE Long Term Evolution

M

MIMO Multiple-Input, Multiple-Output

MSDS material safety data sheet

MTA Major Trading Area

N

NAR North American Region

NEC National Electric Code

NEMA National Electrical Manufacturers Association

NFPA National Fire Protection Association

NRTL Nationally Recognized Test Laboratory

O

OA&M (OAM) operation, administration, and maintenance

OD outside diameter

OET Office of Engineering and Technology (a staff office of the FCC)

OLCS Online Customer Support

OSHA Occupational Safety and Health Administration

P

PCS Personal Communications Services

PE protective earth (ground)

PPE personal protective equipment

Q

QMA quick-locking SMA

R

R2CT Radiall 2 Connectors to Transceiver

RET Remote Electrical Tilt

RF radio frequency

RH relative humidity

RoHS Restriction of the use of certain Hazardous Substances — European Union Directive 2002/95/EC

RoHS 2 (RoHS2) Restriction of the use of certain Hazardous Substances 2 — European Union Directive 2011/65/EU

RRH Remote Radio Head

B25 RRH4x30 (Alcatel-Lucent B25 RRH4x30) Alcatel-Lucent Band 25 Remote Radio Head 4x30

RU (U) rack unit — One rack unit is 1.75 inches (44.45 mm) high.

Rx receiver

S

SD Secure Digital

SELV safety extra low voltage

SFP small form-factor pluggable

SMA SubMiniature version A

SMDF single mode dual fiber

SSD solid-state drive

T

TBD to be determined

TMA tower mounted amplifier

TRDU Transceiver Duplexer Unit

Tx transmitter

TxMON Tx monitor

U

U (RU) rack unit — One rack unit is 1.75 inches (44.45 mm) high.

UL Underwriters Laboratories

URL Uniform Resource Locator

USB Universal Serial Bus

UV ultraviolet

V

VoIP Voice over Internet Protocol

VSWR Voltage Standing Wave Ratio

W

WCS Wireless Communications Service

WES Warrantee Eligibility System

Index

DRAFT

DRAFT