Alcatel-Lucent 9218/9228 Base Station Macro (Formerly Modular Cell 4.0/4.0B)

Outdoor Site Preparation Guidelines

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Ordering information

The ordering number for this document is 401-703-413R36. To order this or other Alcatel-Lucent information products, see “To obtain documentation, training, and technical support or submit feedback” on the Flexent®/AUTOPLEX® *Wireless Networks System Documentation CD-ROM,* 401-010-001 or the documentation web site at (https://wireless.support.lucent.com/amps/rls_info/rls_doc/cd_docs/customer.support/customer.support_toc.pdf.wen).

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Contents

About this document

Purpose

This Information Product (IP) describes the basic site requirements that should be used to plan a Alcatel-Lucent 9218/9228 Base Station Macro (formerly Modular Cell 4.0/4.0B) outdoor site. This document includes specific tasks that should be completed at the job site before an installation can begin.

Important! Alcatel-Lucent has changed the name of products within the CDMA portfolio. The product previously known as the Modular Cell 4.0/4.0B cabinet has been renamed and is now the 9218/9228 Base Station Macro cabinet. The use of any of these names, in this document, refer to the same product with the same functionality.

Reason for revision

The previous issue of this document was 401-703-413R31, Issue 14, October 2008. The Release number refers to the release the document has been updated to. Issue 1 is the initial issue number for a release. In this case, the document number goes from 401-703-413R31 to 401-703-413R36.

This document is *Alcatel-Lucent 9218/9228 Base Station Macro Outdoor Site Preparation Guidelines,* document number 401-703-413R36, Issue 15. This issue incorporates information available as of February, 2011.

This issue includes the following product revision:

- All occurrences of URC-II have been replaced with URC-III.

Intended audience

This IP is intended for customers preparing a 9218/9228 Macro outdoor site.

Conventions used

The following conventions are used in this IP:

Measurements

All measurements are shown in metric form, and are followed by the English conversion in parentheses.

Naming conventions

In this IP, the *Alcatel-Lucent 9218/9228 Macro Outdoor Cabinet* is referred to as *9218/9228 Macro Outdoor Cabinet*.

Standard cross-sections and wire diameters of round copper conductors

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 information product 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
50	0 (1/0)
70	00 (2/0)
95	000 (3/0)
-	0000 (4/0)
120	250 kcmil
150	300 kcmil
185	350 kcmil

ISO rated cross-sectional area (mm^2)	AWG/kcmil size
-	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).	

Related documentation

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

Alcatel-Lucent documents (required, or required as applicable)

- *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115
- *Installation Instructions. Interface kit for attachment of 60EC or 60ECv2 Battery cabinet to Outdoor Modular Cell 3.0 or 9218 Base Station Macro (formerly CDMA Modular Cell 4.0) with Integrated Power,* 109236661
- *Installation Instructions, Interface Kit for Attachment of 60ECv2 Battery Cabinet to Outdoor 9228 Base Station Macro Primary Cabinet with Integrated Power,* 109621573
- *Installation Instructions, Interface Kit for Non-Standard Attachment of 60ECv2 Battery Cabinet to Outdoor 9228 Base Station Macro Primary Cabinet with Integrated Power,* 109676239
- *Installation Instructions, Interface Kit for Installation of Second 60ECv2 Battery Cabinet with First 60ECv2 Battery Cabinet,* 109683177

Other documents (required)

- *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)*
- *GR-487-CORE, Telcordia*
- *GR-63-CORE, Telcordia*

Alcatel-Lucent documents (not required)

The following documents are related but not required for a 9218/9228 Macro outdoor site.

- Flexent® *Modular Cell 3.0 - Outdoor Site Preparation Guidelines,* 401-703-405
- Flexent™ *CDMA Modular Cell Site Preparation Guidelines,* 401-710-120 (This document supports Modular Cell Indoor and Outdoor, for both 1.0 and 2.0.)
- *Alcatel-Lucent Base Stations Macro 9218, 9228, 9228 LP, and 9228 Distributed System Description,* 401-703-486

- *Alcatel-Lucent CDMA Base Stations Operations, Administration and Maintenance,* 401-703-407
- *Engineering Rules/Guidelines* Flexent™ *Modular Cell 4.0,* ER_0102_0002
- *Engineering Rules/Guidelines* Flexent™ *Modular Cell 4.0B,* ER_0102_0004
- *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR

Related training

Alcatel-Lucent offers the following product-related training for the 9218/9228 Macro Outdoor Cabinet:

- Flexent® *Modular Cell 4.0 Installation Video Course,* CL 5494
- Flexent® *CDMA Modular Cell 4.0 Operations, Administration, & Maintenance (OA&M),* CL 5690

To obtain technical support, documentation, and training or submit feedback

The Online Customer Support (OLCS) web site, *http://support.lucent.com*, provides access to technical support, related documentation, related training and feedback tools. On the right side of the page is a technical support telephone number lookup tool. The site also provides account registration for new users.

Site preparation checklists

All site preparation activities, as well as adherence to the guidelines, should be verified before the installation of the cell site equipment.

Checklists and punchlists have been provided in Appendix A, "9218/9228 Macro - Outdoor site preparation checklists". These checklists and punchlists are intended to aid customers and Alcatel-Lucent personnel during a base station site Method of Procedure (MOP) walk-through before equipment installation. Utilization of the checklists helps ensure a quality installation and provides a base station site history file for later reference. The punchlist 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, " 9218/9228 Macro cell site information" 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.

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.

How to comment

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

1 Safety

Overview

Purpose

This chapter covers safety precautions for the 9218/9228 Macro installation.

Contents

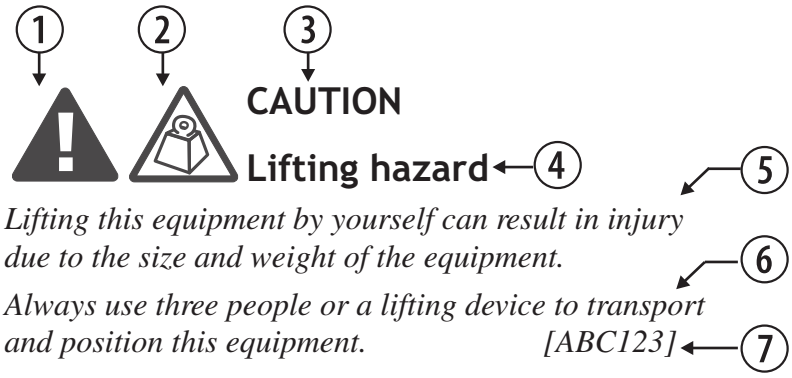
Structure of safety statements

Overview

Safety statements describe the safety risks relevant while performing tasks on Alcatel-Lucent products during deployment and/or use. Failure to avoid the hazards may have serious consequences.

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.

Within this IP, 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.

WARNING

Personal Injury or Damage to Equipment

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

- *Read and understand all instructions.*
- *Follow all warnings and instructions marked on this product.*
- *Installation and maintenance procedures must be followed and performed by trained personnel only.*
- *Grounding and circuit continuity is vital for safe operation of the equipment. Never operate the equipment with grounding/bonding conductor disconnected.*
- *Install only equipment identified in the product's installation manual. Use of other equipment may result in an improper connection which could lead to fire or injury.*
- *Use caution when installing or modifying telecommunications lines.*
- *The product has multiple power inputs. Before servicing, Disconnect all inputs to reduce the risk of energy hazards.*
- *For continued protection against risk of fire, all fuses used in this product must be replaced only with fuses of the same type and rating.*
- *Never install telecommunications wiring during a lightning storm.*
- *Never install telecommunications connections in wet locations.*
- *Never touch uninsulated telecommunications wiring or terminals unless the telecommunications line has been disconnected at the interface.*
- *Never push objects of any kind into the product through slots, as they may touch dangerous voltage points or short-out parts that could result in a fire or an electrical short.*
- *Never spill liquids of any kind on the product.*
- *Slots and openings in the product are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. The product should not be placed in a built-in installation unless proper ventilation is provided.*
- *To reduce the risk of an electrical shock, do not disassemble the product. Opening and removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.*

Safety - specific hazards

DANGER

Lightning Strikes!

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 a Modular Cell during stormy weather.

WARNING

Energy Hazard!

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

For this reason, only trained and qualified personnel may install or service the installation.

WARNING

Energy Hazard!

The power supply lines to the network element are energized. Short circuits can cause burns to the face and hands.

Open the load disconnect switch in the distribution box to completely de-energize the network element.

WARNING

Beryllium Oxide Poisoning Hazard!

The transmitter units include components which contain beryllium oxide (BeO). In this form, BeO ceramics do not constitute a hazardous material as long as this material is not destroyed by external mechanical forces.

In the event that repair work is carried out by the customer or by third parties, the following regulations must be observed:

- *Applicable version of the Regulation on Hazardous Materials in the Workplace*
- *Appropriate accident prevention regulations*

The following must be specifically observed:

- *Eating, drinking, and smoking are not permitted in workplaces where BeO ceramic components are being worked on.*
- *Wash your hands carefully under running water after working with BeO ceramic components.*

If the following symptoms occur, contact a physician:

- *Irritation of the respiratory organs*
- *Difficulty breathing or skin irritation*

NOTICE

Condensation may cause a short circuit!

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

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

NOTICE

ESD hazard

Semiconductor elements can be damaged by static discharges.

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

- *Wear conductive or antistatic work clothes (for example, coat made of 100% cotton).*
- *Wear grounded ESD wrist strap.*
- *Wear shoes with conductive soles.*
- *Leave the modules in their original packaging until ready for use.*
- *Make sure there is no difference in potential between yourself, the workplace, and the package before removing, unpacking, or packing a module.*
- *Hold the module only by the grip without touching the connection pins, tracks, or components.*
- *Place modules removed from the equipment on a conductive surface.*
- *Test or handle the module only with grounded tools on grounded equipment.*
- *Handle defective modules exactly like new ones to avoid causing further damage.*

DANGER

Cabinet lifting hazard!

When lifting cabinets, incorrect or improperly installed eyebolts will fail endangering personnel to bodily injury and destroying the equipment.

Avoid using the wrong eyebolts by following these guideline:

- *If a ½- inch eyebolt threads easily and fully into a lifting nut on the top of the cabinet, then use the ½- inch eyebolts.*
- *If not, check the threads for 12mm eyebolts. The 12 mm eyebolt should thread all the way down without binding, until it bottoms out.*
- *A 12-mm eyebolt is too small for a ½-inch lifting nut, but will not hand thread all the way into the ½-inch nut unless forced. It will cross thread if forced, and may pull out when hoisting, presenting a serious danger.* Do NOT force 12-mm eyebolts into ½-inch lifting nuts. *Doing so will damage the threads of the lifting nuts.*
- *A ½-inch eyebolt will thread less than half a thread into a 12-mm lifting nut.* Do NOT force ½-inch eyebolts into 12-mm lifting nuts. *Doing so will damage the threads of the lifting nuts.*

Product safety

Conformance statements

See Appendix H, "Product conformance statements" for all conformance statements that apply to this product.

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 cabinet, 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.

Important! Refer to "Structure of safety statements" (p. 1-2) for definitions of safety labels.

2 Product overview

Overview

Purpose

This chapter provides an overview of the 9218/9228 Macro Outdoor Cabinet.

Contents

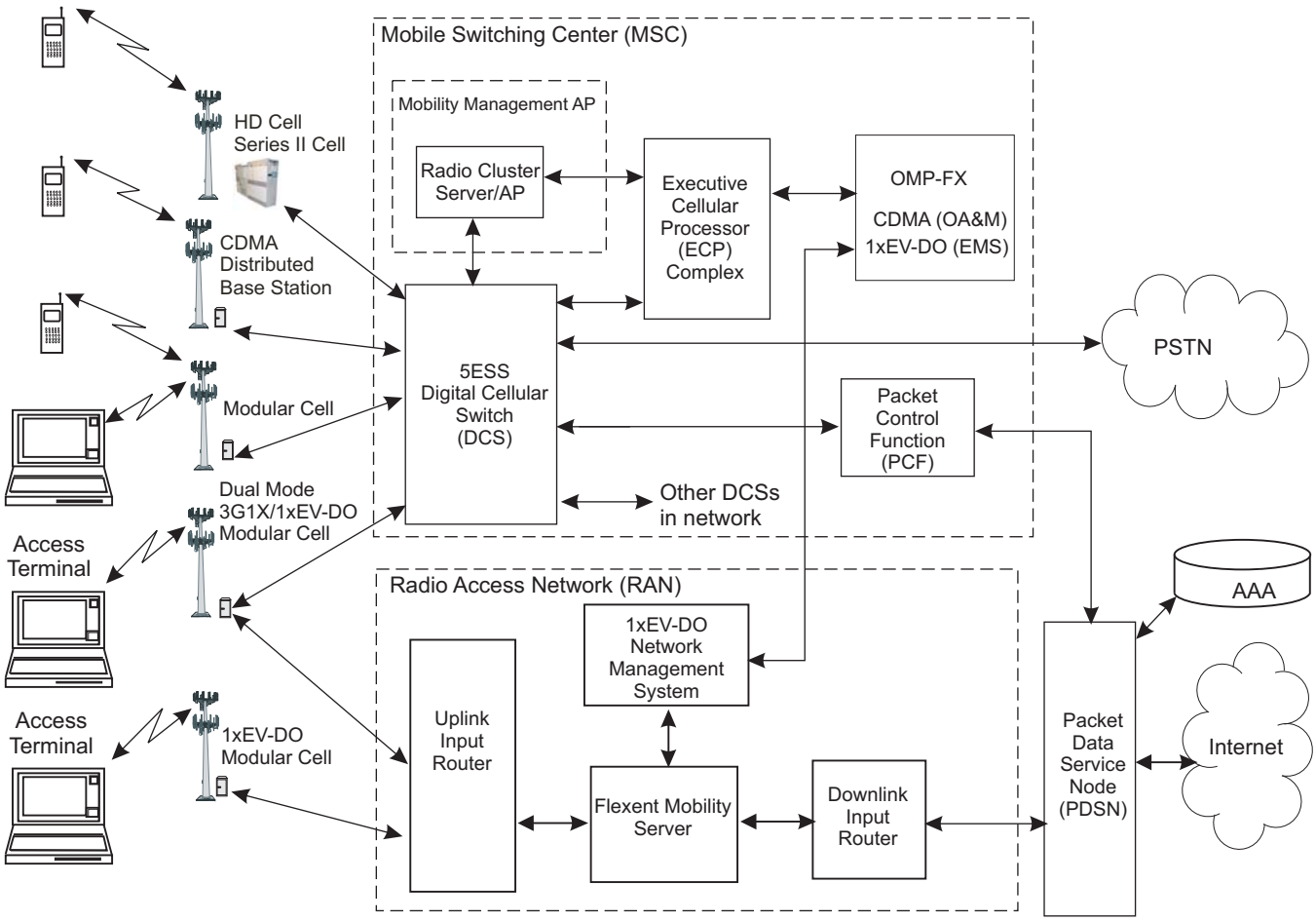
Network view

Overview

This section provides a high-level overview of a 2G/3G wireless network that describes how base station locations are selected, the different base station hardware that may be deployed, and how base stations interconnect with other base stations, the Public Switched Telephone Network, and the Internet.

Wireless network block diagram

The following figure shows how the different Alcatel-Lucent base station cabinets interface with the Mobile Switching Center and the 1xEV-DO radio access network (RAN) to form a wireless network.



Base station location

The location of each cell site is carefully planned by RF engineers so that a continuous radio coverage of a geographical area is maintained. This planning ensures that service to each mobile user is uninterrupted as the user moves throughout the coverage area. At the center of each cell site is a base station, which is available for a number of different RF deployment configurations based on the size of the cell, the expected voice/data call load, its indoor/outdoor location, and the base station release (when the base station was installed).

AUTOPLEX® and Alcatel-Lucent CDMA platforms

In some markets, Alcatel-Lucent CDMA wireless networks are deployed on two platforms: the earlier *AUTOPLEX*® system, using Series II base stations, and the newer Alcatel-Lucent CDMA system, using smaller, more compact modular base stations. The two platforms can coexist within the same network, as shown in the previous figure. Because the Series II base stations are no longer manufactured, the Alcatel-Lucent CDMA base station will be used for all future installations.

The primary difference between Series II and Alcatel-Lucent CDMA base stations is that the Series II base stations contain dedicated radio control data processing circuitry and Alcatel-Lucent CDMA base stations do not. For voice and 3G1X data calls in the Alcatel-Lucent CDMA system, radio control data processing is centralized for all Alcatel-Lucent CDMA base stations by the Mobility Management Application Processor (AP) in the Mobile Switching Center (MSC). Additionally, an Alcatel-Lucent CDMA base station can be configured to service 2G voice and 3G voice/data calls, in addition to 3G 1xEV-DO high-speed data transmissions. Although 1xEV-DO can be collocated in the same base station with 2G/3G voice service, its deployment is outside the MSC domain and it requires a Radio Access Network (RAN) ground network.

Despite the versatility of the Alcatel-Lucent CDMA base station, handling three technologies: 2G voice, 3G voice/data, and 3G 1xEV-DO high speed data, base station installation is transparent of the technology.

T1/E1 connection to base station

Regardless of the 2G/3G1X base station deployment configuration, each base station within a graphical area is connected to a Mobile Switching Center (MSC) via one or more T1/E1 lines. Each T1/E1 line is used to transfer call traffic for a number of mobile users to and from the base station. The call traffic over the T1/E1 line from each user, which may either be voice or a 3G data message, is transferred in a time-share fashion, where the traffic data from each mobile is transferred in discrete DS1 time slots.

In addition to call traffic, a control DS1 time slot is used to transmit signaling and control information between the base station and the MSC. In 1xEV-DO base stations, and base stations that include 1xEV-DO, the T1/E1 lines goes to uplink input routed in the RAN network.

Mobile Switching Center (MSC)

The T1/E1 lines carrying voice calls from all the base stations within a covered area are received at the MSC by a *5ESS*® Digital Cellular Switch (DCS). The DCS switches each voice call either to other DCSs in the cellular network or to the Public Switch Telephone Network (PSTN) to complete mobile calls. When 3G-1X data messages are received, the DCS provides connectivity to the Internet via the Packet Data Service Node (PDSN). This connectivity is handled by the Packet Control Function (PCF) in the MSC. The operation of the PDSN is discussed in "Accessing the internet" (p. 2-6).

The registering and routing of each call switched through the DCS is controlled by the Executive Cellular Processor (ECP). The ECP maintains the control database for all the base stations in the system. After each base station is installed, the operating characteristics of the base station and how the base station interacts with other neighboring base stations is downloaded into the ECP as part of Operations, Administration and Maintenance (OA&M) via the Operation/Maintenance platform (OMP-FX). The database for base stations is then used by a group of Radio Cluster Server (RCS)/AP under the supervision of the Mobility Management AP to control the traffic data though the base stations. Each RCS/AP is a dedicated computer running up to 16 incidents of Radio Cluster Server (RCS) software on a *UNIX*® operating system. Each cellular call is registered through the RCS, which generates switching signal information, which causes the DCS to route the call from/to a base station that is in closest proximity to its mobile user.

Completing landline initiated calls

When a landline-to-mobile call is initiated, call signaling from the PSTN, containing the mobile directory number, is sent the DCS. The call signaling is registered by the ECP via the AP interface. The ECP converted the mobile directory number to its associated electronic mobile serial number. Not knowing where the mobile user is, the mobile serial number is transferred via the AP interface to the DCS and is sent out to all the base stations via a control DS1 time slot on the T1/E1 lines. As a result, each base station will broadcast the mobile serial number over a paging channel. The paging channel is a preassigned channel broadcast over each sector in the base station domain. When the target mobile identifies its serial number on the paging channel, it will transmit a response to acknowledge the page. The response is sent to the base station and sector that are in close proximity to the mobile. The base station receiving this response, then sends the page acknowledgement to its associated RCS, indicating that the call may be forward to the targeted mobile. Subsequently, the RCS generates the appropriated signals causing the

DCS to route the call traffic from the PSTN to the base station to acknowledged the page. The call traffic is routed on an available DS1 time slot on one of the T1/E1 lines going to the base station. At this time, the base station establishes a duplex RF channel with the targeted mobile to complete the call.

Completing mobile initiated calls

If a call is initiated by a mobile user, when the send button on the mobile is activated, the call directory number entered by the mobile user is transmitted to the base station sector closest to the mobile. The base station then sends the directory number to the MSC via the control DS1 slot on its T1/E1 line. If the directory number is associated with a landline telephone, the number is routed to the PSTN to complete the call, and an RF channel is allotted to handle the call traffic. If the directory number is associated with another mobile within the cellular service provider network, the directory number is converted to its associated mobile serial number by ECP. As a result, the serial number is broadcast over the paging channels in the service provider network. If the location of the terminal mobile is unknown, the serial number is routed to other DCSs in the service provider network to widen the page coverage. When the landline phone or terminal mobile is answered, the call is registered in the ECP. At this time, the allotted RF channel is activated, and the DCS is configured by the RCS to route the call traffic between the base station where the call was initiated, and the telephone or mobile where the call is terminated. When the call is terminated to an in-network mobile, the call traffic is routed directly between the DCS where the call is initiated to the DCS where the call is terminated.

1xEV-DO service

The installation of a 1xEV-DO base station is the same as a 2G/3G base station installation regardless of whether the 1xEV-DO base station is a standalone base station or is collocated with a 2G or 3G-1X base station. The difference is the destination of the T1/E1 lines. Rather than going to the MSC, the T1/E1 lines are connected by an Alcatel-Lucent CDMA Mobility Server (FMS) within the RAN network. Users will access the RAN through an Access Terminal (AT) that maintains an air interface with a 1xEV-DO base station. The AT may be used in a laptop computer, a handheld device such a *Palm*™ Pilot or personal digital assistant, or multi-mode mobile with AMPS/IS-95 and 3G-1X/1xEV-DO capabilities.

The FMS is analogous with the mobility management AP in the 2G/3G voice network. It provides call processing functionality that allows an AT user to acquire the RAN network. Each FMS frame is capable of interfacing and handling the call processing function for 48 base stations, and the RAN network can use up to six FMS frames. Therefore, the RAN next can service up to 288 base stations. The uplink input router, which is a bidirectional

device, and provides a common point to terminate back-haul T1/E1 lines from all 1xEV-DO base stations, and steers and converts the uplink data stream received over the T1/E1 line to the FMS frames.

User maintenance and controls for the six FMSs within the RAN are provided through an Element Management System (EMS), which runs on the Alcatel-Lucent CDMA Operations & Management Platform (OMP-FX). The system and base station control and configuration database is downloaded from the Alcatel-Lucent CDMA OMP-FX platform into the 1xEV-DO network management system. When the RAN network is integrated with an Alcatel-Lucent wireless voice network, as shown in the previous figure, the same OMP-FX platform may by used for voice and 1xEV-DO data networks. The FMS-processed data is connected to PDSN via the downlink input router.

Accessing the internet

Each time a user accesses the Internet, either a dynamic Internet Protocol (IP) address is assigned to the user, or the user asserts its own static IP address. The dynamic IP address is assigned for the duration of the Internet session by the PDSN, which is operated as a Home Agent (HA) for the Internet Service Provider (ISP). As its agent, the ISP allocates the PDSN to open an Internet session with a petitioning AT, in the 1xEV-DO system, or a 3G mobile in a 3G-1X system.

Prior to allowing an AT/3G mobile network access, the AT/3G mobile is challenged for authentication to determine if the AT/3G mobile is not masquerading under a false ID, and also for authorization to determine if the AT/3G mobile is permitted (authorized) to access the network. This challenge is implemented by the Authentication, Authorization and Accounting (AAA) server via a server/client relationship with the PDNS client. The AAA maintains a subscriber database which is used to validate the user's ID and password. The PDSN records AT/3G mobile data usage to provide accounting information to the AAA Server.

The IP address defines a physical location on the Internet. When an IP session is established with an AT/3G mobile, the most significant digits of the IP address, which are listed in the Internet routing tables, are used to direct Internet data traffic associated with the AT/3G mobile to and from the PDSN. The PDSN maps the AT/3G mobile to the IP address so that data reaching the PDSN is directed to the AT/3G mobile. Therefore, no matter where the user may go on the Internet, the IP address ensure that response data is routed back to the uses via the PDSN.

Product overview

Introduction

This document supports the following two similar products:

- Alcatel-Lucent 9218 Base Station Macrooutdoor cabinet
- Alcatel-Lucent 9228 Base Station Macro outdoor cabinet

Product description for Alcatel-Lucent 9218 Base Station Macro

The Alcatel-Lucent 9218 Base Station Macro is a high-capacity base station that uses the *OneBTS*™ common platform architecture. The 9218 Macro Outdoor Cabinet is a *OneBTS*™ digital module with UCRs and LAMs.

The 9218 Macro Outdoor Cabinet may be used as a primary cell, or may be configured as a growth cabinet, a dual-band cabinet, or a mixed dual-band cabinet, as described in the following table. All 9218 Macro Outdoor Cabinets have a top solar shield. See Chapter 3, "Site configurations" for details about which cabinets can be used in which new and existing line-up configurations.

The following table describes the different types of 9218 Macro Outdoor Cabinets:

Cabinet	Description
9218 Macro Outdoor Primary Cabinet	The 9218 Macro Outdoor Primary Cabinet houses the CDMA radio communication electronics, amplifiers, filters, cell site control electronics, alarms, T1/E1 facilities interface, and the user alarm interface. If the cabinet has integrated power, it also contains a power module, rectifiers, and up to four backup batteries. The 9218 Macro Outdoor Primary Cabinet is equipped with UCRs and LAMs. The 9218 Macro Outdoor Primary Cabinet contains either 850 carriers, PCS carriers.
9218 Macro Outdoor Growth Cabinet	The 9218 Macro Outdoor Growth Cabinet is used to contain additional carriers when no more can fit in the 9218 Macro Outdoor Primary Cabinet. The 9218 Macro Outdoor Growth Cabinet houses only amplifiers; there is no radio shelf and no filters. The 9218 Macro Outdoor Growth Cabinet contains either 850 carriers or PCS carriers, but not both. The 9218 Macro Outdoor Growth Cabinet integrated power module is controlled by the primary cabinet integrated power module.

Cabinet	Description
9218 Macro Outdoor Dual-band Cabinet	The 9218 Macro Outdoor Dual-band Cabinet is used to contain carriers of a different frequency from those in the 9218 Macro Outdoor Primary Cabinet. The 9218 Macro Outdoor Dual-band Cabinet is equipped the same as a 9218 Macro Outdoor Primary Cabinet, but the 9218 Macro Outdoor Dual-band Cabinet integrated power module is controlled by the primary cabinet integrated power module. Also, the 9218 Macro Outdoor Dual-band Cabinet has no external GPS antenna connection and is supported by the GPS antenna of the primary cabinet.
9218 Macro Outdoor Mixed Dual-band Cabinet	A 9218 Macro Outdoor Mixed Dual-band Cabinet is a single cabinet that contains both 850 and PCS carriers. The 9218 Macro Outdoor Mixed Dual-band Cabinet is equipped the same as a 9218 Macro Outdoor Primary Cabinet, except that the 9218 Macro Outdoor Mixed Dual-band Cabinet has filters for the added band only, and the 9218 Macro Outdoor Mixed Dual-band Cabinet integrated power module is controlled by the primary cabinet integrated power module.

The growth, dual-band, and mixed dual-band cabinets are referred to collectively as "additional cabinets."

9218 Macro additional cabinets can be added to existing line-ups as follows:

- Additional 9218 Macro cabinets *with integrated power* may be used with existing 3.0 or 9218 Macro cabinets.

  Additional 9218 Macro cabinets *without integrated power* may be used with existing 1.0, 2.0, 3.0, or 9218 Macro cabinets.

Product description for Alcatel-Lucent 9228 Base Station Macro

The Alcatel-Lucent 9228 Base Station Macro is a high-capacity base station that uses the *OneBTS*™ common platform architecture. The Alcatel-Lucent 9228 Base Station Macro is a *OneBTS*™ digital module with MCRs and 2PAMs.

The 9228 Macro Outdoor Cabinet may be used as a primary cell, or may be configured as a dual-band cabinet, as described in the following table. All 9228 Macro Outdoor Cabinets have a top solar shield. See Chapter 3, "Site configurations" for details about which cabinets can be used in which new and existing line-up configurations.

The following table describes the different types of 9228 Macro Outdoor Cabinets:

Cabinet	Description
9228 Macro Outdoor Primary Cabinet	The 9228 Macro Outdoor Primary Cabinet houses the CDMA radio communication electronics, amplifiers, filters, cell site control electronics, alarms, T1/E1 facilities interface, and the user alarm interface. If the cabinet has integrated power, it also contains a power module, rectifiers, and up to four optional backup batteries, if the cabinet is not equipped with a A6 amplifier shelf. The 9228 Macro Outdoor Primary Cabinet contains either 850 carriers, PCS carriers, or AWS carriers. The 9228 Macro Outdoor Primary Cabinet is equipped with MCRs and 2PAMs.
9228 Macro Outdoor Dual-band Cabinet	The 9228 Macro Outdoor Dual-band Cabinet is used to support carriers of a different frequency from those in the 9228 Macro Outdoor Primary Cabinet. The 9228 Macro Outdoor Dual-band Cabinet is equipped the same as a 9228 Macro Outdoor Primary Cabinet, except that the 9228 Macro Outdoor Dual-band Cabinet has no external GPS antenna connection and is supported by the GPS antenna of the primary cabinet.

Product attributes

The following table reviews the various attributes of the 9218/9228 Macro cabinets.

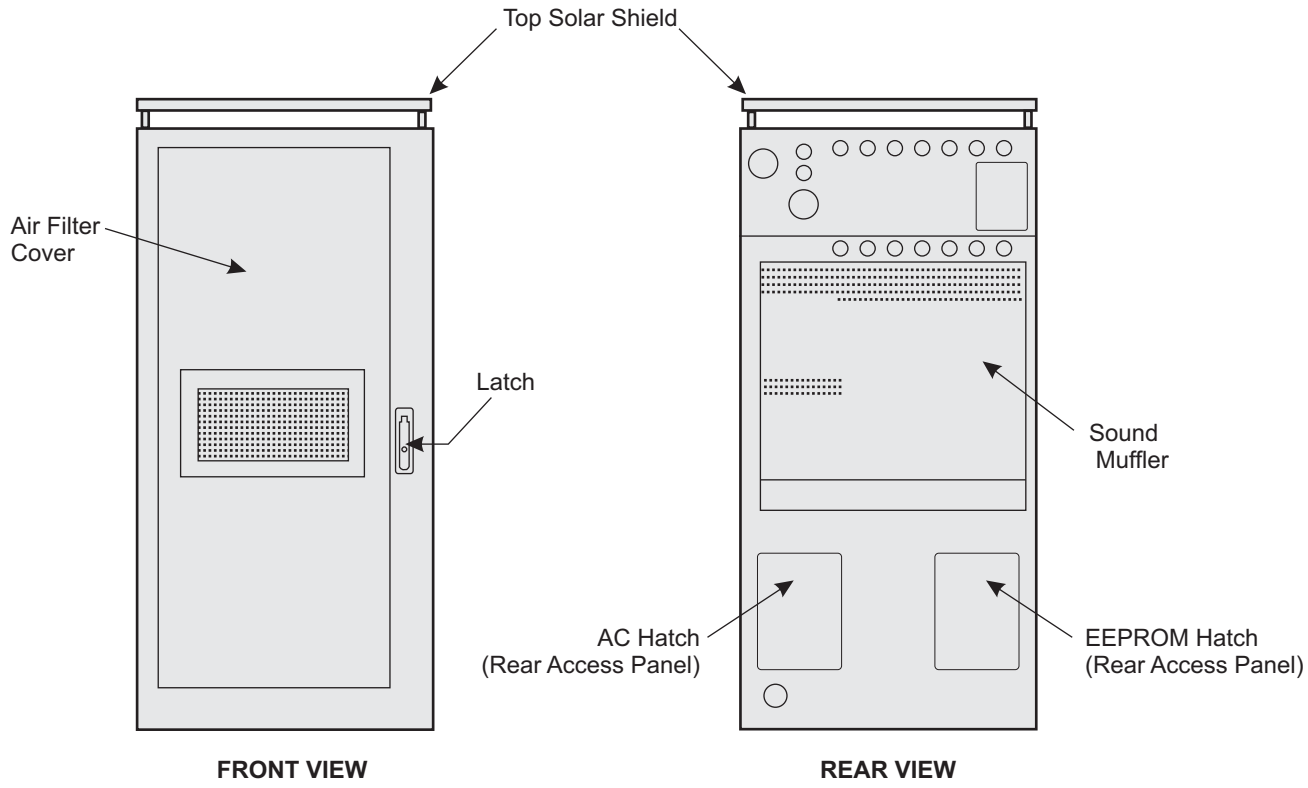
Attributes	9218 Macro (4.0)	9228 Macro (4.0B)
Frequency Bands	• PCS 1900 MHz • Cellular 850 MHz	• PCS 1900 MHz • Cellular 850 MHz • AWS
Operating Temperature	• -40 °C to +46 °C (-40 °F to +115 °F) standard • -40 °C to 50 °C (-40 °F to 122 °F) extended	• -40 °C to +46 °C (-40 °F to +115 °F) standard • -40 °C to 50 °C (-40 °F to 122 °F) extended
Power	Either of the following: • Integrated Power • Without Integrated Power (separate power cabinet required)	Either of the following: • Integrated Power • Without Integrated Power (separate power cabinet required)

Attributes	9218 Macro (4.0)	9228 Macro (4.0B)
Battery backup	For cabinets with integrated power, either of the following: • Internal battery • Battery cabinet For cabinets using customer-supplied power, customer provides appropriate backup power system.	For cabinets with integrated power, one or both of the following: • Internal battery • Battery cabinet For cabinets using customer-supplied power, customer provides appropriate backup power system.
Operating Voltage	• +24 VDC	• +24 VDC • -48 VDC
Sectors	1, 2, or 3 sector	3, 4, or 6 sector 1, 2, or 3 Intelligent Antenna (IA) sectors
Carriers	• 1- 6 per cabinet (with A6 Amplifier Shelf) • 1- 4 per cabinet (without A6 Amplifier Shelf)	For 3-sector cabinets: • 1-11 PCS per cabinet (with A6 Amplifier Shelf) • 1-7 PCS, 1-7 AWS, or 1-8 850 per cabinet (without A6 Amplifier Shelf) For 4- and 6-sector cabinets: • 1-6 PCS, or 1-6 AWS per cabinet (with or without A6 Amplifier Shelf)
Filters	Duplex/Triplex	Dual-Duplex Block Filters Dual-Triplex filters (AWS) Dual-Quadraplex filters (AWS)
T1/E1 Facilities	Up to 12 T1/E1 with URCs	Up to 12 T1/E1 with URCs Up to 20 T1/E1 with URC-IIIs
User alarms	7 for power alarms 25 for user alarms	7 for power alarms 25 for external user alarms
GPS Antenna	Yes	Yes

Physical description

Diagram

The following figure shows the front and rear views of the 9218/9228 Macro cabinet.



Description

The 9218/9228 Macro Outdoor Cabinet is a CDMA base station.

Beginning with Release 28, the cabinet has been redesigned. The new design includes the Fresh Air Cooling (FAC) feature, which replaces the heat exchanger. The FAC feature uses a filter membrane technology to achieve clean-room conditions inside the base station. This technology allows the new 9218/9228 Macro Outdoor Cabinet to outperform earlier models in temperature control, reliability, and power consumption.

The new features of the cabinet with FAC feature include:

- Filter life alarm - The cabinet has a pressure sensing alarm that alerts an administrator when too much force is necessary to draw air into the cabinet.
- Lighter door – The door weighs 60% less than the previously used front heat exchanger door, which means that the door is much easier to remove and install when the cabinet is moved through tight spaces.

- Smaller shadow footprint – The redesigned cabinet is no different in physical dimensions, but the door is 88.9 mm (3.5 in.) less deep.
- Rear access hatches – The rear access door has been removed and replaced with two smaller, more appropriately placed hatches. The AC hatch allows for a much easier access to the wiring and connection point. The EEPROM hatch allows for EEPROM access without requiring exposure of the whole digital shelf to the elements.
- Reintroduced Flex Light – A hands-free flex light in the cabinet is again available as an option.

Because the base station cabinet is in vacuum (low pressure), all openings on the cabinet have to be sealed when the cabinet is in use in order to maintain the low pressure within the cabinet.

A top solar shield (standard for all cabinets) is shipped loose with the cabinet, to be installed in the field.

Important! Refer to Appendix C, “Lifting and moving cabinet guidelines” for guidelines on lifting and moving the cabinet.

Cabinet configurations

Purpose

This section describes the cabinet configurations that are supported for 9218/9228 Macro Outdoor Cabinet.

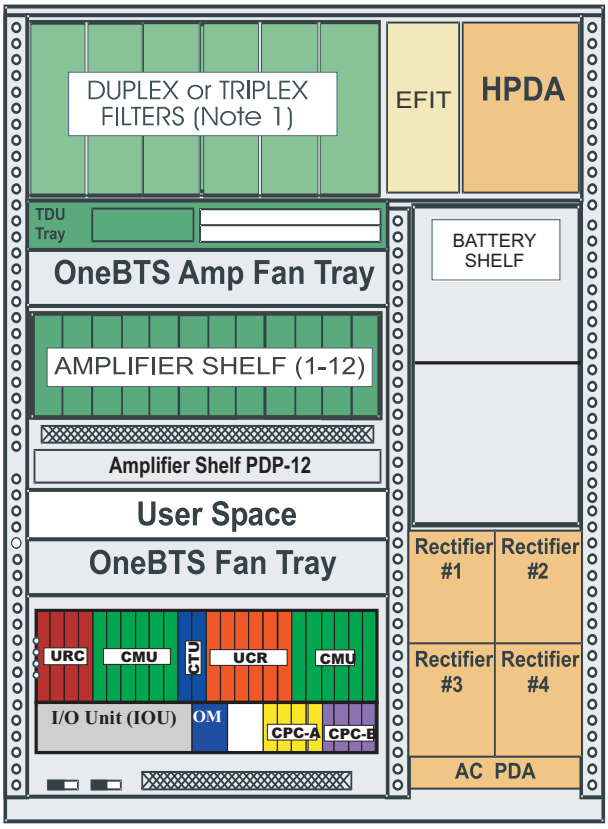
9218 Macro Outdoor Cabinet configurations

The 9218 Macro Outdoor Cabinet houses CDMA radio communication electronics, amplifiers, alarms, T1/E1 facilities interface, filters (except in growth cabinets), and the user alarm interface. Integrated power cabinets also house a power supply, rectifiers, and up to four backup batteries (two strings). The 9218 Macro Outdoor Cabinet can be shipped with components that provide 1-6 carriers, and 1-3 sectors.

Upgrade kits are available to add additional carriers and sectors up to the maximums.

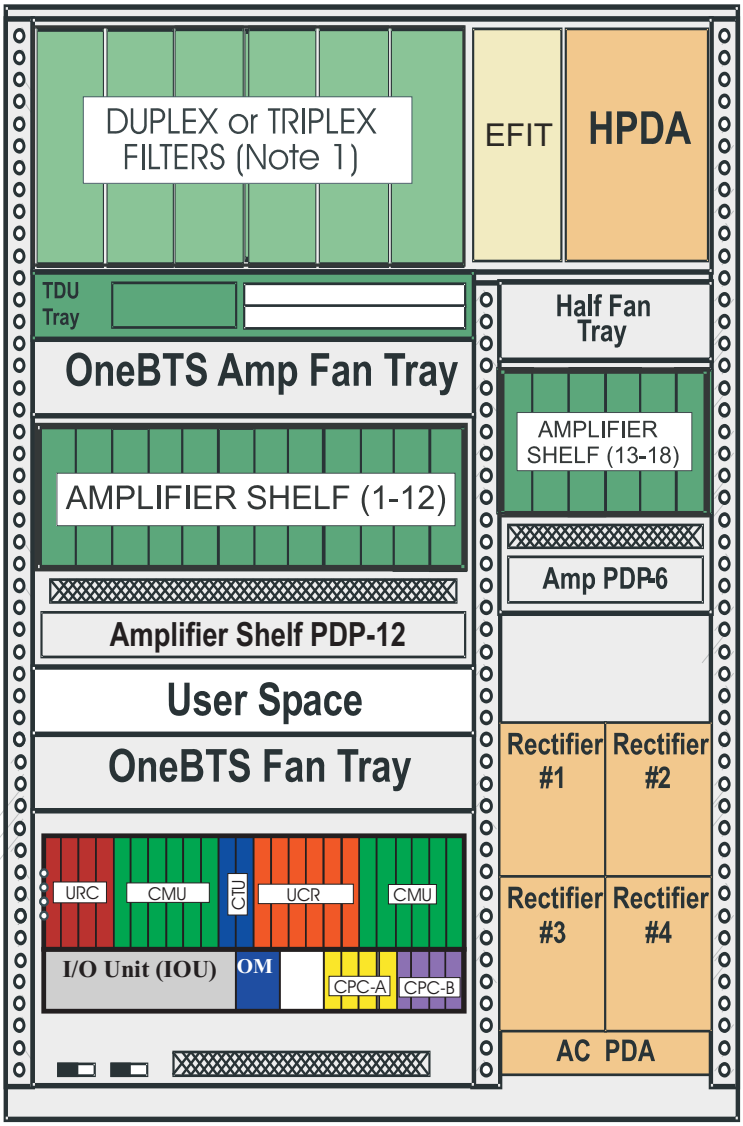
This section shows the various cabinet configurations that are supported.

9218 Macro one to twelve amplifier cabinets with integrated power



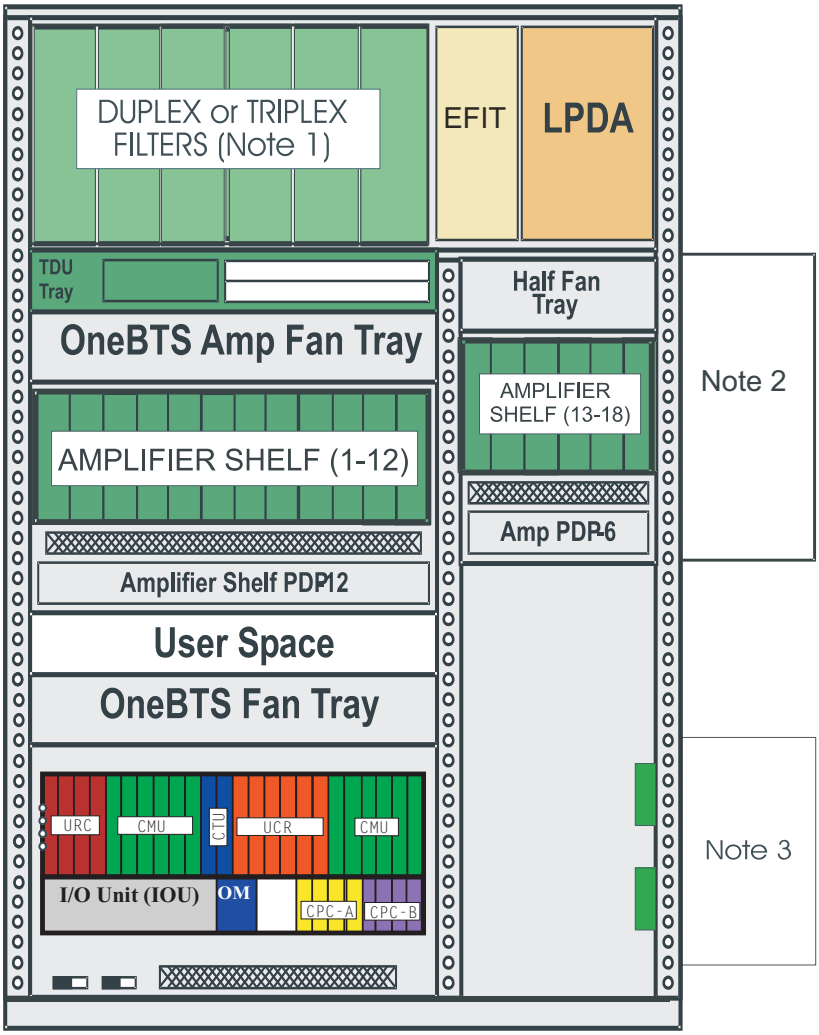
Note 1: Growth cabinets do not contain filters

9218 Macro thirteen to eighteen amplifier cabinets with integrated power (no battery module)



Note 1: Growth cabinets do not contain filters

9218 Macro cabinets without integrated power



Note 1: Growth cabinets do not contain filters

Note 2: Shown with optional A6 shelf for amplifiers 13 through 18

Note 3: AC convenience outlet junction box (NAR only) and heater junction box

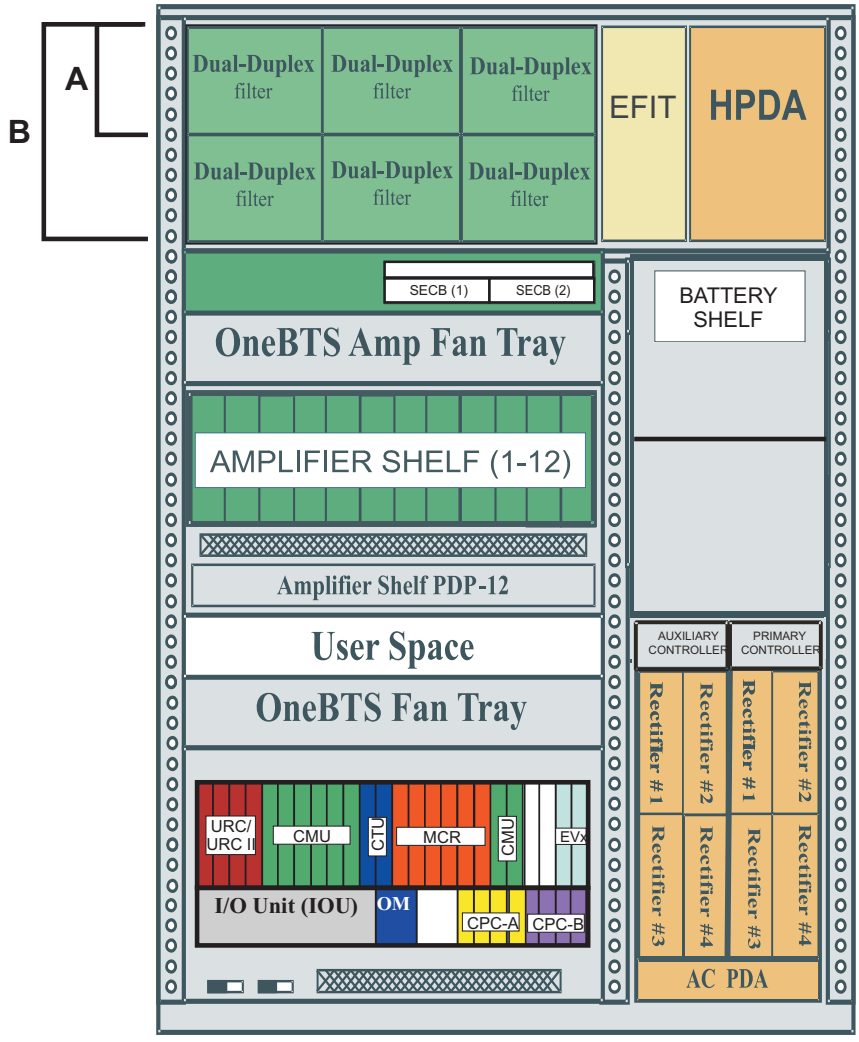
9228 Macro Outdoor Cabinet configurations

The 9228 Macro Outdoor Cabinet houses CDMA radio communication electronics, amplifiers, alarms, T1/E1 facilities interface, filters, and the user alarm interface. Integrated power cabinets also house a power supply, rectifiers, and up to four backup batteries (two strings).

The 9228 Macro Outdoor Cabinet can be shipped with components in different variations, refer to "Line-up configurations for 9228 Macro Outdoor Cabinet" (p. 3-6).

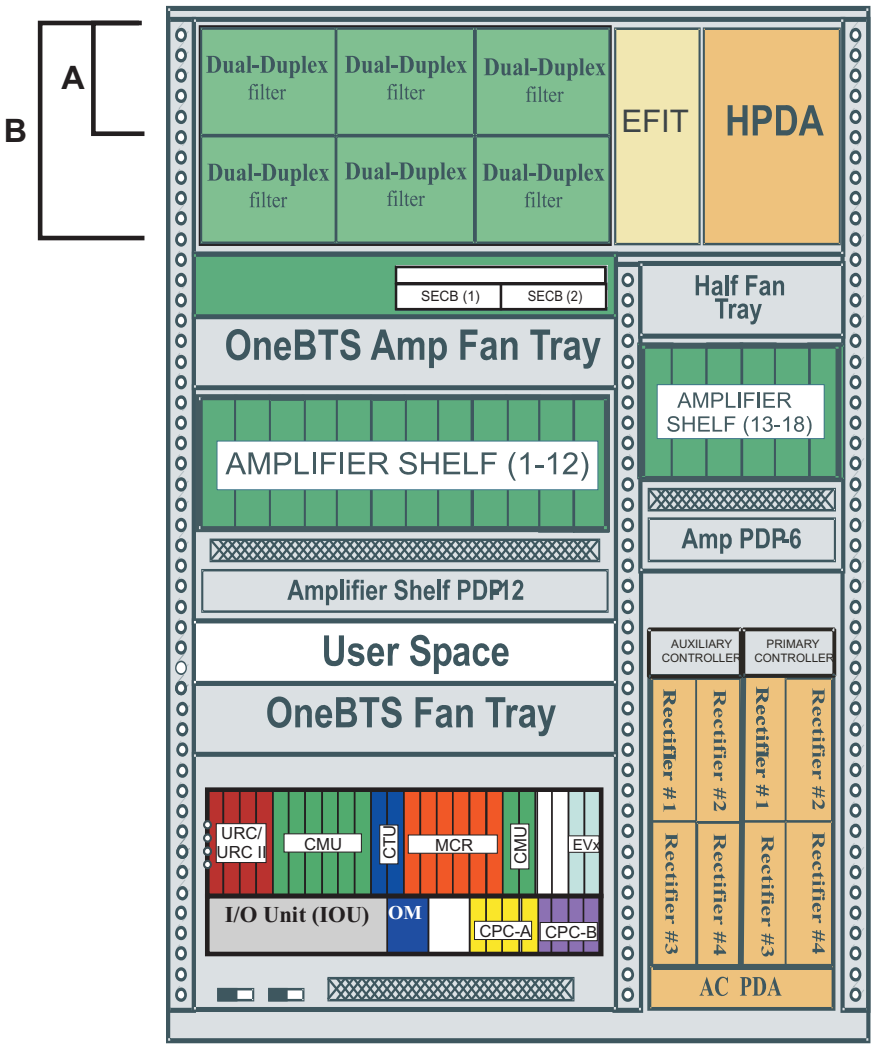
Upgrade kits are available to add additional carriers and sectors up to the maximums.

9228 Macro one to twelve amplifier cabinets with integrated power



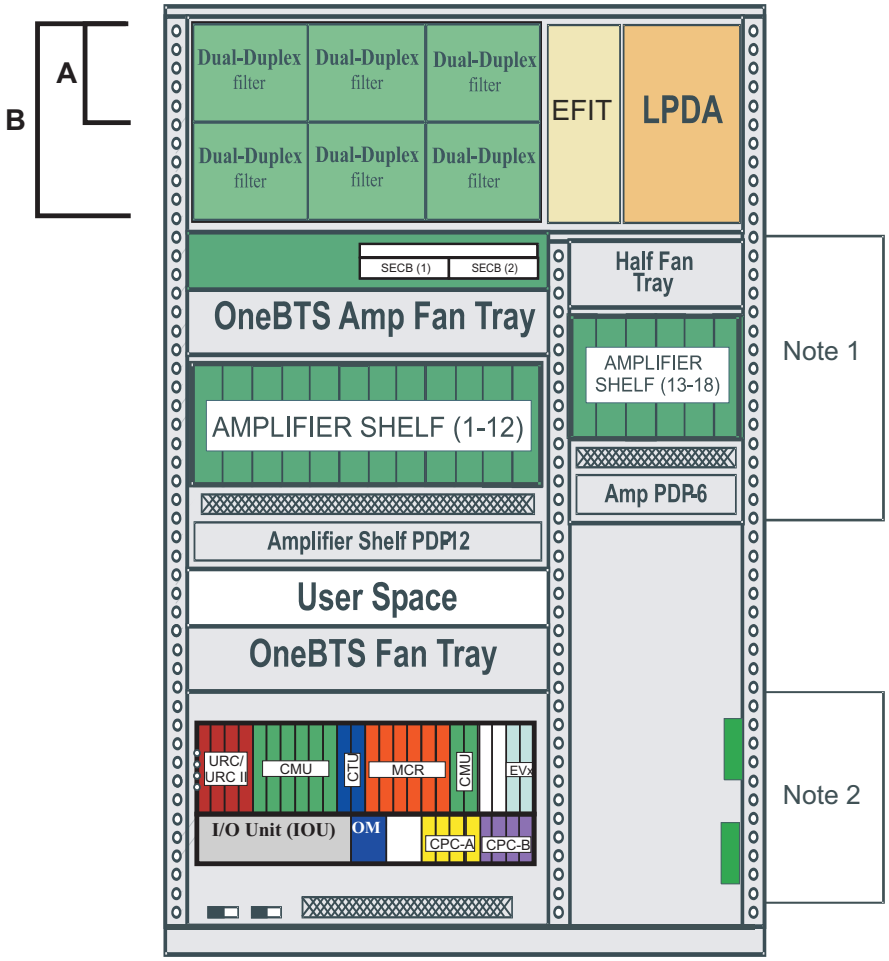
A: Dual Duplex Filters, 1-3 Sectors (850, PCS, AWS)
B: Dual Duplex Filters: 4 or 6 Sectors (850, PCS, AWS)

9228 Macro thirteen to eighteen amplifier cabinets with integrated power (no battery module)



A: Dual Duplex Filters, 1-3 Sectors (850, PCS, AWS)
B: Dual Duplex Filters: 4 or 6 Sectors (850, PCS, AWS)

9228 Macro cabinets without integrated power

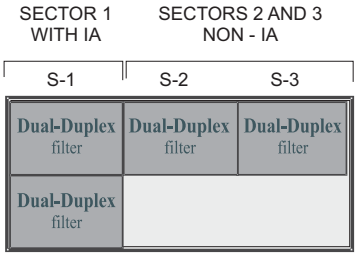


Note 1: Illustrated with A6 shelf for amplifiers 13 through 18.

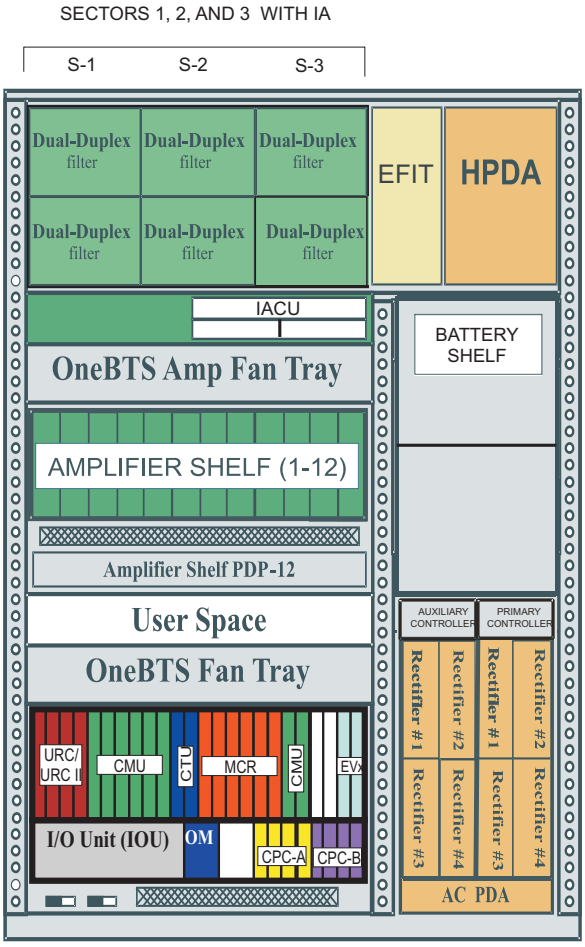
Note 2: AC junction box and convenience outlet.

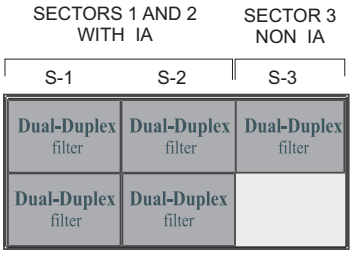
A: Dual Duplex Filters, 1-3 Sectors (850, PCS, AWS)
B: Dual Duplex Filters: 4 or 6 Sectors (850, PCS, AWS)

9228 Macro Primary Cabinet (3-sector with Intelligent Antenna)



THE IA SECTOR MAY ALSO BE S2 OR S3

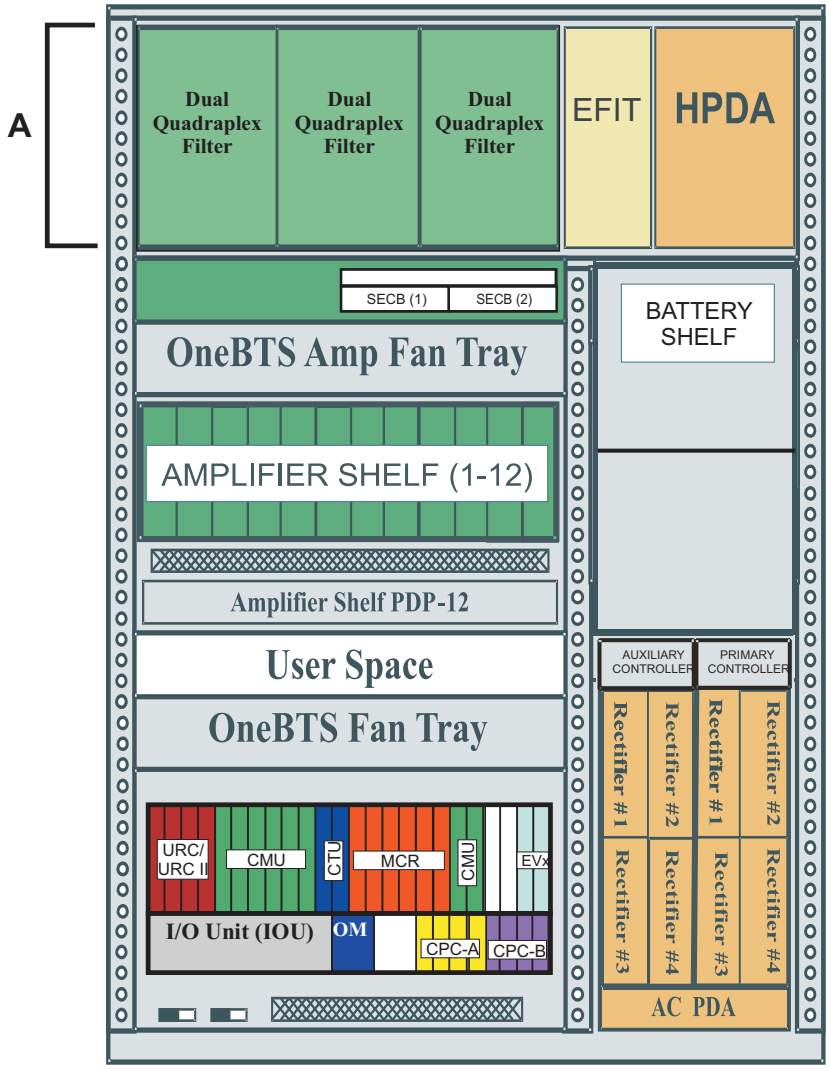




THE TWO IA SECTORS MAY ALSO BE S1 AND S3, OR S2 AND S3

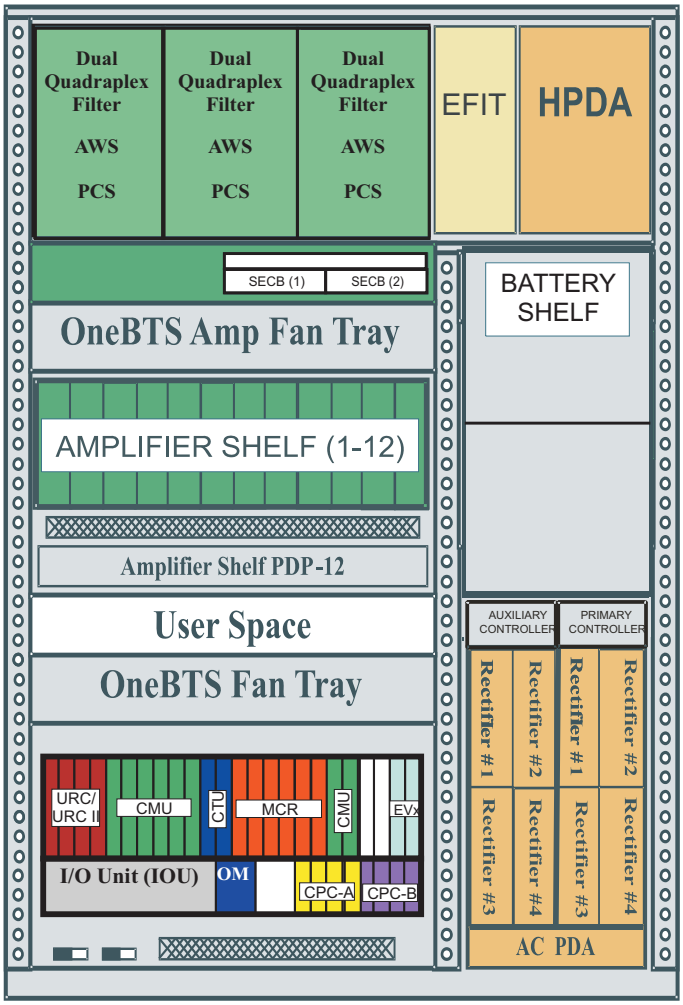
NOTE: DEPENDING UPON THE NUMBER OF CARRIERS, AND THEIR TYPE, THE A6 SHELF MAY REPLACE THE BATTERY MODULE WITH ADDITIONAL AMPLIFIERS

9228 Macro AWS and PCS Dual Band (Single cabinet - 3-sector)

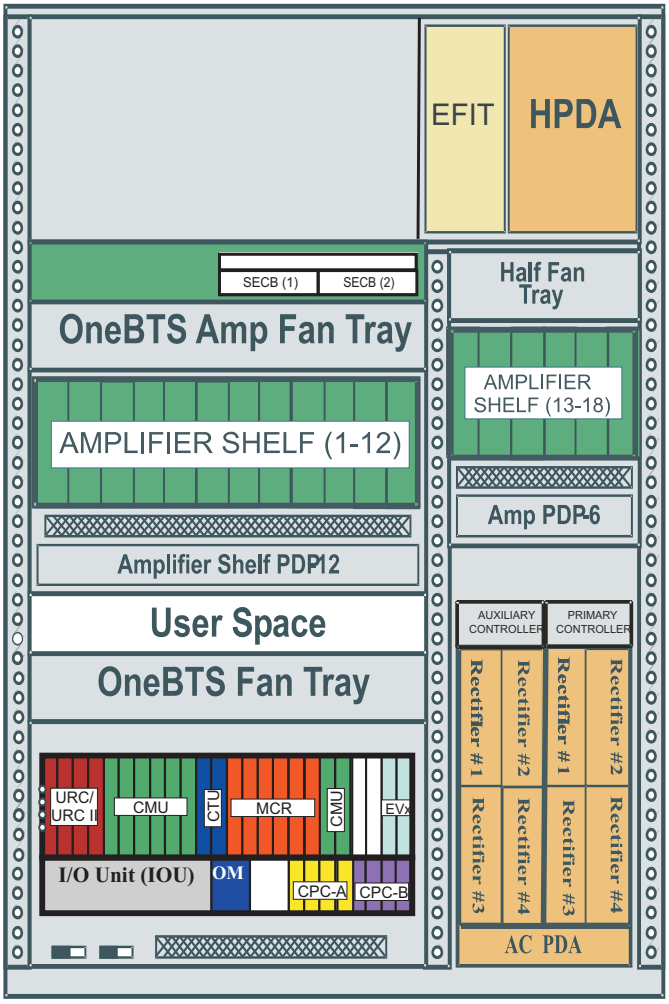


A: Dual Quadraplex Filters, 1-3 Sectors
(AWS and PCS - Single Cabinet)

9228 Macro PCS Primary Cabinet (3-sector) and AWS Dual Band Cabinet (3-sector)

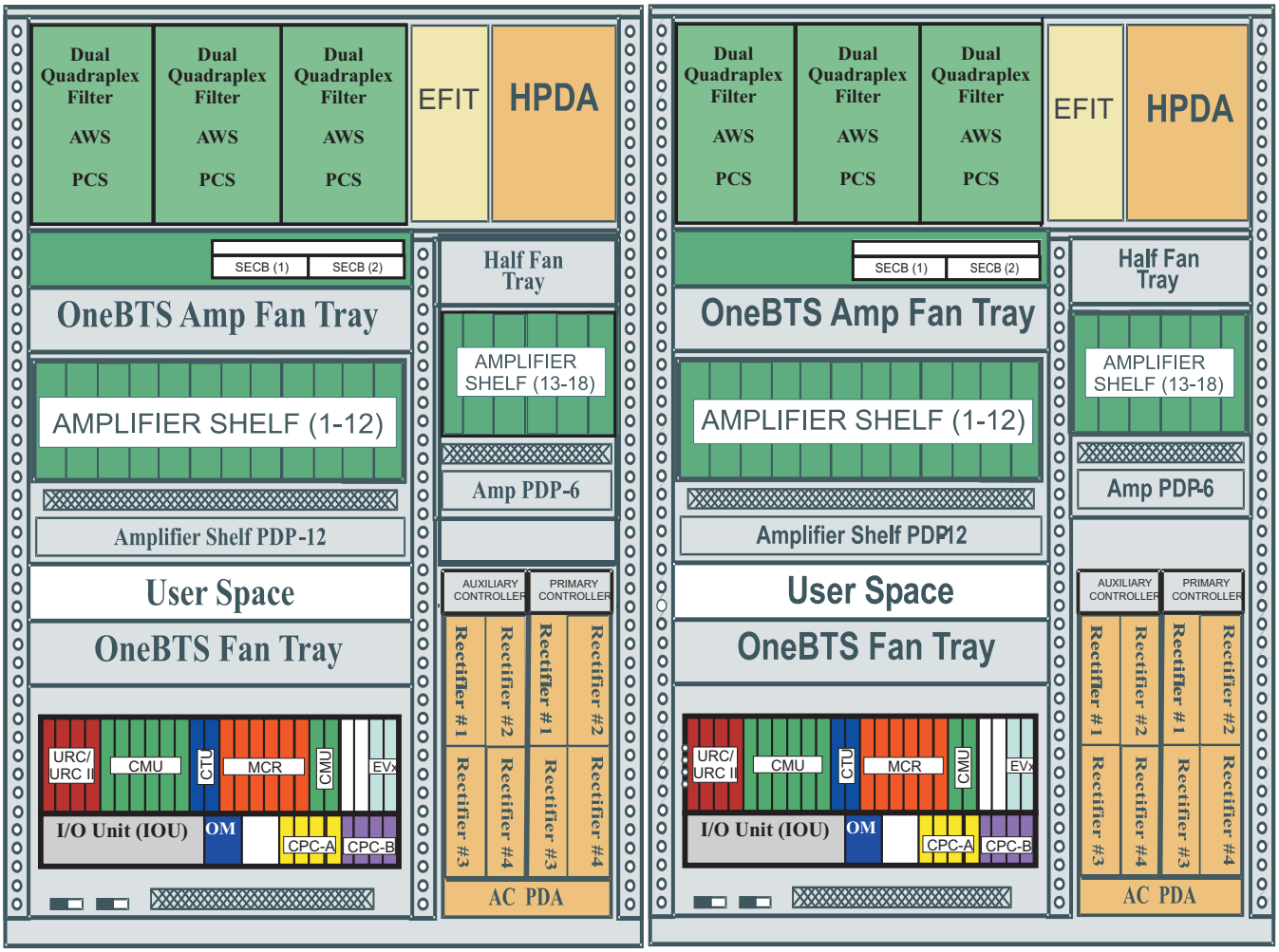


9228 Macro AWS Dual Band Cabinet (Dual Quadraplex Filters, 1-3 Sectors)



PCS Primary Cabinet - 1-3 Sectors (Uses Dual Quadraplex Filters in 9228 Macro AWS Dual Band cabinet)

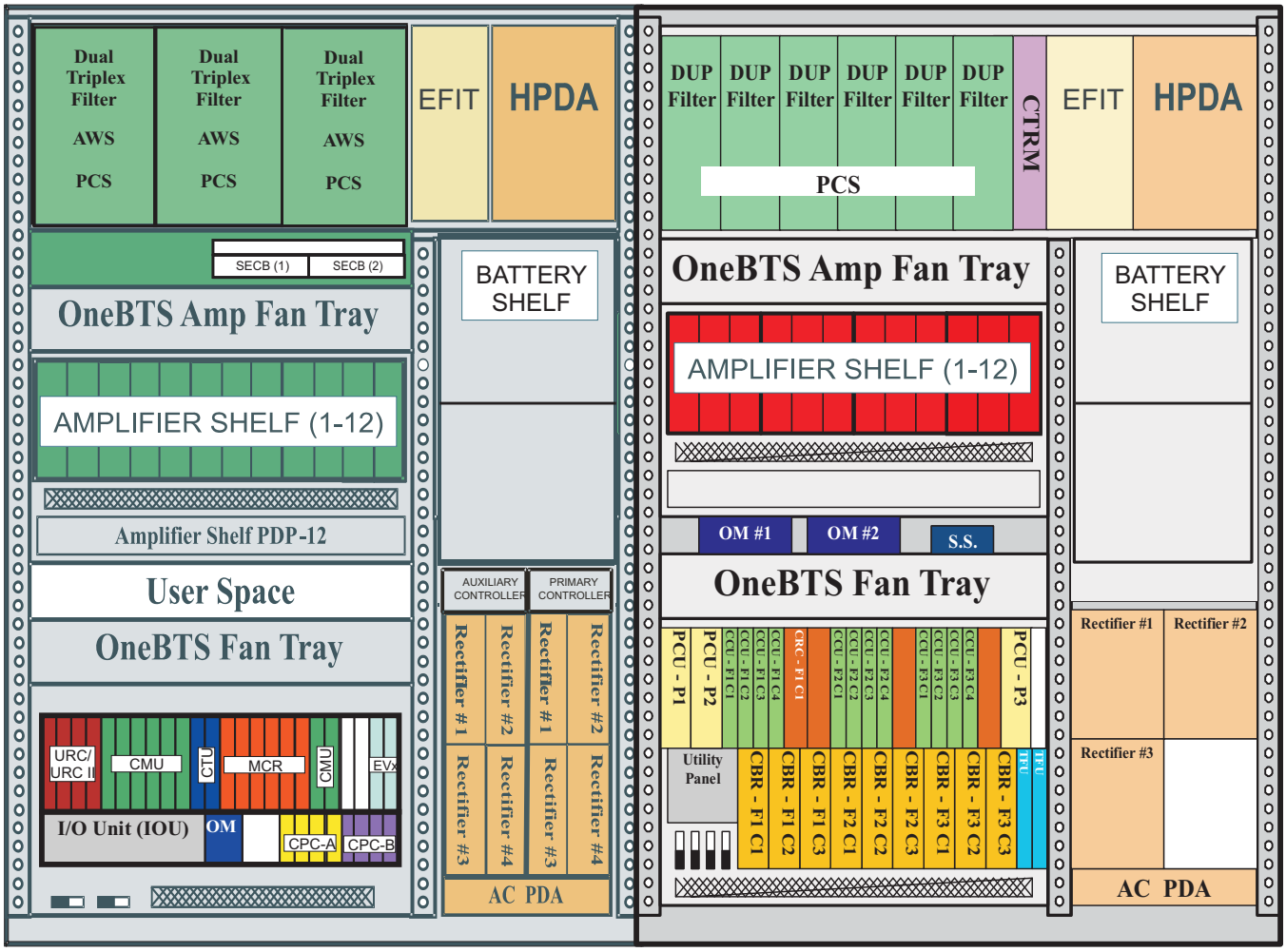
9228 Macro PCS Primary Cabinet (4-6 sector) and AWS Dual Band Cabinet (4-6 sector)



9228 Macro AWS Dual Band Cabinet (Dual Quadraplex Filters for Sectors 4 - 6) Shares filters with PCS Primary Cabinet

PCS Primary Cabinet (Dual Quadraplex Filters for Sectors 1 - 3) Shares filters with 9228 Macro AWS Dual Band Cabinet

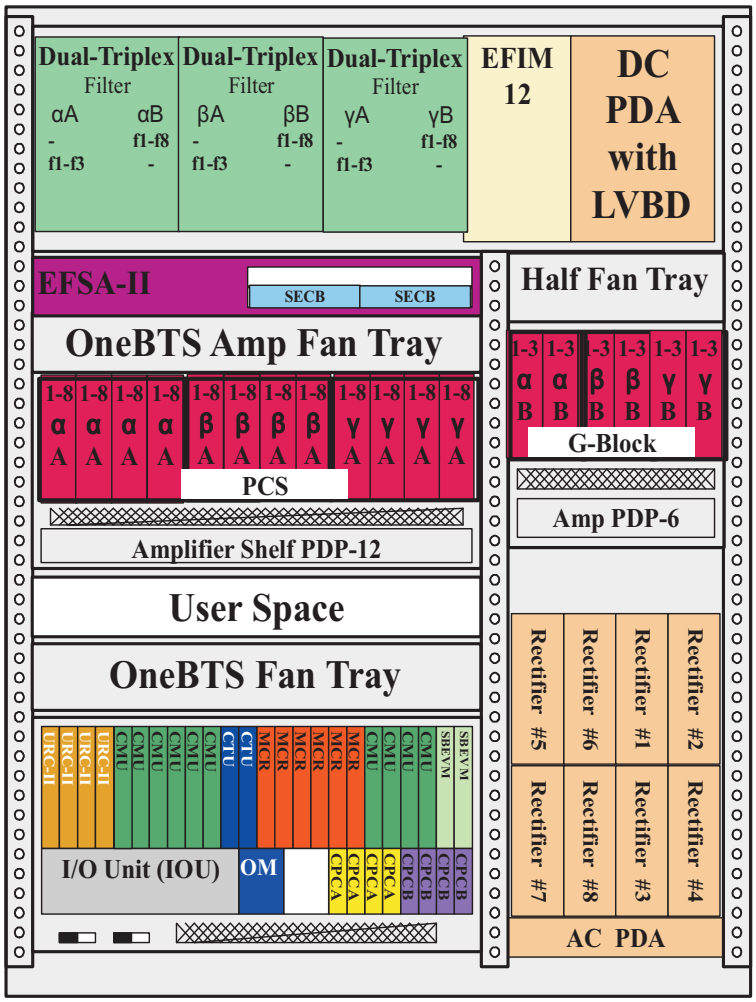
Modular Cell 1.0/2.0/3.0 PCS Primary Cabinet (3-sector) and 9228 Macro AWS Dual Band Cabinet (3-sector)



9228 Macro AWS Dual Band Cabinet (Dual Triplex Filters, 1-3 Sectors)

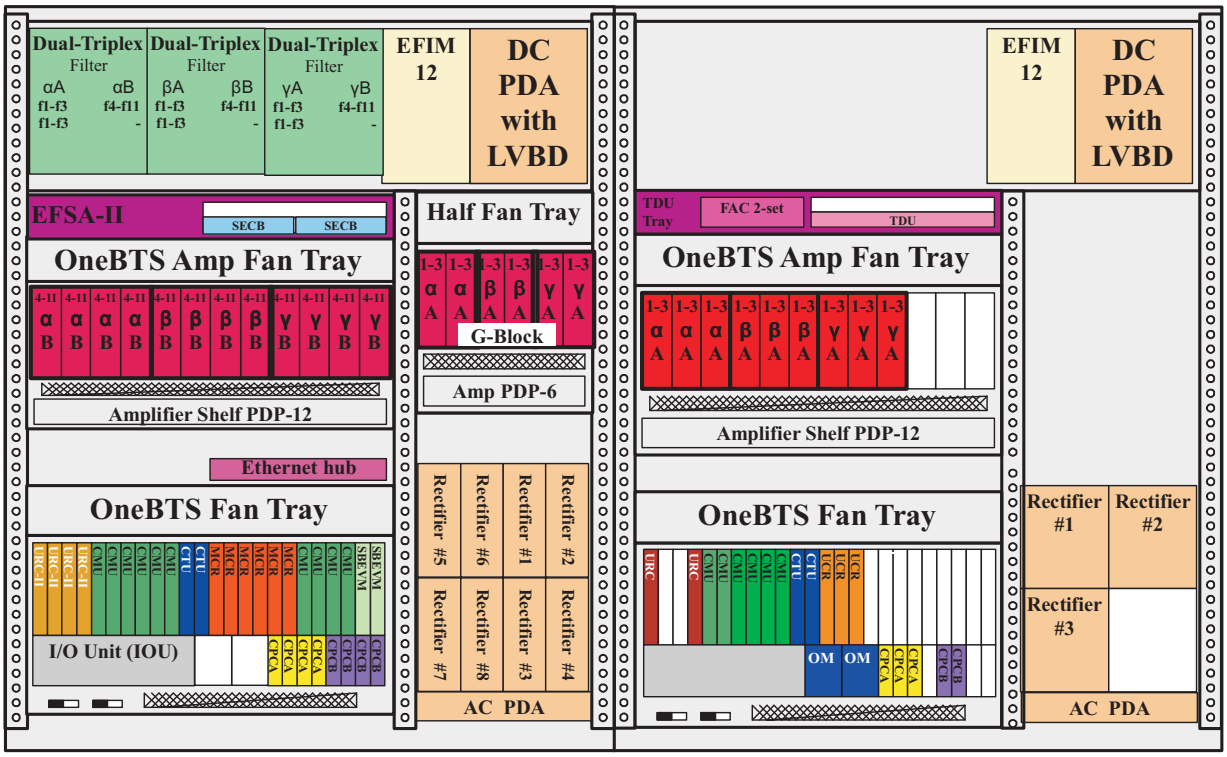
1.0 / 2.0 / 3.0 PCS Primary Cabinet - 1-3 Sectors (Duplex filters use Dual Triplex Filter antennas in 9228 Macro AWS Dual Band cabinet)

PCS/G-Block Primary Cabinet (1-3 sectors)



PCS/G-Block Primary Cabinet (3-sector)

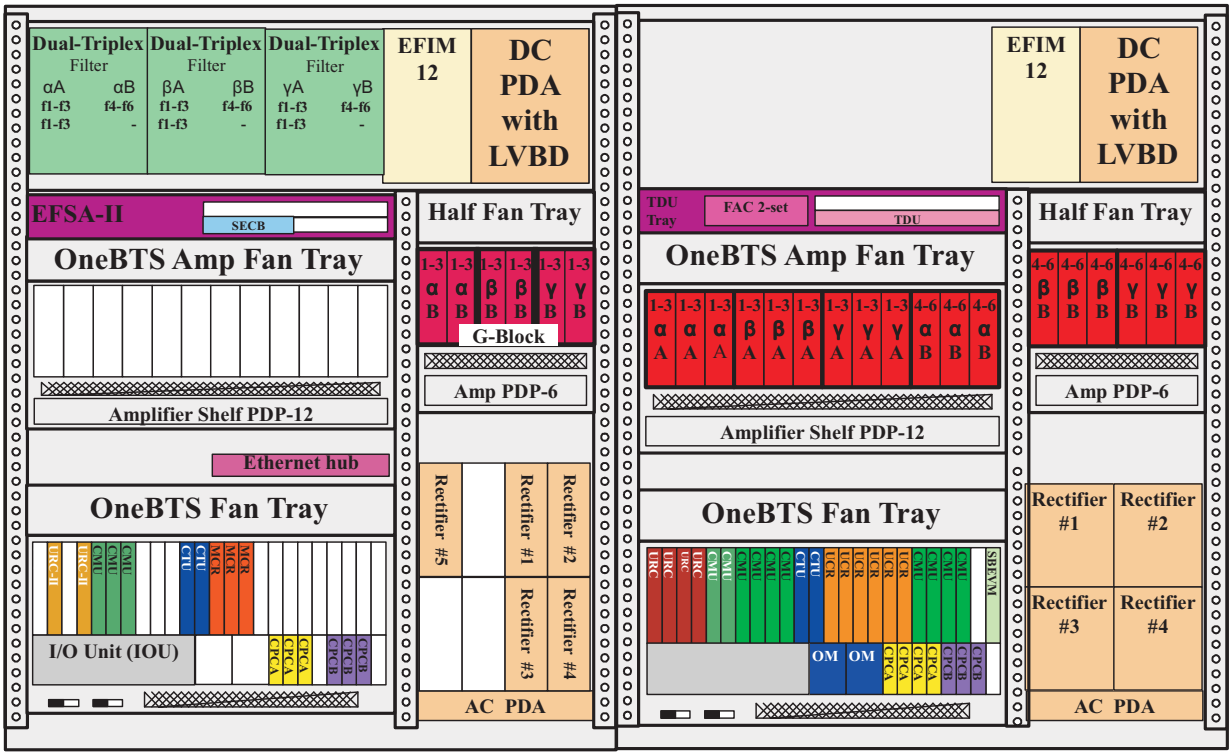
9218 Macro PCS Primary Cabinet (1-3 sector) and 9228 Macro PCS G-Block G-1 Cabinet (4-11 and 1-3 sector)



9228 PCS G-Block G-1 Cabinet (4-11 PCS and 1-3 Sectors)

9218 PCS Primary Cabinet - 1-3 Sectors

9218 Macro PCS Primary Cabinet (1-6 sector) and 9228 Macro PCS G-Block G-1 Cabinet (1-3 sector)



9228 PCS G-Block G-1 Cabinet (1-3 Sectors)

9218 PCS Primary Cabinet - 1-6 Sectors

Equipment weights and dimensions

Introduction

This section provides physical specifications for the various configurations of the 9218 Macro Outdoor Cabinet and 9228 Macro Outdoor Cabinet.

The weight and dimensions in the tables include the top solar shield.

9218 Macro Outdoor Cabinet weights and dimensions

The following table provides weights and dimensions for the 9218 Macro Outdoor Cabinet.

Cabinets	Configuration	Shipped Weight including pallet (estimate)	Maximum Installed Weight (estimate)	Reference Dimensions (Width x Depth x Height)
9218 Macro Primary, Dual Band, or Mixed Dual Band Cabinets Integrated Power	• 1 carrier • Integrated power • Internal battery module	615 kg (1353 lb.)	575 kg (1265 lbs.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 4 carriers • Integrated power • Internal battery module	645 kg (1423 lb.)	605 kg (1331 lb.)	
	• 6 carriers • Integrated Power • *No* Internal Battery Module	491 kg (1081 lb.)	451 kg (993 lb.)	
9218 Macro Primary, Dual Band, or Mixed Dual Band Cabinets Without Integrated Power	• 1 carrier • *No* Integrated Power • *No* Internal Battery Module	399 kg (878 lb.)	359 kg (790 lb.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 6 carriers • *No* Integrated Power • *No* Internal Battery Module	458 kg (1008 lb.)	418 kg (920 lb.)	
9218 Macro Growth Cabinets Integrated Power	• 1 carrier • Integrated Power • Internal Battery Module	533 kg (1173 lb.)	493 kg (1085 lb.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 4 carriers • Integrated Power • Internal Battery Module	563 kg (1239 lb.)	523 kg (1151 lb.)	
	• 6 carriers • Integrated Power • *No* Internal Battery Module	418 kg (921 lb.)	378 kg (833 lb.)	

Cabinets	Configuration	Shipped Weight including pallet (estimate)	Maximum Installed Weight (estimate)	Reference Dimensions (Width x Depth x Height)
9218 Macro Growth Cabinets Without Integrated Power	• 1 carrier • *No*Integrated power • *No* Internal Battery Module	317 kg (698 lb.)	277 kg (610 lb.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 6 carrier • *No*Integrated Power • *No* Internal Battery Module	464 kg (1020 lb.)	424 kg (935 lb.)	

9228 Macro Outdoor Cabinet weights and dimensions

The following table provides weights and dimensions for the 9228 Macro Outdoor Cabinet.

Cabinets	Configuration	Shipped Weight including pallet (estimate)	Maximum Installed Weight (estimate)	Reference Dimensions (Width x Depth x Height)
9228 Macro Primary/Dual Band Cabinet Integrated Power	• 1 carrier • Integrated power • Integrated battery module	615 kg (1353 lb.)	575 kg (1265 lb.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 8 carriers • Integrated power • Integrated battery module	685 kg (1511 lb.)	645 kg (1423 lb.)	
	• 10 carriers • Integrated power • *No* integrated battery module	585 kg (1290 lb.)	545 kg (1202 lb.)	
9228 Macro Primary/Dual Band Cabinet Without Integrated Power	• 1 carrier • *No* Integrated Power • *No* Integrated Battery Module	399 kg (878 lb.)	359 kg (790 lb.)	900 mm x 960 mm x 1925 mm (35.4 in. x 37.8 in. x 75.8 in.)
	• 11 carriers • *No* Integrated Power • *No* Integrated Battery Module	477 kg (1052 lb.)	495 kg (1090 lb.)	

Power cabinet and battery cabinet weights and dimensions

The following table provides weights and dimensions for the power cabinets and battery cabinets that are supported for 9218/9228 Macro Outdoor Cabinet.

Cabinets	Configuration	Shipped Weight including pallet (estimate)	Maximum Installed Weight (estimate)	Reference Dimensions (Width x Depth x Height)
PowerHouse 24 power cabinet	Equipped with 8 12IR125 batteries	359 kg (790 lb.)	795 kg (1750 lb.)	790 mm x 760 mm x 1700 mm (31 x 33 x 66)
EZBFo Modular Battery System	Maximum system (base system + 2 add-on modules + 24 L1 batteries)	153 kg (337 lb.) (Batteries are shipped separately)	1027 kg (2264 lb.)	776 mm x 780 mm x 1757 mm (30 x 31 x 69)
	Maximum system (base system + 2 add-on modules + eighteen 12IR125 batteries)		1103 kg (2432 lb.)	
	Preassembled base system + 1 add-on module	145 kg (320 lb.) (Batteries are shipped separately)		776 mm x 780 mm x 1176 mm (30 x 31 x 46.5)
60ECv2 Battery System	60ECv2 battery cabinet equipped with 20 12IR125 batteries	195 (430)	1284 (2830)	760x790x1500 (30 x 31 x 60)
	60ECv2 battery cabinet equipped with 30 C11 batteries		1096 (2410)	

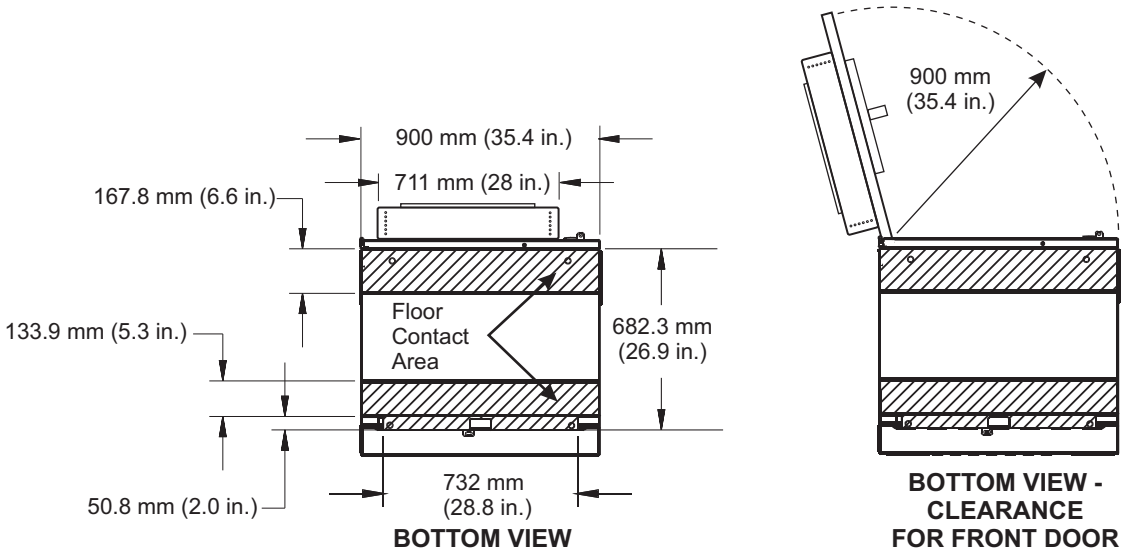
Component weights

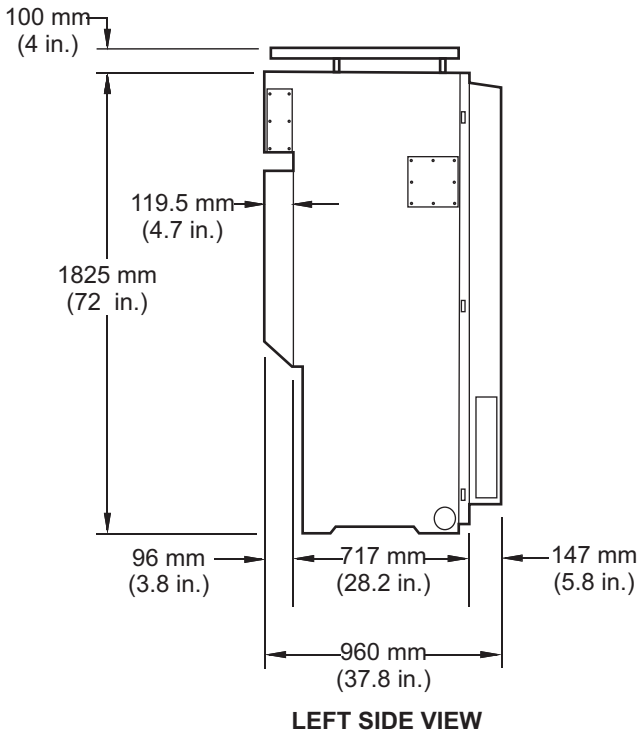
The following table provides approximate weights for batteries and other miscellaneous hardware.

Item	Weight
L1 Battery	32 kg (71 lb.)
L2 Battery	57 kg (126 lb.)
12IR125 battery	55 kg (120 lb.)
12IR145 battery	45 kg (100 lb.)
596B6 Rectifier	6 kg (14 lb.)
3000W Rectifier	5.6 kg (12.5 lb.)
1500W Rectifier	3 kg (6.5 lb.)
Mounting base	41 kg (90 lb.)
Solar shield (top)	5 kg (11 lb.)
Pallet	40 kg (88 lb.)
A6 Amplifier Shelf	9 kg (20 lb.)

9218/9228 Macro Outdoor Cabinet dimensions

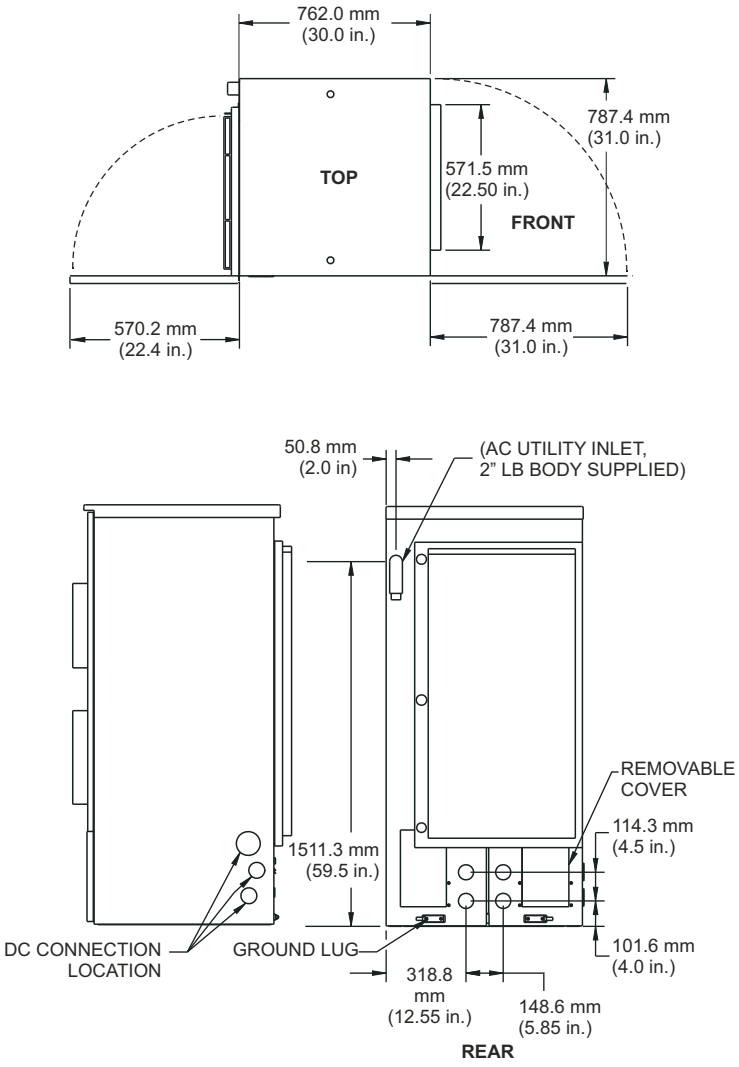
The following diagram shows the dimensions of the 9218/9228 Macro Outdoor Cabinet.

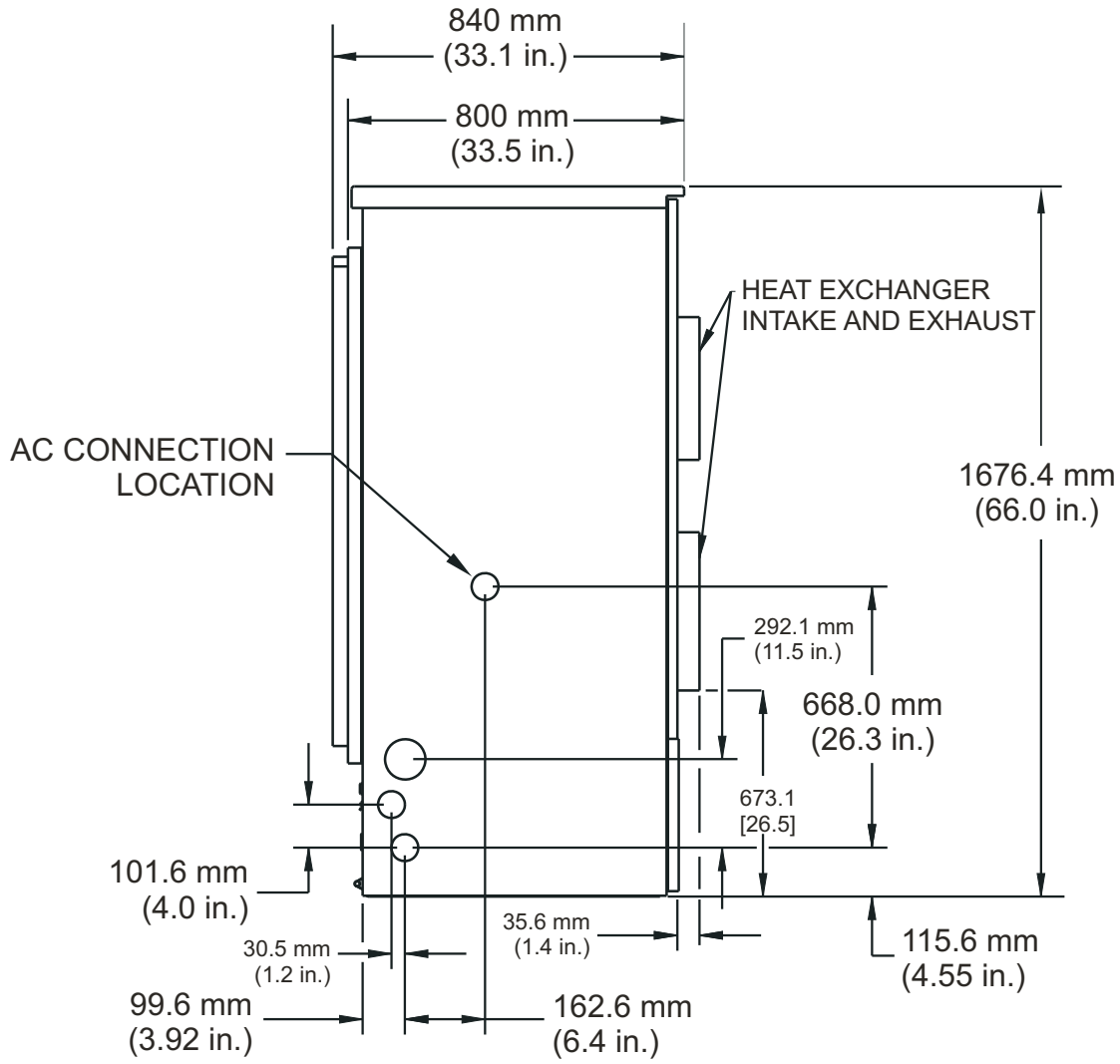




PowerHouse 24 power cabinet dimensions

The following diagram shows the dimensions of the PowerHouse 24 power cabinet.




840 mm
(33.1 in.)
800 mm
(33.5 in.)
HEAT EXCHANGER
INTAKE AND EXHAUST
AC CONNECTION
LOCATION
1676.4 mm
(66.0 in.)
292.1 mm
(11.5 in.)
668.0 mm
(26.3 in.)
673.1
[26.5]
101.6 mm
(4.0 in.)
35.6 mm
(1.4 in.)
115.6 mm
(4.55 in.)
30.5 mm
(1.2 in.)
99.6 mm
(3.92 in.)
162.6 mm
(6.4 in.)

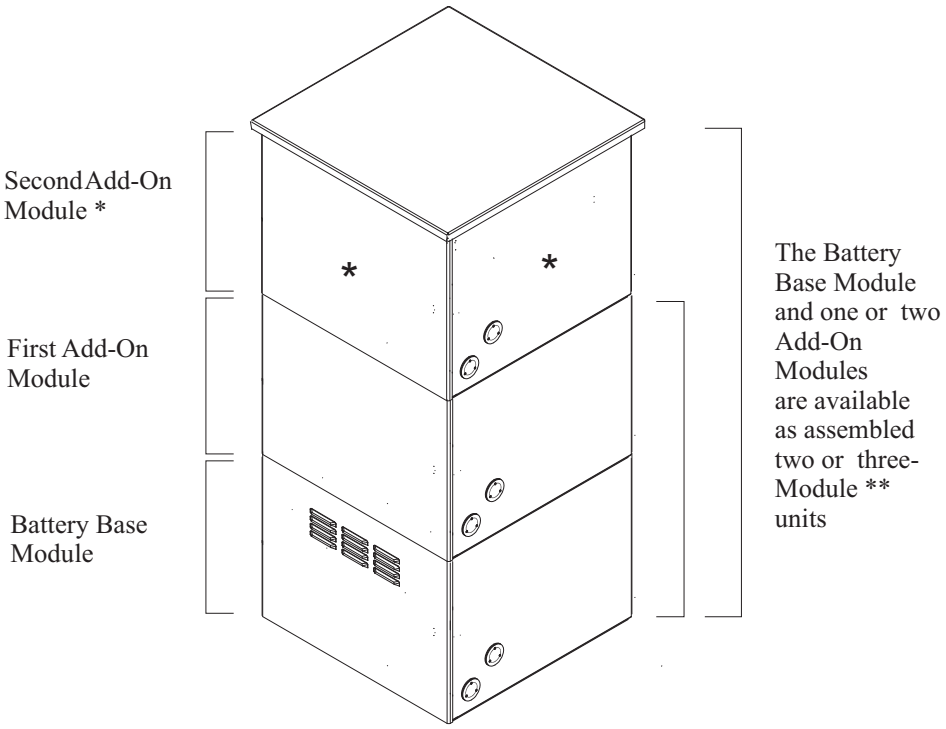
EZBFo battery module overview

EZBFo battery frame description

This topic provides a brief description of the EZBFo battery module, which is the standard backup power configuration for an outdoor cabinet with integrated power.

The optional EZBFo battery frame provides backup batteries (up to (24) L1 batteries or (18) 12IR-125 / 12IR-145 batteries). It can be installed on either side of the 9218/9228 Macro cabinet. However, standard installation is on the right side of the cabinet.

For information on how to transport, place, and install the EZBFo battery frame, refer to *EZBFo Modular Battery Frame Installation Manual,* 401-703-506.

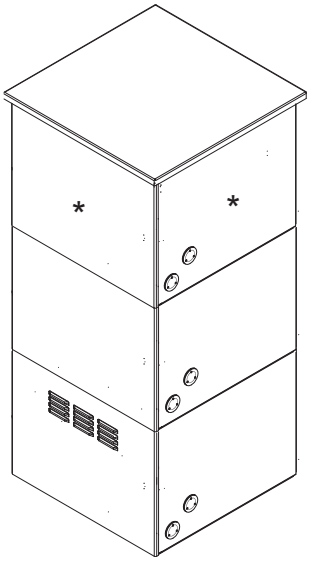


* Installation of a Second Add-On Module in seismic Zone 4 requires the installation of Zone 4 mounting brackets

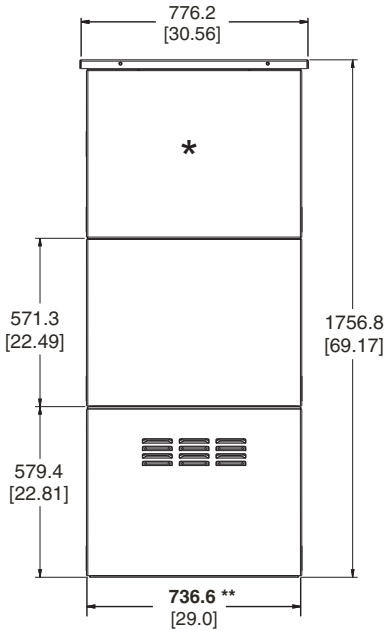
** Installation of a “Three Module Unit” in seismic Zone 4 requires the installation of Zone 4 mounting brackets

EZBFo dimensions

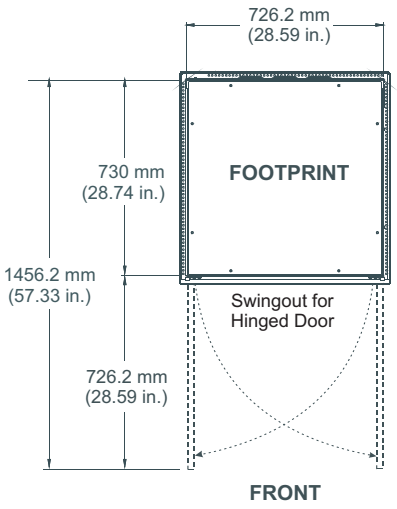
The following diagram shows the dimensions of the EZBFo battery system.



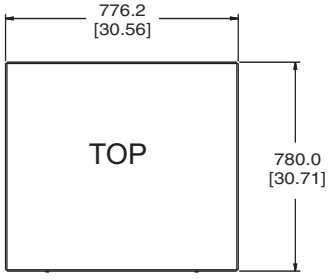
ISO VIEW
(Full Assembly)



FRONT VIEW
(Full Assembly)



FRONT



TOP VIEW

* Installation of a second add-on module in seismic Zone 4 requires installation of a Zone 4 mounting kit

** 736.6 (29.0) is the width of the front door. The actual width of the EZBFo is 726.2 (28.59)

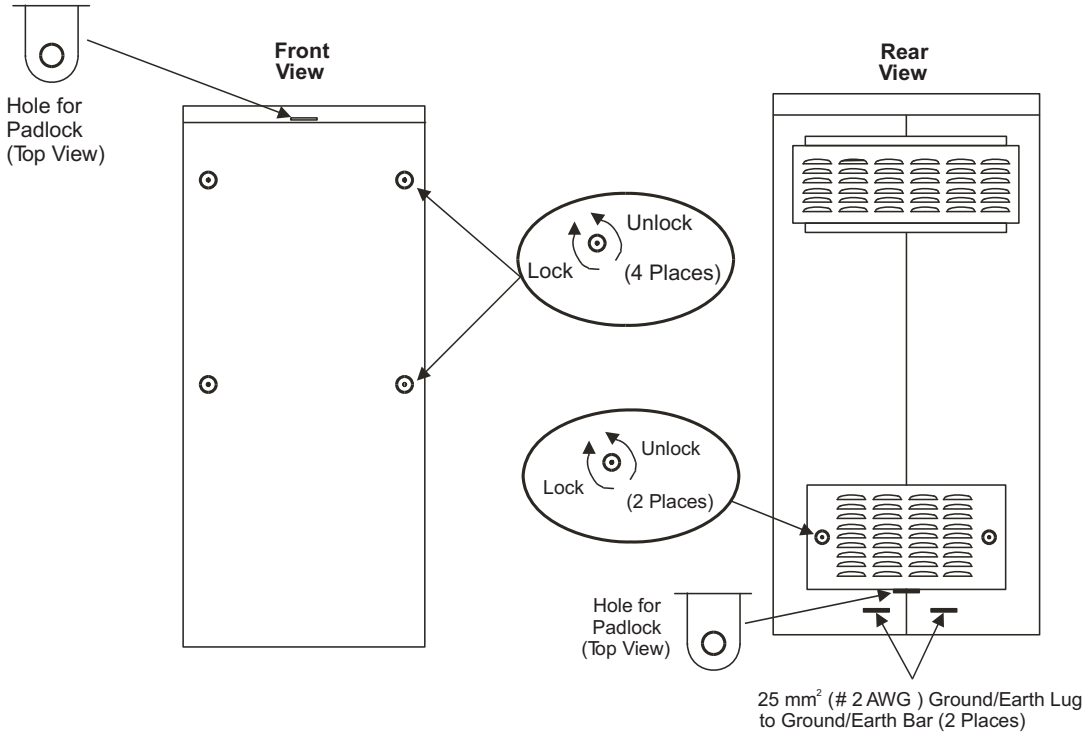
Important! The base module and the first add-on module or the first and second add-on modules can be shipped as an assembled unit.

60ECv2 battery cabinet overview

60ECv2 description

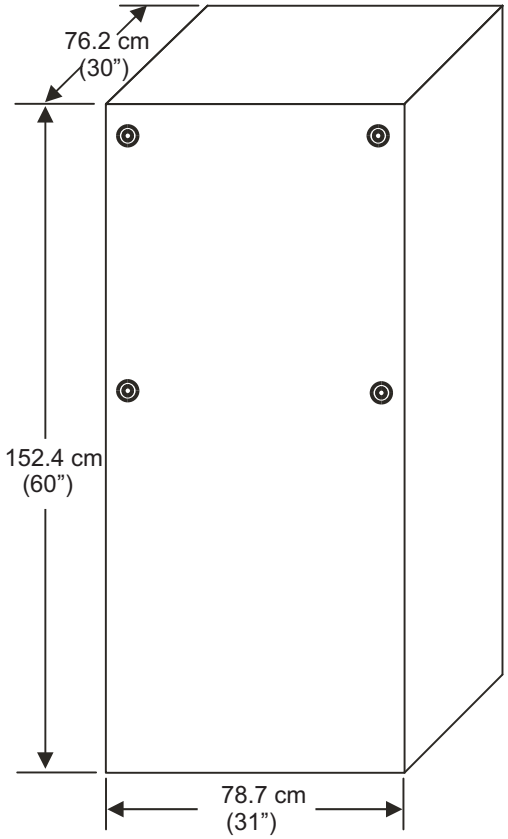
This topic provides a brief description of the 60ECv2 battery cabinet, which is the standard backup power configuration for an outdoor cabinet with integrated power.

The optional 60ECv2 battery cabinet provides backup batteries (up to (30) C11 batteries or (20) 12IR-125 / 12IR-145 batteries). The battery cabinet is to be installed to the right side of the 9218/9228 Macro cabinet.



60ECv2 battery cabinet dimensions

The following diagram shows the dimensions and weight of the 60ECv2 battery cabinet.



- Cabinet shipping
  Weight: 193 kg (425 lbs.)
- Cabinet fully equipped
  with 12IR125 batteries or FA12-125 batteries
  Weight: 1,284 kg (2,825 lbs.)
- Cabinet fully equipped
  with SBS C11 batteries
  Weight: 1,011 kg (2,225 lbs.)

3 Site configurations

Overview

Purpose

This chapter describes configurations and site layouts for the 9218 Macro site.

Contents

Line-up configurations

Overview

Purpose

This section describes the line-up configurations that can be installed at a site, and shows some sample site layouts for completed installations.

Contents

Line-up configuration options

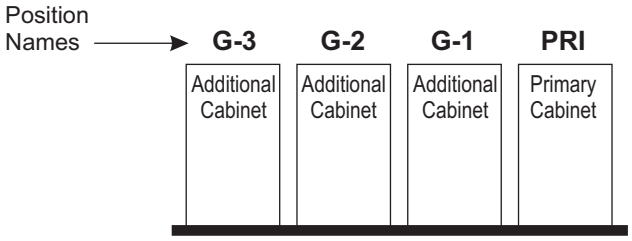
Introduction

The line-up configuration options for the 9218/9228 Macro Outdoor Cabinet are driven by the requirements of the supported applications. This section describes the line-up configurations that are supported.

Cabinet position names

This section uses “position names” to indicate the position of a cabinet in a line-up. Note that the position name refers only to the physical location of a cabinet in a line-up; it does not indicate what type of cabinet is in that position. However, the cabinet in the PRI position is always a primary cabinet.

The following diagram shows the name of each position in a line-up.



Line-up configurations for 9218 Macro Outdoor Cabinet

The following table lists the line-up configurations for 9218 Macro Outdoor Cabinet.

Important! 9218 Macro outdoor cabinets can be configured with Ethernet backhaul. These configuration are achieved by the use of field installable kits, which includes the installation instructions.

Line-up configuration	Sectors per Cell	Maximum carriers per sector
Two 9218 Macro cabinets and one 9228 Macro Dual-band cabinet	Up to 3	1-8 850 in primary and G-1 cabinets 1-11 PCS in dual-band cabinet
Two Modular Cell 1/2/3.0 cabinets, one 9218 Macro cabinet, and one 9228 Macro Dual-band cabinet	3	1-8 850 in primary, G-1, and G-2 cabinets 1-11 PCS in dual-band cabinet
One 9218 Macro cabinet	3	1-6 PCS or 1-6 850
One 9218 Macro (4.0) Primary and one 9218 Macro (4.0) Growth cabinet	3	7-11 PCS or 7-8 850
One Modular Cell 1/2/3.0 Primary and one 9218 Macro Growth cabinet	3	4-9 PCS or 4-8 850
Two Modular Cell 1.0/2.0/3.0 cabinets and one 9218 Macro Growth cabinet	3	7-11 PCS or 7-8 850
One Modular Cell 1.0/2.0 Primary cabinet and two 9218 Macro Growth cabinets	2	8-11 PCS or 8 850
One Modular Cell 3.0 Primary cabinet and two 9218 Macro Growth cabinets	3	8-11 PCS or 8 850
One 9218 Macro Primary and one 9218 Macro Dual-band cabinet	3	1-6 850 or 1-6 PCS

Line-up configuration	Sectors per Cell	Maximum carriers per sector
One 9218 Macro Primary and one 9218 Macro Mixed Dual-band cabinet	3	1-6 850 in primary cabinet and 7-8 850 in mixed dual-band cabinet or 1-3 PCS in mixed dual-band cabinet
Two Modular Cell 1.0/2.0/3.0 cabinets and one 9218 Macro Mixed Dual-band cabinet	3	1-6 850 in primary and G-1 cabinets and 7-8 850 in mixed dual-band cabinet or 1-3 PCS in mixed dual-band cabinet

Line-up configurations for 9228 Macro Outdoor Cabinet

The following table lists the line-up configurations for 9228 Macro Outdoor Cabinet.

Important! 9228 Macro outdoor cabinets can be configured with Ethernet backhaul. These configuration are achieved by the use of field installable kits, which includes the installation instructions.

Line-up configuration	Sectors per Cell	Maximum carriers per sector
One 9228 Macro PCS, 850, or AWS cabinet	4 or 6 sector	1-6 PCS, 850, or AWS
One 9228 Macro PCS cabinet	3	1-11 PCS
One 9228 Macro 850 cabinet	3	1- 8 850
One 9228 Macro AWS cabinet	3	1- 7 AWS
One 9228 Macro PCS or 850 primary cabinet with Intelligent Antenna (with or without integrated power)	3 (1, 2, or 3 IA)	1-8 PCS or 850 (with 2PAMs and MCRs), 0, 1, or 2 of which can be DO
One 9228 Macro 850 primary cabinet with Intelligent Antenna (with or without integrated power) and one PCS dual-band cabinet	3 (1, 2, or 3 IA) in primary only	1-8 850 (no DO carriers); 1-3 PCS in dual-band (Including 0, 1, or 2 DO carriers)
One 9228 Macro PCS and AWS dual band cabinet	3	1–4 PCS carriers 1–4 AWS carriers
One 9228 Macro 850 cabinet and one 9228 Macro PCS dual band cabinet	3	1-8 850 and 1-11 PCS
One 9228 Macro PCS primary cabinet and one 9228 Macro AWS dual band cabinet	3	1-11 PCS or 1–7 AWS
One 9228 Macro PCS primary cabinet and one 9228 Macro AWS band cabinet	4 or 6	1-6 PCS and 1-6 AWS
Two 9218 Macro cabinets and one 9228 Macro Dual-band cabinet	3	1-8 850 in primary and G-1 cabinets 1-11 PCS in dual-band cabinet
One Modular Cell 1.0/2.0/3.0 cabinets, and one 9228 Macro Dual-band cabinet	3	1-3 PCS in primary, G-1, and G-2 cabinets 1-7 AWS in dual band cabinet
Two Modular Cell 1.0/2.0/3.0 cabinets, One 9218 Macro cabinet, and one 9228 Macro Dual-band cabinet	3	1-8 850 in primary cabinet 1-11 PCS in dual band cabinet
One PCS/G-Block Primary Cabinet	3	8 PCS carriers and 3 G-Block carriers

Line-up configuration	Sectors per Cell	Maximum carriers per sector
One 9218 Macro PCS primary cabinet and one 9228 Macro PCS G-Block G1 cabinet	3	1-3 PCS in primary cabinet 4-11 PCS and 1-3 G-Block in G1 cabinet
One 9218 Macro PCS primary cabinet and one 9228 Macro PCS G-Block G1 cabinet	3	1-6 PCS in primary cabinet 1-3 G-Block in G1 cabinet

Line-up configuration types

Purpose

This section describes the following line-up configuration types that are supported for the 9218/9228 Macro Outdoor Cabinet:

- Single-band
- Dual-band
- Mixed dual-band

Single-band line-up configurations

In a single-band line-up configuration, all of the cabinets in the line-up use carriers for a single frequency band. For 9218/9228 Macro Outdoor Cabinet, in a single-band line-up configuration, all of the cabinets in the line-up use only PCS carriers, only 850 carriers, or only AWS carriers.

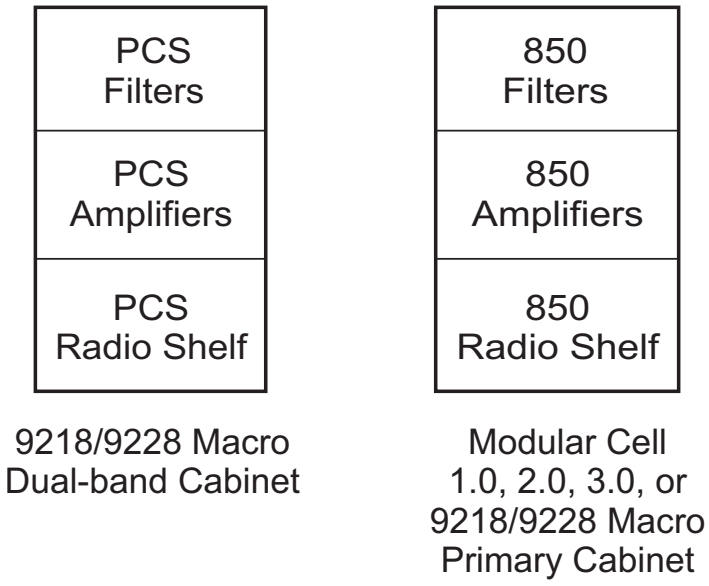
Dual-band line-up configurations

In a dual-band line-up configuration, some of the cabinets in the line-up configuration use carriers for one frequency band, and some of the cabinets in the line-up configuration use carriers for a second frequency band. For 9218/9228 Macro Outdoor Cabinet, in a dual-band line-up configuration, some of the cabinets in the line-up configuration use PCS carriers, some of the cabinets use 850 carriers, and some of the cabinets use AWS carriers.

Note the following details about the dual-band line-up configuration:

- Each 9218/9228 Macro Outdoor Cabinet is equipped as if it is a standalone cabinet, so it has all the required assets for the specific band.
- The 850 cabinet, the PCS cabinet, and the AWS cabinet are each considered as one cell to the entire network.
- Each cabinet has antenna cables for the carriers it contains.
- 9228 Macro dual-band cabinets may only be attached to a 9218 Macro or 9228 Macro cabinet, but may be included in a legacy lineup.

The following diagram is an example of a dual-band line-up configuration. It shows a primary cabinet using 850 carriers and a dual-band cabinet using PCS carriers.



Mixed dual-band line-up configurations

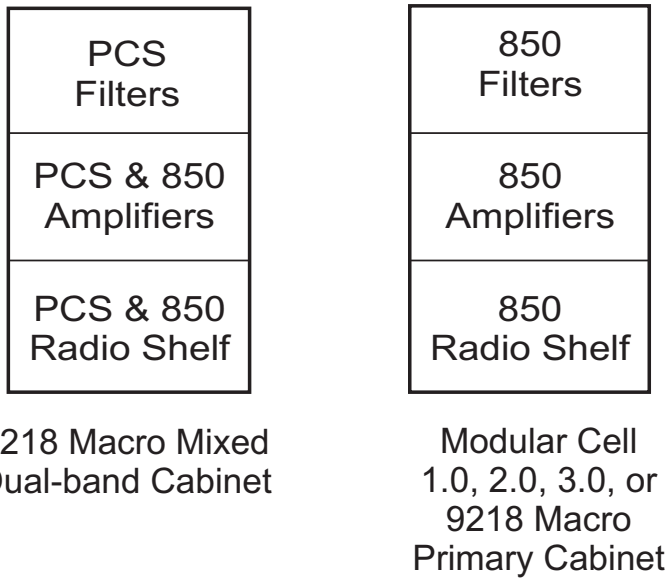
The mixed dual-band line-up configuration is only supported for 9218 Macro Outdoor Cabinet; it is not supported for 9228 Macro Outdoor Cabinet.

In a mixed dual-band line-up configuration, one of the cabinets in the line-up configuration contains carriers for two frequency bands. For 9218 Macro Outdoor Cabinet, in a mixed dual-band line-up configuration, the line-up configuration includes a 9218 Macro Outdoor Mixed Dual-band Cabinet, which contains both PCS and 850 carriers.

Note the following details about the mixed dual-band line-up configuration:

- Carriers in the 9218 Macro Outdoor Mixed Dual-band Cabinet report to the primary cabinet as growth carriers.
- Each cabinet has antenna cables. The 9218 Macro Outdoor Mixed Dual-band Cabinet has antennas only for the PCS carriers it contains. The primary cabinet has antennas for its 850 carriers and the 850 carriers in the 9218 Macro Outdoor Mixed Dual-band Cabinet.

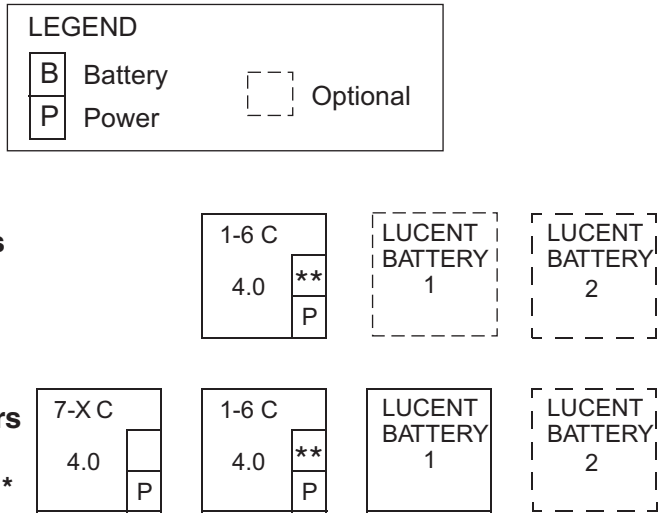
The following diagram is an example of a mixed dual-band line-up configuration. It shows a primary cabinet using 850 carriers, and a 9218 Macro Outdoor Mixed Dual-band Cabinet supporting both 850 carriers and PCS carriers.



9218 Macro Outdoor Cabinet single-band line-up configurations

9218 Macro Primary and Growth Cabinets with integrated power and battery installed at a new site

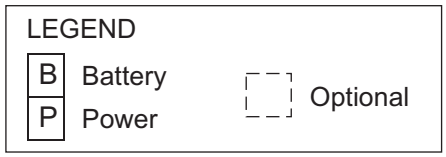
The following diagram shows the line-up configuration options for 9218 Macro Primary and Growth Cabinets equipped with integrated power and battery being installed at a new site.



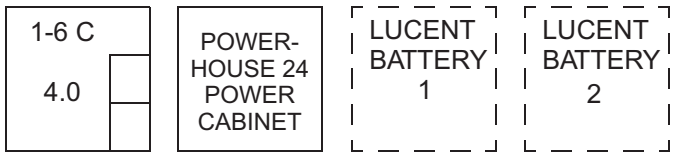
* 850 = Maximum 8 carriers PCS = Maximum 11 carriers
** Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Primary and Growth Cabinets without integrated power and battery using Powerhouse 24 power cabinet installed at a new site

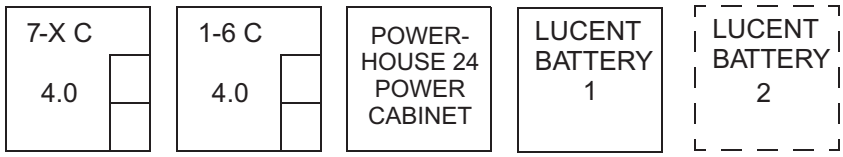
The following diagram shows the line-up configuration options for 9218 Macro Primary and Growth Cabinets without integrated power and battery using Powerhouse 24 power cabinet being installed at a new site.



1-6 PCS Carriers
or
1-6 850 Carriers



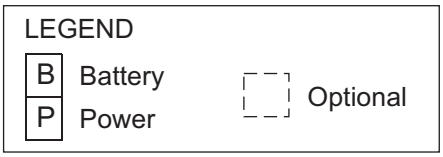
7-11 PCS carriers
or
7-8 850 carriers *



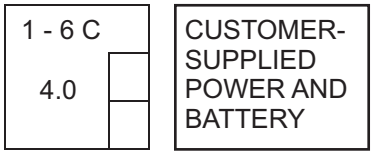
* 850 = Maximum 8 carriers, PCS = Maximum 11 carriers

9218 Macro Primary and Growth Cabinets without integrated power and battery using customer-supplied power installed at a new site

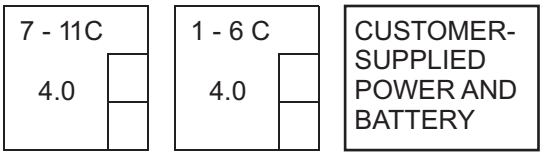
The following diagram shows the line-up configuration options for 9218 Macro Primary and Growth Cabinets without integrated power and battery customer-supplied power being installed at a new site.



1-6 PCS Carriers
or
1-6 850 Carriers



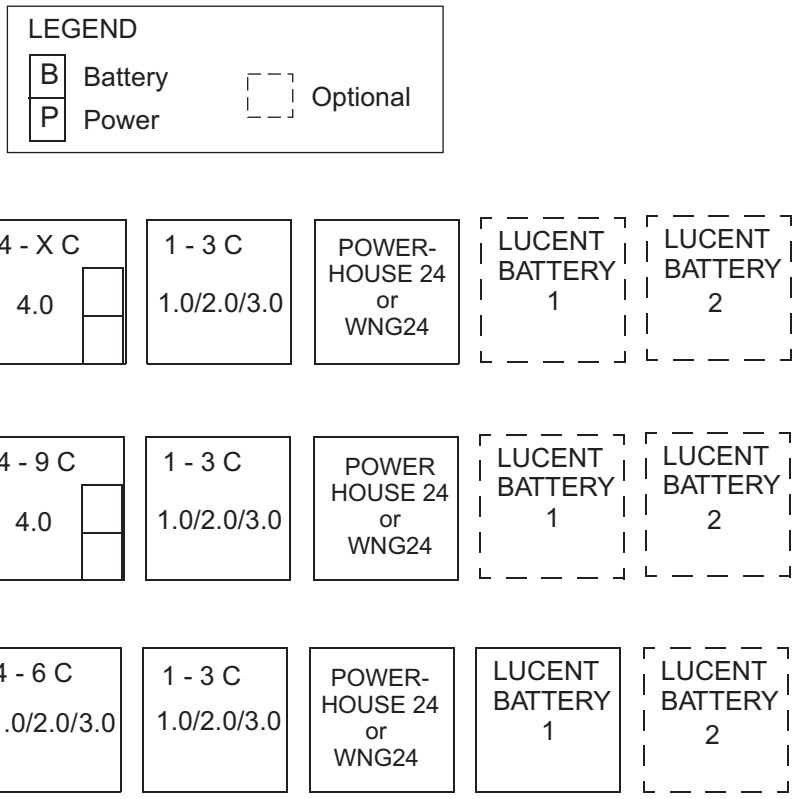
7-11 PCS Carriers
or
7 - 8 850 Carriers *



* 850 = Maximum 8 carriers, PCS = Maximum 11 carriers

9218 Macro Growth Cabinet without integrated power and battery added to an existing site

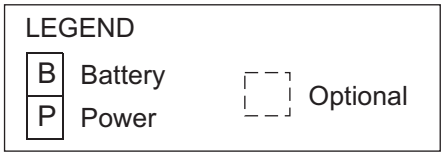
The following diagram shows the line-up configuration options for adding a 9218 Macro Outdoor Growth Cabinet without integrated power and battery being to an existing site.

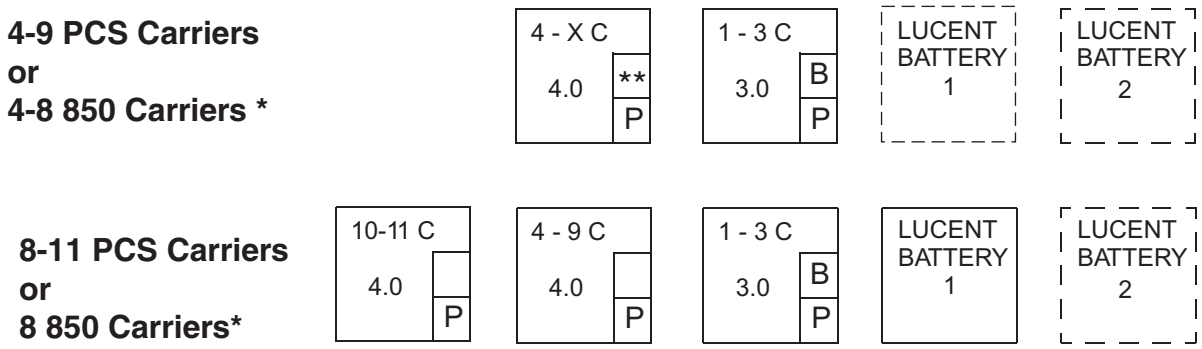


* 850 = Maximum 8 carriers, PCS = Maximum 11 carriers

9218 Macro Growth Cabinet with integrated power and battery added to 3.0 site

The following diagram shows the line-up configuration options for adding a 9218 Macro Outdoor Growth Cabinet to an existing 3.0 Outdoor Cabinet site.

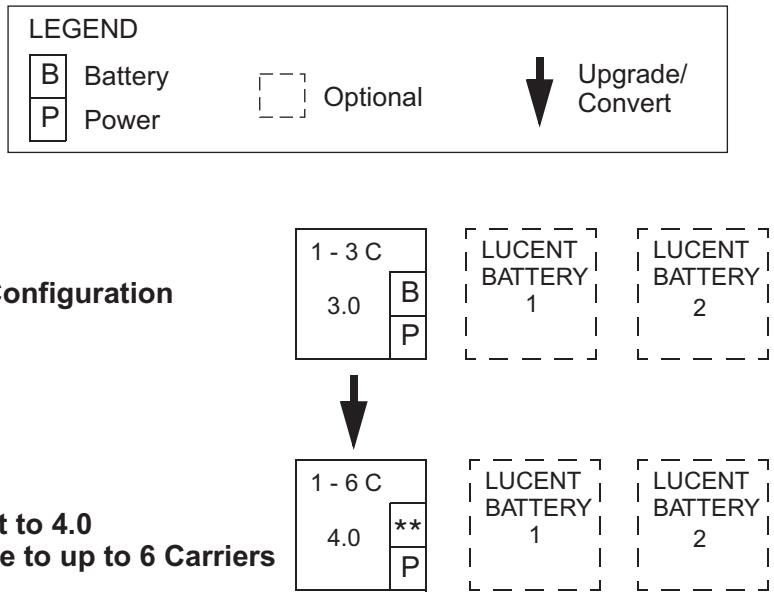




* 850 = Maximum 8 carriers PCS = Maximum 11 carriers
** Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Primary Cabinet upgrade from 3.0 Primary Cabinet

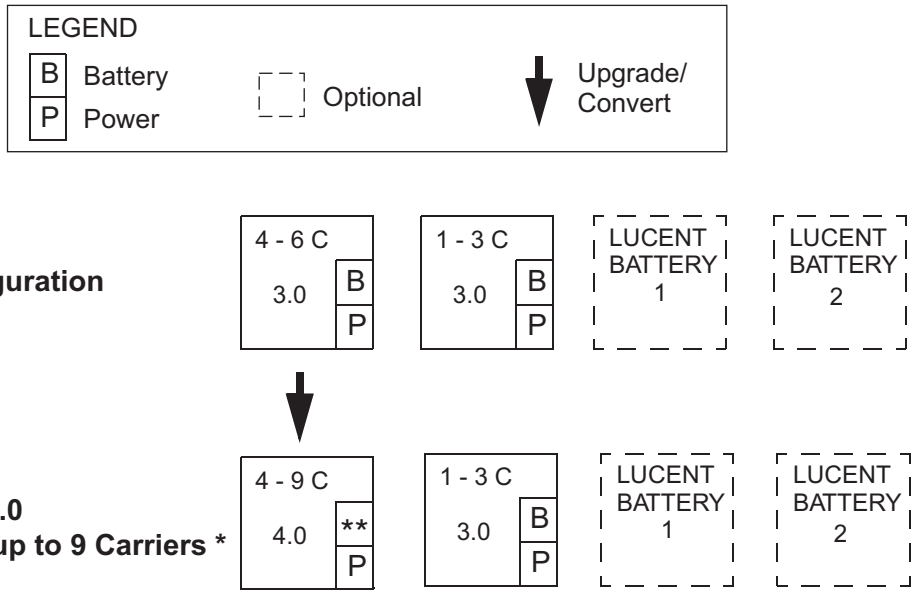
The following diagram shows the line-up configuration options for upgrading an existing 3.0 Outdoor Primary Cabinet to a 9218 Macro Outdoor Primary Cabinet.



* Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Growth Cabinet upgrade from 3.0 Growth Cabinet

The following diagram shows the line-up configuration options for upgrading an existing 4 - 6 carrier 3.0 Outdoor Growth Cabinet to a 4 - 9 carrier 9218 Macro Outdoor Growth Cabinet.



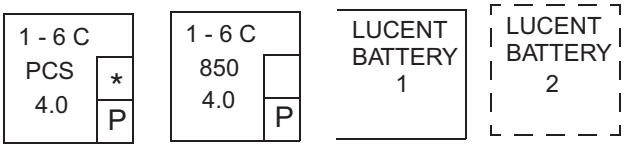
* 850 = Maximum 8 carriers PCS = Maximum 11 carriers
** Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Outdoor Cabinet dual-band line-up configurations

9218 Macro Outdoor Dual-band Cabinet with integrated power installed at a new site

The following diagram shows line-up configuration options for a 9218 Macro Outdoor Dual-band Cabinet with integrated power installed at a new site.

1 - 6 850 Carriers and 1 - 6 PCS Carriers * (Dual Band)



* Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Outdoor Dual-band Cabinet without integrated power using Powerhouse 24 power cabinet installed at a new site

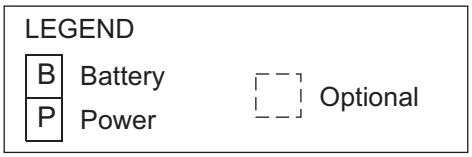
The following diagram shows line-up configuration options for a 9218 Macro Outdoor Dual-band Cabinet without integrated power using Powerhouse 24 power cabinet at a new site.

1-6 850 Carriers and 1-6 PCS Carriers (Dual-band)

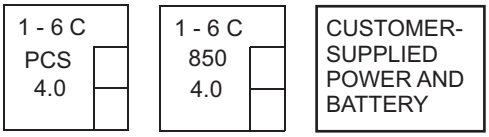
* Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the number of carriers.

9218 Macro Outdoor Dual-band Cabinet without integrated power using customer-supplied power installed at a new site

The following diagram shows line-up configuration options for a 9218 Macro Outdoor Dual-band Cabinet without integrated power using customer-supplied power at a new site.



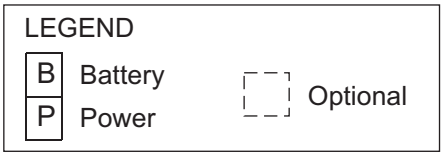
1-6 850 Carriers and 1-6 PCS Carriers (Dual-band)



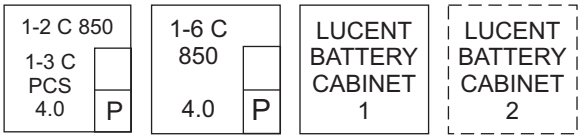
9218 Macro Outdoor Cabinet mixed dual-band line-up configurations

9218 Macro Mixed Dual-Band Cabinet with integrated power installed at a new site

The following diagram shows the line-up configuration options for 9218 Macro Outdoor Mixed Dual-band Cabinet with integrated power.

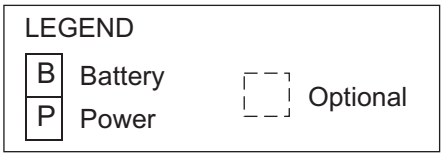


7-8 850 CARRIERS and 1-3 PCS CARRIERS (Mixed Dual Band)



9218 Macro Mixed Dual-Band Cabinet without integrated power using customer-supplied power installed at a new site

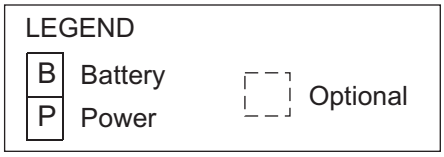
The following diagram shows the line-up configuration options for the9218 Macro Outdoor Mixed Dual-band Cabinet without integrated power using customer-supplied power installed at a new site.



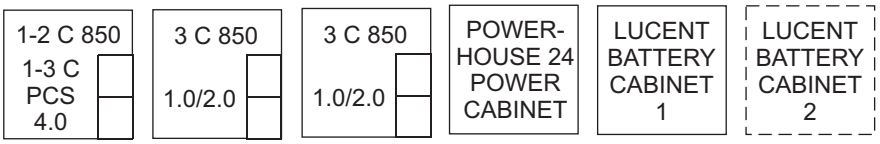
7 - 8 850 CARRIERS and 1-3 PCS CARRIERS (Mixed Dual Band)

9218 Macro Mixed Dual-Band Cabinet without integrated power added to an existing site

The following diagram shows the line-up configuration options for the9218 Macro Outdoor Mixed Dual-band Cabinet without integrated power added to an existing site.



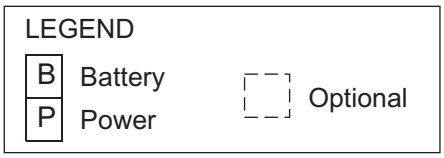
7-8 850 CARRIERS and 1-3 PCS CARRIERS (Mixed Dual Band)



9228 Macro Outdoor Cabinet single-band configurations

9228 Macro Primary Cabinet with integrated power installed at a new site

The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Primary Cabinet equipped with integrated power.



1 - 6 PCS, 850, or AWS CARRIERS (4 OR 6 SECTOR)

1 - 7 AWS CARRIERS or 1 - 11 PCS CARRIERS or 1 - 8 850 CARRIERS (3 SECTOR)

INTELLIGENT ANTENNA (IA) 1-8 850 or PCS CARRIERS (Including 0, 1, or 2 DO Carriers) ***

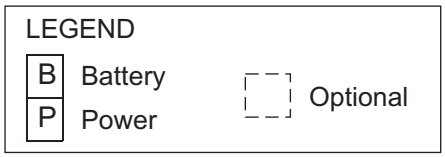
* 850 cabinets have batteries. Other cabinets may not have batteries because of the presence Of the A6 Amplifier Shelf, which is determined by carrier count and/or desired output power.

** Cabinet has batteries if it has no A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the combination of IA sectors, DO carriers, and total number of carriers

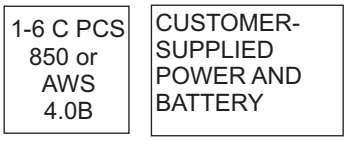
*** The following sector options are available for Intelligent Antenna (IA):
- 1 IA sector and 2 Non-IA sectors
- 2 IA sectors and 1 Non-IA sector
- 3 IA sectors

9228 Macro Primary Cabinet without integrated power, using customer-supplied power and battery, installed at a new site

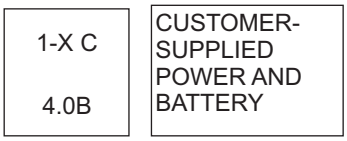
The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Primary Cabinet equipped without integrated power , using customer-supplied power and battery.



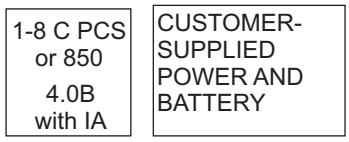
1 - 6 PCS, 850, or AWS CARRIERS (4 OR 6 SECTOR)



1 - 7 AWS CARRIERS or 1 - 11 PCS CARRIERS or 1 - 8 850 CARRIERS (3 SECTOR)



INTELLIGENT ANTENNA (IA) 1-8 850 or PCS CARRIERS (Including 0, 1, or 2 DO Carriers) *

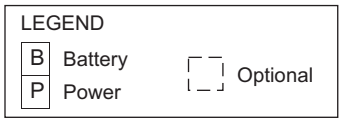


* The following sector options are available for Intelligent Antenna (IA):
  - 1 IA sector and 2 Non-IA sectors
  - 2 IA sectors and 1 Non-IA sector
  - 3 IA sectors

9228 Macro Outdoor Cabinet dual-band line-up configurations

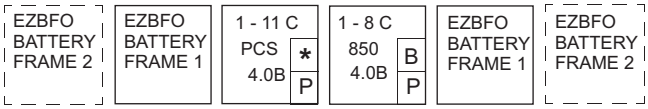
9228 Macro Dual-band PCS/850 and AWS Cabinet with integrated power installed at a new site

The following diagram shows the line-up configuration options for 9228 Macro Dual-band PCS/850 and AWS Cabinet with integrated power, installed at a new site.

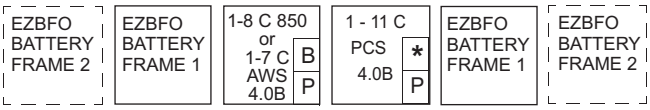


1 - 4 AWS CARRIERS
And 1-4 PCS CARRIERS
(Dual Band)

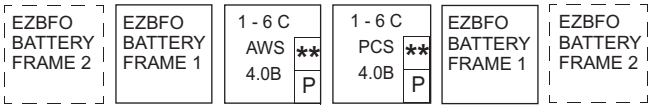
1-8 850 CARRIERS
And 1-11 PCS CARRIERS
(Dual Band)



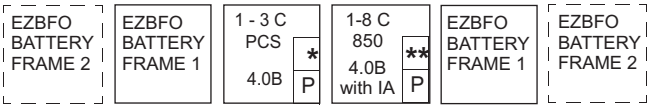
1-11 PCS CARRIERS
and 1-8 850 or 1-7 AWS CARRIERS
(Dual Band)



1-6 PCS CARRIERS
and 1-6 AWS CARRIERS
(Dual band, 4 or 6 SECTOR)



INTELLIGENT ANTENNA (IA)
850 PRIMARY: 1-3 IA Sectors ***
1-8 CARRIERS (No DO carriers)
PCS DUAL BAND: 1-3 Non-IA Sectors
1-3 CARRIERS (Including 0, 1, or 2 DO carriers)



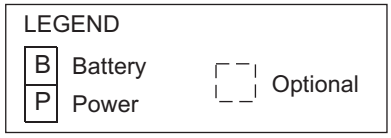
* 850 cabinets have batteries. PCS cabinets above 8 carriers will not have batteries because of the presence of the A6 Amplifier Shelf.

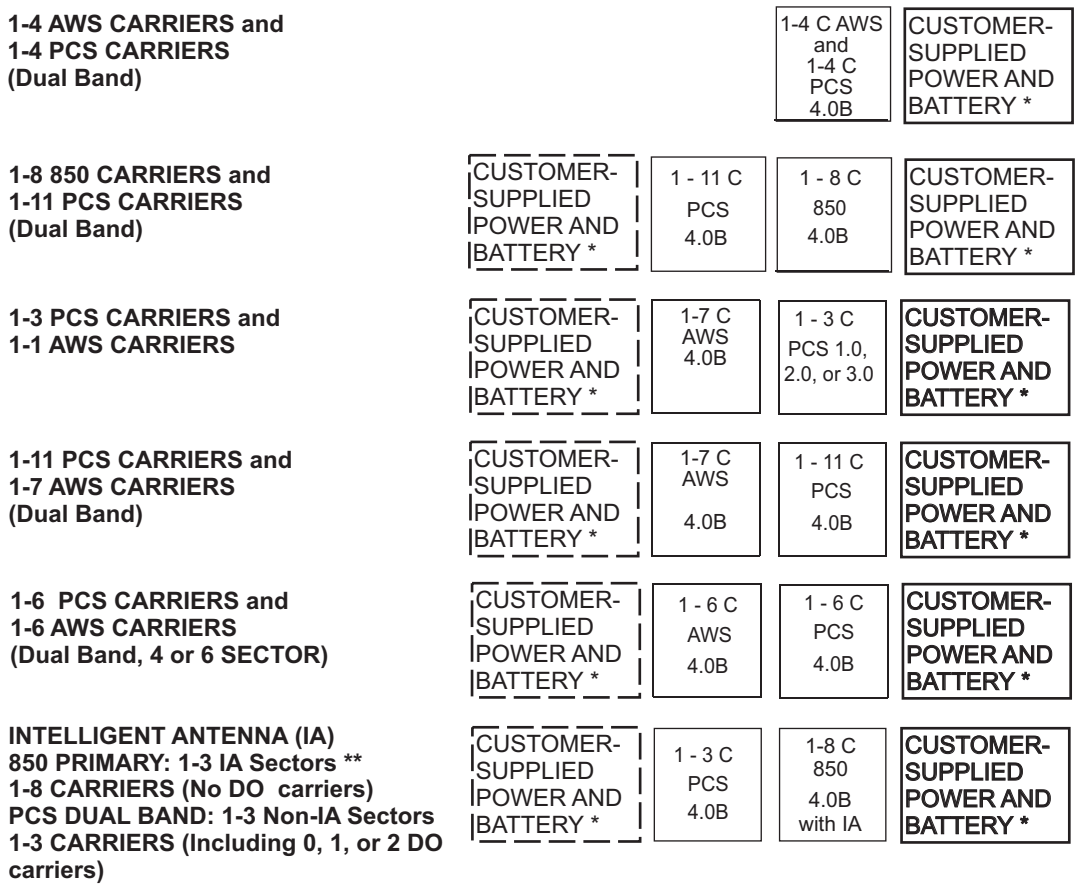
** Cabinets have no batteries if they have an A6 Amplifier Shelf. The presence of the A6 Amplifier Shelf is determined by the combination of IA sectors, DO carriers, total number of carriers, and Required output power.

*** The following sector options are available for Intelligent Antenna (IA):
- 1 IA sector and 2 Non-IA sectors
- 2 IA sectors and 1 Non-IA sector

9228 Macro Dual-band PCS/850 and AWS Cabinet without integrated power, using customer-supplied power and battery, installed at a new site

The following diagram shows the line-up configuration options for 9228 Macro Dual-band PCS/850 and AWS Cabinet without integrated power, using customer-supplied power and battery, installed at a new site.



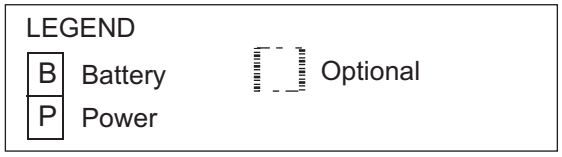


* Customer-supplied power and battery may be supplied from either side, or both sides, of the line-up.

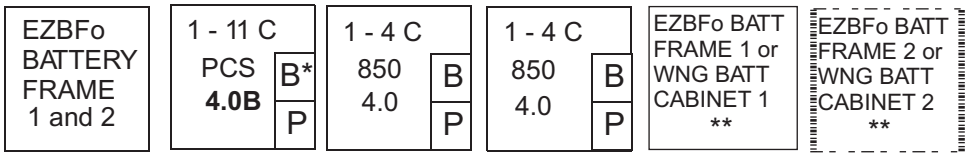
** The following sector options are available for Intelligent Antenna (IA):
- 1 IA sector and 2 Non-IA sectors
- 2 IA sectors and 1 Non-IA sector

9228 Macro Dual-band Cabinet with integrated power added to a legacy site with integrated power

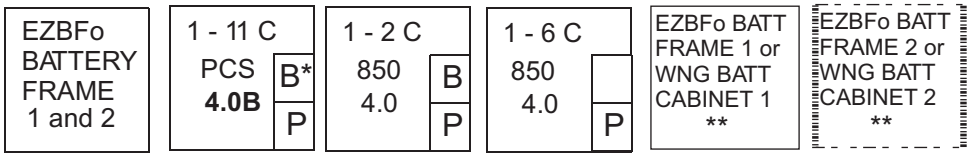
The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Dual-band Cabinet with integrated power added to a legacy site that uses integrated power.



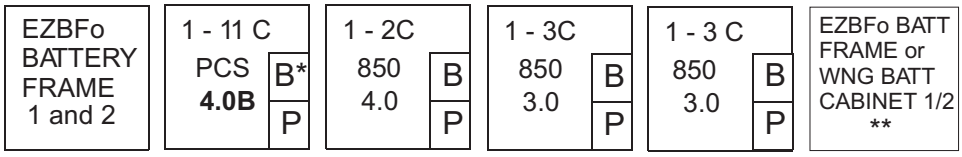
5-8 850 CARRIERS (in G-1 with 4C Primary) 1-11 PCS CARRIERS (4.0B Dual Band) *



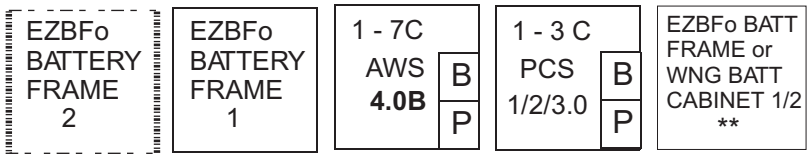
7-8 850 CARRIERS (in G-1 with 6C Primary) 1-11 PCS CARRIERS (4.0B Dual Band) *



8 850 CARRIERS (3.0 Primary, G-1, AND 4.0 G-2) 1-11 PCS CARRIERS (4.0B Dual Band) *



3 PCS CARRIERS (1/2/3.0 Primary) AND 1-7AWS CARRIERS (4.0B Dual Band)

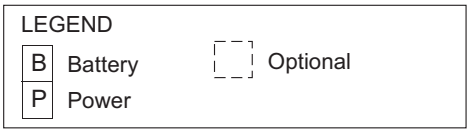


* 850 cabinets have batteries. Other cabinets may not have batteries because of the presence of the A6 Amplifier Shelf, which is determined by carrier count and/or desired output power.

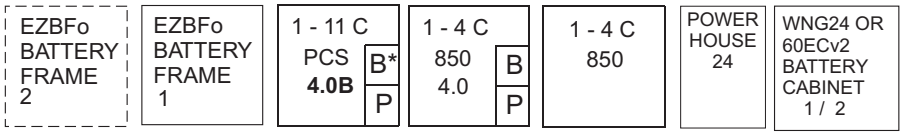
** 60ECv2 battery cabinets may also have been used to support the existing legacy cabinets in these Configurations.

9228 Macro Dual-band Cabinet with integrated power added to a legacy site with Powerhouse 24 power cabinet

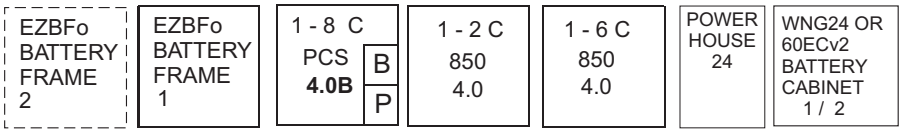
The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Dual-band Cabinet with integrated power added to a legacy site that uses a Powerhouse 24 power cabinet.



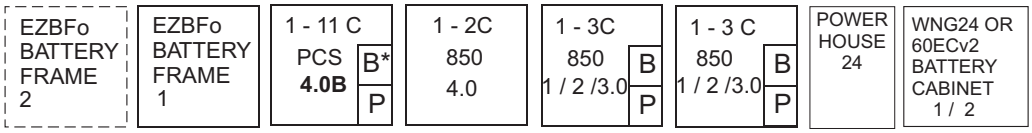
5-8 850 CARRIERS And 1-11 PCS CARRIERS (Dual-band)



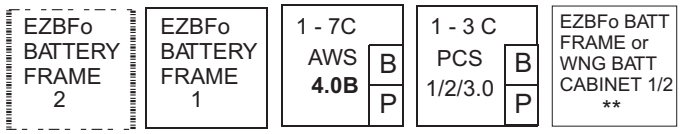
5-8 850 CARRIERS And) 1-8 PCS CARRIERS ** (Dual-band)



8 850 CARRIERS and 1 - 11 PCS CARRIERS (Dual-band)



3 PCS CARRIERS and 1-7 AWS CARRIERS (Dual-band)

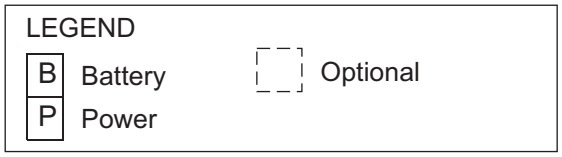


* 850 cabinets have batteries. Other cabinets may not have batteries because of the presence of the A6 amplifier shelf, Which is determined by carrier count and desired output power.

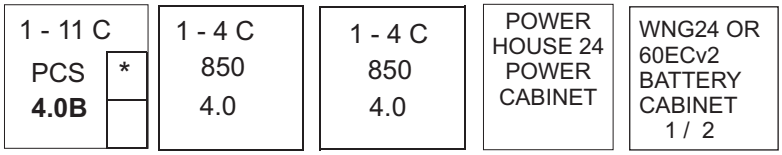
** The number of PCS carriers limited to 8 by the number of available PowerHouse24 DC terminals.

9228 Macro Dual-band Cabinet without integrated power added to a legacy site with Powerhouse 24 power cabinet

The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Dual-band Cabinet without integrated power added to a legacy site that uses a Powerhouse 24 power cabinet.



5-8 850 CARRIERS And 1-11 PCS CARRIERS ** (Dual Band)

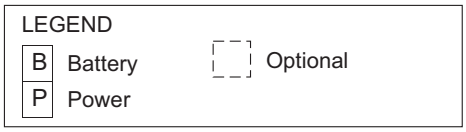


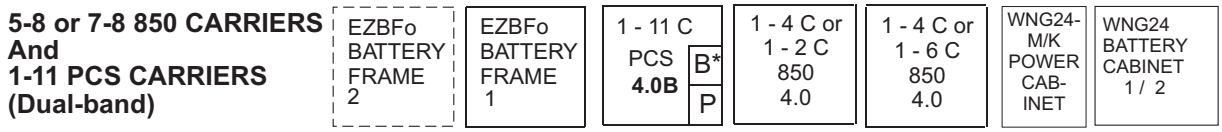
* 850 cabinets have batteries; PCS cabinets above 8 carriers will not have batteries because of the presence of the A6 amplifier shelf.

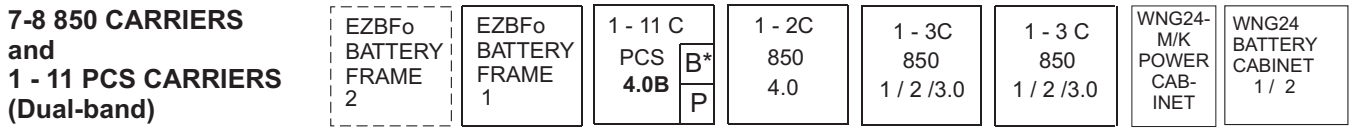
** The maximum output of the PowerHouse 24, WNG24-DJ, WNG24-K, and WNG24-M power cabinets is 17 kW. If a 4.0B dual band cabinet is installed with existing 1.0, 2.0, 3.0, or 4.0 cabinets that utilize any of these power cabinets, the total number of carriers in the 4.0B dual-band cabinet will be limited due to power constraints. Use of a 4.0B dual band cabinet with integrated power is recommended to overcome this limitation.

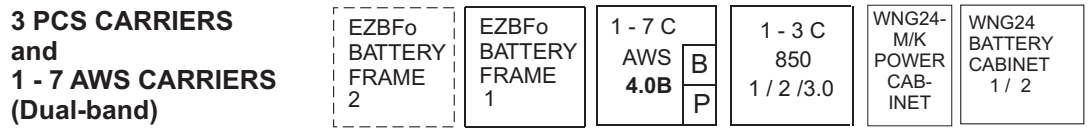
9228 Macro Dual-band Cabinet with integrated power added to a legacy site with WNG24 power cabinet

The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Dual-band Cabinet with integrated power added to a legacy site that uses a WNG24 power cabinet.





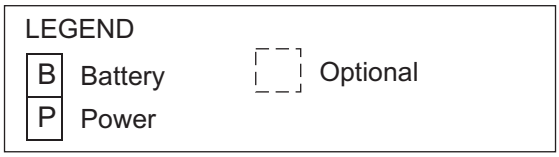




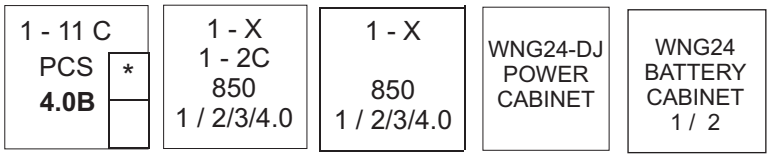
* 850 cabinets have batteries. Other cabinets may not have batteries because of the Presence of the A6 amplifier shelf, which is determined by carrier count and desired output power.

9228 Macro Dual-band Cabinet without integrated power added to a legacy site with WNG24 power cabinet

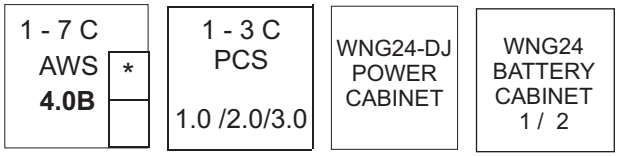
The following diagram shows the line-up configuration options for a 9228 Macro Outdoor Dual-band Cabinet without integrated power added to a legacy site that uses a WNG24 power cabinet.



1-8 850 CARRIERS And 1-11 PCS CARRIERS (Dual Band)



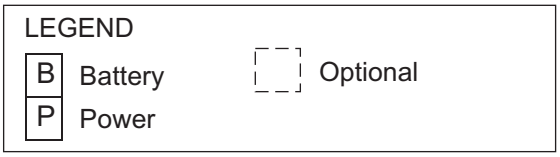
3 PCS CARRIERS And 1-7 AWS CARRIERS (Dual Band)

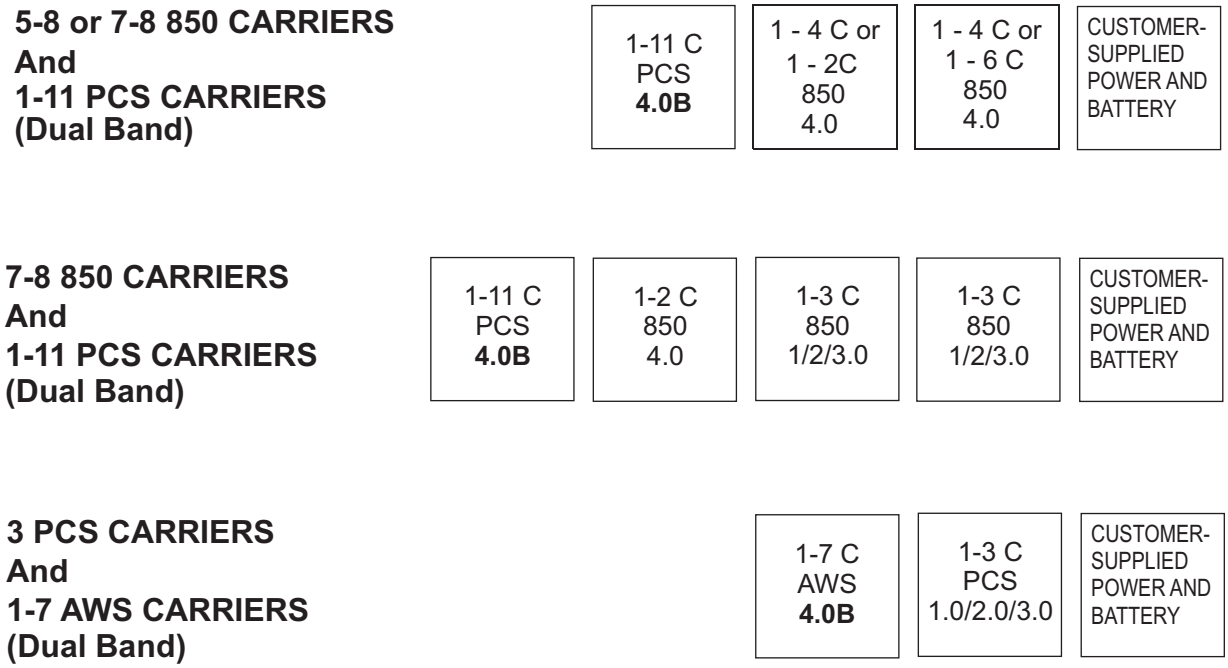


* 850 cabinets have batteries; PCS cabinets above 8 carriers will not have batteries because of the presence of the A6 amplifier shelf.

9228 Macro Dual-band Cabinet without integrated power added to a legacy site with customer-supplied power

The following diagram shows line-up configuration options for 9228 Macro Outdoor Dual-band Cabinet without integrated power added to a legacy site that uses customer-supplied power.

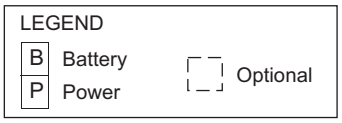




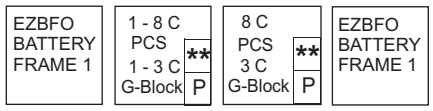
9228 Macro Outdoor Cabinet G-Block (BC-14) line-up configurations

9228 Macro G-Block Cabinet with integrated power installed at a new site

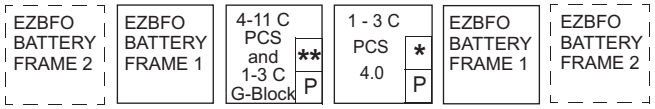
The following diagram shows the line-up configuration options for 9228 Macro Outdoor G-Block Cabinet with integrated power, installed at a new site.



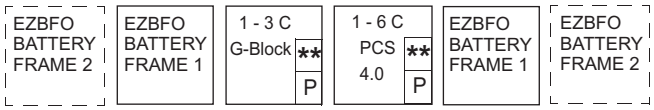
8 PCS CARRIERS and 1-3 G-BLOCK CARRIERS



1-11 PCS CARRIERS and 1-3 G-BLOCK CARRIERS



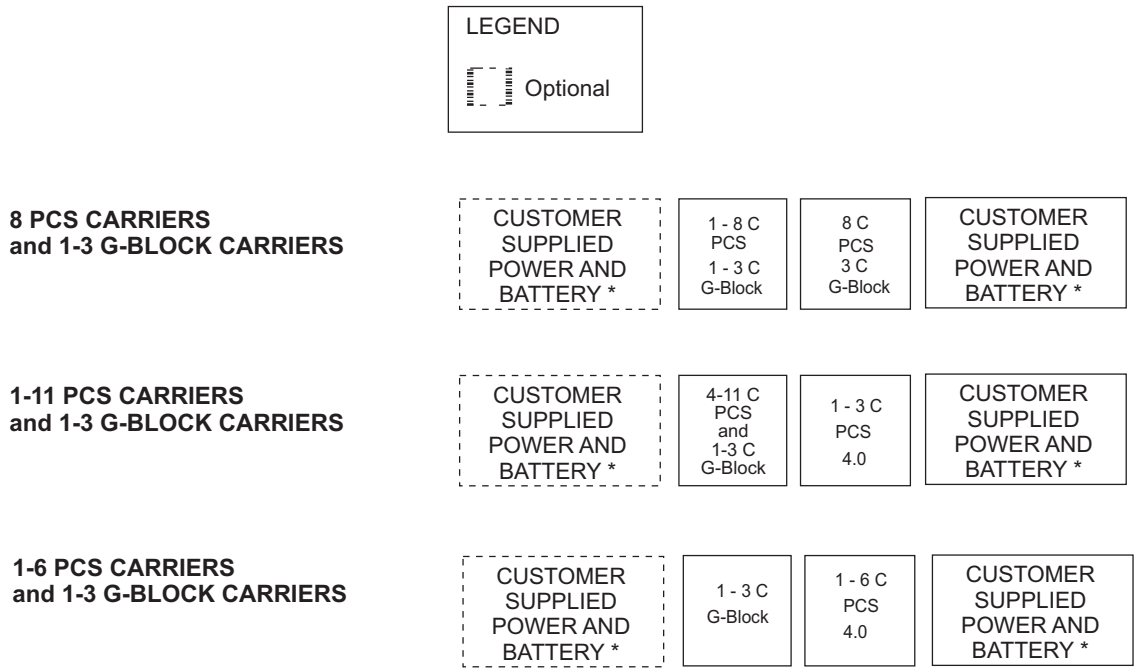
1-6 PCS CARRIERS and 1-3 G-BLOCK CARRIERS



* No batteries.
** These cabinets have no batteries because they have an A6 Amplifier Shelf.

9228 Macro G-Block Cabinet without integrated power, using customer-supplied power and battery, installed at a new site

The following diagram shows the line-up configuration options for 9228 Macro Outdoor G-Block Cabinet without integrated power, using customer-supplied power and battery, installed at a new site.



* Customer-supplied power and battery may be supplied from either side, or both sides of the line-up

Site layouts

Overview

Purpose

This section describes the site layouts for 9218 Macro Outdoor Cabinets.

Contents

9218/9228 Macro Outdoor Cabinet site layouts

Purpose

This section describes the site layouts for 9218/9228 Macro Outdoor Cabinets. Many configurations of equipment at a site are possible, so the diagram shown here is a sample installation. These site layouts should be used to anticipate the impact upon a site of a completed installation.

Mounting options

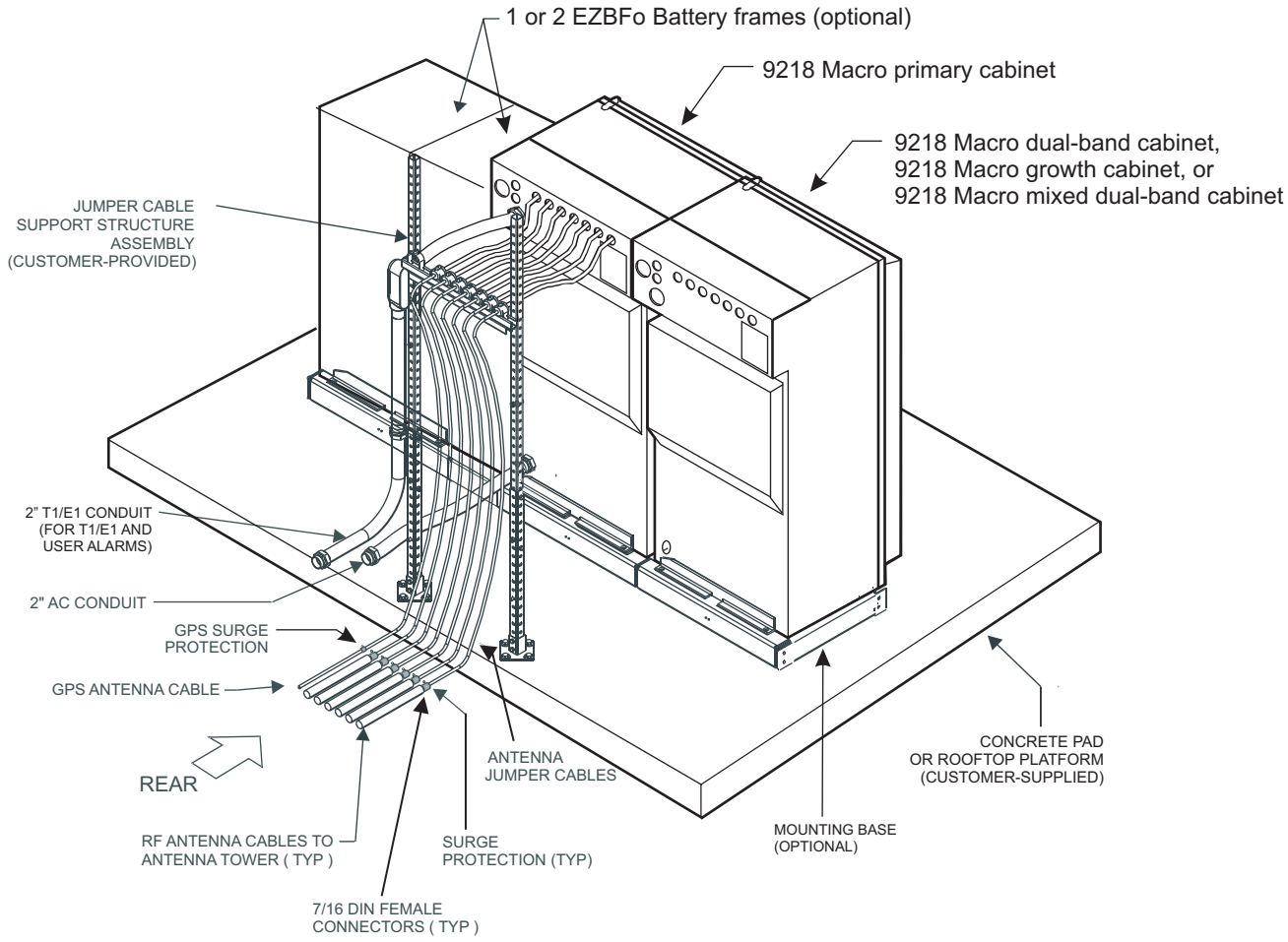
The 9218/9228 Macro Outdoor Cabinet can be mounted on the following surfaces:

- Concrete pad (with optional mounting bases)
- Rooftop (may be supported by a mounting structure or raised platform provided by the customer)

Installing 9218/9228 Macro Outdoor Cabinets at a new site

9218 Macro Outdoor Cabinet

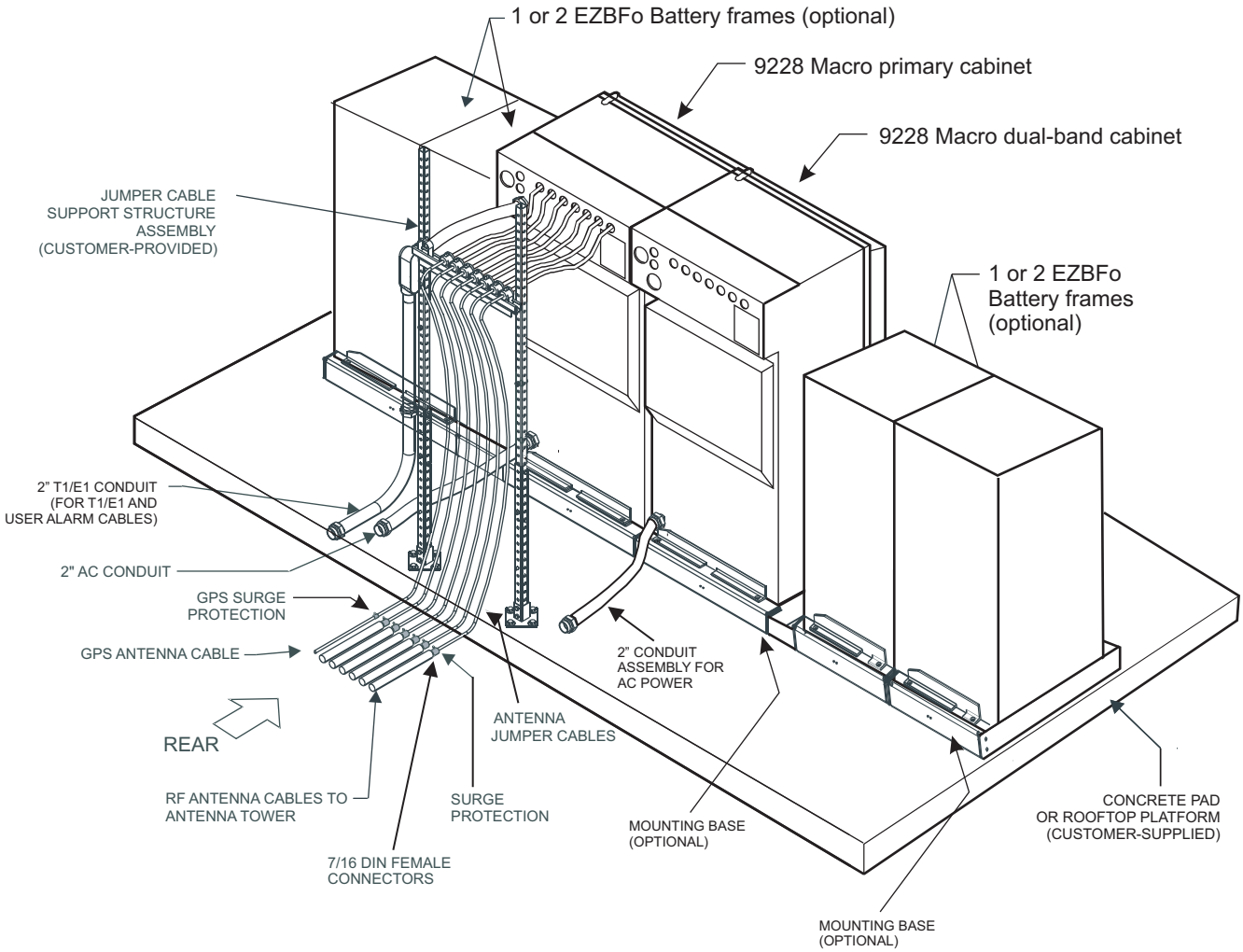
The following diagram shows the site layout for a configuration of 9218 Macro Outdoor Cabinets with integrated power installed at a new site.



NOTE: The antenna jumper cables for the cabinet next to the primary cabinet (except for the 9218 Macro Outdoor Growth Cabinet, which does not use antennas) are not shown in this figure. Also, the top solar shields are not illustrated.

9228 Macro Outdoor Cabinet

The following diagram shows the site layout for a configuration of 9228 Macro Outdoor Cabinets with integrated power installed at a new site.

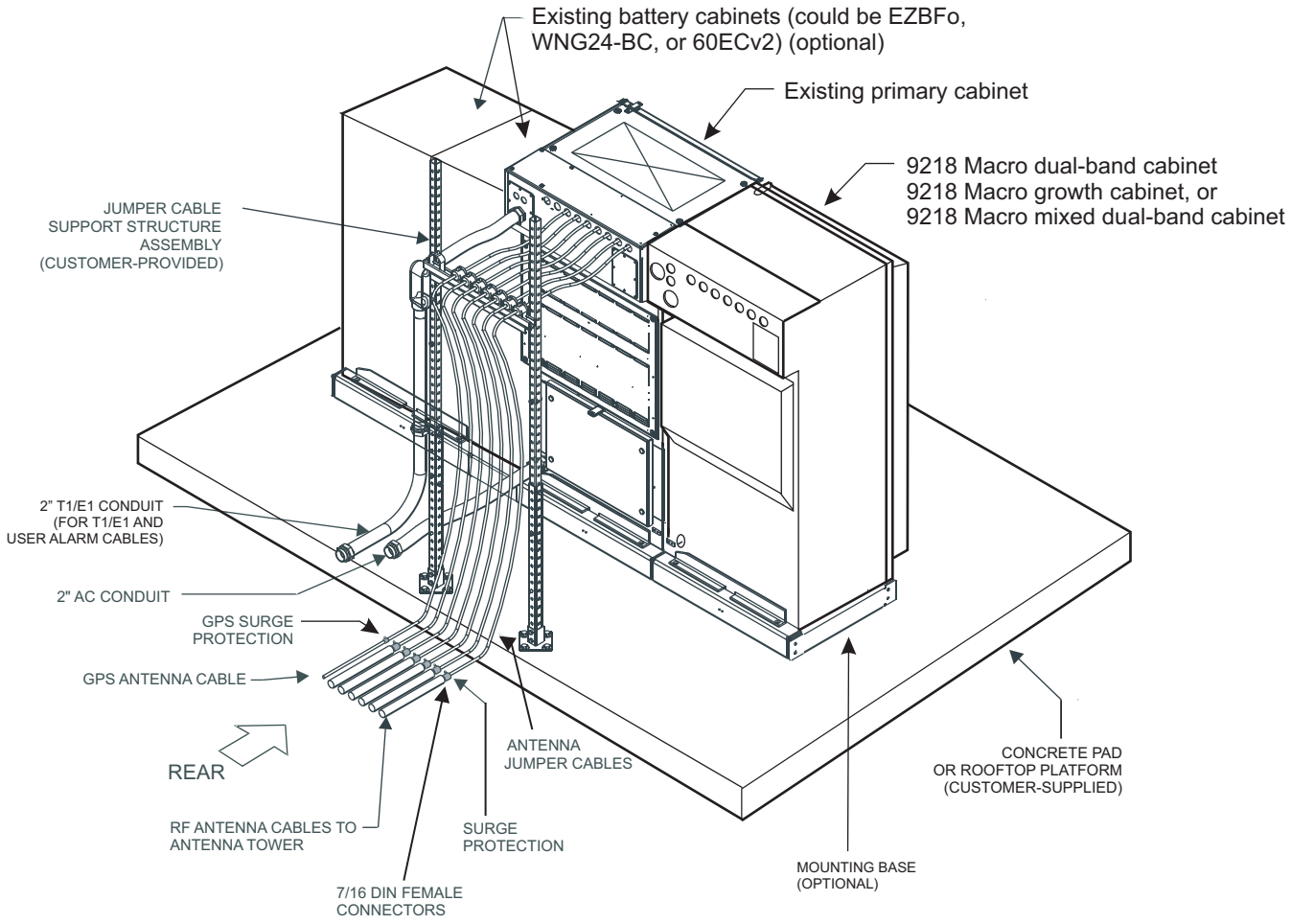


NOTE: The antenna jumper cables for the dual-band cabinet are not shown in this figure. Also, the top solar shields are not illustrated.

9218/9228 Macro Outdoor Cabinet installed at an existing site

9218 Macro Outdoor Cabinet

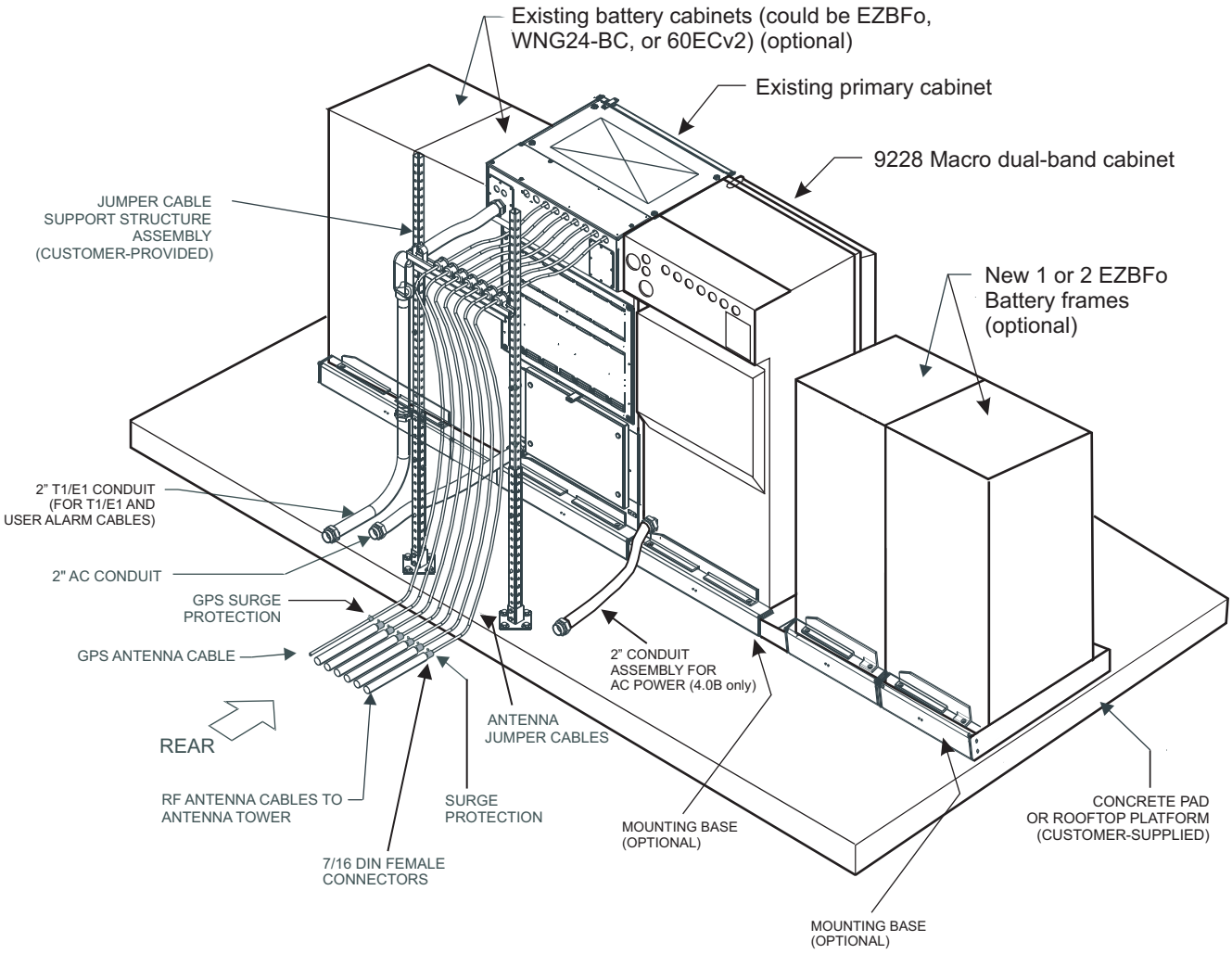
The following diagram shows the site layout for a 9218 Macro Outdoor Cabinet with integrated power installed at an existing site.



NOTE: The antenna jumper cables for the dual-band cabinet are not shown in this figure. Also, the top solar shields are not illustrated.

9228 Macro Outdoor Cabinet

The following diagram shows the site layout for a 9228 Macro Outdoor Cabinet with integrated power installed at an existing site.



NOTE: The antenna jumper cables for the dual-band cabinet are not shown in this figure. Also, the top solar shields are not illustrated.

4 Basic site preparation requirements and cabinet footprints

Overview

Purpose

This chapter provides the site requirements for the installation site for 9218/9228 Macro Outdoor Cabinet and the procedures that may be performed to prepare the installation site.

Contents

Site requirements

Overview

Purpose

This section describes the requirements for the installation site for the 9218/9228 Macro Outdoor Cabinet.

Contents

Storage requirements for unpowered outdoor cabinets

Purpose

Important! Alcatel-Lucent does not support an unpowered radio or battery cabinet in an uncontrolled environment for any length of time beyond the installation window. However, if cabinets must remain unpowered to meet aggressive deployment schedules, the Alcatel-Lucent Design Team has provided the following guidelines to minimize moisture inside the cabinet.

This section describes how to properly store outdoor cabinets that have been delivered to an installation site but are not yet installed. The main concern with unpowered cabinets is condensed moisture inside which can cause corrosion or electrical shorts. The location and storage time influence the severity of this problem. These guidelines include a prevention step and then a drying step.

Prevention of moisture problems

To prevent moisture from collecting in a stored outdoor cabinet, any unpowered deployed outdoor cabinet must be tightly covered with a waterproof tarp to assure no water gets in should a door, cover plate, or other hole not be closed tight. Seal the tarp with duct tape. Moisture collection due to temperature and humidity swings should be prevented with any readily available desiccant packet inside the frame to absorb moisture. The amount of desiccant is a function of the length of time and volume of space. Upon uncovering a brief visual should be given to look for condensed moisture evidence.

Drying a stored outdoor cabinet

Before turning on the electronics, take out the desiccant and throw it away. Then run the digital shelf fan for 30 minutes with the door open. You may need to disengage the CPAs to do this. This dries the frame.

Additional storage requirements

In addition to the above steps, ensure the following:

- Cabinet must be properly grounded.
- RF and GPS antenna jumper cables should not be connected to the cabinet to avoid any surges coming to the cabinet.
- Cabinet is shipped with a plastic cover for the hole for AC conduit. It is not a watertight cover. In case AC will not be connected to the cabinet, this hole must be plugged with a watertight hole plug.
- Any unused holes must be plugged with watertight plugs.

Environmental requirements

Environmental requirements for outdoor installations

An outdoor installation is one in which temperature, humidity, or ventilation are uncontrolled.

The 9218/9228 Macro cabinets are weather-hardened, and each may be equipped with a heat exchanger which enables them to operate in environments within the conditions described in the following table.

Condition	Specification
Operating temperature	-40 °C to +46 °C (-40 °F to +115 °F)
Extended operating temperature	-40 °C to 50 °C (-40 °F to 122 °F)
Relative humidity	5 to 100% (non-condensing but not to exceed 0.024 kg water/kg of dry air)
Enclosure rating	Type 3R (NEMA)
	IP35 (IEC 60529)
Acoustic noise suppression	65 dBA at 25 °C (77 °F) and sea level
Operating altitude	-60.96 to 1798 m (-200 to 5900 ft.) above sea level
Extended operating altitude	-60.96 to 3048 m (-200 to 10000 ft.). An operating temperature de-rating of 1 °C per 1000 feet above 6000 feet is allowed
Wind driven rain	Refer to Telcordia GR-487-CORE
Dust and water ingress	Refer to Telcordia GR-487-CORE
Bullet resistance	Refer to Telcordia GR-487-CORE
Wind resistance	Refer to Telcordia GR-487-CORE
Storage requirements	Refer to Telcordia GR-63-CORE, Section 4.1.1

Heat dissipation

The following table provides heat dissipation information for the outdoor 9218/9228 Macro cabinets.

Cabinet	Sectors/Carriers	Maximum Heat Dissipation (watt)
9218 Macro (4.0) *with* integrated power	3-sector / 6-carrier	9583
9218 Macro (4.0) *without* integrated power and battery	3-sector / 6-carrier	8240
9228 Macro (4.0B) *with* integrated power	3-sector / 11-carrier	12,600
9228 Macro (4.0B) *without* integrated power and battery	3-sector / 11-carrier	10,000
PowerHouse 24 (at 17 kW load)	PowerHouse 24 (at 17 kW load)	2450

Minimum installation temperatures

Power wire insulation tends to crack while being handled during installation at extremely cold temperatures. For this reason minimum temperatures have been established for the installation.

The following installations are affected by the minimum working temperatures:

- All 9218 Macro radio cabinets *without integrated power* being installed with PowerHouse 24 or customer-supplied power cabinets
- All 9228 Macro radio cabinets *without integrated power* being installed with customer-supplied power cabinets
- The EZBFo battery frame

The following are the affected wire sizes:

- 33.6-mm^2 (2-AWG) and larger

The following are the affected wire insulation types:

- Class B: THHN type insulation (T90 NYLON type insulation in Canada).

The following are the minimum storage and working temperatures:

- Storage prior to installation: 20 °C (68 °F)
- Working (Installation): -25 °C (-13 °F)

Installations at -25 ˚C (-13 ˚F) or below

If shelter is available, do the following:

- Store cables in a heated area (20 °C [68 °F] or higher) for 24 hours prior to installation.
- Keep cables sheltered from wind and temperatures below -25 °C (-13 °F) during installation.
- It is recommended to perform the installation in a heated tent.

If shelter cannot be provided, the following cable along with the associated hardware is recommended. The size of the cable determines the correct tool to use, as well as the inside diameter of the lug and the insulating sleeve.

- Industrial Wire & Cable Corp. Type MTW Machine Tool Wire, MTWxxxx
- FCI Terminal Lug (or equivalent), 3/8" Bolt Size, Straight, 2-Hole, 1" Center to Center
- FCI Terminal Lug (or equivalent), 1/4" Bolt Size, Straight, 2-Hole, 5/8" Center to Center
- FCI Terminal Lug (or equivalent), 5/16 Bolt Size, Straight, One-Hole
- Panduit (or equivalent) Type HSTTV 75-T2 Insulating Sleeve, Heat Shrink, Red
- Panduit (or equivalent) Type HSTTV 75-T Insulating Sleeve, Heat Shrink, Black

Site requirements

General requirements

The following general requirements must be met before the installation of the 9218/9228 Macro site can begin:

- An appropriate installation site must be selected. For more information, see "Mounting options" (p. 4-13).
- Adequate clearance must be provided for service access, as described in "Support structure" (p. 4-15).
- The environment must comply with "Environmental requirements for outdoor installations" (p. 4-4).
- Cabinet anchor holes must be drilled, as described in "Drill anchor holes" (p. 4-30).
- Support structure and ice bridge (if required) must be installed, as described in "Support structure, ice bridge, and clearance for service access" (p. 4-15).
- Tower light power must be installed (if required).
- Tower light alarm must be installed (if required).
- Conduits must be installed, as described in "Conduit requirements" (p. 4-8).
- If the Intelligent Antenna feature is being installed, the site requirements to support that feature must met, as described in "Hardware requirements for Intelligent Antenna" (p. 4-11).
- AC electric service must be installed as described in Chapter 5, "Electrical power requirements".
- RF and GPS antenna runs must be installed, as described in Chapter 6, "Site preparation requirements for antennas". Two RF antennas are required per sector. Additional antennas (2 per sector) must be installed for dual-band cabinets.
- Surge protection for antennas must be installed, as described in Chapter 6, "Site preparation requirements for antennas"
- Grounding electrode system must be installed with sufficient pigtails, as described in Chapter 7, "Grounding and lightning protection requirements".
- T1/E1 and user alarm facilities must be installed at demarcation point as described in Chapter 8, "Site preparation for T1/E1 and user alarm facilities".
- Balun Protector Box must be installed, if required, as described in "Cable specifications for T1/E1 and user alarm cables" (p. 8-2).

Refer to Appendix A, "9218/9228 Macro - Outdoor site preparation checklists" of this document for checklists of detailed requirements.

Conduit requirements

Rigid conduits

Rigid conduits are used to bring various types of cables to the installation site. It is the responsibility of the customer to provide the rigid conduits and install them as part of site preparation.

The conduit requirements for the 9218/9228 Macro Outdoor Cabinet differ depending on whether or not the cabinet has integrated power.

The following table describes the rigid conduits that are required:

Required conduit	Needed for which cabinet types	Purpose	Conduit specifications
AC power supply conduit	With integrated power	AC power cables are brought to the installation site in the AC power supply conduit. [1]	2-inch rigid conduit, can be steel or PVC
NIU conduit [2]	With or without integrated power	T1/E1 cables and the user alarm cable are terminated at the Network Interface Unit (NIU) and brought to the installation site in the NIU conduit.	2-inch rigid conduit, can be steel or PVC

Notes:

1. For 9228 Macro Outdoor Cabinet only, each cabinet requires a separate AC feed. A junction box behind the cabinets is recommended to attach the AC power supply conduit (rigid conduit) to two AC conduits (flexible conduits, one for primary cabinet and one for dual-band cabinet).
2. Install at new sites only. For 9218/9228 Macro Outdoor Cabinet being added to an existing site, the T1/E1 and user alarm cables are routed through the conduits that are already in place for the primary cabinet and then are routed within the cabinets to the additional cabinet.

Flexible conduits

Flexible conduits are used to connect various types of cables to the 9218/9228 Macro Outdoor Cabinet during installation. It is the responsibility of the customer to purchase the flexible conduits and all required fittings and connectors as part of site preparation, and provide them to the installer in preparation for installation.

The conduit requirements for the 9218/9228 Macro Outdoor Cabinet differ depending on whether or not the cabinet has integrated power.

The following table describes the flexible conduits that are required:

Required conduit	Needed for which cabinet types	Purpose	Required Supplies
DC Conduit	Without integrated power	Connects the external power cabinet to the 9218/9228 Macro Outdoor Cabinet	2 1/2-inch liquid-tight flexible metal conduit and 2 1/2-inch LB connectors
AC conduit	With integrated power	Connects the 2-inch rigid steel conduit for AC power supply to the 9218/9228 Macro Outdoor Cabinet.[1]	2-inch liquid-tight flexible metal conduit and 2-inch LB connectors
	Without integrated power	Connects the PowerHouse 24 or customer-supplied power cabinet to the 9218/9228 Macro Outdoor Cabinet	2-inch liquid-tight flexible metal conduit and 2-inch LB connectors
T1/E1 conduit [2]	With or without integrated power	Connects the 2-inch rigid steel conduit for T1/E1 and user alarms to the 9218/9228 Macro Outdoor Cabinet	2-inch liquid-tight flexible metal conduit and 2-inch LB connectors

Notes:

1. For 9228 Macro Outdoor Cabinet only, each cabinet requires a separate AC feed. A junction box behind the cabinets is recommended to attach the AC power supply conduit (rigid conduit) to two AC conduits (flexible conduits, one for primary cabinet and one for dual-band cabinet).
2. Install at new sites only. For9218/9228 Macro Outdoor Cabinet being added to an existing site, the T1/E1 and user alarm cables are routed through the conduits that are already in place for the primary cabinet and then are routed within the cabinets to the additional cabinet.

Architectural considerations

All architectural considerations shall comply with all applicable national and local codes, including the following:

- Uniform Building Code (UBC)
- Building Officials and Code Administrators (BOCA)
- Southern Uniform Building Code (SUBC)
- American Concrete Institute (ACI)
- American National Standard Institute (ANSI)
- American Standard Testing Methodology (ASTM)
- National Fire Protection Association (NFPA)

Additional site requirements for Intelligent Antenna feature

Purpose

The Intelligent Antenna feature is supported for 9228 Macro Outdoor Cabinet, and is not supported for 9218 Macro Outdoor Cabinet. The IA feature is supported on cells with three sectors, and is supported for one, two, or three sectors of a 3-sector cell.

When the IA feature is used, there are additional site requirements, which are explained in this topic, in the section titled "Site preparation for RF antennas when Intelligent Antenna is used" (p. 6-6), and in Appendix F, "Intelligent Antenna loss measurements".

Hardware requirements for Intelligent Antenna

The Intelligent Antenna feature requires the standard hardware in a *Flexent*®/*AUTOPLEX*® wireless network and the following additional hardware:

- One calibration cable from the Host IA-capable Antenna Panel to the base station (supports antennas for up to three sectors).
- IA-Capable Antenna Panel: this specially designed antenna is available from Kathrein. It contains two pairs of cross-polarized antenna columns to provide two closely spaced beamsteering antenna pairs for use with the Intelligent Antenna feature.

  Basic specification for the PCS antenna are:

  – Gain: 17.5 dBi minimum

  – Frequency Range: 1850 to 1990 MHz

  – Half Power Beamwidth: 65 degrees horizontal, 5 to 7 degrees vertical

  – Weight: 15.88 kg (35 lbs.) or less

  – Dimensions: 1574.8 mm (62 in.) high by 304.8 mm (12 in.) wide by 127 mm (5 in.) deep or smaller

  Basic specifications for the 850 antennas are:

  – Gain: 2 x 14.0 dBi

  – Frequency Range: 816 to 894 MHz

  – Half Power Beamwidth: 65 degrees horizontal, 12 degrees vertical

  – Weight: 25 kg (55 lb.) or less

  – Dimensions: 1700 mm (67 in.) high by 365 mm (14 in.) wide by 150 mm (6 in.) deep or smaller

  Two antenna panels are available:

  – A host antenna that contains a 3:1 combiner for the calibration signals

  – A client antenna panel that does not contain a 3:1 combiner

Cells with more than one IA sector must have one host antenna panel, and the IA antenna panels for other sectors of the cell must be client panels. Cells with only one IA sector can utilize either the host or the client antenna panel.

Calculate losses for the background calibration process

The IA feature uses four transmission paths for each IA-enabled sector and includes a continuously running background calibration process. The IA background calibration process is sensitive to different losses in the four transmission paths for a sector, and to differences in losses of the transmission paths among sectors. In order to insure a successful introduction of the IA feature, installation of the antenna panels should include measurements of each of the RF paths to the calibration cable, and the losses should be equalized to within 2 dB.

The measurements that must be taken are explained in Appendix F, “Intelligent Antenna loss measurements”.

Mounting options

Purpose

This topic describes the mounting options for 9218 Macro Outdoor Cabinet.

Structural requirements

Floor loading, roof loading, and foundations must be considered during site preparation. In some cases, the cell site equipment will not rest directly on the concrete pad, floor, or rooftop. In those cases, the cell equipment will need to be supported by an intermediate structure that is fastened directly to the mounting surface. The cabinets must be supported along all four edges. The support structure must be designed in compliance with BOCA national building codes and all other applicable codes.

If the cabinets are elevated more than 152.4 mm (6 in.) above the floor surface, it is recommended that a platform be placed under the cabinets to provide a safe and convenient work surface for technicians. The customer may use a custom-designed platform and will be responsible for supplying the 12-mm (1/2-in.) bolt size hardware. A platform bolt-down kit is available from Alcatel-Lucent.

Options for mounting the 9218 Macro Outdoor Cabinet

The 9218 Macro Outdoor Cabinet can be mounted on the following surfaces:

- Concrete pad (with optional mounting bases)
- Rooftop (may be supported by a mounting structure or raised platform supplied and installed by the customer)

Concrete pad requirements

If cabinets will be installed on a concrete pad, the concrete pad must be supplied as part of site preparation and must meet the following requirements:

- Minimum pressure = 175 kg/cm^2 (2500 psi)
- Minimum thickness = 114 mm (4.5 in.)
- The surface of the concrete pad must comply with national and local building codes.
- The concrete pad must be able to support the maximum weight of the cabinets.
- The concrete pad must be able to allow drilling of up to 100-mm anchor holes to secure the cabinets to the pad.
- The concrete pad must be level. The top surface must be flat within ±1/4-inch total variation.

Rooftop requirements

If cabinets will be installed on the roof of a building, the following requirements must be met:

- The building must comply with Building Officials and Code Administrators (BOCA) building codes.
- Additional support structure is required.
- The rooftop must be able to support the maximum weight of the cabinets and other auxiliary equipment.
- Adequate clearance must be provided to transport the cabinet to the roof.

Mounting bases

Mounting bases may be used to provide a raised, level, and stable cabinet mounting surface for outdoor installations.

Mounting bases can either be supplied by Alcatel-Lucent or be customer-supplied.

Raised platform

Rooftop installations may be supported by a mounting structure or raised platform provided by the customer. The design and installation of the rooftop platforms are the responsibility of the customer.

Support structure, ice bridge, and clearance for service access

Purpose

This topic describes the site preparation requirements for support structure and ice bridge for the 9218/9228 Macro Outdoor Cabinet

Support structure

Support brackets and support structures must meet the requirements specified in this document and all current applicable ASTM specifications.

A customer-supplied support structure shall be used to support antennas, conduits, ice bridge, and grounding.

Ice bridge

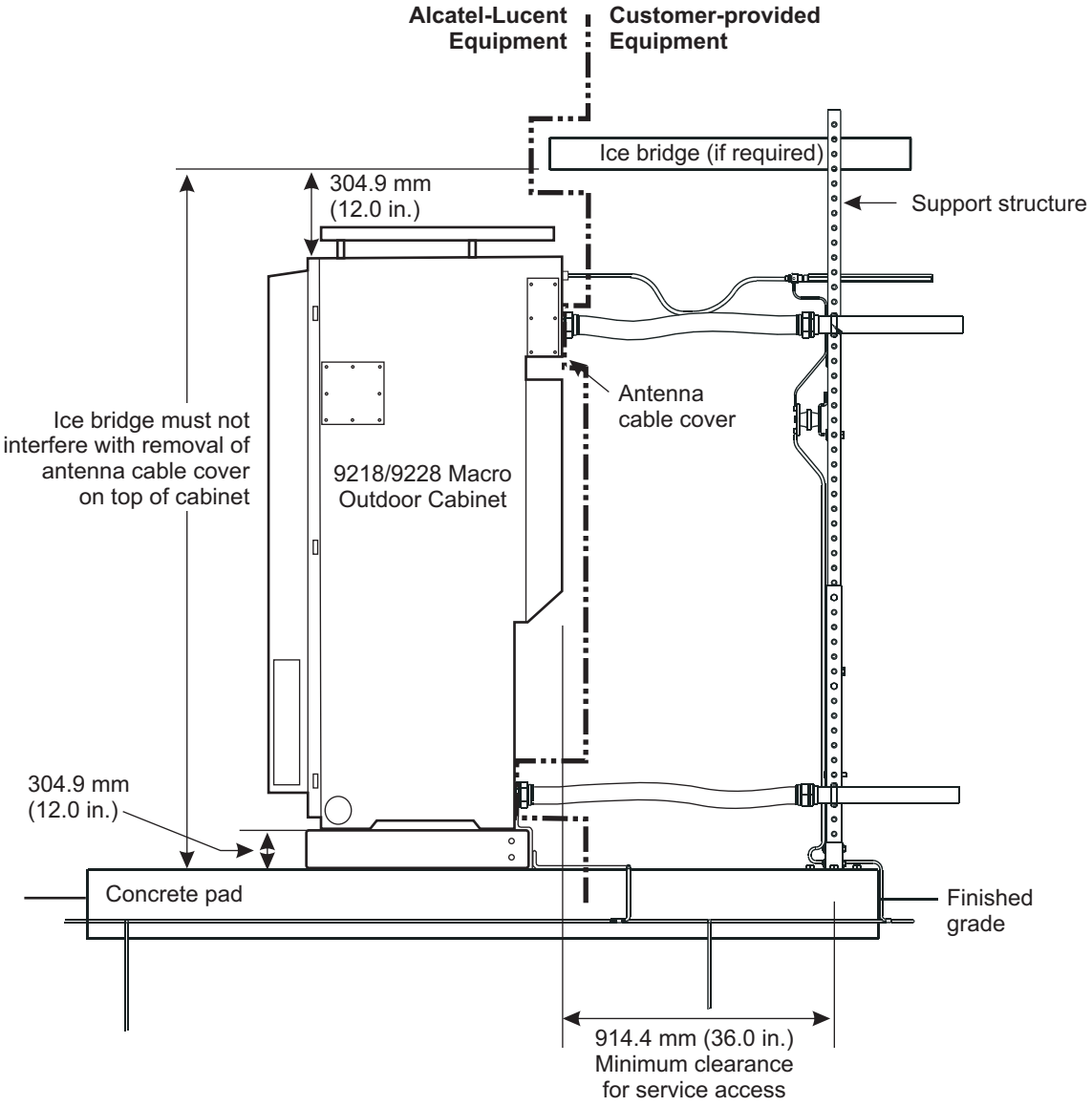
For installations where falling ice can damage cables, a customer-supplied ice bridge should be used to support antenna cable runs and protect them from falling ice. The height and position of the ice bridge must not interfere with access to antenna connections on the upper rear of the Modular Cell cabinet.

Clearance for service access

Adequate space must be maintained to allow service access to the cabinets.

Diagram

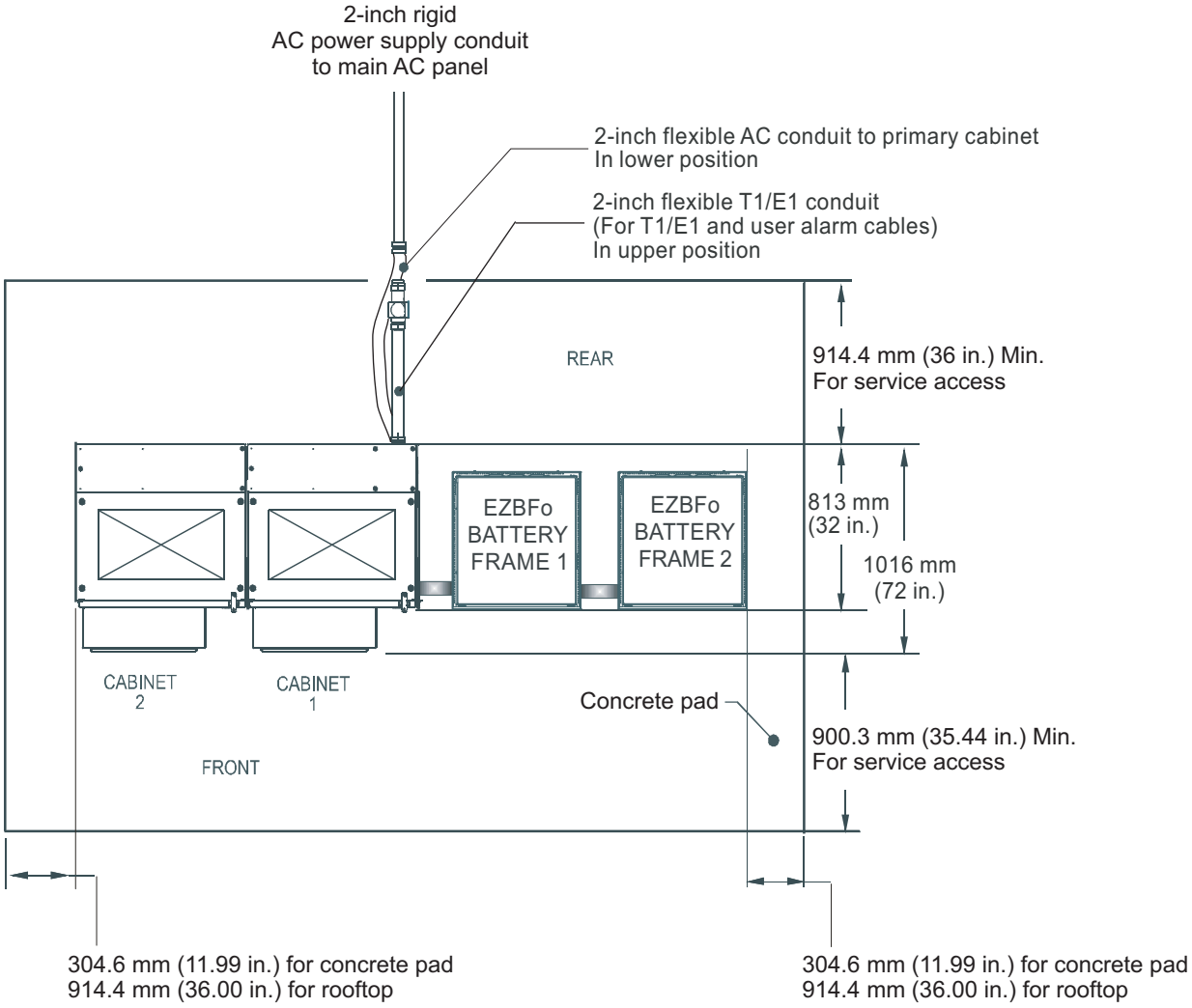
Refer to the following figure for minimum allowances for measurements for support structure, ice bridge, and clearance for service access.



Equipment layouts

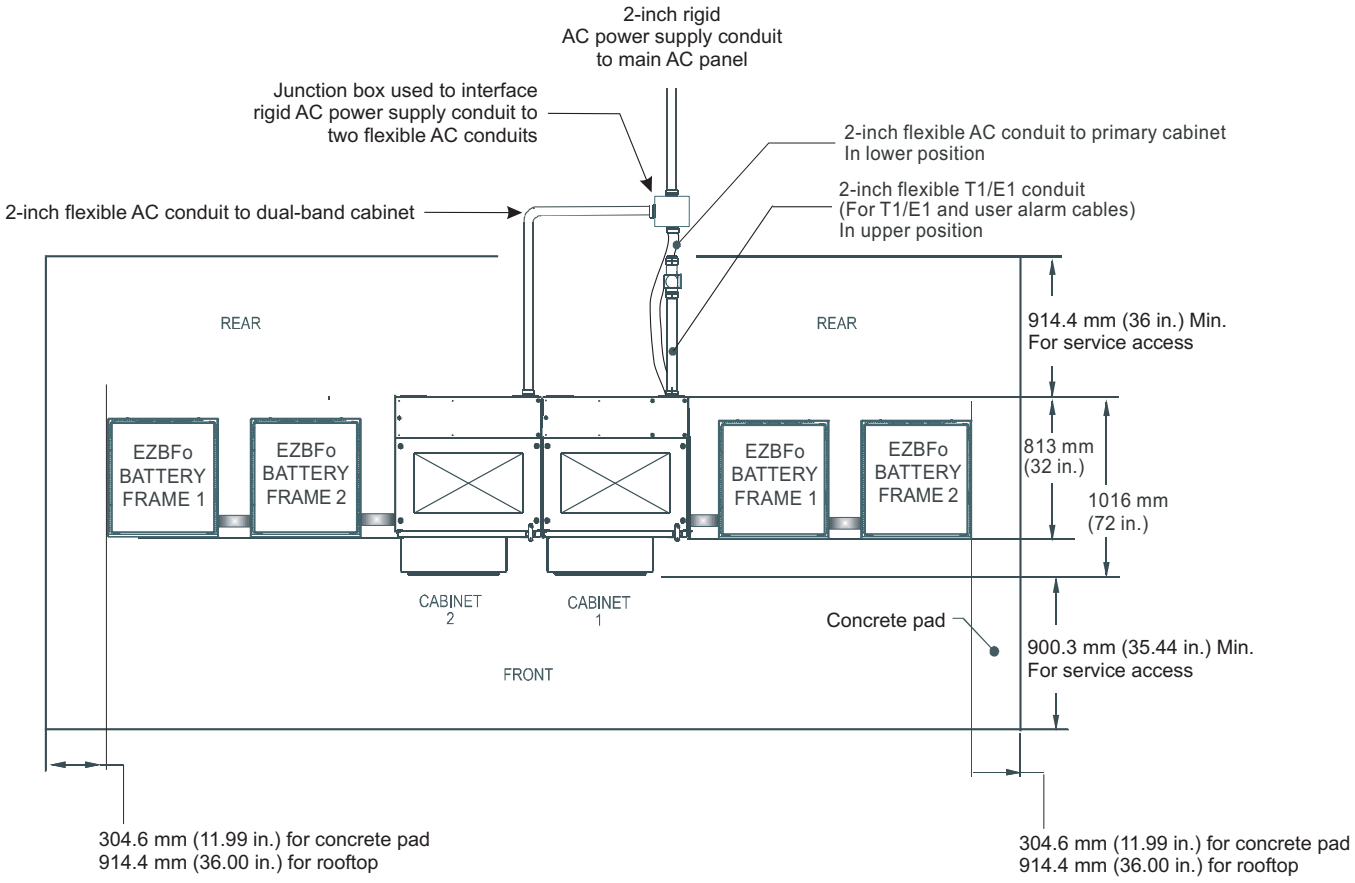
Equipment layout for new site: 9218 Macro Outdoor Cabinet with integrated power and EZBFo battery

The following diagram shows the typical equipment layout for a new installation of 9218 Macro Outdoor Cabinet with integrated power and EZBFo battery.



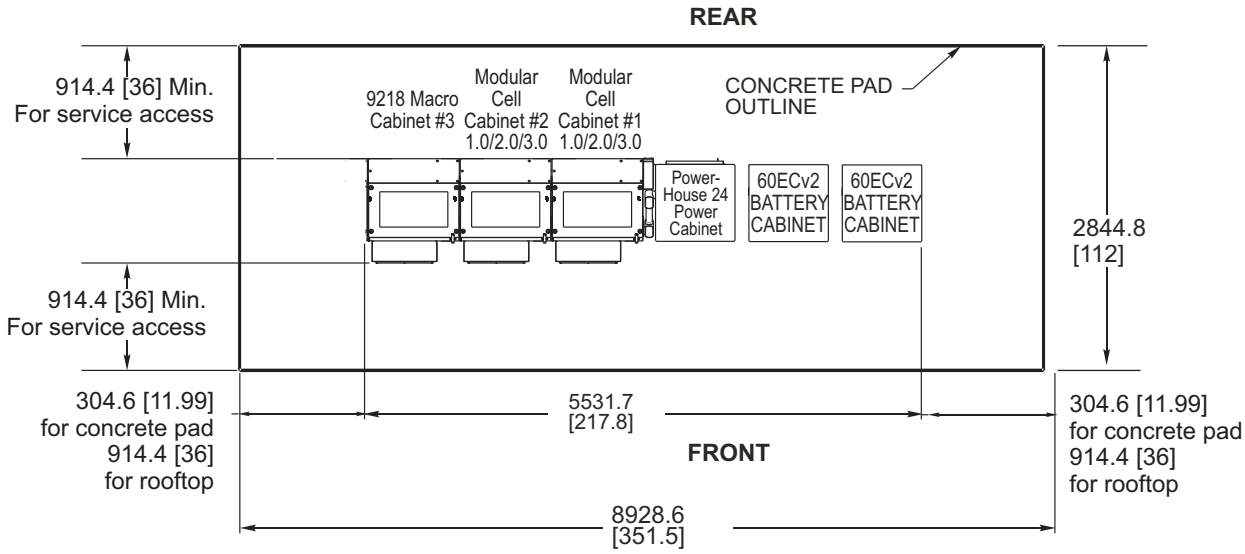
Equipment layout for new site: 9228 Macro Outdoor Cabinet with integrated power and EZBFo battery

The following diagram shows the typical equipment layout for a new installation of 9228 Macro Outdoor Cabinet with integrated power and EZBFo battery.



Equipment layout for existing site: adding 9218 Macro to 1.0/2.0/3.0 site

The following diagram shows the typical equipment layout for 9218 Macro Outdoor Cabinet added to an existing 1.0/2.0/3.0 site.



Anchoring requirements

Overview

Cabinet anchoring must meet all requirements of the local codes, taking into consideration the seismic zone of the installation site.

Anchor specifications

Use the following table to determine the type of anchor to use, and the hole size and depth required for the anchor hole.

Equipment	Seismic Zone	Anchor Type	Number of Anchors Required	Hole Size/Depth	Anchor set before or after unit placement?
9218/9228 Macro cabinets	0, 1, 2	1/2" drop-in anchor	4	16-mm (5/8 in.) bit /50-mm (2 in.) deep	Before or after
	3, 4	12-mm expansion stud anchor	4	18-mm (11/16 in.) bit /101-mm (4 in.) minimum deep[1]	Before or after
Mounting bases	0, 1, 2	1/2" drop-in anchor	4	16-mm bit (5/8 in.) /50-mm (2 in.) deep	Before
	3, 4	12-mm expansion stud anchor	4	18-mm (11/16 in.) bit / minimum 101-mm (4 in.) deep[1]	Before
PowerHouse 24 power cabinet	0, 1, 2	1/2" drop-in anchor	4	16-mm (5/8 in.) bit / 50-mm (2 in.) deep	Before or after
	3, 4	12-mm expansion stud anchor	4	18-mm (11/16 in.) bit / minimum 101-mm (4 in.) deep[1]	Before or after
EZBFo [2]	0, 1, 2, 3	1/2" drop-in anchor	4	16-mm bit (5/8 in.) bit /50 mm (2 in.) deep	Before
	4	1/2" drop-in anchor	8	16-mm bit (5/8 in.) bit /50 mm (2 in.) deep	Before

Notes:

1. If a 101-mm (4 in.) hole depth cannot be attained for a 12-mm expansion stud anchor, a 76-mm (3-in.) hole depth can be used. To make the anchor fit the shorter depth, a spacer may be removed from the anchor assembly and 25-mm (1 in.) may be cut from the end of the threaded rod prior to the anchor being set.
2. In Zone 4 installations, a Zone 4 Mounting Kit is required when installing the second add-on module to the EZBFo.

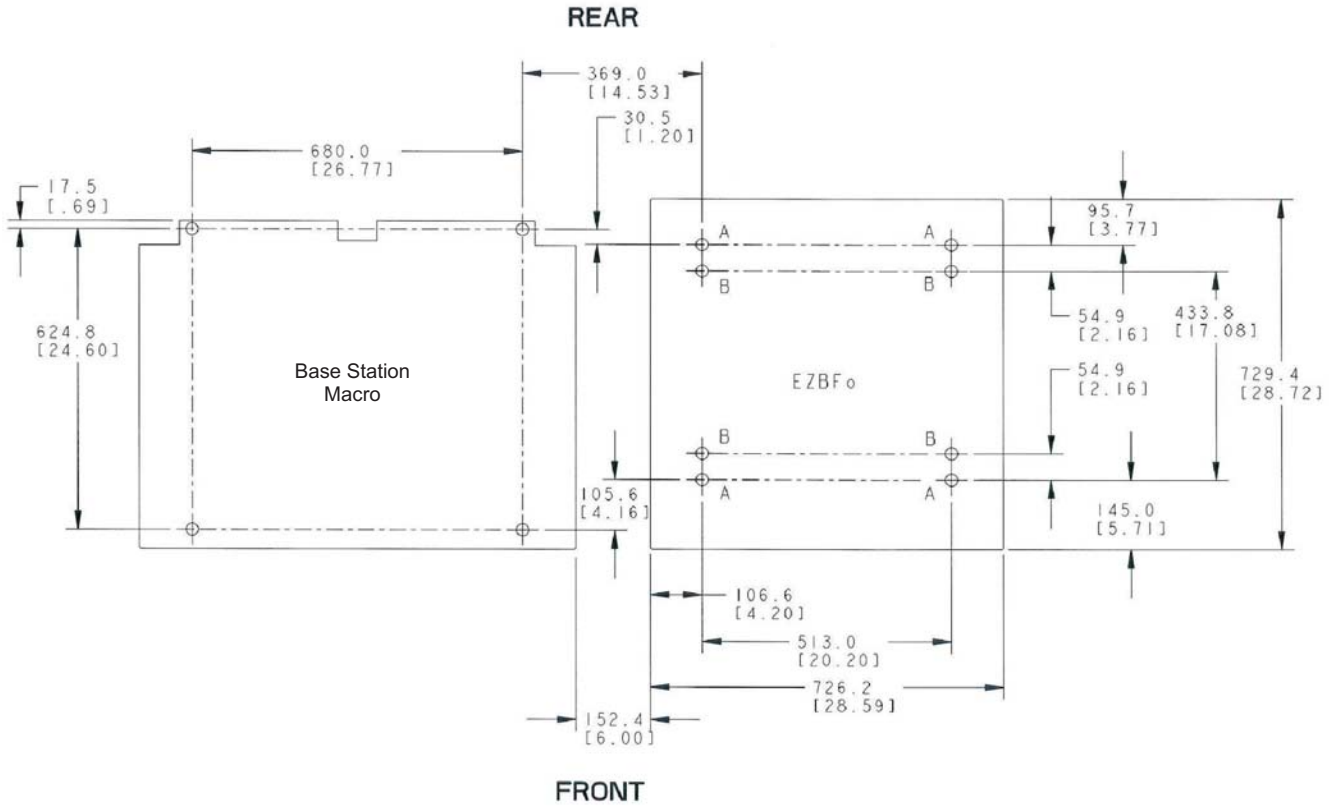
Anchoring footprints

Template

A hinged aluminum template to facilitate the marking of anchor holes for the modular cabinet on a concrete pad is available from Alcatel-Lucent (OI # 300325594).

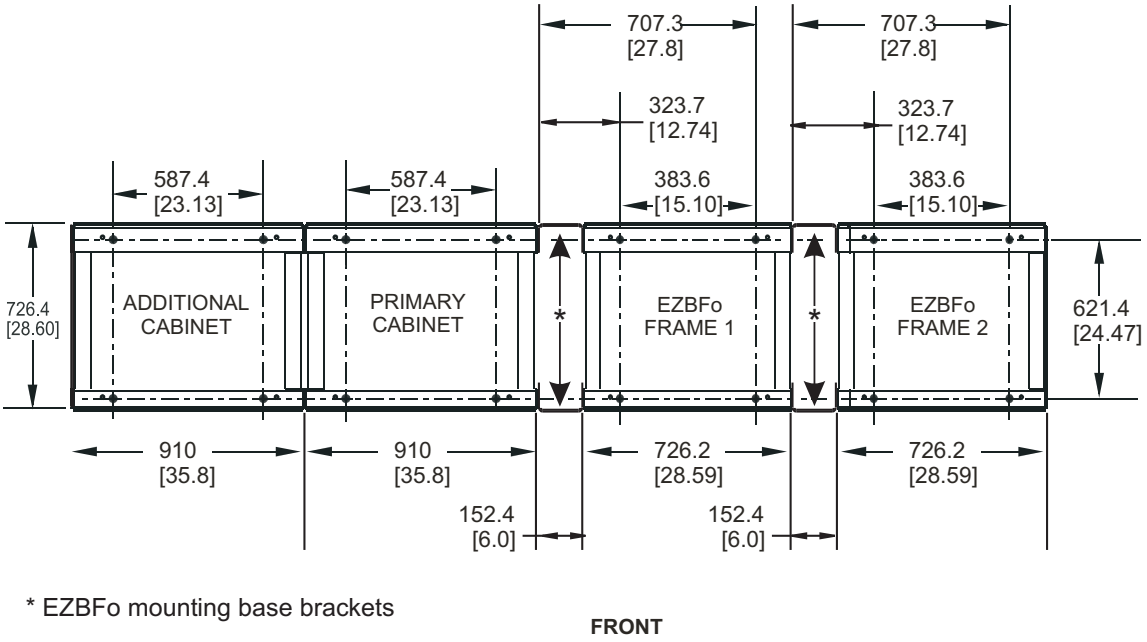
Anchoring footprint for new site: 9218/9228 Macro Outdoor Cabinet with EZBFo

The following diagram shows anchoring footprint for the 9218/9228 Macro Outdoor Cabinet with the EZBFo Modular Battery System.



Anchoring footprint for new site: mounting bases for 9218 Macro (4.0) with EZBFo

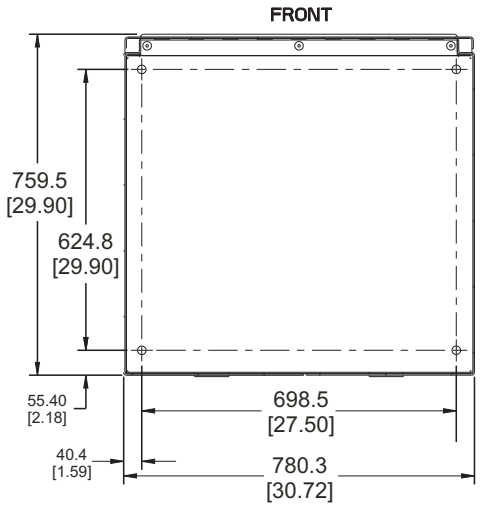
The following diagram shows anchoring footprint for mounting bases for 9218/9228 Macro Outdoor Cabinet with the EZBFo Modular Battery System.



Anchoring footprints for the power cabinets

The following diagram shows the anchoring footprint for the PowerHouse 24 power cabinet.

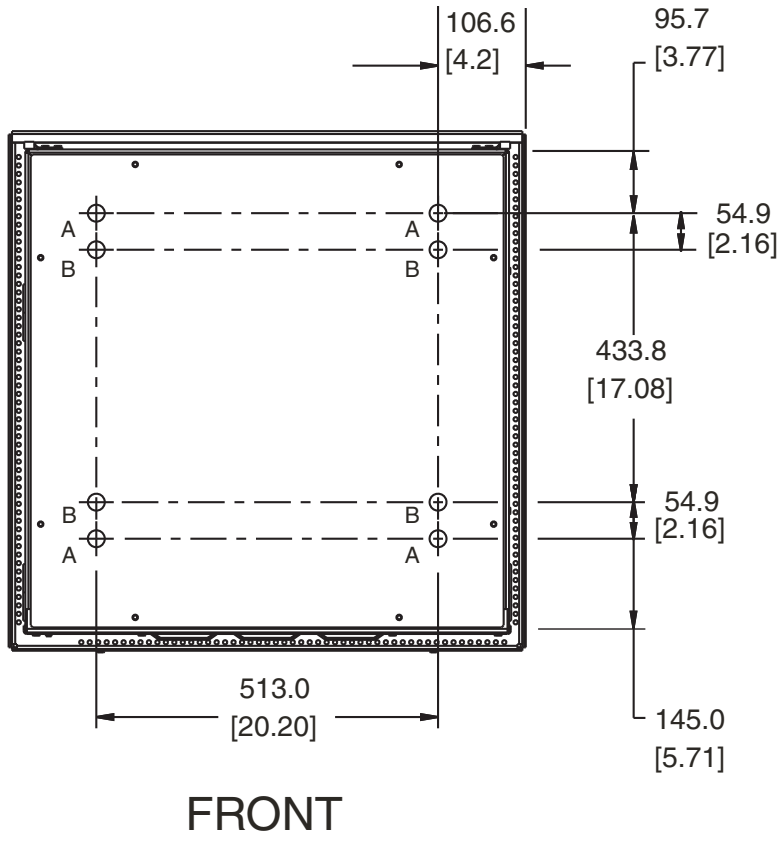
PowerHouse24 CABINET



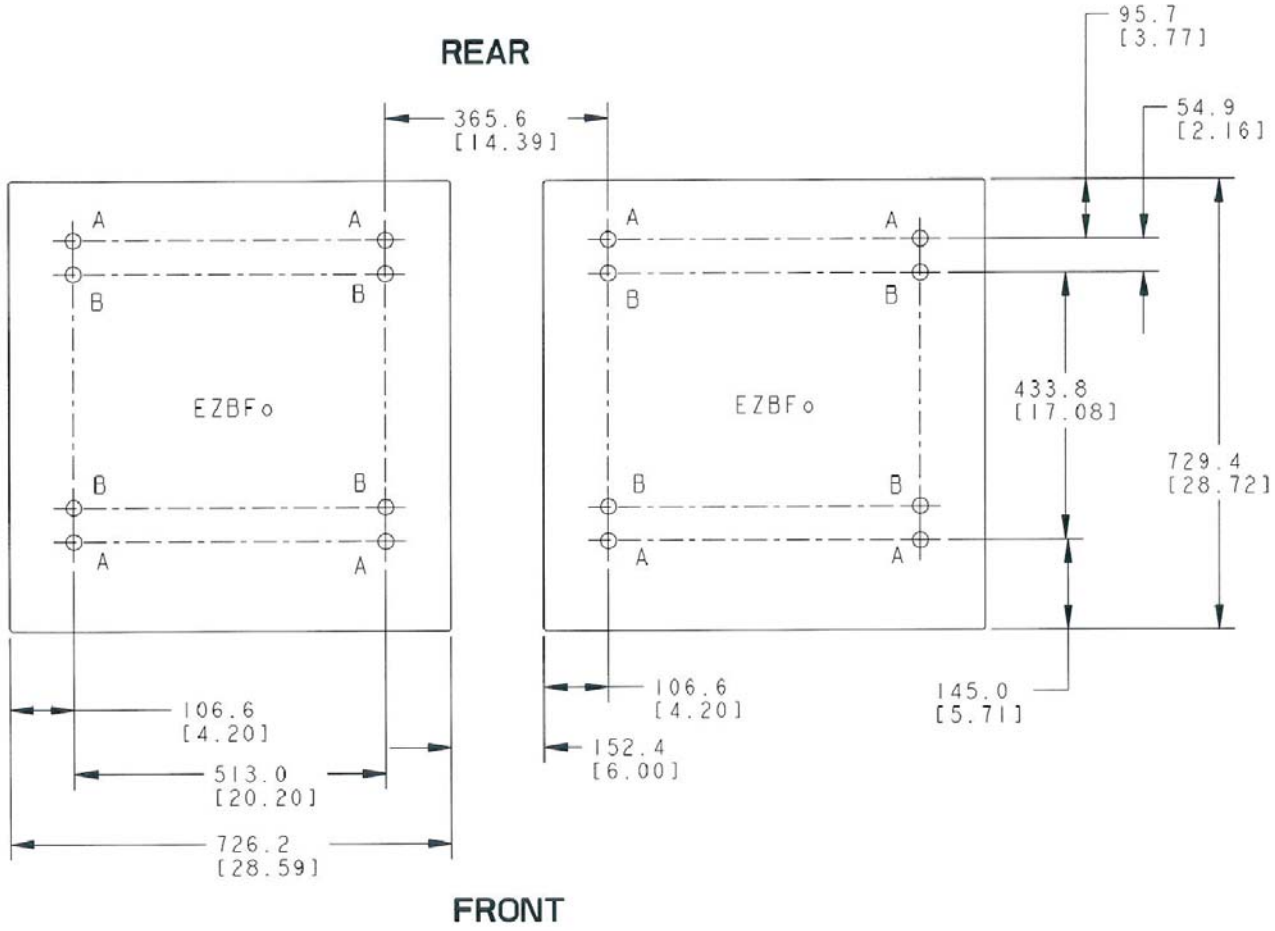
Anchoring footprints for EZBFo Modular Battery System

Important! EZBFo Modular Battery Systems installed in zones 0, 1, 2 and 3 require four anchor holes, which are marked in the diagram as "A." Zone 4 requires four *additional* anchor holes (for a total of eight holes), which are marked in the diagram as "B."

The following diagram shows the anchor footprint for the EZBFo Modular Battery System.

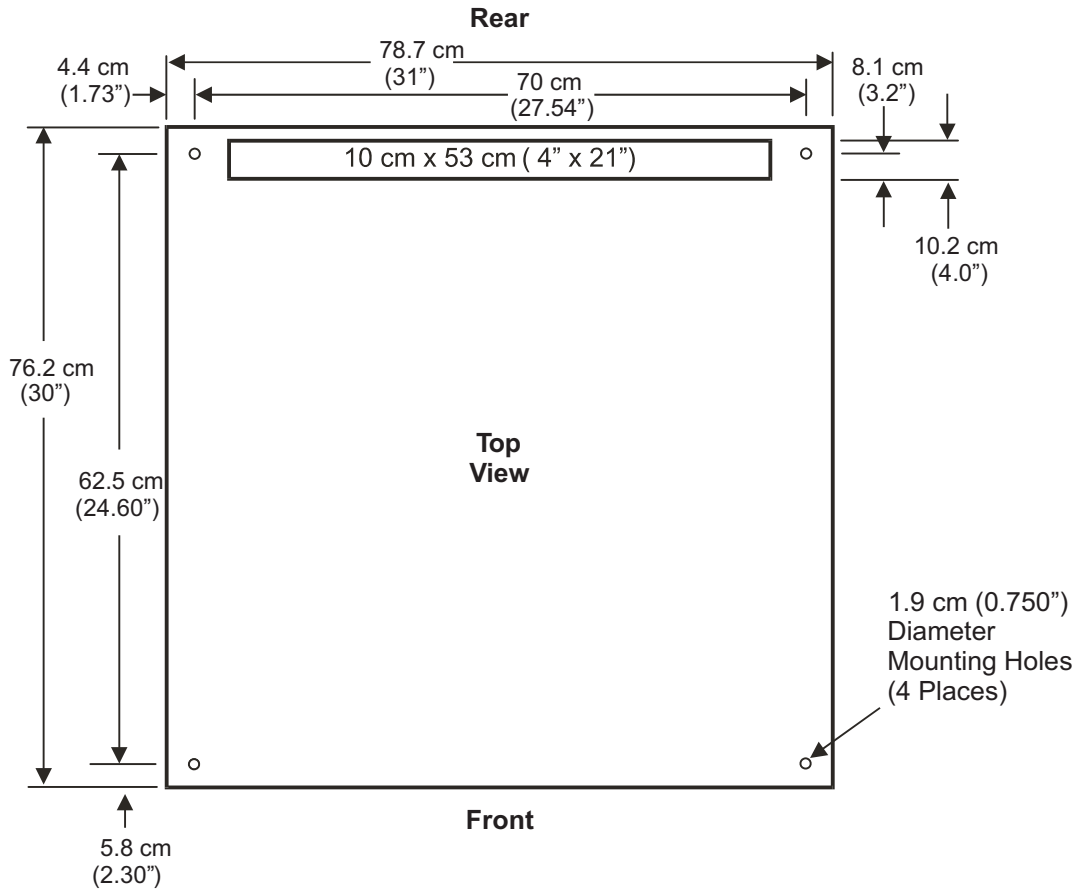


The following diagram shows the anchor footprint for the two EZBFo Modular Battery Systems installed side-by-side.



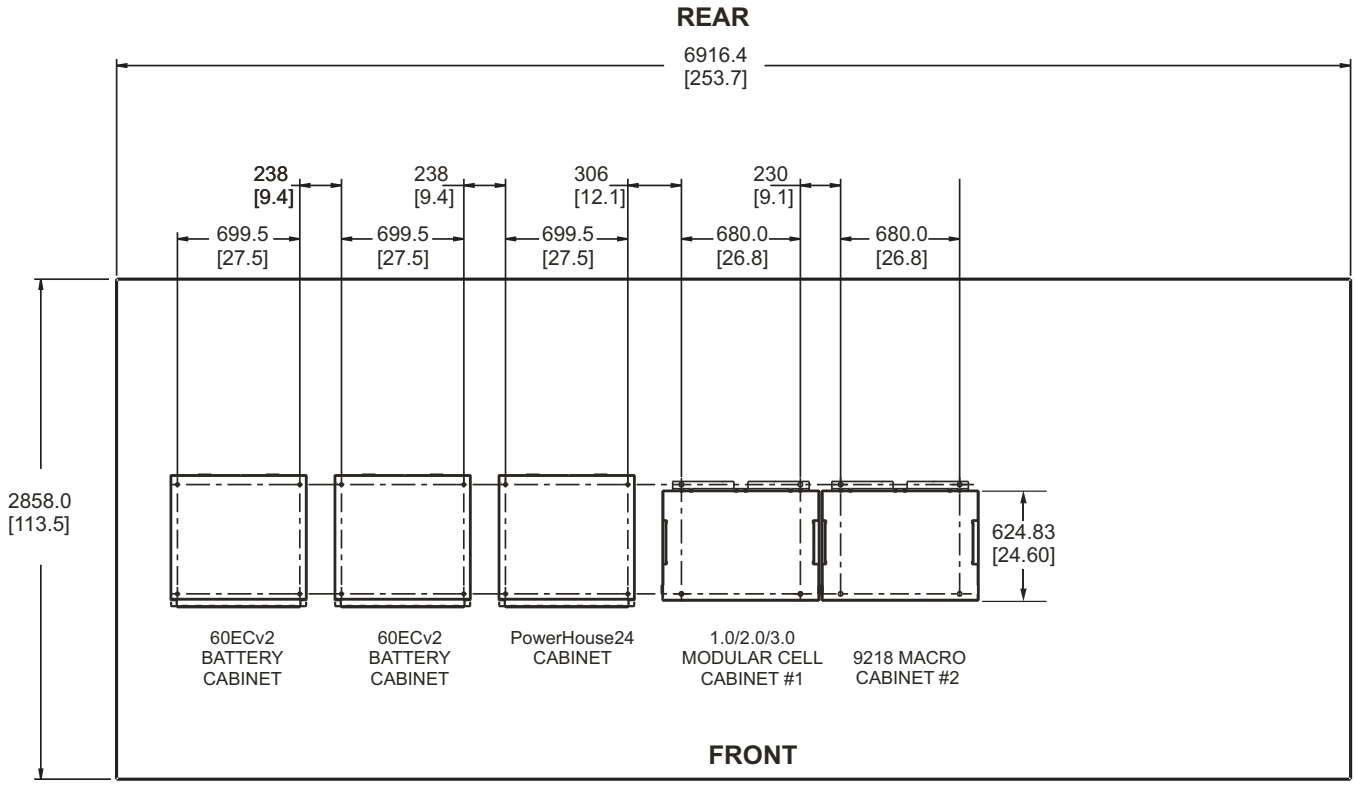
Anchoring footprint for 60ECv2 battery cabinet

The following diagram shows the anchoring footprint for the 60ECv2 battery cabinet to be used for site preparation.



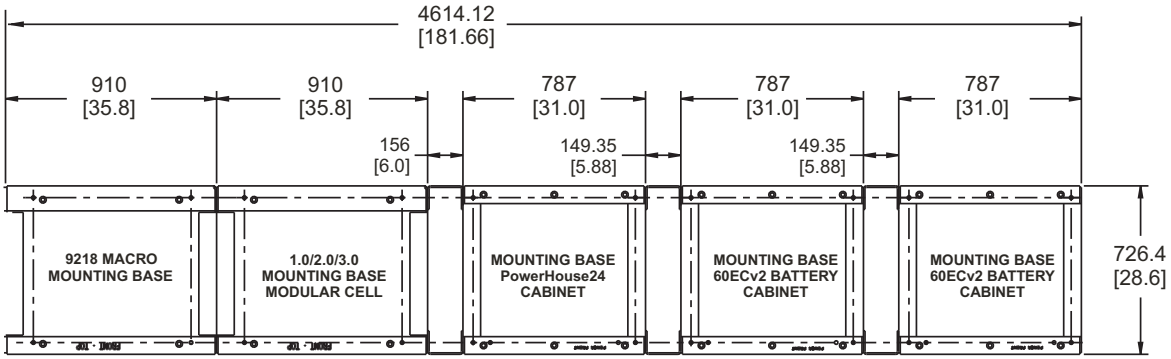
Anchoring footprint for existing site: add 9218 Macro to existing 1.0/2.0/3.0 site

The following diagram shows the anchoring footprint for a 9218 Macro addition to an existing 1.0/2.0/3.0 site. A hinged aluminum template to facilitate the marking of anchor holes on a concrete pad is available from Alcatel-Lucent (OI # 300325594).



Anchoring footprint for existing site: add 9218 Macro to existing 1.0/2.0/3.0 site with optional mounting bases

The following diagram shows the anchor footprint for a 9218 Macro addition to an existing 1.0/2.0/3.0 site using optional mounting bases.



Site preparation procedures

Overview

Purpose

This section contains the procedures that may be performed to prepare the installation site for the 9218/9228 Macro Outdoor Cabinet.

Contents

Drill anchor holes

Purpose

Use this procedure to drill anchor holes in a concrete surface for the following:

- 9228 Macro Outdoor Primary Cabinet
- 9228 Macro Outdoor Dual-band Cabinet
- Mounting bases

  Important! An optional drilling template is available from Alcatel-Lucent to aid in marking and drilling the anchor holes.

Related information

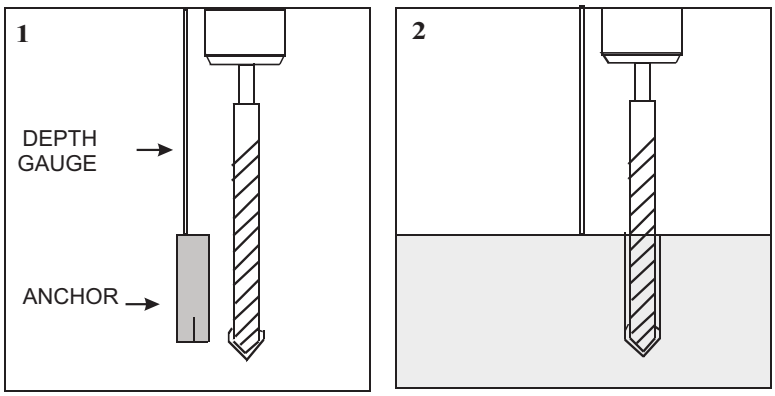
See the following topics in this document:

- "Anchoring requirements" (p. 4-20)
- "Anchoring footprints" (p. 4-21)

Steps

Use the following procedure to drill the anchor holes in a concrete surface.

1. If using the optional drilling template, place the template in position.
2. Mark the surface for all cabinets to be installed. Refer to "Anchoring footprints" (p. 4-21) for cabinet anchoring dimensions.
3. If using the optional drilling template, remove the template.
4. Drill the anchor holes to the proper size and depth as specified in "Anchoring requirements" (p. 4-20). Refer to the following figure for the anchor hole drilling method.



5 Vacuum out the holes.

6 Tape over the open holes to prevent debris from falling inside.

Important! Do not install the anchors at this time. Anchors will be installed as part of cabinet installation by equipment installers.

END OF STEPS

5 Electrical power requirements

Overview

Purpose

This chapter provides AC/DC electrical power requirements for 9218/9228 Macro cabinets installed at new sites.

For power requirements for 9218 Macro Outdoor Cabinets being added to an existing 1.0/2.0/3.0/4.0 site, see Appendix D, "Power requirements for 9218 Macro (4.0) additions to 1.0/2.0/3.0 or 9218 Macro (4.0) cell sites"

To obtain the power requirements for a 9228 Macro Outdoor Cabinet being added to an existing 9218 Macro site, add the power requirements for the 9228 Macro Outdoor Cabinet to the power requirements for the 9218 Macro Outdoor Cabinet.

Contents

Power overview

Overview

Purpose

This section provides an overview of the power requirements for 9218/9228 Macro Outdoor Cabinet.

Contents

Power systems

Power system options

The following table provides power system options for the 9218/9228 Macro Outdoor Cabinet.

Power options	Description
Integrated power	A 9218/9228 Macro Outdoor Cabinet that is equipped with an internal power module. The internal power module converts the AC power at the site into DC power that is used to power the cabinet.
Without integrated power	A 9218/9228 Macro Outdoor Cabinet that is not equipped with an internal power module. In this case, an external power cabinet is used to provide +24 VDC power, or -48 VDC (-48 VDC is 9228 Macro only).

Supported power cabinets

This topic describes the power cabinets that may be used with the 9218/9228 Macro Outdoor Cabinet without integrated power.

Customer-supplied power cabinets

A non-Alcatel-Lucent external power system can be provided by the customer to provide +24/-48 VDC power. See "Power requirements for 9218/9228 Macro cabinets without Integrated Power using customer-supplied power" (p. 5-33).

PowerHouse™ 24

The *PowerHouse*™ 24 power cabinet is offered by Alcatel-Lucent to provide power for 9218 Macro primary and additional 9218 cabinets without integrated power. (The *PowerHouse*™ 24 power cabinet is not supported for 9228 Macro Outdoor Cabinet.)

This power cabinet operates from a nominal 240 VAC source. The cabinet houses all of the power supply electronics such as rectifiers and circuit breakers. The rectifiers provide a +24 volt output to provide main power to the radio cabinets. An AC distribution panel provides AC power to the radio cabinets for AC convenience outlets (NAR only) and heaters. The power cabinet contains batteries which will provide backup power should the AC utility power source fail.

Power cabinets for 9218/9228 Macro Outdoor Cabinet additions or swapouts at existing sites

When a 9218/9228 Macro Outdoor Cabinet is added to an existing Modular Cell 1.0, 2.0, 3.0 site, the existing power cabinet may be used, in certain cases, to support the 9218/9228 Macro Outdoor Cabinet even though it is not a supported power cabinet for 9218/9228 Macro Outdoor Cabinet. See the following for the power requirements for this situation.

- Refer to Appendix D, "Power requirements for 9218 Macro (4.0) additions to 1.0/2.0/3.0 or 9218 Macro (4.0) cell sites" for information about the addition of 9218 Macro cabinets to an existing 1.0/2.0/3.0/4.0 site.
- To obtain the power requirements for a 9228 Macro Outdoor Cabinet being added to an existing 9218 Macro site, add the power requirements for the 9228 Macro Outdoor Cabinet to the power requirements for the 9218 Macro Outdoor Cabinet.

The maximum output of the PowerHouse 24, WNG24-DJ, WNG24-K, and WNG24-M power cabinets is 17 kW. If a 9228 Macro dual-band cabinet is installed at an existing site with 1.0, 2.0, 3.0, or 9218 Macro cabinets that utilize any of these power cabinets, the total number of carriers in the 9228 Macro dual-band cabinet will be limited due to power constraints. Use of a 9228 Macro dual band cabinet with integrated power is recommended to overcome this limitation.

Backup power systems

About backup power

Modular cell cabinets with integrated power require a backup power system (a battery system) to be used in case of a power failure to the modular cell

Modular cell cabinets without integrated power use customer-supplied power. When customer-supplied power is used, the customer is responsible for providing an appropriate backup power system.

Battery backup options

The following table provides battery backup options for the 9218/9228 Macro Outdoor Cabinet.

Battery options	Description
Internal battery	9218/9228 Macro Outdoor Cabinets equipped with batteries built into the cabinet. The internal batteries provide battery backup for a limited time. An external battery cabinet may be used to provide *additional* battery reserve time if desired. Integrated power is required in order to have internal battery.
No internal battery	9218/9228 Macro Outdoor Cabinets equipped without internal batteries. In this case, one or two external battery cabinets are used to provide battery backup.

Approved batteries for internal battery

The following batteries may be used for internal battery in the 9228 Macro Outdoor Cabinet.

- Enersys PowerSafe VE 12VE115F-FR, L1-Type batteries (four) with interconnecting bus bars and spacers (one per battery)
- Marathon GNB M12V105FT, L1-type batteries (four) with interconnecting bus bars and spacers (one per battery)

  Important! Do not mix batteries from different manufacturers on the same shelf.

Supported battery cabinets

This topic describes the battery cabinets that may be used with 9218/9228 Macro Outdoor Cabinet.

60ECv2 battery cabinet

The 60ECv2 Battery Cabinet provides +24 VDC battery backup for either of the following:

- 9218/9228 Macro cabinets with integrated power, where it supplements the L1 batteries (2 strings - 4 batteries) in the modular cell cabinet.
  This battery cabinet is not supported for 9228 Macro Outdoor Dual-band Cabinet.
- PowerHouse 24 power cabinet, where it supplements the 12IR125 or 12IR145 batteries in the power cabinet

One or two 60ECv2 battery cabinets may be used. The batteries are charged by the power module in the primary cabinet. Shelf heaters are provided to keep the batteries warm in cold weather. Temperature sensors control the shelf heaters.

For information on how to install the 60ECv2 battery cabinet refer to the *Installation Instructions Interface Kit for Standard Attachment of 60ECv2 Battery Cabinet to Modular cell cabinets,* CC 109-621-573.

EZBFo Modular Battery System

The EZBFo Modular Battery System provides battery backup for a 9218/9228 Macro Outdoor Cabinet with integrated power.

Each EZBFo battery frame provides one of the following to supplement the batteries (2 strings - 4 batteries) in the modular cell cabinet:

- Up to 18 12IR125 or 12IR145 batteries per battery frame
- Up to 24 L1 batteries per battery frame

The batteries are charged by the power module in the modular cell cabinet. Shelf heaters are provided to keep the batteries warm in cold weather. Temperature sensors control the shelf heaters.

EZBFo battery frames must be installed to the right of the 9228 Macro Outdoor Primary Cabinet (as viewed from the rear) and to the left of the 9228 Macro Outdoor Dual-band Cabinet. See *EZBFo Modular Battery System Installation Manual for +24V and -48V,* 401-703-506 for installation instructions for EZBFo battery frames.

Customer-supplied battery cabinets

A battery cabinet can be provided by the customer to provide battery backup.

Battery cabinets for 9218/9228 Macro Outdoor Cabinet additions or swapouts at existing sites

When a 9218/9228 Macro Outdoor Cabinet is added to an existing Modular Cell 1.0, 2.0, 3.0 site, the existing battery cabinet may be used, in certain cases, to support the 9218/9228 Macro Outdoor Cabinet even though it is not a supported battery cabinet for 9218/9228 Macro Outdoor Cabinet. See the following for the power requirements for this situation.

- Refer to Appendix D, "Power requirements for 9218 Macro (4.0) additions to 1.0/2.0/3.0 or 9218 Macro (4.0) cell sites" for information about the addition of 9218 Macro cabinets to an existing 1.0/2.0/3.0/4.0 site.
- To obtain the power requirements for a 9228 Macro Outdoor Cabinet being added to an existing 9218 Macro site, add the power requirements for the 9228 Macro Outdoor Cabinet to the power requirements for the 9218 Macro Outdoor Cabinet.

VRLA battery maintenance procedure

Overview

The following information applies to all 12V mono-block valve-regulated lead acid (VRLA) batteries used in, or with, Alcatel-Lucent CDMA base station products. These batteries employ an absorbed glass mat (AGM) technology and are classified as non-spillable according to “Code of Federal Regulations Tile 49”, (49 CFR), revised 10/1/05, section 173.159 (d).

Battery Storage

All VRLA batteries are shipped from the manufacturer in a charged condition. If batteries are not place in service immediately they should be stored in at 25°C (77°F), in a clean area.

Battery maintenance procedures

Refer to *Alcatel-Lucent CDMA Base Stations R30 Operations, Administration and Maintenance,* 401-703-407, for detailed information on the following items:

- Battery storage and recharge
- In-service maintenance
- Maintenance checks every 6 months
- Conditions for battery replacement

Important! Failure to perform the appropriate maintenance on VRLA batteries may cause the batteries to sulfate, lose capacity, and possibly render the batteries useless and void warranty.

Electrical ratings of the 9218/9228 Macro cabinets

Electrical ratings

The electrical ratings of the 9218/9228 Macro cabinets are marked on the nameplate labels of the cabinets, and are as follows:

Power	Type	Electrical Ratings	
		9218 Macro	9228 Macro
Integrated power	AC Input Primary Cabinet	• 120/208 VAC, 120/240 VAC, 3 wire + Gnd., 80 A, 50/60 Hz • 230 VAC, 80 A, 50/60 Hz	• 120/208 VAC, 120/240 VAC, 3 wire + Gnd., 80 A, 50/60 Hz • 230 VAC, 80 A, 50/60 Hz
	AC Input Growth or Dual-band Cabinet	• 120/208 VAC, 120/240 VAC, 3 wire + Gnd., 64 A, 50/60 Hz • 230 VAC, 64 A, 50/60 Hz	• 120/208 VAC, 120/240 VAC, 3 wire + Gnd., 80 A, 50/60 Hz • 230 VAC, 80 A, 50/60 Hz
Non-integrated power	AC convenience outlet (NAR only)	120 VAC, 50/60 Hz, 6 A	120 VAC, 50/60 Hz, 6 A
	Heater	208-240 VAC, 50/60 Hz, 20 A	208-240 VAC, 50/60 Hz, 20 A
	DC Feeders	• One 33.6-mm^2 (2-AWG) feeder 100 A BKR 24V • Three 42.4-mm^2 (1-AWG) feeders 150 A BKR 24V	• Three 42.4-mm^2 (1-AWG) feeders 150 A BKR 24V • When the A6 Amplifier Shelf is used, there is an additional 42.4-mm^2 (1-AWG) feeder and one more 150 A BKR

Power requirements for 9218 Macro Outdoor Cabinets with Integrated Power

Overview

Purpose

This section provides the power requirements for 9218 Macro Outdoor Cabinets with integrated power.

Contents

General requirements

Introduction

This section describes the AC power requirements for the Alcatel-Lucent equipment at the site.

Requirements overview

AC power must also be provided for lighting, AC convenience outlets, and any additional AC-powered equipment present at the site. The appropriate product information must be consulted to determine the total AC power required for the equipment at the site.

As part of site preparation, the site must be equipped with the appropriate AC service panel board, or AC branch circuit load center for supplying power to all AC equipment at the site. All AC power wiring, distribution, and protection equipment must be installed during site preparation and be ready for connection to the Alcatel-Lucent power and/or radio cabinets with integrated power.

CAUTION

Personnel Safety and/or Electrical Damage to Equipment

All AC wiring and over-current protection must be installed in accordance with the National Electric Code (NFPA-70), the Canadian Electrical Code, Part 1 (CSA C22.1) or the local electrical code in effect.

An appropriate equipment ground connection is required before commercial AC service can be connected to any equipment at the site.

Conduit requirements

A rigid conduit for AC power supply conduit is required. It is the responsibility of the customer to provide the rigid conduit and install it as part of site preparation.

A flexible conduit for AC is also required. It is the responsibility of the customer to purchase the flexible conduits as part of site preparation, and hold them for the installer, who will install them during installation.

See “Conduit requirements” (p. 4-8) for specifications for the required conduits.

Power requirements and battery reserve times calculations

This section provides power requirements and battery reserve time tables for various configurations of 9218 Macro.

The term “typical” in tables implies that the DC load is operating with “busy hour” traffic and at normal room temperatures, with the batteries on float charge. The maximum levels in the table represent the expected maximum load.

The total AC power load consists of the AC power to the rectifier, which is converted to supply the 9218 Macro Outdoor Cabinet DC power and charging current to the batteries, plus the AC power for all the cabinet heaters.

AC convenience outlet, AC PDA, and AC line surge protection

AC convenience outlet

Cell sites must be equipped with at least one duplex AC convenience outlet, which is needed for installation and maintenance procedures. The outlet is required to power test equipment and installation tools. The duplex outlet must be protected in accordance with national and local electrical codes. An outlet must be installed within 1.5 meters (5 ft.) of the Modular Cell cabinets. Ground Fault Circuit Interrupters (GFCI) or Residual Current Devices (RCD), used in non-North American type installations, are recommended and must be used where required by code.

For NAR installations, this AC convenience outlet is provided in the 9218/9228 Macro Outdoor Cabinets, and the customer does not need to provide an additional AC convenience outlet at the site.

AC PDA

The AC Power Distribution Assembly (AC PDA) is inside the 9218 Macro cabinet with integrated power. AC power to the 9218 Macro (4.0) must be supplied from an external AC service panel board or branch circuit load center capable of supplying two, two-pole single-phase circuits for connection to the primary Modular Cell cabinet at the site. One for the circuits is for a G-1 cabinet.

The AC PDA is equipped with a terminal block rail populated with “strip and poke” terminals for connection of the AC input conductors and the equipment grounding conductor. The terminals are configured for either North American 120/240 V, 3-wire single-phase connections, 120/208 V, 3-wire single-phase connections, or for single-phase 230 V (line-to-neutral) connections used in other locations around the globe.

When a North American NEMA 15A-240V duplexed AC convenience outlet is equipped, a terminal is provided for the connection of the neutral conductor for this outlet.

If the AC service panel board or branch circuit load center is a three-phase panel, each of the two single-phase circuits to the primary Modular Cell cabinet should be fed from a different phase to balance the load on the three-phase AC power system. Any additional single phase load should be connected to the third phase.

The AC PDA in the 9218 Macro cabinet is used for distributing AC power to Alcatel-Lucent equipment only. It cannot be used to supply power to external non-Alcatel-Lucent equipment.

AC line surge protection

Important! The 9218 Macro cabinets are not equipped with AC line surge protection. AC line surge protection is required at the site's main AC panel.

A surge protection device capable of discharging the surge waveforms as defined in *IEEE C62.41 (1991), Recommended Practice on Surge Voltage in Low-Voltage AC Power Circuits, for Location Category "C3" and "High System Exposure"* must be installed in the AC panel board or load center supplying AC power to the power cabinet and/or radio cabinet with integrated power. The AC panel board or load center, surge protector, and AC wires from the service panel to the applicable cabinet, are not supplied with the cabinet. They must be procured and installed as part of site preparation.

AC input requirements

Basic AC input requirements

The 9218 Macro requires up to two, single-phase branch circuits supplied from an external service panel. The panel must be installed during site preparation, one for the primary cabinet and one for each additional cabinet.

AC input requirements for a fully configured system (North American installation)

For a fully configured system (11-carriers), the AC panel is rated at 200 A. If additional AC equipment is installed at the site, the total power consumption for all site equipment must not exceed the service rating.

The AC power feeders should be class B stranded, insulated cable with THHN type insulation (T90 NYLON type insulation in Canada).

The installation should not be performed in extremely cold temperatures (-15 °C/ -5 °F or less).

The following table provides AC input requirements for a fully configured system (11-carriers) with a 200-A service panel (North American installation). The following table provides the recommended wire sizes.

Modular Cell Type	Equipment	Circuit 1	Circuit 2 [1]
9218 Macro	Circuit breaker rating	100 Amp	80 Amp
	L1 & L2 wire size	42.4-mm^2 (1-AWG)[2]	27-mm^2 (3-AWG)[3]
	Neutral wire size	2.1-mm^2 (14-AWG)	N/A
	Equipment grounding conductor wire size	8.4-mm^2 (8-AWG)[4]	N/A

Notes:

1. Circuit 2 is required for the growth cabinet. Terminals are provided in the Primary cabinet AC PDA for this connection to the Growth cabinet. Circuit 2 can be installed during the Primary cabinet installation or during Growth cabinet installation.
2. 27-mm^2 (3-AWG) wire may be used if the terminals on each end of the input conductors are marked “75° C.” The AC input terminal block in the Modular Cell cabinet is rated at 75° C.
3. 21.2-mm^2 (4-AWG) wire may be used if the terminals on each end of the input conductors are marked “75° C.” The AC input terminal block in the Modular Cell cabinet is rated at 75° C.

4. In Canada, 13.3-mm^2 (6-AWG) wire is required for telecommunications primary protector grounding. Supplementary ground conductors, sized between 13.3-mm^2 (6-AWG) and 33.6-mm^2 (2-AWG) are provided with this equipment. Refer to "Grounding electrode system" (p. 7-6).

AC input requirements for a system that is not fully configured (North American installation)

For sites with limited AC service available, a 100-A service will support two 9218 Macro cabinets with up to six carriers each. If additional AC equipment will be installed at the site, the total power consumption for all site equipment must not exceed the service rating. If growth beyond six carriers is planned, a 200-A minimum service is recommended.

The AC power feeders must be class B stranded, insulated cable with THHN type insulation (T90 NYLON type insulation in Canada).

The following table provides AC input requirements for a system that is not fully configured (six carriers) with a 100-A service panel (North American installation). The following table provides the recommended wire sizes.

Modular Cell Type	Equipment	Circuit 1	Circuit 2
9218 Macro (up to six carriers)	Circuit breaker rating	100 Amp	N/A
	L1 and L2 wire size	42.4-mm^2 (1-AWG)[1]	N/A
	Neutral wire size	2.1-mm^2 (14-AWG)	N/A
	Equipment grounding conductor wire size	8.4-mm^2 (8-AWG)[2]	N/A

Notes:

1. 27-mm^2 (3-AWG) wire may be used if the terminals on each end of the input conductors are marked "75° C." The AC input terminal block in the Modular Cell cabinet is rated at 75° C.
2. In Canada, 13.3-mm^2 (6-AWG) wire is required for telecommunications primary protector grounding. Supplementary ground conductors, sized between 13.3-mm^2 (6-AWG) and 33.6-mm^2 (2-AWG) are provided with this equipment. Refer to "Grounding electrode system" (p. 7-6).

AC and DC power requirements for 9218 Macro installations at new sites

AC and DC power requirements for 850/PCS cabinets with integrated power

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC and DC power requirements for 850, PCS, and dual-band configurations.

850 = Up to 8C, PCS = Up to 11C		Rectifiers KS24637 (3 kW) N+1 (Note 1, 2)	DC Power (kW)		AC Power (kW)				
Sector/ Carrier	No. of cabinet				Cabinet Heaters off		Cabinet Heaters on		
			Typical at 25 °C (77 °F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	1	2	2.1	2.5	2.4	6.9	8.5	8.8	9.0
3S/2C	1	3	3.2	3.6	3.7	10.3	11.9	12.3	12.5
3S/3C	1	3	4.4	4.8	5.1	10.3	11.9	12.3	12.5
3S/4C	1	3	5.6	6.3	6.4	13.8	11.9	12.3	12.5
3S/5C	1	4	6.7	7.5	7.7	13.8	15.4	15.7	15.9
3S/6C	1	4	7.8	8.6	9.0	13.8	15.4	15.7	15.9
3S/7C	2	*5 (4,1)*	9.8	10.9	11.3	17.2	20.4	21.1	21.5
3S/8C	2	5 (4,1)	11.0	12.0	12.6	17.2	20.4	21.1	21.5
3S/9C	2	6 (4,2)	12.2	13.4	14.0	20.7	23.9	24.6	24.9
3S/10C	2	6 (4,2)	13.4	14.8	15.4	20.7	23.9	24.6	24.9
3S/11C	2	7 (4,3)	14.5	15.9	16.7	24.1	27.3	28.0	28.4

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. 5 (4,1) indicates (as an example) 4 rectifiers in cabinet #1 and 1 rectifier in cabinet #2, for a total of 5 rectifiers.
3. Add 1 kW to AC load for the heaters of each Alcatel-Lucent external battery cabinet installed, at 208 V.

AC and DC power requirements for dual-band cabinets with integrated power

Dual band 9218 Macro (4.0) Site Configuration			DC Power (kW)		AC Power (kW)				
Sector/ Carrier	Band / No. of cabinet	Rectifiers KS24637 (3 kW) (N) (Note 1)			Cabinet Heaters off		Cabinet Heaters on (note 4)		
			Typical at 25 °C (77 °F) (Note 2)	Maximum (Note 2)	Typical (Note 2)	Maximum (Note 3)	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	850/1	1	2.1	2.5	2.4	3.4	5.0	5.4	5.6
3S/2C	850/1	2	3.2	3.6	3.7	6.9	8.5	8.8	9.0
3S/3C	850/1	2	4.4	4.8	5.1	6.9	8.5	8.8	9.0
3S/4C	850/1	2	5.6	6.3	6.4	6.9	8.5	8.8	9.0
3S/5C	850/1	3	6.7	7.5	7.7	10.3	11.9	12.3	12.5
3S/6C	850/1	3	7.8	8.6	9.0	10.3	11.9	12.3	12.5
3S/1C	PCS/2	1	2.1	2.5	2.4	3.4	5.0	5.4	5.6
3S/2C	PCS/2	2	3.2	3.6	3.7	6.9	8.5	8.8	9.0
3S/3C	PCS/2	2	4.4	4.8	5.1	6.9	8.5	8.8	9.0
3S/4C	PCS/2	2	5.6	6.3	6.4	6.9	8.5	8.8	9.0
3S/5C	PCS/2	3	6.7	7.5	7.7	10.3	11.9	12.3	12.5
3S/5C	PCS/2	3	7.8	8.6	9.0	10.3	11.9	12.3	12.5

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. Total number of rectifiers for any combination of 850 carrier with PCS carrier may be calculated with the following formula:
2. No. of Rect. (N+1) = Rect. for 850 + Rect. for PCS + 1 Rect. for Redundancy. - Example: Total No. of Rect. for 3S/1C (850) and 3S/3C (PCS) combination is = 1+2+1= 4.
3. Total DC typical, DC maximum and AC typical power for any combination may be calculated by adding the specific carrier combination values of 850 and PCS together. - Example: Total DC typical value for 3S/1C (850) and 3S/3C (PCS) combination is = 2.1 kW + 4.4 kW = 6.5 kW.
4. Total AC maximum power (Cab. heater off) = Total required No. of rectifiers X 3 kW) / Rect. Efficiency X power factor). - Example: Total AC max. power for 3S/1C (850) and 3S/3C (PCS) combination is = (1 + 2 + 1) X 3 kW / (0.88 X 0.99) = 13.77 kW.
5. Total AC maximum power (Cab. heaters on), at 208 VAC = Total AC maximum power (Cab. heaters off) + 1.6 kW. Total AC maximum power (Cab. heaters on), at 230 VAC = Total AC maximum power (Cab. heaters off) + 1.95 kW. Total AC maximum power (Cab. heaters on), at 240 VAC = Total AC maximum power (Cab. heaters off) + 2.13 kW.
6. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.

Battery reserve times

Introduction

The tables in this section provide approximate battery reserve times for 9218 Macro outdoor sites at typical load conditions.

Battery reserve times for 12IR125 Battery strings for the 9218 Macro with integrated power and ONE optional 60ECv2 Battery Cabinet

The following table provides approximate battery reserve times for 12IR125 Battery strings for the 9218 Macro with integrated power and ONE optional 60ECv2 Battery Cabinet. Values in parentheses are the hours of reserve with 10 strings of batteries.

850 = Up to 8C PCS = Up to 11C		DC Power (kW)	9218 Macro backup time (minutes) with 2 internal List 1 battery strings per cabinet	Total number of 24-V battery strings for desired reserve times (2 batteries per string) (Does not include List 1 batteries in the Modular Cell cabinets)			
Sector/Carrier	No. of cabinet	Typical at 25 °C (77 °F)		2 hours	4 hours	6 hours	8 hours
3S/1C	1	2.1	99	2	4	6	6
3S/2C	1	3.2	58	4	6	8	10
3S/3C	1	4.4	39	6	8	10	14 [1]
3S/4C	1	5.6	29	6	10	14 [1]	16 [1]
3S/5C	1	6.7	N/A	8	12 [1]	16 [1]	20 [1]
3S/6C	1	7.8	N/A	8	14 [1]	18 [1]	(7.1) [1]
3S/7C	2	9.8	N/A	10	16 [1]	(5.3) [1]	(5.3) [1]
3S/8C	2	11	N/A	12 [1]	18 [1]	(4.6) [1]	(4.6) [1]
3S/9C	2	12.2	N/A	12 [1]	20 [1]	(4.1) [1]	(4.1) [1]
3S/10C	2	13.4	N/A	14 [1]	(3.6) [1]	(3.6) [1]	(3.6) [1]
3S/11C	2	14.5	N/A	14 [1]	(3.3) [1]	(3.3) [1]	(3.3) [1]

Notes:

1. Requires two 60ECv2 Battery Cabinets

Battery reserve times for 12IR125 batteries for 3-sector dual-band cabinets with integrated power and ONE optional 60ECv2 Battery Cabinet

The following table provides approximate battery reserve times for 12IR125 Battery strings for the Dual band 9218 Macro with integrated power and ONE optional 60ECv2 Battery Cabinet. Values in parentheses are the hours of reserve with 20 strings of batteries.

PCS carrier conf. / Typical power, kW			1C / 2.1	2C / 3.2	3C / 4.4	4C /5.6	5C /6.7
850 9218 Macro carrier conf. / Typical power, kW	Backup time (minutes) with 2 internal List 1 battery strings per cabinet	Times	Total number of 24-V battery strings (2 batteries per string) for various reserve times (Does not includes battery strings in the 9218 Macro (4.0) cabinets)				
1C / 2.1	99	2 Hours	4	6	6	8	10
2C / 3.2	58		6	6	8	10	10
3C / 4.4	39		6	8	10	10	*12
4C / 5.6	29		8	10	10	*12	*12
5C / 6.7	N/A		10	10	*12	*12	*14
6C / 7.8	N/A		10	*12	*12	*14	*14
1C / 2.1	99	4 Hours	8	10	*12	*14	*16
2C / 3.2	58		10	*12	*14	*16	*16
3C / 4.4	39		*12	*14	*16	*18	*18
4C / 5.6	29		*14	*16	*18	*18	*20
5C / 6.7	N/A		*16	*16	*18	*20	*(3.6)
6C / 7.8	N/A		*16	*18	*20	*(3.6)	*(3.3)
1C / 2.1	99	6 Hours	10	*12	*16	*18	*(6.1)
2C / 3.2	58		*12	*16	*18	*20	*(5.3)
3C / 4.4	39		*16	*18	*20	*(5.2)	*(4.6)
4C / 5.6	29		*18	*20	*(5.2)	*(4.5)	*(4.0)
5C / 6.7	N/A		*20	*(5.3)	*(4.6)	*(4.0)	*(3.6)
6C / 7.8	N/A		*(5.3)	*(4.6)	*(4.1)	*(3.6)	*(3.3)
1C / 2.1	99	8 Hours	*12	*16	*20	*(7.2)	*(6.1)
2C / 3.2	58		*16	*20	*(7.3)	*(6.1)	*(5.3)
3C / 4.4	39		*20	*(7.3)	*(6.1)	*(5.2)	*(4.6)
4C / 5.6	29		*(7.2)	*(6.1)	*(5.2)	*(4.5)	*(4.0)
5C / 6.7	N/A		*(6.1)	*(5.3)	*(4.6)	*(4.0)	*(3.6)
6C / 7.8	N/A		*(5.3)	*(4.6)	*(4.1)	*(3.6)	*(3.3)

Notes:

1. * Requires two optional 60ECv2 Battery Cabinets.

Battery reserve times using L1 batteries in the EZBFo

The following table provides approximate battery reserve times for the L1 batteries in the EZBFo.

9218 Macro site configuration	DC Power (kW)	Backup time (minutes) with 2 internal List 1 battery strings per cabinet	*** Total number of 24-V battery strings for various reserve times (Not including 2 internal L1 battery strings in the plinth)			
Sector/Carrier	Typical at 25° C		2 hours	4 hours	6 hours	8 hours
3S/1C	2.1	99	4*	6**	6**	8**
3S/2C	3.2	58	4*	8**	10+	12+
3S/3C	4.4	39	6**	10+	12+	16+*
3S/4C	5.6	29	8**	12+	16+*	20+**
3S/5C	6.7	N/A	8**	14+*	18+**	24++
3S/6C	7.8	N/A	10+	16+*	22++	(7.1)

Notes:

1. The EZBFo Battery Frame (full assembly) consists of three Battery Modules. There are eight L1 batteries per module.
2. * Requires a Battery Base Module.
3. ** Requires a Battery Base Module plus an Add-on Battery Module.
4. + Requires a Battery Base Module plus two Add-on Battery Modules.
5. + * Requires a Battery Frame plus a Battery Base Module.
6. + ** Requires a Battery Frame plus a Battery Base Module and an add-on Battery Module.
7. ++ Requires two Battery Frames.
8. *** Two batteries per string.

Battery reserve times using 12IR125 batteries in the EZBFo

The following table provides approximate battery reserve times for the 12IR125 batteries in the EZBFo.

9218 Macro site configuration	DC Power (kW)	Backup time (minutes) with 2 internal List 1 battery strings per cabinet	*** Total number of 24-V battery strings for various reserve times (Not including 2 internal L1 battery strings in the plinth)			
Sector/Carrier	Typical at 25 °C		2 hours	4 hours	6 hours	8 hours
3S/1C	2.1	99	3*	6**	6**	6**
3S/2C	3.2	58	3*	6**	9+	9+
3S/3C	4.4	39	6**	9+	12+*	15+**
3S/4C	5.6	29	6**	9+	15+**	18++
3S/5C	6.7	N/A	9+	12+*	15+**	18++
3S/6C	7.8	N/A	9+	15+**	18++	(6.2)

Notes:

1. The EZBFo Battery Frame (full assembly) consists of three Battery Modules. There are four or eight L1 batteries per module.
2. * Requires a Battery Base Module.
3. ** Requires a Battery Base Module plus an Add-on Battery Module.
4. + Requires a Battery Base Module plus two Add-on Battery Modules.
5. + * Requires a Battery Frame plus a Battery Base Module.
6. + ** Requires a Battery Frame plus a Battery Base Module and a add-on Battery Module.
7. ++ Requires two Battery Frames.
8. *** Two batteries per string.

Power requirements for 9228 Macro Outdoor Cabinets with Integrated Power

Overview

Purpose

This section describes the power requirements for 9228 Macro Outdoor Cabinets with integrated power.

Contents

General requirements

Purpose

This section describes the AC power requirements for the Alcatel-Lucent equipment at the site.

AC power requirements

AC power must also be provided for lighting, AC convenience outlets, and any additional AC-powered equipment present at the site. The appropriate product information must be consulted to determine the total AC power required for the equipment at the site.

As part of site preparation, the site must be equipped with the appropriate AC service panel board, or AC branch circuit load center for supplying power to all AC equipment at the site. All AC power wiring, distribution, and protection equipment must be installed during site preparation and be ready for connection to the Alcatel-Lucent power and/or radio cabinets with integrated power.

The 9228 Macro Outdoor Primary Cabinet and the 9218 Macro Outdoor Dual-band Cabinet each require their own AC power feed. A junction box is needed to attach the AC power supply to two cabinets. (The 9228 Macro Outdoor Dual-band Cabinet differs from the 9218 Macro Outdoor Dual-band Cabinet, which received power from the primary cabinet.)

CAUTION

Personnel Safety and/or Electrical Damage to Equipment

All AC wiring and over-current protection must be installed in accordance with the National Electric Code (NFPA-70), the Canadian Electrical Code, Part 1 (CSA C22.1) or the local electrical code in effect.

An appropriate equipment ground connection is required before commercial AC service can be connected to any equipment at the site.

Conduit requirements

A rigid conduit for AC power supply conduit is required. It is the responsibility of the customer to provide the rigid conduit and install it as part of site preparation.

A flexible conduit for AC is also required. It is the responsibility of the customer to purchase the flexible conduits as part of site preparation, and hold them for the installer, who will install them during installation.

See “Conduit requirements” (p. 4-8) for specifications for the required conduits.

Power requirements for Intelligent Antenna

The Intelligent Antenna feature is supported for 9228 Macro Outdoor Primary Cabinet, and is not supported for 9218 Macro Outdoor Cabinet or for 9218 Macro Outdoor Dual-band Cabinet. Intelligent Antenna does not require additional power beyond the standard power requirements for the 9228 Macro Outdoor Cabinet.

AC convenience outlet, AC PDA, and AC line surge protection

AC convenience outlet

Cell sites must be equipped with at least one duplex AC convenience outlet, which is needed for installation and maintenance procedures. The outlet is required to power test equipment and installation tools. The duplex outlet must be protected in accordance with national and local electrical codes. An outlet must be installed within 1.5 meters (5 ft.) of the Modular Cell cabinets. Ground Fault Circuit Interrupters (GFCI) or Residual Current Devices (RCD), used in non-North American type installations, are recommended and must be used where required by code.

For NAR installations, this AC convenience outlet is provided in the 9218/9228 Macro Outdoor Cabinets, and the customer does not need to provide an additional AC convenience outlet at the site.

AC PDA

The AC Power Distribution Assembly (AC PDA) is inside the 9228 Macro cabinet with integrated power. AC power to the 9228 Macro (4.0B) must be supplied from an external AC service panel board or branch circuit load center capable of supplying a two-pole single-phase circuit for connection to the primary Modular Cell cabinet at the site.

The AC PDA is equipped with a terminal block rail populated with “strip and poke” terminals for connection of the AC input conductors and the equipment grounding conductor. The terminals are configured for either North American 120/240 V, 3-wire single-phase connections, 120/208 V, 3-wire single-phase connections, or for single-phase 230 V (line-to-neutral) connections used in other locations around the globe.

When a North American NEMA 15A-240V duplexed AC convenience outlet is equipped, a terminal is provided for the connection of the neutral conductor for this outlet.

Requirement for a 9228 Macro dual band cabinet are the same as for the primary cabinet, given above. If the AC service panel board or branch circuit load center is a three-phase panel, each of the two single-phase circuits (one for the primary and one for the dual band cabinet) should be fed from a different phase to balance the load on the three-phase AC power system. Any additional single phase load should be connected to the third phase.

The AC PDA in the 9228 Macro cabinet can only be used for distributing AC power to Alcatel-Lucent equipment.

AC line surge protection

Important! The 9228 Macro cabinets are not equipped with AC line surge protection. AC line surge protection is required at the site's main AC panel.

A surge protection device capable of discharging the surge waveforms as defined in *IEEE C62.41 (1991), Recommended Practice on Surge Voltage in Low-Voltage AC Power Circuits, for Location Category "C3" and "High System Exposure"* must be installed in the AC panel board or load center supplying AC power to the power cabinet and/or radio cabinet with integrated power. The AC panel board or load center, surge protector, and AC wires from the service panel to the applicable cabinet, are not supplied with the power cabinet. They must be procured and installed as part of site preparation.

AC input requirements

Basic AC input requirements

The 9228 Macro primary or dual band cabinet require a single-phase branch circuit supplied from an external service panel. The panel must be installed during site preparation.

AC input requirements for a fully configured system (North American installation)

For a fully configured system (11-carriers), the AC panel must be rated at 100 A. If additional AC equipment is installed at the site, the total power consumption for all site equipment must not exceed the service rating.

If two 9228 Macro Outdoor Cabinets are installed at a site, the AC panel must be rated at 200 A (100 A for each cabinet).

The AC power feeders are class B stranded, insulated cable with THHN type insulation (T90 NYLON type insulation in Canada). The installation should not be performed in extremely cold temperatures (-15 °C/ -5 °F or less).

The following table provides AC input requirements for a fully configured system (11-carriers) with 100-A service panel (North American installation). The following table provides the recommended wire sizes.

Modular Cell Type	Equipment	Circuit 1
9228 Macro Primary or dual-band cabinet	Circuit breaker rating	100 Amp
	L1 and L2 wire size	42.4-mm^2 (1-AWG) [1]
	Neutral wire size	2.1-mm^2 (14-AWG)
	Equipment grounding conductor wire size	8.4-mm^2 (8-AWG) [2]

Notes:

1. 27-mm^2 (3-AWG) wire may be used if the terminals on each end of the input conductors are marked “75° C.” The AC input terminal block in the Modular Cell cabinet is rated at 75° C.
2. In Canada, 13.3-mm^2 (6-AWG) wire is required for telecommunications primary protector grounding. Supplementary ground conductors, sized between 13.3-mm^2 (6-AWG) and 33.6-mm^2 (2-AWG) are provided with this equipment. Refer to “Grounding electrode system” (p. 7-6).

Power requirements for 9228 Macro (4.0B) installations at new sites

How to find power requirements for 9228 Macro (4.0B) installations

The primary source for power requirements is *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR. This document is reproduced in Appendix G, "Power and Battery Engineering Rules for 9228 Macro (4.0B)".

How to calculate power requirements for 9228 Macro (4.0B) configuration variations

The typical and maximum DC power requirement and number of rectifiers required for various 9228 Macro (4.0B) configurations are provided in *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR. This document is reproduced in Appendix G, "Power and Battery Engineering Rules for 9228 Macro (4.0B)".

The following table shows how to calculate AC power requirements for the various 9228 Macro (4.0B) configurations, using the DC power and number of rectifiers obtained from the Engineering Rules document.

	Configuration	Information obtained from ER (ER_0102_0004_PWR)			Information calculated (Notes #3, 4, and 5)		
Measurements	Sector/ Carrier	DC Power (kW) Typical (Note #1)	DC Power (kW) Maximum (Note #1)	N = No. of 1.5 kW Rectifier N+1: (Note #2)	Typical AC Power with cabinet heater Off	Maximum AC power with cabinet heater Off	Maximum AC power with cabinet heater On
Example	3S/1C	1.9	2.2	N = 2 N+1= 3	Typical DC Power/ Rectifier efficiency 1.9 kW / 0.88 = 2.16 kW	N+1 x Rectifier kW / Rectifier efficiency 3 x 1.5 kW / 0.88 = 5.11 kW.	AC Power with cabinet heater Off + cabinet heater. 5.11 kW + 1.6 kW at 208 V= 6.71 kW

Notes:

1. To obtain DC current, divide the wattage by 27.24 volts for +24 V systems.
2. N = the number of rectifiers required. N+1 = the number of rectifiers required + 1 for redundancy and battery recharge. The 1.5 kW rectifier efficiency varies between 0.82 and 0.88.
3. The AC cabinet heater power is given at certain voltage and can be converted for different voltage by following method. Determine value of R = V^2 (heater voltage) / heater power watt. The heater wattage at different voltage = V^2 (new voltage) / Calculated R.

4. To cover the AC requirements of the battery cabinet heaters, add 1 kW to AC load for each 60ECv2 Battery Cabinet installed, and add 2 kW for each EZBFo module installed. No more than 5 EZBFo modules should be connected to a 6-sector 9228 Macro Outdoor Cabinet.
5. To obtain AC current, divide the wattage by the nominal AC voltage.

Battery reserve times

Battery reserve times for 9228 Macro (4.0B) installations

The primary source for battery reserve times for 9228 Macro (4.0B) installations is *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR. This document is reproduced in Appendix G, “Power and Battery Engineering Rules for 9228 Macro (4.0B)”.

Power requirements for 9218/9228 Macro cabinets without Integrated Power using customer-supplied power

Overview

Purpose

The purpose of this section is to provide DC power requirements for the 9218/9228 Macro when a customer-supplied power system is used. In addition, this section specifies a minimum set of power system alarms to be reported to the 9218/9228 Macro.

Contents

General requirements

Scope

This section specifies the DC power and power system alarm interface requirements for the 9218/9228 Macro equipment, including 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 9218/9228 Macro cabinets. This section provides information on the quality and characteristics of the DC power to be supplied to the 9218/9228 Macro cabinets.

This document is intended for use by a customer specifying a power system other than the standard Alcatel-Lucent CDMA Modular Cell Power System Products. By meeting these requirements, all Alcatel-Lucent equipment referenced in this section, should meet their electrical and RF performance specification.

NOTICE

Personnel Safety and/or Electrical Damage to Equipment

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.

Requirements for customer-supplied power system

The power system must support a fully configured 9218/9228 Macro site. Designing a system that cannot support the fully configured system will limit the potential for future growth.

The power systems must provide rectification of commercial AC power to DC to power the modular assemblages and float charge the backup batteries. The power systems must provide uninterrupted DC power to the 9218/9228 Macro cabinet. In the event of loss of AC input power, the power system must continue to provide DC power for the duration of the battery reserve. In addition, the power system must provide AC power to each 9218/9228 Macro outdoor cabinet for powering its heater.

Under no circumstances shall any modification (for example, drilling) be made to the 9218/9228 Macro cabinet(s) unless the modification is covered by an Alcatel-Lucent "Change Notice."

Standard reference documents

Alcatel-Lucent strongly recommends the power system meet all applicable requirements specified in the following documents. Use the appropriate requirements, based on the "country of use." Adherence to all additional requirements mandated by the "country of use" is the customer's responsibility. The power system must meet the specified UL and FCC requirement documents in order for the 9218/9228 Macro 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 Number Issue Number	Title
FCC	FCC	*FCC Rules & Regulations Title 47, Code of Federal Regulations Part 15, Class B*
IEC	IEC-61000	*International Standard. Electromagnetic Compatibility (EMC). Testing & Measurement Techniques*
IEEE	IEEE/ANSIC62.34- 1996	*IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arrestors)*
NFPA	NFPA-70	*National Electrical Code*
Telcordia	GR-063-CORE, Issue 2, April 2002	NEBS™ *Requirements: Physical Protection*
Telcordia	GR-001089-CORE, Issue 3, October 2002	*Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment*
Telcordia	GR-947-CORE, Issue 1, December 1996	*Generic Requirements for a -48 Volt Telecommunications Switchmode Rectifier/Power Supply*
UL	UL 60950-1	*Information Technology Equipment, - Safety - Part 1: General Requirements*
CSA	C22.1	*Canadian Electrical Code, Part 1*
CSA	CAN/CSA-C22.2 No. 60950-1-03	*Information Technology Equipment, - Safety - Part 1: General Requirements*
UL	UL 50 Eleventh Edition	*Standard for Enclosures for Electrical Equipment*
IEC	IEC 60950-1, First Edition, 2001-10	*Information Technology Equipment, - Safety - Part 1: General Requirements*
IEC	IEC 60529, Edition 2.1, 2001-2	*Degrees of Protection Provided by Enclosures (IP Code)*

Power requirements for Intelligent Antenna

The Intelligent Antenna feature is supported for 9228 Macro Outdoor Primary Cabinet, and is not supported for 9218 Macro Outdoor Cabinet or for 9218 Macro Outdoor Dual-band Cabinet. Intelligent Antenna does not require additional power beyond the standard power requirements for the 9228 Macro Outdoor Cabinet.

Power system requirements

General

This section specifies the mechanical, electrical, and environmental requirements the power system must meet. Unless specified, the following requirements apply to 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

Cabinet interface requirements

This topic describes the interface requirements required to connect the 9218/9228 Macro cabinet to a customer-supplied power system.

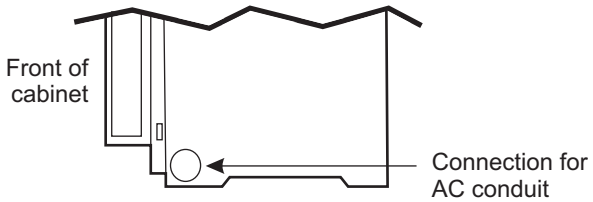
Mechanical Interface

The customer is responsible for specifying all the mechanical requirements for the power system such as dimensions, weights, anchoring, grounding, conduit/cable interfaces, and installation features.

Electrical Interface Requirements

The electrical interfaces between the power system and the 9218/9228 Macro cabinets consist of AC power cables, DC power cables, and power system alarms. All power system alarms interface with the 9218/9228 Macro Primary cabinet only.

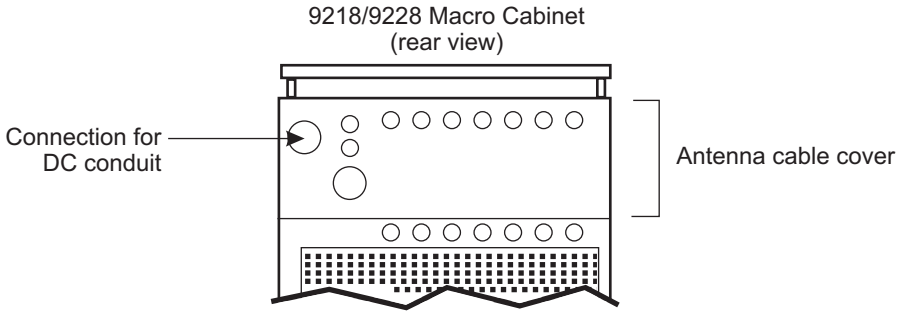
AC power cables for the AC convenience outlet (NAR only) and the heaters are connected to the primary cabinet using the AC conduit. The AC conduit connects to an opening that is sized for a 2-inch diameter trade size conduit on the bottom right side of the primary cabinet. The location of the opening is shown in the following figure.



9218/9228 Macro Cabinet (right side view)

AC power for additional cabinets is routed inside the cabinets from the primary cabinet.

DC power cables are connected to the primary cabinet using the DC conduit. The DC conduit connects to an opening that is sized for a 2 1/2-inch conduit on the top rear of the primary cabinet. The location of the opening is shown in the following figure.

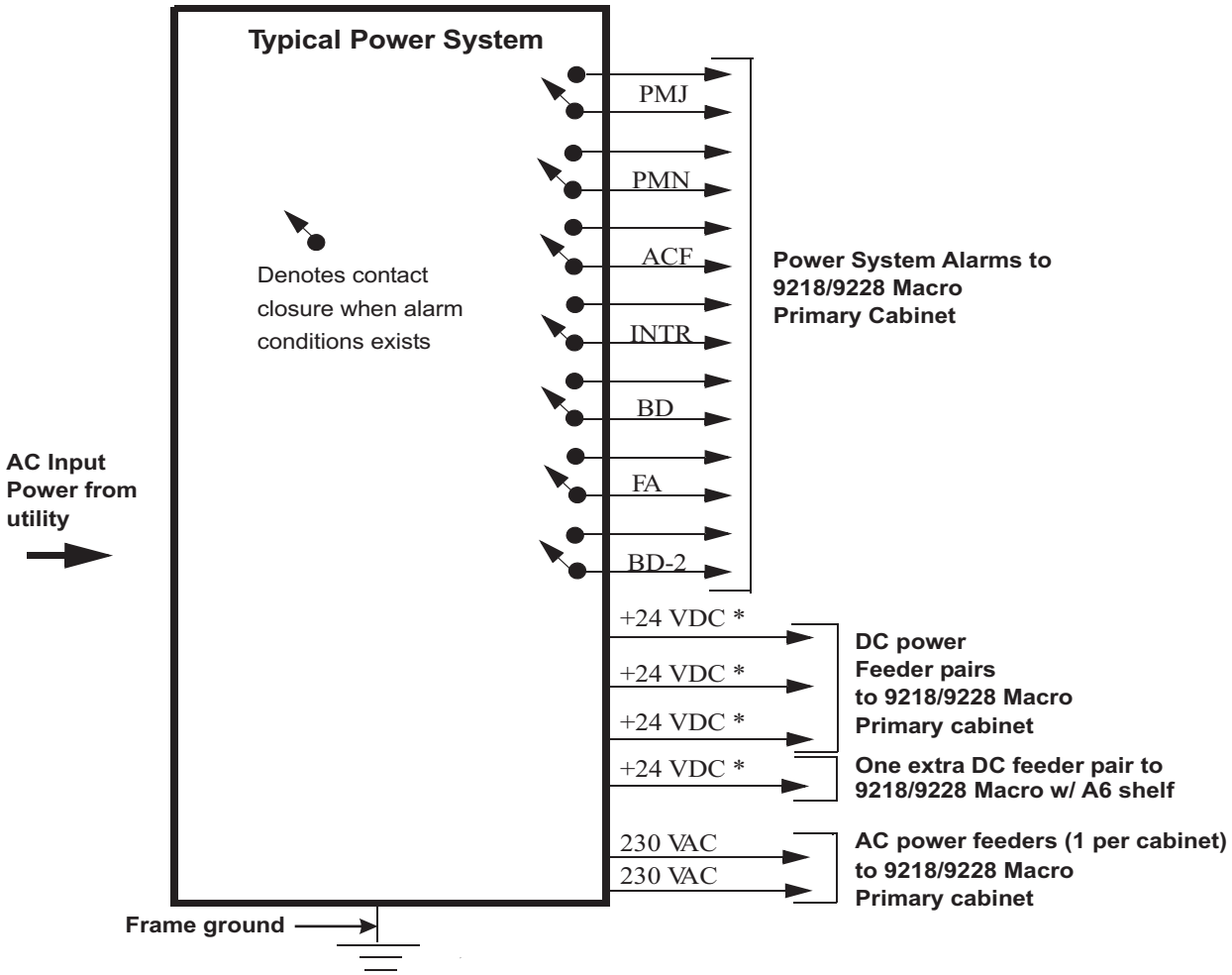


DC power for additional cabinets is routed inside the cabinets from the primary cabinet.

The power alarm cable is also connected to the primary cabinet using the DC conduit.

Typical power system interface

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



PMJ = Power Major Alarm
PMN = Power Minor Alarm
ACF = AC Fail
INTR = Intrusion Alarm
BD = Batteries on Discharge, first stage
FA = Fuse Alarm *
BD-2 = Batteries on Discharge, second stage **

* Also -48VDC on 9228 Macro only

** Optional; not required

AC power requirements

9218/9228 Macro AC specifications

This section provides AC specifications for the 9218/9228 Macro cabinet. AC power is required for the 9218/9228 Macro cabinet(s) AC heaters.

The following table provides AC power specifications for the 9218/9228 Macro cabinet(s).

9218/9228 Macro	AC requirements
Nominal AC input voltage	The Modular cell cabinet(s) accepts a nominal input voltage of 230 VAC, single phase.
Operating AC input voltage range	The operating AC input voltage ranges from 180 VAC to 264 VAC single phase.
AC input frequency	The operating frequency ranges from 47 to 63 Hz, 50/60 Hz nominal.
Number of phases	Single-phase only
AC input current	10 A maximum
Number of AC feeds	1 for 230 V for heaters 1 for 120 V, 15 A for convenience outlet (NAR only)

AC input requirements

The following table, lists the nominal AC power required for the 9218/9228 Macro cabinet at the specified input voltage. The heating elements are resistive devices, therefore the power is proportional to the input voltage. The AC power dissipation can be adjusted according to the actual nominal AC voltage applied to the equipment.

9218/9228 Macro	Nominal AC input power (watts)			Maximum Current (Ampere)
	208 Vrms	230 Vrms	240 Vrms	
Primary Cabinet	1600	1956	2130	10
Growth Cabinet, Dual-band Cabinet, Mixed Dual-band Cabinet	1600	1956	2130	10

Notes:

1. AC circuit breakers and feeders must be sized according to local and National Electrical Code for the "country of use."

AC grounding

The power system must have an AC Equipment Ground (ACEG) that complies with the national and local electrical codes for the country of use. In the absence of national and/or local codes, the ACEG must comply with National Electrical Code (NEC) Article 250, and UL 1950 Class I equipment requirements.

DC power requirements

+24/-48 VDC input requirements

9218 Macro cabinets are +24 VDC only. 9228 Macro cabinets may be +24 VDC or -48 VDC

The nominal +24/-48 VDC power supplied to the Macro cabinet(s) must meet the requirements specified in this section. All of the electronic equipment related to processing of calls, and the fans in the Macro cabinet are powered from the +24/-48 VDC power supplied to the equipment. The DC power system must be capable of providing constant power to the equipment over the entire range of environmental condition for the "country of use." DC feeders must be Class B.

DC input power

The DC power system must be capable of providing constant DC power to all equipment configurations listed in "Line-up configurations" (p. 3-2) for new cell sites and for 9218/9228 Macro additions to existing 1.0/2.0/3.0 sites, 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° C. The 9218/9228 Macro cabinet(s) have constant power load characteristics. The power levels in the table are based on an input of 27.24 VDC for +24 VDC systems, or 54.48 VDC for -48 VDC systems.

For various 9228 Macro configurations, the typical and maximum DC power requirements and number of required rectifiers are provided in *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR, which is reproduced in Appendix G, "Power and Battery Engineering Rules for 9228 Macro (4.0B)".

DC feeders and connection interface

Each 9218/9228 Macro cabinet requires three DC feeds as shown in the applicable table on the next page. 9218/9228 Macro cabinets equipped with an A6 shelf require a fourth DC feeder.

The DC Power Terminal Block is located at the top/rear of the 9218/9228 Macro cabinet. The terminal block has the same physical dimensions for both the 9218 Macro and 9228 Macro.

The following tables provide the circuit breaker sizes, wire gauges, maximum wire lengths and lug dimensions for DC feeders #1, #2, #3, and #4.

DC feeders and connection interface: 9218 Macro [1]							
9218 Macro (4.0)	Feeder #1			Feeder #2, #3, and #4			Dimensions for lug on DC terminal block
	Circuit breaker (AMPS)	Wire size [2]	Max. Length (Feet)	Circuit breaker (AMPS)	Wire size[2]	Max. Length (Feet)	
+24 VDC	100	33.6 mm^2 (2-AWG)	20	150	42.4 mm^2 (1-AWG)	20	5/16 (threaded stud) 11/16 (max. width) Single-hole lug

Notes:

1. All wire sizes are minimum required
2. DC wires and lugs must be rated for 90 °C. For longer wire runs, calculate wire size and circuit breaker rating according to the National Electric Code or Canadian Electric Code, Part 1 (NAR markets) and IEC 60364, or local electrical code in effect (International markets).

DC feeders and connection interface: 9228 Macro				
9228 Macro	Feeder 1#, #2, #3, and #4 [1]			Dimensions for lug on DC terminal block
	Circuit breaker (AMPS)	Wire size[2]	Max. Length (Feet)	
+24 VDC	150	42.4 mm^2 (1-AWG)	20	5/16 (threaded stud) 11/16 (max. width) Single-hole lug
-48 VDC	90	35 mm^2 (2-AWG)	20	5/16 (threaded stud) 11/16 (max. width) Single-hole lug

Notes:

1. The fourth feed is required only if the 9228 Macro cabinet is equipped with an A6 amplifier shelf.
2. DC wires and lugs must be rated for 90 °C. For longer wire runs, calculate wire size and circuit breaker rating according to the National Electric Code or Canadian Electric Code, Part 1 (NAR markets) and IEC 60364, or local electrical code in effect (International markets).

Alternate wire gauges may be used for the DC feeders, but must be sized to limit the round trip voltage drop between the power system output terminals and the Macro input terminals to less than one volt for +24/-48 VDC systems. A current level equal to 80% of the circuit breaker current rating specified should be used for this calculation. The wire

used for the DC feeders should be rated for the environmental condition in which it is used. The circuit breaker characteristics must be equivalent to Airpax Inc. model LEL/LML, circuit breakers with type 51, DC trip delay curve characteristics.

9218/9228 Macro DC power terminal block (rear view)

*** +24VDC for 9218 Macro,**
+24VDC and -48VDC for 9228 Macro

DC input surge requirements

The DC input terminals of the 9218/9228 Macro Outdoor Cabinet are 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 9218/9228 Macro Outdoor Cabinet .

9218/9228 Macro	Inrush current (Amps)	Time (milliseconds)
+24 VDC	400 to 1250	up to 1
-48 VDC (9228 Macro only)	600 to 1200	up to 1

The circuit breakers providing DC power to the 9218/9228 Macro 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, used in +24/-48 VDC modular cells . If an alternate circuit breaker is used, it must have equivalent overload trip.

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 - 6.5	0.3 - 3	0.1 - 1.2	0.3 - 0.5	0.011- 0.25	0.004 - 0.1	0.004 - 0.08

DC input voltage range

The normal DC input voltage range, the set point of float voltage for the battery and the maximum float voltage set points for the 9218/9228 Macro Outdoor Cabinet, are provided in the following table.

9218/9228 Macro	Normal input voltage range (volts DC)	Set point of float voltage (volts DC)	Maximum float voltage (volts DC)
+24 VDC	20 to 28.1	27.24	28.1
-48 VDC (9228 Macro only)	-42.2 to -56.2	-54.48	-56.2

Default voltage

The DC power system output voltage must remain within the range specified in the table above. If a failure occurs with the DC power system controller, the power system should remain within the values above, or it should shut down to protect the equipment from an overvoltage condition.

DC voltage regulation

The DC voltage must 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 9218/9228 Macro must 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.

9218/9228 Macro	Ripple voltage mVpp (0 to 100 MHz)	Ripple voltage mVpp (mVrms)	DC system noise mV (psophometric)
+24 VDC	Not to exceed 100	50	Less than 1
-48 VDC (9228 Macro only)	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 9218/9228 Macro must remain within 5.0% and return to the 0.5% regulation band within 300 milliseconds.

High voltage shutdown

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

9218/9228 Macro	Max. voltage range (VDC)	Maximum voltage for up to one second
+24 VDC	28.1 to 30	30
-48 VDC (9228 Macro only)	-56.2 to -60	-60

Notes:

1. The DC power system must not provide sustained voltage to the 9218/9228 Macro at the maximum voltage values, for more than one second, as shown in the table above. 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 must shut down or clamp its output voltage below 30 (for +24 VDC) and -56.2 (for -48 VDC) until the problem is corrected.

Backup power requirements

In the event of a commercial AC power failure, Alcatel-Lucent recommends the DC power provided to the 9218/9228 Macro be backed up for a minimum of 30 minutes. The DC power to the equipment must not be interrupted during the transition from normal operation to backup operation and vice versa.

Important! If the DC power supplied to the 9218/9228 Macro cabinets is not equipped with backup power, undesirable performance may be experienced during interruption and/or transients to the AC input power

Transient surge protection

The DC power system must be designed to prevent surge transients at its input passing through to the output and causing voltage transient in excess of 30 Volts (for +24 VDC systems) or -60 Volts (for -48 VDC systems) to the Macro cabinet(s). Adequate transient surge protection must be provided for the DC feeders by running the feeders from the power system to equipment inside properly grounded metallic conduit. In addition, surge protectors and/or surge suppressors may be required to limit surge voltages to less than 30 Volts (for +24 VDC systems) or -60 Volts (for -48 VDC systems). If external surge protection is required to meet this limit, it should be installed near the DC Terminal Block of the 9218/9228 Macro cabinet.

DC power grounding

The 24/-48 VDC return bus must be bonded to the frame ground system at the output of the DC power system. For proper site grounding of the equipment, refer to *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

In certain RF configurations, this equipment may have the return of DC feeder (DC return) connected to the chassis and ground.

The following instructions, marked on the product, must be followed:

“This equipment has a connection between the grounded conductor of the DC supply circuit and the grounding conductor. ” In this case, the equipment must be bonded to the same ground bus bar or grounding system where the return of DC power supply is grounded.

“This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the grounded conductor of the same DC supply circuit and the grounding conductor, and also the point of grounding of the DC system. The DC system shall not be grounded elsewhere.”

“The DC supply source is to be located within the same premises as this equipment”

“There shall be no switching or disconnecting devices in the grounded circuit conductor between the DC source and the point of connection of the grounding electrode conductor”

+24/-48 VDC power system alarms

Each alarm generated by the power system must be provided by a set of isolated dry relay contacts.

An “alarm state” may be indicated by a “closed circuit” or an “open circuit.”

- If an alarm condition is indicated by a “closed circuit,” the DC power system alarm contacts must present a contact closure when the alarm circuit fails or loses power.
- If an alarm condition is indicated by a “open circuit,” the DC power system alarm contacts must present an “open circuit” when the alarm circuit fails or looses power.

The resistance of a “closed circuit” must be less than 100 ohms. The resistance of an “open circuit” must be greater than 1 megaohms.

The following table also provides for the 5 standard and 2 optional power system alarm assignments and connection points for the 9218/9228 Macro cabinet.

The PCS and 850 CDMA 9218/9228 Macro have twenty-five additional external user alarm positions provided through the J3 and J4 connector located at the EFIM inside the 9218/9228 Macro cabinet. These user alarms are available at the 9218/9228 Macro cabinet to alarm additional equipment. The 9218/9228 Macro software configuration must be programmed to report an “open circuit” or “closed circuit” for an alarm condition. (The 9218/9228 Macro software is configured for a “contact closure” for power system alarms. A software change to the User Alarm definitions is required to announce a power system an “open circuit” as an alarm condition).

The following table lists a recommended set of alarm functions to be provided to alert and announce power system failures. These seven alarms are specially dedicated and provisioned ONLY for power connections. The connection points are located at the EFIM unit inside the 9218/9228 Macro cabinet. (Refer to the following table and figure for the power alarms termination.)

Power alarm cable assignment and connections on the EFIM (Locations 1-7)		
Alarm function	**Alarm #**	**Terminal numbering at J3**
Power Major (PMJ)	User Alarm 0	+ 0 (Top)
		- 0 (Bottom)
Power Minor (PMN)	User Alarm 1	+ 1 (Top)
		- 1 (Bottom)
AC Fail (ACF)	User Alarm 2	+ 2 (Top)
		- 2 (Bottom)
Power Cabinet Intrusion (INTR)	User Alarm 3	+ 3 (Top)
		- 3 (Bottom)

Power alarm cable assignment and connections on the EFIM (Locations 1-7)		
Alarm function	**Alarm #**	**Terminal numbering at J3**
Batteries on Discharge (BD)	User Alarm 4	+ 4 (Top)
		- 4 (Bottom)
Fuse Alarm (FA) [3]	User Alarm 5	+ 5 (Top)
		- 5 (Bottom)
Batteries on Discharge (BD) 2 [3]	User Alarm 6	+ 6 (Top)
		- 6 (Bottom)

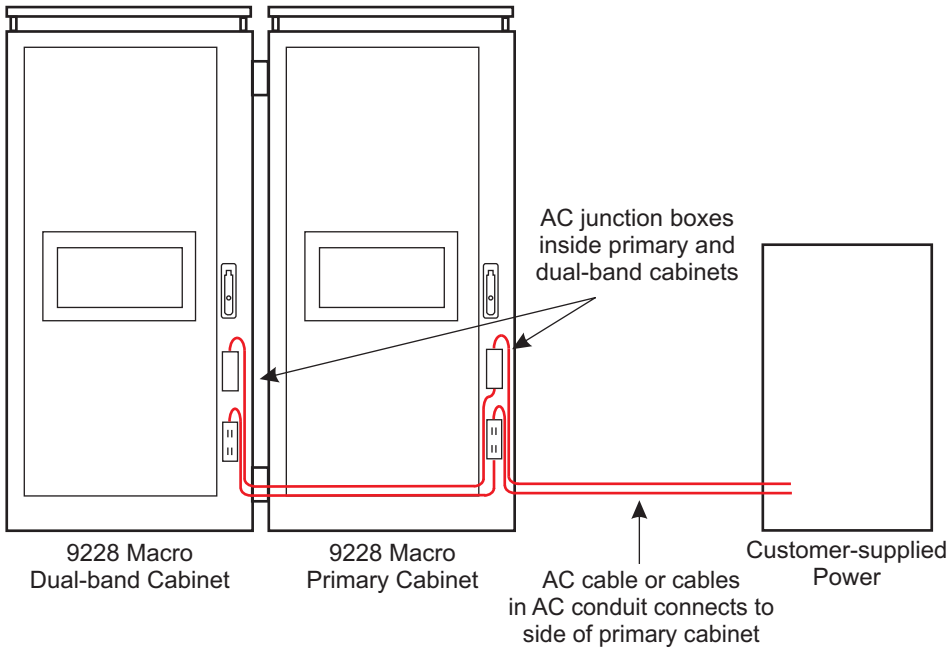
Notes:

1. If the DC power system does not support some of the alarms as described above, it is strongly recommended that the customer do not connect alarms for different equipment to these user alarms. Since these power alarms are reported back to the core network, it is important that the customer maintains the circuit integrity to avoid misinterpretations when reporting equipment alarms and failures.
2. Therefore, each specific power alarm function maintains its identity throughout the network and can not be used for any other purpose.
3. Optional alarm.

AC connection

For the primary cabinet, AC wiring from the customer-supplied power source is routed through a customer-supplied 2-inch liquid-tight flexible conduit and through an opening on the side of the primary cabinet, and then is connected in the primary cabinet.

For the dual-band cabinet, AC wiring from the primary cabinet is routed into the dual-band cabinet, and then is connected in the dual-band cabinet.



FRONT VIEW

Power requirements for 9218 Macro Outdoor Cabinets without Integrated Power using PowerHouse 24 power cabinet

Overview

Purpose

The purpose of this section is to provide power requirements for the 9218 Macro Outdoor Cabinet when a PowerHouse 24 power cabinet is used.

Contents

General requirements

AC power connections

The Alcatel-Lucent-supplied PowerHouse 24 power cabinet +24 V power cabinet supports 9218 Macro cabinets without integrated power.

This power cabinet accepts AC power from North American 120/240 V, 3-wire single-phase connections, 120/208 V, 3-wire single-phase connections, or single-phase 230 V (line-to-neutral) connections used in other locations around the globe.

AC power must also be provided for lighting and any additional AC-powered equipment present at the site. The appropriate product information must be consulted to determine the total AC power required for the equipment at the site.

As part of site preparation, the site must be equipped with the appropriate AC service panel board, or AC branch circuit load center for supplying power to all AC equipment at the site. All AC power wiring, distribution, and protection equipment must be installed during site preparation and be ready for connection to the Alcatel-Lucent power equipment.

The PowerHouse 24 power cabinet contains an AC convenience outlet, so the customer does not need to provide an additional AC convenience outlet at the site.

Power requirements when installing at an existing site with legacy equipment

Refer to the following documents for power requirements for legacy cabinets:

- Flexent® *Modular Cell 3.0 - Outdoor Site Preparation Guidelines,* 401-703-405
- Flexent™ *CDMA Modular Cell Site Preparation Guidelines,* 401-710-120 (This document supports Modular Cell Indoor and Outdoor, for both 1.0 and 2.0.)

9218 Macro Outdoor Dual-band Cabinet installed at an existing site with legacy equipment, power load issue

The maximum output of the PowerHouse 24 power cabinet is 17 kW. If a 9228 Macro dual band cabinet is installed with existing 1.0, 2.0, 3.0, or 9218 Macro cabinets that utilize any of these power cabinets, the total number of carriers in the 9228 Macro dual-band cabinet will be limited due to power constraints. Use of a 9228 Macro dual band cabinet with integrated power is recommended to overcome this limitation.

Power requirements and battery reserve times calculations

This section provides power requirements and battery reserve times tables for various configurations. The term “typical” in the tables implies the site is operating with “busy hour” traffic and at normal room temperatures, with the batteries on float charge. The maximum levels in the table represent the expected maximum load, with all the heaters in the cabinets on, and with the rectifiers supplying full power to the 9218 Macro and

maximum charging current to the batteries. The total AC power load consists of the AC power to the rectifier, which is converted to supply the 9218 Macro cabinet DC power and charging current to the batteries, plus the AC power for all the cabinet heaters.

NOTICE

Personnel Safety and/or Electrical Damage to Equipment

All AC wiring and over-current protection must be installed in accordance with the National Electric Code (NFPA-70), the Canadian Electrical Code, Part 1 (CSA C22.1) or the local electrical code in effect.

An appropriate equipment ground connection is required before commercial AC service can be connected to any equipment at the site.

NOTICE

Temperature Control

At sites operating up to 52° C, the front door-mounted heat exchanger must be equipped on the power cabinet.

NOTICE

Temperature Control

Lack of a proper heat exchanger can cause system damage.

At sites operating up to 46° C or higher, the front door- mounted heat exchanger must be equipped on the power cabinet when one or more of the following conditions exists:

- *The power cabinet DC load exceeds 6 kW.*
- *Modular Cell cabinet #2 is installed, and the site is equipped with four or more carriers.*

Battery reserve times with 12IR125 batteries (new site)

The following table provides approximate battery reserve times for outdoor 9218 Macro sites using 12IR125 batteries at typical load conditions.

The following table provides approximate battery reserve times for 850/PCS CDMA battery reserve times for 9218 Macro at sites using 12IR125 batteries. Values in parentheses are the hours of reserve with 20 strings of batteries.

850 = Up to 8C PCS = UP to 11C		DC Power (kW)	Total number of 24-V battery strings [3] (two batteries per string) for various reserve times			
Sector/ Carrier	No. of 9218 Macro cabinets	Typical at 25 °C (77 °F)	2 hours	4 hours	6 hours	8 hours
3S/1C	1	2.1	2 [1]	4 [1]	6 [1]	6 [1]
3S/2C	1	3.2	4 [1]	6 [1]	8 [1]	10 [1]
3S/3C	1	4.4	6 [1]	8 [1]	10 [1]	14 [2]
3S/4C	1	5.6	6 [1]	10 [1]	14 [2]	16 [2]
3S/5C	1	6.7	8 [1]	12 [2]	16 [2]	20 [2]
3S/6C	1	7.8	8 [1]	14 [2]	18 [2]	(7.1)
3S/7C	2	9.8	10 [1]	16 [2]	(5.3)	(5.3)
3S/8C	2	11.0	12 [2]	18 [2]	(4.6)	(4.6)
3S/9C	2	12.2	12 [2]	20 [2]	(4.1)	(4.1)
3S/10C	2	13.4	14 [2]	(3.6)	(3.6)	(3.6)
3S/11C	2	14.5	14 [2]	(3.6)	(3.3)	(3.3)

Notes:

1. Requires one optional battery backup cabinet
2. Requires two optional battery backup cabinets
3. Does not include four strings in a PowerHouse 24 power cabinet.

6 Site preparation requirements for antennas

Overview

Purpose

This chapter describes the site preparation requirements related to antennas for 9218/9228 Macro Outdoor Cabinet.

Contents

General requirements

Introduction

This section describes site preparation guidelines specific to the antennas. This section supplements the site preparation guidelines described in the rest of this chapter.

Requirements

The following are general requirements for RF and GPS antennas, and for Intelligent Antenna.

- All materials for outdoor antenna cables must be rated for outdoor use.
- Alcatel-Lucent recommended antenna jumper cables or equivalent should be used.
- 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.

If Alcatel-Lucent antenna jumper cables are not being utilized, the jumper cable used must be terminated at one end, and a cable entry assembly must be installed prior to preparing the other end of the cable.

Site preparation for RF antennas

Introduction

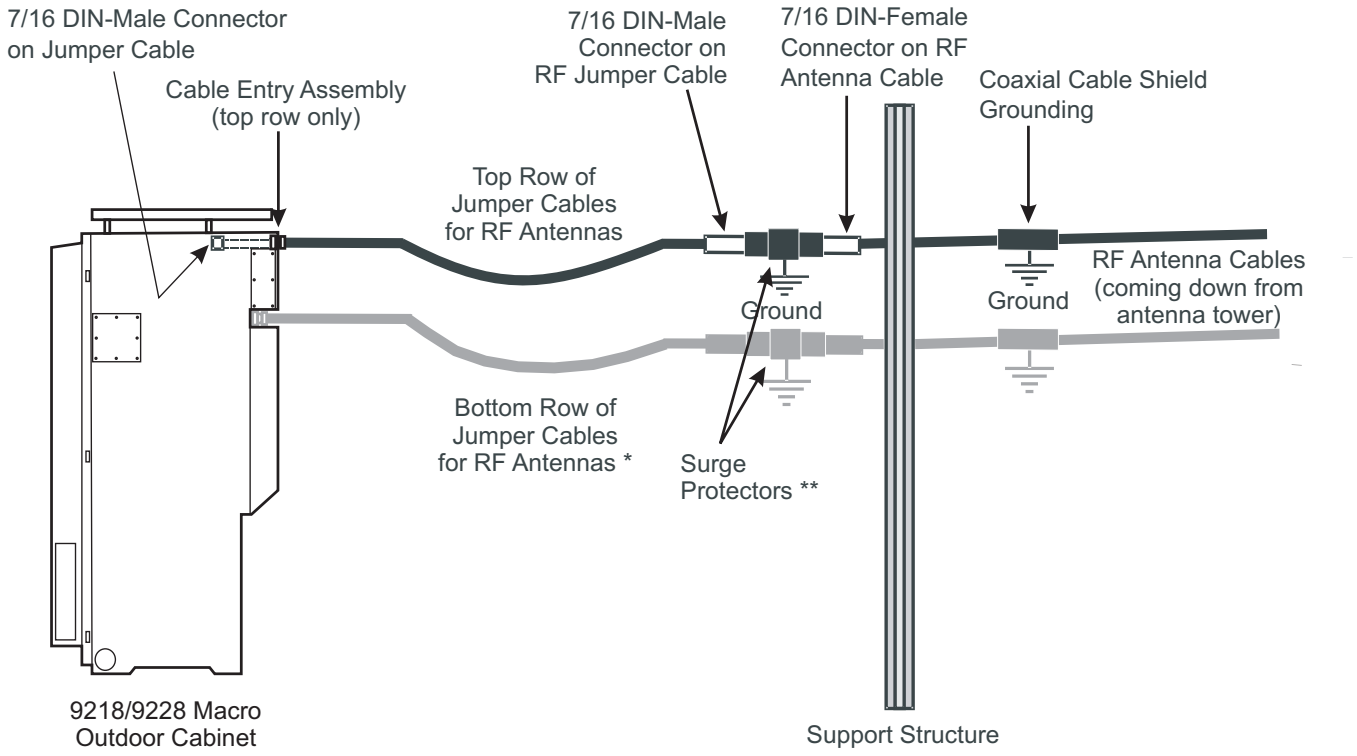
This section describes how to perform site preparation for RF antennas. If the Intelligent Antenna feature is used, skip this topic and proceed to "Site preparation for RF antennas when Intelligent Antenna is used" (p. 6-6).

Connection overview for RF antennas

The 9228 Macro Outdoor Cabinet cabinet is equipped with filters and antenna connections to support two RF antennas per sector. The 9218 Macro Outdoor Cabinet supports 1-, 2-, or 3-sector operation, and the 9228 Macro Outdoor Cabinet supports 3-, 4- or 6-sector operation.

All RF/GPS cable connectors and 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.)

The following diagram shows a side view of the RF antenna connections.



* Only for 9228 Macro with 4 or 6 sectors, a second set of antenna jumper cables connects at the lower row of connectors (under the antenna cover). Cable entry assembly are not used on the bottom row of connectors.

** External RF antenna surge protectors are *not required* for radio cabinets that utilize dual-duplex, dual-triplex, or dual-quadraplex filters, because these filters are internally equipped with surge protection.

Important! An RF antenna surge protector *is* required for the calibration cable when supporting Intelligent Antennas. A gas tube surge protector is always required for a GPS antenna.

Label the ends of the RF antennas at the site

During site preparation, it is the customer's responsibility to label the ends of the RF antenna cables at the site so that, during installation, the installer can accurately tell the purpose of each antenna cable and connect it appropriately.

The following table describes how to label the ends of the RF antenna cables at the site.

For Sector...	Apply This Label to the RF Antenna Cable
Sector 1	S1D0
	S1D1
Sector 2	S2D0
	S2D1
Sector 3	S3D0
	S3D1
Sector 4	S4D0
	S4D1
Sector 5	S5D0
	S5D1
Sector 6	S6D0
	S6D1

RF antenna jumper cable lengths

The following jumper cables may be ordered from Alcatel-Lucent for the RF antenna cables. These jumper cables will be installed during installation.

Cable Length	Terminations
• 4 feet • 12 feet • 32 feet	Connectorized (7/16" DIN Male) at one end only; one 7/16" DIN Male connector supplied loose
• 4 feet • 10 feet • 20 feet • 32 feet	Connectorized (7/16" DIN Male) at both ends

Surge protection for RF antenna jumper cables

RF surge protection is required for 9218 Macro Outdoor Cabinet

RF surge protection is not required for 9228 Macro Outdoor Cabinet because it has dual-duplex filters, which are equipped with 1/4-wave surge protection.

Antenna shield grounding for RF antennas

Antenna cable outer shields must be grounded at the top of the antenna, the bottom of the antenna, and every 100 feet between the top and bottom. Antenna cable outer shields must be terminated with 7/16 DIN female connectors at approximately 3 feet from the equipment.

Grounding of the antenna cable outer shield must be performed in accordance with the ground kit manufacturer's instructions and as outlined in *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

Site preparation for RF antennas when Intelligent Antenna is used

Introduction

This section describes how to perform site preparation for when the Intelligent Antenna feature is used. Skip this topic if Intelligent Antenna is not going to be implemented.

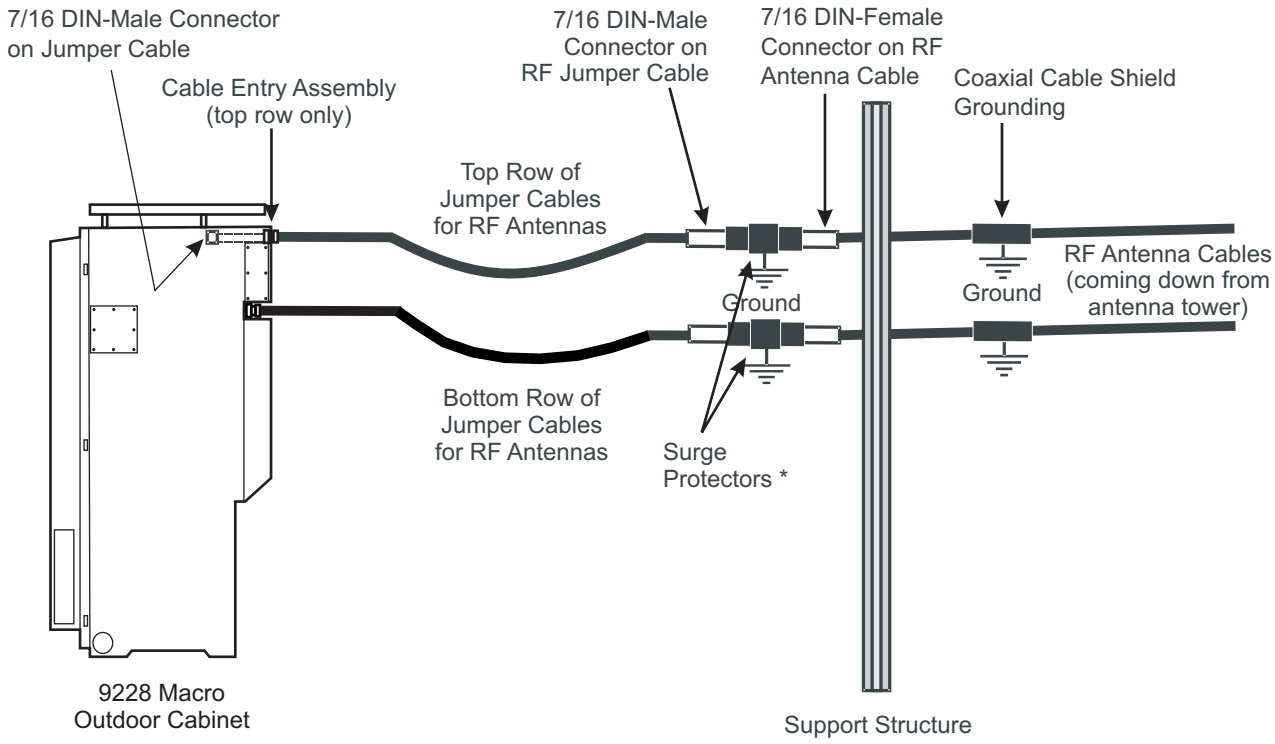
The Intelligent Antenna feature is only supported for 9228 Macro Outdoor Primary Cabinet, and is not supported for 9228 Macro Outdoor Dual-band Cabinet or for 9218 Macro Outdoor Cabinet.

An IA background calibration measurement must be perform during site preparation. The measurements that must be taken are explained in Appendix F, “Intelligent Antenna loss measurements”.

Connection overview for RF antennas when Intelligent Antenna is used

The 9228 Macro Outdoor Primary Cabinet is equipped with filters and antenna connections to support one antenna panel for each Intelligent Antenna (IA)-enabled sector. Each IA sector uses two connectors in the top row and two connectors in the bottom row. Each cabinet can support one, two, or three IA sectors. When one IA sector is supported, there are two non-IA sectors. When two IA sectors are supported, there is one non-IA sector.

The following diagram shows a side view of the RF antenna connections when the Intelligent Antenna feature is used.



* External RF antenna surge protectors are *not required* for radio cabinets that utilize dual-duplex, dual-triplex, or dual-quadraplex filters, because these filters are internally equipped with surge protection.

Important! An RF antenna surge protector *is* required for the calibration cable when supporting Intelligent Antennas. A gas tube surge protector is always required for a GPS antenna.

Label the ends of the RF antennas at the site

During site preparation, it is the customer's responsibility to label the ends of the RF antenna cables at the site so that, during installation, the installer can accurately tell the purpose of each antenna cable and connect it appropriately.

The tables in this section describe how to label the ends of the RF antenna cables at the site when Intelligent Antenna is used. When using these tables, note that the two client antennas may be in the reverse position, and that one or two of the client antennas may not exist, and that those sectors may have standard antennas.

Note that in the following tables:

- The Host antenna is Sector 1, 2, or 3. The Client antennas are the remaining two sectors. If one of the Client antennas does not exist, the single Client antenna may be in *either* of the two remaining sectors relative to the Host antenna sector.
- If one or two of the Client antennas do not exist, those sectors may have standard antennas, which are connected as explained in the previous section.

Three sectors with Sector 1 the Host IA antenna

For Sector...	Apply This Label to the RF Antenna Cable
Sector 1 (Alpha)	S1 - Host Ant. - J1
	S1 - Host Ant. - J2
	S1 - Host Ant. - J3
	S1 - Host Ant. - J4
	IACAL - J5
Sector 2 (Beta)	S2 - Client Ant. - J1
	S2 - Client Ant. - J2
	S2 - Client Ant. - J3
	S2 - Client Ant. - J4
Sector 3 (Gamma)	S3 - Client Ant. - J1
	S3 - Client Ant. - J2
	S3 - Client Ant. - J3
	S3 - Client Ant. - J4

Three sectors with Sector 2 the Host IA antenna

For Sector...	Apply This Label to the RF Antenna Cable
Sector 1 (Alpha)	S1 - Client Ant. - J1
	S1 - Client Ant. - J2
	S1 - Client Ant. - J3
	S1 - Client Ant. - J4
Sector 2 (Beta)	S2 - Host Ant. - J1
	S2 - Host Ant. - J2
	S2 - Host Ant. - J3
	S2 - Host Ant. - J4
	IACAL - J5

For Sector...	Apply This Label to the RF Antenna Cable
Sector 3 (Gamma)	S3 - Client Ant. - J1
	S3 - Client Ant. - J2
	S3 - Client Ant. - J3
	S3 - Client Ant. - J4

Three sectors with Sector 3 the Host IA antenna

For Sector...	Apply This Label to the RF Antenna Cable
Sector 1 (Alpha)	S1 - Client Ant. - J1
	S1 - Client Ant. - J2
	S1 - Client Ant. - J3
	S1 - Client Ant. - J4
Sector 2 (Beta)	S2 - Client Ant. - J1
	S2 - Client Ant. - J2
	S2 - Client Ant. - J3
	S2 - Client Ant. - J4
Sector 3 (Gamma)	S3 - Host Ant. - J1
	S3 - Host Ant. - J2
	S3 - Host Ant. - J3
	S3 - Host Ant. - J4
	IACAL - J5

RF antenna jumper cable lengths

The following jumper cables may be ordered from Alcatel-Lucent for the RF antenna cables.

Cable Length	Terminations
• 4 feet • 12 feet • 32 feet	Connectorized (7/16" DIN Male) at one end only; one 7/16" DIN Male connector supplied loose
• 4 feet • 10 feet • 20 feet • 32 feet	Connectorized (7/16" DIN Male) at both ends

Surge protection for RF antenna jumper cables

RF surge protection is not required because the 9228 Macro Outdoor Cabinet has dual-duplex filters, which are equipped with 1/4-wave surge protection.

Antenna shield grounding for RF antenna jumper cables

Antenna cable outer shields must be grounded at the top of the antenna, the bottom of the antenna, and every 100 feet between the top and bottom. Antenna cable outer shields must be terminated with 7/16 DIN female connectors at approximately 3 feet from the equipment.

Grounding of the antenna cable outer shield must be performed in accordance with the ground kit manufacturer's instructions and as outlined in *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

Site preparation for calibration cable

Introduction

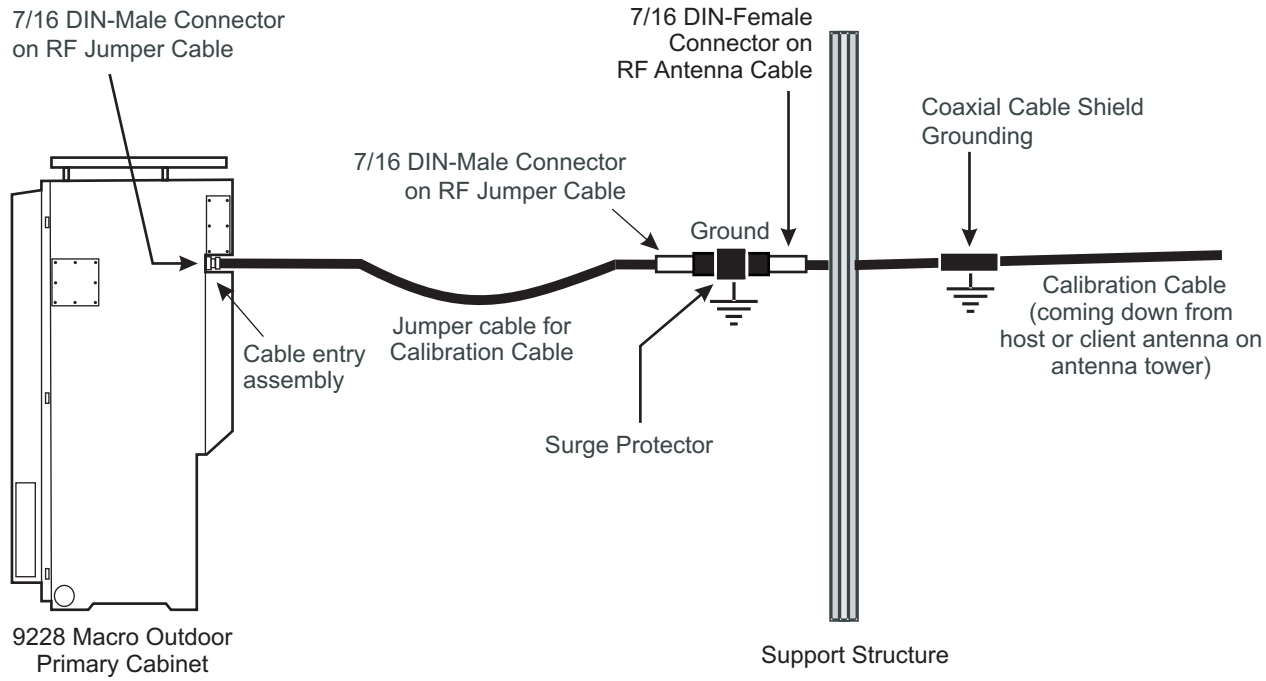
When the Intelligent Antenna feature is used, a jumper cable connects the calibration cable to the IA Calibration Unit in the 9228 Macro Outdoor Primary Cabinet. The Intelligent Antenna feature is supported for 9228 Macro Outdoor Primary Cabinet, and is not supported for 9228 Macro Outdoor Dual-band Cabinet or 9218 Macro Outdoor Cabinet.

This section describes how to perform site preparation for the calibration cable.

Connection overview for the calibration cable

One connection for the calibration cable must be made to support Intelligent Antenna.

The following diagram shows a side view of the calibration cable connections.



Label the end of the calibration cable at the site

During site preparation, it is the customer's responsibility to label the end of the calibration cable at the site so that, during installation, the installer can accurately tell the purpose of the calibration cable and connect it appropriately.

Apply the label “IACAL” to the end of the calibration cable at the site.

Calibration cable jumper cable lengths

The following jumper cables may be ordered from Alcatel-Lucent for the calibration cable.

Cable Length	Terminations
• 4 feet • 12 feet	Connectorized (7/16" DIN Male) at one end only; one 7/16" DIN Male connector supplied loose
• 4 feet • 10 feet • 20 feet • 32 feet	Connectorized (7/16" DIN Male) at both ends

Surge protection for calibration cable jumper cables

Surge protectors are required for the calibration cable. 1/4-wave surge protectors are used, and must be installed as part of site preparation.

Antenna shield grounding for calibration cable

Antenna cable outer shields must be grounded at the top of the antenna, the bottom of the antenna, and every 100 feet between the top and bottom. Antenna cable outer shields must be terminated with 7/16 DIN female connectors at approximately 3 feet from the equipment.

Grounding of the antenna cable outer shield must be performed in accordance with the ground kit manufacturer's instructions and as outlined in *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

Site preparation for GPS antenna requirements

Introduction

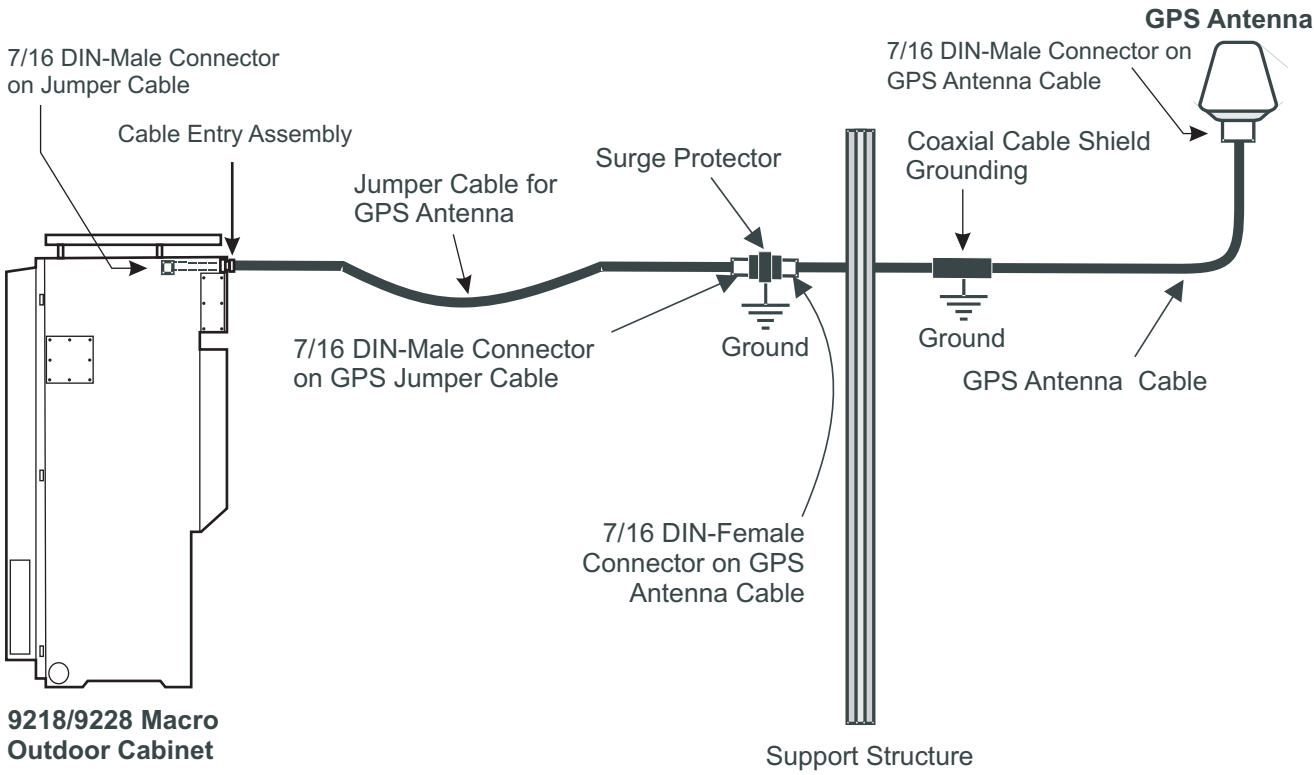
This section describes how to perform site preparation for the GPS antenna.

Connection overview for GPS antenna

The GPS antenna is a receive-only antenna that requires only one antenna run. The GPS antenna cable is terminated at the antenna support structure with a 7/16 DIN female connector and at the antenna with a 7/16 DIN-male connector. A gas tube surge protector with DIN male/female connectors is installed. A jumper cable connects the GPS antenna surge protector to the GPS antenna connection on the 9218 Macro Outdoor Primary Cabinet or 9228 Macro Outdoor Primary Cabinet.

All RF/GPS cable connectors and 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.)

The following diagram shows a side view of the GPS antenna connection.



Label the end of the GPS cable at the site

During site preparation, it is the customer's responsibility to label the end of the GPS cable at the site so that, during installation, the installer can accurately tell the purpose of the GPS cable and connect it appropriately.

Apply the label “GPS Ant.” to the end of the calibration cable at the site.

Required GPS antenna

A 26 dB ± 3 dB gain GPS antenna (low gain) is required. The required GPS antenna is listed as KS24019, list # (L112A).

Recommended GPS antenna cable

Important! The recommended cable type is outdoor (UV) as well as riser (fire retardant) rated. The recommended cable is *Andrews LDF4-RN-50A* .

The following table provides information for the recommended GPS antenna cable type.

Product Specification	Manufacturer (Reference)	Cable P/N (Reference)
WP-93807 L3	Andrew	LDF4-RN-50A

GPS antenna jumper cable lengths

The following jumper cables may be ordered from Alcatel-Lucent for the GPS antenna cable.

Cable Length	Terminations
• 4 feet • 12 feet • 32 feet	Connectorized (7/16" DIN Male) at one end only; one 7/16" DIN Male connector supplied loose
• 4 feet • 10 feet • 20 feet • 32 feet	Connectorized (7/16" DIN Male) at both ends

Surge protection for GPS antenna jumper cables

Surge protectors are required for the GPS antenna. Gas tube surge protectors are used, and must be installed as part of site preparation.

Antenna shield grounding for GPS antenna jumper cables

The GPS antenna cable coaxial cable shield shall be bonded at one point minimum near the equipment, provided the GPS antenna is installed in the cone of protection using short (less than 60 feet) coaxial cables.

Grounding of the antenna cable outer shield must be performed in accordance with the ground kit manufacturer's instructions and as outlined in *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115.

GPS antenna cable lengths

The following table provides GPS antenna cable lengths information for various configurations.

Cable Type	GPS Antenna Gain (dB)	Maximum cable length [1] M (Ft.)	
		Primary 9218/9228 Macro	Growth 9218 Macro (4.0) [2]
LDF4	26	75 (245)	74 (242)

Notes:

1. Cable lengths are based on typical applications. Cable lengths includes antenna cable and jumper cable.
2. Assumes Growth cabinet is associated with Primary 1.0/2.0/3.0/4.0.

Verify GPS antenna installation

It is highly recommended that a Garmin 45XL (or equivalent) be used to verify the GPS antenna installation and line of site prior to installing the 9218/9228 Macro equipment.

For detailed installation instructions for the GPS antenna, refer to Appendix E, “GPS antenna installation”.

7 Grounding and lightning protection requirements

Overview

Purpose

This chapter provides information on grounding and lightning protection requirements for a 9228 Macro (4.0B) site.

Contents

Grounding requirements

General requirements

The 9218/9228 Macro base station must be grounded with an integrated (multipoint) grounding system. The equipment is susceptible to lightning surges due to its association with towers and antennas. Therefore, it is imperative that the cell site be properly grounded and that a low impedance path to earth is provided. The grounding conductors must be as straight and short as possible. No sharp bends or loops are permitted in grounding conductors.

NOTICE

Equipment Warranty

The equipment warranty can be voided if the guidelines in the National Electrical Code (NFPA 70), the Canadian Electrical Code, Part 1 (CSA C22.1), or the local code in effect, as well as the Standard for Installation of Lighting Protection Systems (NFPA 780, latest edition), and Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites, 401-200-115 are not followed.

Surge protection requirements

General surge protection requirements

Commercial AC power and T1/E1 facilities are susceptible to lightning surges and must be properly protected. An appropriate surge protection device must be installed at the service entry point and be connected directly to the grounding electrode system.

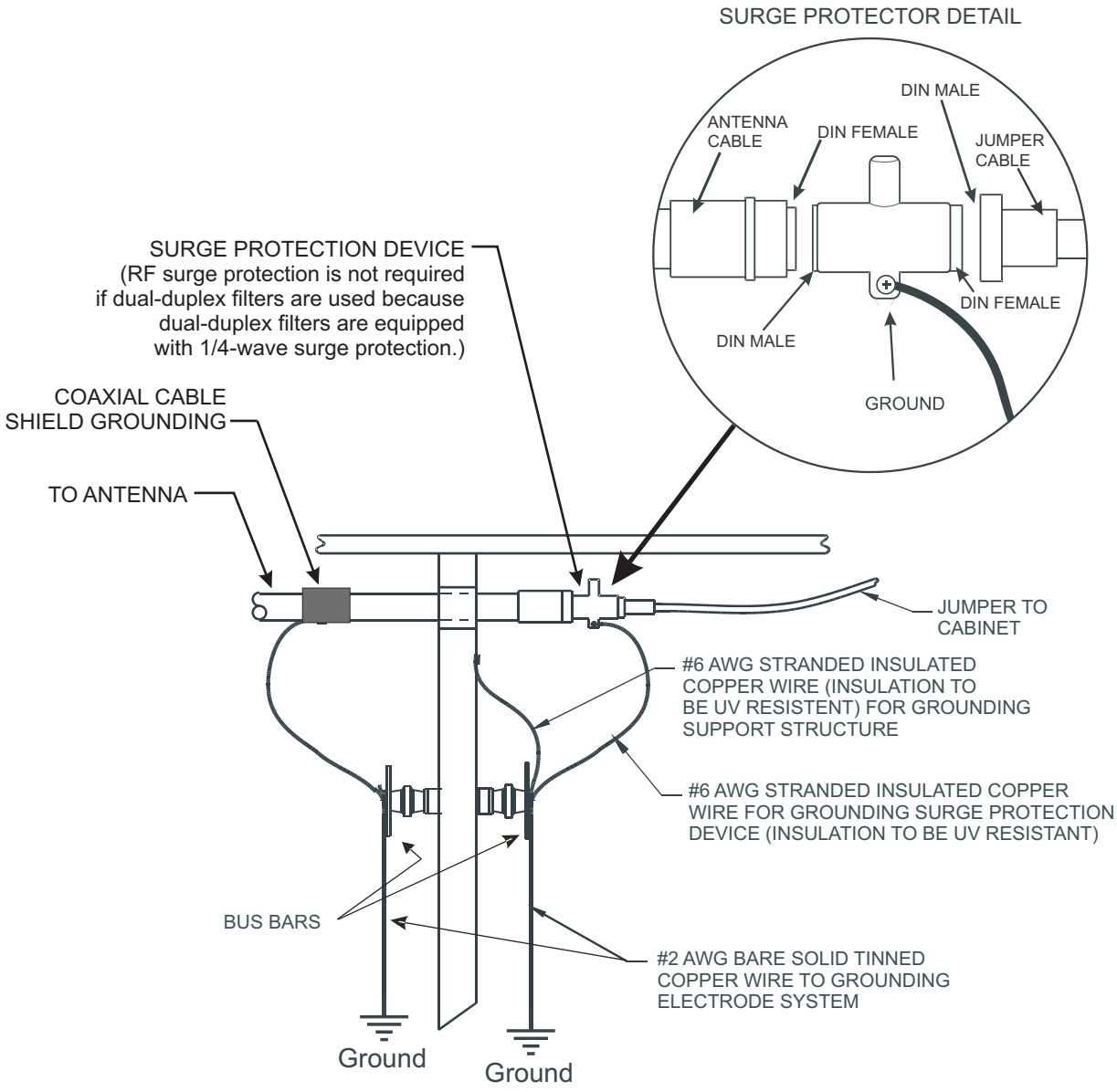
The RF and GPS antenna coaxial cables are also susceptible to lightning surges and must be protected.

As part of site preparation, a surge protection device must be installed between each antenna coaxial cable and jumper cable, approximately 1 meter (3 ft.) away from the equipment. They can be obtained from Alcatel-Lucent (KS24577, L-3A for GPS and KS24577, L-4A 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 at two points.

Diagram of a typical surge protector installation

The following diagram shows a typical surge protector installation.



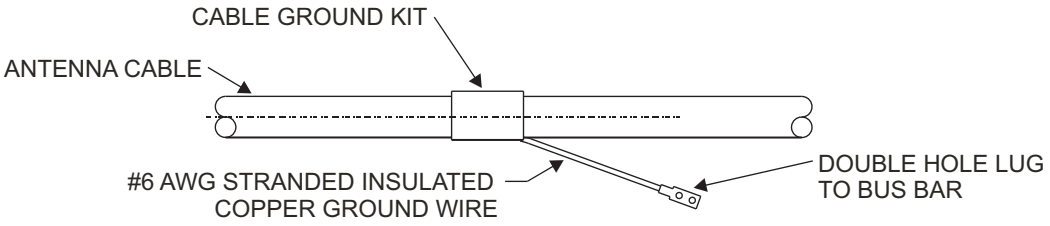
Antenna cable shield grounding for RF antennas and GPS antenna

The RF antenna cable shield must be bonded at the top of the tower next to the RF antenna, and at the bottom of the vertical run. If the tower is too high, the antenna cable shield must be bonded at approximately 30-meter (100-ft.) intervals. The tower or metallic support for the antenna must also be bonded to the grounding electrode system.

The GPS antenna coaxial cable shield shall also be bonded at one point (minimum), near the equipment, before entering a building, provided the GPS antenna is installed in Zone of protection with short (60 feet / 18 meters or less) coaxial cable.

Important! If the coaxial run along the tower is more than 60 feet / 18 meters, then the coaxial cable shields to be grounded at multiple points near the antenna and equipment at 100 foot (30 meter) intervals.

The following diagram shows a typical method for grounding an antenna cable outer shield.



Grounding electrode system

Grounding electrode system requirements

9218/9228 Macro sites must be equipped with a grounding electrode system (that is, buried ring ground, copper clad rod, electrolytic rods, metallic water pipe, etc.). The cell site grounding, including all cabinets 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, 33.6 mm^2 (2-AWG) bare, solid, tinned copper wire. Exterior ground conductors must be, at a minimum, 33.6 mm^2 (2-AWG) either solid, bare, tinned copper or stranded, insulated (outdoor insulation to be sunlight-resistant) copper cable.

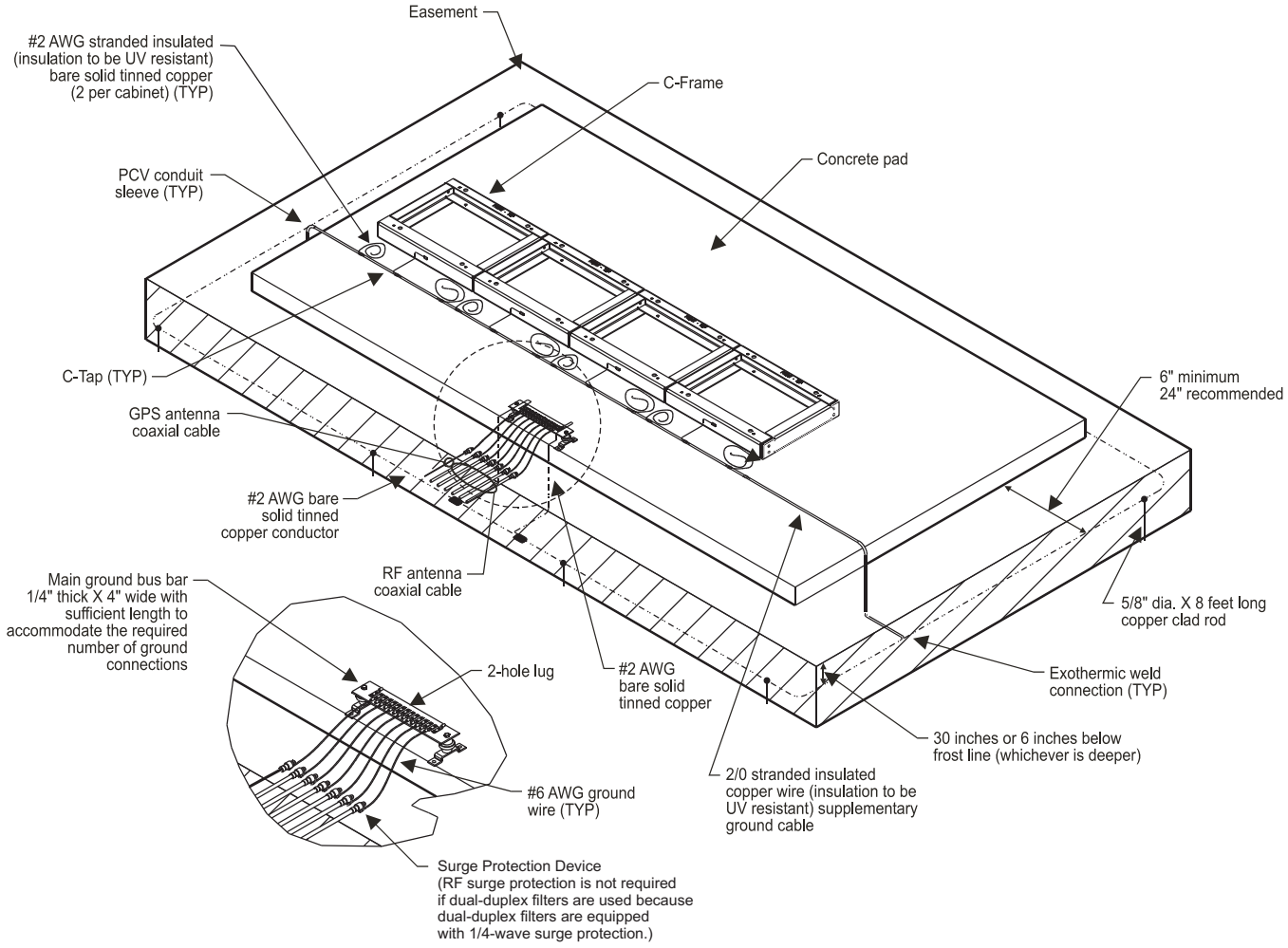
Exothermic weld

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.

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

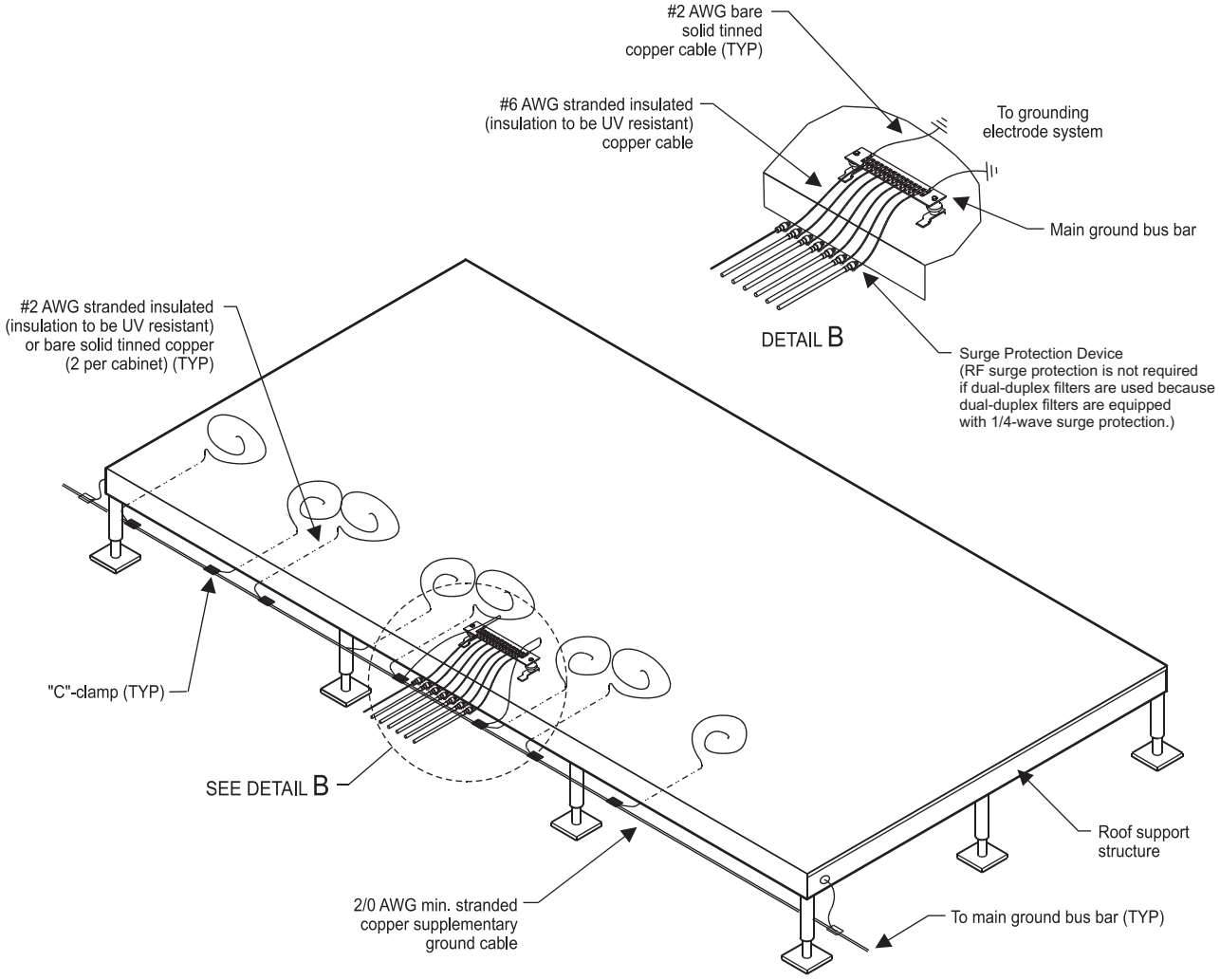
Typical grounding configuration (concrete pad)

The following diagram shows a typical grounding configuration for a 9218/9228 Macro site on a concrete pad.



Typical grounding configuration (rooftop)

The following diagram shows a typical grounding configuration for a 9218/9228 Macro site on a rooftop.



8 Site preparation for T1/E1 and user alarm facilities

Overview

Purpose

This chapter describes the site preparation requirements related to T1/E1 and user alarm facilities for 9218/9228 Macro Outdoor Cabinet.

Contents

Cable specifications for T1/E1 and user alarm cables

Purpose

This topic provides the cable specifications for T1/E1 and user alarm cables.

The same type of twisted-pair cable is recommended for both T1/E1 and user alarm cables.

Cable specification

The 12-meter (40-ft.) twisted-pair cable may be purchased from Alcatel-Lucent.

The recommended cable consists of 24 twisted pairs of 0.205-mm^2 (24-AWG) solid, tinned, copper wire with tinned, copper, braided shield, and gray PVC inner and outer jackets. If a balun block is used, the recommended cable is 12-meter (40-ft.) of 24 twisted pair, 0.205-mm^2 (24-AWG) solid, tinned, copper wire, connectorized at one end with twelve RJ45 connectors.

These cables should be color-coded in accordance with standard telephone industry code.

Important! The outside diameter of the twisted-pair cable must be within the range of 6 mm (0.24 in.) to 12 mm (0.47 in.) in order to fit through the connector supplied on the 9218/9228 Macro cabinet.

Color codes

The following table provides the color codes for the recommended twisted-pair cable. If a different cable is used, the color may vary.

Color Code specified cable		
Pair No.	**Color**	
1	White-Blue	Blue-White
2	White-Orange	Orange-White
3	White-Green	Green-White
4	White-Brown	Brown-White
5	White-Slate	Slate-White
6	Red-Blue	Blue-Red
7	Red-Orange	Orange-Red
8	Red-Green	Green-Red
9	Red-Brown	Brown-Red
10	Red-Slate	Slate-Red

Color Code specified cable		
Pair No.	**Color**	
11	Black-Blue	Blue-Black
12	Black-Orange	Orange-Black
13	Black-Green	Green-Black
14	Black-Brown	Brown-Black
15	Black-Slate	Slate-Black
16	Yellow-Blue	Blue-Yellow
17	Yellow-Orange	Orange-Yellow
18	Yellow-Green	Green-Yellow
19	Yellow-Brown	Brown-Yellow
20	Yellow-Slate	Slate-Yellow
21	Violet-Blue	Blue-Violet
22	Violet-Orange	Orange-Violet
23	Violet-Green	Green-Violet
24	Violet-Brown	Brown-Violet

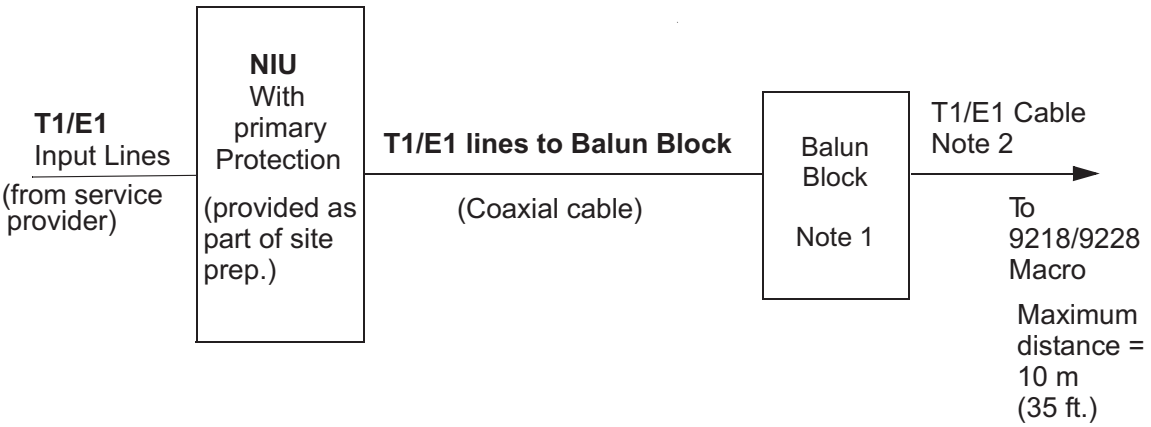
The following tables provide the punch down and color code information for the T1/E1 cable to be connected between the balun block and the Modular Cell cabinet. The customer must label each balun block with the specific cable name that will be connected.

Balun block requirements

Overview

The customer is responsible to convert the 75-ohm unbalanced coaxial cable to 120-ohm balanced twisted pairs. The conversion of the coaxial cable to twisted pairs may be accomplished with Alcatel-Lucent balun or equivalent.

Important! The customer shall provide primary protection and the appropriate hardware to mount and ground the balun block.



NOTE 1: If the balun block is used it must be located within 10m (35 ft) of the radio cabinet.

NOTE 2: RJ-45 connectors installed on T1/E1 cable and connect to the balun block during cabinet installation. Each of the two possible T1/E1 cables consists of a 24 twisted pair cable on the Modular Cell cabinet end, with three branch cables consisting of 8 twisted pair each, on the balun blocks end. Each balun block accomodates 4 T1 lines and uses 8 twisted pair (2 per T1 line). The 24 twisted pair cable can therefore handle 12 T1 lines up to 3 balun blocks. This applies to 9218 Macro and 9228 Macro with URCs having a maximum of 12 T1 lines. Refer to balun blocks #1, #2, and #3 in the following table.

With 9228 Macro and URCIIs (which allow up to 20 lines) a second 24 twisted pair cable is required. 16 of the 24 twisted pair would be utilized. Refer to balun blocks #4 and #5 in the following table.

Balun block connections

Important! The balun block must be installed within 10m (35ft.) of the Modular Cell cabinet. The T1/E1 cable will be connected directly to the Balun Block. Four RJ-45 loose connectors will be provided with each balun block to be installed on the T1/E1 cable during installation of the Modular cabinet. A RJ-45 connector crimping tool is required for connecting the RJ-45 connectors to the T1/E1 cable. The part # for the RJ-45 connector crimping tool is (R-5520).

The customer must label each balun block with the specific numbers that will be connected, per the following table:

Important! UCRIIs, when installed in 9218 Macro (4.0) cabinets, allow only four lines each unless the 9218 Macro (4.0) cabinet is field upgraded with SECB and Pod B EFIM, which then allow 8 lines each.

Condition	URC/URC-III Position Number	If URC or URC-III	The number of T1/E1 Lines is:	The number assigned to Balun Block
If Data and/or Voice lines, assign Balun Block to	1	URC	4	#1
		URC-III	First 4	#1
			Second 4	#4
If Voice lines only assign Balun Block to	2	URC	4	#2
		URC-III	First 4	#2
			Plus 2*	#5
	3	URC	4	#3
		URC-III	First 4	#3
			Plus 2*	#5
* URC-IIIs can accept 8 lines each (8 x 3 = 24). However, only a maximum of 20 lines may be available. Therefore, the final 4 lines (17-20) are split between URC-III, position 2 and URC-III, position 3, and utilize only one Balun Block				

Site preparation for T1/E1 and user alarm cables

Purpose

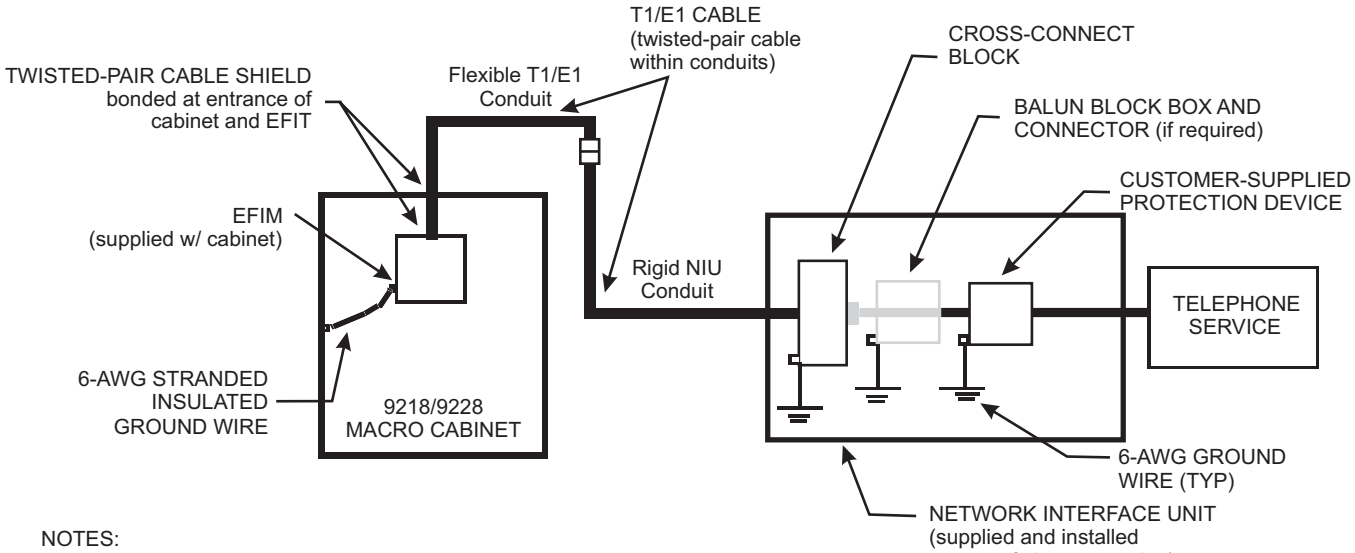
This section describes how to perform site preparation for T1/E1 and user alarm cables.

T1/E1 cables must be connected for all cabinet types, but user alarm cables are only connected for primary cabinets.

T1/E1 and user alarm cables are both twisted-pair cables that are connected on one side to the Network Interface Unit (NIU) and on the other side to the 9218/9228 Macro Outdoor Cabinet. The site preparation for T1/E1 and user alarm cables is performed at the same time.

Connection overview for T1/E1 and user alarm cables

The following diagram shows the installation of the twisted-pair cable from the NIU to the EFIM inside the 9218/9228 Macro cabinet.



NOTES:
For cabinets using URCs, one T1/E1 cable and one balun block box is used. For cabinets using URCIIs, up to two T1/E1 cables and two balun block boxes are used.

Twisted-pair cable is used to connect the cross-connect block to the EFIM in the Modular Cell 9218/9228 Macro cabinet. If balun block is used, install the four RJ45 connectors shipped with balun onto the twisted-pair cable and connect to balun.

Important! The T1/E1 cable will be connected directly to the Balun Block. Four RJ-45 loose connectors will be provided with the Balun block to be installed on the T1/E1 cable during installation of the Modular cabinet. A RJ-45 connector crimping tool is required for connecting the RJ-45 connectors to the T1/E1 cable. The part # for the RJ-45 connector crimping tool is (R-5520).

Number of T1/E1 cables

The number of T1/E1 cables, which can be connected to a Modular Cell cabinet varies depending upon the number and type of Universal Radio Controller (four lines for URC and eight lines for URC-III) installed in the cabinet.

- Cabinets with three URCs accept up to *twelve* T1/E1 lines and require only one cable.
- Cabinets utilizing three URC-IIIs accept up to *twenty* T1/E1 lines and require two cables if *eight* additional T1/E1 lines are used.

URC-IIIs in 9218 Macro (4.0) cabinet allow only *four* lines each. If the 9218 Macro (4.0) cabinet is upgraded in the field with SECB and Pod B EFIM, *eight* lines are allowed for each.

Number of user alarm cables

One user alarm cable is connected to the primary cabinet only. If more than 24 alarms are required, two user alarm cables are used.

Connect T1/E1 cables and user alarm cables to NIU

The T1/E1 and user alarm facilities must be in place prior to installation of the 9218/9228 Macro cabinets. The service provider normally supplies the T1/E1 facility with a carbon or gas tube protector. The 9218/9228 Macro outdoor cabinet is already equipped with Listed primary surge protection. If required, a balun must also be supplied and installed for conversion of unbalanced coaxial cable to twisted pairs at the Network Interface Unit (NIU).

The required twisted-pair cable must be supplied and installed to the T1/E1 facility at the NIU as part of site preparation. Sufficient cable length must be routed and coiled to allow for future connection to the Enhanced Facility Interface Module (EFIM) inside of the 9218/9228 Macro cabinet. The appropriate number of T1/E1 cables must be available at the site prior to installation.

Important! In the United States, refer to Article 800 of the National Electrical Code, NFPA 70, for selection and installation of the primary protector. In Canada, refer to Section 60 of the Canadian Electrical Code, Part 1, CSA C22.1 for selection and installation of the primary protector.

For international applications, refer to ITU K.11, “Principles of Protection Against Over-voltages and Over-currents.”

Important! Unused or spare T1/E1 cables available and/or terminated at the NIU must not be looped back towards the Modular Cell cabinet during normal operation.

The twisted-pair cable must be installed in a dry location with minimal humidity. The installation must not be performed in extremely cold temperatures (-15 °C [5 °F] or less) (see “Minimum installation temperatures” (p. 4-5)).

It is recommended to bond the shield of twisted-pair cable at the NIU end.

Install rigid NIU conduit and flexible T1/E1 conduit

This topic describes the conduits required for T1/E1 and user alarm cables. Skip this section if you are adding a 9218/9228 Macro Outdoor Cabinet to an existing site. In this case, the T1/E1 and user alarm cables are routed through the conduits that are already in place for the primary cabinet and then are routed within the cabinets to the additional cabinet.

A rigid NIU conduit is required, and is used to bring the T1/E1 and user alarm cables to the site. It is the responsibility of the customer to provide this rigid conduit, and all required connections and fittings, and install it as part of site preparation.

The installation recommendations for the rigid NIU conduit are:

- The rigid NIU conduit must be installed from the NIU to one meter away from the 9218/9228 Macro cabinet.
- Use a PVC conduit for the rigid NIU conduit when it is buried, and use a metal conduit for the rigid NIU conduit when it is exposed. The NIU end of the conduit must be bonded if it is metallic.

A flexible T1/E1 conduit is also required. It is the responsibility of the customer to purchase the flexible conduits, and all required connections and fittings, as part of site preparation, and hold them for the installer, who will install them during installation.

See "Conduit requirements" (p. 4-8) for specifications for the required conduits.

Route the T1/E1 and user alarm cables through the conduits

After the T1/E1 and user alarm cables have been connected to the NIU, and the conduits have been installed, the T1/E1 and user alarm cables must be routed through the NIU conduit, and coiled approximately 6 meters (20 ft.) at the end of the conduit.

To prevent damage to the twisted-pair cable inside the conduit, the conduit end must be properly protected against the environment, rodents, and other interferences. This can be done by stuffing the twisted-pair cable into the conduit, and capping the end of the conduit.

Determine the T1/E1 line assignments

Purpose

This section describes how to determine the T1/E1 line assignments for T1/E1 cables, and record them in a table that will be used during installation.

Record the T1/E1 line assignments

During site preparation, it is the customer's responsibility to determine the T1/E1 line assignments for the T1/E1 cables so that, during installation, the installer can make the EFIM punchdowns correctly. The customer must complete the left side of the tables in this section, and provide them to the installer before installation begins.

T1/E1 line assignments for 9218/9228 Macro Outdoor Cabinets that utilize URCs (maximum twelve T1/E1 lines)

The following table is used to provide the installer with the T1/E1 line assignments for 9218/9228 Macro Outdoor Cabinets that utilize three URCs, which support four T1/E1 lines each, for a maximum of twelve T1/E1 lines. The table must be completed as part of site preparation.

Important! Note that the TX and RX punchdowns are not located in numerically consecutive order in the table. They represent the physical arrangement on the EFIM.

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC, Position # DATA / VOICE**
Line:____ URC, Position 1	Tx ____-T		TX1-T (Top)	URC, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX1-R (Bottom)	
	Rx ____-T		RX1-T (Top)	
	Rx ____-R		RX1-R (Bottom)	
Line:____ URC, Position 1	Tx ____-T		TX2-T (Top)	
	Tx ____-R		TX2-R (Bottom)	
	Rx ____-T		RX2-T (Top)	
	Rx ____-R		RX2-R (Bottom)	

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC, Position # DATA / VOICE**
Line:____ URC, Position 2	Tx ____-T		TX7-T (Top)	URC, Position 2 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX7-R (Bottom)	
	Rx ____-T		RX7-T (Top)	
	Rx ____-R		RX7-R (Bottom)	
Line:____ URC, Position 2	Tx ____-T		TX8-T (Top)	
	Tx ____-R		TX8-R (Bottom)	
	Rx ____-T		RX8-T (Top)	
	Rx ____-R		RX8-R (Bottom)	
Line:____ URC, Position 1	Tx ____-T		TX3-T (Top)	URC, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX3-R (Bottom)	
	Rx ____-T		RX3-T (Top)	
	Rx ____-R		RX3-R (Bottom)	
Line:____ URC, Position 1	Tx ____-T		TX4-T (Top)	
	Tx ____-R		TX4-R (Bottom)	
	Rx ____-T		RX4-T (Top)	
	Rx ____-R		RX4-R (Bottom)	
Line:____ URC, Position 3	Tx ____-T		TX9-T (Top)	URC, Position 3 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX9-R (Bottom)	
	Rx ____-T		RX9-T (Top)	
	Rx ____-R		RX9-R (Bottom)	
Line:____ URC, Position 3	Tx ____-T		TX10-T (Top)	
	Tx ____-R		TX10-R (Bottom)	
	Rx ____-T		RX10-T (Top)	
	Rx ____-R		RX10-R (Bottom)	

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC, Position # DATA / VOICE**
Line:____ URC, Position 2	Tx ____-T		TX5-T (Top)	URC, Position 2 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX5-R (Bottom)	
	Rx ____-T		RX5-T (Top)	
	Rx ____-R		RX5-R (Bottom)	
Line:____ URC, Position 2	Tx ____-T		TX6-T (Top)	
	Tx ____-R		TX6-R (Bottom)	
	Rx ____-T		RX6-T (Top)	
	Rx ____-R		RX6-R (Bottom)	
Line:____ URC, Position 3	Tx ____-T		TX11-T (Top)	URC, Position 3 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX11-R (Bottom)	
	Rx ____-T		RX11-T (Top)	
	Rx ____-R		RX11-R (Bottom)	
Line:____ URC, Position 3	Tx ____-T		TX12-T (Top)	
	Tx ____-R		TX12-R (Bottom)	
	Rx ____-T		RX12-T (Top)	
	Rx ____-R		RX12-R (Bottom)	

Notes:

1. For Data (EV-DO) lines, up to the current maximums per radio cabinet equipage and individual URC, it is recommended that they be assigned as follows:

   - The first EV-DO line to URC, position 1 for new installations from the factory.
   - A second EV-DO line (and additional EV-DO line(s) when available), can use another URC (position 2 or 3) or the same URC (position 1), up to the current maximums, based on radio cabinet equipage and EV-DO traffic at the cell site location.
   - For field upgrades it is recommended that the first EV-DO line be assigned to URC, position 3, if Voice is using URC, position 1.

T1/E1 line assignments for 9228 Macro Outdoor Cabinets that utilize URC-IIIs (and SEC-B) (maximum twenty T1/E1 lines)

The following table is used to provide the installer with the T1/E1 line assignments for 9228 Macro Outdoor Cabinets that utilize three URC-IIIs, which support eight T1/E1 lines each for a maximum of twenty T1/E1 lines. The table must be completed as part of site preparation.

Note the following:

- The TX and RX punchdowns are in numerical order in the table. Because more than twelve lines are used, the numerical order represents the physical arrangement on the EFIM.
- A second T1/E1 cable is used to support the lines that punch down at URC-III, positions 13-20. Note that 8 pairs in the second T1/E1 cable are always unused.
- 9218 Macro (4.0) cabinets can support twenty T1/E1 lines (and use this table) with three URC-IIIs. The 9218 Macro (4.0) cabinet has been upgraded in the field with SECB and Pod B EFIM, which allow 8 lines each.

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number [2]	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC-III Position DATA / VOICE**
Line:____ URC II, Position 1	Tx ____-T		TX1-T (Top)	URC-III, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX1-R (Bottom)	
	Rx ____-T		RX1-T (Top)	
	Rx ____-R		RX1-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX2-T (Top)	
	Tx ____-R		TX2-R (Bottom)	
	Rx ____-T		RX2-T (Top)	
	Rx ____-R		RX2-R (Bottom)	

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number [2]	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC-III Position DATA / VOICE**
Line:____ URC-III, Position 2	Tx ____-T		TX7-T (Top)	URC-III, Position 2 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX7-R (Bottom)	
	Rx ____-T		RX7-T (Top)	
	Rx ____-R		RX7-R (Bottom)	
Line:____ URC-III, Position 2	Tx ____-T		TX8-T (Top)	
	Tx ____-R		TX8-R (Bottom)	
	Rx ____-T		RX8-T (Top)	
	Rx ____-R		RX8-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX3-T (Top)	URC-III, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX3-R (Bottom)	
	Rx ____-T		RX3-T (Top)	
	Rx ____-R		RX3-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX4-T (Top)	
	Tx ____-R		TX4-R (Bottom)	
	Rx ____-T		RX4-T (Top)	
	Rx ____-R		RX4-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX9-T (Top)	URC-III, Position 3 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX9-R (Bottom)	
	Rx ____-T		RX9-T (Top)	
	Rx ____-R		RX9-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX10-T (Top)	
	Tx ____-R		TX10-R (Bottom)	
	Rx ____-T		RX10-T (Top)	
	Rx ____-R		RX10-R (Bottom)	

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number [2]	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC-III Position DATA / VOICE**
Line:____ URC-III, Position 2	Tx ____-T		TX5-T (Top)	URC-III, Position 2 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX5-R (Bottom)	
	Rx ____-T		RX5-T (Top)	
	Rx ____-R		RX5-R (Bottom)	
Line:____ URC-III, Position 2	Tx ____-T		TX6-T (Top)	
	Tx ____-R		TX6-R (Bottom)	
	Rx ____-T		RX6-T (Top)	
	Rx ____-R		RX6-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX11-T (Top)	URC-III, Position 3 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX11-R (Bottom)	
	Rx ____-T		RX11-T (Top)	
	Rx ____-R		RX11-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX12-T (Top)	
	Tx ____-R		TX12-R (Bottom)	
	Rx ____-T		RX12-T (Top)	
	Rx ____-R		RX12-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX13-T (Top)	URC-III, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX13-R (Bottom)	
	Rx ____-T		RX13-T (Top)	
	Rx ____-R		RX13-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX14-T (Top)	
	Tx ____-R		TX14-R (Bottom)	
	Rx ____-T		RX14-T (Top)	
	Rx ____-R		RX14-R (Bottom)	

T1/E1 Cable Side (Customer responsibility to complete)			Alcatel-Lucent Side (Used by Installer to make EFIM punchdowns)	
T1/E1 Line Number [2]	**Signal Pair Assignment / Tip Ring**	**Cable Color Coding**	**EFIM Terminal Block Label / Tip Ring**	**URC-III Position DATA / VOICE**
Line:____ URC-III, Position 1	Tx ____-T		TX15-T (Top)	URC-III, Position 1 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX15-R (Bottom)	
	Rx ____-T		RX15-T (Top)	
	Rx ____-R		RX15-R (Bottom)	
Line:____ URC-III, Position 1	Tx ____-T		TX16-T (Top)	
	Tx ____-R		TX816-R (Bottom)	
	Rx ____-T		RX16-T (Top)	
	Rx ____-R		RX16-R (Bottom)	
Line:____ URC-III, Position 2	Tx ____-T		TX17-T (Top)	URC-III, Position 2 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX17-R (Bottom)	
	Rx ____-T		RX17-T (Top)	
	Rx ____-R		RX17-R (Bottom)	
Line:____ URC-III, Position 2	Tx ____-T		TX18-T (Top)	
	Tx ____-R		TX18-R (Bottom)	
	Rx ____-T		RX18-T (Top)	
	Rx ____-R		RX18-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX19-T (Top)	URC-III, Position 3 [1] DATA or VOICE (Mutually exclusive)
	Tx ____-R		TX19-R (Bottom)	
	Rx ____-T		RX19-T (Top)	
	Rx ____-R		RX19-R (Bottom)	
Line:____ URC-III, Position 3	Tx ____-T		TX20-T (Top)	
	Tx ____-R		TX20-R (Bottom)	
	Rx ____-T		RX20-T (Top)	
	Rx ____-R		RX20-R (Bottom)	

Notes:

1. For Data (EV-DO) lines, up to the current maximums per radio cabinet equipage and individual URC-III, it is recommended that they be assigned as follows:

- The first EV-DO line to URC-III, position 1 for new installations from the factory.
- A second EV-DO line (and additional EV-DO line(s) when available), can use another URC-III (position 2 or 3) or the same URC-III (position 1), up to the current maximums, based on radio cabinet equipage and EV-DO traffic at the cell site location.
- For field upgrades it is recommended that the first EV-DO line be assigned to URC-III, position 3, if Voice is using URC-III, position 1.

2. A second T1/E1 cable is used to support the lines that punch down for URC-III, positions 13-20. Note that 8 pairs of the second T1/E1 cable are always unused.

Site preparation specific to user alarm cables

User alarm requirements

Each generated user alarm is generated by a set of isolated dry relay contacts.

An “alarm state” may be indicated by a “closed circuit” or an “open circuit.”

- If an alarm condition is indicated by a “closed circuit,” the alarm contacts must present a contact closure when the alarm circuit fails or loses power.
- If an alarm condition is indicated by an “open circuit,” the alarm contacts must present an “open circuit” when the alarm circuit fails or loses power.

The resistance of a “closed circuit” must be less than 100 ohms. The resistance of an “open circuit” must be greater than 1 megohms.

The user alarm switches (if desired) must be installed as part of site preparation. The 9218/9228 Macro cabinet is equipped with primary surge protection.

Record the user alarm assignments

During site preparation, it is the customer's responsibility to determine the user alarm assignments, so that during installation, the installer can make the EFIM punchdowns correctly. The customer must complete the right side of the following table, and provide them to the installer before installation begins.

The following table is used to provide the installer with the user alarm assignments. The table must be completed as part of site preparation.

The following table describes how the user alarm cable will be connected during installation.

Alarm #	Wire Color	Used for Which Alarm (Customer responsibility to complete)
Alarms 0 to 6		Power alarms. Refer to “+24/-48 VDC power system alarms” (p. 5-48).
User Alarm 7	Red-Green	
	Green-Red	
User Alarm 8	Red-Brown	
	Brown-Red	
User Alarm 9	Red-Slate	
	Slate-Red	

Alarm #	Wire Color	Used for Which Alarm (Customer responsibility to complete)
User Alarm 10	Black-Blue	
	Blue-Black	
User Alarm 11	Black-Orange	
	Orange-Black	
User Alarm 12	Black-Green	
	Green-Black	
User Alarm 13	Black-Brown	
	Brown-Black	
User Alarm 14	Black-Slate	
	Slate-Black	
User Alarm 15	Yellow-Blue	
	Blue-Yellow	
User Alarm 16	White-Blue	
	Blue-White	
User Alarm 17	White-Orange	
	Orange-White	
User Alarm 18	White-Green	
	Green-White	
User Alarm 19	White-Brown	
	Brown-White	
User Alarm 20	White-Slate	
	Slate-White	
User Alarm 21	Red-Blue	
	Blue-Red	
User Alarm 22	Red-Orange	
	Orange-Red	
User Alarm 23	Red-Green	
	Green-Red	
User Alarm 24	Red-Brown	
	Brown-Red	

Alarm #	Wire Color	Used for Which Alarm (Customer responsibility to complete)
User Alarm 25	Red-Slate	
	Slate-Red	
User Alarm 26	Black-Blue	
	Blue-Black	
User Alarm 27	Black-Orange	
	Orange-Black	
User Alarm 28	Black-Green	
	Green-Black	
User Alarm 29	Black-Brown	
	Brown-Black	
User Alarm 30	Black-Slate	
	Slate-Black	
User Alarm 31	Yellow-Blue	
	Blue-Yellow	

Important! Note that there are 34 physical connections on the EFIM (0–33).

Appendix A: 9218/9228 Macro - Outdoor site preparation checklists

Overview

Purpose

This section is for use by authorized personnel to verify completion of cell site preparation activities prior to installation of base station equipment.

Contents

SP-GEN Cell site general information form

Purpose

The following form must be completed prior to the installation of the cell site equipment.

Form

Complete the following information about the cell site.

- Cell Site Name: _____
- Cell Site Address: _____
- Cell Site Access Contact Name: _____
- MTA Name: _____
- Cell Site # : _____
- Contact Phone # : _____

SP-1 Site preparation general checklist

Purpose

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

Checklist

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is the work site free of environmental, health and safety (EH&S) hazards?	Y	N	N/A	
2.	Are cell site environmental conditions within equipment specified operating range?	Y	N	N/A	
3.	Has the optional ice bridge been installed?	Y	N	N/A	
4.	Has the required space been provided around equipment (that is, maintenance access, cabinets, heat dissipation, safety) ?	Y	N	N/A	
5.	Is support structure properly secured and anchored per earthquake zoning requirements?	Y	N	N/A	
6.	Will structure support cabinets/equipment (including batteries, etc.) ?	Y	N	N/A	
7.	Are all site permits completed?	Y	N	N/A	
8.	Has a Method of Procedure (MOP) been developed with the installation supervisor?	Y	N	N/A	
9.	Is cell translations information available?	Y	N	N/A	
10.	Has installer cell site equipment parameter sheet been completed and reviewed with the installation supervisor?	Y	N	N/A	
11.	Are the ECP/Switch and cell software generics compatible?	Y	N	N/A	
12.	Are T1/E1 and user alarm facilities available and active?	Y	N	N/A	
13.	If T1/E1 facility is 75 ohms coaxial, has the protection/conversion of coaxial cable to twisted-pair cable been provided?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
14.	Is adequate primary surge protection provided for the T1/E1 service entrance?	Y	N	N/A	
15.	Are the T1/E1 long enough to reach from the T1/E1 service entrance to the punchdown block or conversion block?	Y	N	N/A	
16.	Is the conduit for routing T1/E1 and user alarm cables to the radio cabinet in place?	Y	N	N/A	
17.	Is the twisted-pair cable installed and protected for T1/E1?	Y	N	N/A	
18.	Is the twisted-pair cable installed and protected for user alarm?	Y	N	N/A	
19.	Has all equipment been ordered and has delivery to site been scheduled?	Y	N	N/A	
20.	Have all necessary arrangements been made for access to the site?	Y	N	N/A	
21.	Have all necessary arrangements been made to get equipment onto the site (crane, etc.) ?	Y	N	N/A	

Completed by: _____

Date: _____

SP-2 Site preparation power source checklist

Purpose

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

Checklist

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is AC service available?	Y	N	N/A	
2.	Have AC service and conduits been approved by local code?	Y	N	N/A	
3.	Is AC service equipped with surge protection at service entry point?	Y	N	N/A	
4.	Is AC power source appropriate for equipment being installed?	Y	N	N/A	
5.	Does AC service have proper circuit breaker rating(s) and labeling?	Y	N	N/A	
6.	Is AC circuit breaker(s) available and labeled for power system?	Y	N	N/A	
7.	Is AC 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	
9.	If not supplied with the cabinets, have at least two AC duplex convenience outlets been provided within 1.5 meters (5 feet) of radio cabinet(s)? NOTE: A Ground Fault Circuit Interrupt (GFCI) type is recommended, and must be used when required by code.	Y	N	N/A	
10.	Is each outlet protected by a UL/CSA listed, or approved 15 A circuit breaker?	Y	N	N/A	

SP-3 Site preparation grounding checklist

Purpose

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

Checklist

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	
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 7.62-meter (25-foot) intervals?				

Item #	Description	Yes (Y)	No (N)	N/A	Comments
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 cabinet support structure grounded?	Y	N	N/A	
13.	Are metallic conduits bonded at both ends and 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 power supply equipped with a surge protection device and is the device properly connected to the ground system?	Y	N	N/A	
17.	Is T1/E1 line equipped with a surge protection device and is the device properly connected to the ground system?	Y	N	N/A	
18.	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	
19.	Are the RF antenna and GPS antenna, cable shields properly grounded? Is surge protection in place and properly grounded for RF antennas to9218 Macro Outdoor Cabinets (not needed for 9228 Macro Outdoor Cabinet) and for GPS antenna?	Y	N	N/A	
20.	If the Intelligent Antenna feature is being implemented, is the calibration cable shield properly grounded? Is surge protection in place and properly grounded for calibration cable?				

Item #	Description	Yes (Y)	No (N)	N/A	Comments
21.	Is supplementary conductor connected to grounding electrode system? (Exposed end, if any, must be taped.)	Y	N	N/A	
22.	Are down conductors in compliance with Alcatel-Lucent specifications? (If building is less than 23 meters (75 ft.) high, use two 33.6-mm^2 (2-AWG) copper conductors. If higher than 23 meters (75 ft.), use two 2/0 copper conductors).	Y	N	N/A	
23.	Is steel column used as one down conductor?	Y	N	N/A	
	Pad Cell Site Installation Only				
24.	Is supplementary conductor connected to grounding electrode system at both ends (if applicable) ?	Y	N	N/A	
25.	Were buried ring ground and its connections inspected before the trench was back-filled?	Y	N	N/A	
26.	Was a photo taken of the buried ring ground and its connections prior to back-filling for reference file?	Y	N	N/A	

Completed by: _____

Date: _____

SP-4 Site preparation RF antenna checklist

Purpose

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

Checklist

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is tower properly installed and secured?	Y	N	N/A	
2.	Are all antenna cable runs installed?	Y	N	N/A	
3.	Are all antenna cable runs properly terminated with 7/16 DIN female connectors on the equipment side?	Y	N	N/A	
4.	Are all cable connections torqued to the appropriate value?	Y	N	N/A	
5.	Is surge protection in place and properly grounded for RF antennas to 9218 Macro Outdoor Cabinets (not needed for 9228 Macro Outdoor Cabinet)?	Y	N	N/A	
6.	Are all external cables UV rated?	Y	N	N/A	
7.	Are antenna cable runs demarcation points in proper location?	Y	N	N/A	
8.	Are RF antenna cables each labeled so installer can connect them properly during installation?	Y	N	N/A	
9.	If Intelligent Antenna feature is being implemented, is the calibration cable labeled so installer can connect it properly during installation?	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	
13.	Are antennas properly installed and secured?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
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 tilt?	Y	N	N/A	
18.	Have diversity antennas been properly separated?	Y	N	N/A	

Completed by: _____

Date: _____

SP-5 Site preparation GPS antenna checklist

Purpose

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

Checklist

Item #	Description	Yes (Y)	No (N)	N/A	Comments
1.	Is antenna installed with base level within two degrees?	Y	N	N/A	
2.	Is antenna installed with less than 25% of the sky masked by obstruction?	Y	N	N/A	
3.	Is GPS antenna located at least 3.05 mm (10 ft.) vertically and horizontally from any active transmit antenna?	Y	N	N/A	
4.	Are aggregate cable loss, cable Voltage Standing Wave Ratio (VSWR), total cable length, cable type, GPS antenna gain, KS list and serial numbers recorded in the site installation records?	Y	N	N/A	
5.	Is proper gain antenna installed for the total aggregate cable loss and length?	Y	N	N/A	
6.	Is measured cable VSWR within its specified value?	Y	N	N/A	
7.	Is GPS antenna cable properly grounded, and equipped with proper surge protection device?	Y	N	N/A	
8.	Are proper service loops provided near antenna?	Y	N	N/A	
9.	Is proper drip loop provided at the 9218/9228 Macro antenna cable cover?	Y	N	N/A	
10.	Are cable connections torqued to the appropriate value?	Y	N	N/A	
12.	Are all external cables UV rated?	Y	N	N/A	
13.	Are antenna bracket, pipes, and antenna properly secured?	Y	N	N/A	

Item #	Description	Yes (Y)	No (N)	N/A	Comments
14.	Was GPS antenna location verified for line of sight using a Garmin 45XL test unit or equivalent?	Y	N	N/A	
15.	Is GPS antenna location free of external interference (i.e., radio stations, collocated equipment, etc.) ?	Y	N	N/A	

Completed by: _____

Date: _____

SP-6 Site preparation punchlist sheet

Purpose

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

Punchlist

Item #	Comment/Description	Severity (1/2/3)	Corrective Action Required	
			(Y/N)	Completed Date

Severity Column 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

Was the punchlist continuation sheet on the next page used?	□ Yes	□ No
Inspector's Name:	_____	
Inspector's Signature:	_____	
Date:	_____	

SP-6A Site preparation punchlist sheet

Purpose

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

Punchlist

Item #	Comment/Description	Severity (1/2/3)	Corrective Action Required	
			(Y/N)	Completed Date

Appendix B: 9218/9228 Macro cell site information

Overview

Purpose

This section is for use by Customer Project Management to document cell site configuration information.

Contents

CSC-1 Cell site configuration information

General base station information

Complete the following cell site information:

Cell Site	information (provided by inspector)
Name	
Address	
Contact name	
MTA name	
Cell Site #	
Contact Phone & Pager #	

Installation type

Check all that apply:

- □ Indoor
- □ Outdoor
- □ Controlled Environment
- □ Uncontrolled Environment
- □ Concrete Pad
- □ Rooftop
- □ Other (Specify) : _____

Base station substructure

Check all that apply:

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

Earthquake zone rating

Check one:

- □ Zone 0
- □ Zone 1
- □ Zone 2
- □ Zone 3
- □ Zone 4

Base station equipment

Complete the information for the 9218/9228 Macro equipment:

Cabinet Type	Serial #	# of sector	Duplex/ Triplex/ Dual Duplex
Primary cabinet			
Growth cabinets			
Battery cabinet			

Antennas

Complete the following (if required) :

PCS Channel # (1-1999) _____

# of Carriers (1-9) _____

GPS Antenna KS/Model _____

PCS Freq. Block (A-F) _____

GPS Cable Length (ft.) _____

GPS Antenna Gain (dB) _____

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

Quantity of Antenna Jumper Cables (1-15)

_____

Power

Total # of Battery Strings _____

Power source

- □ +24 VDC
- □ -48 VDC

Integrated power?

- □ Yes
- □ No

External power?

- □ Yes
- □ No

Power collocated with base station equipment?

- □ Yes
- □ No

Other cell 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
Ice Bridge? Covering: (check one) ____ Cables Only ____ Cables and Equipment	Y	N	N/A
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

Equipment description	Yes (Y)	No (N)	N/A
AC Service: Size (amps) ____ Voltage (v) ____ Phase (1 or 3) ____			
Customer-supplied Power System? NOTE: If YES, the customer is responsible for the configuration of the power system.	Y	N	
Earthquake Bracing Required?	Y	N	N/A
Tx/Rx Antenna? (mounting location) ____ Tower ____ Steel Structure ____ Building ____ Antenna Support Structure	Y	N	N/A
Cell 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: Lifting and moving cabinet guidelines

Overview

Purpose

This Appendix provides guidelines for lifting and moving the 9218/9228 Macro cabinets and the 60ECv2 battery cabinet.

Contents

Lifting and moving cabinets

Purpose

Cabinets are usually shipped to the customer via truck and are delivered to the installation site. During installation, it may be necessary to lift the cabinet to move it to a new location. This section describes how to safely lift the cabinets. Use this information as you perform the lifting procedures.

WARNING

Equipment damage

A dolly with straps can damage the front air filter cover and the rear muffler cover of the modular cell cabinet if too much tension is applied to the straps.

When a dolly with straps is used to move the modular cell cabinet, adjust the straps and the tension so that the air filter cover and the rear muffler cover are not damaged by the straps.

Lifting machinery

To lift the cabinet, do one of the following:

- Use a forklift with forks that are at least 4 feet long to lift a cabinet attached to a pallet from the bottom.
- Install lifting eyebolts on the top of the cabinet, and use a derrick and slings to lift the cabinet from its top.

Safety precautions for using lifting machinery

WARNING

Personnel injury or equipment damage

Cabinets are too heavy to move without appropriate lifting devices.

Derrick equipment or a forklift must be used to lift the cabinet. Do not attempt to move the cabinet manually, or remove it from the pallet manually.

Comply with the following guidelines when using lifting machinery:

- Only operators who are specifically trained and meet company requirements should be permitted to operate derrick or forklift equipment.
- All persons working with derricks or forklifts must wear standard safety headgear, footwear, eye protection, and insulated gloves (if required).

- Do not operate a derrick until both stabilizers are extended and firmly supported. Do not extend stabilizers after a load is suspended from the derrick.
- While raising the derrick from the stowed position, be alert for overhead obstructions, such as power lines, that may interfere.
- At all times, keep bystanders away from the work area.
- Operators must not suspend loads over people, nor can any person be permitted to work, stand, or pass under a suspended load.
- When a cabinet is being lifted with slings, it is unsafe to lift the cabinet when lifting sling angle is less than 45 degrees to the top of the cabinet.

Guidelines for using a derrick

When a derrick is used to move a cabinet, lifting eyebolts and slings are used to attach the cabinet to the derrick.

Lifting eyebolts

DANGER

Cabinet lifting hazard!

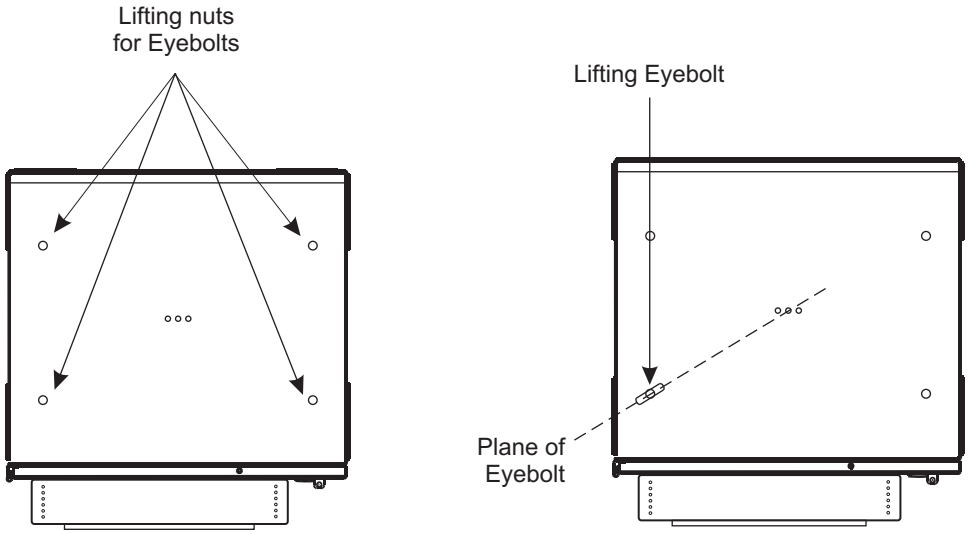
When lifting cabinets, incorrect or improperly installed eyebolts will fail endangering personnel to bodily injury and destroying the equipment.

Avoid using the wrong eyebolts by following these guideline:

- *If a ½- inch eyebolt threads easily and fully into a lifting nut on the top of the cabinet, then use the ½- inch eyebolts.*
- *If not, check the threads for 12mm eyebolts. The 12 mm eyebolt should thread all the way down without binding, until it bottoms out.*
- *A 12-mm eyebolt is too small for a ½-inch lifting nut, but will not hand thread all the way into the ½-inch nut unless forced. It will cross thread if forced, and may pull out when hoisting, presenting a serious danger.* Do NOT force 12-mm eyebolts into ½-inch lifting nuts. *Doing so will damage the threads of the lifting nuts.*
- *A ½-inch eyebolt will thread less than half a thread into a 12-mm lifting nut.* Do NOT force ½-inch eyebolts into 12-mm lifting nuts. *Doing so will damage the threads of the lifting nuts.*

Install lifting eyebolts on Modular cell cabinets

Four R-ITE-6110 M12, or Four R-ITE-6113 1/2-inch lifting eyebolts are screwed into the lifting nuts on the top of the cabinet, as shown in the following figure.

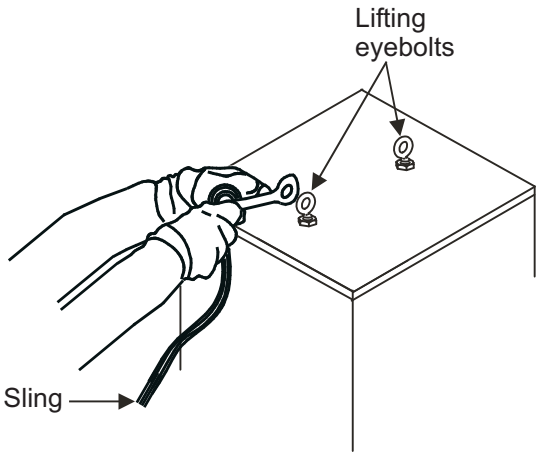


Position each lifting eyebolt so that the plane of the eyebolt points at the center of the top of the cabinet, as shown in the previous figure. When this is done, and the load is applied, the plane of the eyebolt will align with the load. Eyebolts that are not aligned with the load can bend as the load pulls on them sideways. Refer to the following figure for the correct method to install the lifting eyebolts.

Install lifting eyebolts on 60ECv2 cabinet

Two R-ITE-6113 1/2-inch lifting eyebolts are screwed into the lifting nuts on the top of the cabinet, as shown in the following figure.

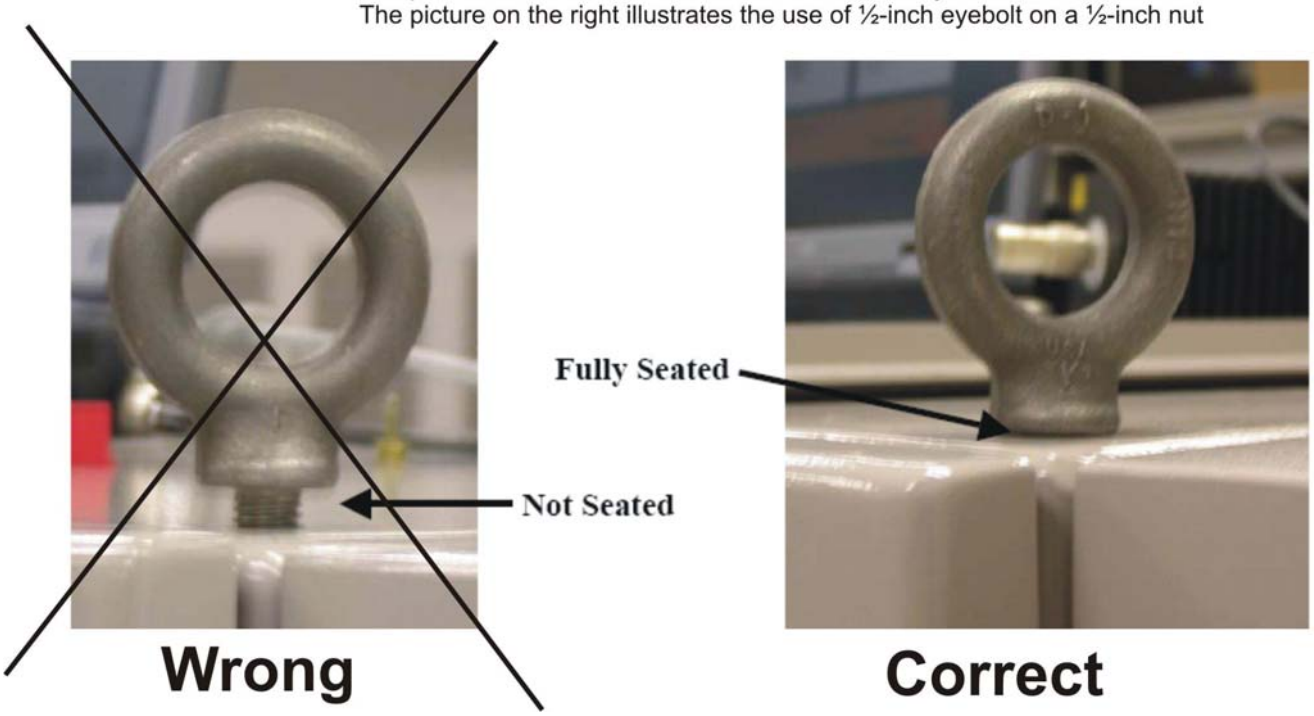
Important! Do NOT use R-ITE-6110 M12 eyebolts to lift the 60ECv2 cabinet.



Secure each lifting eyebolt at the top of the cabinet, as shown in the previous figures, and ensure the shoulder of the eyebolts is properly seated. Refer to the following figure for the correct method to install the lifting eyebolts.

Install lifting eyebolts

Note: Eyebolts are labled ½ or **M12.**
The picture on the left illustrates the use of a M12 eyebolt on a ½-inch nut.
The picture on the right illustrates the use of ½-inch eyebolt on a ½-inch nut

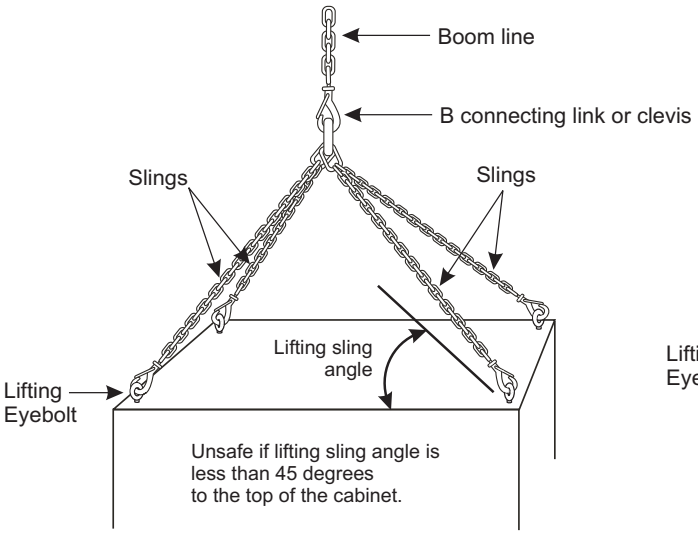


Slings

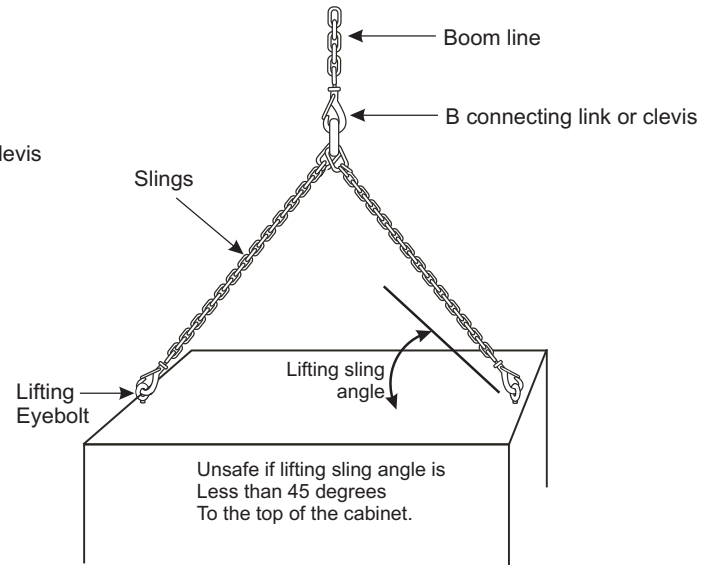
Attach the slings to the boom line with a B connecting link or clevis. Attach the other ends of the slings to the lifting eyebolts with a B connecting link or clevis.

When a cabinet is being lifted with slings, it is unsafe to lift the cabinet when the lifting sling angle is less than 45 degrees to the top of the cabinet. At closer than 45 degrees, there is too much side stress on the lifting eyebolts. Use slings that are long enough to keep the lifting sling angle at greater than 45 degrees from the top of the cabinet.

Modular Cell cabinet



60ECv2 battery cabinet



Control the cabinet while it is being lifted

NOTICE

When Moving Cabinet

When moving a cabinet, do not tilt the cabinet beyond 30 degrees from vertical. Do not stand under the cabinet.

A rope tied to the pallet attached to the cabinet should be used to guide the cabinet while it is being lifted. The rope must be sufficiently long. As the cabinet is being lifted and transported, use the rope to guide the cabinet and prevent the cabinet from tilting or swinging.

Always lift cabinets carefully, and keep the boom line tight to prevent the cabinet from tipping while it is moving. At the end of the lift, slowly place the cabinet on the ground.

Appendix D: Power requirements for 9218 Macro (4.0) additions to 1.0/2.0/3.0 or 9218 Macro (4.0) cell sites

Overview

Purpose

This chapter provides guidelines for site preparation of AC/DC electrical power when adding 9218 Macro (4.0) cabinets to an existing 1.0, 2.0, 3.0, or 9218 Macro (4.0) cell site.

Contents

Power requirements (general)

Purpose

This section describes the general power requirements for the Alcatel-Lucent equipment at the site.

Power requirements and battery reserve times calculations

This appendix provides power requirements and battery reserve times tables for various configurations. The term “typical” in the tables implies the site is operating with “busy hour” traffic and at normal room temperatures, with the batteries on float charge. The maximum levels in the table represent the expected maximum load, with all the heaters in the cabinets on, and with the rectifiers supplying full power to the 9218 Macro (4.0) and maximum charging current to the batteries. The total AC power load consists of the AC power to the rectifier, which is converted to supply the 9218 Macro (4.0) cabinet DC power and charging current to the batteries, plus the AC power for all the cabinet heaters.

NOTICE

Personnel Safety and/or Equipment Damage to Equipment

All AC wiring and over-current protection must be installed in accordance with the National Electric Code (NFPA-70), the Canadian Electrical Code, Part 1 (CSA C22.1) or the local electrical code in effect.

An appropriate equipment ground connection is required before commercial AC service can be connected to any equipment at the site.

NOTICE

Equipment Damage

If another manufacturer's power equipment is used, it must comply with the requirements described in “Power requirements for 9218/9228 Macro cabinets without Integrated Power using customer-supplied power” (p. 5-33) of this document.

NOTICE

Temperature Control

At sites operating up to 52 degrees Celsius, the front door-mounted heat exchanger must be equipped on the power cabinet.

NOTICE

Temperature Control

Lack of a proper eat exchanger can cause system damage.

At sites operating up to 46° C or higher, the front door- mounted heat exchanger must be equipped on the power cabinet when one or more of the following conditions exists:

- *The power cabinet DC load exceeds 6 kW.*
- *Modular Cell cabinet #2 is installed and the site is equipped with four or more carriers.*

AC and DC power requirements for 9218 Macro (4.0) cabinets

AC power requirements

AC power must also be provided for lighting, AC convenience outlets, and any additional AC-powered equipment present at the site. The appropriate product information must be consulted to determine the total AC power required for the equipment at the site.

For NAR installations, this AC convenience outlet is provided in the 9218/9228 Macro Outdoor Cabinets, and the customer does not need to provide an additional AC convenience outlet at the site.

As part of site preparation, the site must be equipped with the appropriate AC service panel board, or AC branch circuit load center for supplying power to all AC equipment at the site. All AC power wiring, distribution, and protection equipment must be installed during site preparation and be ready for connection to the Alcatel-Lucent power equipment.

For further information about power requirements at 1.0/2.0 sites, refer to Flexent® *CDMA Modular Cell Site Preparation Guidelines,* 401-710-120.

For further information about power requirements at 3.0 sites, refer to Flexent® *CDMA Modular Cell 3.0 - Outdoor Site Preparation Guidelines,* 401-703-405.

AC and DC power requirements for 9218 Macro (4.0) as first growth added to existing 1.0/2.0 site that uses PowerHouse 24, WNG24-DJ, or WNG24-M power cabinet

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at existing 1.0/2.0 sites. A PowerHouse 24, WNG24-DJ, or WNG24-M cabinet will be used at the site at typical load conditions.

850/PCS CDMA AC and DC Power Requirements for Modular Cell 4.0 as first growth added to an existing 1.0/2.0 site using PowerHouse 24, WNG24-DJ, or WNG24-M cabinet

850 = Up to 8C PCS = UP to 9C		Rectifiers 596F/ 596B4/ Vortex N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 °C (77 °F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	1 existing 1.0/2.0 Mod Cell cabinet	2	2.3	2.5	2.6	6.9	9.5	10.1	10.4
3S/2C		3	3.6	4.0	4.1	10.3	12.9	13.5	13.8
3S/3C		4	5.0	5.5	5.7	13.8	16.4	17.0	17.3
3S/4C	1	4	7.1	8.0	8.2	17.2	21.4	22.4	22.8
3S/5C	1	5	8.2	9.1	9.4	17.2	21.4	22.4	22.8

850/PCS CDMA AC and DC Power Requirements for Modular Cell 4.0 as first growth added to an existing 1.0/2.0 site using PowerHouse 24, WNG24-DJ, or WNG24-M cabinet									
850 = Up to 8C PCS = UP to 9C		Rectifiers 596F/ 596B4/ Vortex N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 °C (77 °F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/6C	1	6	9.4	10.3	10.8	20.7	24.9	25.8	26.3
3S/7C	1	6	10.6	11.8	12.2	20.7	24.9	25.8	26.3
3S/8C	1	7	11.7	13.0	13.4	24.1	28.3	29.3	29.7
3S/9C	1	7	12.8	14.1	14.7	24.1	28.3	29.3	29.7

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Power requirements for 9218 Macro (4.0) as second growth added to existing 1.0/2.0 site using PowerHouse 24, WNG24-DJ, or WNG24-M cabinet

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at existing 1.0/2.0 sites. A PowerHouse 24, WNG24-DJ, or WNG24-M cabinet will be used at the site at typical load conditions.

850/PCS CDMA AC and DC Power Requirements for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 site using PowerHouse 24, WNG24-DJ, or WNG24-M cabinet

850 = Up to 8C PCS = UP to 11C		Rectifiers 596F/ 596B4/ Vortex N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 °C (77 °F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	Primary existing 1.0/2.0	2	2.3	2.5	2.6	6.9	9.5	10.1	10.4
3S/2C		3	3.6	4.0	4.1	10.3	12.9	13.5	13.8
3S/3C		4	5.0	5.5	5.7	13.8	16.4	17.0	17.3
3S/4C	Growth 1 existing 1.0/2.0	4	7.1	8.0	8.2	17.2	21.4	22.4	22.8
3S/5C		5	8.2	9.1	9.4	17.2	21.4	22.4	22.8
3S/6C		6	9.4	10.3	10.8	20.7	24.9	25.8	26.3
3S/7C	1	7	10.6	11.8	12.2	20.7	24.9	25.8	26.3
3S/8C	1	7	11.7	13.0	13.4	24.1	28.3	29.3	29.7
3S/9C	1	8	14.3	15.8	16.4	27.6	31.8	32.7	23.2
3S/10C	1	8	15.5	17.3	17.8	27.6	31.8	32.7	33.2
3S/11C	1	9	16.6	18.5	19.1	31.0	35.2	36.2	36.6

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Power requirements for 9218 Macro (4.0) as growth added to existing 3.0 sites using PowerHouse 24

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at a site using a PowerHouse 24 power cabinet.

850/PCS CDMA AC and DC Power Requirements for 9218 Macro (4.0) growth without integrated power using PowerHouse 24 power cabinet									
850 = Up to 8C PCS = UP to 9C		Rectifiers 596B4 N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 ˚C (77 ˚F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	One 3.0 primary cabinet	Up to 4 existing rectifiers	2.1	2.5	2.4	6.9	8.8	11.2	9.5
3S/2C			3.2	3.6	3.7	10.3	12.3	14.6	12.9
3S/3C			4.4	4.8	5.1	13.8	15.7	18.1	16.3
3S/4C	1	4	6.5	7.3	7.5	13.8	17.3	18.1	18.5
3S/5C	1	5	7.6	8.4	8.7	17.2	20.7	21.5	21.9
3S/6C	1	5	8.8	9.6	10.1	17.2	20.7	21.5	21.9
3S/7C	1	6	10	11.1	11.5	20.7	24.2	25.0	25.4
3S/8C	1	6	11.1	12.3	12.8	20.7	24.2	25.0	25.4
3S/9C	1	7	12.2	13.4	14.0	24.1	27.6	28.4	28.8

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Power requirements for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 sites using WNG24-K cabinet

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at existing 1.0/2.0 sites using the WNG24-K cabinet at typical load conditions.

850/PCS CDMA AC and DC Power Requirements for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 sites using WNG24-K cabinet

850 = Up to 8C PCS = UP to 11C		Rectifiers DMR 75 N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0)0 cabinets		Typical at 25 ˚C (77 ˚F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	Primary 1.0/2.0 cabinet	3	2.3	2.5	2.6	6.9	9.5	10.1	10.4
3S/2C		3	3.6	4.0	4.1	6.9	9.5	10.1	10.4
3S/3C		4	5.0	5.5	5.7	9.2	11.8	12.4	12.7
3S/4C	Growth 1.0/2.0 cabinet	5	7.2	8.0	8.2	11.5	14.1	14.7	15.0
3S/5C		6	8.5	9.5	9.4	13.8	16.4	17.0	17.3
3S/6C		7	9.9	11.0	10.8	16.1	18.7	19.3	19.6
3S/7C	1	8	12.0	13.5	13.8	18.4	22.6	23.5	24.0
3S/8C	1	9	13.1	14.6	15.1	20.7	24.9	25.8	26.3
3S/9C	1	9	14.3	15.8	16.7	20.7	24.9	25.8	26.3
3S/10C	1	10	15.5	17.3	17.8	23.0	27.2	28.1	28.6
3S/11C	1	10	16.6	18.5	19.1	23.0	27.2	28.1	28.6

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Power requirements for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 sites using WNG24-K cabinet

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at existing 1.0/2.0 sites using the WNG24-K cabinet at typical load conditions.

850/PCS CDMA AC and DC Power Requirements for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 sites using WNG24-K cabinet

850 = Up to 8C PCS = Up to 9C		Rectifiers DMR 75 N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 °C (77 °F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	1 existing 1.0/2.0 Mod Cell cabinet	Up to 4 existing rectifiers	2.3	2.5	2.6	6.9	9.5	10.1	10.4
3S/2C			3.6	4.0	4.1	6.9	9.5	10.1	10.4
3S/3C			5.0	5.5	5.7	9.2	11.8	12.4	12.7
3S/4C	1	5	7.1	8.0	8.2	11.5	15.7	16.7	17.1
3S/5C	1	6	8.2	9.1	9.4	13.8	18.0	18.9	19.4
3S/6C	1	7	9.4	10.3	10.8	16.1	20.3	21.2	21.7
3S/7C	1	7	10.6	11.8	12.2	16.1	20.3	21.2	21.7
3S/8C	1	8	11.7	13.0	13.4	18.4	22.6	23.5	24.0
3S/9C	1	8	12.8	14.1	14.7	18.4	22.6	23.5	24.0

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Power requirements for 9218 Macro (4.0) as growth added to existing 3.0 sites using WNG24-K cabinet

The following table provides 208 Vrms, 230 Vrms, and 240 Vrms AC input power requirements for outdoor 850 and PCS configurations at sites using a WNG24-K power cabinet.

850/PCS CDMA AC and DC Power Requirements for 9218 Macro (4.0) growth without integrated power at an existing 3.0 site using WNG24-K power cabinet									
850 = Up to 8C PCS = UP to 9C		Rectifiers DMR75 N+1 note 1	DC Power (kW)		AC Power (kW)				
					Cabinet Heaters off		Cabinet Heaters on (note 3)		
Sector/ Carrier	No. of 9218 Macro (4.0) cabinets		Typical at 25 ˚C (77 ˚F)	Maximum	Typical	Maximum	Maximum 208 V	Maximum 230 V	Maximum 240 V
3S/1C	One 3.0 primary cabinet	up to 4 existing rectifiers	2.1	2.5	2.4	6.9	8.8	11.2	9.5
3S/2C			3.2	3.6	3.7	6.9	8.8	11.2	9.5
3S/3C			4.4	4.8	5.1	9.2	11.1	13.5	11.8
3S/4C	1	5	6.5	7.3	7.5	11.5	15.0	15.8	16.2
3S/5C	1	6	7.6	8.4	8.7	13.8	17.3	18.1	18.5
3S/6C	1	6	8.8	9.6	10.1	13.8	17.3	18.1	18.5
3S/7C	1	7	10	11.1	11.5	16.1	19.6	20.4	20.8
3S/8C	1	8	11.1	12.3	12.8	18.4	21.9	22.7	23.1
3S/9C	1	8	12.2	13.4	14.0	18.4	21.9	22.7	23.1

Notes:

1. N+1 = the number of required rectifiers + 1 for redundancy. The number of rectifiers is based on the maximum DC power draw.
2. To obtain DC current, divide the value in the table by 27.24 volts for +24 V systems. To obtain AC current, divide the value in the table by the nominal AC voltage.
3. Add 1 kW to AC load for each external battery cabinet installed.

Battery reserve times for 9218 Macro (4.0) cabinets

Battery reserve times with 12IR125 batteries for 9218 Macro (4.0) as first growth added to an existing 1.0/2.0 site

The following tables provide approximate battery reserve times for outdoor 850 and PCS configurations at existing 1.0/2.0 sites using 12IR125 batteries at typical load conditions.

850/PCS CDMA battery reserve times for 9218 Macro (4.0) as first growth added to an existing 1.0/2.0 sites using 12IR125 batteries							
850 = Up to 8C PCS = UP to 9C		DC Power (kW)	9218 Macro (4.0) backup time (minutes) with 2 internal List 1 battery strings per cabinet	Total number of 24V battery strings for desired reserve times (2 batteries per string) (Does not includes battery strings in the 9218 Macro (4.0) cabinets)			
Sector / Carrier	No. of 9218 Macro (4.0) cabinets	Typical at 25 ˚C (77 ˚F)		2 hours	4 hours	6 hours	8 hours
3S/1C	1 existing 1.0/2.0 Mod Cell cabinet	2.3	N/A	4	4	*6	*8
3S/2C		3.6	N/A	4	*6	*10	*12
3S/3C		5.0	N/A	*6	*10	*12	*14
3S/4C	1	7.1	99	*8	*12	**16	**22
3S/5C	1	8.2	58	*8	*14	**20	**24
3S/6C	1	9.4	39	*10	**16	**22	***(7.0)
3S/7C	1	10.6	29	*10	**18	**24	***(6.0)
3S/8C	1	11.7	N/A	*12	**20	***(5.4)	***(5.4)
3S/9C	1	12.8	N/A	*12	**22	***(4.8)	***(4.8)

Notes:

1. * Requires one optional battery backup cabinet
2. ** Requires two optional battery backup cabinets
3. ***(value) The value in the parenthesis is the hours of reserve with 24 strings of batteries.

Battery reserve times with 12IR125 batteries for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 site

The following tables provide approximate battery reserve times for outdoor 850 and PCS configurations at existing 1.0/2.0 sites using 12IR125 batteries at typical load conditions.

850/PCS CDMA battery reserve times for 9218 Macro (4.0) as second growth added to an existing 1.0/2.0 sites using 12IR125 batteries							
850 = Up to 8C PCS = UP to 11C		DC Power (kW)	9218 Macro (4.0) backup time (minutes) with 2 internal List 1 battery strings per cabinet	Total number of 24V battery strings for desired reserve times (2 batteries per string) (Does not includes battery strings in the 9218 Macro (4.0) cabinets)			
Sector / Carrier	No. of 9218 Macro (4.0) cabinets	Typical at 25 °C (77 °F)		2 hours	4 hours	6 hours	8 hours
3S/1C	Primary 1.0/2.0 cabinet	2.3	N/A	4	4	*6	*8
3S/2C		3.6	N/A	4	*6	*10	*12
3S/3C		5.0	N/A	*6	*10	*12	*14
3S/4C	Growth 1 1.0/2.0 cabinet	7.2	99	*8	*12	**18	*22
3S/5C		8.5	58	*8	*14	**20	***(7.9)
3S/6C		9.9	39	*10	**18	**24	***(6.6)
3S/7C	1	12.0	29	*12	**20	***(5.2)	***(5.2)
3S/8C	1	13.1	N/A	*12	**22	***(4.7)	***(4.7)
3S/9C	1	14.3	N/A	*14	**24	***(4.2)	***(4.2)
3S/10C	1	15.5	36	**16	***(3.8)	***(3.8)	***(3.8)
3S/11C	1	16.6	30	**16	***(3.5)	***(3.5)	***(3.5)

Notes:

1. * Requires one optional battery backup cabinet
2. ** Requires two optional battery backup cabinets
3. ***(value) The value in the parenthesis is the hours of reserve with 24 strings of batteries.
4. *** Two batteries per string

Battery reserve times with 12IR125 batteries for 9218 Macro (4.0) as growth added to an existing 3.0 site

The following tables provide approximate battery reserve times for outdoor 9218 Macro (4.0) sites using 12IR125 batteries at typical load conditions.

850/PCS CDMA battery reserve times for 9218 Macro (4.0) growth without integrated power at sites using 12IR125 batteries							
850 = Up to 8C PCS = UP to 9C		DC Power (kW)	9218 Macro (4.0) backup time (minutes) with 2 internal List 1 battery strings per cabinet	Total number of 24-v battery strings (two batteries per string) for various reserve times (Does not includes battery strings in the 9218 Macro (4.0) cabinets)			
Sector / Carrier	No. of 9218 Macro (4.0) cabinets	Typical at 25 °C (77 °F)		2 hours	4 hours	6 hours	8 hours
3S/1C	One 3.0 primary cabinet	2.1	N/A	2	4	*6	*6
3S/2C		3.2	N/A	4	*6	*8	*10
3S/3C		4.4	N/A	*6	*8	*10	*14
3S/4C	1	6.5	99	*8	*12	**16	**20
3S/5C	1	7.6	58	*8	*14	**18	**22
3S/6C	1	8.8	39	*10	**16	**20	***(7.7)
3S/7C	1	10	29	*10	**18	**24	***(6.5)
3S/8C	1	11.1	N/A	*12	**18	***(5.7)	***(5.7)
3S/9C	1	12.2	N/A	*12	**20	***(5.1)	***(5.1)

Notes:

1. * Requires one optional battery backup cabinet
2. ** Requires two optional battery backup cabinets
3. ***(value) The value in the parenthesis is the hours of reserve with 20 strings of batteries.

Battery reserve times with SBS-C11 batteries for 9218 Macro (4.0) as first growth added to an existing 1.0/2.0 site

The following tables provide approximate battery reserve times for outdoor 850 and PCS configurations at existing 1.0/2.0 sites using SBS-C11 batteries at typical load conditions.

Each string of batteries consists of six SBS-C11 batteries connected into three parallel circuits. This is designed to fill up each shelf completely; partial filling of a battery shelf is not supported.

850/PCS CDMA battery reserve times for 9218 Macro (4.0) as first growth added to an existing 1.0/2.0 sites using SBS-C11 batteries

850 = Up to 8C PCS = UP to 9C		DC Power (kW)	9218 Macro (4.0) backup time (minutes) with 2 internal List 1 battery strings per cabinet	Total number of 24-V battery strings for desired reserve times (6 batteries per string) (Does not includes battery strings in the 9218 Macro (4.0) cabinets)			
Sector / Carrier	No. of 9218 Macro (4.0) cabinets	Typical at 25 ˚C (77 ˚F)		2 hours	4 hours	6 hours	8 hours
3S/1C	1 existing 1.0/2.0 Mod Cell cabinet	2.3	N/A	2	2	*3	*3
3S/2C		3.6	N/A	2	*3	*4	*5
3S/3C		5.0	N/A	*3	*4	*6	*7
3S/4C	1	7.1	99	*3	*6	*7	**9
3S/5C	1	8.2	58	*4	*6	**9	**11
3S/6C	1	9.4	39	*4	*7	**10	**12
3S/7C	1	10.6	29	*5	**8	**11	**(7.1)
3S/8C	1	11.7	N/A	*5	**9	**12	**(6.3)
3S/9C	1	12.8	N/A	*6	**10	**(5.6)	**(5.6)

Notes:

1. * Requires one optional battery backup cabinet
2. ** Requires two optional battery backup cabinets
3. **(value) The value in the parenthesis is the hours of reserve with 12 strings of batteries

Appendix E: GPS antenna installation

Overview

Purpose

This appendix contains the information needed to install the GPS antenna.

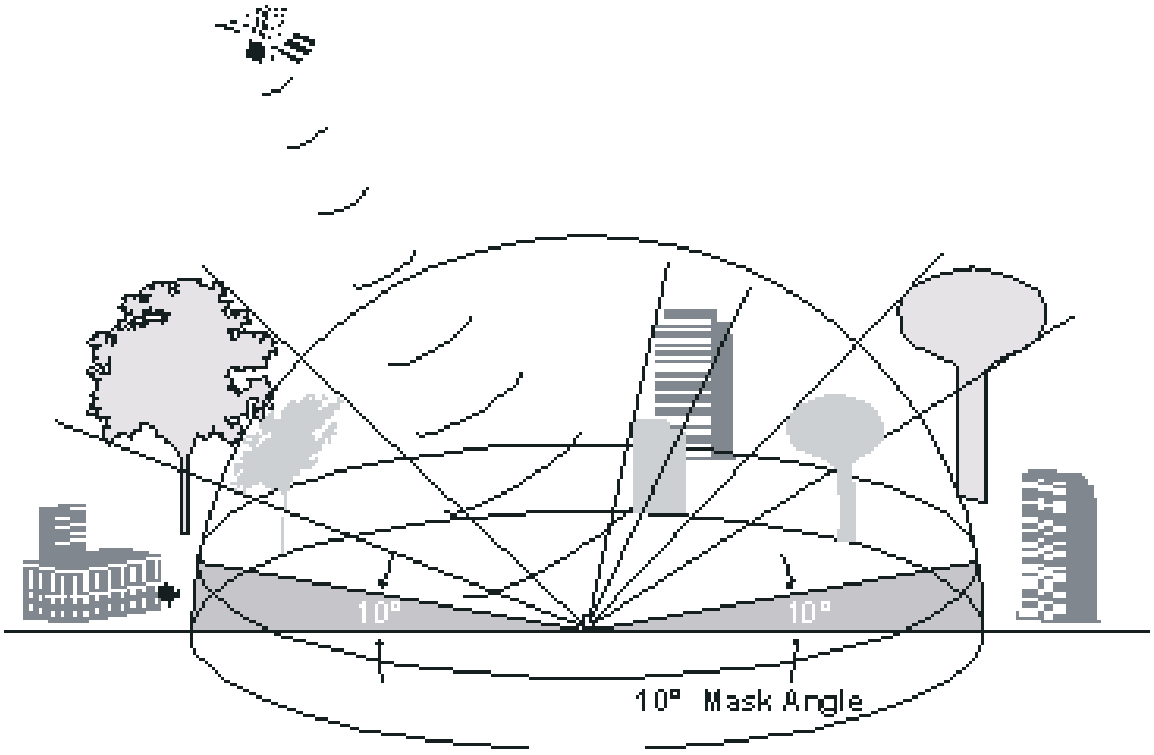
Contents

GPS antenna installation (general)

Site selection

The GPS antenna installation site should be selected such that the maximum aggregate of all blockages above the 10 degree mask angle, such as buildings or mountains, does not exceed 25% of the surface area of a hemisphere around the GPS antenna. This blockage should not be in one contiguous quadrant of the hemisphere. Each contiguously blocked quadrant should be less than 12.5% of the sphere's surface area.

The following diagram shows the mask angle definition for the GPS antenna.



Important! Do not install the GPS antenna directly under structures that may accumulate or shed snow or ice.

It is desirable that the antenna has the clearest view to the south, east, and west in the northern hemisphere and to the north, east, and west in the southern hemisphere.

Obstructions and interference

The following types of obstructions and possible sources of interference need to be considered:

- Hills, mountains, trees and surrounding plant life.
- Adjacent buildings or any large sky obstructing structures such as grain elevators, airplane hangers, bridges, overhead roadways, etc.
- Water towers or any close range large metal objects that could cause excessive sky obstruction.
- Any locations where birds or animals may easily nest or build on or around the antenna.
- Any collocated RF transmission antennas, TV stations, cable television cables, or arc-welding equipment.
- High-voltage lines will not cause interference with GPS signal reception.
- Self-supporting or guyed towers will generally not block the GPS signal.
- Trees do not totally block but rather degrade GPS reception, especially during periods of heavy rain or snow. Consider if increased summer plant life could also become a problem.
- If a GPS antenna is mounted to a monopole antenna mast, it must be mounted a minimum distance (D) from the monopole such that less than 12.5% of a contiguous surface area of a hemisphere around the antenna is blocked by the monopole. The GPS antenna must be spaced a minimum distance D = 1.61 x R (where R is the radius of the monopole at the attachment point of the GPS antenna), from the outside surface of the monopole.

Example:

Monopole radius (inches) R = 12

D = (1.61 x 12)

D = 19.3" minimum

This example assumes, of course, that the monopole is the only obstruction to be considered, and constitutes a contiguous 12.5% blockage of the sky. This condition would constitute a contiguous blockage in one quadrant of the hemisphere.

RF interference considerations

RF interference considerations

The GPS antenna installation site should be chosen such that it is not in a direct radiation pattern of the cell site transmit antennas, and situated such that no other antennas, microwave transmit dishes, and other sources of RF radiation that could affect GPS reception are in close proximity. The GPS antenna should not be located within 10 feet horizontally and 10 feet vertically from any actively transmitting antenna.

Lightning interference consideration

Lightning considerations

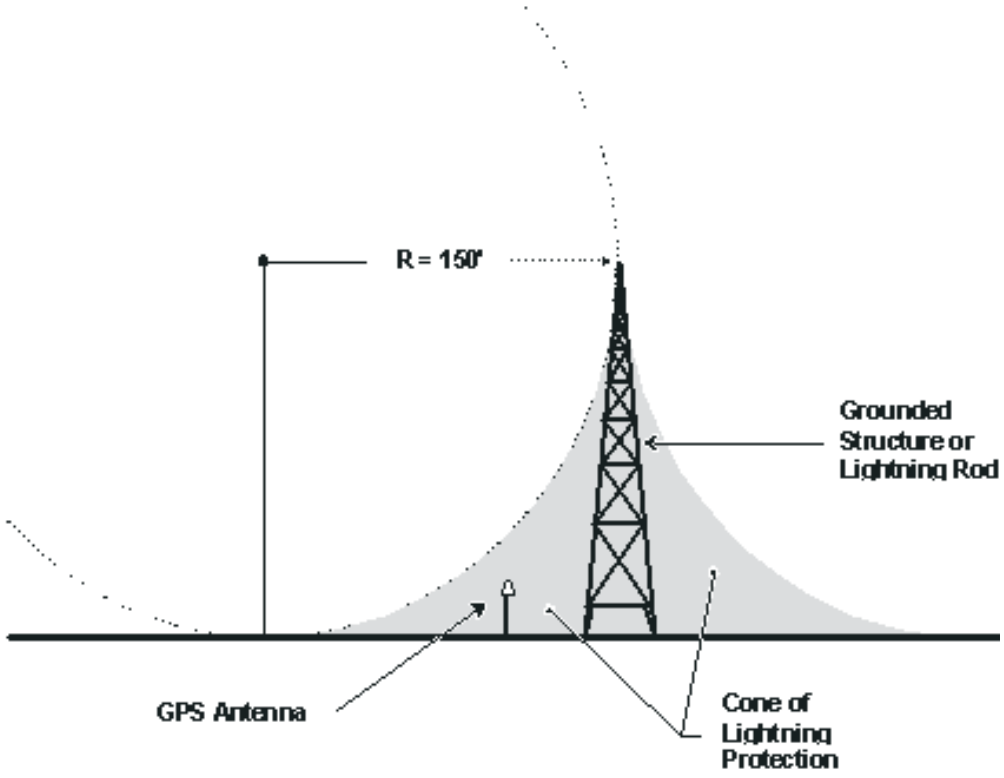
Industry standard practices for lightning protection should be followed for GPS antenna installations. Several sources for such information are:

- *Grounding and Lightning Protection Guidelines for Alcatel-Lucent Network Wireless System Cell Sites,* 401-200-115
- *National Fire Protection Association (NFPA), NFPA 780, Standard for Installation of Lightning Protection Systems*
- *Poly Phaser Corporation "The Grounds"* for lightning protection and grounding solutions for communication sites.

The GPS antenna should be installed such that it is not the highest point in an installation (The GPS antenna must not be a lightning rod). The GPS antenna must be within the "protective cone" (see Figure on the following page) of any grounded structure such as an antenna tower or ancillary lightning rod. The "protective cone" is the area between the circumference of a circle with a 150 foot radius that tangentially touches the ground and the side or top of a grounded structure and the ground or structure.

Protective cone installation

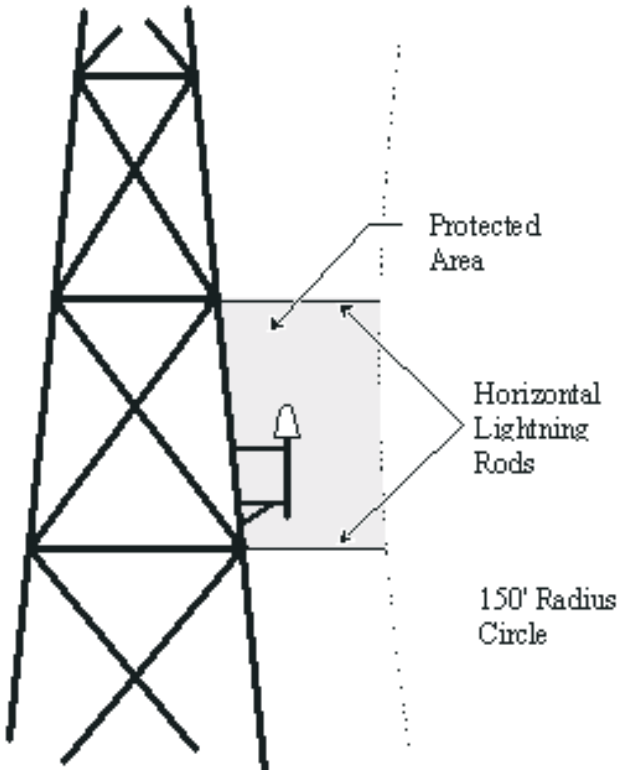
The following diagram shows the GPS antenna installed within the protective cone.



Important! The percentage of protection for the shaded zone is 96%.

Lightning rod installation

If the GPS antenna is mounted to the side of an antenna tower above the 150 foot point, then horizontal lightning rods must be employed such that the antenna is within the area of a 150 foot sphere that touches both lightning rods, as shown in the following diagram.



In addition, the GPS antenna coaxial cable shield shall be bonded at one point minimum near the equipment and/or hatch plate, provided the GPS antenna is installed in the cone of protection using short (less than 60 feet) coaxial cable.

Important! If the coaxial cable run along the tower is more than 60 feet, then the coaxial cable shield shall be grounded at multiple points near the antenna and equipment, at 100 foot intervals.

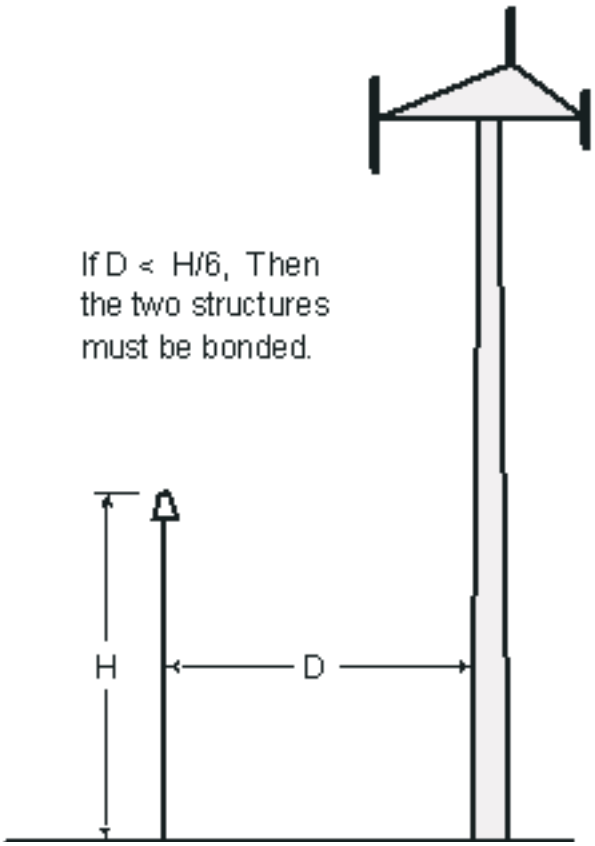
Preventing Arc-over between structures and antenna

If the GPS antenna is mounted on a separate pole or structure of height (H) near an antenna tower or other grounded structure, and the distance (D) from the pole or structure to the tower or other grounded structure is less than the height of the pole divided by six (H/6), then the pole or structure and the antenna tower must be bonded together eliminate possible arc over during a lightning strike.

Example:

If the pole is 50 feet tall, then D=8.3 feet. (50/6 = 8.3).

Refer to the following diagram for more detail.


If D < H/6, Then
the two structures
must be bonded.
H
D

GPS antenna mount kit

General

GPS antenna mount kit are available from Andrews in several forms. The standard mount kit (denoted by the letters MS at the end of the part number) contains two separate kits that can be used together or separately in the installation of the mount. These separate kits are the Collar Bracket Mount Kit (part number 602214) and the L-Bracket Mount Kit (part number 602215). Alternatively, any one of these kits may be installed if the user requires. Remaining mount kit material may be retained for later use.

GPS-QBW-26NMS

The GPS-QBW-26NMS is a self contained GPS antenna and mount kit. The kit includes a right hand circularly polarized antenna that incorporates a 26 dB high performance low noise amplifier as well as mounting hardware to attach the antenna to vertical pipe within a range of diameter.

Pipe diameter

The L-Bracket Mount Kit will attach the GPS antenna onto a customer-supplied vertical pipe of diameter ranging between 3/4" to 1/12".

Important! Before installing any components ensure that the mounting pipe is the correct diameter and free of any components from previous installations.

This kit contains two mounting bracket types. The two brackets can be used together, as the standard mount kit, or separately as the L-Bracket Mount or the Collar Bracket Mount. The three mounting arrangements are covered in the following section.

NOTICE

Equipment Damage

Twisting a cable can damage the cable.

DO NOT TWIST ANTENNA TO ATTACH OR REMOVE CABLE.

Bracket mount kits parts lists

The following table provides description of the mounting kit parts.

Collar Bracket Mount Kit (Part #602214)			
Item #	**Part #**	**Quantity**	**Description**
1a	602186	1	Collar

Collar Bracket Mount Kit (Part #602214)			
Item #	**Part #**	**Quantity**	**Description**
2	602190	1	Gasket
3a	602189	4	#10-32 UNF x 0.5" Captive Screw
4a	9978-78	2	0.25" - 20 UNC-3A x 1.0" Set Screw
5a	9903-7	1	Allen Wrench

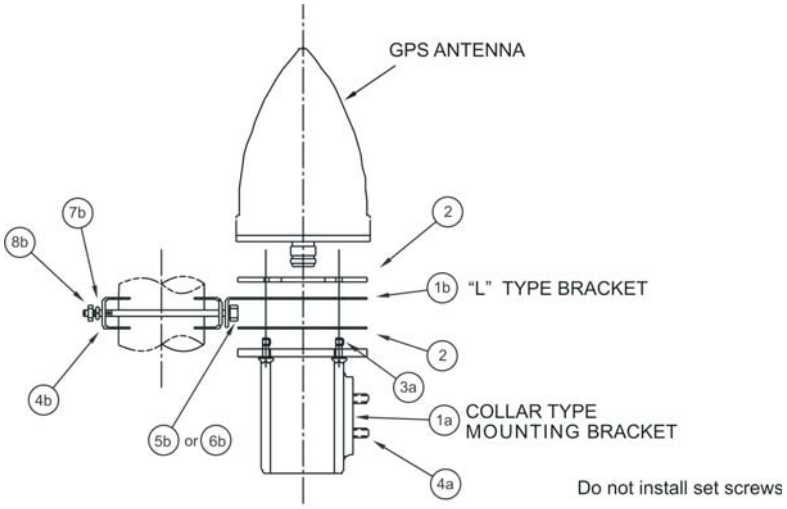
L- Bracket Mount Kit (Part #602215)			
Item #	**Part #**	**Quantity**	**Description**
1b	602187-2	1	L - Bracket
2	602190	1	Gasket
3b	9845-2	4	#10-32 UNF x 0.312" Screw
4b	726042	2	Cleat
5b	9963-131	2	0.25" - 20 UNCx2.5" Hex Head Cap Screw
6b	9963-256	2	0.25" - 20 UNCx3.25" Hex Head Cap Screw
7b	9974-15	2	0.25" Lockwasher
8b	9999-57	2	0.25" - 20 Hex Nut

GPS antenna mounting instructions

Standard mount kit

Perform the following steps and refer to the following diagram to mount the GPS antenna. (See "Bracket mount kits parts lists" (p. E-9) on the previous page for part's description).

1 Attach L-Bracket, Item 1b, to customer-supplied vertical pipe using bolts (Items 5b or 6b to suit) and Items 4b, 7b and 8b. Locate in desired position.



STANDARD MOUNT ASSEMBLY

2 Tighten 0.25 inch hardware.

3 Insert the cable assembly, fitted with N male connector, through the Collar, Item 1a, and Gasket, Item 2. Install Captive Screws, Item 3a. Do not install set screws, Items 4a, for this configuration.

4 With Gasket, Item 2, on top of the L- Bracket, insert cable assembly through L-Bracket and Gasket. Attach the cable assembly to the GPS antenna and tighten the connector as required.

5 Slide the Collar and Gasket up to the antenna and attach to the antenna by pushing through the four Captive screws through the Gaskets and tighten them into the antenna base.

6 Install weatherproofing that extends from directly underneath the flange on the collar bracket to at least 3 inches below the bottom of the collar measured on the cable assembly. The unused set screw holes will be covered.

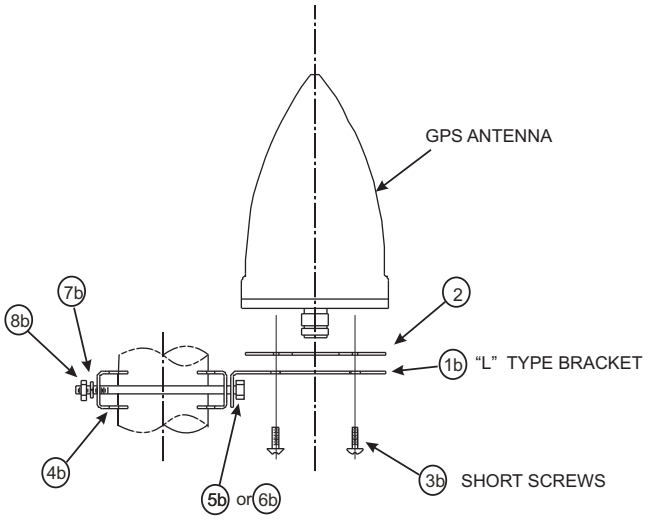
Important! Weatherproofing is not provided with this kit.

END OF STEPS

L-bracket mount kit

Perform the following steps and refer to the following diagram to mount the GPS antenna.

1 Attach L-Bracket, Item 1b, to customer-supplied vertical pipe using bolts (Items 5b or v 6b to suit) and Items 4b, 7b and 8b. Locate in desired position.



"L" - BRACKET MOUNT

2 Tighten 0.25 inch hardware.

3 With a Gasket, Item 2, on top of the L-Bracket, insert cable assembly through L-Bracket and Gasket. Attach the cable assembly to the GPS antenna and tighten the connector as required.

4 Insert the four short, Item 3b, screws through the L-Bracket and Gasket and attach antenna and tighten screws. Do not use the Captive Screws for this configuration.

5 Install weatherproofing that extends at least 2 inch below the bottom of the connector on the cable assembly to directly underneath the base plate of the antenna.

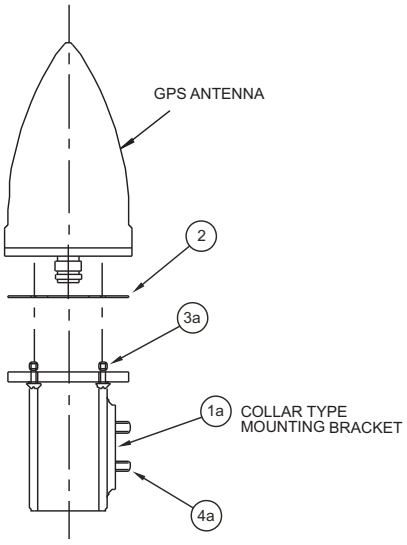
Important! Weatherproofing is not provided with this kit.

END OF STEPS

Collar mount kit

Perform the following steps and refer to the following diagram to mount the GPS antenna.

1 Install Captive Screws, Item 3a, and Set Screws, Item 4a, in Collar, Item 1a, then push



COLLAR MOUNT BRACKET

Captive Screws, Item 3a, through Gasket, Item 2, holes in order to retain Gasket.

2 Insert the cable assembly fitted with N male connector through the customer-supplied vertical mounting pipe, and Collar and Gasket assembly previously prepared.

3 Attach cable assembly to the GPS antenna and tighten connector as required.

4 Attach Collar and Gasket assembly to antenna and tighten Captive Screws, Item 3a, into antenna base.

5 Slide assembly down so that the Collar slides over the mounting pipe. Tighten Set Screws, Item 4a.

6 Install weatherproofing that extends from directly underneath the flange on the collar bracket to at least 3 inches below the bottom of the collar measured on the cable assembly.

Important! Weatherproofing is not provided with this kit.

END OF STEPS

Active GPS antenna Standard Wave Ratio (SWR) test

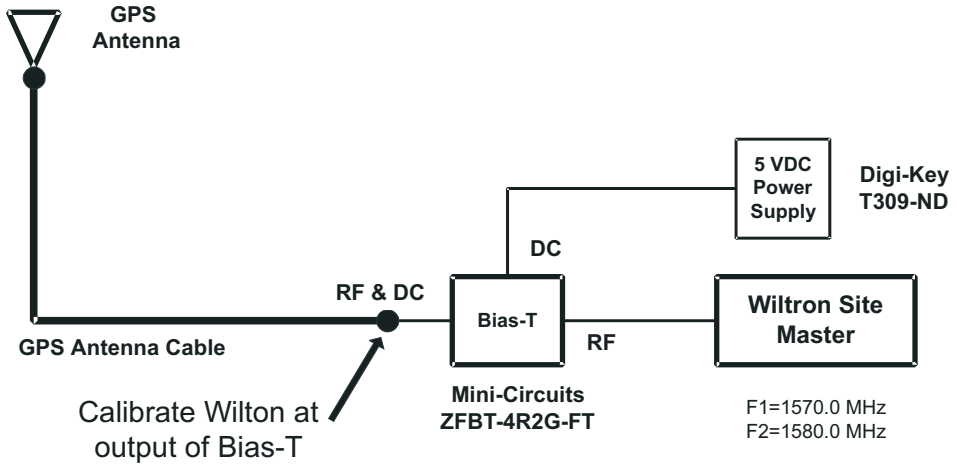
SWR test

The RF signals from the GPS satellites are extremely low-level microwave signals that must reach the RFTG with minimal distortion and loss. To verify the RF integrity of the complete antenna and cable system, a Standing Wave Ratio (SWR) or Distance-to-Fault (DTF) test should be performed.

Since the GPS antenna is an active device, a standard SWR or DTF test setup cannot be used. A Bias-T must be employed to inject +5 VDC into the RF line to power the antenna's Low Noise Amplifier (see Figure below).

Important! The antenna will meet it's specified SWR only when powered in this way.

Calibrate the Wiltron as shown and per the manufacturer's instructions. Perform the SWR or DTF measurement as shown and per the manufacturer's instructions. Record the MAX SWR indicated and/or DTF data. If it MAX SWR is greater than 2.5, the fault must be repaired and the antenna and cable retested.



Antenna SWR spec.
MAX SWR = 2.5 (7.4 dB return loss)

Digi-Key (800) 344-4539
Mini-Circuits (800) 654-7949

Appendix F: Intelligent Antenna loss measurements

Overview

Purpose

This appendix provides guidance on measurements that are needed when preparing a site for a cell that will utilize the Intelligent Antenna Feature for one or more sectors. Following these guidelines and carefully marking the RF cables as described in the site preparation guidelines will help to insure a smooth introduction of the IA feature.

Contents

Background

Overview

This appendix provides supplementary information regarding site preparation for cells that utilize the IA Feature (FID-8859.6, FID-8869.9, or FID-8859.13),

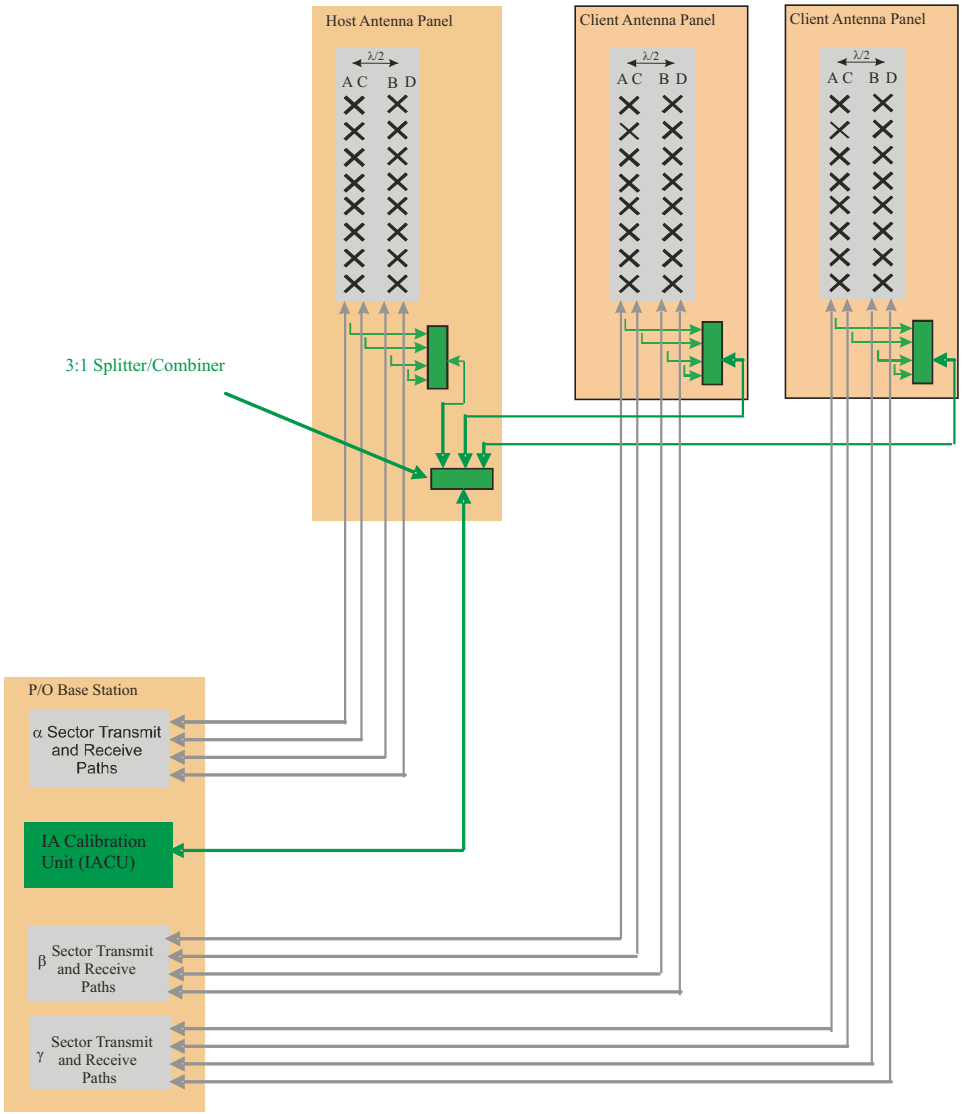
The IA feature uses four transmission paths for each IA-enabled sector and includes a continuously running background calibration process. In addition, the IA feature uses special antenna panels that are only available from Kathrein Scala Company. There are two types of IA antenna panels available from Kathrein Scala – a “host” antenna panel, and a “client” antenna panel. The only difference between the two panels is that the host antenna panel includes a 3:1 combiner/splitter inside the radome, and two additional connectors are included on the bottom of the panel. Typically, client antenna panels are connected to the host antenna panel, and a single calibration cable is brought back to the base station as shown in the following diagram.

Purpose

The purpose of this appendix is to describe measurements that should be made during the installation of IA antenna panels to insure that the IA feature will work properly when the base station is installed, and the feature is enabled. All measurements should be made using a CDMA signal near the center frequency of the 3G1X carriers that will be used with the IA feature.

Connections

The following diagram shows the IA Antenna and Calibration Connections.

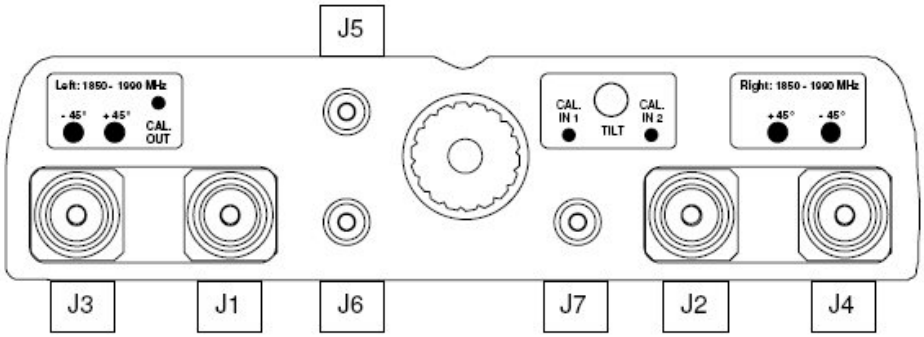


The IA background calibration process is sensitive to different losses in the four transmission paths for a sector, and to differences in losses of the transmission paths among sectors. In order to insure a successful introduction of the IA feature, installation of the antenna panels should include measurements of each of the RF paths to the calibration cable, and the losses should be equalized to within 2 dB. The measurements that must be taken are explained in greater detail in this Appendix.

Bottom view

A bottom view of an IA host antenna panel is shown in the following diagram. The client antenna panel is similar, but does not include the N-type connectors that are designated as J6 and J7 in the following diagram.

The following diagram shows the bottom view of the Host Antenna Panel showing port designations



Port Designation	Signal	Type
J1	Left Column, +45° polarization	7/16 Din - Female
J2	Right Column, +45° polarization	7/16 Din - Female
J3	Left Column, – 45° polarization	7/16 Din - Female
J4	Right Column, –45° polarization	7/16 Din - Female
J5	Calibration (Client + Host)	N-Female
J6	Calibration (Host)	N-Female
J7	Calibration (Host)	N-Female
P1	Interface Cable AISG1: Issue 1.1 section 6.2.1- Multi-pole connector	8-pin circular (IEC 60130-9 -Ed. 3.0 with screw-ring locking)

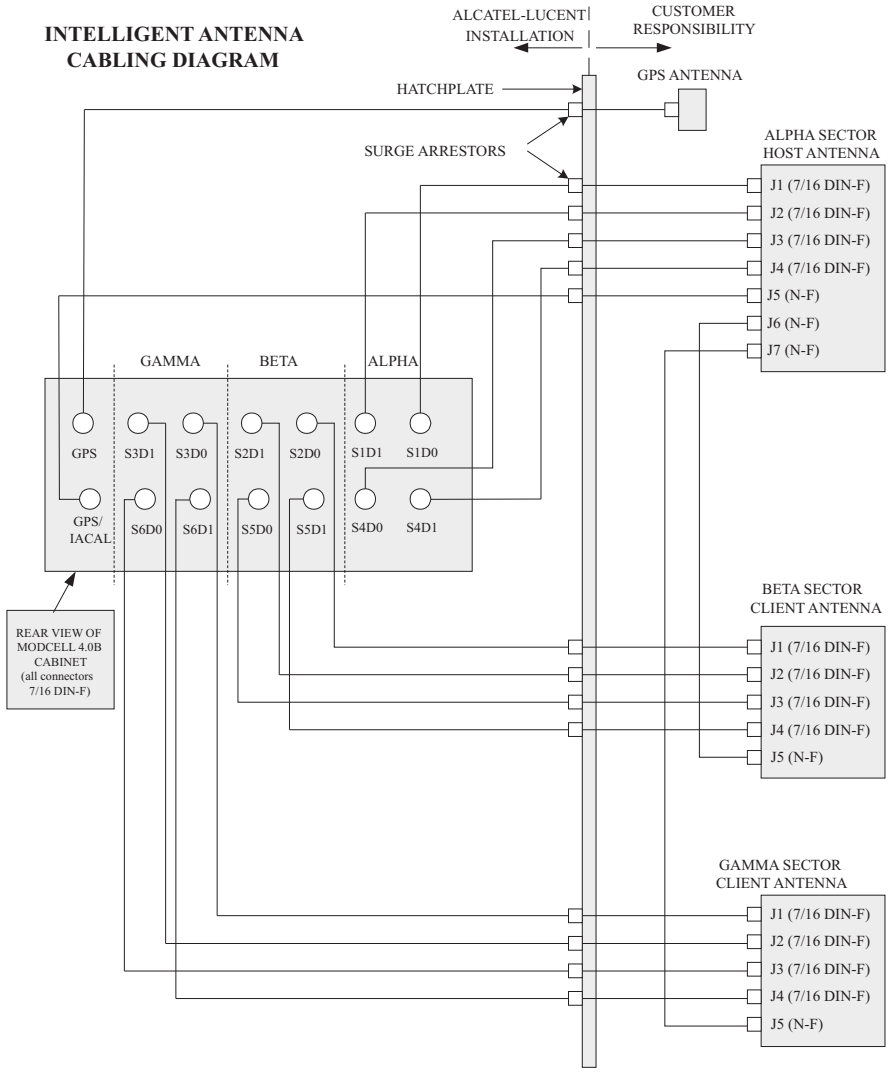
The port designations of J1 – J7 will be used in the remainder of this document to refer to the connectors on the bottom of the antenna panel.

Measurements with host and client antennas

Overview

An overview of the interconnection of a three sector outdoor cell with IA antenna panels is shown in the following diagram. In this case, the host antenna is shown on the alpha sector, but, depending on the configuration (see the example calculations later in this Alert), the drawing could be modified to show the host IA antenna panel on one of the other sectors.

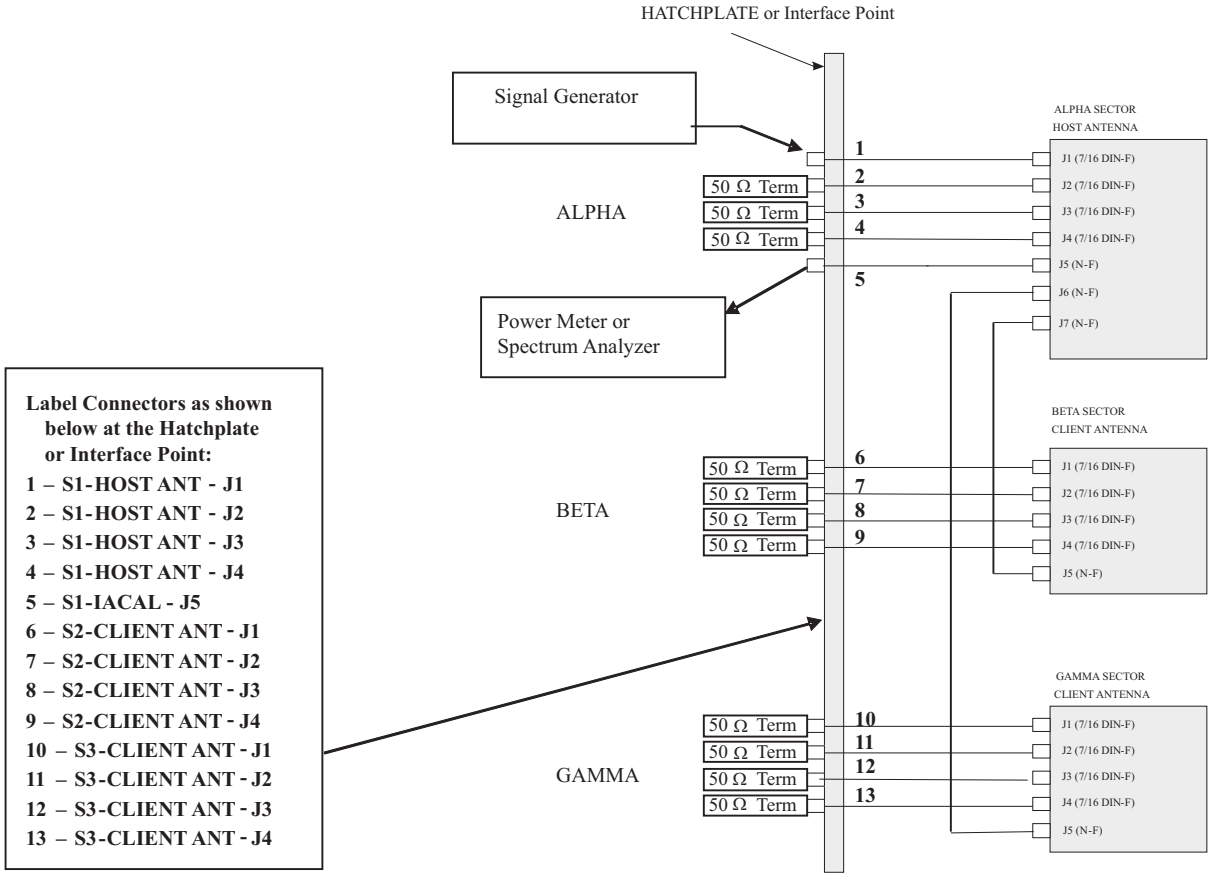
The following diagram shows the interconnection of outdoor 9228 Macro (4.0B) to Intelligent Antenna host and client antenna panels



Setup for measurements

The following diagram shows the setup for measurements that must be made from the point where RF cables and the IA calibration cable terminate at a hatchplate or other interface point. This diagram can be modified as needed if the host antenna panel is on a sector other than the alpha sector, or if there are fewer than three IA-enabled sectors on the base station.

The following diagram shows the measurement setup for Intelligent Antenna cable loss measurements with host and client antennas



Measurement procedure

In the measurement procedure that follows, a CDMA signal should be used that falls near the center frequency of the carriers that will be used with the IA feature. The procedure to be used for the measurements is as follows:

1 Attach signal generator to S1-HOST ANT-J1 and power meter to IACAL-J5, as shown. Unused ports (S1-HOST ANT-J2, J3, and J4, S2-CLIENT ANT-J1, J2, J3, and J4, and S3-CLIENT ANT-J1, J2, J3, and J4) of the antenna feeders should be terminated with 50 Ω.

2 Record measurement. Move signal generator successively to ports S1- HOST ANT-J2[1], J3[1], and J4[1], and record power at IACAL-J5

3 Move the signal generator to port S2-CLIENT ANT-J1[1], insure that all ports of the antenna feeders for sectors 1 and 3 are terminated, and record measured loss. Measure ports of antenna for sector 2 and record. This will include ports S2-CLIENT ANT-J1[1], J2[1], J3[1], AND J4[1].

4 Move the signal generator to port S3-CLIENT ANT-J1[1], insure that all ports of the antenna feeders for sectors 1 and 2 are terminated, and record measured loss. Measure ports of antenna for sector 3. This will include ports S3-CLIENT ANT-J1[1], J2[1], J3[1], AND J4[1].

All path loss measurements should fall between 42 and 67 dB, and the difference between the highest and lowest losses should be no more than 2 dB. A sample table that can be used to record the measurement results is shown in the following table. These measurements and any necessary loss balancing should be completed as part of the antenna installation.

Important! Some test sets will perform a direct loss measurement and provide a path loss reading. In that case, just enter the path loss in the right hand column.

1. Unused ports of the antenna feeders should be terminated with 50 Ω termination during each measurement.

END OF STEPS

Table for Recording Antenna Cable Loss Measurements

Sample table for recording Antenna Cable loss measurements

Signal Generator on Port	Injected Signal Level (dBm)	Measured Signal Level at Port 5 (dBm)	Path Loss (Injected Signal minus Measured Signal) (dB)
1 (S1-Host Ant-J1)			
2 (S1-Host Ant-J2)			
3 (S1-Host Ant-J3)			
4 (S1-Host Ant-J4)			
6 (S2-Client Ant-J1)			
7 (S2-Client Ant-J2)			
8 (S2-Client Ant-J3)			
9 (S2-Client Ant-J4)			
10 (S3-Client Ant-J1)			
11 (S3-Client Ant-J2)			
12 (S3-Client Ant-J3)			
13 (S3-Client Ant-J4)			

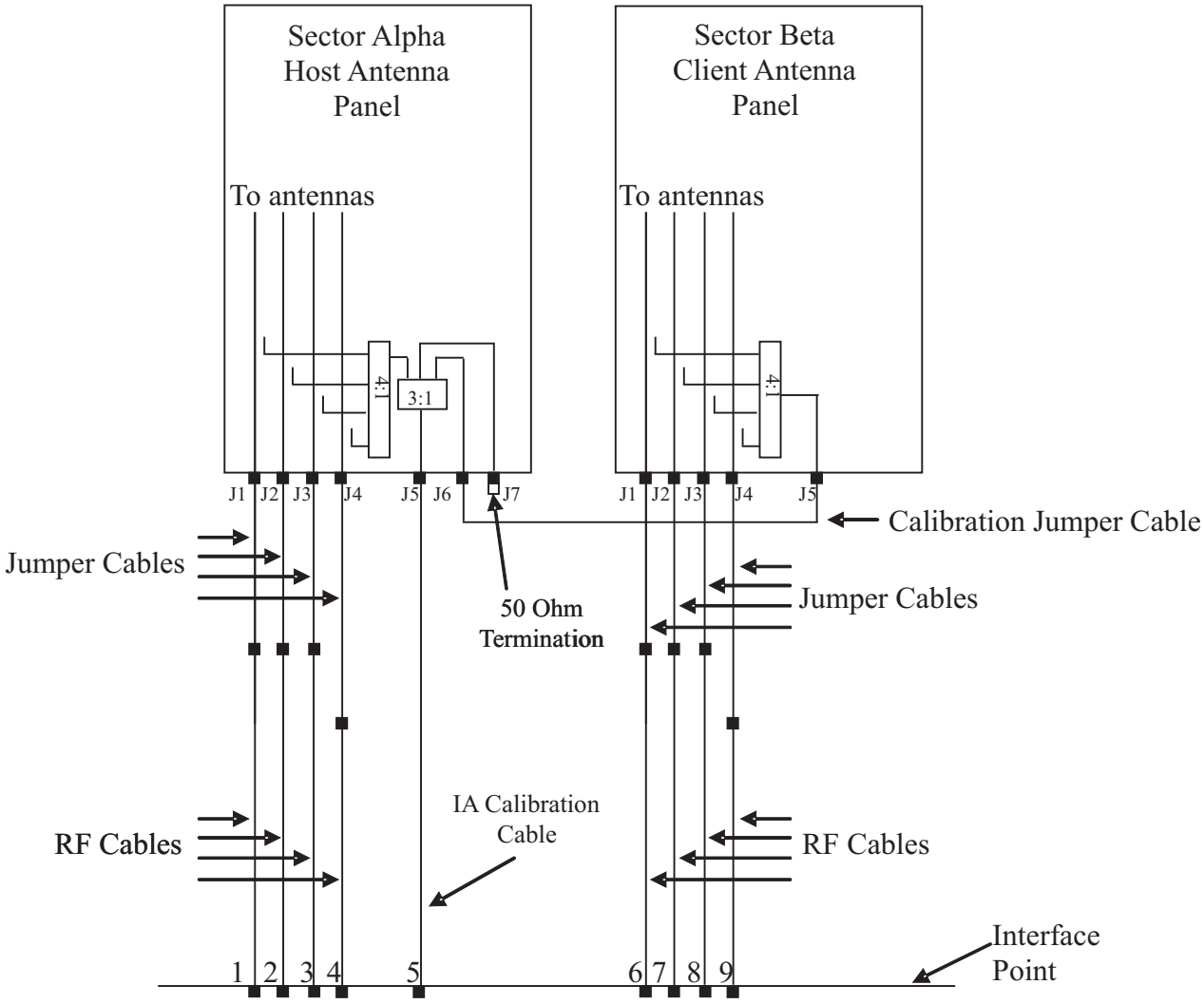
Sample Calculations

Factors that must be accommodated

In order to demonstrate the factors that must be accommodated in the layout of cables and the antennas, the following example is provided.

Assume that we have a cell with two IA enabled sectors, and that the antenna configuration for the IA sectors are as shown in the following diagram.

The following diagram shows example connections for loss calculations



Assumptions

These example calculations assume the following:

1. Assumed Cable Losses (note that these losses are typical for PCS frequencies)
   a. ½ Inch jumper cables – 0.033 dB/foot
   b. 7/8 Inch cable – 0.019 dB/foot (not used in this example)
   c. 1-5/8 Inch cable – 0.011 dB/foot
2. The eight RF Cables in Figure 8 are 1-5/8 inch cable
3. The nine jumper cables (including the calibration jumper cable) are ½ inch cable.
4. The IA calibration cable is ½ inch cable.

Cable lengths

Assume the lengths for the cables shown in the above diagram are as shown in the table below.

Table 1. Example Cable Lengths in Feet

	RF Cable	Jumper Cable
Port 1	120	15
Port 2	120	15
Port 3	120	15
Port 4	135	25
Port 6	130	15
Port 7	130	15
Port 8	130	15
Port 9	140	20
Port 5 (IA calibration cable)		135
Calibration Jumper Cable		30

Expected losses

A sample calculation for the expected losses from port 1 to port 5 at the interface point is shown in table below.

Table 2. Example Calculation of Loss from Port 1 to Port 5

Path from Port 1 to Port 5	Length (feet)	Loss per foot (dB)	Cable Loss (dB)	Connector Loss (dB)	Total Loss (dB) [1]
RF cable	120	0.011	1.3	0.5	1.8
Jumper	15	0.033	0.5	0.5	1.0
Coupler in Antenna Panel + 4:1 Combiner					37
3:1 Combiner					5.2
IA Calibration Cable	135	0.033	4.5	0.5	5.0
Calculated Loss					50.0

Notes:

1. Connector loss of 0.5 dB is added to each cable loss

Loss calculations

Similarly, the loss from port 8 to port 5 can be calculated as shown in the following table. The calculation is similar, but now, the loss of the calibration jumper cable must also be included.

Table 3. Example Calculation of Loss from Port 8 to Port 5

Path from Port 8 to Port 5	Length (feet)	Loss per foot	Cable Loss (dB)	Connector Loss (dB)	Total Loss (dB)
RF cable	130	0.011	1.4	0.5	1.9
Jumper	15	0.033	0.5	0.5	1.0
Coupler in Antenna Panel + 4:1 Combiner					37
Calibration Jumper Cable	30	0.033	1.0	0.5	1.5
3:1 Combiner					5.2
IA Calibration Cable	135	0.033	4.5	0.5	5.0
Calculated Loss					51.6

Remaining calculations

The example calculations shown above were repeated for the remaining paths. The example results are shown in the following table.

Table 4. Results of Example Calculations for all Ports

Port	1	2	3	4	6	7	8	9
RF Cable Loss	1.8	1.8	1.8	2.0	1.9	1.9	1.9	2.0
Jumper Cable Loss	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.2
Antenna Coupler Loss + 4:1 Combiner Loss	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0
Calibration Jumper Loss	0.0	0.0	0.0	0.0	1.5	1.5	1.5	1.5
3:1 Combiner Loss	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
IA calibration Cable Loss	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total Loss	50.0	50.0	50.0	50.5	51.6	51.6	51.6	51.8
Minimum	50.0							
Maximum	51.8							
Max Differential	1.8							

Since the maximum differential predicted for the losses from ports 1,2,3,4, 6, 7, 8, and 9 to port 5 is 1.8 dB (which is less than the 2 dB requirement), the system is expected to function properly. As indicated previously, the predictions should be verified by measurements.

If the maximum differential loss was greater than 2 dB, the use of a larger diameter calibration jumper cable between the host antenna and the client antenna panel (e.g., 7/8 inch cable) could be evaluated. For example, if the 30 foot calibration jumper cable was 7/8 inch cable, then its loss would be 30 feet times 0.019 dB/foot plus 0.5 dB for connector loss or 1.1 dB instead of 1.5 dB in the above example.

Appendix G: Power and Battery Engineering Rules for 9228 Macro (4.0B)

Overview

Purpose

This appendix contains a copy of the document *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR, which is the primary source for power requirements and battery backup information for the 9228 Macro (4.0B).

Contents

Engineering Rules Document

Description

The remaining pages of this appendix are the pages of the *Power & Battery Engineering Rules for Alcatel-Lucent CDMA Modular Cell 4.0B,* ER_0102_0004_PWR.

Appendix H: Product conformance statements

Overview

Purpose

This section presents the product conformance statements that apply to the 9218/9228 Macro cabinet.

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

Canada

Introduction

The statements that follow are the product conformance statements that apply to the 9218/9228 Macro cabinet when deployed in Canada.

Industry Canada

ICES-003: Interference-Causing Equipment Standard Digital Apparatus

This Class A digital apparatus complies with Canadian ICES-003.

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

IC CS-03: Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility

This product meets the applicable Industry Canada technical specifications.

RF approval

RSS-132: Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz

The term “IC” before the certification/registration number only signifies that the Industry Canada technical specifications were met.

RSS-133: PCS Radio Standards Specifications

The term “IC” before the certification/registration number only signifies that the Industry Canada technical specifications were met.

Product safety conformance

The 9218/9228 Macro cabinet is Safety Certified ITE by Underwriters Laboratories (UL) and UL Canada.

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

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

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

Antenna exposure

Antenna installations for the 9218/9228 Macro cabinet 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.

Human exposure

Pursuant to Health Canada Safety Code 6, Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, all installations must be evaluated against the Maximum Exposure Limits as described in Chapter 2, Health Canada 99-EHD-237.

Optical transmitters

Alcatel-Lucent declares that 9218/9228 Macro cabinet complies with the International Electrotechnical Commission (IEC) standards IEC 60825-1 Edition 2.0 (2007) and IEC 60825-2 Edition 3.1 (2007). It is a Class I/1 laser optical fiber communication systems "product" under the IEC classifications.

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

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, please contact the Alcatel-Lucent Services - Environmental Health and Safety organization. For installations not performed by Alcatel-Lucent Technologies, please contact the Alcatel-Lucent Customer Support Center at:

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

European Union

Introduction

The statements that follow are the product conformance statements that apply to the 9218/9228 Macro cabinet bearing the CE Marking and when deployed in the European Union.

Declaration of Conformity for radio and telecommunication terminal equipment under the scope of Directive 1999/5/EC

Hereby, Alcatel-Lucent declares that the equipment documented in this publication is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

The technical documentation as required by the Conformity Assessment procedure is kept at the Alcatel-Lucent location which is responsible for this product. For more information please contact your local Alcatel-Lucent Customer Service Organization.

CE marking

This product has been CE-marked in accordance with the following European Directive:

- Radio and Telecommunication Terminal Equipment (R&TTE) 1999/5/EC

EMC and radio spectrum compliance for the 850 MHz product

The equipment complies with the following EMC and radio spectrum specifications:

- EN 300 339 V1.1.1 (1998-06)
- ETSI EN 301 489-1 V1.6.1 (2005-09)
- ETSI EN 301 489-26 V2.3.1 (2005-07)
- ETSI EN 301 908-1 V2.2.1 (2003-10)
- Code of Federal Regulations FCC part 24(E)
- IS 3GPP2 - C.S0010-B

Product safety conformance

The equipment complies with the following product safety specifications:

- EN 60950-1:2001
- EN 60215:1989

Telecommunications Standards

The equipment complies with the following telecommunication specifications:

- Technical Basis Regulation TBR 13

Antenna exposure

Antenna installations for the 9218/9228 Macro cabinet 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

- European Council Recommendation 1999/519/EC “On the limitation of exposure of the general public to electromagnetic fields” dated 12 July 1999 and
- ICNIRP (International Commission on Non-Ionising Radiation Protection) “Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields”,

all installations must be evaluated against the Reference Levels, and if necessary exclusion zones for public and installation workers defined.

The following information on Alcatel-Lucent supplied equipment is available from customer representatives:

- Output power and antenna characteristic, if the product is equipped with an integral antenna.
- A detailed description of at least one typical normal configuration, including antenna system (feeders, connectors, combiners, antennas etc.), if the product is intended to be used with external antennas.
- Limit distances for general public and occupational exposure. If the product is intended for use with external antennas, limit distances shall be given for the given typical system configurations.
- Information how to specify exposure levels and limit distances for any optional system configuration not specified in detail.
- Information on how to install the equipment/system or the external antennas in order to ensure that the separation between the radiating antenna and general public are exceeding the maximum allowed distances.

Information on the methodology used for the determination of RF safety compliance distances and exclusion zones, and the results of the compliance evaluation shall be available for inspection by officials of the governing authorities.

Optical transmitters

Alcatel-Lucent declares that 9218/9228 Macro cabinet complies with the CENELEC standards EN 60825-1 Edition 1994 and its amendment 1 (2002) and amendment 2 (2001) and EN 60825-2 Edition 2004. It is a Class I/1 laser optical fiber communication systems "product" under the IEC classifications.

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

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, please contact the Alcatel-Lucent Services - Environmental Health and Safety organization. For installations not performed by Alcatel-Lucent Technologies, please contact the Alcatel-Lucent Customer Support Center at:

Technical Support Services, from all other countries: +1 630 224 4672, prompt 2

Recycling / take-back / disposal of product

Electronic products and batteries bearing or referencing the symbols shown below when put on the market within the European Union, shall be collected and treated at the end of their useful life, in compliance with applicable European Union and local legislation. They shall not be disposed of as part of unsorted municipal waste. Due to materials that may be contained in the product and batteries, such as heavy metals, the environment and human health may be negatively impacted as a result of inappropriate disposal.

Note 1: For electronic products put on the market in the European Union, a solid bar under the crossed-out wheeled bin indicates that the product was put on the market after 13 August 2005.

Note 2: For batteries put on the market in the European Union, a chemical symbol Hg (mercury), Cd (cadmium), or Pb (lead), or a combination of those symbols, beneath the cross-out wheeled bin indicates that the battery contains the corresponding heavy metals.

Moreover, in compliance with legal requirements and contractual agreements, where applicable, Alcatel-Lucent will offer to provide for the collection and treatment of Alcatel-Lucent products bearing the logo at the end of their useful life, or products displaced by Alcatel-Lucent equipment offers.

For information regarding take-back, recycling, or disposal of equipment by Alcatel-Lucent or for equipment take-back requests, visit the Alcatel-Lucent Take-Back web page *(http://www.alcatel-lucent.com/product_takeback)*, or contact Alcatel-Lucent Takeback Support at takeback@alcatel-lucent.com. For technical information on product treatment, consult the Alcatel-Lucent Recycling Information web page *(http://www.alcatel-lucent.com/product_recycling)*

Material content compliance

European Union (EU) Directive 2002/95/EC, "Restriction of the use of certain Hazardous Substances" (RoHS), restricts the use of lead, mercury, cadmium, hexavalent chromium, and certain flame retardants in electrical and electronic equipment. This Directive applies to electrical and electronic products placed on the EU market after 1 July 2006, with various exemptions, including an exemption for lead solder in network infrastructure equipment. Alcatel-Lucent products shipped to the EU after 1 July 2006 comply with the EU RoHS Directive.

United States

Introduction

The statements that follow are the product conformance statements that apply to the 9218/9228 Macro cabinet 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 A (as marketed)

Important! This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protections against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's expense.

FCC Part 15 Class B (as marketed)

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

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

FCC Part 68

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

- FIC 04DU9-1SN
- SOC 6.0N

The T1 network interface on this equipment is hard wired to a punch down block , which meets the FCC specifications.

If this equipment 9218/9228 Macro cabinet causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. However, if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

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

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

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

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

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

RF approval

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

This device complies with Part 22 - Public Mobile Services, Subpart H - Cellular Radiotelephone Services

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

This equipment complies with Part 27 - Miscellaneous Wireless Communications Services

FDA/IEC optical transmitter product compliance

Alcatel-Lucent declares that 9218/9228 Macro cabinet 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.

Product safety conformance

The 9218/9228 Macro cabinet is Safety Certified ITE by Underwriters Laboratory (UL) and UL Canada.

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

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

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

Antenna exposure

Antenna installations for the 9218/9228 Macro cabinet 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.

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, please contact the Alcatel-Lucent Services - Environmental Health and Safety organization. For installations not performed by Alcatel-Lucent Technologies, please contact the Alcatel-Lucent Customer Support Center at:

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

Material content compliance

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

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

For California:

Perchlorate Material - special handling may apply.

See *http://www.dtsc.ca.gov/hazardouswaste/perchlorate/*

Glossary

Numerics

12IR125 Battery

A type of battery designed to withstand the rigors of harsh environments and uncontrolled temperatures.

12IR145 Battery

A type of battery designed to withstand the rigors of harsh environments and uncontrolled temperatures.

850 CDMA

CDMA technology in the Cellular frequency band (824-894 MHz).

A

A (Ampere)

Base SI unit of electrical current.

AC (Alternating Current)

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

AC convenience outlet

Modular Cell sites must be equipped with at least two duplex outlets for installation and maintenance procedures. These outlets, known as AC convenience outlets, are required to power test the equipment and installation tools.

For NAR installations, this convenience outlet is provided in the 9218/9228 Macro Outdoor Cabinets.

ACF (AC Fail)

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

Ambient temperature

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

ANSI (American National Standards Institute)

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

Antenna

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

AP (Application Processor)

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

AWG (American Wire Gauge)

American standard for classifying wire diameter.

B

Backup

Facility used to replace an element which has failed.

Balun (Balanced to Unbalanced)

A device used to couple a balanced device or line to an unbalanced device or line.

Base station

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

BD (Battery on Discharge, first stage)

The batteries on Discharge (BD) alarm indicates the power system output voltage has decreased bellow the batteries on discharge threshold set point. The batteries on discharge threshold shall be set for 25.0 volts.

BD-2 (Battery on Discharge -2)

The batteries on Discharge (BD-2) alarm indicates the power system output voltage has decreased bellow the batteries a second discharge threshold set point. The batteries on a second discharge threshold shall be set for 22.0 volts.

Bonding

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

Branch circuit

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

Breaker, circuit

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

Buried cable

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

Buried ring ground

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

Bus bar

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

Busy hour

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

C

Cabinet

An enclosure with frame and door designed for surface or flush mounting, housing electrical and/or electronic equipment.

Cable entry assembly

Weather resistant protection for GPS and RF jumper cables.

Cable run

Referring to cable routing.

Cable sweep

(See Sweep)

Carriers

A wave suitable for modulation by an information-bearing signal.

CDMA (Code Division Multiple Access)

A digital technology that assigns each active call a unique pseudonoise code that is used by the system to distinguish a call from all other calls occupying the same CDMA carrier band.

Cell

A geographical area, usually depicted as hexagon-shaped, that is served by a cellular system. Cellular technology is based on the premise that a group of radio frequencies used within one cell can be used again in a distant cell.

Cell site

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

CIC (Customer Information Center)

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

Circuit

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

transistors, and power sources connected together in one or more closed loops.

Coaxial cable

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

Configuration

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

Controlled environment

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

CSA (Canadian Standards Association)

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

CSC (Cell Site Configuration)

Sheets provided in Appendix A, "9218/9228 Macro - Outdoor site preparation checklists" for documenting cell site configuration, conditions, and other pertinent information for reference during product deployment, and future additions.

Customer-supplied power system

A power system that was not supplied by Alcatel-Lucent.

D

dB (Decibel)

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

DC (Direct Current)

Current flow in one direction.

DCS (Digital Cellar Switch)

Switch that terminates all voice trunks in the cellular system (i.e., 5ESS-2000).

Demarcation

A terminal acting as a physical interface between equipment which are the responsibilities of different carriers.

Diversity

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

Down conductor

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

Drip loop

A cable which has been curved with the arc facing the ground to prevent water from flowing to the connectors at either end of the cable. When it rains, the water drips from the lowest point of the curve towards the ground.

Driven ground rod

A copper-clad steel or stainless steel rod, a minimum of 8'0" long and 5/8" in diameter.

DS0 (Digital Signal-level 0)

The basic channel in the digital hierarchy, DS0 consists of digital signal of 64 kbps.

DS1 (Digital Signal-level 1)

A level of digital hierarchy that transmits a time multiplexed signal that contains 24 DS0 channels. A DS1 channel 1.544 Mbps. Also referred to as a T1 facility or span.

Dual band cabinet

A dual band cabinet is a growth cabinet in which one or more of the carriers are of a different band than the carriers in the primary cabinet.

E

E1

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

Earthquake zone

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

ECP (Executive Cellular Processor)

An Alcatel-Lucent 3B21D computer and its associated input/output devices, which controls system operations. The ECP is responsible for mobility management, call processing, system maintenance, technical interfaces, and system integrity.

EFIM (Enhanced Facility Interface Module)

EFIT (Enhanced Facility Interface Tray)

Electrolytic ground electrode (rods)

A low resistance grounding rod (pipe) using low resistivity materials.

Exothermic weld

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

F

FA (Fuse Alarm)

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

Facility

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

FCC (Federal Communications Commission)

A group founded in 1934 to regulate all types of communications in the United States.

Float

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

Frequency

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

Fuse

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

G

Gain

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

Garmin 45XLS

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

GFCI (Ground Fault Circuit Interrupter)

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

GPS (Global Positioning System)

A system of 24 satellites that provides, among other things, extremely accurate timing information to CDMA-equipped cell sites.

Ground

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

Grounding conductor

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

Grounding electrode system

The conductive objects that are intentionally bonded to furnish connection to earth (i.e., buried ring ground with ground rods, electrically continuous buried metallic water pipe, electrolytic ground electrode, etc.).

Growth cabinet

Additional cabinet used to expand the number of carriers.

Guy

Steel wire or rope used to hold a pole upright.

H

Halo ground

An interior ring ground, stranded copper cable with green insulation that is installed around the equipment approximately 2.4 meters (8 ft.) above the floor or 1.8 meters (6 ft.) below the ceiling.

Handoff

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

Heat dissipation

The heat generated by cabinets during operation.

HVAC (Heating, Ventilation, Air Conditioning)

Hz (hertz)

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

I

Indoor site

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

Intelligent Antenna

The Intelligent Antenna uses beamsteering and Phase Sweep Transmit Diversity (PSTD) to improve downlink RF capacity and four branch receive diversity to improve uplink RF capacity. The Intelligent Antenna maximizes signal reception and minimizes interference, and when combined with Phase Sweep Transmit Diversity, significantly increases the Radio Frequency (RF) capacity on up to three sectors of a base station.

The Intelligent Antenna feature is supported for 9228 Macro Outdoor Primary Cabinet, and is not

supported for 9218 Macro Outdoor Cabinet or for 9218 Macro Outdoor Dual-band Cabinet.

INTR (Intrusion Alarm)

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

L

Load

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

Loss

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

M

MGB (Main Ground Bus)

A copper bus bar used to provide the electrical interfaces for connection of the isolated ground plane to the integrated ground system.

MHz (Megahertz)

Reference of radio frequency spectrum of one-million cycles.

Modular Cell

Provides radio access interfaces and radio resources management functions, as well as call handling with the *5ESS*® Switch at Cellular and PCS frequencies.

MOP (Method of Procedure)

Cell site walk-through where site preparation activities are verified prior to installing the Modular Cell equipment.

MSC (Mobile Switching Center)

In an automatic cellular mobile system, the interface between the radio system and the public switched telephone network. The MSC performs all signaling functions that are necessary to establish calls to and from mobile stations.

MTA (Major Trading Area)

The market area specified by the FCC for PCS A and B band licenses. Each MTA is comprised of a number of basic trading areas. The USA has 51 MTA license areas.

N

NEC (National Electric Code)

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

Network

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

NFPA (National Fire Protection Association)

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

NIU (Network Interface Unit)

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

Nominal

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

P

Pair cable

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

PCS (Personal Communications Services)

Services for digital RF equipment operating in the 2-GHz spectrum.

Phase

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

Pigtail

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

PMJ

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

PMN

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

PVC (Polyvinyl Chloride)

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

R

RCS (Radio Cluster Server)

Receive-only

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

RF (Radio Frequency)

Electromagnetic wave used for, among other things, cellular voice and data communications.

RMS (Root Mean Square)

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

Rx (Receive)

S

Sector

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

Service provider

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

Shield

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

Short-term

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

Single-phase

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

Site preparation

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

Stranded

Wires twisted together to form a strong flexible cable.

Surge protector

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

Sweep

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

T

T1

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

THHN (Thermoplastic high-heat resistant nylon-coated)

Three-phase

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

Triplex

Operating method in which transmission is possible simultaneously, in three directions of a telecommunication channel.

Twisted-pair cable

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

Tx (Transmit)

U

UL (Underwriters Laboratories)

(UL) is an independent, product safety-testing and certification organization. UL tests products for public safety.

URC (Universal Radio Controller)

Circuit board in Digital Shelf. implements various control and interface functions.

UV (Ultraviolet)

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

V

V (Volt)

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

VAC (Volts Alternating Current)

VDC (Volts Direct Current)

Vrms (Volts Root Mean Square)

VSWR (Voltage Standing Wave Ratio)

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

W **W (watts)**

The derived SI unit of power. It is equivalent to 1 joule per second, or 1 volt-ampere.

Walk-through

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

Waveform

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

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