DBS3900 GSM

V300R008

Product Description

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Part Number

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Contents

Figures

Tables

About This Document

Purpose

This document describes the composition, orientation, software and hardware structure, subsystems, configuration type, signal flow, clock synchronization, topologies of the DBS3900 GSM. This document also lists the specifications for the capacity, RF, engineering, surge protection, and physical ports of the DBS3900 GSM.

Product Version

The following table lists the product version related to this document.

Product Name	Product Version
DBS3900 GSM (referred to as DBS3900 in this manual)	V300R008

Intended Audience

This document is intended for:

- Network planners
- Field engineers
- System engineers

Change History

For changes in the document, refer to **Changes in the DBS3900 GSM Product Description**.

Organization

1 DBS3900 Product Family

This describes the function modules and auxiliary equipment in the DBS3900 product family.

2 Introduction to the DBS3900

This describes the components of the DBS3900 and also describes the software structure and logical structure of the DBS3900.

3 Network Topologies of the DBS3900

This describes the network topologies of the BBU and RRU.

4 Typical Scenarios of the DBS3900

This describes the typical installation scenarios of the DBS3900 in outdoor and indoor applications.

5 DBS3900 Monitoring Schemes

The monitoring system of the DBS3900 monitors the power supply, fans, and environment.

6 Clock Synchronization Modes of the DBS3900

The DBS3900 supports three clock synchronization modes: line clock, BITS clock, and free-run clock.

7 Configuration of the DBS3900

The DBS3900 features flexible configuration and supports multiple receive and transmit modes.

8 OM System of the DBS3900

This describes the OM system of the DBS3900. The OM system manages, monitors, and maintains the DBS3900. The OM system also provides various OM modes and multiple maintenance platforms to meet different maintenance requirements.

9 Specifications of the DBS3900

This describes the specifications of the DBS3900. The specifications cover items such as the capacity, RF, engineering, surge protection, ports, environment, and compliant standards.

Conventions

1. Symbol Conventions

The following symbols may be found in this document. They are defined as follows

Symbol	Description
DANGER	Indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
CAUTION	Indicates a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.
TIP	Indicates a tip that may help you solve a problem or save your time.
NOTE	Provides additional information to emphasize or supplement important points of the main text.

2. General Conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Boldface	Names of files,directories,folders,and users are in **boldface**. For example,log in as user **root** .
Italic	Book titles are in *italics*.
`Courier New`	Terminal display is in Courier New.

3. Command Conventions

Convention	Description
Boldface	The keywords of a command line are in **boldface**.
Italic	Command arguments are in *italic*.
[ ]	Items (keywords or arguments) in square brackets [ ] are optional.
{x | y | ...}	Alternative items are grouped in braces and separated by vertical bars.One is selected.
[x | y | ...]	Optional alternative items are grouped in square brackets and separated by vertical bars.One or none is selected.
{ x | y | ... } *	Alternative items are grouped in braces and separated by vertical bars.A minimum of one or a maximum of all can be selected.
[x | y | ...] *	Alternative items are grouped in braces and separated by vertical bars.A minimum of zero or a maximum of all can be selected.

4. GUI Conventions

Convention	Description
Boldface	Buttons,menus,parameters,tabs,window,and dialog titles are in **boldface**. For example,click **OK**.
>	Multi-level menus are in **boldface** and separated by the ">" signs. For example,choose **File** > **Create** > **Folder** .

5. Keyboard Operation

Convention	Description
Key	Press the key.For example,press **Enter** and press **Tab**.
Key1+Key2	Press the keys concurrently.For example,pressing **Ctrl+Alt+A** means the three keys should be pressed concurrently.

Convention	Description
Key1,Key2	Press the keys in turn.For example,pressing Alt,A means the two keys should be pressed in turn.

6. Mouse Operation

Action	Description
Click	Select and release the primary mouse button without moving the pointer.
Double-click	Press the primary mouse button twice continuously and quickly without moving the pointer.
Drag	Press and hold the primary mouse button and move the pointer to a certain position.

1 DBS3900 Product Family

This describes the function modules and auxiliary equipment in the DBS3900 product family.

Function Modules of the DBS3900

The function modules of the DBS3900 are the BBU3900, RRU3004, and RRU3008, as shown in **Figure 1-1**.

Figure 1-1 Function modules of the DBS3900

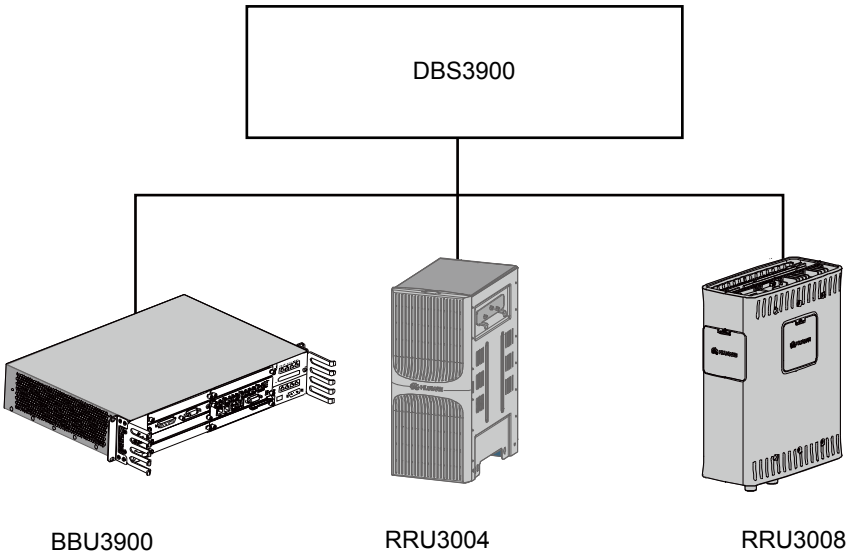


Table 1-1 describes the function modules.

Table 1-1 Function modules of the DBS3900

Function Module	Description
BBU3900	The BBU3900 is an indoor baseband unit. It provides physical ports for connections to the BSC and RRU, manages the entire base station system in terms of OM and signaling processing, and provides system clocks.

Function Module	Description
RRU3004	The RRU3004 is an outdoor remote radio unit. It processes RF and baseband signals. Each RRU module of the RRU3004 supports two carriers, so two RRU modules installed in one rack support four carriers.
RRU3008	The RRU3008 is an outdoor remote radio unit. It processes RF and baseband signals. Each RRU module of the RRU3008 supports eight carriers.

Auxiliary Equipment of the DBS3900

Table 1-2 describes the auxiliary equipment of the DBS3900. The DBS3900 can be configured with one or more types of auxiliary equipment.

Table 1-2 Auxiliary equipment of the DBS3900

Auxiliary Equipment	Description
APM	The APM is an integrated power backup system for outdoor application. It functions as follows: ● Supplies -48 V DC power output. ● Provides backup power. ● Performs temperature control. ● Provides installation space for user devices. Two types of APM can be used in the DBS3900. They are the APM200 and APM30. For details about the functions of the APM200 and APM30, see the *APM200 User Guide* and the *APM30 User Guide* respectively.
IBBS	The IBBS is a battery cabinet. It functions as follows: ● Supplies -48 V DC power output. ● Houses batteries of different sizes. ● Supports serial or parallel connection between battery groups. For details about the functions of the IBBS, see the *IBBS User Guide*.
DCDU-03B	The DCDU-03B is a DC power distribution box. It provides multiple DC power outputs.
EMUA	The EMUA is an environment monitoring device. It functions as follows: ● Monitors the environment. ● Monitors entry into the associated equipment. ● Monitors power distribution. For details about the functions of the EMUA, see the *EMUA User Guide*.

2 Introduction to the DBS3900

About This Chapter

This describes the components of the DBS3900 and also describes the software structure and logical structure of the DBS3900.

2.1 System Architecture of the DBS3900
This describes the system architecture of the DBS3900, in which the function modules can be configured flexibly to meet different coverage requirements.

2.2 Logical Structure of the DBS3900
This describes the internal logical units of the BBU and RRU.

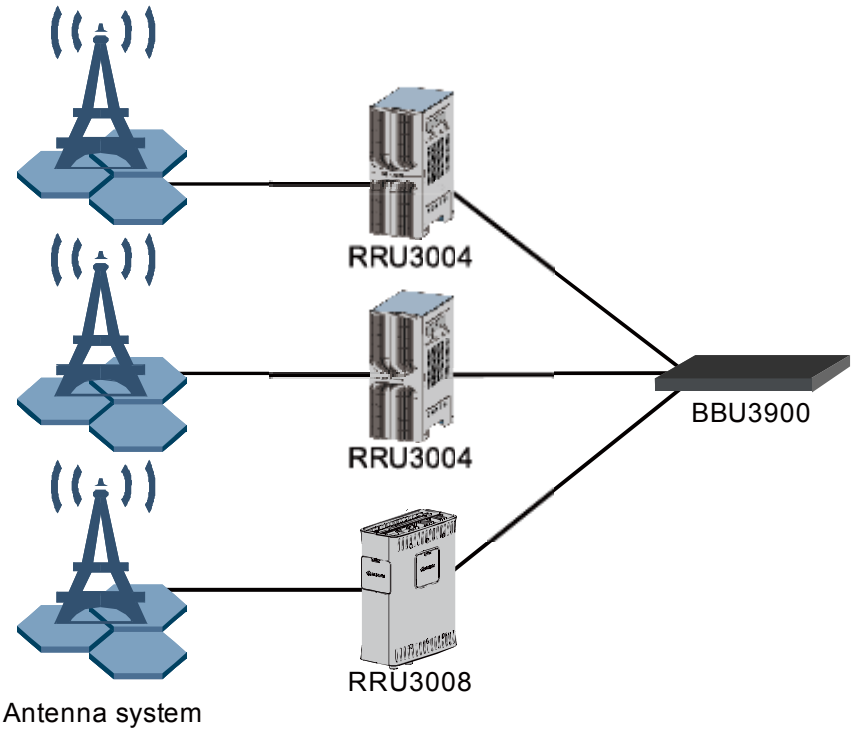
2.3 Software Structure of the BTS
The BTS software consists of the platform software, signaling protocol software, OM software, and data center. The latter three are application software, and the platform software provides support for the application software.

2.1 System Architecture of the DBS3900

This describes the system architecture of the DBS3900, in which the function modules can be configured flexibly to meet different coverage requirements.

Figure 2-1 shows the system architecture of the DBS3900.

Figure 2-1 System architecture of the DBS3900



- The DBS3900 consists of the BBU3900 and the RRU3004/RRU3008. The BBU is connected to the RRUs through optical cables.
- The Local Maintenance Terminal (LMT) and Man-Machine Interactive (MMI) maintains the DBS3900 through the BBU3900.
- The antenna system receives uplink signals and transmits downlink signals.

NOTE

Unless otherwise specified, BBU is short for BBU3900 in this document.

2.2 Logical Structure of the DBS3900

This describes the internal logical units of the BBU and RRU.

2.2.1 Logical Structure of the BBU

The BBU3900 consists of five units: BTS interface unit, central processing unit, high-speed interface unit, clock unit, and monitoring unit.

2.2.2 Logical Structure of the RRU

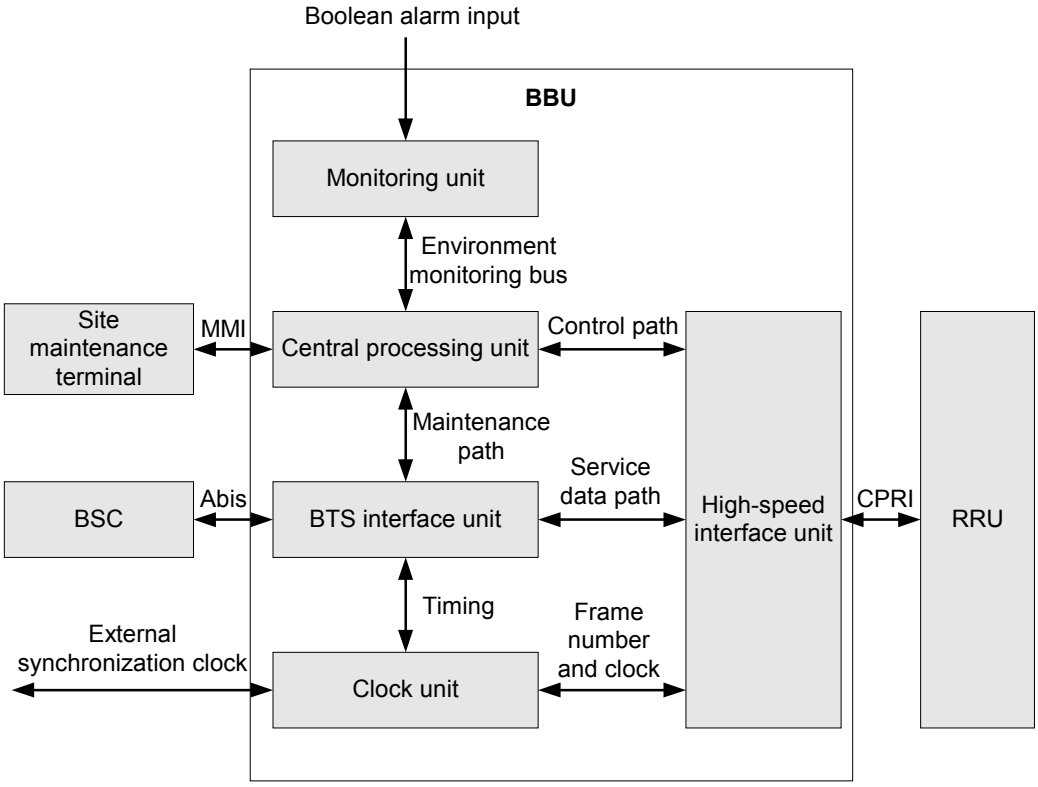
An RRU module consists of the high-speed interface unit, signal processing unit, power amplifier (PA), dual duplexer, and low noise amplifier (LNA).

2.2.1 Logical Structure of the BBU

The BBU3900 consists of five units: BTS interface unit, central processing unit, high-speed interface unit, clock unit, and monitoring unit.

Figure 2-2 shows the logical structure of the BBU3900.

Figure 2-2 Logical structure of the BBU3900



BTS Interface Unit

The BTS interface unit performs the following functions:

- Connects the BTS to the BSC.
- Exchanges data between the E1 link and the DBUS.
- Synchronizes the lower-level clock with the upper-level clock.

Central Processing Unit

The central processing unit performs centralized management of the entire distributed base station system in terms of OM and signaling processing, and provides system clocks. The central processing unit performs the following functions:

- Supports the protocols such as UART and HDLC.

- Controls the BTS interface unit to enable the communication between the BBU and the BSC.
- Controls the high-speed interface unit in the BBU to enable the communication between the BBU and the RRU.
- Performs the clock-related functions, that is, provides timing signals, manages BTS clocks, and supports external synchronization clock input.

High-Speed Interface Unit

The high-speed interface unit performs the following functions:

- Receives uplink baseband data from the RRU.
- Transmits downlink baseband data to the RRU.
- Provides up to six SFP optical ports per BBU3900.

Clock Unit

The clock unit performs the following functions:

- Provides the high-accuracy clock source for the BTS and provides the system clock based on this clock source.
- Checks the phase-locking status, provides software phase-locking, adjusts DA values, and generates frame numbers.

Monitoring Unit

The monitoring unit collects the information of Boolean alarms and reports the alarm information to the central processing unit.

2.2.2 Logical Structure of the RRU

An RRU module consists of the high-speed interface unit, signal processing unit, power amplifier (PA), dual duplexer, and low noise amplifier (LNA).

Figure 2-3 shows the logical structure of the RRU3004.

Figure 2-3 Logical structure of the RRU3004

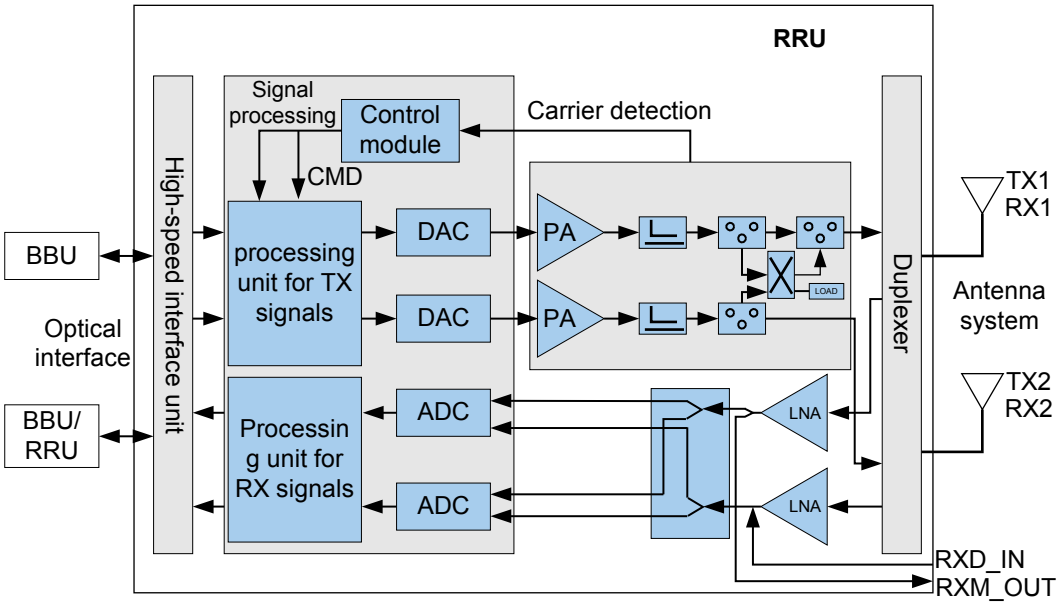
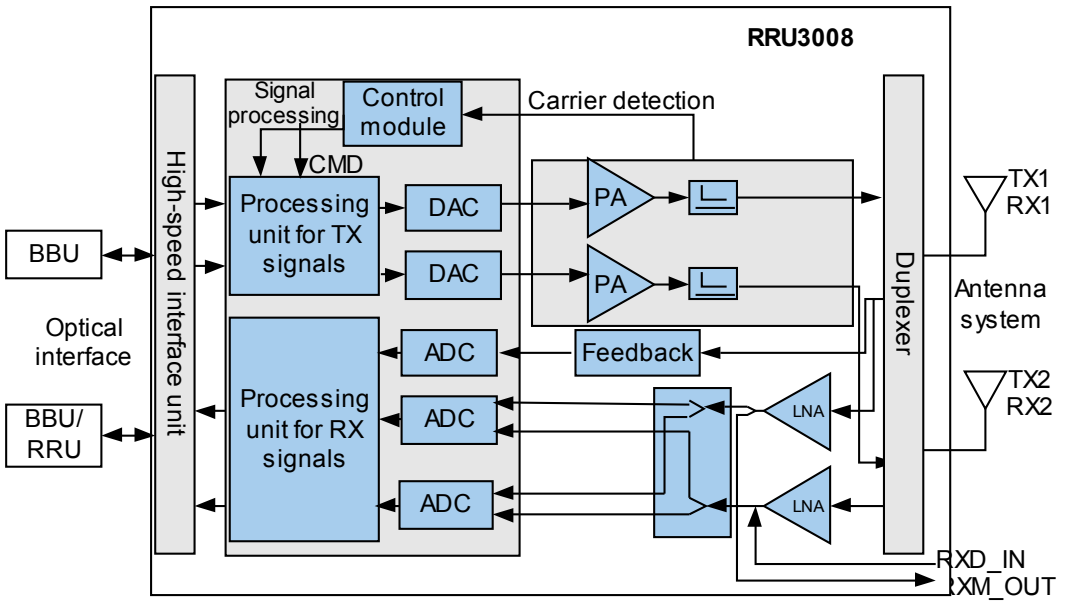


Figure 2-4 shows the logical structure of the RRU3008.

Figure 2-4 Logical structure of the RRU3008



RXM_OUT: RRU RX main output for cascaded RRU modules

RXM_IN: RRU RX diversity input for cascaded RRU modules

High-Speed Interface Unit

The high-speed interface unit performs the following functions:

- Receives downlink data from the upper-level equipment, such as the BBU.
- Transmits uplink data to the upper-level equipment, such as the BBU.

- Transfers data between cascaded RRU modules through the CPRI electrical ports.

Signal Processing Unit

The signal processing unit consists of two uplink RX channels, two downlink TX channels, and a control module. The signal processing unit processes baseband signals and RF signals. The baseband signal processing involves decoding GMSK and 8PSK baseband signals.

The uplink RX channels perform the following functions:

- Down-converts the RX signals into Intermediate Frequency (IF) signals.
- Amplifies the IF signals and performs IQ demodulation.
- Performs analog-to-digital (A/D) conversion through the ADC.
- Performs sampling of digital signals.
- Performs matched filtering.
- Performs Digital Automatic Gain Control (DAGC).
- Processes data and assembles the data into packets.

The downlink TX channels perform the following functions:

- Disassembles the packaged signals (timing signals, control signals, and data signals) from the BBU and sends them to associated units.
- Performs coding, modulation, shaping, and filtering of downlink signals.
- Performs digital-to-analog (D/A) conversion through the DAC and performs IQ modulation.
- Up-converts RF signals to the TX band.

The control module performs the following functions:

- Initializes and loads the RRU.
- Collects alarm information and reports the board status.
- Receives configuration commands from the BBU and performs configuration management of other modules.
- Operates and maintains the RRU.

PA

The PA performs the following functions:

- Combines or divides the signals of the two carriers.
- Amplifies the low-power RF signals sent from the signal processing unit.

Dual Duplexer

The dual duplexer performs the following functions:

- Multiplexes RX signals and TX signals so that they can share an antenna channel.
- Filters the RX signals and TX signals.

LNA

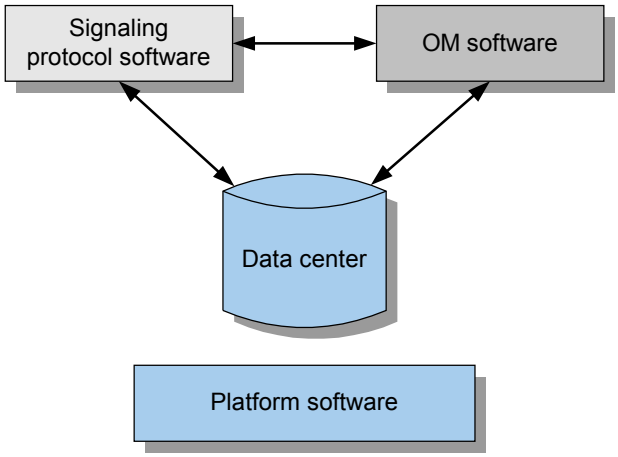
The LNA amplifies the signals received from the antennas.

2.3 Software Structure of the BTS

The BTS software consists of the platform software, signaling protocol software, OM software, and data center. The latter three are application software, and the platform software provides support for the application software.

Figure 2-5 shows the software structure of the BTS.

Figure 2-5 Software structure of the BTS



Platform Software

The platform software provides support for the signaling protocol software, OM software, and data center. The functions of the platform software are as follows:

- Timing management
- Task management
- Memory management
- Module management
- Managing the loading and running of the application software
- Providing the message forwarding mechanism between modules
- Tracing massages between modules to facilitate troubleshooting

Signaling Protocol Software

The functions of the signaling protocol software are as follows:

- Processing the radio network layer protocol
- Processing the transport network layer protocol, which performs transport data configuration, ALCAP processing, and SAAL processing

- Managing the internal logical resources (such as cells and channels) of the BTS and the mapping between physical resources and logical resources

OM Software

The OM software works together with the maintenance terminals such as the LMT to maintain the BTS. The functions of the OM software are as follows:

- Equipment management
- Data configuration
- Performance management
- Commissioning management
- Alarm management
- Software management
- Tracing management
- Security management
- Backup management
- Log management

Data Center

The data center stores the configuration data of all the modules.

3 Network Topologies of the DBS3900

About This Chapter

This describes the network topologies of the BBU and RRU.

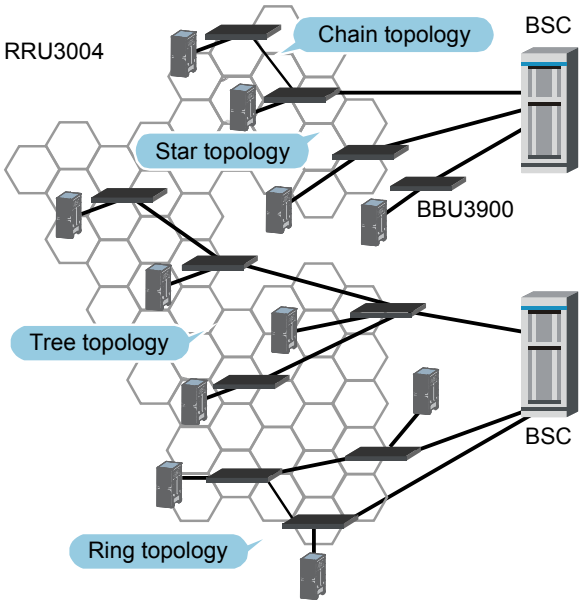
3.1 Network Topologies of the BBU

The BSC and BBUs support multiple network topologies: star, chain, tree, and ring.

Typical Network Topologies

Figure 3-1 shows the typical network topologies between the BSC and the BBUs.

Figure 3-1 Typical network topologies between the BSC and the BBUs



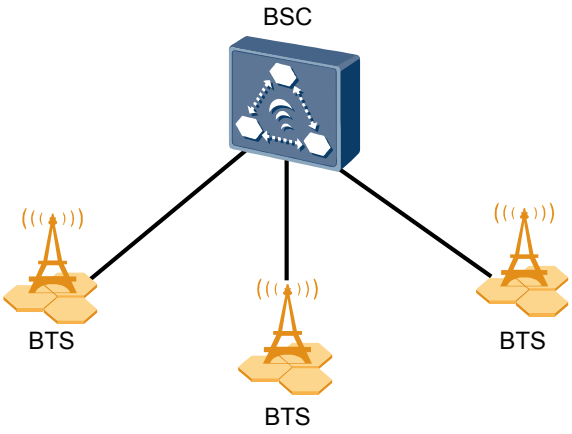
NOTE

The BBU and RRU form the BTS. For easy description, the following figures take the BTS as a whole, instead of the BBU and RRU, to describe the network topologies.

Star Topology

As the commonest network topology, the star topology applies to most areas, especially densely populated areas. **Figure 3-2** shows the star topology.

Figure 3-2 Star topology



The advantages of the star topology are as follows:

- Each BTS is directly connected to the BSC. Therefore, this topology is simple and facilitates construction, maintenance, and capacity expansion.
- Each BTS directly exchanges data with the BSC. The line reliability is high because signals are transmitted across only a few nodes.

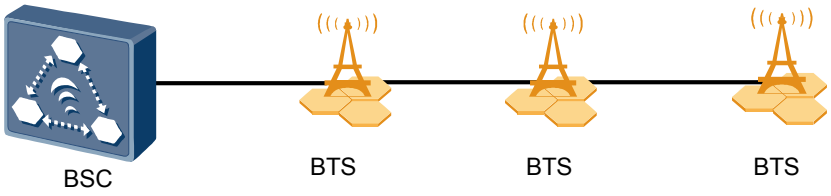
The disadvantages of the star topology are as follows:

Compared with other topologies, the star topology requires more transmission resources.

Chain Topology

The chain topology applies to belt-shaped and sparsely populated areas, such as highways and railways. **Figure 3-3** shows the chain topology.

Figure 3-3 Chain topology



The advantages of the chain topology are as follows:

The chain topology reduces costs in transmission equipment, construction, and transmission link lease.

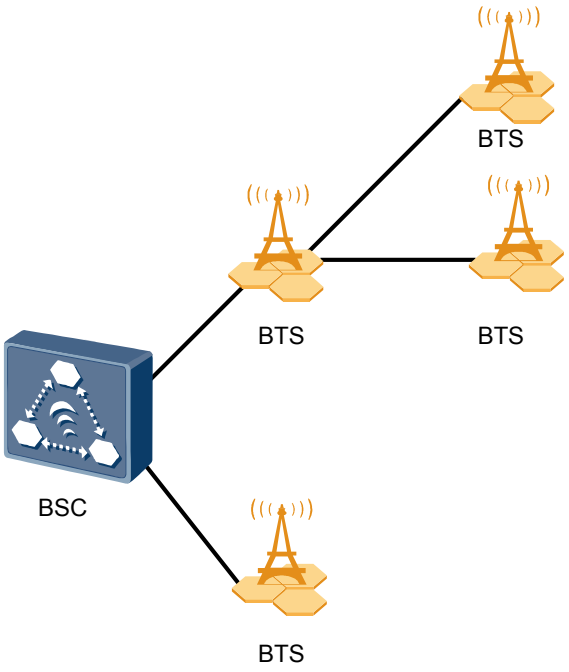
The disadvantages of the chain topology are as follows:

- The line reliability is poor because signals are transmitted across many nodes.
- The faults in the upper-level BTSs may affect the lower-level BTSs.
- The number of levels in the chain topology should not exceed five.

Tree Topology

The tree topology applies to areas in which the network structure, site distribution, and subscriber distribution are complicated, for example, hotspot areas where subscribers are widely distributed. **Figure 3-4** shows the tree topology.

Figure 3-4 Tree topology



The advantages of the tree topology are as follows:

Compared with the star topology, the tree topology requires fewer transmission cables.

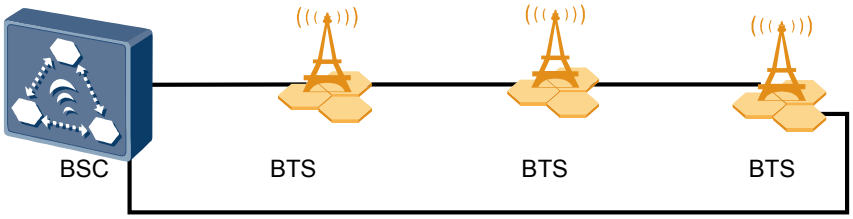
The disadvantages of the tree topology are as follows:

- The line reliability is poor and the construction and maintenance are complicated because signals are transmitted across many nodes.
- The faults in the upper-level BTSs may affect the lower-level BTSs.
- Capacity expansion is difficult because it may involve major modification to the network structure.
- The number of levels in the tree topology should not exceed five.

Ring Topology

The ring topology applies to common scenarios. Due to its strong self-healing capability, the ring topology is preferred if permitted by the routing. **Figure 3-5** shows the ring topology.

Figure 3-5 Ring topology



The advantages of the ring topology are as follows:

The ring topology has strong self-healing ability, that is, if one E1 link becomes faulty, the ring topology can change to a chain or tree topology.

The disadvantages of the ring topology are as follows:

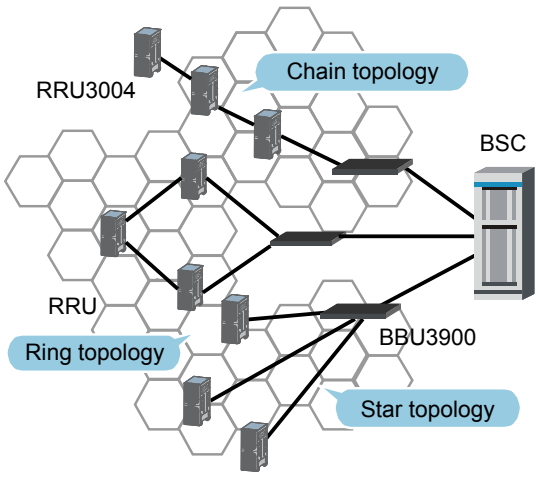
In the ring topology, there is always a link section that does not transfer data.

3.2 Network Topologies of the RRU

The BBU and RRUs support the star and chain topologies.

Figure 3-6 shows the typical network topologies between the BBU and the RRUs.

Figure 3-6 Typical network topologies between the BBU and the RRUs



NOTE

When the chain topology is applied, a maximum of three levels of RRUs can be connected to one BBU.

4 Typical Scenarios of the DBS3900

About This Chapter

This describes the typical installation scenarios of the DBS3900 in outdoor and indoor applications.

The full spellings of common cabinet names whose abbreviations are used in this document are listed as follows:

- BBC: Battery Cabinet
- TMC: Transmission Cabinet
- APM: Advance Power Module

4.1 BBU3900 Outdoors and RRU3004 Outdoors

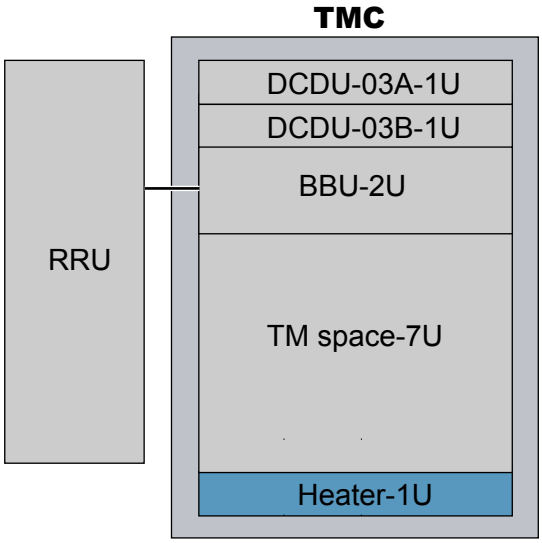
This describes the scenarios that the BBU3900 and RRU3004 of the DBS3900 are installed outdoors.

4.1.1 Scenario 1: -48 V DC Power Input

When -48 V DC power is available on site, the installation scenario of BBU+RRU+TMC is applicable.

Figure 4-1 shows the installation scenario of BBU+RRU+TMC.

Figure 4-1 Installation scenario of BBU+RRU+TMC



In this installation scenario,

- The TMC can be installed on the floor, pole, or wall.
- The TMC provides an installation space no greater than 7 U.
- The BBU can be installed in the TMC, which is equipped with the DCDU-03B to provide power for the BBU and RRU.
- The DCDU-03A configured in the TMC supplies power to transmission units.
- The heater in the TMC is optional.
- The RRU can be installed on a pole, wall, or tower.

- The requirement for the switch quantity and capacity of the external power input system is 1 x 63 A.

4.1.2 Scenario 2: 220 V AC Power Input

When 220 V AC power is available on site and the required space for transmission units is not greater than 4 U, the installation scenario of BBU+RRU+APM30+BBC is applicable.

NOTE

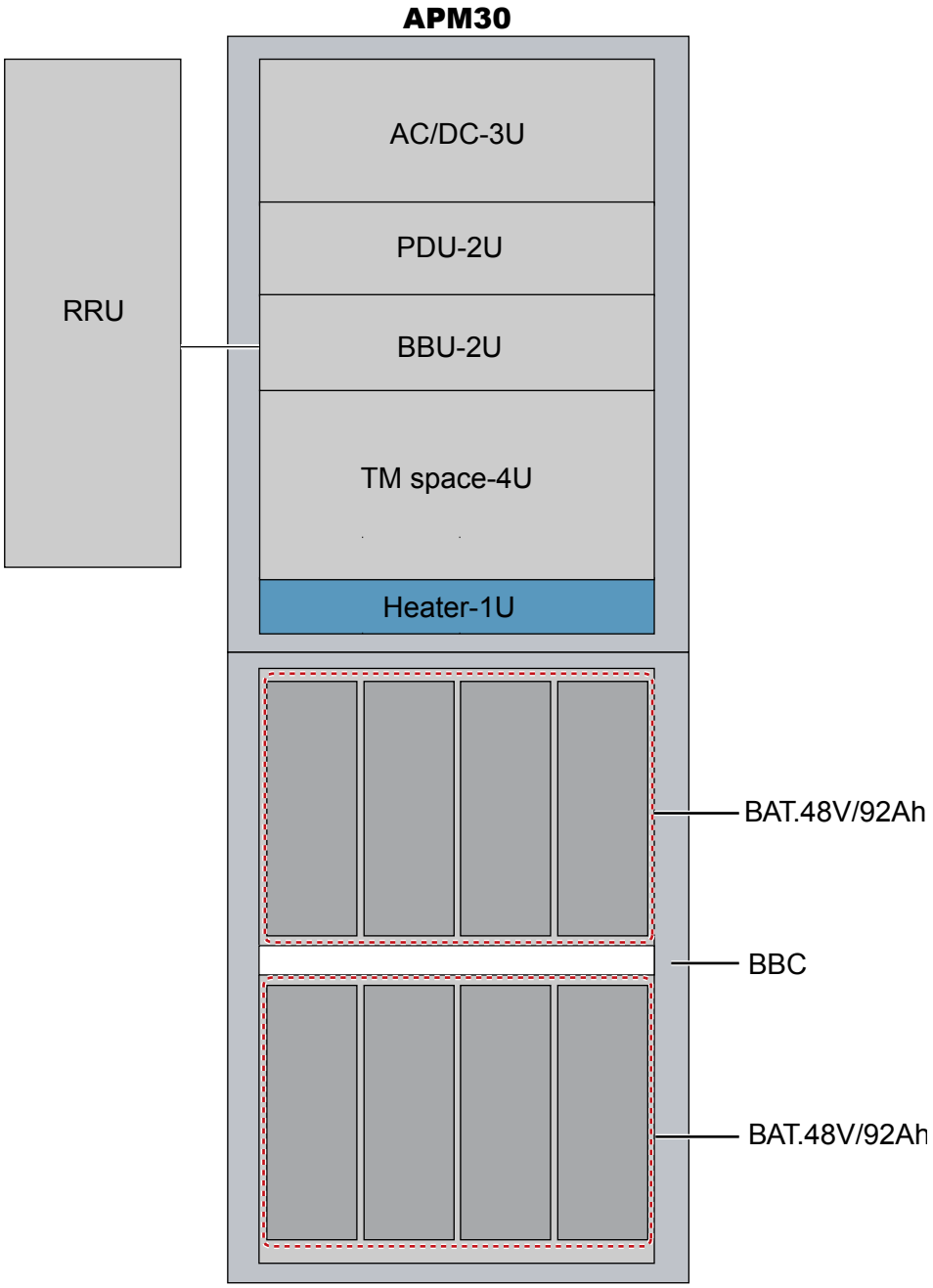
If the required space for transmission units is greater than 4 U, configure a TMC and ensure that the distance between the APM30 and the TMC is not longer than 1 m.

Scenario of Four-Hour Backup Power

If the backup power required at the site is not greater than four hours, installation scenario 1 of BBU+RRU+APM30+BBC is applicable.

Figure 4-2 shows installation scenario 1 of BBU+RRU+APM30+BBC.

Figure 4-2 Installation scenario 1 of BBU+RRU+APM30+BBC



In this installation scenario,

- The BBC is installed on the floor. By default, the APM30 is stacked on the BBC.
- The heater in the APM30 is optional. The APM30 provides a maximum of 4 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The heater in the BBC is optional. Without occupying additional internal space, the heater can be placed under the baffle plate at the bottom of each battery layer.

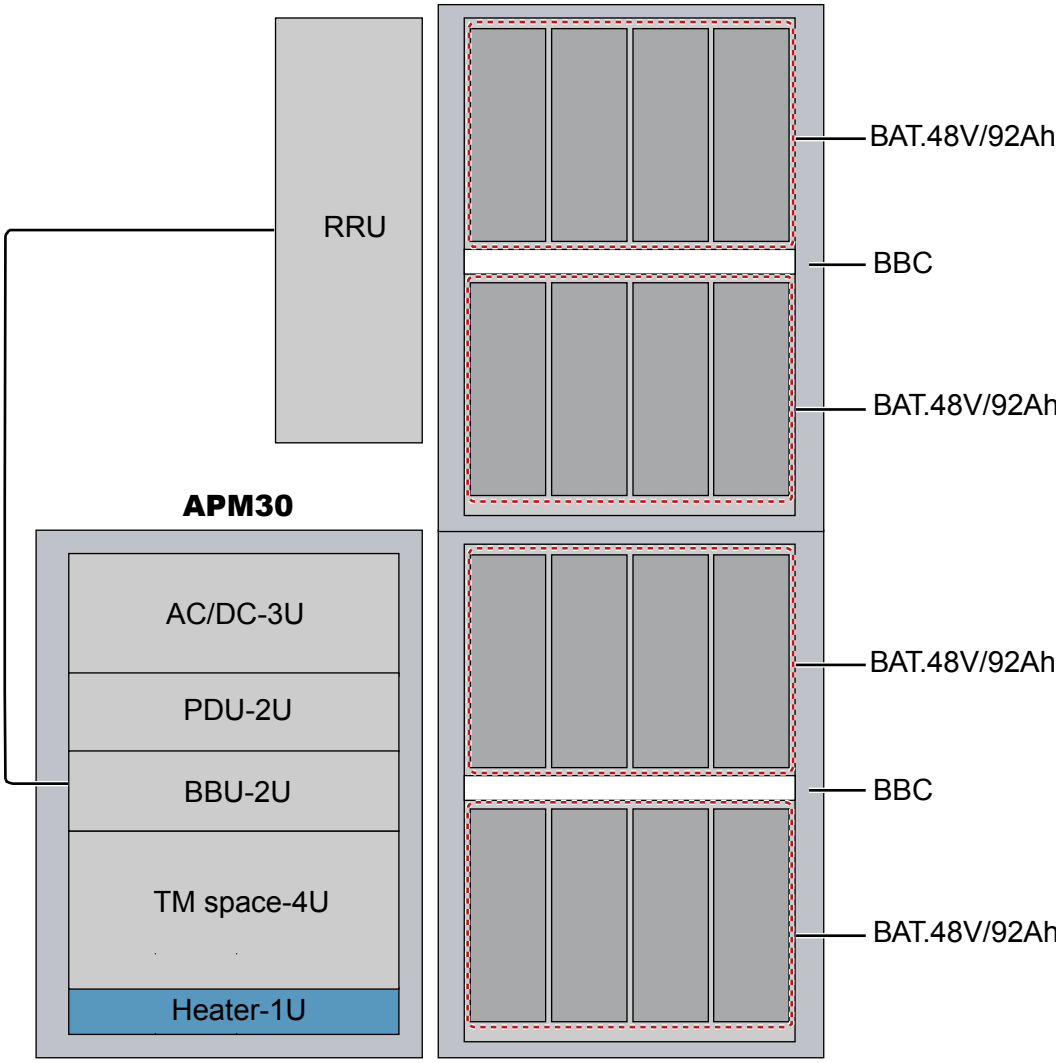
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

Scenario of Eight-Hour Backup Power

If eight-hour backup power is required at the site, installation scenario 2 of BBU+RRU+APM30 +BBC is applicable.

Figure 4-3 shows installation scenario 2 of BBU+RRU+APM30+BBC.

Figure 4-3 Installation scenario 2 of BBU+RRU+APM30+BBC



In this installation scenario,

- The APM30 and the BBC can be installed on the floor. By default, the two BBCs are stacked.

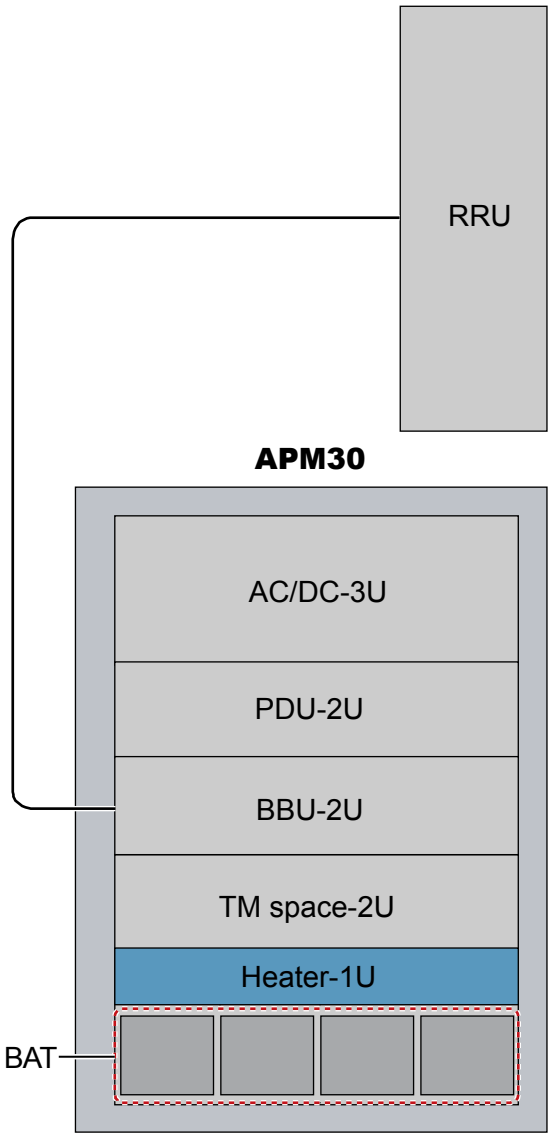
- The APM30 provides a maximum of 4 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The heater in the BBC is optional. Without occupying additional internal space, the heater can be placed under the baffle plate at the bottom of each battery layer.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

Scenario of Half-Hour Backup Power

If half-hour backup power is required at the site, the installation scenario of BBU+RRU+APM30 is applicable.

Figure 4-4 shows the installation scenario of BBU+RRU+APM30.

Figure 4-4 Installation scenario of BBU+RRU+APM30



In this installation scenario,

- The batteries providing 24 Ah backup power can be placed in the APM30. The batteries support a maximum cell configuration of S4/4/4.
- The APM30 provides a maximum of 2 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

4.2 BBU3900 Indoors and RRU3004 Indoors

This describes the scenarios that the BBU3900 and RRU3004 of the DBS3900 are installed indoors.

4.2.1 Scenario 1: -48 V DC Power Input

When -48 V DC power and the equipment room are available on site, the BBU and RRU can be installed indoors.

Centralized Installation Scenarios

Figure 4-5 and **Figure 4-6** show the indoor centralized installation scenarios of the BBU and RRUs.

Figure 4-5 Centralized installation (S2)

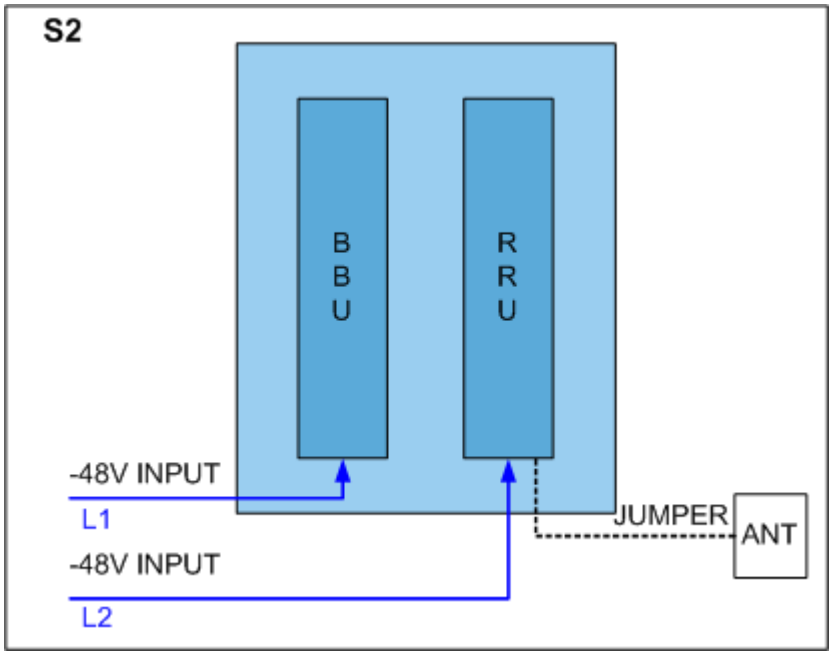
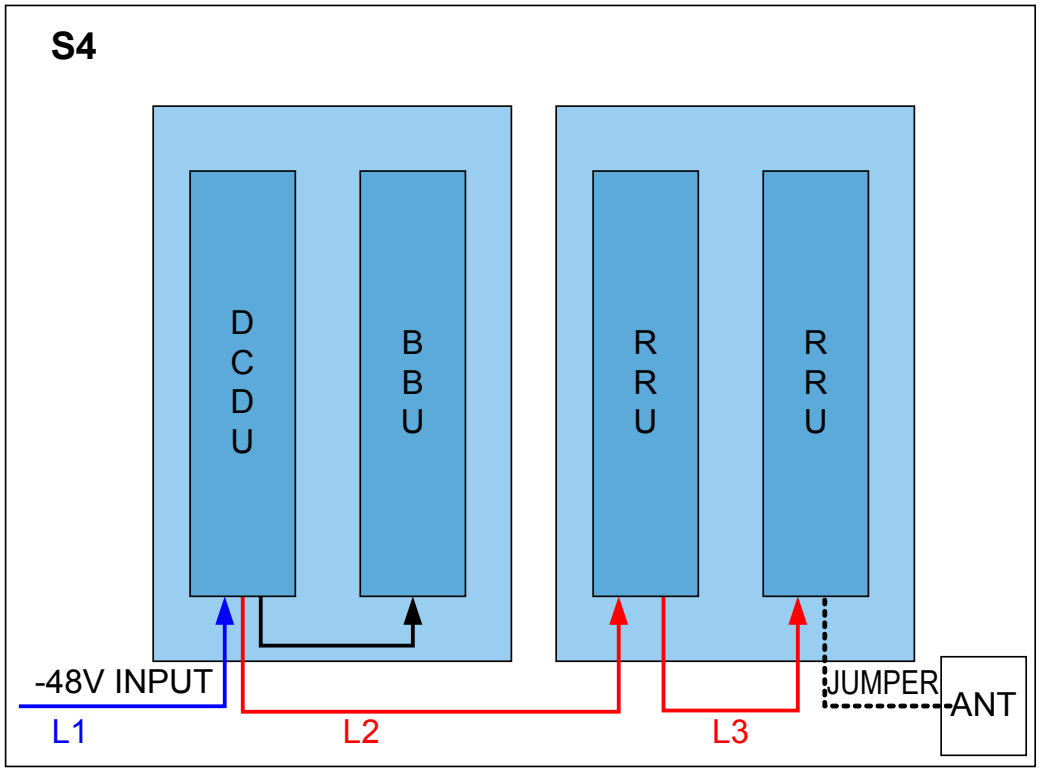


Figure 4-6 Centralized installation (S4)



In this installation scenario,

- The BBU and DCDU-03B are installed in an RRU rack through the 2 U-high adapting pieces.
- The RRU rack can be installed on the wall or stand.
- The requirement for the switch quantity and capacity of the external power input system is 1 x 10 A.
- The RRUs, BBU, and DCDU-03B are equipotentially connected and then grounded through one PGND cable.

Separate Installation Scenarios

Figure 4-7 and **Figure 4-8** show the indoor separate installation scenarios of the BBU and RRUs.

Figure 4-7 Separate installation (S2+S2)

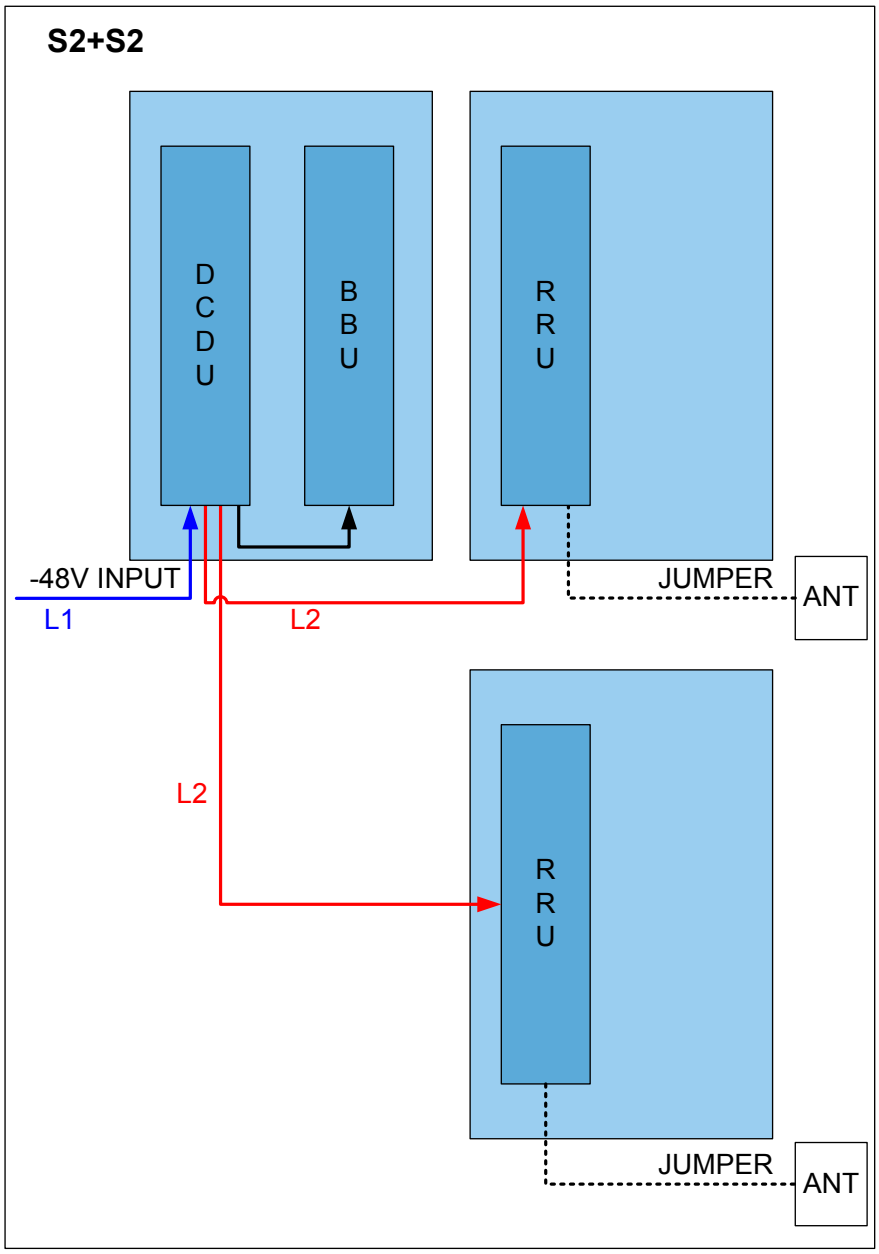
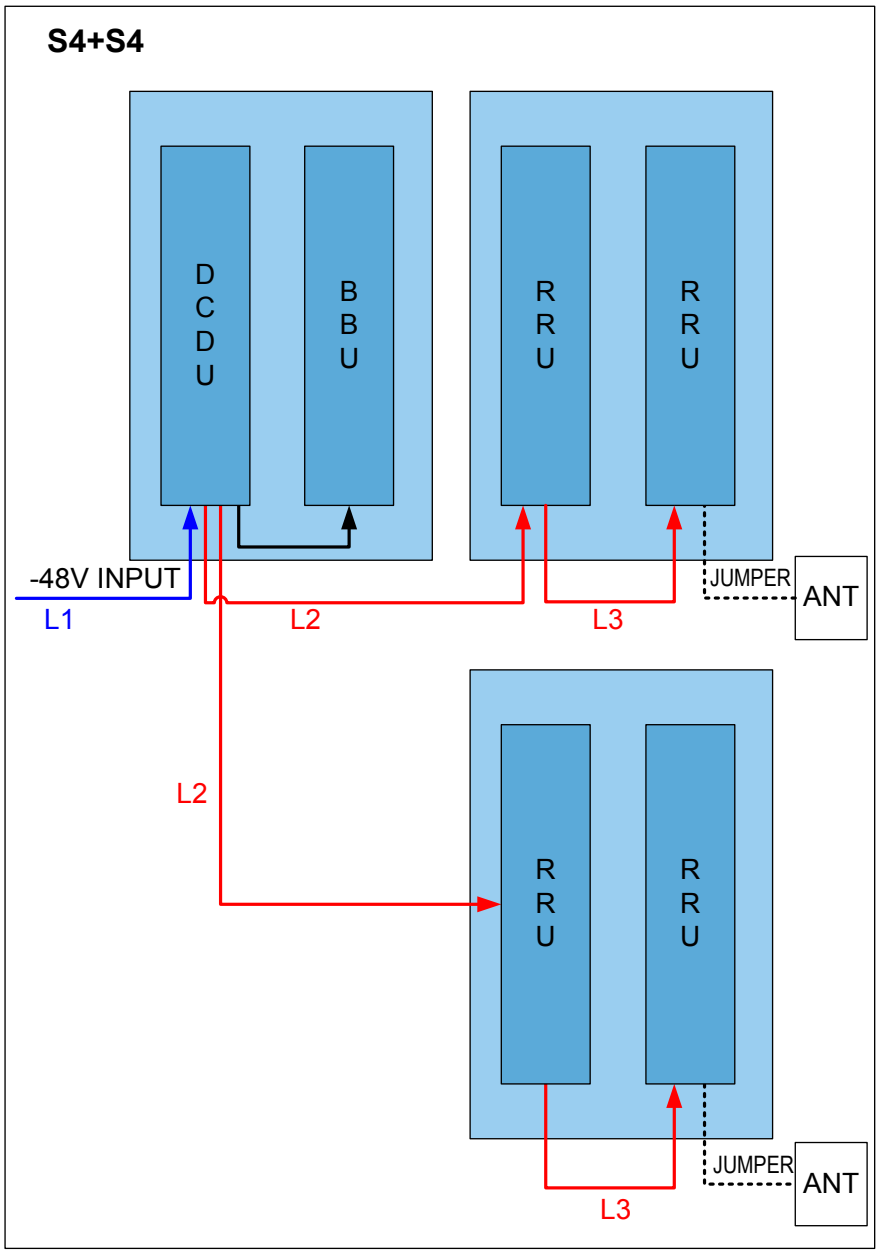


Figure 4-8 Separate installation (S4+S4)



In this installation scenario,

- The BBU and DCDU-03B are installed in an RRU rack through the 2 U-high adapting pieces.
- The RRU rack can be installed on the wall or stand.
- In S2+S2 configuration, the requirement for the switch quantity and capacity of the external power input system is 1 x 10 A. In S4+S4 configuration, the requirement is 1 x 20 A.
- Two cascaded RRUs are equipotentially connected and then grounded through one PGND cable.

4.2.2 Scenario 2: 220 V AC Power Input

When 220 V AC power and the equipment room are available on site, the BBU and RRU can be installed indoors.

Centralized Installation Scenarios

Figure 4-9 and **Figure 4-10** show the indoor centralized installation scenarios of the BBU and RRUs.

Figure 4-9 Centralized installation (S2)

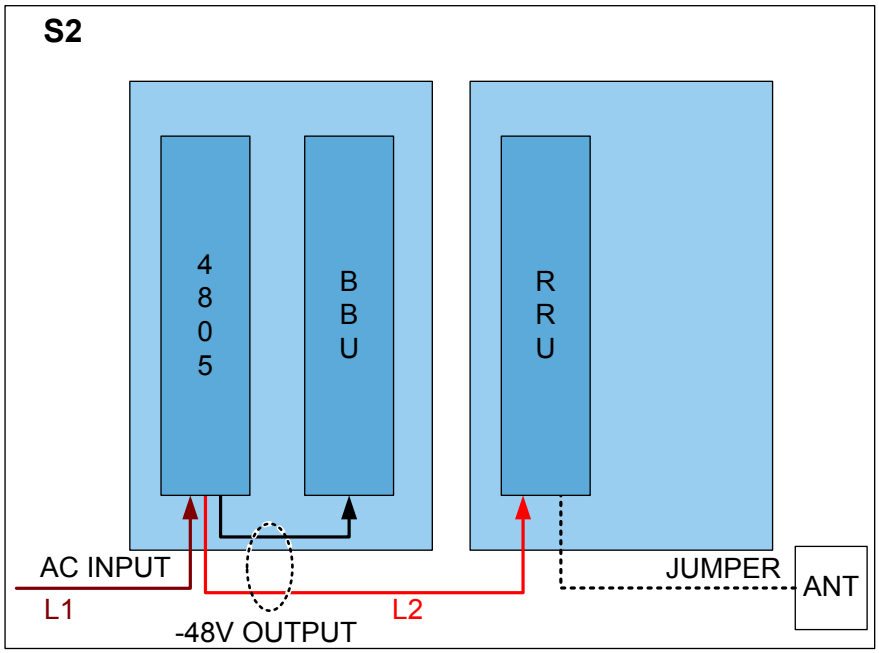
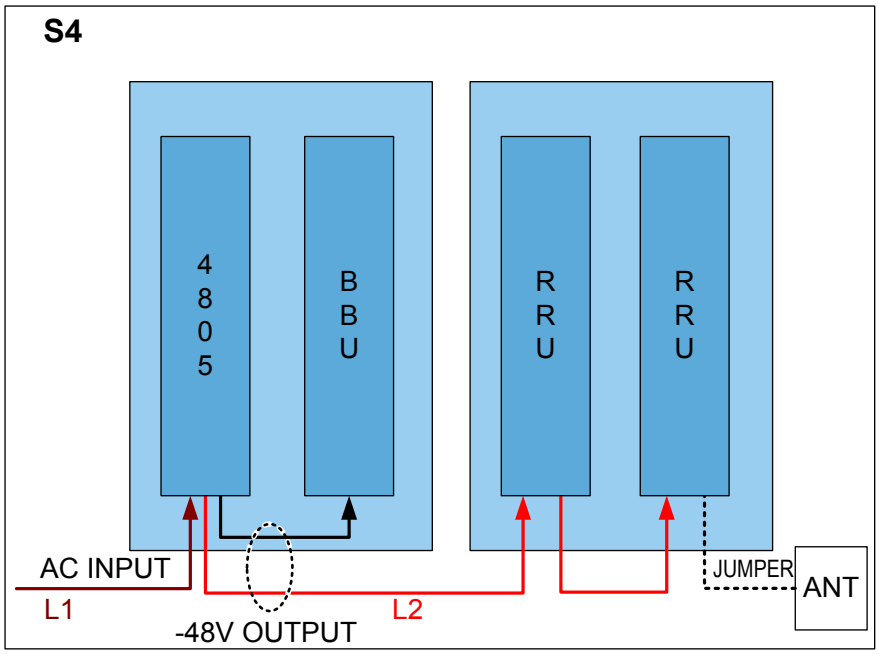


Figure 4-10 Centralized installation (S4)



In this installation scenario,

- The 4805 is an AC/DC conversion unit. It converts the 220 V AC power into the -48 V DC power for the BBU and RRUs.
- The BBU is installed in an RRU rack through a 2 U-high adapting piece. The same is true of the 4805.
- The RRU rack can be installed on the wall or stand.
- The requirement for the switch quantity and capacity of the external power input system is 1 x 5A (AC).
- The RRUs, BBU, and 4805 are equipotentially connected and then grounded through one PGND cable.
- When the 4805 is installed in the same rack as the BBU, the 4805 reports dry contact alarms to the BBU.

Separate Installation Scenarios

Figure 4-11 and **Figure 4-12** show the indoor separate installation scenarios of the BBU and RRUs.

Figure 4-11 Separate installation (S2+S2)

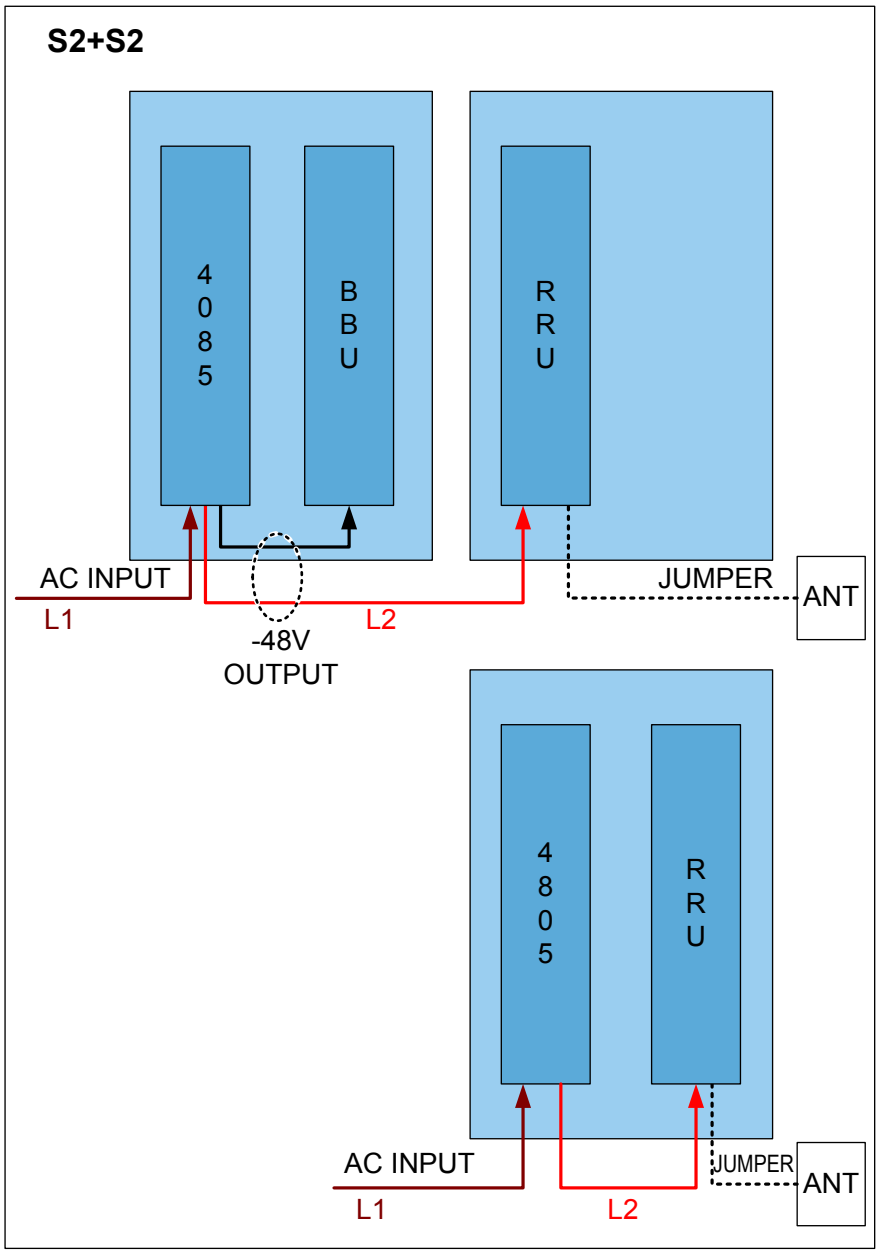
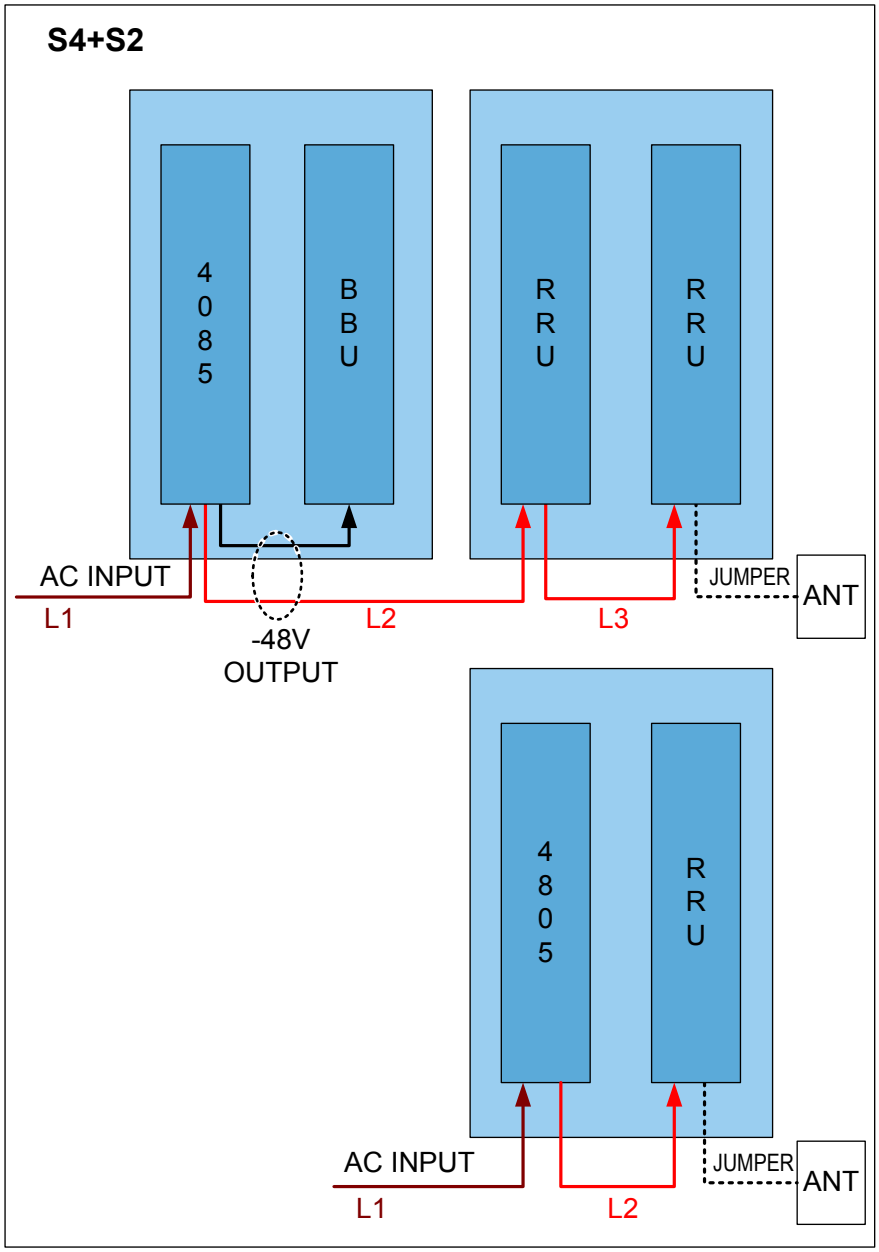


Figure 4-12 Separate installation (S4+S2)



In this installation scenario,

- The 4805 is an AC/DC conversion unit. It converts the 220 V AC power into the -48 V DC power for the BBU and RRUs.
- The BBU is installed in an RRU rack through a 2 U-high adapting piece. The same is true of the 4805.
- The RRU rack can be installed on the wall or stand.
- The requirement for the switch quantity and capacity of the external power input system is 2 x 5A.
- The RRU and 4805 are equipotentially connected and then grounded through one PGND cable.

- When the 4805 is installed in the same rack as the BBU, the 4805 reports dry contact alarms to the BBU.
- When the 4805 is installed in the same rack as the RRU, the RRU does not support detection and monitoring functions. Therefore, monitoring is not performed in this scenario.

4.3 BBU3900 Indoors and RRU3004 Outdoors

This describes the scenarios that the BBU3900 and RRU3004 of the DBS3900 are installed indoors and outdoors respectively.

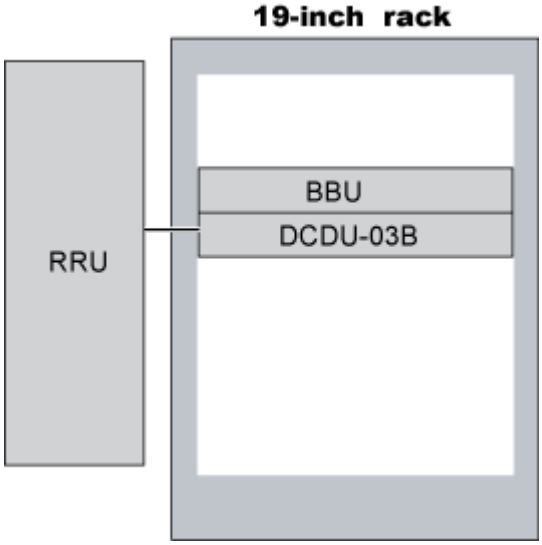
When -48 V DC power is available on site, the installation scenario of BBU+RRU+DCDU-03B is applicable.

4.3.1 Scenario 1: -48 V DC Power Input

When -48 V DC power is available on site, the installation scenario of BBU+RRU+DCDU-03B is applicable.

Figure 4-13 shows the installation scenario of BBU+RRU+DCDU-03B.

Figure 4-13 Installation scenario of BBU+RRU+DCDU-03B



In this installation scenario,

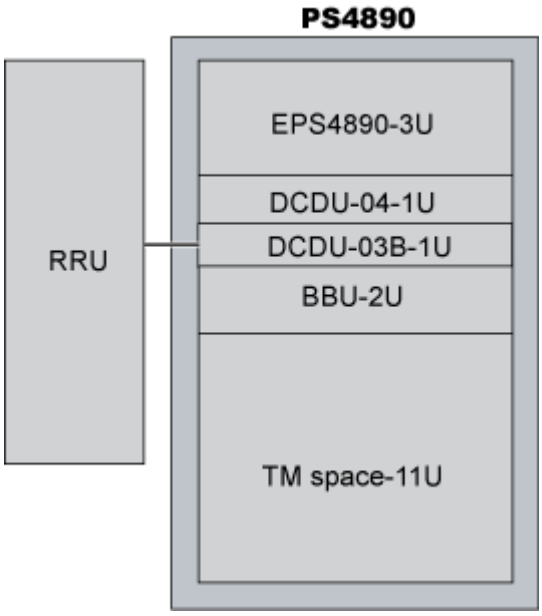
- The BBU and DCDU-03B are installed in an indoor 19-inch rack.
- The RRU can be installed outdoors on a pole or wall.
- The requirement for the switch quantity and capacity of the external power input system is 1 x (63 A to 100 A). The 63 A input is recommended.

4.3.2 Scenario 2: 220 V AC Power Input

When 220 V AC power is available on site, the installation scenario of BBU+RRU+PS4890 +DCDU-03B is applicable.

Figure 4-14 shows the installation scenario of BBU+RRU+PS4890+DCDU-03B.

Figure 4-14 Installation scenario of BBU+RRU+PS4890+DCDU-03B



In this installation scenario,

- The BBU and DCDU-03B are installed in an indoor PS4890.
- The RRU can be installed outdoors on a pole or wall.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

4.4 BBU3900 Outdoors and RRU3008 Outdoors

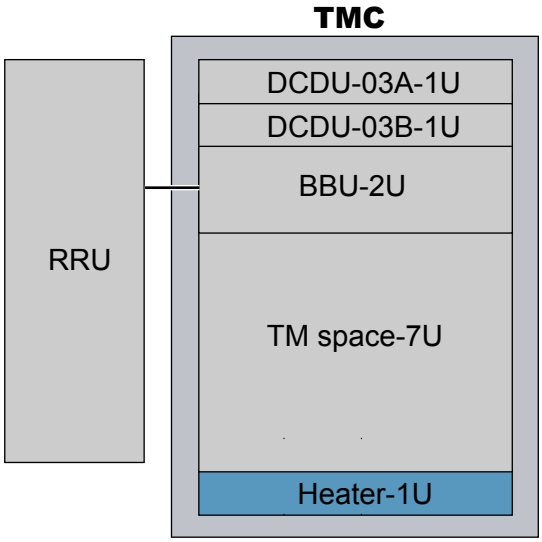
This describes the scenarios that the BBU3900 and RRU3008 of the DBS3900 are installed outdoors.

4.4.1 Scenario 1: -48 V DC Power Input

When -48 V DC power is available on site, the installation scenario of BBU+RRU+TMC is applicable.

Figure 4-15 shows the installation scenario of BBU+RRU+TMC.

Figure 4-15 Installation scenario of BBU+RRU+TMC



In this installation scenario,

- The TMC can be installed on the floor, pole, or wall.
- The TMC provides an installation space no greater than 7 U.
- The BBU can be installed in the TMC, which is equipped with the DCDU-03B to provide power for the BBU and RRU.
- The DCDU-03A configured in the TMC supplies power to transmission units.
- The heater in the TMC is optional.
- The RRU can be installed on a pole, wall, or tower.
- The requirement for the switch quantity and capacity of the external power input system is 1 x 63 A.

4.4.2 Scenario 2: 220 V AC Power Input

When 220 V AC power is available on site and the required space for transmission units is not greater than 4 U, the installation scenario of BBU+RRU+APM30+BBC is applicable.

NOTE

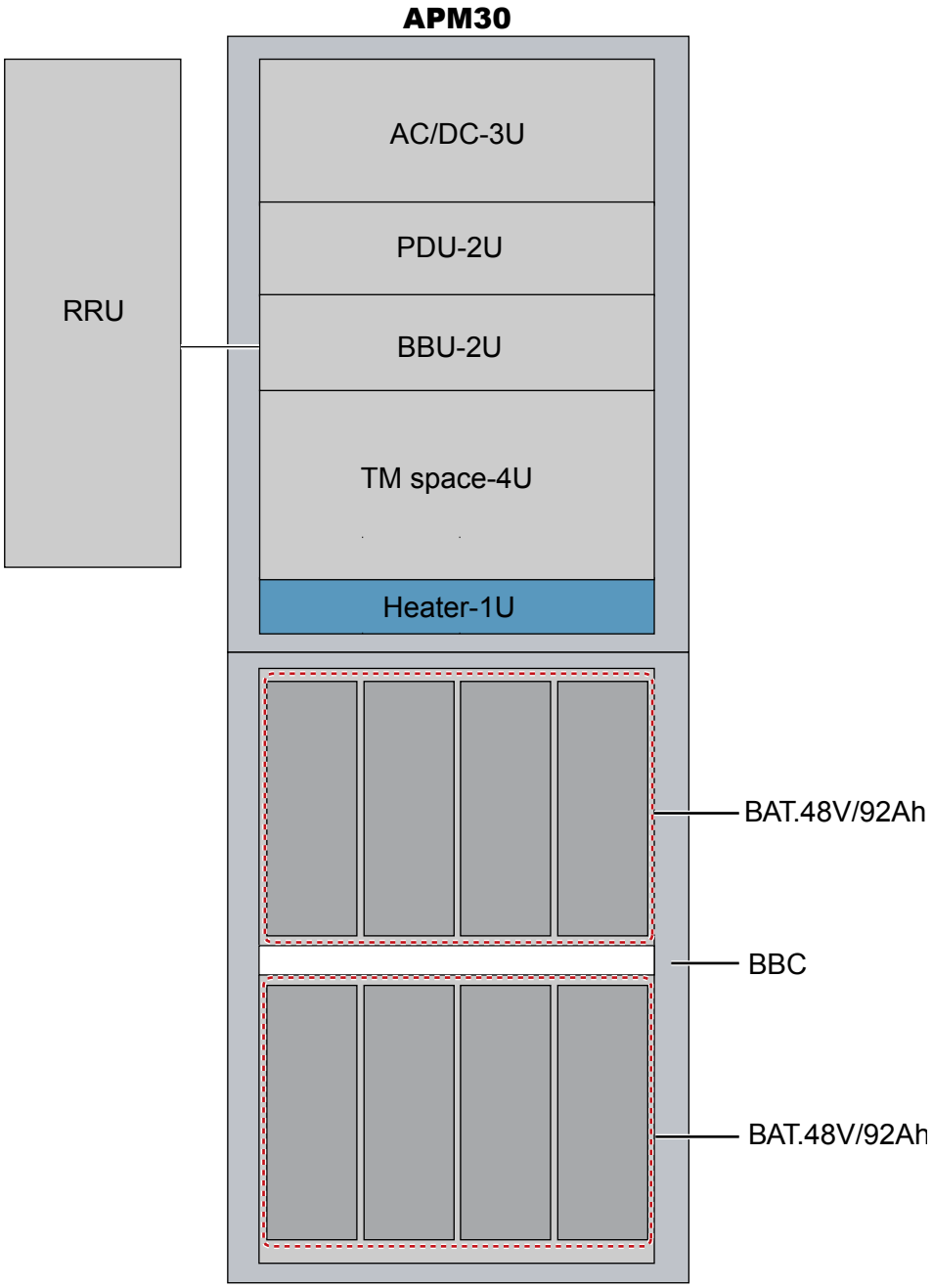
If the required space for transmission units is greater than 4 U, configure a TMC and ensure that the distance between the APM30 and the TMC is not longer than 1 m.

Scenario of Four-Hour Backup Power

If the backup power required at the site is not greater than four hours, installation scenario 1 of BBU+RRU+APM30+BBC is applicable.

Figure 4-16 shows installation scenario 1 of BBU+RRU+APM30+BBC.

Figure 4-16 Installation scenario 1 of BBU+RRU+APM30+BBC



In this installation scenario,

- The BBC is installed on the floor. By default, the APM30 is stacked on the BBC.
- The heater in the APM30 is optional. The APM30 provides a maximum of 4 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The heater in the BBC is optional. Without occupying additional internal space, the heater can be placed under the baffle plate at the bottom of each battery layer.

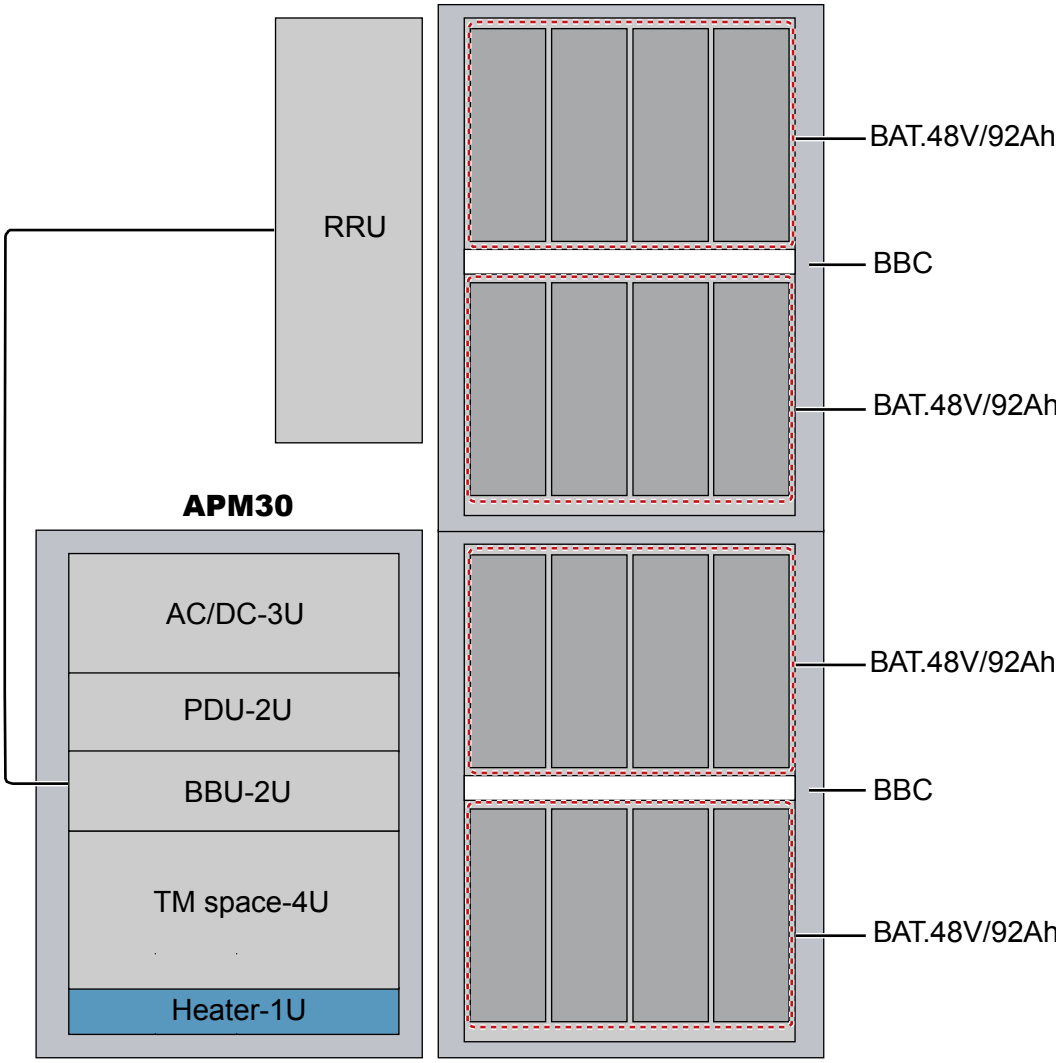
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

Scenario of Eight-Hour Backup Power

If eight-hour backup power is required at the site, installation scenario 2 of BBU+RRU+APM30 +BBC is applicable.

Figure 4-17 shows installation scenario 2 of BBU+RRU+APM30+BBC.

Figure 4-17 Installation scenario 2 of BBU+RRU+APM30+BBC



In this installation scenario,

- The APM30 and the BBC can be installed on the floor. By default, the two BBCs are stacked.

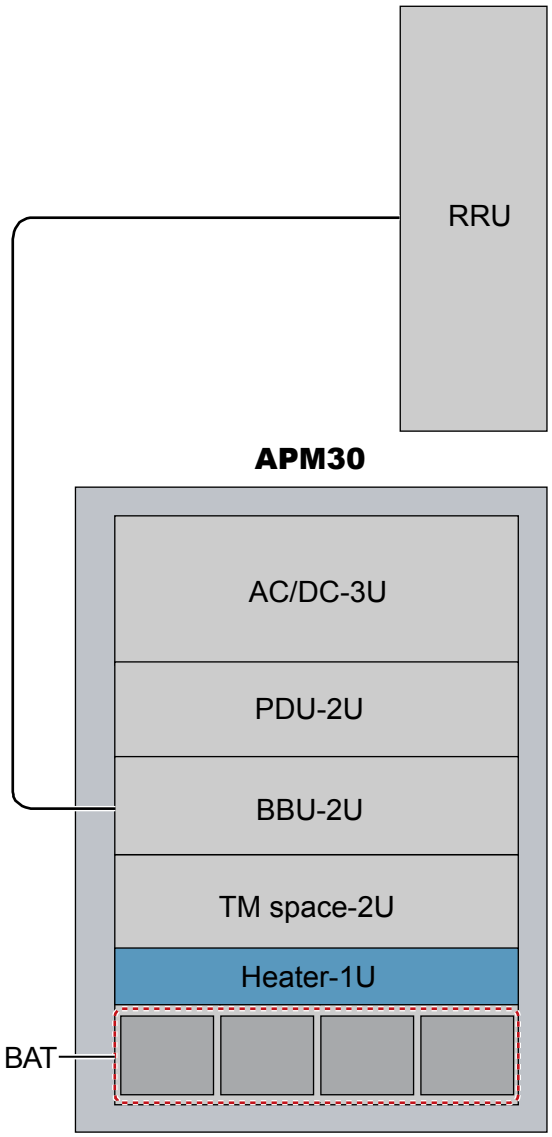
- The APM30 provides a maximum of 4 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The heater in the BBC is optional. Without occupying additional internal space, the heater can be placed under the baffle plate at the bottom of each battery layer.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

Scenario of Half-Hour Backup Power

If half-hour backup power is required at the site, the installation scenario of BBU+RRU+APM30 is applicable.

Figure 4-18 shows the installation scenario of BBU+RRU+APM30.

Figure 4-18 Installation scenario of BBU+RRU+APM30



In this installation scenario,

- The batteries providing 24 Ah backup power can be placed in the APM30. The batteries support a maximum cell configuration of S4/4/4.
- The APM30 provides a maximum of 2 U space for transmission units.
- The BBU can be installed in the APM30, which supplies -48 V DC power to the BBU and RRU.
- The RRU can be installed on a pole, wall, or tower.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

4.5 BBU3900 Indoors and RRU3008 Indoors

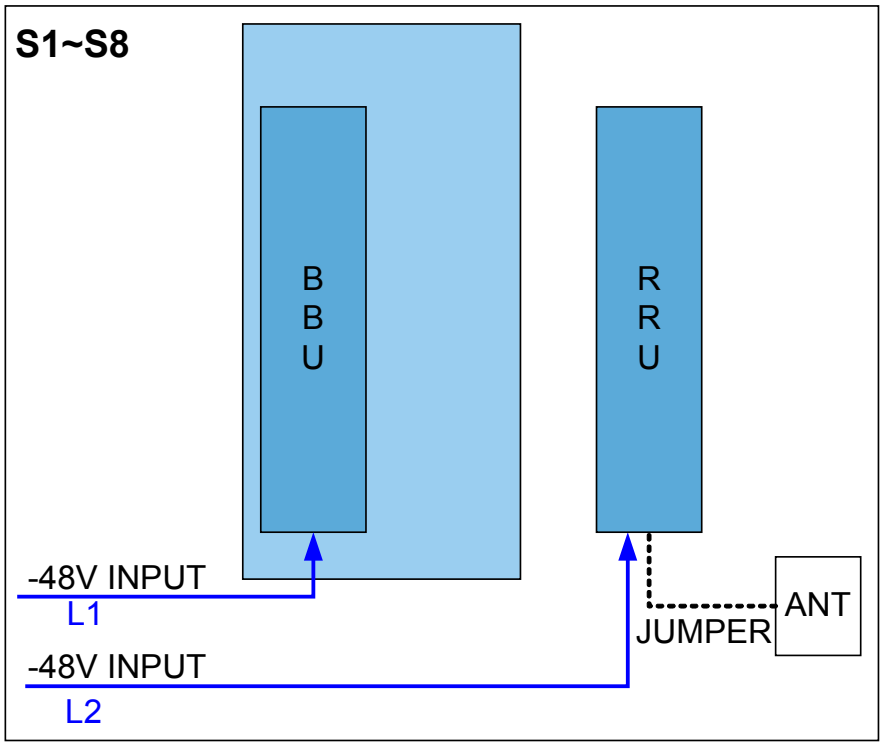
This describes the scenarios that the BBU3900 and RRU3008 of the DBS3900 are installed indoors.

4.5.1 Scenario 1: -48 V DC Power Input

When -48 V DC power and the equipment room are available on site, the BBU and RRU can be installed indoors.

Figure 4-19 shows the indoor centralized installation scenario of the BBU and RRU.

Figure 4-19 Indoor centralized installation



In this installation scenario,

- The BBU is installed in an RRU rack through a 2 U-high adapting piece. The RRU rack can be installed on the wall or stand.
- The RRU can be installed on the wall or stand.

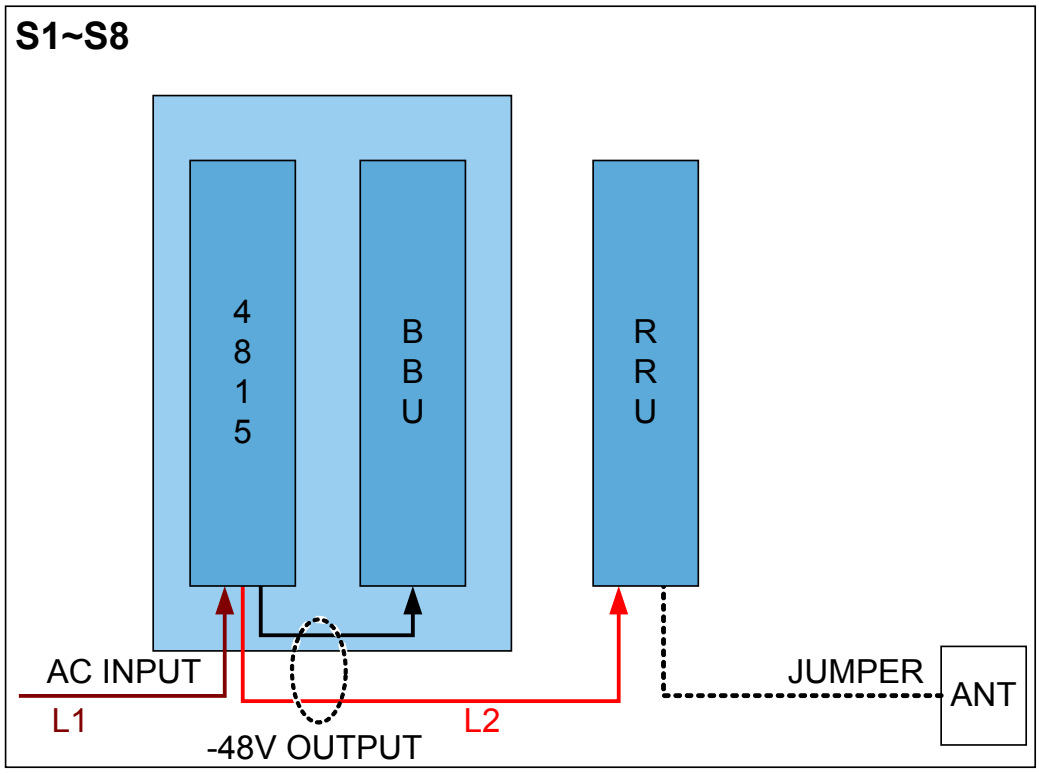
- For the BBU, the requirement for the switch quantity and capacity of the external power input system is 1 x (5 A to 10 A). For the RRU, the requirement is 1 x (10 A to 20 A).

4.5.2 Scenario 2: 220 V AC Power Input

When 220 V AC power and the equipment room are available on site, the BBU and RRU can be installed indoors.

Figure 4-20 shows the indoor centralized installation scenario of the BBU and RRU.

Figure 4-20 Indoor centralized installation



In this installation scenario,

- The 4815 is an AC/DC conversion unit. It converts the 220 V AC power into the -48 V DC power for the BBU and RRUs.
- The BBU and 4815 are installed in an RRU rack through the 2 U-high adapting pieces. The RRU rack can be installed on the wall or stand.
- The RRU can be installed on the wall or stand.
- The requirement for the switch quantity and capacity of the external power input system is 1 x 10 A (AC).

4.6 BBU3900 Indoors and RRU3008 Outdoors

This describes the scenarios that the BBU3900 and RRU3008 of the DBS3900 are installed indoors and outdoors respectively.

4.6.1 Scenario 1: -48 V DC Power Input

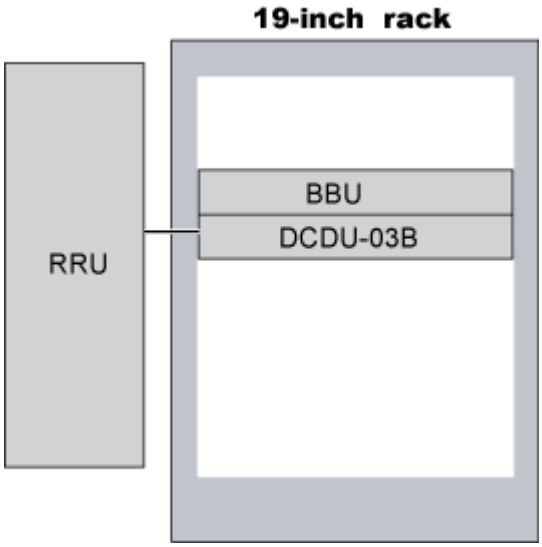
When -48 V DC power is available on site, the installation scenario of BBU+RRU+DCDU-03B is applicable.

4.6.1 Scenario 1: -48 V DC Power Input

When -48 V DC power is available on site, the installation scenario of BBU+RRU+DCDU-03B is applicable.

Figure 4-21 shows the installation scenario of BBU+RRU+DCDU-03B.

Figure 4-21 Installation scenario of BBU+RRU+DCDU-03B



In this installation scenario,

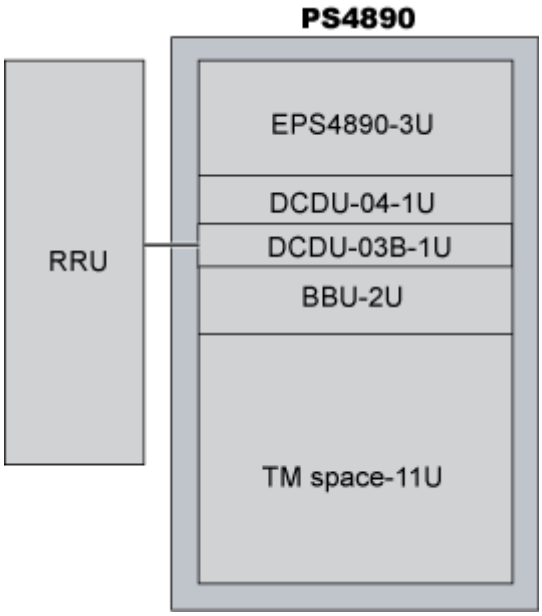
- The BBU and DCDU-03B are installed in an indoor 19-inch rack.
- The RRU can be installed outdoors on a pole or wall.
- The requirement for the switch quantity and capacity of the external power input system is 1 x (63 A to 100 A). The 63 A input is recommended.

4.6.2 Scenario 2: 220 V AC Power Input

When 220 V AC power is available on site, the installation scenario of BBU+RRU+PS4890 +DCDU-03B is applicable.

Figure 4-22 shows the installation scenario of BBU+RRU+PS4890+DCDU-03B.

Figure 4-22 Installation scenario of BBU+RRU+PS4890+DCDU-03B



In this installation scenario,

- The BBU and DCDU-03B are installed in an indoor PS4890.
- The RRU can be installed outdoors on a pole or wall.
- The requirements for the switch quantity and capacity of the external power input system are as follows:
  - 110 V AC dual-live-wire: 2 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC single-phase: 1 x (32 A to 50 A). The 32 A input is recommended.
  - 220 V AC three-phase: 3 x (20 A to 30 A). The 20 A input is recommended.

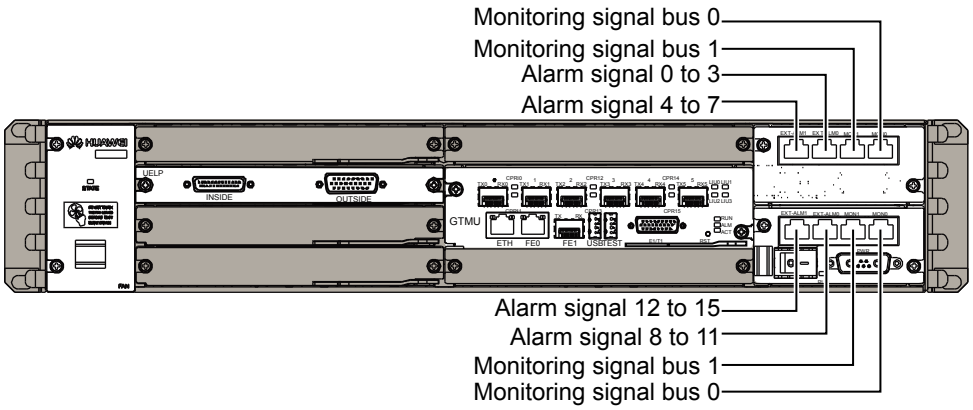
5 DBS3900 Monitoring Schemes

The monitoring system of the DBS3900 monitors the power supply, fans, and environment.

Monitoring Ports on the BBU

Figure 5-1 shows the monitoring ports on the BBU.

Figure 5-1 Monitoring ports on the BBU

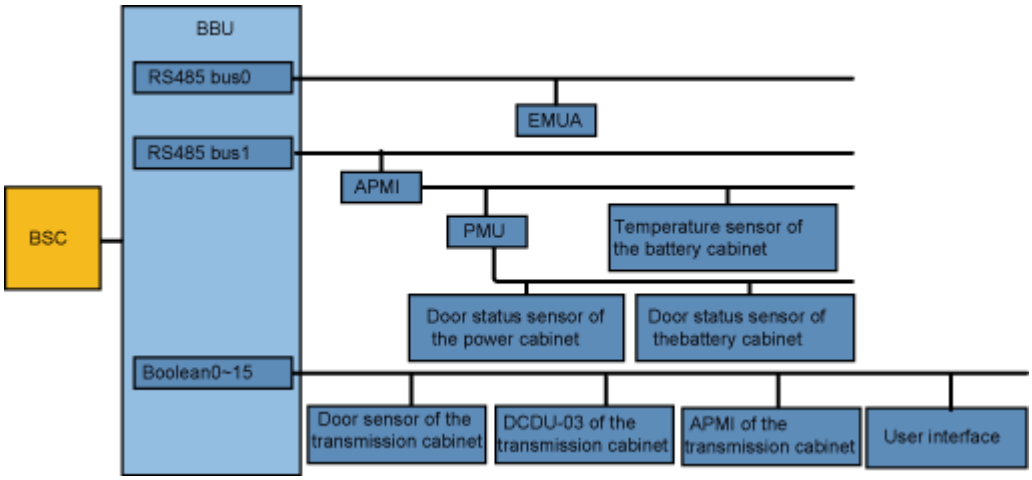


- The BBU can provide a maximum of 2 RS485 buses and 16 Boolean signal inputs.
- The modules connected to RS485 bus 0 cannot change to be connected to RS485 bus 1, and the other way round.

Components of the Monitoring System

Figure 5-2 shows the components of the DBS3900 monitoring system.

Figure 5-2 Components of the monitoring system



Functions of the Monitoring System

Table 5-1 describes the functions of the monitoring system.

Table 5-1 Functions of the monitoring system

Module	Monitoring Function
EMUA	• Communicates with the BBU through the RS485 port, through which two-channel RS485 signals are transmitted. • Detects the input voltage. • Provides ports for connections to the humidity and temperature sensor (12 V DC/24 V DC current type). • Provides ports for detecting the Boolean input signals of dry contact type and of OC type. • Provides ports for controlling six external Boolean outputs of relay node type.
PMU in the APM30	• Communicates with the BBU through the RS232/RS422 serial port. • Manages the power system and the battery recharging and discharging. • Detects and reports water damage alarms, smoke alarms, door status alarms, and standby Boolean value alarms, and reports ambient humidity and temperature, battery temperature, and standby analog values. • Detects power distribution and reports alarms.
DCDU-03	Monitors surge protection failure.

6 Clock Synchronization Modes of the DBS3900

The DBS3900 supports three clock synchronization modes: line clock, BITS clock, and free-run clock.

Line Clock

The BBU directly extracts the clock from the E1/T1 interface. Then, the BBU exports the precise 2 MHz and 8 kHz clocks after frequency dividing, phase locking, and phase adjusting. The 2 MHz and 8 kHz clocks are used for frame synchronization and bit synchronization in the DBS3900.

BITS Clock

The BBU3900 supports the BITS clock mode by providing a port for the input of 2.048 MHz BITS clock.

Free-Run Clock

The internal free-run clock guarantees the normal operation of the BTS when external clock references are unavailable.

7 Configuration of the DBS3900

About This Chapter

The DBS3900 features flexible configuration and supports multiple receive and transmit modes.

Configuration Features

The DBS3900 has the following features in terms of configuration:

- It supports omni-directional and directional coverage modes.
- The RF modules can be cascaded.
- For the RRU3004, the transmit mode can be transmit independency or combining, PBT, transmit diversity, or dynamic PBT. For the RRU3008, the transmit mode can be transmit independency and transmit diversity.
- The receive mode can be the main and diversity mode.
- The antenna modes can be single-antenna, single-antenna double-receiver, double-antenna, and double-antenna four-receiver.

7.1 Typical Configurations of the DBS3900

The DBS3900 supports the omni-directional, 2-sector, and 3-sector configurations.

Table 7-1 describes the typical configurations of the DBS3900 that uses the RRU3004.

Table 7-1 Typical configurations of the DBS3900 with the RRU3004

Configuration	Number of BBUs	Number of RRU Modules (No Transmit Diversity)
S1/1/1	1	3
S2/2/2	1	3
S3/3/3	1	6
S4/4/4	1	6
S5/5/5	1	9
S6/6/6	1	9
S7/7/7	1	12
S8/8/8	1	12

Table 7-2 describes the typical configurations of the DBS3900 that uses the RRU3008.

Table 7-2 Typical configurations of the DBS3900 with the RRU3008

Configuration	Number of BBUs	Number of RRU Modules (No Transmit Diversity)
S3/3/3	1	3
S4/4/4	1	3
S5/5/5	1	3 to 6
S6/6/6	1	3 to 6
S7/7/7	1	3 to 6
S8/8/8	1	3 to 6
S9/9/9	1	6
S10/10/10	1	6
S11/11/11	1	6
S12/12/12	1	6
S13/13/13	1	6

Configuration	Number of BBUs	Number of RRU Modules (No Transmit Diversity)
S14/14/14	1	6
S15/15/15	1	6
S16/16/16	1	6

NOTE

For details about RF cable connections in different configurations of the DBS3900, see **7.2 RF Cable Connections of the RRU3004** and **7.3 RF Jumper Connections of the RRU3008**.

7.2 RF Cable Connections of the RRU3004

The RF cables of the RRU are classified into the RF jumpers and the interconnect jumpers. According to the actual conditions, the RF jumper can be connected to the feeder or can be connected to the antenna directly. The interconnect jumper connects the **RX_IN/OUT** ports of two RRU3004 modules and transmits RF signals between the two modules. You can determine the appropriate RF cable connection mode based on the actual networking mode.

Table 7-3 describes the RF cable connections in different configuration modes.

NOTE

Table 7-3 takes the star topology between the BBU3900 and the RRU3004 as an example.

The RF cables differ from each other in colors. **Figure 7-1** shows the mapping between the RF signal cables and their colors.

Figure 7-1 Mapping between the RF signal cables and their colors

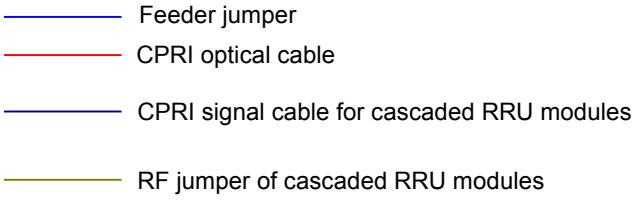
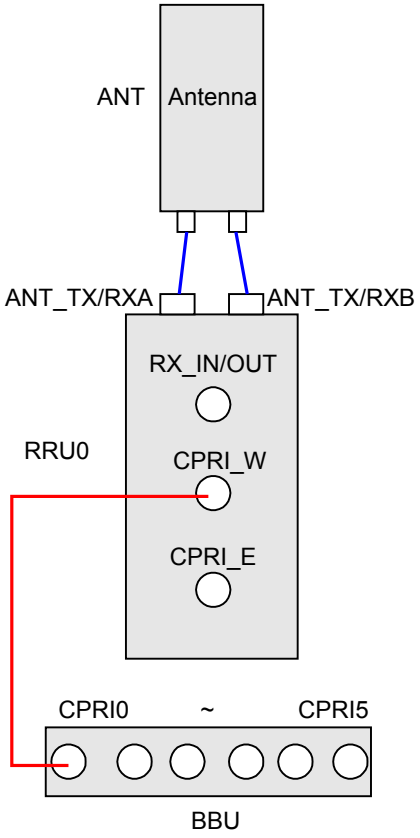
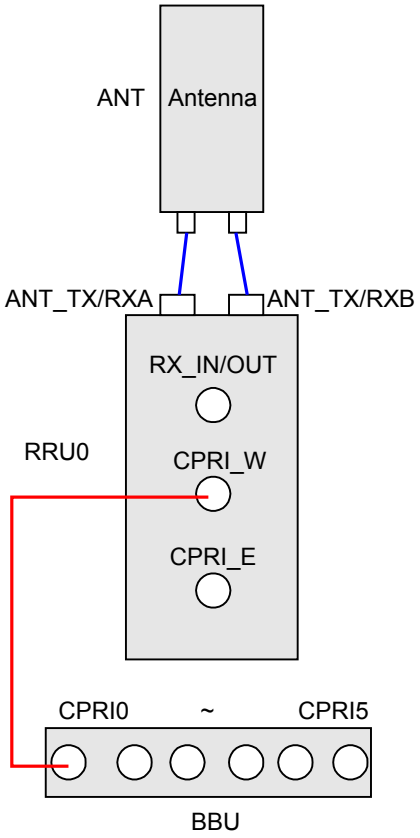
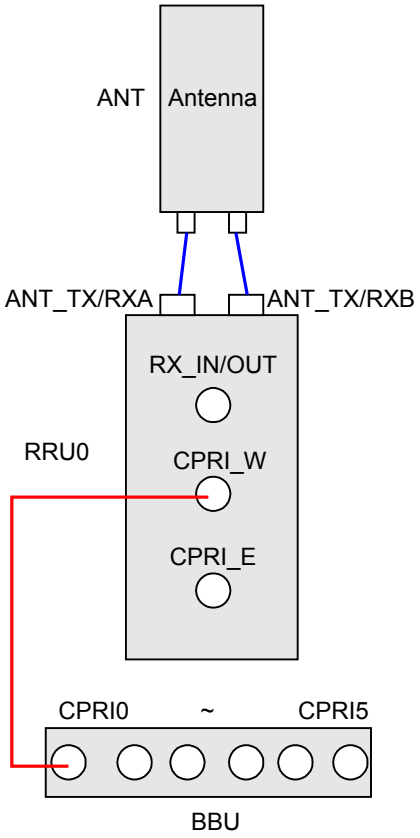
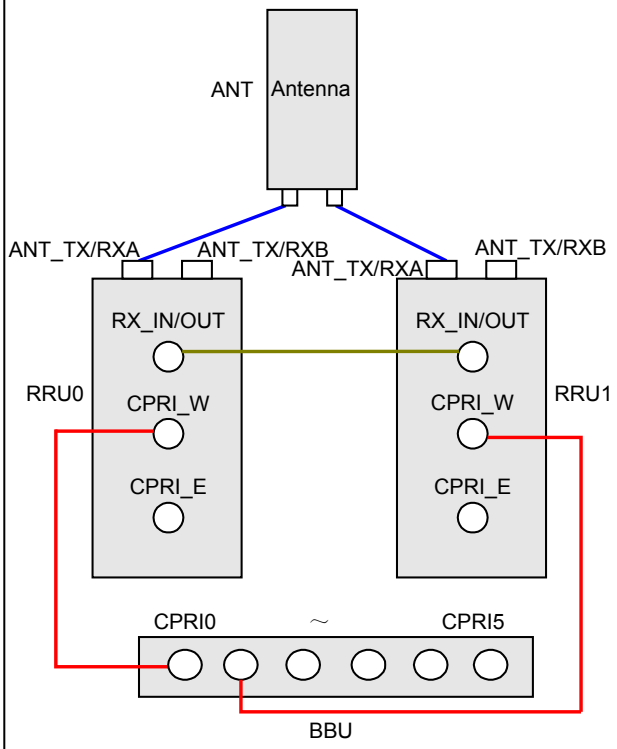


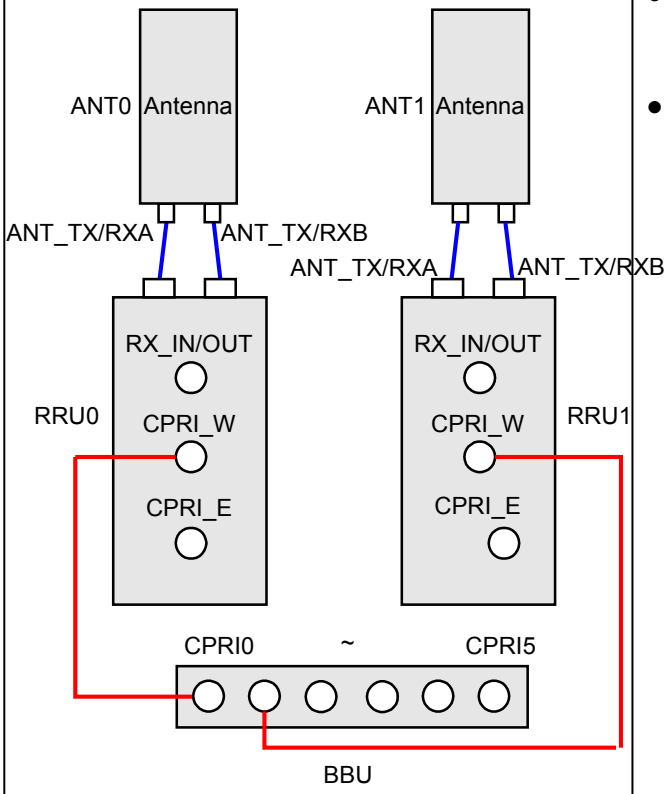
Table 7-3 RF cable connections of the RRU

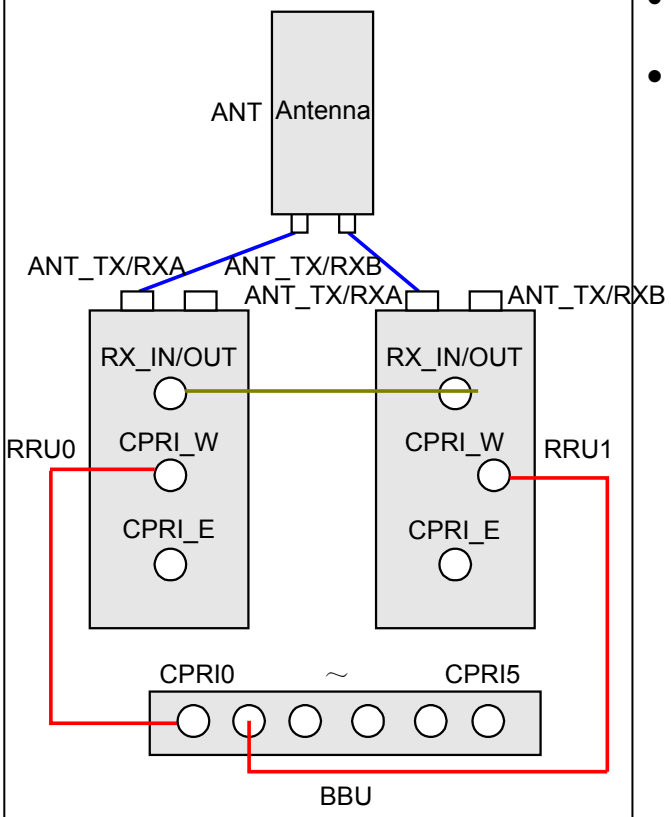
Typical Configuration	Hardware Configuration	Software Configuration
S1	• One RRU module • One dual-polarized antenna **Figure 7-2** shows the connections of the RF cables. **Figure 7-2** Connections of the RF cables for S1 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna**

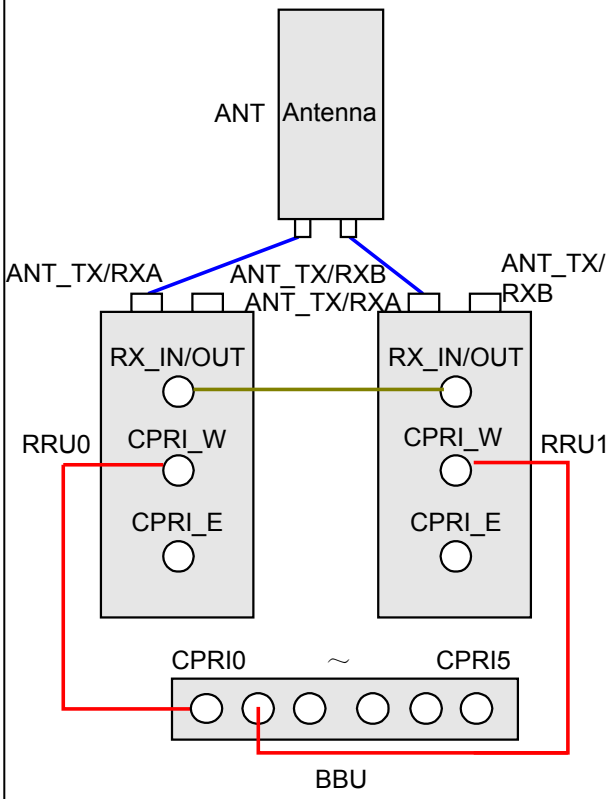
Typical Configuration	Hardware Configuration	Software Configuration
S1	• One RRU module • One dual-polarized antenna Figure 7-3 shows the connections of the RF cables. **Figure 7-3** Connections of the RF cables for S1 (transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Diversity** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna**

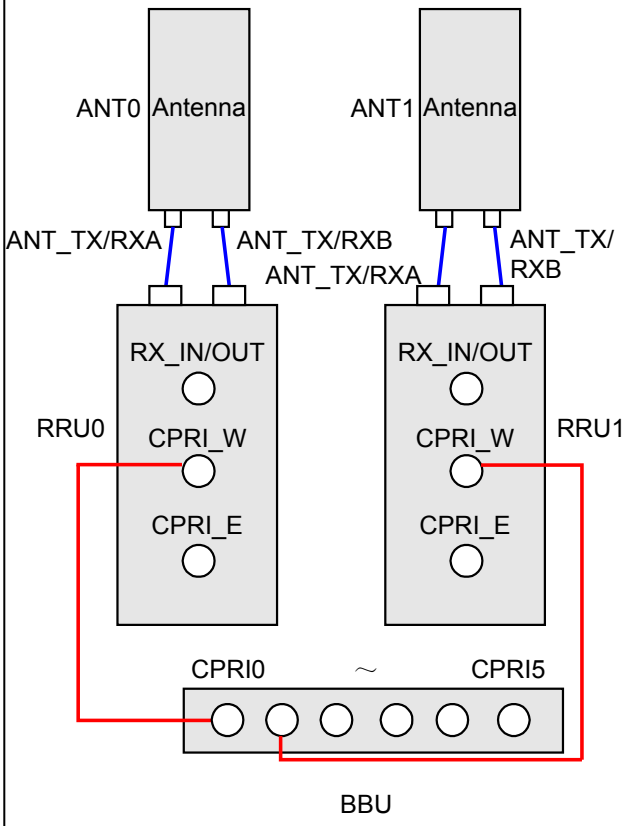
Typical Configuration	Hardware Configuration	Software Configuration
S2	• One RRU module • One dual-polarized antenna Figure 7-4 shows the connections of the RF cables. **Figure 7-4** Connections of the RF cables for S2 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna**

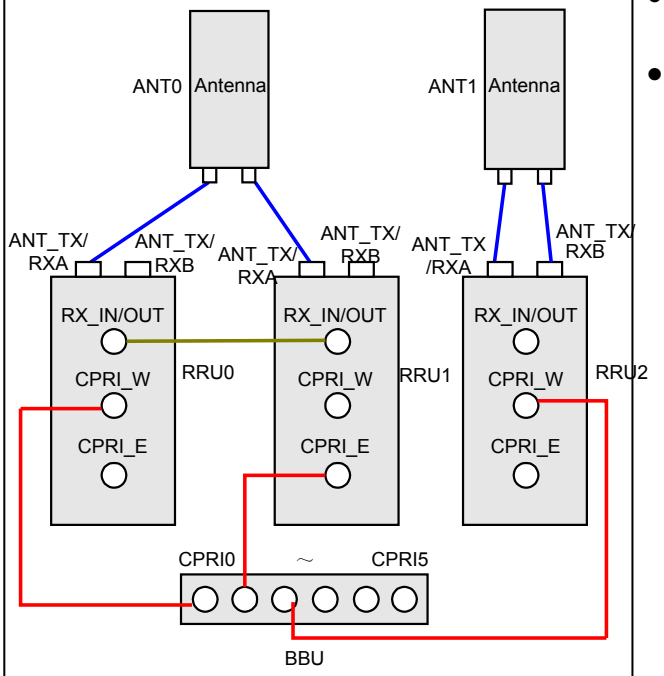
Typical Configuration	Hardware Configuration	Software Configuration
S2	• Two RRU modules • One dual-polarized antenna Figure 7-5 shows the connections of the RF cables. **Figure 7-5** Connections of the RF cables for S2 (PBT)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **PBT** • Receive mode: **Receive Diversity** • Antenna mode: **Single Antenna Double Receiver**

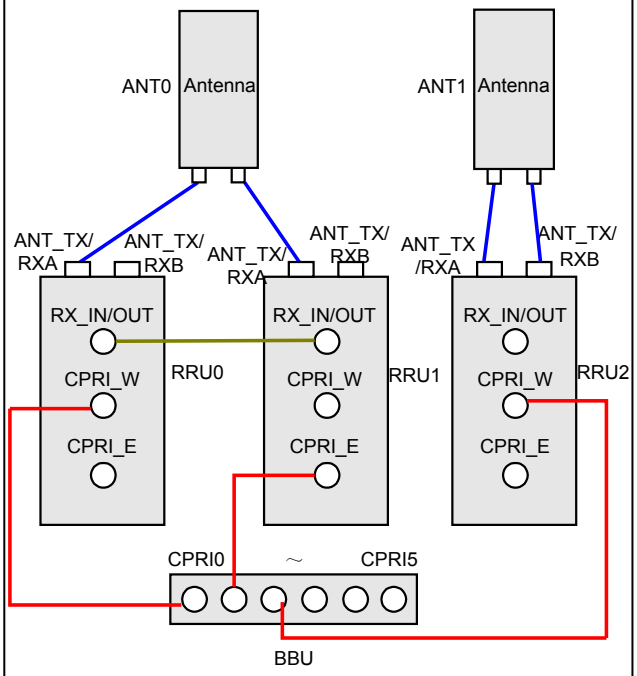
Typical Configuration	Hardware Configuration	Software Configuration
S2	• Two RRU modules • Two dual-polarized antennas Figure 7-6 shows the connections of the RF cables. **Figure 7-6** Connections of the RF cables for S2 (transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Diversity** • Receive mode: **4-Way Receive Diversity** • Antenna mode: **Double Antenna**

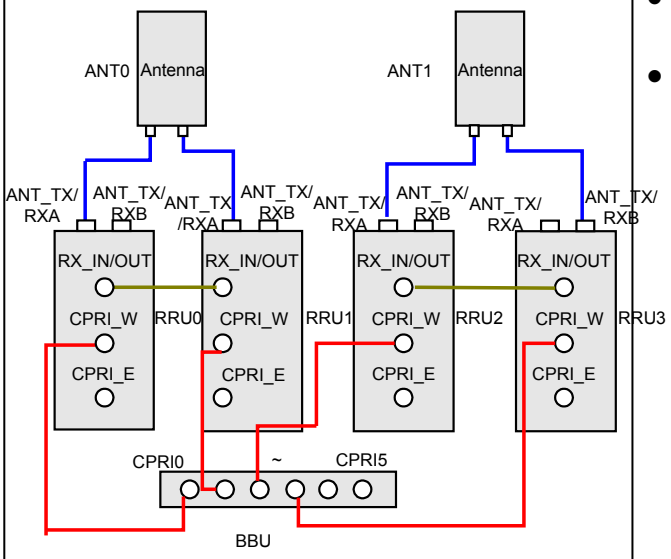
Typical Configuration	Hardware Configuration	Software Configuration
S3	• Two RRU modules • One dual-polarized antenna Figure 7-7 shows the connections of the RF cables. **Figure 7-7** Connections of the RF cables for S3 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Single Antenna Double Receiver**

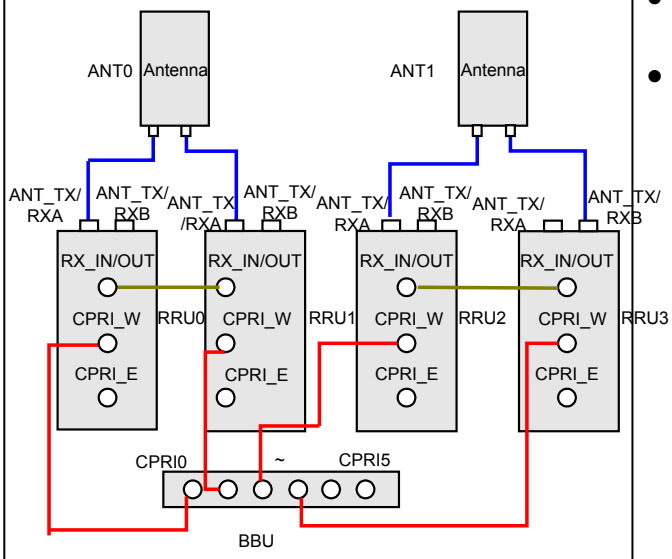
Typical Configuration	Hardware Configuration	Software Configuration
S4	• Two RRU modules • One dual-polarized antenna Figure 7-8 shows the connections of the RF cables. **Figure 7-8** Connections of the RF cables for S4 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Single Antenna Double Receiver**

Typical Configuration	Hardware Configuration	Software Configuration
S4	• Two RRU modules • Two dual-polarized antennas Figure 7-9 shows the connections of the RF cables. **Figure 7-9** Connections of the RF cables for S4 (transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna**

Typical Configuration	Hardware Configuration	Software Configuration
S5	• Three RRU modules • Two dual-polarized antennas **Figure 7-10** shows the connections of the RF cables. **Figure 7-10** Connections of the RF cables for S5 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna** for RRU0 and RRU1, and **Single Antenna Double Receiver** for RRU2

Typical Configuration	Hardware Configuration	Software Configuration
S6	• Three RRU modules • Two dual-polarized antennas **Figure 7-11** shows the connections of the RF cables. **Figure 7-11** Connections of the RF cables for S6 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Double Antenna** for RRU0 and RRU1, and **Single Antenna Double Receiver** for RRU2

Typical Configuration	Hardware Configuration	Software Configuration
S7	• Four RRU modules • Two dual-polarized antennas **Figure 7-12** shows the connections of the RF cables. **Figure 7-12** Connections of the RF cables for S7 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Single Antenna Double Receiver**

Typical Configuration	Hardware Configuration	Software Configuration
S8	• Four RRU modules • Two dual-polarized antennas **Figure 7-13** shows the connections of the RF cables. **Figure 7-13** Connections of the RF cables for S8 (no transmit diversity)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Independency or Combining** • Receive mode: **Receive Diversity** • Antenna mode: **Single Antenna Double Receiver**

7.3 RF Jumper Connections of the RRU3008

You can determine the appropriate RF cable connection mode based on the actual networking mode.

Table 7-4 describes the RF cable connections in different networking modes.

NOTE

For easy description, **Table 7-4** takes the star topology between the BBU3900 and the RRU3008 as an example.

The RF cables differ from each other in colors. **Figure 7-14** shows the mapping between the RF cables and their colors.

Figure 7-14 Mapping between the RF cables and their colors

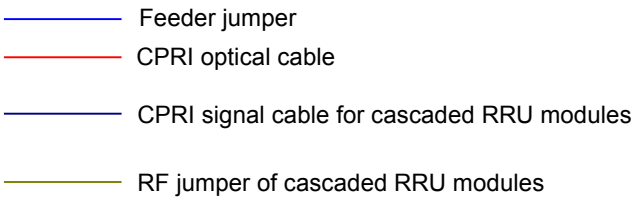
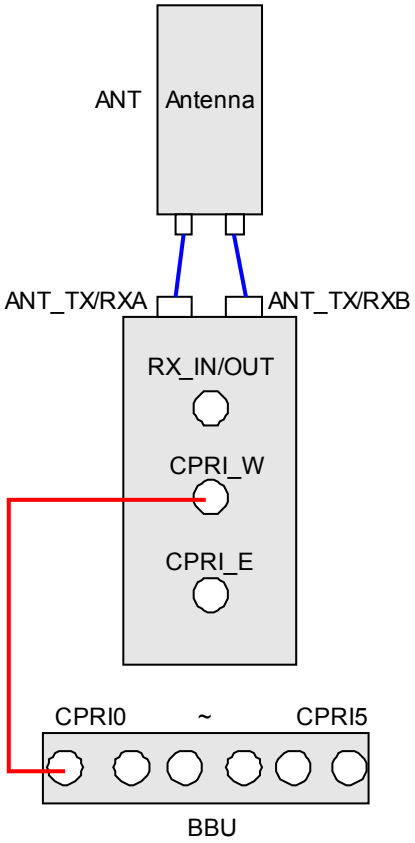
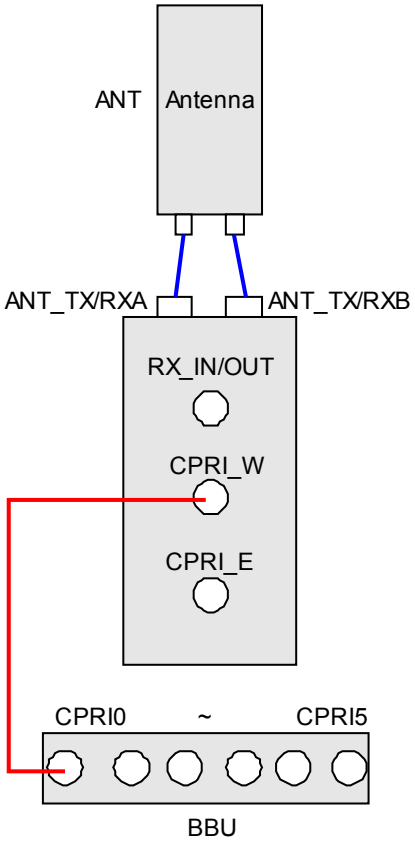
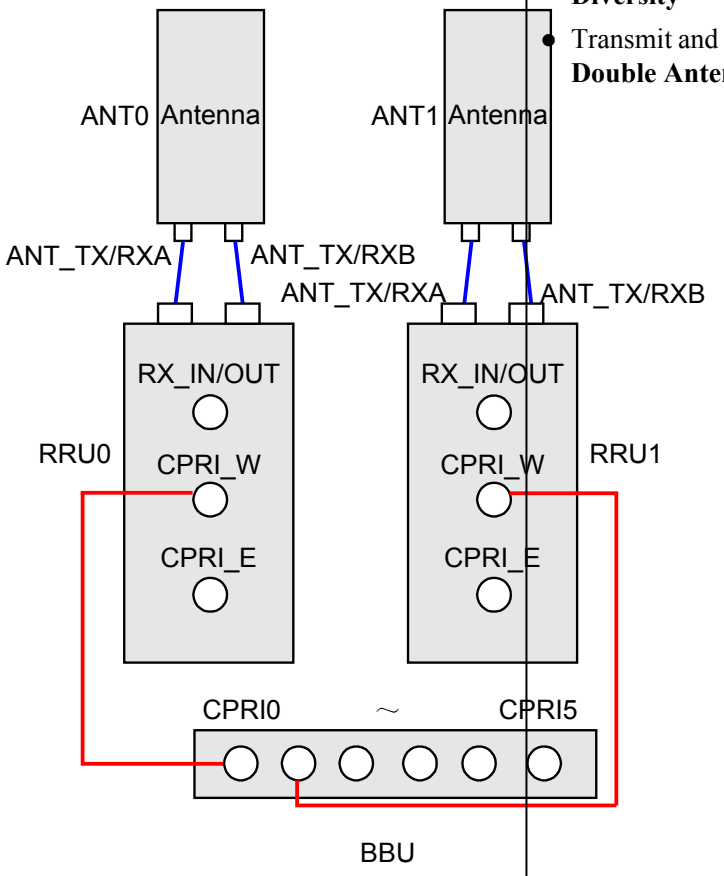
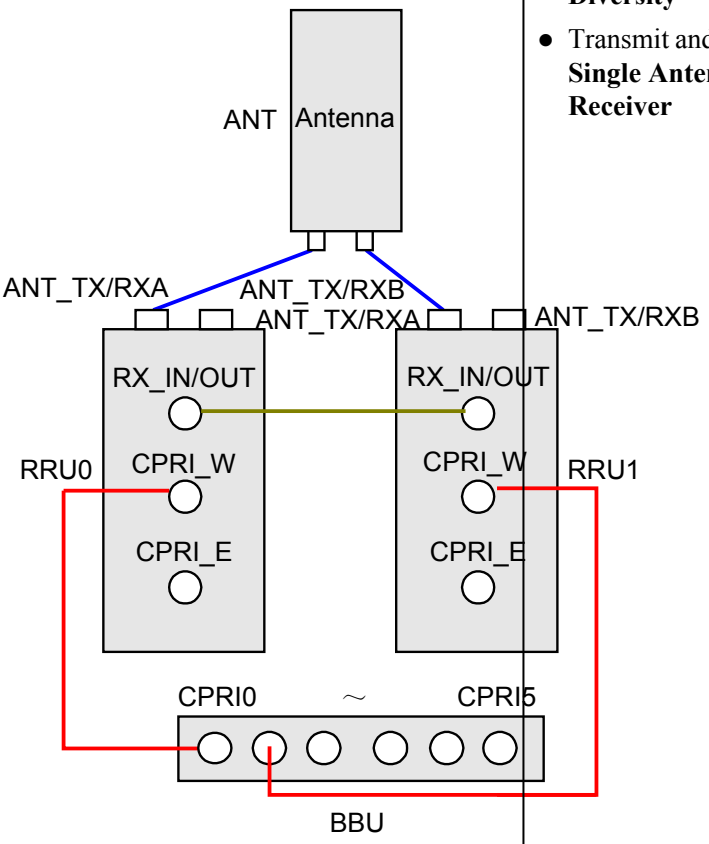


Table 7-4 RF cable connections of the RRU3008

Networking Mode	Hardware Configuration	Software Configuration
S1 to S8	• One RRU3008 • One dual-polarization antenna Figure 7-15 shows the connections of RF cables. **Figure 7-15** RF cable connections (1) 	TRX attributes and antenna mode on the BSC side: • Transmit mode: **No Combining** • Transmit mode: **Main Diversity** • Transmit and receive mode: **Double Antenna**

Networking Mode	Hardware Configuration	Software Configuration
S1 to S4	• One RRU3008 • One dual-polarization antenna **Figure 7-16** shows the connections RF cables. **Figure 7-16** RF cable connections (2)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **Transmit Diversity** • Transmit mode: **Main Diversity** • Transmit and receive mode: **Double Antenna**

Networking Mode	Hardware Configuration	Software Configuration
S5 ~ S16	• One RRU3008 • Two dual-polarization antennas Figure 7-17shows the connections RF cables. **Figure 7-17** RF cable connections (3)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **No Combining** • Transmit mode: **Main Diversity** • Transmit and receive mode: **Double Antenna**

Networking Mode	Hardware Configuration	Software Configuration
S5 ~ S16	• One RRU3008 • One dual-polarization antenna Figure 7-18shows the connections RF cables. **Figure 7-18** RF cable connections (4)  	TRX attributes and antenna mode on the BSC side: • Transmit mode: **No Combining** • Transmit mode: **Main Diversity** • Transmit and receive mode: **Single Antenna Double Receiver**

8 OM System of the DBS3900

About This Chapter

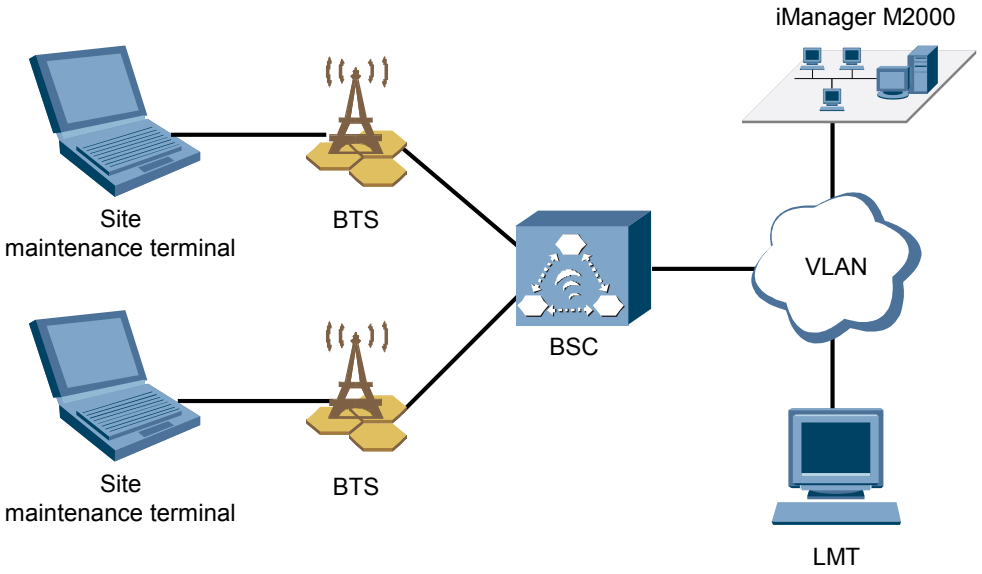
This describes the OM system of the DBS3900. The OM system manages, monitors, and maintains the DBS3900. The OM system also provides various OM modes and multiple maintenance platforms to meet different maintenance requirements.

8.1 OM Modes of the DBS3900

The OM modes of the DBS3900 consist of the Site Maintenance Terminal mode, Local Maintenance Terminal (LMT) mode, and iManager M2000 (M2000) mode.

Figure 8-1 shows the network structure of the DBS3900 OM system.

Figure 8-1 Network structure of the OM system



You can maintain the DBS3900 in following modes:

- Site Maintenance Terminal mode: The Site Maintenance Terminal is locally connected to the BTS through the Ethernet. You can use the Site Maintenance Terminal to operate and maintain the site, cell, Radio Carrier (RC), Baseband Transceiver (BT), channel, and board. In this mode, only one BTS can be maintained at a time.
- LMT mode: The LMT can be used to maintain the BTS through the OM links on the Abis interface between the BSC and the BTS. The LMT communicates with the BSC through a LAN. You can use the LMT to operate and maintain the site, cell, RC, channel, and board. This mode is used for configuring and modifying the data of the BSC and BTS.
- M2000 mode: You can use the M2000 to maintain the BTS through the OM network. The site, cell, channel, and board can be operated and maintained on the M2000. In this mode, multiple BTSs can be maintained at a time.

8.2 OM Functions of the DBS3900

DBS3900The OM functions of the DBS3900 consist of security management, equipment management, configuration management, software management, alarm management, environment monitoring, and performance management. The OM functions of the DBS3900 can be performed on the Site Maintenance Terminal, LMT, and M2000.

Security Management

The DBS3900 authorizes maintenance engineers with hierarchical operation rights to ensure the system security. At the same time, dialog boxes are displayed before dangerous operations are performed. Before issuing an important OM command, you are prompted to view the possible results of the operation and then to confirm the operation.

Equipment Management

Equipment management consists of equipment maintenance and data configuration.

Configuration Management

The functions of configuration management are as follows:

- Checking whether the added, deleted, or modified BTS data is consistent with the actual configurations
- Supporting automatic data backup
- Supporting dynamic and static data configuration modes In dynamic data configuration mode, the modified data takes effect immediately. In static data configuration mode, the modified data takes effect only after the BTS is restarted.

Software Management

The functions of the software management are as follows:

- Software activation
- Consistency check on software versions and hardware versions
- Version management such as querying software and hardware versions
- Upgrade of software versions

Alarm Management

The functions of alarm management are as follows:

- Querying real-time alarms and history alarms
- Collecting internal and external alarms, such as the environment monitoring device inputs and Boolean inputs
- Processing alarm correlation to ensure precision and accuracy in locating alarms
- Supporting the alarm storage, interpretation, indication, masking, filtering, confirmation, clearing, post processing, and reporting functions

Environment Monitoring

To ensure the normal operation of the BTS equipment and to help you handle various emergencies, the BTS provides a complete environment monitoring system.

The environment monitoring system provides customized solutions regarding door control, infrared, smoke, water immersion, humidity, and temperature.

Performance Management

Performance management is to measure and report performance counters based on services requirements. The functions are as follows:

- Monitoring the performance of the internal and external telecommunications networks and generating alarms when the performance deteriorates
- Monitoring the running status of the BTS, such as monitoring the traffic volume on the ports and measuring the technical data of the BTS
- Monitoring the usage of crucial components, such as the CPU and DSP on the board

Specific OM Functions of the DBS3900

Table 8-1 describes the specific OM functions of the DBS3900 based on the Site Maintenance Terminal, LMT, and M2000.

Table 8-1 Functions of the BTS OM system

Maintenance Object	Maintenance Items of the Site Maintenance Terminal	Maintenance Items of the LMT	Maintenance Items of the M2000
Site	View Resource Performing site Opstart Conducting RF counters tests Assigning site management rights Performing forced software loading Software activation Resetting sites hierarchically Testing sites Environment Monitoring Testing the transmission performance Viewing ring topology parameters Viewing bar codes Viewing the alarm delay time E1 BER Detection Managing the RET antenna	Get Site Software Version Get Site Attributes View Resource Multi-site Software Load Multi-site Software Activation Resetting sites hierarchically Environment Monitoring Testing sites Alarm shielding Viewing the alarm delay time Query Faults in Multiple BTSs Testing the transmission performance Viewing ring topology parameters Viewing bar codes Multi-site Software Version Query Multi-site Board Matching Query Site Board Parameter Management dialog box Query Equipment Room Temperature Board Bar Code Report E1 BER Detection Antenna Feeder Connection Check Managing the RET antenna	Managing the reporting of performance data Managing NE users Monitoring NE Status Providing centralized user management Monitoring NE Performance Monitoring NE in Real Time Querying File Information in NE

Maintenance Object	Maintenance Items of the Site Maintenance Terminal	Maintenance Items of the LMT	Maintenance Items of the M2000
Cell	Managing cell attributes Managing extended cell attributes Performing cell Opstart Testing the cell performance Change Cell Management State	Modify Administrative State Performing force handovers Send Cell System Message Query Frequency Scan Configure Frequency Scan	Checking Distribution of Cells Checking Basic Cell Configuration Information Checking CCH Configuration Information Checking Neighbor Cells Monitoring the configuration of an object Summarizing Alarms of Monitored Objects Blocking/ Unblocking Cells
BT	Performing BT Opstart Reinitializing the BT TRX Full Power Emission Change BT Management State Testing the BT View Channel State	-	-

Maintenance Object	Maintenance Items of the Site Maintenance Terminal	Maintenance Items of the LMT	Maintenance Items of the M2000
RC	Managing RC attributes Managing RC extended attributes Performing RC Opstart Reinitializing the RC Change RC Management State Querying the automatic power adjustment type Get RC Power Mode	Modify Administrative State Test TRX Performance Query Power Mode Query Automatic Power Correction Type Test TRX Loopback Test Idle Timeslot Test CODEC Mode Reset TRX Controlling TRX Power	-
Channel	Managing channel attributes Performing channel Opstart Change Channel Management State Conducting loopback tests	Modify Administrative State Monitor Channel Status Monitor Channel Interference Band Test Channel Loopback Testing Channel Performance	Checking Basic Cell Configuration Information Checking CCH Configuration Information

Maintenance Object	Maintenance Items of the Site Maintenance Terminal	Maintenance Items of the LMT	Maintenance Items of the M2000
Board	Configuring racks Configuring boards Managing boards	Query Board Running Software Version Query Board Match Query Board Bar Code Viewing Board Information Maintain Clock Reset Board Switch Board Query Power Module Status Reset Smoke Alarm Maintain Battery Set/Query Power Module Parameters Testing BTS Board Loopback Querying the Cavity State and the Cavity Frequency Setting TMA Feeder Resetting the Auxiliary Equipment Maintaining the RET Antenna	Viewing NE Board Reports Querying Inventory Data

9 Specifications of the DBS3900

About This Chapter

This describes the specifications of the DBS3900. The specifications cover items such as the capacity, RF, engineering, surge protection, ports, environment, and compliant standards.

9.1 Capacity Specifications of the DBS3900
This describes the capacity specifications of the DBS3900 in terms of the number of supported carriers and cells.

9.2 RF Specifications of the DBS3900
This describes the RF specifications of the DBS3900. The RF specifications involve the operating frequency band, transmitter, and receiver.

9.3 Engineering Specifications of the DBS3900
This describes the engineering specifications of the DBS3900. The engineering specifications involve the physical dimensions, equipment weight, power input, and power consumption.

9.4 Surge Protection Specifications of Ports on the DBS3900
This describes the surge protection specifications of the external ports on the BBU3900 and RRU3004.

9.5 Ports on the DBS3900
This describes the ports on the DBS3900. The ports consist of the grounding ports, power ports, transmission ports, alarm ports, clock ports, and other ports.

9.6 Compliance Standards of the DBS3900
This describes the standards that the DBS3900 complies with in terms of Electromagnetic Compatibility (EMC), acoustic noise, storage environment, transportation environment, operating environment, and anti-seismic performance.

9.7 Environmental Requirements of the DBS3900
This describes the environmental requirements of the DBS3900. The environmental requirements consist of operating environment requirements, transportation requirements, and storage requirements.

9.1 Capacity Specifications of the DBS3900

This describes the capacity specifications of the DBS3900 in terms of the number of supported carriers and cells.

Capacity of the BBU3900

A single BBU3900 supports a maximum of 36 carriers when it is connected to only RRU3004s and supports a maximum of 72 carriers when it is connected to only RRU3008s.

Capacity of the RRU Module

- Each RRU3004 consists of two RRU modules. Therefore, an RRU3004 supports four carriers.
- An RRU3008 module supports eight carriers.

9.2 RF Specifications of the DBS3900

This describes the RF specifications of the DBS3900. The RF specifications involve the operating frequency band, transmitter, and receiver.

Operating Frequency Band

Table 9-1 lists the frequency bands supported by the RRU3004.

Table 9-1 Operating frequency bands of the RRU3004

Operating Frequency Band	RX Frequency Band	TX Frequency Band
900 MHz	880 MHz to 915 MHz	925 MHz to 960 MHz
1800 MHz	1710 MHz to 1785 MHz	1805 MHz to 1880 MHz

Table 9-2 lists the frequency bands supported by the RRU3008.

Table 9-2 Operating frequency bands of the RRU3008

Operating Frequency Band	RX Frequency Band	TX Frequency Band
850 MHz	824 MHz to 849 MHz	869 MHz to 894 MHz
900 MHz	890 MHz to 915 MHz	935 MHz to 960 MHz
1900 MHz	1850 MHz to 1910 MHz	1930 MHz to 1990 MHz

Transmitter Specifications

Table 9-3 lists the rated output power per carrier at the TX antenna connector of the RRU3004.

Table 9-3 Output power of the RRU3004

Operating Frequency Band	Working Mode	Output Power (GMSK/8PSK TOC)
900 MHz	No combination	30 W/20 W
1800 MHz		20 W/15 W
900 MHz	Combination	15 W/10 W
1800 MHz		10 W/7.5 W
900 MHz	PBT	40 W/25 W
1800 MHz		30 W/20 W

Table 9-4 lists the rated output power per carrier at the TX antenna connector of the RRU3008.

Table 9-4 Output power of the RRU3008

Operating Frequency Band	Number of Carriers	Output Power (GMSK/8PSK TOC)
850 MHz/900 MHz/1900 MHz	3	20 W/13.2 W
850 MHz/900 MHz/1900 MHz	4	15 W/10 W
850 MHz/900 MHz/1900 MHz	5	12 W/8 W
850 MHz/900 MHz/1900 MHz	6	10 W/6.6 W
850 MHz/900 MHz/1900 MHz	7	7 W/4.6 W
850 MHz/900 MHz/1900 MHz	8	5.5 W/3.6 W

NOTE

- GMSK = Gaussian Minimum Shift Keying
- PSK = Phase Shift Keying

Receiver Specifications

Table 9-5 lists the static receiver sensitivity of the DBS3900.

Table 9-5 Receiver sensitivity of the DBS3900

RX Diversity Mode	Static Receiver Sensitivity
1-way	-113 dBm (typical value)
2-way	-116 dBm (typical value)

9.3 Engineering Specifications of the DBS3900

This describes the engineering specifications of the DBS3900. The engineering specifications involve the physical dimensions, equipment weight, power input, and power consumption.

9.3.1 Engineering Specifications of the BBU

This describes the engineering specifications of the BBU, which involve the dimensions, weight, power input, and power consumption.

Dimensions

The BBU can be installed in a standard 19-inch cabinet. Table 9-6 lists the dimensions of the BBU.

Table 9-6 Dimensions of the BBU

Item	Height (mm)	Width (mm)	Depth (mm)
BBU	86 (2 U)	442	310

Weight

Table 9-7 lists the weight of the BBU.

Table 9-7 Weight of the BBU

Item	Weight
BBU in a typical configuration	7
BBU in the maximum configuration	12

Power Input

Table 9-8 lists the power input of the BBU.

Table 9-8 Power input of the BBU

Power Type	Normal Value	Permissible Range
-48 V DC	-48 V DC	-38.4 V DC to -57 V DC
+24 V DC	+24 V DC	+21.6 V DC to +29 V DC

NOTE

- The BBU3900 supports two types of power input: -48 V DC and +24 V DC.
- With an auxiliary power conversion system, 220 V AC power can be converted into -48 V DC power for the BBU3900.

Power Consumption

The typical power consumption of the BBU is 50 W.

9.3.2 Engineering Specifications of the RRU

This describes the engineering specifications of the RRU, which involve the dimensions, weight, power input, and power consumption.

Dimensions

Table 9-9 lists the dimensions of the RRU.

Table 9-9 Dimensions of the RRU

Item	Height (mm)	Width (mm)	Depth (mm)
RRU3004 module (two carriers, without the rack)	480	100	356
RRU3004 (four carriers, with the rack)	556	247	410
RRU3008 module	480	140	366

Item	Height (mm)	Width (mm)	Depth (mm)
RRU3008 (with the housing)	490	150	366

Weight

Table 9-10 lists the weight of the RRU.

Table 9-10 Weight of the RRU

Item	Weight
RRU3004 module (two carriers, without the rack)	15 kg
RRU3004 (four carriers, with the rack)	38 kg
RRU3008 module	21 kg
RRU3008 (with the housing)	23 kg

Power Input

Table 9-11 lists the power input of the RRU.

Table 9-11 Power input of the RRU

Power Type	Normal Value	Permissible Range
-48 V DC	-48 V DC	-36 V DC to -57 V DC
220 V AC	220 V AC	176 V AC to 290 V AC

NOTE

With an auxiliary power conversion system, 220 V AC power can be converted into -48 V DC power for the RRU.

Power Consumption

Table 9-12 and Table 9-13 list the power consumption of the DBS3900 in the typical configuration.

Table 9-12 Total power consumption of the DBS3900 (with the RRU3004)

Operating Frequency Band	Configuration	Cabinet-Top Power	Combination Type	Typical Power Consumption
900 MHz	S2/2/2	30 W	No combination	510 W
	S4/4/4	15 W	Combination	730 W
1800 MHz	S2/2/2	20 W	No combination	510 W
	S4/4/4	10 W	Combination	730 W

Table 9-13 Total power consumption of the DBS3900 (with the RRU3008)

Operating Frequency Band	Configuration	Cabinet-Top Power	Typical Power Consumption
850 MHz/900 MHz	S3/3/3	20 W	810 W
	S4/4/4	15 W	740 W
	S5/5/5	12 W	740 W
	S6/6/6	10 W	710 W
	S7/7/7	7 W	690 W
	S8/8/8	5.5 W	670 W
1900 MHz	S3/3/3	20 W	850 W
	S4/4/4	15 W	760 W
	S5/5/5	12 W	770 W
	S6/6/6	10 W	730 W
	S7/7/7	7 W	720 W
	S8/8/8	5.5 W	700 W

NOTE

The typical power consumption is the value measured when the traffic volume is 30% of the maximum traffic volume.

9.4 Surge Protection Specifications of Ports on the DBS3900

This describes the surge protection specifications of the external ports on the BBU3900 and RRU3004.

Surge Protection Specifications of the External Ports on the BBU3900

Table 9-14 lists the surge protection specifications of the external ports on the BBU3900.

Table 9-14 Surge protection specifications of the external ports on the BBU3900

Port	Surge Protection Mode	Surge Current
Power supply port	Differential mode	2 kA
	Common mode	4 kA
E1 port	Differential mode (UELP not configured)	250 A
	Common mode (UELP not configured)	250 A
	Differential mode (UELP configured)	3 kA
	Common mode (UELP configured)	5 kA
GPS signal input port	Differential mode (GPS surge protector configured)	8 kA
	Common mode (GPS surge protector configured)	20 kA
Dry contact alarm port	Common mode	250 A

Surge Protection Specifications of the External Ports on the RRU3004

Table 9-15 lists the surge protection specifications of the external ports on the RRU3004.

Table 9-15 Surge protection specifications of the external ports on the RRU3004

Port	Surge Protection Mode	Surge Current
-48 V DC power port	Differential mode	10 kA
	Common mode	15 kA
Duplex RF port	Differential mode	8 kA
	Common mode	40 kA
Dry contact alarm port	Differential mode	3 kA
	Common mode	5 kA
RET antenna port	Differential mode	3 kA
	Common mode	5 kA

NOTE

- The surge protection specifications of the DBS3900 are based on the surge waveform of 8/20 μs.
- The surge current, unless otherwise specified as the maximum discharge current, refers to a nominal discharge current.

9.5 Ports on the DBS3900

This describes the ports on the DBS3900. The ports consist of the grounding ports, power ports, transmission ports, alarm ports, clock ports, and other ports.

9.5.1 Ports on the BBU

The ports on the BBU are the power port, transmission ports, alarm ports, and other ports.

Power Port

Table 9-16 Power port on the BBU

Port	Connector Type	Position	Description
PWR	3V3 power connector	On the UPEU	The port leads in -48 V power.

Transmission Port

Table 9-17 Transmission ports on the BBU

Port	Connector Type	Position	Description
INSIDE	DB25 male	On the UELP	The port transmits the four E1s/T1s between the UELP and the GTMU.
OUTSIDE	DB26 male		The port transmits and receives the four E1s/T1s between the BBU and the BSC.

Port	Connector Type	Position	Description
CPRI0 to CPRI5	SFP	On the GTMU	The port transmits and receives optical and electrical signals between the BBU and the RF module.
E1/T1	DB26 male		The port transmits and receives the four E1s/T1s between the GTMU and the UELP or between the GTMU and the BSC.
FE0	RJ45		Reserved. The port connects the BBU to a routing device in the equipment room through the Ethernet cable to transmit network information.
FE1	DLC		Reserved. The port connects the BBU to a routing device in the equipment room through the optical cable to transmit network information.

Alarm Port

Table 9-18 Alarm ports on the BBU

Port	Connector Type	Position	Description
MON0	RJ45	On the UPEU or UEIU	The port transmits the externally collected environment monitoring signals in RS485 format to the GTMU and receives the signals from the GTMU.
MON1	RJ45		Reserved
EXT-ALM0	RJ45		The port transmits the externally collected environment monitoring signals in dry contact format to the GTMU.
EXT-ALM1	RJ45		Reserved

Other Ports

Table 9-19 Other ports on the BBU

Port	Connector Type	Position	Description
ETH	RJ45	On the GTMU	The port is used for local maintenance and commissioning.
USB	USB		Reserved. The port is used for software upgrade from a USB disk.
TST	USB		The port is used for the test of output timing signals.

9.5.2 Ports on the RRU Module

The posts on the RRU module are the grounding ports, power ports, transmission ports, alarm port, and other ports.

Grounding Port

The grounding bolts at the bottom of the RRU module are used for grounding the RRU module.

Power Port

Table 9-20 describes the power ports on the RRU module.

Table 9-20 Power ports on the RRU module

Port	Port Type	Quantity	Connector Type
Power port	-48 V DC power port	2	OT terminal

Transmission Port

Table 9-21 describes the transmission ports on the RRU module.

Table 9-21 Transmission ports on the RRU module

Port Type	Quantity	Transmission Rate	Connector Type
Optical/ electrical port (CPRI)	2	1.2288 Gbit/s	SFP

Alarm Port

Table 9-22 describes the alarm port on the RRU module.

Table 9-22 Alarm port on the RRU module

RRU Model	Port Type	Quantity	Connector Type
RRU3004	Port for two-channel dry contact alarms	1	DB15
RRU3008	Port for two-channel dry contact alarms and one-channel RS485 signal	1	DB15

Other Ports

Table 9-23 lists the other ports on the RRU module.

Table 9-23 Other ports on the RRU module

Port	Port Type	Quantity	Connector Type
RET antenna port	AISG port	1	DB9
RF port	Port for the feeder jumper	2	DIN, round, and waterproof
	Port for the RF jumper between cascaded RRU modules	1	DB2W2

9.6 Compliance Standards of the DBS3900

This describes the standards that the DBS3900 complies with in terms of Electromagnetic Compatibility (EMC), acoustic noise, storage environment, transportation environment, operating environment, and anti-seismic performance.

EMC

The DBS3900 meets the EMC requirements and complies with the following standards:

- R&Directive 99/5/EC
- 3GPP TS 25.113 V4.4.0 (2002-12)
- ETSI EN 301 489-1 V1.5.1 (2004-11)

- ETSI EN 301 908-1 V2.2.1 (2003-10)
- ITU-T SM 329-10 (2003)
- FCC PART15

Acoustic Noise

The DBS3900 complies with the following acoustic noise specifications:

- The Sound Power Level (SPL) of acoustic noise generated by the BBU is lower than 45 dBA as stipulated in ETS300 753.
- The RRU operates silently.

Storage Environment

The storage environment of the DBS3900 complies with the following standard:

ETSI EN 300019-1-1 V2.1.4 (2003-04) Class 1.2 "Weatherprotected, not temperature-controlled storage locations"

Transportation Environment

The transportation environment of the DBS3900 complies with the following standard:

ETSI EN 300019-1-2 V2.1.4 (2003-04) Class 2.3 "Public transportation"

Operating Environment

- The operating environment of the BBU complies with the ETSI EN 300019-1-3 V2.2.2 (2004-07) Class 3.1 "Temperature-controlled locations."
- The operating environment of the RRU complies with the following standards:
  - 3G TS 25.141 V3.0.0
  - ETSI EN 300019-1-4 V2.1.2 (2003-04) Class 4.1 "Non-weatherprotected locations"

Anti-Seismic Performance

- The anti-seismic performance of the BBU complies with the IEC 60068-2-57 (1999-11).
- The anti-seismic performance of the RRU complies with the NEBS GR63 zone4.

9.7 Environmental Requirements of the DBS3900

This describes the environmental requirements of the DBS3900. The environmental requirements consist of operating environment requirements, transportation requirements, and storage requirements.

9.7.1 Working Environment Requirements of the DBS3900
This describes the working environment requirements of the DBS3900.

9.7.2 Transportation Requirements of the DBS3900
This describes the transportation requirements of the DBS3900.

9.7.3 Storage Requirements of the DBS3900
This describes the storage requirements of the DBS3900.

9.7.1 Working Environment Requirements of the DBS3900

This describes the working environment requirements of the DBS3900.

Climatic Requirements

Table 9-24 lists the climatic requirements for the working environment of the DBS3900.

Table 9-24 Climatic requirements of the DBS3900

Item	Specification
Altitude	≤ 4,000 m
Air pressure	70 kPa to 106 kPa
Temperature	• RRU: -40℃ to +45℃ (with solar radiation) • RRU: -40℃ to +50℃ (without solar radiation) • BBU: -20℃ to +55℃ (long-term working environment)
Temperature variation rate	≤ 3℃/min
Relative humidity	• BBU: 5% to 95% • RRU: 5% to 100%
Solar radiation	Outdoors: ≤ 1,120 W/m^2 Indoors: ≤ 700 W/m^2
Thermal radiation	≤ 600 W/m^2
Wind speed	≤ 67 m/s
Noise	Indoor noise pressure level ≤ 60 dBA Indoor sound power < 7.2 bel Outdoor noise pressure level ≤ 65 dBA Outdoor sound power in daytime ≤ 6.7 bel; outdoor sound power at night ≤ 6.1 bel
Dustproof and waterproof capabilities	• BBU: IP20 • RRU: IP65

Biological Requirements

The working environment of the DBS3900 should meet the following biological requirements:

- The environment is not conducive for the growth of fungus or mildew.
- There are no rodents such as rats.

Air Cleanliness Requirements

The working environment of the DBS3900 should meet the following air cleanliness requirements:

- There is no explosive, conductive, magneto-conductive or corrosive dust in the air.
- The density of the physically active materials complies with the requirements of **Table 9-25**.

Table 9-25 Requirements for the density of physically active materials

Physically Active Material	Unit	Density
Suspended dust	mg/m^3	⩽ 0.01
Falling dust	$mg/(m^2h)$	⩽ 10
Sand	mg/m^3	There is no visible sand.
Note: ● Suspended dust: diameter ⩽ 75 μm ● Falling dust: 75 μm ⩽ diameter ⩽ 150 μm ● Sand: 150 μm ⩽ diameter ⩽ 1,000 μm		

- The density of the chemically active materials complies with the requirements of **Table 9-26**.

Table 9-26 Requirements for the density of chemically active materials

Chemically Active Material	Unit	Density
SO_2	mg/m^3	⩽ 1.50
NH_3	mg/m^3	⩽ 0.15
Cl_2	mg/m^3	⩽ 0.30

Mechanical Stress Requirements

Table 9-27 lists the mechanical stress requirements for the working environment of the DBS3900.

Table 9-27 Mechanical stress requirements

Item	Subitem	Specification	
Sinusoidal vibration (ETSI requirements)	Offset	⩽ 3.5 mm	-

Item	Subitem	Specification	
	Acceleration	-	≤ 10.0 m/s^2
	Frequency range	5 Hz to 9 Hz	9 Hz to 200 Hz
Sinusoidal vibration (GR63 requirements)	Frequency range: 5-100-5 Hz; acceleration: 0.1 g; scanning frequency: 0.1 oct/min; triaxial test		
Unsteady impact	Impact response spectrum II	≤ 100 m/s^2	
	Static payload	0	
Anti-seismic requirements	Earthquake	Frequency range: 0.3 Hz to 50 Hz Zero Period Acceleration (ZPA): 1.5 g 30s	
Note: ● Impact response spectrum refers to the maximum acceleration response curve generated by the equipment under the specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms. ● Static payload refers to the capability of the equipment in a packing case to bear the pressure from the top in normal pile-up method.			

9.7.2 Transportation Requirements of the DBS3900

This describes the transportation requirements of the DBS3900.

Climatic Requirements

Table 9-28 lists the climatic requirements for the transportation environment of the DBS3900.

Table 9-28 Climatic requirements (transportation)

Item	Range
Altitude	≤ 5,000 m
Air pressure	70 kPa to 106 kPa
Temperature	-40℃ to +70℃
Temperature variation rate	≤ 3 ℃/min
Relative humidity	10% to 100%
Solar radiation	≤ 1,120 W/m^2
Thermal radiation	≤ 600 W/m^2
Wind speed	≤ 67 m/s

Waterproofing Requirements

The transportation environment of the DBS3900 should meet the following waterproofing requirements:

- The package is intact.
- Waterproofing measures should be taken to prevent rainwater from entering the package.
- There should be no water accumulated inside transportation vehicles.

Biological Requirements

The transportation environment of the DBS3900 should meet the following biological requirements:

- The environment should not be conducive for the growth of fungus or mildew.
- There should be no rodents, such as rats.

Air Purity Requirements

The transportation environment of the DBS3900 should meet the following air cleanliness requirements:

- There should be no explosive, conductive, magneto-conductive, or corrosive dust in the air.
- The physically active material must meet the requirements listed in **Table 9-29**.

Table 9-29 Requirements for physically active material

Physically Active Material	Unit	Density
Suspended dust	(mg/m^3)	No requirement
Falling dust	$mg/(m^2h)$	$\leqslant$ 3.0
Sand	(mg/m^3)	$\leqslant$ 100
Remarks: ● Suspended dust: diameter $\leqslant$ 75 μm ● Falling dust: 75 μm $\leqslant$ diameter $\leqslant$ 150 μm ● Sand: 150 μm $\leqslant$ diameter $\leqslant$ 1,000 μm		

- The chemically active material must meet the requirements listed in **Table 9-30**.

Table 9-30 Requirements for chemically active material

Chemically Active Material	Unit	Density
SO_2	(mg/m^3)	⩽ 0.30
H_2S	(mg/m^3)	⩽ 0.10
NO_2	(mg/m^3)	⩽ 0.50
NH_3	(mg/m^3)	⩽ 1.00
Cl_2	(mg/m^3)	⩽ 0.10
HCl	(mg/m^3)	⩽ 0.10
HF	(mg/m^3)	⩽ 0.01
O_3	(mg/m^3)	⩽ 0.05

Requirements for Mechanical Stress

Table 9-31 lists the mechanical stress requirements for the transportation environment of the DBS3900.

Table 9-31 Mechanical stress requirements (transportation)

Item	Sub-Item	Range		
Sinusoidal vibration	Shift	⩽ 7.5 mm	-	-
	Acceleration	-	⩽ 20.0 m/s^2	⩽ 40.0 m/s^2
	Frequency range	2 Hz to 10 Hz	10 Hz to 200 Hz	200 Hz to 500 Hz
Random vibration	Spectrum density of accelerated speed	1 m^2/s^3	–3 dB	Total mean square root accelerated speed: 0.781 Grms
	Frequency range	5 Hz to 20 Hz	20 Hz to 200 Hz	
Unsteady impact	Impact response spectrum II	⩽ 300 m/s^2		
	Static payload	⩽ 10 kPa		

Item	Sub-Item	Range
Falling	Falling	When the mass is less than 15 kg, the free fall is less than or equal to 1.0 m. When the mass ranges from 100 kg to 200 kg, the free fall is less than or equal to 0.3 m.
Remarks: ● Impact response spectrum refers to the maximum acceleration response curve generated by the equipment under the specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms. ● Static payload refers to the capability of the equipment in package to bear the pressure from the top in normal pile-up method.		

9.7.3 Storage Requirements of the DBS3900

This describes the storage requirements of the DBS3900.

Climatic Requirements

Table 9-32 lists the climatic requirements for the storage environment of the DBS3900.

Table 9-32 Climatic requirements (storage)

Item	Range
Altitude	≤ 5,000 m
Air pressure	70 kPa to 106 kPa
Temperature	-40℃ to +70℃
Temperature variation rate	≤ 1 ℃/min
Relative humidity	10% to 100%
Solar radiation	≤ 1,120 W/m^2
Thermal radiation	≤ 600 W/m^2
Wind speed	≤ 50 m/s

Waterproofing Requirements

The waterproofing requirements related to the indoor storage environment of the DBS3900 are as follows:

- There should not be water on the ground. No water is leaked on the package of the equipment.

- The equipment must be kept away from the auto fire-protection devices and air-conditioners that are prone to leakage.

If you have to place the equipment outdoors, ensure the following:

- The package is intact.
- Waterproofing measures are taken to prevent rainwater from entering the package.
- There should not be water on the ground and water should not enter the package.
- The package should not be exposed to direct sunlight.

Biological Requirements

The storage environment of the DBS3900 should meet the following biological requirements:

- The environment should not be conducive for the growth of fungus or mildew.
- There should be no rodents, such as rats.

Air Purity Requirements

The storage environment of the DBS3900 should meet the following air cleanliness requirements:

- There should be no explosive, conductive, magneto-conductive, or corrosive dust in the air.
- The physically active material must meet the requirements listed in **Table 9-33**.

Table 9-33 Requirements for physically active material

Physically Active Material	Unit	Density
Suspended dust	(mg/m^3)	⩽ 5.00
Falling dust	$mg/(m^2h)$	⩽ 20.0
Sand	(mg/m^3)	⩽ 300
Remarks: ● Suspended dust: diameter ⩽ 75 μm ● Falling dust: 75 μm ⩽ diameter ⩽ 150 μm ● Sand: 150 μm ⩽ diameter ⩽ 1,000 μm		

- The chemically active material must meet the requirements listed in **Table 9-34**.

Table 9-34 Requirements for chemically active material

Chemically Active Material	Unit	Density
SO_2	(mg/m^3)	⩽ 0.30

Chemically Active Material	Unit	Density
H_2S	(mg/m^3)	⩽ 0.10
NO_2	(mg/m^3)	⩽ 0.05
NH_3	(mg/m^3)	⩽ 1.00
Cl_2	(mg/m^3)	⩽ 0.10
HCl	(mg/m^3)	⩽ 0.10
HF	(mg/m^3)	⩽ 0.01
O_3	(mg/m^3)	⩽ 0.05

Requirements for Mechanical Stress

The storage environment of the DBS3900 should meet the mechanical stress requirements listed in **Table 9-35**.

Table 9-35 Mechanical stress requirements (storage)

Item	Sub-Item	Range	
Sinusoidal vibration	Shift	⩽ 7.0 mm	-
	Acceleration	-	⩽ 20.0 m/s^2
	Frequency range	2 Hz to 9 Hz	9 Hz to 200 Hz
Unsteady impact	Impact response spectrum II	⩽ 250 m/s^2	
	Static payload	⩽ 5 kPa	
Remarks: ● Impact response spectrum refers to the maximum acceleration response curve generated by the equipment under the specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms. ● Static payload refers to the capability of the equipment in package to bear the pressure from the top in normal pile-up method.			