AAU3902

Hardware Description

Issue   06

Date   2014-07-30

Huawei Technologies Co., Ltd.

About This Document

Overview

This document provides reference for planning and deploying an Active Antenna Unit 3902 (AAU3902, which is shortened to AAU in this document). It describes the exteriors, functions, configurations, ports, indicators, technical specifications, cable types, connector specifications, and cable connections of the AAU.

The exteriors of components or cables in this document are for reference only. The actual exteriors may be different.

Product Version

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

Product Name	Solution Version	Product Version
DBS3900	SRAN7.0 and later versions	V100R007C00 and later versions
	RAN14.0 and later versions	V200R014C00 and later versions
	eRAN3.0 and later versions	V100R005C00 and later versions

Intended Audience

This document is intended for:

- Base station installation personnel
- System engineers
- Site maintenance personnel

Organization

1 Changes in AAU3902 Hardware Description

This chapter describes changes in *AAU3902 Hardware Description*.

2 AAU Introduction

This chapter describes the AAU exteriors, functions, slot assignment, ports, indicators, RET system, and engineering specifications.

3 AAU Cables

This chapter describes the cables connected to an AAU.

Conventions

Symbol Conventions

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

Symbol	Description
⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
⚠ NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
📖 NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

General Conventions

The general conventions that may be found in this document are defined as follows.

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.

Convention	Description
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`	Examples of information displayed on the screen are in Courier New.

Command Conventions

The command conventions that may be found in this document are defined as follows.

Convention	Description
Boldface	The keywords of a command line are in **boldface**.
Italic	Command arguments are in *italics*.
[ ]	Items (keywords or arguments) in brackets [ ] are optional.
{ x | y | ... }	Optional items are grouped in braces and separated by vertical bars. One item is selected.
[x | y | ...]	Optional items are grouped in brackets and separated by vertical bars. One item is selected or no item is selected.
{ x | y | ... }*	Optional items are grouped in braces and separated by vertical bars. A minimum of one item or a maximum of all items can be selected.
[x | y | ...]*	Optional items are grouped in brackets and separated by vertical bars. Several items or no item can be selected.

GUI Conventions

The GUI conventions that may be found in this document are defined as follows.

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**.

Keyboard Operations

The keyboard operations that may be found in this document are defined as follows.

Format	Description
Key	Press the key. For example, press **Enter** and press **Tab**.
Key 1+**Key 2**	Press the keys concurrently. For example, pressing **Ctrl**+**Alt**+**A** means the three keys should be pressed concurrently.
Key 1, **Key 2**	Press the keys in turn. For example, pressing **Alt**, **A** means the two keys should be pressed in turn.

Mouse Operations

The mouse operations that may be found in this document are defined as follows.

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.

Contents

1 Changes in AAU3902 Hardware Description

This chapter describes changes in *AAU3902 Hardware Description*.

06 (2014-07-30)

This is the sixth commercial release.

Compared with Issue 05 (2014-04-20), this issue does not include any new topic and does not exclude any topic.

Compared with Issue 05 (2014-04-20), this issue includes the following change.

Topic	Change Description
2 AAU Introduction	Changed the PU22 module in slot 2 to a filler panel by moving the two RF ports on the PU22 module to the bottom of the AU.

05 (2014-04-20)

This is the fifth commercial release.

Compared with Issue 04 (2014-03-14), this issue does not include any new topic and does not exclude any topic.

Compared with Issue 04 (2014-03-14), this issue includes the following change.

Topic	Change Description
2.5 AAU RET System	● Modified the numbers of RCU serial number. ● Optimized descriptions of the content.

04 (2014-03-14)

This is the fourth commercial release.

Compared with Issue 03 (2014-01-20), this issue does not include any new topic and does not exclude any topic.

Compared with Issue 03 (2014-01-20), this issue includes the following change.

Topic	Change Description
2.4 Ports and Indicators on an AAU	Optimized descriptions of the content.

03 (2014-01-20)

This is the third commercial release.

Compared with Issue 02 (2013-11-28), this issue does not include any new topic and does not exclude any topic.

Compared with Issue 02 (2013-11-28), this issue includes the following changes.

Topic	Change Description
2.3 AAU Slot Assignment	Modified descriptions of slot configurations supported by different product versions.
2.6 AAU Engineering Specifications	● Modified the section title as well as the contents as follows: Removed all contents except engineering specifications in the original section "AAU Technical Specifications" and provided links to other contents. ● Added descriptions about the weight of an AAU that is configured with two RUs. ● Added descriptions about the weight of the handles, decorating plates, and mounting kits.

02 (2013-11-28)

This is the second commercial release.

Compared with Issue 01 (2013-09-26), this issue does not include any new topic and does not exclude any topic.

Compared with Issue 01 (2013-09-26), this issue includes the following change.

Topic	Change Description
2.3 AAU Slot Assignment	Added descriptions of slot configurations supported by different product versions.

01 (2013-09-26)

This is the first commercial release.

Compared with Draft A (2013-07-30), this issue includes the following new topic:

● **2.5 AAU RET System**

Compared with Draft A (2013-07-30), this issue includes the following change.

Topic	Change Description
2.2 AAU Function	Added the AAU logical structure and the function descriptions of each module in an AAU.

Compared with Draft A (2013-07-30), this issue does not exclude any topic.

Draft A (2013-07-30)

This is a draft.

2 AAU Introduction

About This Chapter

This chapter describes the AAU exteriors, functions, slot assignment, ports, indicators, RET system, and engineering specifications.

2.1 AAU Exterior
This section describes the exterior of an AAU and its components.

2.2 AAU Function
The function of an AAU is performed by the functional modules in it.

2.3 AAU Slot Assignment
This section describes the slot assignment of an AAU.

2.4 Ports and Indicators on an AAU
This section describes ports and indicators on an AAU.

2.5 AAU RET System
The remote electrical tilt (RET) system of an AAU consists of the remote control unit (RCU), motor, gearing, and phase shifter. In the RET system, the RCU is used to remotely adjust the downtilts of AU beams.

2.6 AAU Engineering Specifications
This section describes engineering specifications of an AAU, including input power and equipment specifications.

2.7 Optical Modules
An optical module transmits optical signals between an optical port and a fiber optic cable.

2.1 AAU Exterior

This section describes the exterior of an AAU and its components.

Exterior

The following figure shows the exterior of an AAU.

Figure 2-1 AAU exterior

(1) Front   (2) Rear
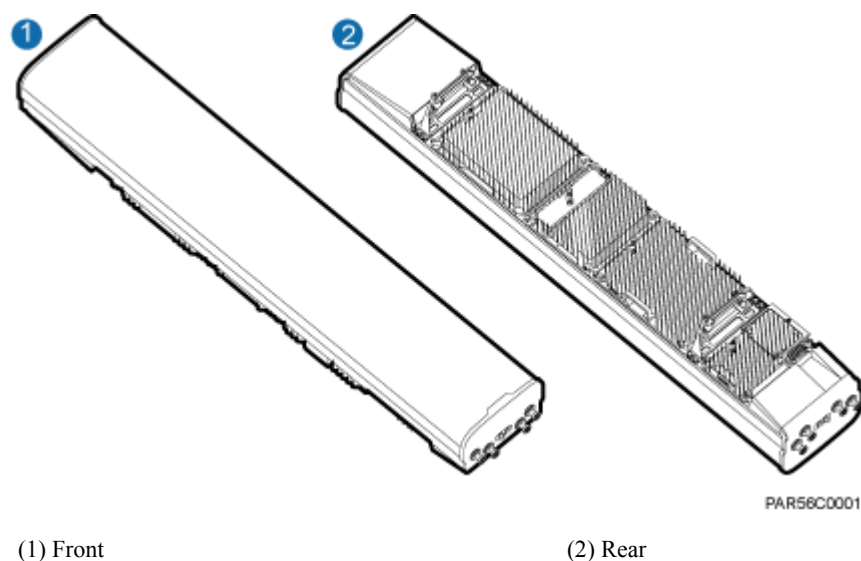
Structure

📖**NOTE**

- Active Antenna-Antenna Unit (AAAU): the antenna unit on an active antenna (shortened to AU)
- Active Antenna-Management Unit (AAMU): the management unit on an active antenna (shortened to MU)
- Active Antenna-Radio Unit (AARU): the radio unit on an active antenna (shortened to RU)
- Active Antenna-Cover Unit (AACU): the cover unit on an active antenna (shortened to CU)

An AAU can use any of the following compositions:

- One MU and two RUs
- One MU, one RU, and one CU

The following figure shows the second composition as an example.

Figure 2-2 AAU composition
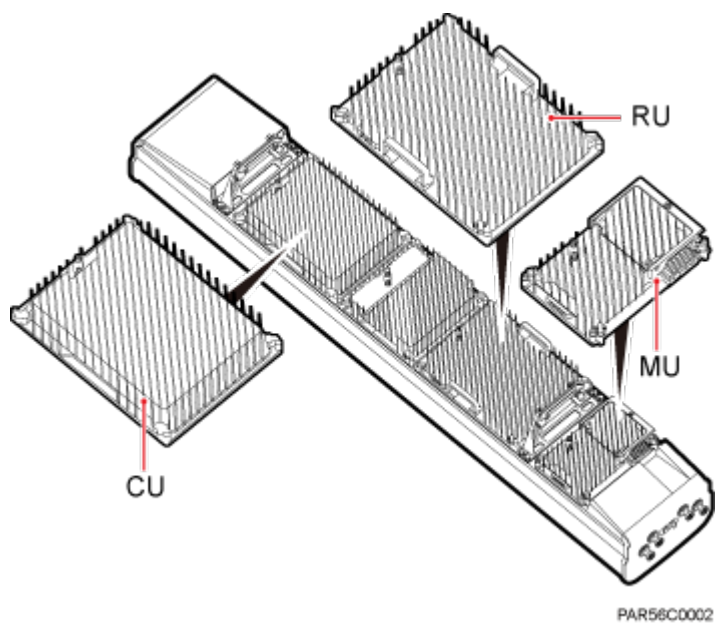
2.2 AAU Function

The function of an AAU is performed by the functional modules in it.

The following figure shows the logical structure of an AAU.

Figure 2-3 Logical Structure of an AAU
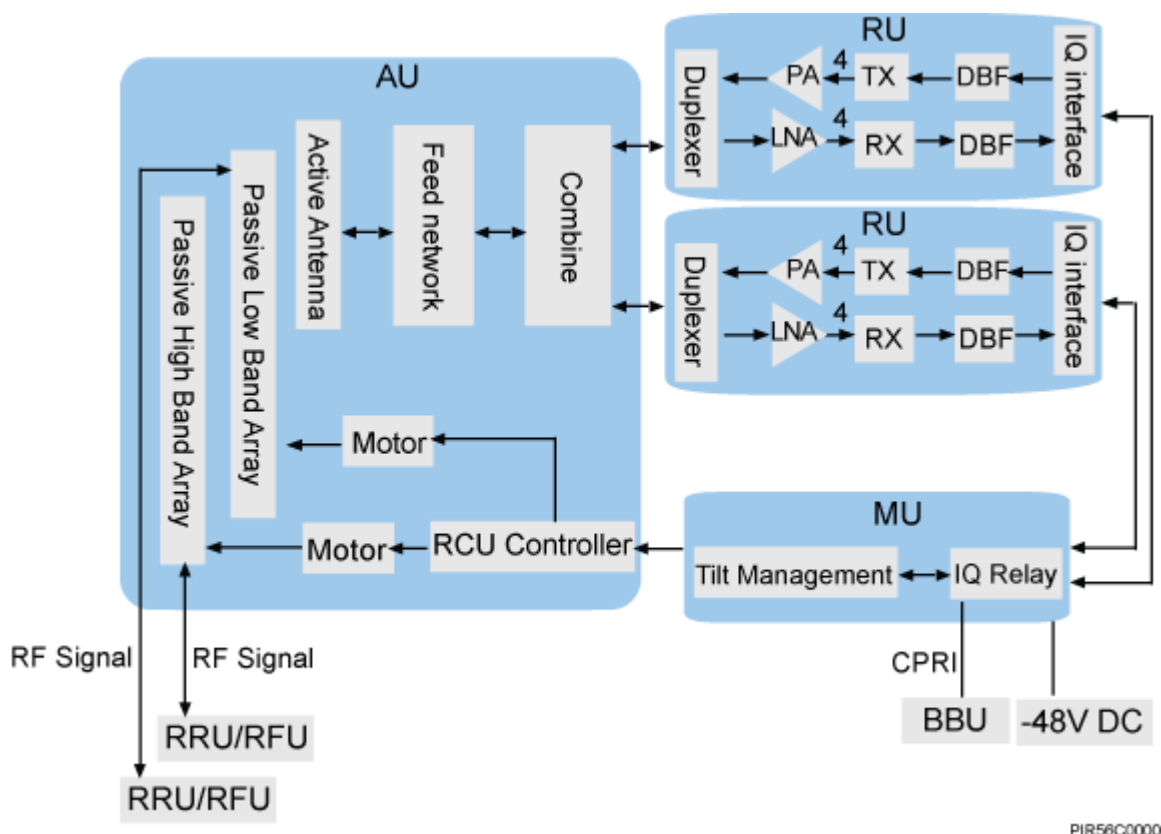
An AAU performs the following functions:

● Receives downlink baseband data from the BBU and sends uplink baseband data to the BBU.

● On the RX channel, it receives RF signals through feeders, down-converts the RF signals into IF signals, amplifies them, and performs analog to digital conversion (ADC). On the TX channel, it filters signals, performs digital to analog conversion (DAC), and up-converts the RF signals to the TX band.

● Multiplexes RX signals and TX signals to enable these signals to share the same antenna path, and filters RX and TX signals.

● Transmits or receives radio waves and forms beams.

The following table describes functional modules of an AAU.

| Functional Module	Function	Logical Structure
AU	- Provides AU arrays, feed power, phase shift network, and drive system. - Provides built-in remote control units (RCUs) that can control circuits. - Reports information about the AU capability and RU in-position status. - Provides the power supplying channel and communication ports between the RU and the MU. - Provides ports for AAU mounting kits.	See illustration AU in **Figure 2-3**.
MU	- Provides a -48 V DC port. - Provides CPRI ports for CPRI convergence and distribution. - Provides protection and filtering. - Provides OM of the AAU and management of the RUs.	See illustration MU in **Figure 2-3**.
RU	- On the RX channel, down-converts RF signals into IF signals, amplifies them, and performs ADC. - On the TX channel, filters signals, performs DAC, and up-converts the RF signals to the TX band. - Multiplexes RX signals and TX signals on the RF channel. - Provides active antenna calibration and compensation and parameter configuration. - Exchanges data between the AU and MU.	See illustration RU in **Figure 2-3**.
CU	Protects a vacant slot from dust and water.	-

2.3 AAU Slot Assignment

This section describes the slot assignment of an AAU.

The following figure shows the slots in an AAU.

Figure 2-4 Slots in an AAU
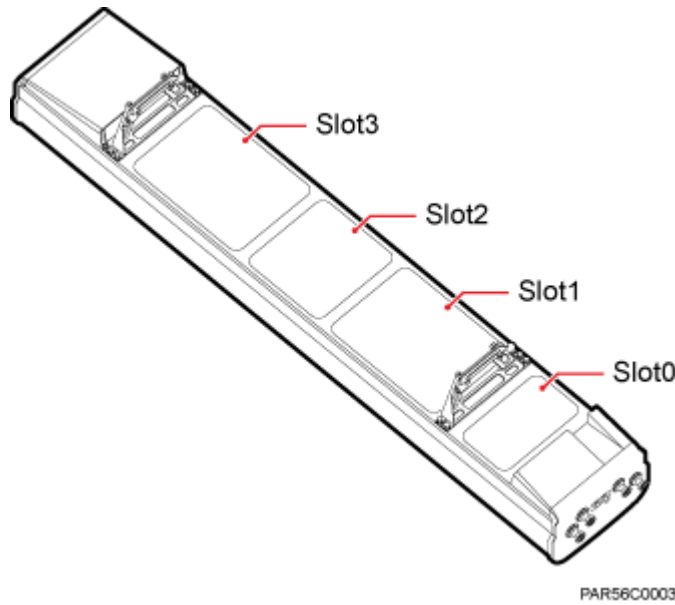
The following table describes the slot assignment of an AAU.

Table 2-1 AAU slot assignment

Slot	Configured Module	Model	Maximum Quantity	Optional/ Mandatory	Configuration Description
Slot 0	MU	MU02	1	Mandatory	• Maximum configuration: Both optional slots are occupied by RUs, as shown in **Figure 2-5**.
Slot 1	RU or CU	• The RU model is RU44-2.1G. • The CU model is CU.	1	Optional	• Typical configuration: The two optional slots are occupied by an RU and a CU respectively, as shown in **Figure 2-6**.
Slot 2	-	-	-	-	• The DBS3900 V100R007C00 and DBS3900 V100R008C01 only support the typical configuration in which an RU44-2.1G is installed in slot 1. • The DBS3900 V100R008C00 supports both the typical and maximum configurations. The RU44-1.8G configured

Slot	Configured Module	Model	Maximum Quantity	Optional/ Mandatory	Configuration Description
Slot 3	RU or CU	● The RU model is RU44-1.8G. ● The CU model is CU.	1	Optional	in slot 3 only supports LTE FDD mode. ● The DBS3900 V100R009C00 and later versions support both the typical and maximum configurations. The RU44-1.8G configured in slot 3 supports GL dual-mode or LTE FDD mode.

☐**NOTE**

The filler panel in slot 2 is integrated with the antenna and cannot be removed.

Figure 2-5 Maximum configuration of an AAU
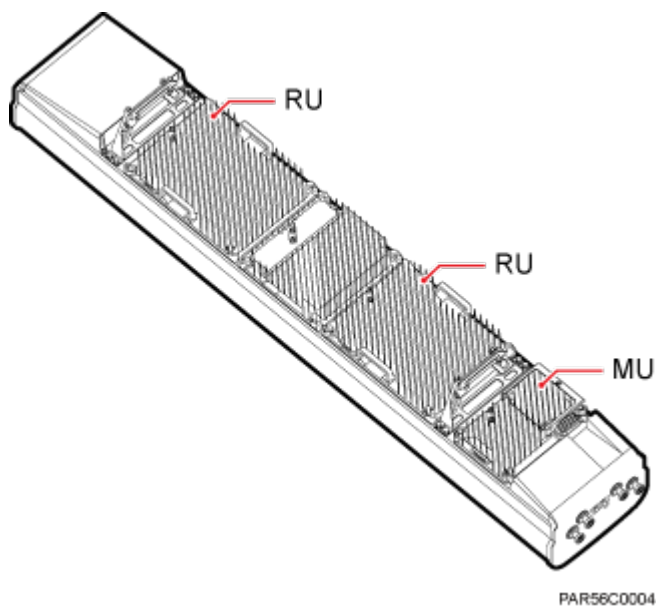
Figure 2-6 Typical configuration of an AAU
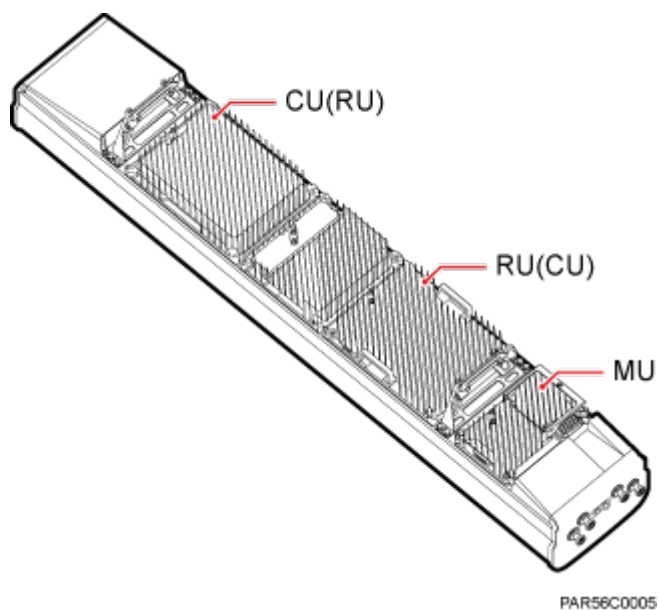
2.4 Ports and Indicators on an AAU

This section describes ports and indicators on an AAU.

The following figure shows ports and indicators on an AAU.

Figure 2-7 Ports and indicators on an AAU

(1) RU indicators	(2) MU indicators
(3) AU ports	(4) MU ports	-

The following table describes ports on the AAU panel.

Table 2-2 Ports

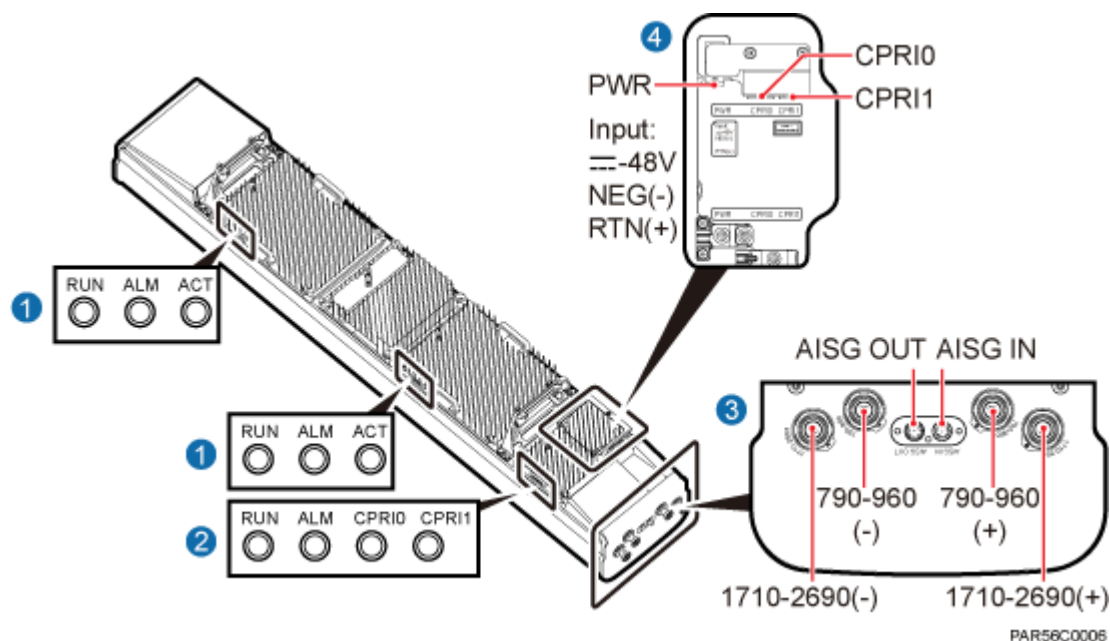| Item	Silkscreen	Description
AU ports	790-960(+)	RF ports connected to the ANT ports on the external low-frequency RF module
	790-960(-)	
	1710-2690(+)	RF ports connected to the ANT ports on the external high-frequency RF module
	1710-2690(-)	
	AISG IN	RET antenna port connected to the RET port on the external RF module
	AISG OUT	RET antenna cascading port connected to the RET antenna port on an external RET antenna so that the external RF module can adjust downtilts of cascaded antennas
MU ports	RX TX CPRI0	Optical/electrical port 0
	RX TX CPRI1	Optical/electrical port 1
	PWR	-48 V DC power supply port

The following table describes indicators on an AAU.

Table 2-3 Indicators

Item	Silkscreen	Color	Status	Description
RU indicators	RUN	Green	Steady on	There is power supply, but the module is faulty.
			Steady off	There is no power supply, or the module is faulty.
			Blinking (on for 1s and off for 1s)	The module is functioning properly.
			Blinking (on for 0.125s and off for 0.125s)	The module is being loaded or is not started.
	ALM	Red	Steady on	Alarms are generated, and the module must be replaced.

Item	Silkscreen	Color	Status	Description
			Blinking (on for 1s and off for 1s)	Alarms are generated. The alarms may be caused by the faults on the related modules or ports. Therefore, you need to locate the fault before deciding whether to replace the module.
			Steady off	No alarm is generated.
	ACT	Green	Steady on	The module is functioning properly with TX channels enabled.
			Blinking (on for 1s and off for 1s)	The module is functioning properly with TX channels disabled.
MU indicators	RUN	Green	Steady on	There is power supply, but the module is faulty.
			Steady off	There is no power supply, or the module is faulty.
			Blinking (on for 1s and off for 1s)	The module is functioning properly.
			Blinking (on for 0.125s and off for 0.125s)	Software is being loaded to the module, or the module is not started.
	ALM	Red	Steady on	Alarms are generated, and the module must be replaced.
			Steady off	No alarm is generated.
			Blinking (on for 1s and off for 1s)	Alarms are generated. The alarms may be caused by the faults on the related modules or ports. Therefore, you need to locate the fault before deciding whether to replace the module.
	CPRI0	Red or green	Steady green	The CPRI link is functioning properly.
			Steady red	An optical module fails to receive or transmit signals because the optical module is faulty or the fiber optic cable is broken.

Item	Silkscreen	Color	Status	Description
			Blinking red (on for 1s and off for 1s)	The CPRI link is out of lock. The possible cause is that clocks of two modes are not synchronized or the data rate negotiation over CPRI ports fails. You are advised to check the system configuration to locate the cause.
			Steady off	The SFP module is not properly installed, or the optical module is powered off.
	CPRI1	Red or green	Steady green	The CPRI link is functioning properly.
			Steady red	An optical module fails to receive or transmit signals because the optical module is faulty or the fiber optic cable is broken.
			Blinking red (on for 1s and off for 1s)	The CPRI link is out of lock. The possible cause is that clocks of two modes are not synchronized or the data rate negotiation over CPRI ports fails. You are advised to check the system configuration to locate the cause.
			Steady off	The SFP module is not properly installed, or the optical module is powered off.

2.5 AAU RET System

The remote electrical tilt (RET) system of an AAU consists of the remote control unit (RCU), motor, gearing, and phase shifter. In the RET system, the RCU is used to remotely adjust the downtilts of AU beams.

RET Function

After a remote control unit (RCU) receives the control signals from the base station, it drives the stepper motor. The stepper motor drives the adjustable phase shifter in the AU to adjust downtilts of the AU. In this way, remote electrical tilt (RET) is achieved.

RCU RET consists of the following:

● Internal control: Signals are received through the CPRI ports on an MU.

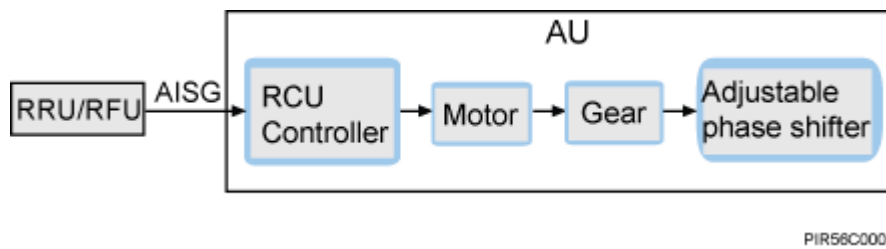● External control: Signals are received through AISG ports at the bottom of an AU.

The following figure shows the logical structure of RCU internal control.

Figure 2-8 RCU internal control
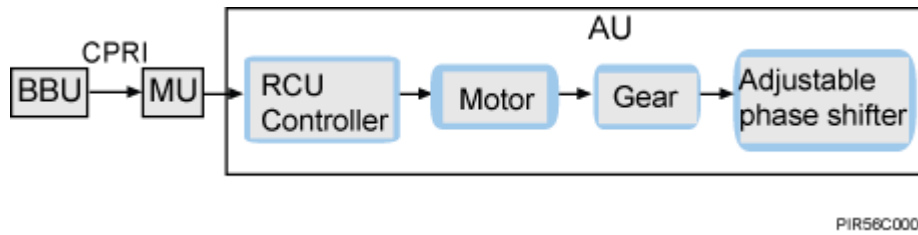
The following figure shows the logical structure of RCU external control.

Figure 2-9 RCU external control

There are three arrays in an AAU, including active high-frequency AU array, passive low-frequency AU array, and passive high-frequency AU array. The RCU RET has the following characteristics:

● The three AU arrays are independently controlled by the RCU.

● The active high-frequency AU array supports only internal control mode.

● The two passive AU arrays support both internal and external control modes.

● In external control mode, the RET port does not support OOK signals. Therefore, if OOK signals are transmitted, an SBT must be installed to separate OOK signals from the combined signals and convert the OOK signals to RS485 signals.

RCU Serial Numbers on an AAU

The following figure shows the positions and silkscreens of the three RCU serial numbers on an AAU.

Figure 2-10 Positions and silkscreens of RCU serial numbers
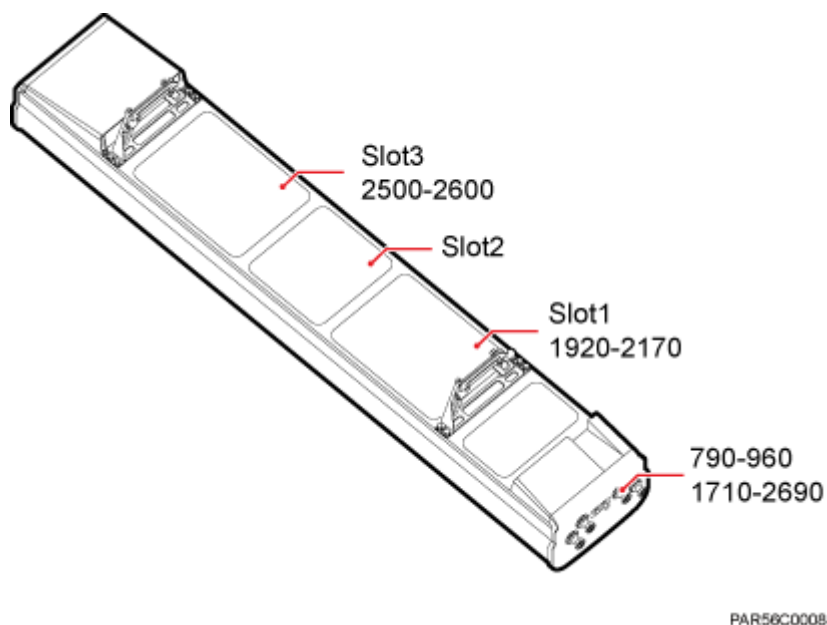
☐ NOTE

> Slots 1 and 3 share one RCU serial number.

Each RCU serial number has 19 characters. The following table describes the encoding scheme of an RCU serial number and the meaning of each field in the RCU serial number.

Field	Number of Characters	Description
Unit code	2	Always set to HW
Equipment type	7	Always set to AAU3902
Reserved field	2	Randomly generated
Year	1	It represents the year in which the product is produced. One character is used to represent the last two digits of a year. For example, characters 1 to 9 are used to represent the last two digits of the years 2001 to 2009, respectively. The 26 letters from A to Z are used to represent the years starting from 2010. The letter A represents 2010 and the subsequent letters represent the years following 2010.
Month	1	It represents the month in which the product is produced. Hexadecimal is adopted. For example, characters 1 to 9 represent January to September, respectively. A represents October, B represents November, and C represents December.

Field	Number of Characters	Description
Sequence number	4	Sequence number generated during the production
DIN position	1	It represents the position of the RF ports which are counted from the bottom of the AU. 0 represents the bottom of the AU. The digits 1 and 3 are reserved.
Array position	1	0 represents the low-frequency (790 MHz to 960 MHz) array, and 1 represents the high-frequency (1710 MHz to 2690 MHz) array.

RET Configuration Principles

The RET configuration principles are as follows:

- The RET port inside the AU can scan any RCU serial number carrying no link. The RET port on the bottom of the AU only can scan the RCU serial number carrying no link corresponding to passive AU arrays.

- There is no priority on logical RCUs when links are established on them. Only one AISG link can be established for an RCU serial number. If a link needs to be switched, you must delete the configuration on the link so that the link can be released.

- Once the RCU link is established, the RCU serial number is not displayed in the scanning result of other RET ports.

2.6 AAU Engineering Specifications

This section describes engineering specifications of an AAU, including input power and equipment specifications.

Input Power Specifications

The following table lists input power specifications of the AAU.

Table 2-4 Input power specifications of an AAU

Input Power	Voltage Range
-48 V DC	-36 V DC to -57 V DC

Equipment Specifications

The following table lists equipment specifications of an AAU.

Table 2-5 Equipment specifications of an AAU

Item	Specifications
Dimensions (H x W x D)	● AAU: 2000 mm x 350 mm x 260 mm (78.74 in. x 13.78 in. x 10.24 in.) (excluding the attachment plate) ● Spacing between the upper and lower main brackets: 1265 mm (49.8 in.)
Weight	● Main module: 　– 53 kg (116.87 lb) (configured with one RU) 　– 62 kg (136.71 lb) (configured with two RUs) ● Handles and decorating plates: 4.6 kg (10.14 lb) ● Mounting kits: 6 kg (13.23 lb)

The following table lists equipment specifications of functional modules in an AAU.

Table 2-6 Equipment specifications of functional modules in an AAU

Item	Specifications
Dimensions (H x W x D)	● AU: 2000 mm x 350 mm x 197 mm (78.74 in. x 13.78 in. x 7.76 in.) (excluding the attachment plate) ● RU: 416 mm x 310 mm x 132 mm (16.38 in. x 12.2 in. x 5.2 in.) ● CU: 416 mm x 310 mm x 112 mm (16.38 in. x 12.2 in. x 4.41 in.) ● MU: 205 mm x 310 mm x 113 mm (8.07 in. x 12.2 in. x 4.45 in.)
Weight	● AU: 33.5 kg (73.87 lb) (excluding the attachment plate) ● RU: 10.9 kg (24.03 lb) ● CU: 2.4 kg (5.29 lb) ● MU: 3.4 kg (7.5 lb)

☐**NOTE**

For other engineering specifications of the AAU, see section **"Technical Specifications of AAU3902"** in *3900 Series Base Station Technical Description*.

2.7 Optical Modules

An optical module transmits optical signals between an optical port and a fiber optic cable.

☐**NOTE**

> The exteriors of an optical module and the label on an optical module in this section are for reference only. The actual exteriors may be different.

Exterior

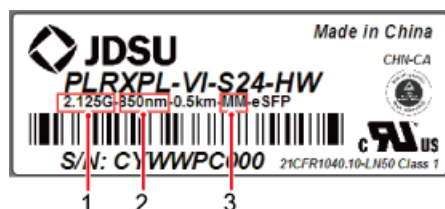The following figure shows the exterior of an optical module.

Figure 2-11 Exterior of an optical module

PAA02C0021
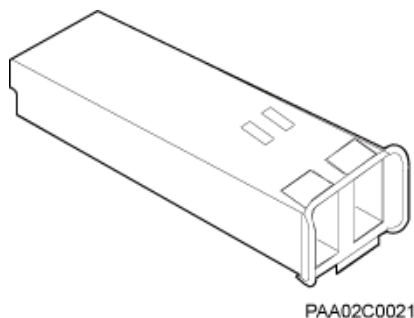
Label on an optical module

There is a label on each optical module, which provides information such as the rate, wavelength, and transmission mode, as shown in the following figure.

Figure 2-12 Label on an optical module

| (1) Rate | (2) Wavelength | (3) Transmission mode |

Optical Module Type

Optical modules can be divided into single- and multimode optical modules, which can be distinguished as follows:

- The puller of a single-mode optical module is blue and the puller of a multimode optical module is black or gray.

- The transmission mode is displayed as "SM" on the label of a single-mode optical module and "MM" on the label of a multimode optical module.

3 AAU Cables

About This Chapter

This chapter describes the cables connected to an AAU.

3.1 List of AAU Cables

The cable list provides reference for cable installation and replacement.

The following table lists AAU cables.

Table 3-1 List of AAU cables

Cable	One End		The Other End	
	Connector	**Installation Position**	**Connector**	**Installation Position**
3.2 AAU PGND Cable	OT terminal (M6, 16 mm^2 or 0.025 in.^{2})	Ground terminal on the AAU	OT terminal (M8, 16 mm^2 or 0.025 in.^{2})	Ground terminal on the ground bar
3.3 AAU Power Cable	EPC5 connector	PWR port on the AAU	Depending on the power supply equipment	External power equipment
3.4 CPRI Fiber Optic Cable	DLC connector	CPRI0 port on the AAU	DLC connector	CPRI port on the BBU
3.5 (Optional) Cascading CPRI Fiber Optic Cable	DLC connector	CPRI1 port on the AAU	DLC connector	CPRI0 port on the AAU
Feeder (optional or delivered with other equipment)	DIN male connector	1710-2690(+) or 1710-2690(-) port on the AAU 790-960(+) or 790-960(-) port on the AAU	DIN male connector	ANT port on the RRU
AISG Multi-Wire Cable	DB9 waterproof male connector	RET port on the RRU	Standard AISG female connector	AISG IN port on the AAU or standard AISG male connector on the AISG extension cable
AISG Extension Cable	Standard AISG male connector	Standard AISG female connector on the AISG multi-wire cable	Standard AISG female connector	AISG IN port on the AAU

3.2 AAU PGND Cable

A PGND cable connects an AAU and a ground bar for proper grounding of the AAU. The maximum length of an AAU PGND cable is 8 m (26.25 ft).

A PGND cable is a green or green and yellow cable. An OT terminal is installed at each end of the cable. The following figure shows the exterior of a PGND cable.

Figure 3-1 Exterior of a PGND cable

PAD00C6011

(1) OT terminal (16 mm^2 or 0.025 in.^{2}, M6)   (2) OT terminal (16 mm^2 or 0.025 in.^{2}, M8)

□NOTE

- If the customer prepares the PGND cable, a copper-core cable with a cross-sectional area of 16 mm^2 (0.025 in.^{2}) or larger is recommended.
- One OT terminal must be added to each end of the PGND cable onsite.

3.3 AAU Power Cable

An AAU power cable feeds external -48 V DC power into an AAU. The maximum length of an AAU power cable between the AAU and its power supply is 100 m (328.08 ft).

□NOTE

If the power equipment is provided by the customer:

- When a single RU is configured, circuit breakers of 20 A are recommended for the power equipment.
- When two RUs are configured, circuit breakers of 30 A are recommended for the power equipment.

Exterior

There are two types of AAU power cables in terms of cross-sectional areas: 6 mm^2 (0.009 in.^{2}) and 10 mm^2 (0.015 in.^{2}), both complying with European standards.

An AAU power cable has an EPC5 connector at one end and a customized connector at the other end.

The following figure shows an AAU power cable with an EPC5 connector at each end.

Figure 3-2 Exterior of an AAU power cable

PAD00C2140

(1) EPC5 connector

Description

The following table describes a AAU power cable.

Table 3-2 Specifications of an AAU power cable

Cable	Wire	Color (in the North America)	Color (in the Europe)
AAU power cable	RTN(+)	Black	Brown
	NEG(-)	Blue	Blue

3.4 CPRI Fiber Optic Cable

CPRI fiber optic cables are classified into multimode fiber optic cables and single-mode fiber optic cables. They transmit CPRI signals.

The maximum length of a multimode fiber optic cable connecting a BBU and an AAU is 150 m (492.12 ft).

A single-mode fiber optic cable consists of a single-mode pigtail and a trunk single-mode fiber optic cable, which are connected through an optical distribution frame (ODF). The maximum length of the single-mode pigtail on the BBU side is 20 m (65.62 ft), and the maximum length of the single-mode pigtail on the AAU side is 70 m (229.66 ft).

☐**NOTE**

- The ODF and trunk single-mode fiber optic cable are provided by the customer and must comply with the ITU-T G.652 standard.

- The ODF is an outdoor transfer box for fiber optic cables, which interconnects the single-mode pigtail and trunk single-mode fiber optic cable.

- A multimode fiber optic cable and a single-mode fiber optic cable are connected to a multimode optical module and a single-mode optical module, respectively.

Exterior

Multimode fiber optic cable: The multimode fiber optic cable has a DLC connector at each end, as shown in the following figure.

Figure 3-3 Multimode fiber optic cable

| (1) DLC connector | (2) Breakout cable | (3) Label on the breakout cable |
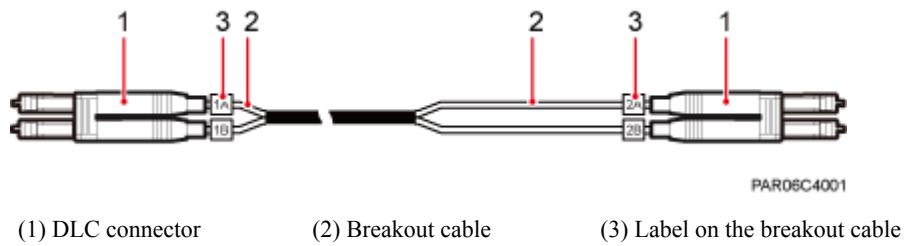
📖**NOTE**

> When a multimode fiber optic cable connects a BBU and an AAU, the breakout cable on the BBU side is 340 mm (13.39 in.) and the breakout cable on the AAU side is 30 m (1.18 in.).

The following figure shows the connection of the multimode fiber optic cable between a BBU and an AAU.

Figure 3-4 Connection of the multimode fiber optic cable between a BBU and an AAU
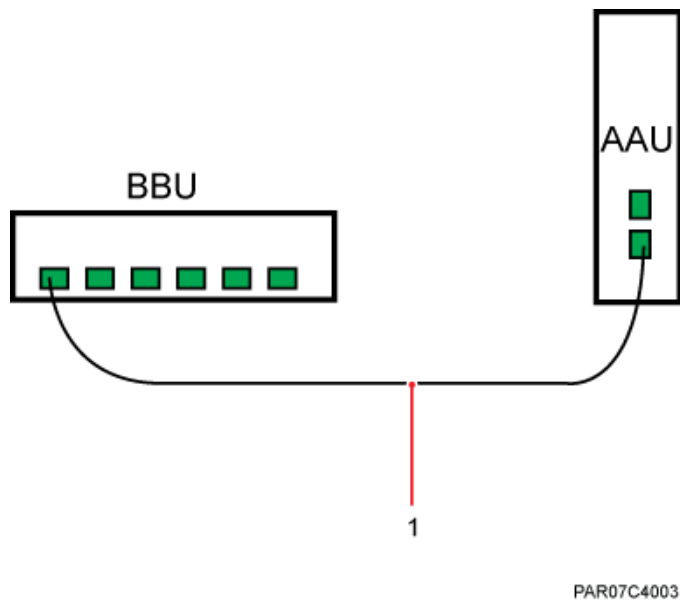
(1) Multimode fiber optic cable between a BBU and an AAU

Single-mode pigtail: The single-mode pigtail has a DLC connector at one end and an FC, LC, or SC connector at the other end, as shown in the following figure.

Figure 3-5 Single-mode pigtail

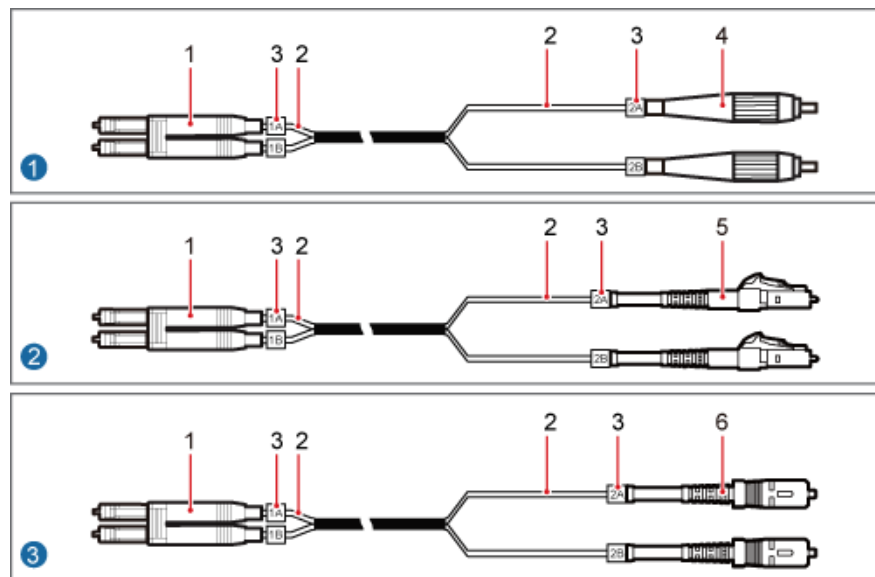| (1) DLC connector | (2) Breakout cable | (3) Label on the breakout cable | (4) FC connector | (5) LC connector | (6) SC connector |

NOTE

- When a single-mode pigtail connects a BBU and an ODF, the breakout cables on the BBU side and ODF side are 340 mm (13.39 in.) and 800 mm (31.5 in.), respectively.
- When a single-mode pigtail connects an ODF and an AAU, the breakout cables on the AAU side and ODF side are 30 mm (1.19 in.) and 800 mm (31.5 in.), respectively.

The following figure shows the connection of the single-mode pigtail.

Figure 3-6 Connection of the single-mode pigtail
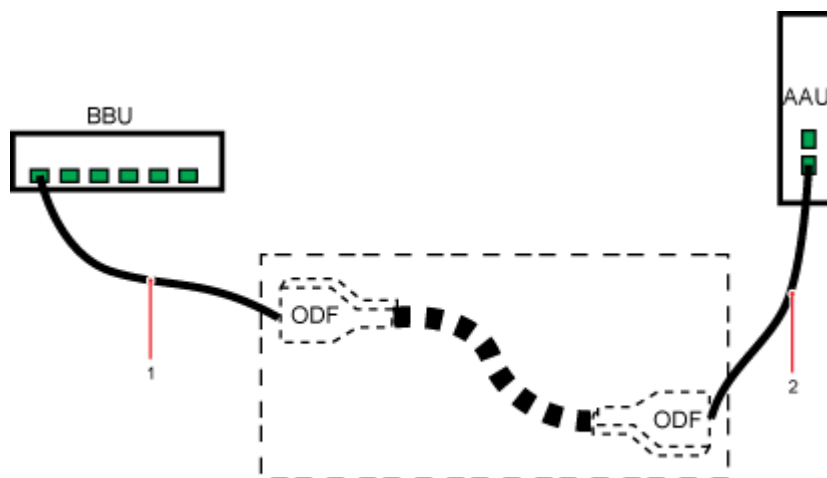
(1) Single-mode pigtail between a BBU and an ODF   (2) Single-mode pigtail between an AAU and an ODF

Selection Principle

The following table describes the principles for selecting CPRI fiber optic cables.

Table 3-3 Principles for selecting CPRI fiber optic cables

Remote Distance	Selection Principle	Remarks
≤ 100 m (328.08 ft)	Multimode fiber optic cable	Connects the BBU and AAU When it connects two AAUs, the distance between the two AAUs must be shorter than or equal to 10 m (32.81 ft).
Longer than 100 m (328.08 ft) and shorter than or equal to 150 m (492.12 ft)	Multimode fiber optic cable	Connects the BBU and AAU
	Recommended: single-mode fiber optic cable (single-mode pigtail and trunk single-mode optical fiber)	The single-mode pigtail on the AAU or BBU side is connected to the trunk single-mode fiber optic cable using the ODF.
Greater than 150 m (492.12 ft)	Single-mode fiber optic cable (single-mode pigtail and trunk single-mode fiber optic cable)	

Pin Assignment

The following table describes the labels on breakout cables of a CPRI fiber optic cable and recommended connections of the breakout cables.

Table 3-4 Labels on and recommended connections for the breakout cables of a CPRI fiber optic cable

Label	Installation Position		
	Multimode Fiber Optic Cable Between a BBU and an AAU	**Multimode Fiber Optic Cable Between Two AAUs**	**Single-mode Pigtail (Transited by the ODF)**
1A	CPRI RX port on the AAU	CPRI RX port on AAU 1	RX port on the BBU or CPRI RX port on the AAU
1B	CPRI TX port on the AAU	CPRI TX port on AAU 1	TX port on the BBU or CPRI TX port on the AAU
2A	TX port on the BBU	CPRI TX port on AAU 0	ODF

Label	Installation Position		
	Multimode Fiber Optic Cable Between a BBU and an AAU	**Multimode Fiber Optic Cable Between Two AAUs**	**Single-mode Pigtail (Transited by the ODF)**
2B	RX port on the BBU	CPRI RX port on AAU 0	ODF

3.5 (Optional) Cascading CPRI Fiber Optic Cable

Cascading CPRI fiber optic cables are classified into multimode fiber optic cables and single-mode fiber optic cables. They transmit CPRI signals.

☐**NOTE**

● When the distance between two AAUs is shorter than 100 m (328. 08 ft), a multimode fiber optic cable is used. When the distance is longer than or equal to 100 m (328. 08 ft.), a single-mode fiber optic cable is used.

● A cascading CPRI fiber optic cable must be connected to the optical module in a CPRI port. A multimode fiber optic cable and single-mode fiber optic cable are connected to a multimode optical module and single-mode optical module, respectively.

Exterior

The following figure shows the exterior of a cascading CPRI fiber optic cable.

Figure 3-7 Cascading CPRI fiber optic cable

(1) DLC connector   (2) Breakout cable   (3) Label on the breakout cable
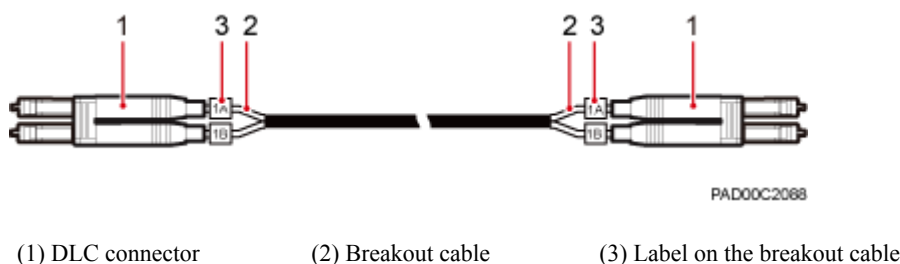
3.6 Feeder

A feeder connects an RRU and an AAU and transmits signals between the base station and the antenna system.

Exterior

Figure 3-8 shows a feeder with a DIN male connector at each end.

Figure 3-8 Exterior of a feeder

(1) DIN male connector

3.7 AISG Multi-Wire Cable

An AISG multi-wire cable connects an RRU and an AAU to transmit control signals from a base station to an RET antenna. When the RRU is connected to the RET antenna, an AISG multi-wire cable transmits RS485 signals. The length of an AISG multi-wire cable is 5 m (16.40 ft).

☐**NOTE**

- An AAU contains built-in remote control units (RCUs).

- An RCU is a driving motor used for the phase shifter in the RET antenna. It receives control commands from a base station and runs commands to drive the stepper motor. Using a gear, the stepper motor drives the adjustable phase shifter in the antenna to change the downtilt of the antenna.

Exterior

The following figure shows the exterior of an AISG multi-wire cable.

Figure 3-9 Exterior of an AISG Multi-wire cable
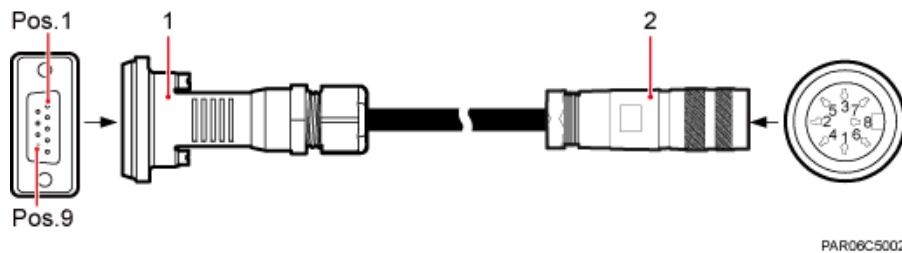
(1) Waterproof DB9 male connector   (2) Standard AISG female connector

Description

The following table describes an AISG multi-wire cable.

Table 3-5 Description of an AISG multi-wire cable

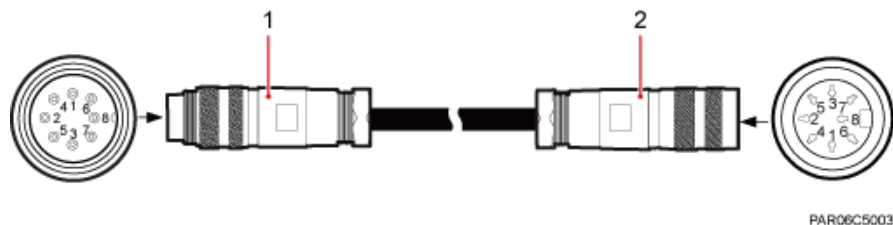| X1 End (Pin of the Waterproof DB9 Male Connector)	X2 End (Pin of the Standard AISG Female Connector)	Color	Wire	Description
X1.1	X2.1	White and blue	Twisted pair	+12 V
		Blue		
X1.3	X2.3	White and orange	Twisted pair	RS485 B
X1.5	X2.5	Orange		RS485 A
X1.4	X2.4	White and green	-	GND
X1.9 and X1.4 are interconnected.	-	-	-	GND
-	X2.1 and X2.6 are interconnected.	-	-	+12 V
-	X2.4 and X2.7 are interconnected.	-	-	GND

3.8 AISG Extension Cable

When the distance between an RRU and an AAU is longer than 5 m (16.4 ft), an AISG multi-wire cable is not long enough to connect the RRU and the AAU. In this case, an AISG extension cable is used to extend the AISG multi-wire cable. An AISG extension cable is 15 m (49.21 ft).

Exterior

The following figure shows the exterior of an AISG extension cable.

Figure 3-10 Exterior of AISG extension cable

PAR06C5003

(1) Standard AISG male connector	(2) Standard AISG female connector

Description

The following table describes an AISG extension cable.

Table 3-6 Description of an AISG Extension cable

X1 End (Pin of the Standard AISG Male Connector)	X2 End (Pin of the Standard AISG Female Connector)	Color	Wire	Description
X1.1	X2.1	White and blue	Twisted pair	+12 V
		Blue		
X1.7	X2.7	White and orange	Twisted pair	DC Return A
		Orange		
X1.3	X2.3	White and green	Twisted pair	RS485 B
X1.5	X2.5	Green		RS485 A
X1.6	X2.6	White and brown	Twisted pair	+24 V
		Brown		