User Manual

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FCC Statement

Operational Instructions and Training Guidelines

To ensure optimal performance and compliance with the general/Uncontrolled environment RF energy exposure limits in the above standards and guidelines, users should always adhere to the following procedures:

● Antenna gain must not exceed 2dBi.
● The antenna must be installed complying with the requirements of manufacturer or supplier, and it must be at least 0.65 meters away from human body.

Compliance with RF Exposure Standards

Hytera's radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR § 1.1307, 1.1310 and 2.1091

- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1:2005; Canada RSS102 Issue 5 March 2015
  Institute of Electrical and Electronic Engineers (IEEE) C95.1:2005 Edition

ISEDC Statement

This device complies with Innovation, Science and Economic Development Canada Compliance license-exempt RSS standard(s). Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISEDC Radiation Exposure Statement:

This device must be restricted to work related operations in an General/Uncontrolled RF exposure Environment.

This equipment should be installed and operated with minimum distance 65cm between the antenna & your body.

ISEDC exposition aux radiations:

Ce dispositif doit être limité aux opérations liées au travail dans un environnement d'exposition RF général/ Incontrôlée.

Cet équipement doit être installé et utilisé avec un minimum de 65cm de distance entre le antenne et votre corps.

WARNING:

Contents

Documentation Information

This section describes the audiences, conventions and revision history of this document.

Intended Audience

This document is intended to be read by:

- Sales engineers

- Common users

Documentation Conventions

Icon Conventions

Icon	Description
Tip	Indicates information that can help you make better use of your product.
Note	Indicates references that can further describe the related topics.
Caution	Indicates situations that could cause data loss or equipment damage.
Warning	Indicates situations that could cause minor personal injury.
Danger	Indicates situations that could cause major personal injury or even death.

Notation Conventions

Item	Description	Example
Boldface	Denotes menus, tabs, parameter names, window names, dialogue names, and hardware buttons.	To save the configuration, click **Apply**.
		The **Log Level Settings** dialogue appears.
		Press the **PTT** key.
" "	Denotes messages, directories, file names,	The screen displays "Invalid!"

Item	Description	Example
	folder names, and parameter values.	Open "PDT_PSS.exe".
		Go to "D:/opt/local".
		In the **Port** text box, enter "22".
>	Directs you to access a multi-level menu.	Go to **File** > **New**.
Italic	Denotes document titles.	For details about using the DWS, refer to *Dispatch Workstation User Guide*.
`Courier New`	Denotes commands and their execution results.	To set the IP address, run the following command: `vos-cmd - m name IP`

Revision History

Document Version	Product Version	Release Date	Description
03	V1.0	August 2018	● Added descriptions on digital repeaters of low configuration. ● Added detail steps in "Setting Parameters".
02	V1.0	May 2018	Added contents on the wireless-access donor unit and band-selective repeater.
01	V1.0	March 2018	Modified the names of several devices.
00	V1.0	January 2018	Initial release.

1. Introduction

1.1 Product Description

DS-9300 Digital Repeater ("DS-9300") is the new generation of repeater developed by Hytera. Using optical fibers to transmit signal, DS-9300 effectively makes up for the signal decline between base stations (BSs) and radios.

Featuring low transmission loss and easy wiring, DS-9300 delivers long distance transmission of multicarrier signals and strong and dynamic signal coverage. It is an ideal solution to blind zones such as populated urban areas, large exhibition halls, stadiums, campuses, tunnels, metro stations and etc.

DS-9300 has two types of configurations, including low configuration and high configuration, which have the same appearance but different features.

1.2 Highlights

DS-9300 has the following highlights:

- Flexible monitoring

  DS-9300 provides remote monitoring (through IP network) and local monitoring (through RS232 serial port). Users can manage all devices through the network management system, or remotely query, configure and upgrade a single device.

- Excellent hardware performance

  DS-9300 has low intermodulation noise, strong out-of-band rejection, low interference and great interference resistance.

- Software-Defined Radio (SDR) Technology

  DS-9300 achieves uplink squelch, delay compensation, carrier rejection, digital multi-carrier and etc with the SDR Technology. It supports multiple network topologies such as star, chain, ring and hybrid topologies.

- Effective mechanical design

- DS-9300 is compact and portable with effective heat dissipation and resistance to water, dust and salt spray. Various installation methods are available for DS-9300 including wall-mounting, pole-mounting and etc.

1.3 System Architecture

DS-9300 consists of the donor unit and the remote unit. They transparently convey and amplify the

wireless signal between the BS and the radios. Donor unit includes the cable-access donor unit and the wireless-access donor unit. The cable-access donor unit is mounted into a 19-inch rack at the BS location while the wireless-access donor unit can be installed remotely from the BS. The remote unit is installed away from the donor unit over a fiber link. The following figure shows the networking of DS-9300 and the BS.
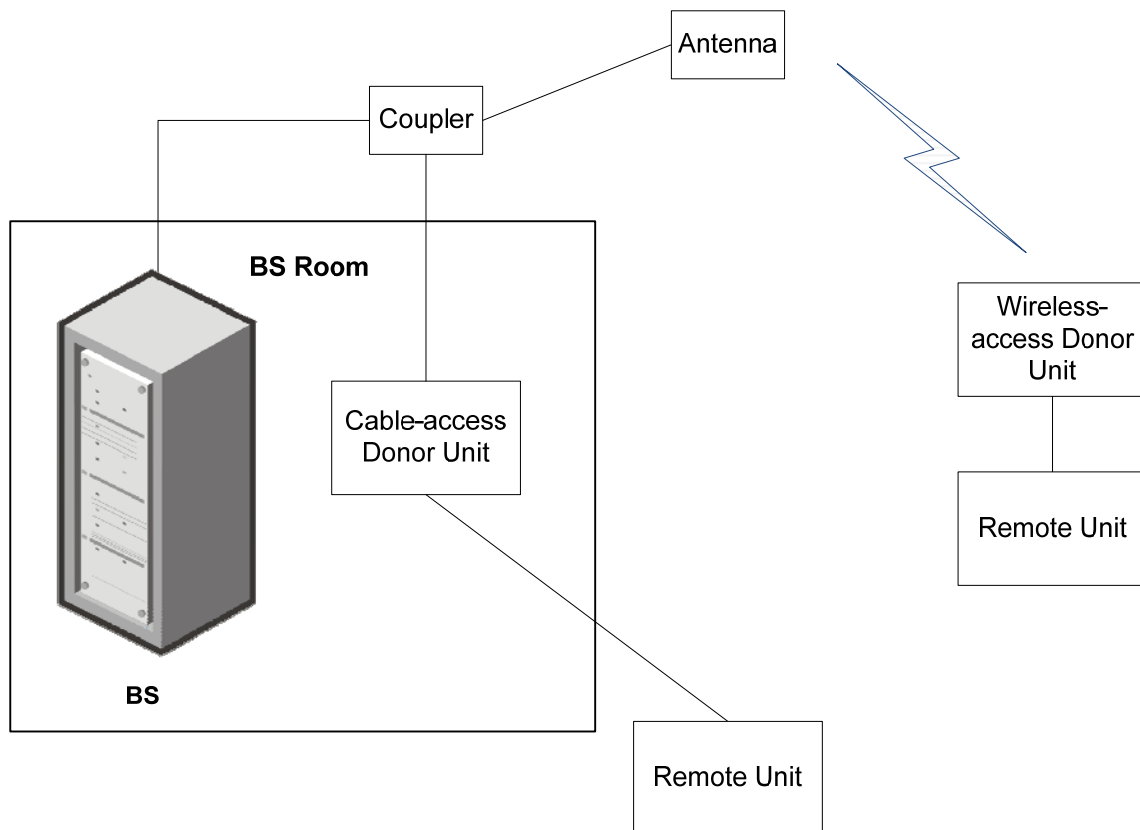
Various topologies are available for networking between the donor and the remote units, including star, chain, ring and hybrid topologies.

1.3.1 Star Topology

Low Configuration

For low configuration of star topology, each SFP port of the donor unit can connect to up to four remote units, while one donor unit can connect to at most four remote units (N≤4).
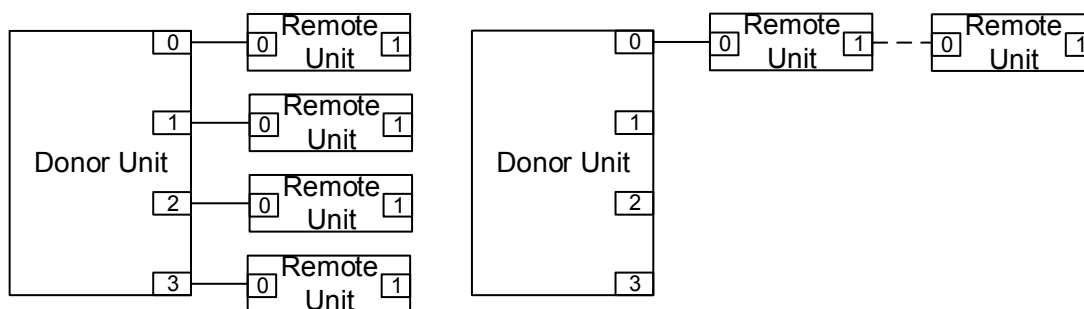
High Configuration

For high configuration of star topology, each SFP port of the donor unit can connect to up to eight remote units, while one donor unit can connect to at most 16 remote units (N≤16).
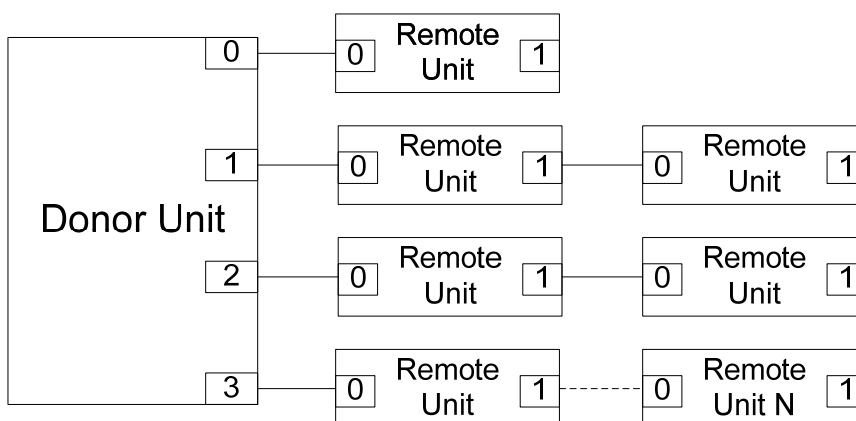
1.3.2 Chain Topology

Low Configuration

For low configuration of chain topology, only one of the SFP ports on the donor unit is used and it can connect to at most four remote units (N≤4).
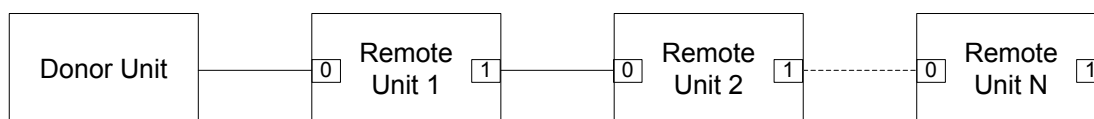
High Configuration

For high configuration of chain topology, the SFP port on the donor unit can connect to at most eight remote units (N≤8).

1.3.3 Ring Topology

Low Configuration

For low configuration of ring topology, the donor unit can form at most two rings, with each ring can connect to up to two remote units; or the donor unit forms one ring and connects to four remote units.

High Configuration

For high configuration of ring topology, at most two rings can be formed on the donor unit, with each ring can connect to up to eight remote units (N≤8).
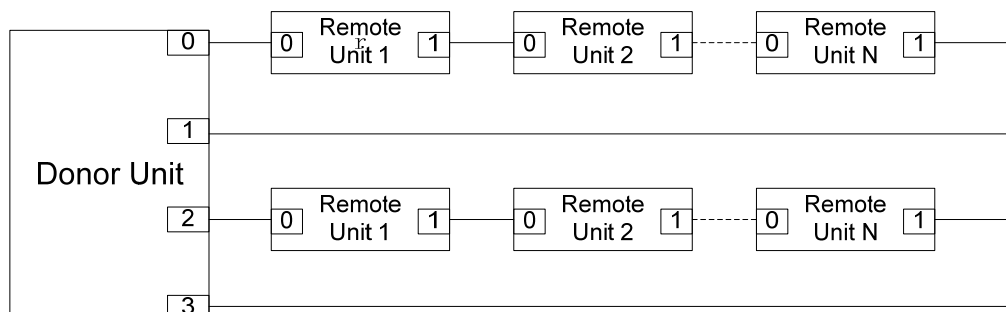
1.3.4 Hybrid Topology

Low Configuration

For low configuration of hybrid topology, each SFP port of the donor unit can connect up to four remote units, while one donor unit can connect to at most four remote units.

High Configuration

For high configuration of hybrid topology, each SFP port of the donor unit can connect up to eight remote units, while one donor unit can connect to at most 16 remote units.
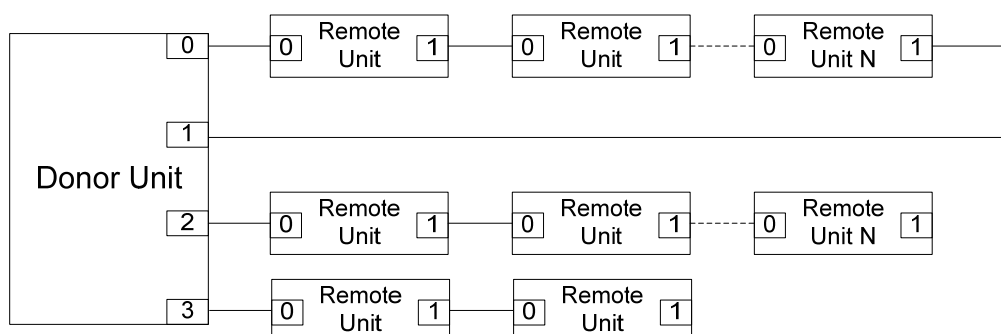
1.4 Specifications

No.	Item	Specifications	
		Downlink	Uplink
1	Frequency Range	460-470MHz(DL)	450-460MHz(UL)

| No.	Item		Specifications	
			Downlink	**Uplink**
			5 MHz (operating bandwidth)	
2	Channel Bandwidth		25 kHz	
3	Channel Capacity		1–8	
4	Max. Output Power		5W	1W
5	Max. Gain		• Cable-access: 50 dB±3 dB • Wireless-access: 95 dB±3 dB	• Cable-access: 45 dB±3 dB • Wireless-access: 90 dB± 3 dB
6	Gain Adjustment Range/Step		30 dB/1 dB	
7	Gain Adjustment Error		≤1 dB@ gain of 0–20 dB ≤1.5 dB@ gain of 21–30 dB	
8	Noise Figure		Wireless-access: ≤5 dB	≤5 dB
9	Max. Input Level		• Cable-access: 10 dBm • Wireless-access: –10 dBm	–10 dBm
10	Automatic Level Control (ALC)		Output power variation < 2 dB or be off when adding 10 dB at max output power. Control range≥20 dB.	
11	In-Band Ripple		≤3 dB	
12	Input/Output VSWR		≤1.5	
13	Delay		≤35 µs	
14	Frequency Offset		≤5×10^{-8} ppm	
15	Spurious Emission	In-band	≤–15 dBm/30 kHz	
		Out-of-band (2.5 MHz away from the	≤–36 dBm@9 kHz to 1 GHz	
			≤–30 dBm@1 GHz to 12.75 GHz	

No.	Item		Specifications	
			Downlink	**Uplink**
		band edge		
16	Intermodulation Attenuation	In-band	● ≤–40 dBc@RBW3 kHz 8 CH 75 kHz Carrier Spacing ● ≤–45 dBc@RBW3 kHz 2 CH 75 kHz Carrier Spacing	
		Out-of-band (2.5 MHz away from the band edge)	≤–36 dBm/100 kHz@9 kHz to 1 GHz	
			≤–30 dBm/1 MHz@1 GHz to 12.75 GHz	
17	Out-of-band Rejection (–6 dB)		≤–20 dBc@±50 kHz	
			≤–25 dBc@±75 kHz	
			≤–30 dBc@±125 kHz	
			≤–63 dBc@±250 kHz	
			≤–67 dBc@±500 kHz	
18	Optical Bypass (optional)		When the remote unit is powered down or the optical path is faulty, the optical path is automatically bypassed, and other cascaded remote units are not affected.	
19	Optical Loop		When the remote unit is powered down or the optical path is interrupted, other cascaded devices can work normally through the loop.	
20	Network Topology		Star, Chain, Ring, Hybrid and etc.	
21	Optical Transmission Distance		≥20 km	
22	Transmission Rate		1.25 GB/s, 2.5 GB/s, 3.02 GB/s, 6.04 GB/s (optional)	
23	Optical TX Power		–9.5 dBm to –3 dBm	
24	Max. Optical RX Sensitivity		–20 dBm	
25	RF Connector		N/F, 50 Ω	

No.	Item		Specifications	
			Downlink	**Uplink**
26	Fiber Connector		Donor Unit: LC/UPC Remote Unit: LC/UPC	
27	Power Supply		Donor Unit /Remote Unit: 90 V to 264 V AC	
28	Power Consumption	Donor Unit	● Cable-access: ≤30 W ● Wireless-access: ≤100 W	
		Remote Unit	≤100 W	
29	Ingress Protection Rating		● Cable-access Donor Unit: IP20 ● Wireless-access Donor Unit: IP65 ● Remote Unit: IP65	
30	Safety		IEC 60950 Compliance	
31	EMC		IEC 61000 class B Compliance	
32	Dimensions		● Cable-access Donor Unit: 44 mm x 442 mm x 320 mm ● Wireless-access Donor Unit: 142 mm x 300 mm x 385 mm ● Remote Unit: 142 mm x 300 mm x 385 mm	
33	Monitoring		Supports local monitoring and remote monitoring. Local monitoring: RS232 Remote monitoring: SNMP Internal Communication: RS485	
34	MTBF		≥100,000 h	
35	Operating Temperature		● Cable-access Donor Unit: –10°C to +45°C ● Wireless-access Donor Unit: –25°C to +55°C ● Remote Unit: –25°C to +55°C	
36	Storage Temperature		–40°C to +85°C	

2. Packing List

Please unpack carefully and check that all items listed below are received. If any item is missing or damaged, please contact us or your dealer.

2.1 Cable-access Donor Unit

Item	Qty.	Item	Qty.
Main Unit	1	Cable Kit	1
Packing material for 19-inch Rack	1	Optical Cable Kit	1
Square Nut Kit	4	Power Cord	1
Crown Screw	4	Documentation Kit	1

2.2 Wireless-access Donor Unit

Item	Qty.	Item	Qty.
Main Unit	1	Signal Cable (8-core)	1
Packing material	1	Power Cord	1
Mechanical parts of Die Casting Machine installation	1	Cable Kit	1
Signal Cable (1-core)	1	Optical Cable Kit	1
Documentation Kit	1	/	/

2.3 Remote Unit

Item	Qty.	Item	Qty.
Main Unit	1	Signal Cable (8-core)	1
Packing material	1	Power Cord	1
Mechanical parts of Die Casting Machine installation	1	Optical Cable Kit	1
Signal Cable (1-core)	1	SFP Optical Module	2
Documentation Kit	1	/	/

3. Getting Started

3.1 Appearance

DS-9300 adopts modular design. For the wireless-access donor unit and the remote unit, its LED indicators and connectors are provided on the front and rear panels of the rack. The following figure shows the appearance of the remote unit.
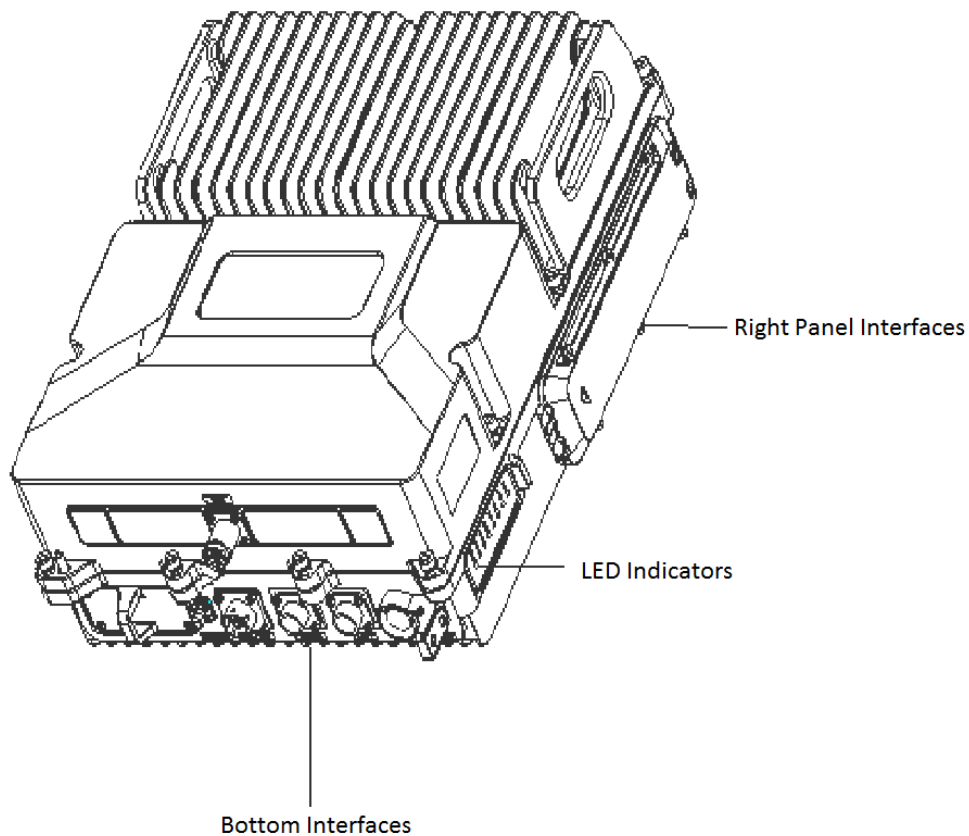
For the donor unit, its LED indicators are provided on the right side and connectors are provided on its bottom and right side. The following figure shows the appearance of the donor unit.
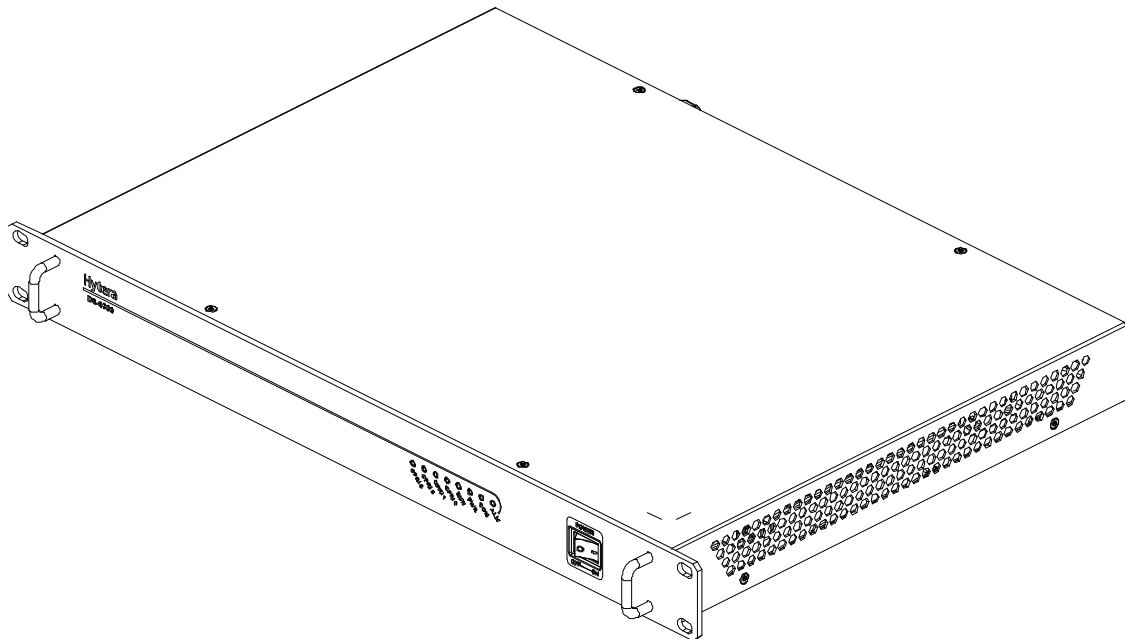
3.2 Donor Unit Interfaces

3.2.1 Cable-access Donor Unit
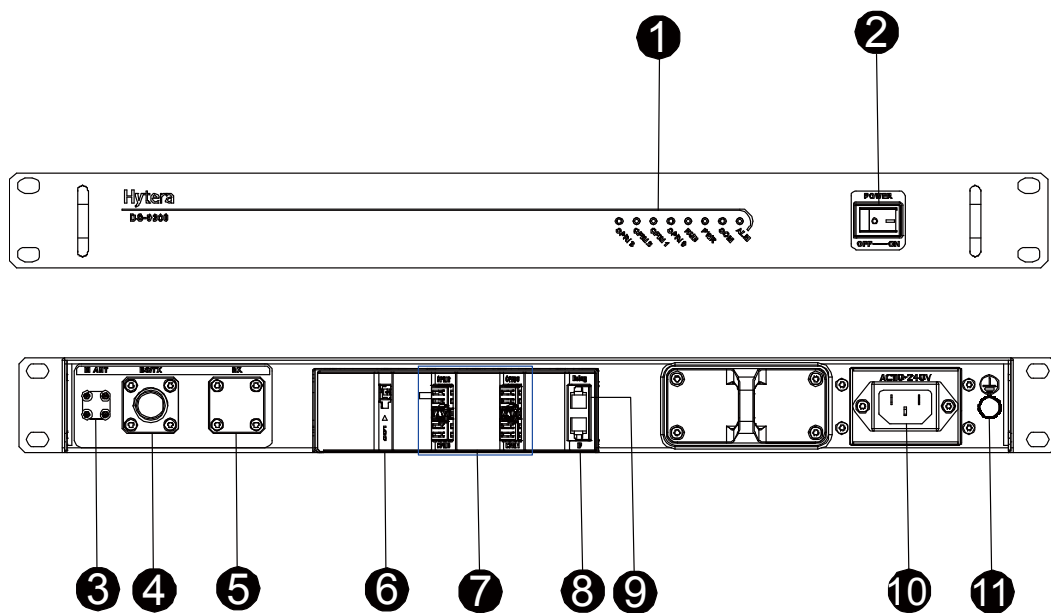
3.2.2 Wireless-access Donor Unit
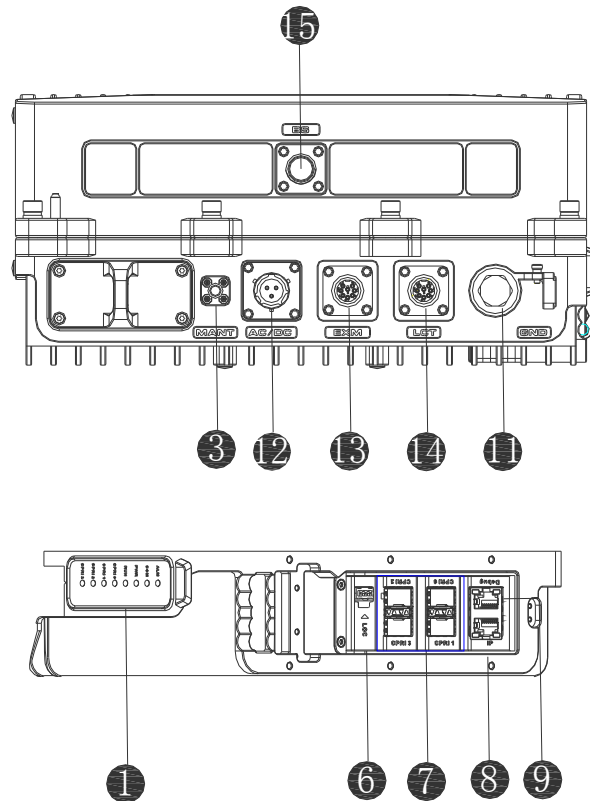
3.3 Remote Unit Interfaces
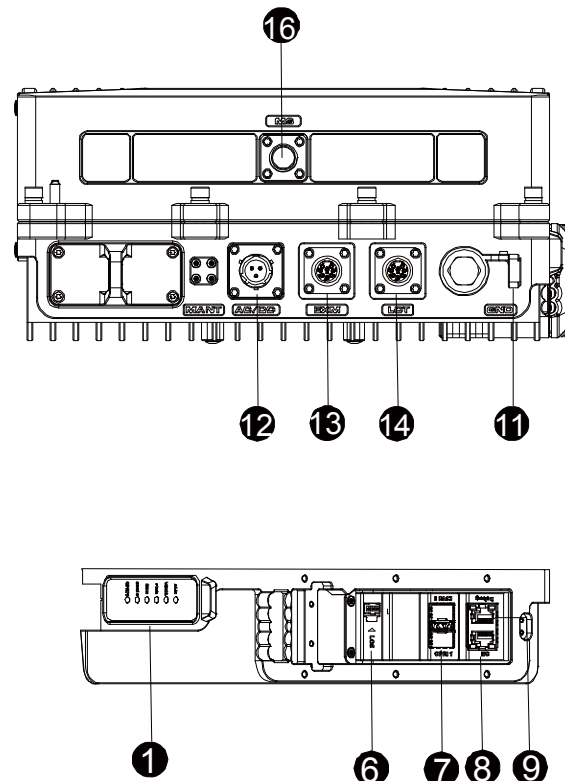
3.4 Interface Description

No.	Label	Meaning	Connector	Description
1	/	LED indicators	/	See "3.6".
2	POWER	Power switch	Single-pole-double-throw switch	/
3	MANT	Modem antenna connector	SMA-F	Reserved.
4	BS/TX	ANT port of the duplexer, or TX port of the BS	N/F	Connected to the ANT port of the duplexer, or connected to the TX port of the BS if the duplexer does not exist.
5	RX	RX port of the BS	N/F	Connected to the RX port of the BS if the duplexer does not exist.
6	LOC	Local debug interface	3-pin connector	Connected to computer through the serial cable for debugging and monitoring.
7	CPRI 0–3	Optical port	SFP connector, dual-layer	The donor unit connects to remote units through CPRI interface.
8	IP	Remote monitoring port	RJ45 port	Connected to computer through the network cable for remote debugging and monitoring.
9	Debug	Optical module debug interface	RJ45 port	Interface for board debugging, used by R&D engineers.
10	AC 90-264 V	Power inlet	3-pin AC connector	/
11	GND	Ground terminal	/	/
12	AC	Power inlet	3-pin round electric connector	AC power inlet.
13	EXM	External alarm port	8-pin round electric connector	Connected to external devices that need alarm monitoring.
14	LCT	Alarm port for	6-pin round	● Donor Unit: Monitors location change

No.	Label	Meaning	Connector	Description
		location change and door entry	electric connector	(generates an alarm upon illegal location change). ● Remote Unit: Monitors location change and the optical bypass switch.
15	BS	RF interface	N/F	Connected to the donor antenna.
16	MS	RF interface	N/F	Connected to the service antenna.

3.5 Interface Definition

EXM

Pin No.	Signal Name	Definition	Remarks
1	INT1	External alarm 1	Closed: Alarm; Open: No alarm.
2	INT2	External alarm 2	Closed: Alarm; Open: No alarm.
3	INT3	External alarm 3	Closed: Alarm; Open: No alarm.
4	GND	Ground (signal)	Common terminal.
5	OUT1	Reserved	Customized Alarm 1 Closed: Alarm; Open: No alarm.
6	GND	Reserved	Drive current: 10 mA (nominal), and 30 mA (max)
7	OUT2	Reserved	Customized Alarm 2 Closed: Alarm; Open: No alarm.
8	GND	Reserved	Drive current: 10 mA (nominal), and 30 mA (max)

LCT

Pin No.	Signal Name	Definition	Remarks
1	LCT	Alarm for location change	Monitors location change of the devices.
2	GND	Ground	/
3	DOOR	Door entry alarm	Subjects to the chassis structure (available for cast chassis).

Pin No.	Signal Name	Definition	Remarks
4	GND	Ground	/

LOC

Pin No.	Signal Name	Definition	Remarks
1	TX	Data transmission	Output.
2	RX	Data receiving	Input.
5	GND	Ground	/

3.6 LED Indicators

The LED indicators on the donor and the remote units indicate the running status.

LED Indicator	Color	Status	Description
ALM/VSWR	Red	Off	The device is running well.
		Glowing or flashing	The device malfunctions.
COM	Green	Glowing	Remote communication works well.
		Off	Remote communication error.
PWR	Green	Glowing	The device is properly powered.
		Flashing or off	The device is not properly powered.
RUN	Green	Flashing	The device runs properly.
		Glowing or off	The device malfunctions.
CPRI 0	Green	Glowing	Optical synchronization works well.
		Flashing or off	Optical synchronization error.
CPRI 1	Green	Glowing	Optical synchronization works well.
		Flashing or off	Optical synchronization error.
CPRI 2	Green	Glowing	Optical synchronization works well.
		Flashing or off	Optical synchronization error.
CPRI 3	Green	Glowing	Optical synchronization works well.

LED Indicator	Color	Status	Description
		Flashing or off	Optical synchronization error.

4. Installation

4.1 Safety Information

Before performing any operation, read the following precautions and operation instructions carefully to ward off potential risks.

Local Laws and Regulations

When installing a device, comply with the local safety laws and regulations.

Power Supply

⚠️**Danger**

➢ Direct contact or indirect contact (through moist objects) with the high voltage or mains electricity may result in fatal danger.

➢ Non-standard and incorrect operations on the high-voltage power supply may result in fire and electric shock.

● Never wear conductive objects such as watches, bracelets and rings during operation.

● Do use special tools when operating at high or AC voltage.

● Do keep moisture out of the power system during operation in moist environment.

● The equipment should be well earthed to avoid damage as a result of lightning strikes.

● Do turn off the power before assembly or disassembly.

● Do verify the cable specifications prior to connection.

● Ensure that the equipment is well earthed before power-on.

● Turn off the power immediately when the cabinet is found to get wet.

● Make sure the power switch is toggled to the **Off** position before installing the equipment.

Working Aloft

Work performed more than 2 m (6.56 ft.) above the ground is regarded as work at heights.

● While working at heights, stay alert to the following conditions.

● Stop such work in any of the following conditions: adverse weather, wet steel tubes, and other risky situations.

● Set danger signs and prevent unauthorized person from entering the work area.

● Avoid stacking scaffolds and other materials, and staying or passing below the aerial work platform.
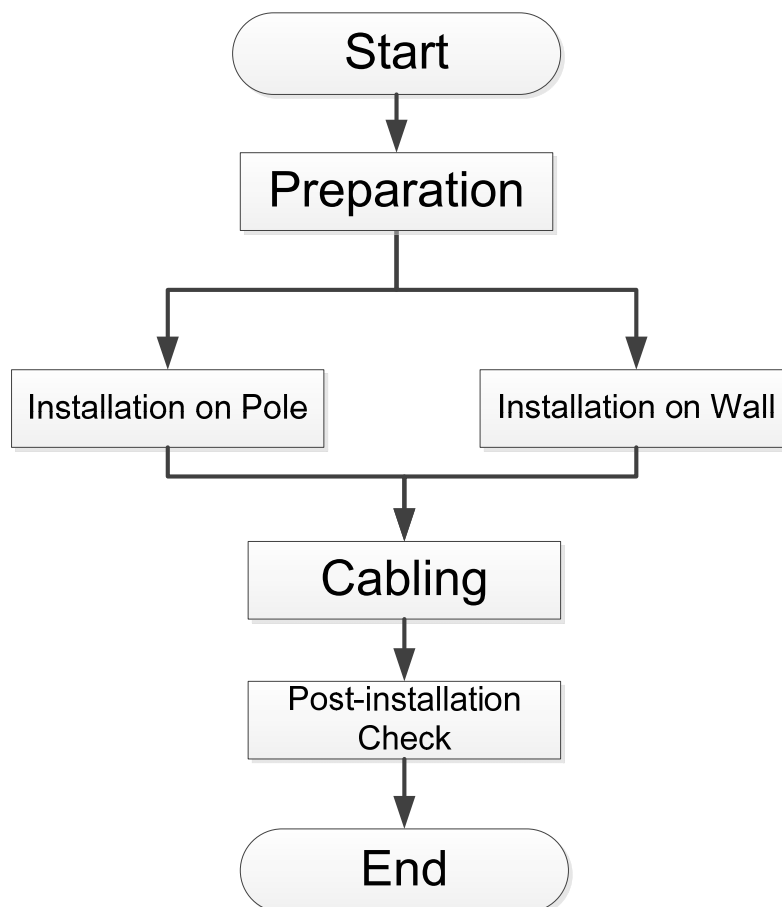
- Avoid dropping machinery and tools from the heights. Use strong ropes, hanging baskets or cable cars to deliver tools.

- Take sound safety actions such as wearing hamlets and safety belts properly.

- Do wear heat-retaining clothes for working in cold areas.

- Make sure the ladder is safe for use. Overload is strictly prohibited.

- The slant of the ladder is suggested to be 75°. When using a ladder, place it on a stable ground, and take protective measures on the base part of the ladder for skid resistance.

- Handle and use all devices and tools with care to avoid falling.

- Do not play or sleep on the aerial work platform.

Personnel

Installation and maintenance personnel must be trained to perform operations correctly and safely.

4.2 Installation Flow

Install DS-9300 device by following the installation flow below.

```
           ┌──────────────┐
           │    Start     │
           └──────┬───────┘
                  │
                  ▼
           ┌──────────────┐
           │ Preparation  │
           └──────┬───────┘
          ┌───────┴───────┐
          ▼               ▼
 ┌──────────────┐  ┌──────────────┐
 │Installation  │  │Installation  │
 │  on Pole     │  │  on Wall     │
 └───────┬──────┘  └──────┬───────┘
         └───────┬────────┘
                 ▼
          ┌──────────────┐
          │   Cabling    │
          └──────┬───────┘
                 ▼
          ┌──────────────┐
          │Post-installation│
          │    Check     │
          └──────┬───────┘
                 ▼
          ┌──────────────┐
          │     End      │
          └──────────────┘
```

4.3 Preparation

4.3.1 Environment

Space Requirements

- It is recommended that the space of at least 200 mm be left between the product top and the ceiling, and 500 mm between the product bottom and the ground.

- For product installed at its back, the space of at least 500 mm should be left at the right side, and 200 mm at the left side of product; for product installed at its left side, the space of at least 200 mm should be left in front of product, and 200 mm in the back of product.

- For product installed at its back, the space of at least 800 mm should be left in front of product; for product installed at its left side, the space of at least 800 mm should be left at its right side.

- Install the product upright at a proper position.
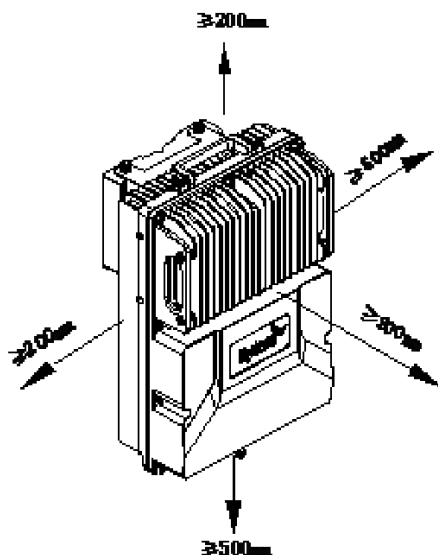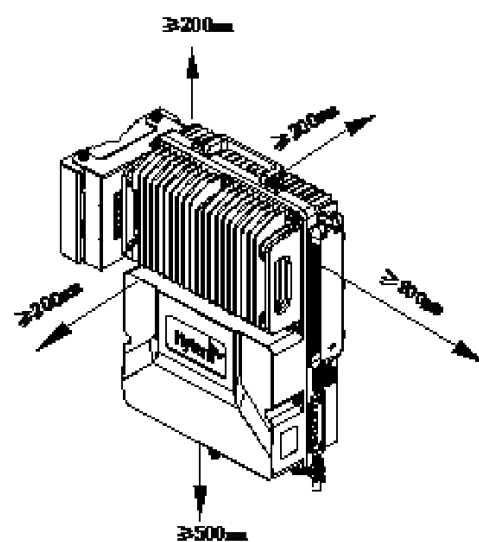
Back Installation   Side Installation

Environmental Protection

To ensure device reliability, install the devices in places with stable temperature.

- Protection against Sun

  If the devices are exposed to the sun, it is necessary to keep them well-ventilated and heat sinking. If the temperature is more than 40°C, shielding device is required.

- Protection against Rain, Water and Snow

  The devices are rain proof, waterproof and snow proof. But temporary protective measures are needed for maintenance.

- Protection against Interferences

The devices should be installed far away from electromagnetic interferences such as large electric devices.

● Outdoor Installation and Maintenance

If the devices are installed outdoor, do not perform maintenance on extreme weathers such as storm, extreme temperature or high humidity.

Grounding Requirements

● The ground wire must be connected before device installation, and be removed after the device is dismantled. Do not damage the grounding conductors.

● Do not operate the devices when the grounding conductor is not installed.

● The devices must be permanently grounded. Before any operation, please check the electrical connection of the devices, making sure they are grounded properly.

4.3.2 Instruments and Tools

The following table lists the required tools:

Regular Tools	Torx screwdriver, Philips driver, flat blade screwdriver, adjustable wrench, Allen wrench, cross-type torque screwdriver, combination wrench, rubber hammer, and torque wrench.
Safety Tools	Antistatic wrist strap, safety belt, helmet, safety rope, and slip-proof gloves.
Cable Making Tools	Wire stripper, wire crimper, and wire cutter.
Measuring Tools	Multi-meter, tape measure, and level.
Auxiliary Tools	Fixed pulley, step ladder, marker pen, percussion drill, electrical tape, anti-UV cable tie, label, screw kit, expansion screw, utility knife, heat gun, and duct tape.

4.3.3 Material Preparation

Before installation, check that all materials are well received according to the packing list.

4.4 Installing the Units

Place and fix the cable-access donor unit inside the cabinet.

The wireless-access donor unit and the remote unit can be mounted on a pole or wall as per needs. Check latter chapters for more details.

4.4.1 Installation Parts

The following figure shows the parts needed for installation, including the auxiliary fixture, back panel, latches and M6 screws.
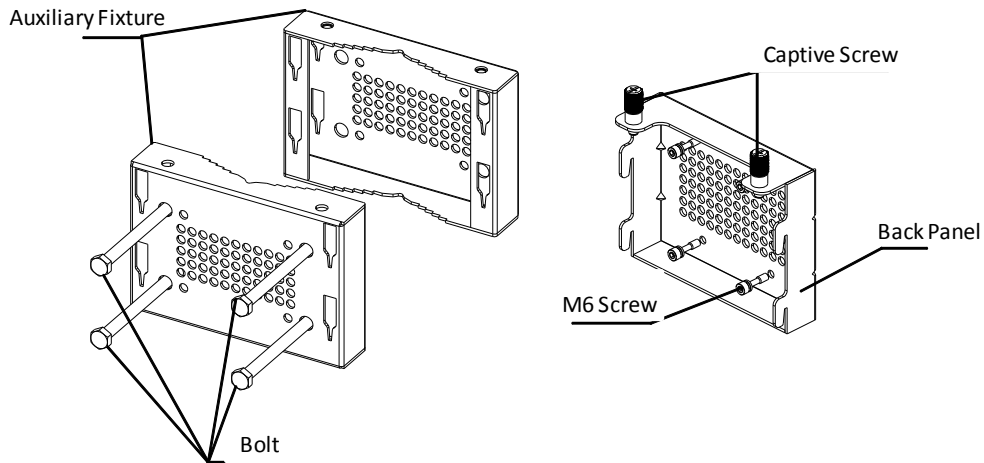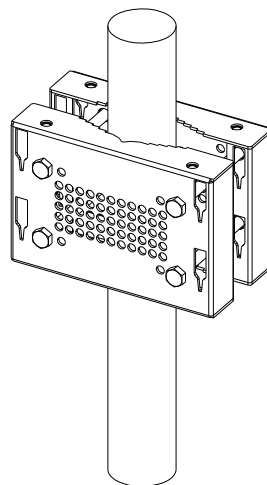

4.4.2 Installing the Product

Installation on Pole

You can install the product at its back or at its left side. The pole diameter should be between 60 mm to 114 mm.
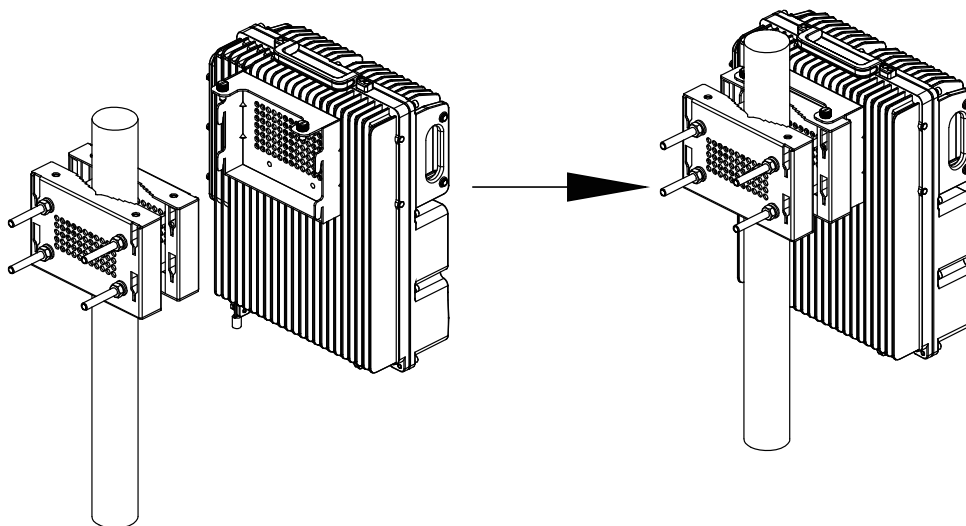
Installing at Back

1. Mark the installation position of the auxiliary fixture on the pole by using a marking pen.

2. Place the auxiliary fixture onto the pole, insert four bolts into the auxiliary fixture and then tighten four nuts by using a torque wrench.

3. Secure the back panel onto the back of the product using four M6 screws.
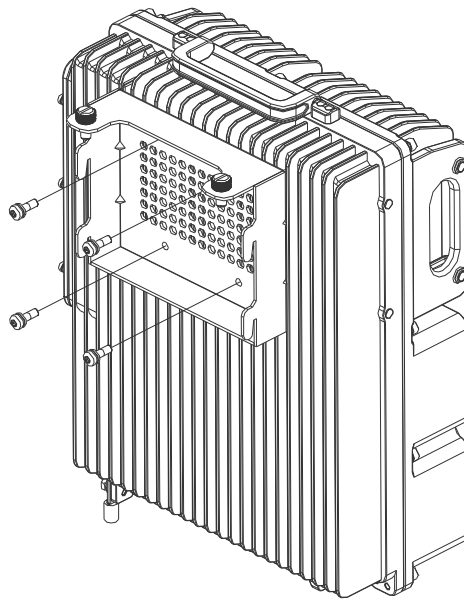
4. Insert the back panel into the auxiliary fixture and tighten the captive fasteners on the back panel of the product.

Installing at Left Side

Installing the product at left side and installing the product at back are almost the same. The only difference is that the back panel is secured to the left side rather than back of the product. The following figure shows the product installed at its left side.

Installation on Wall

You can install the product on a wall at the back or left side of the product.

Installing at Back

1. Place the auxiliary fixture on the wall at the installation position and then mark the anchor points by using a marking pen.
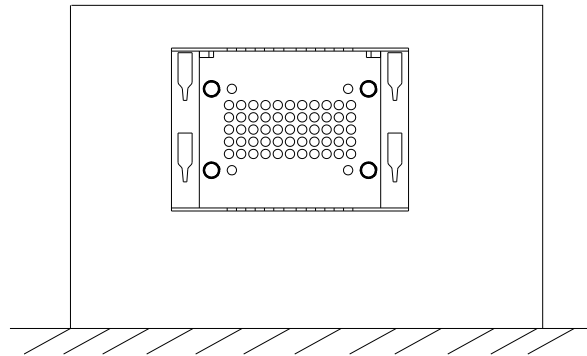
2. Drill holes at the anchor points and then install the expansion bolt assemblies.

3. Fit the auxiliary fixture on the expansion bolts, and then tighten the bolts.

4. Secure the back panel onto the back of the product using four M6 screws.
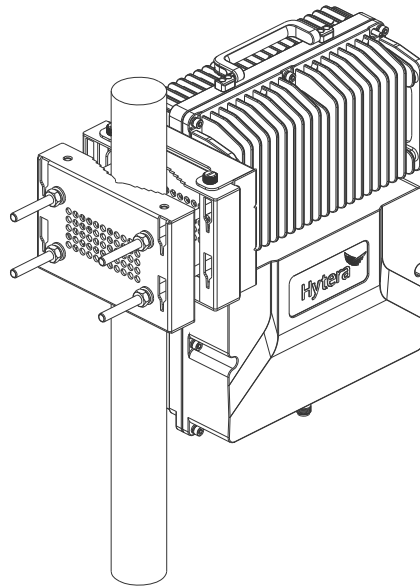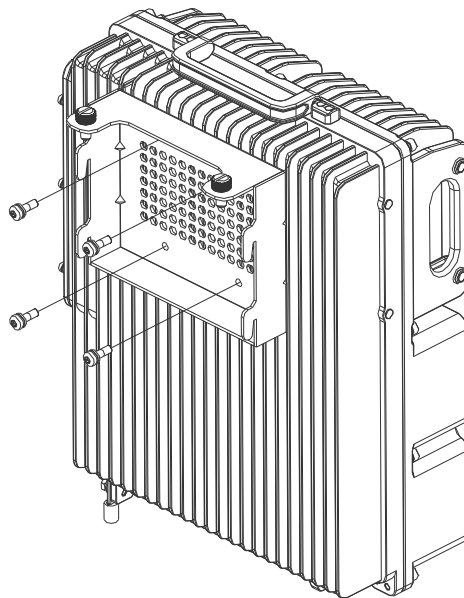

5. Insert the back panel into the auxiliary fixture and tighten the captive fasteners on the back panel of the product.
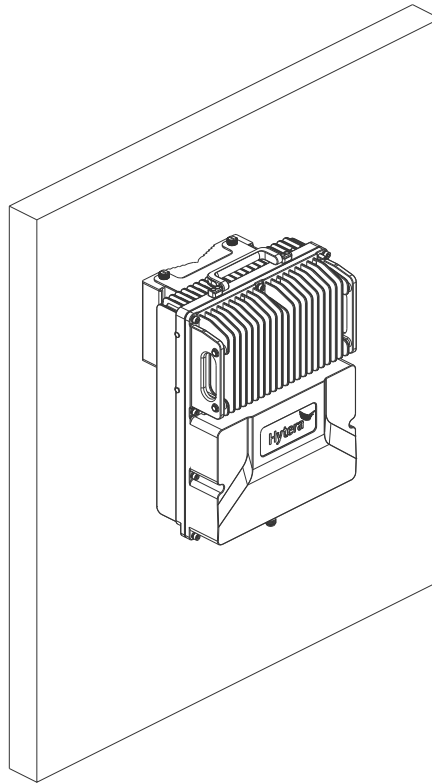
Installing at Left Side

Installing the product at left side and installing the product at back are almost the same. The only difference is that the back panel is secured to the left side rather than back of the product. The following figure shows the product installed at its left side.
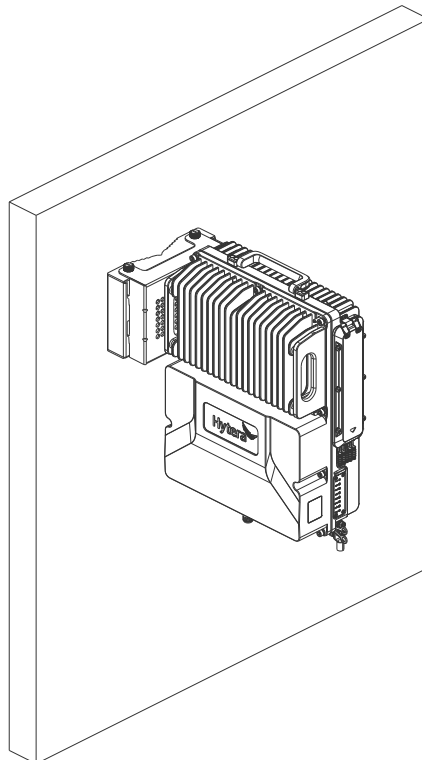
4.4.3 Cabling

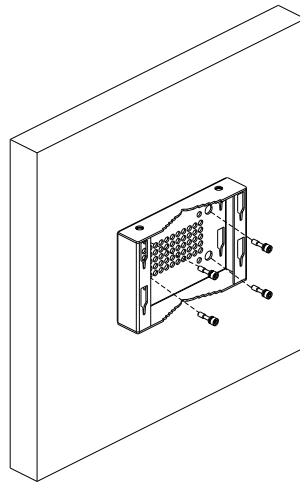## Cabling Requirements

Lay out cables according to requirements to reduce interference between them.

Safety Requirements

- Lay out cables away from sharp objects or jagged walls, or protect cables using conduit.

- Lay out cables away from heat sources, or add heat-insulation materials between cables and heat sources.

Requirements for Binding Cables

- Bind same cables together.

- Bind cables securely and neatly, without damaging the cable jackets.

- Ensure that cable ties face the same direction and are aligned in rows horizontally.

- After installing cables, attach labels or tags to the two ends of each cable.

- Cables of different types cannot be crossed.

Requirements for Laying Out Power Cables

- The routing of power cables must meet engineering design drawing requirements.

- If the power cable length is insufficient, replace the power cable. The power cable must be complete and cannot have splices or welding points.

- Avoid knotting or twisting the cable.

Requirements for Laying Out Grounding Cables

- The grounding cable cannot be led in aerially, but buried in the earth or arranged indoor.

- The grounding cables must be separated from signal cables to reduce interference between them.

- All metal components in the chassis must be securely connected to the grounding cable.

Requirements for Laying Out Optical Fibers

- Do not bind optical fibers where they are bent.

- Do not press optical fibers forcibly or crush optical fibers with force. Leave sharp objects away from optical fibers to prevent damage to optical fibers.

- Coil up redundant optical fibers around specialized devices such as the splice tray.

- Optical jumpers must be bound with optical fiber tapes. If the fiber is required to be fixed on the cabinet or device, then use the cable tie to bind the fibers on the optical fiber tape. Attention that the optical fiber must be flexible in the cable tie, and must not be bent into 90° angle.

- Coil optical fibers gently and do not break them.

● Cover idle optical fiber connectors with protective caps.

Cable List

Cable-access Donor Unit Cable List

Cable	One end (at DS-9300 device)		Other end
	Connector	Connected to ……	Connected to ……
Grounding Cable	Ring Terminal	Ground Terminal	Grounding Bar
RF Antenna	N-M	RX/TX/BS Interfaces	Base Station
Power Cable	3-pin AC Connector	AC 90-264 V	External Power Supply
Optical Fiber	SFP/SFP+	CPRI 0–3	Fiber Optic Network

Wireless-access Donor Unit Cable List

Cable	One end (at DS-9300 device)		Other end
	Connector	Connected to ……	Connected to ……
Grounding Cable	Ring Terminal	Ground Terminal	Grounding Bar
RF Antenna	N-M	BS Interface	Antenna System
Power Cable	Round Electric Connector	AC Interfaces	External Power Supply
Optical Fiber	SFP/SFP+	CPRI 0–3 Interfaces	Optical Fiber Network
Monitoring Cable	8-pin/1-pin Aviation Connector	EXM/LCT Interfaces	External Monitoring Device

Remote Unit Cable List

Cable	One end (at DS-9300 device)		Other end
	Connector	Connected to ……	Connected to ……
Grounding Cable	Ring Terminal	Ground Terminal	Grounding Bar
RF Antenna	N-M	MS Interface	Antenna System

Cable	One end (at DS-9300 device)		Other end
	Connector	Connected to ……	Connected to ……
Power Cable	Round Electric Connector	AC Interfaces	External Power Supply
Optical Fiber	SFP/SFP+	CPRI 0–1 Interfaces	Optical Fiber Network
Monitoring Cable	8-pin/1-pin Aviation Connector	EXM/LCT Interfaces	External Monitoring Device

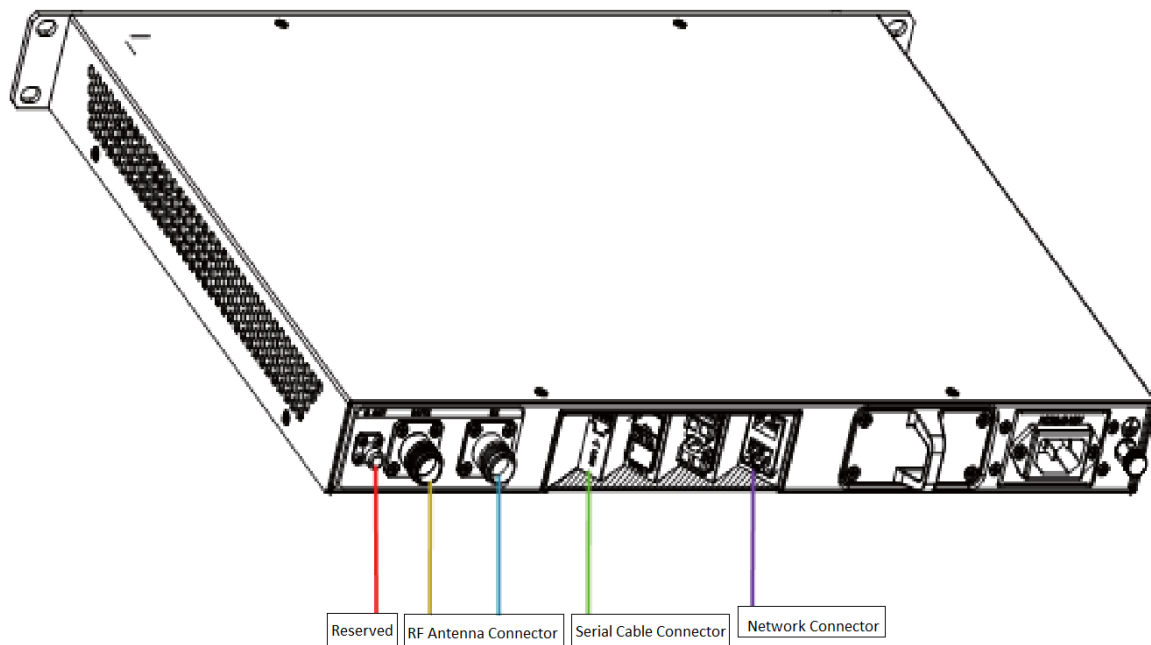## Cabling Guide
Cable-access Donor Unit

Wireless-access Donor Unit
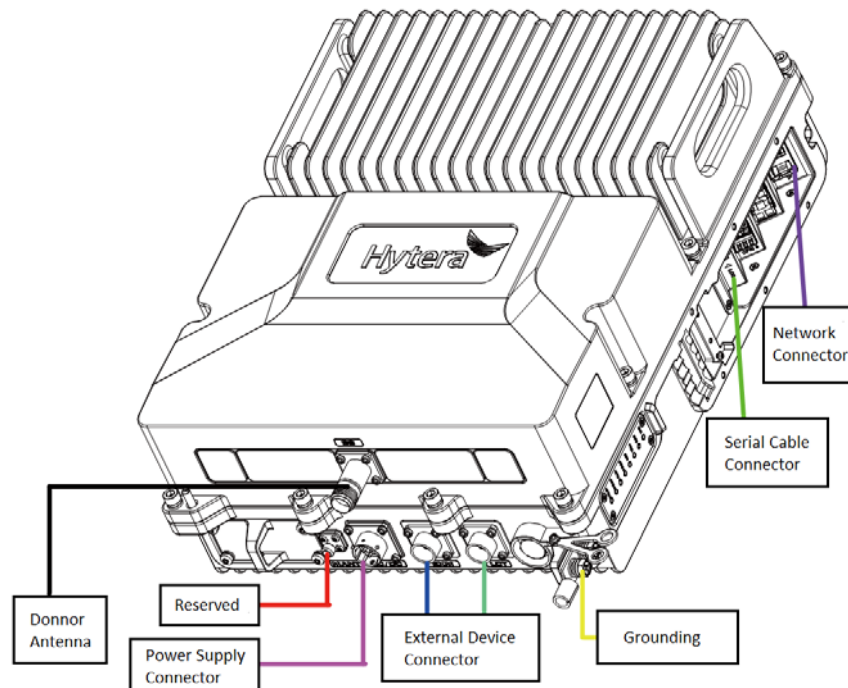
Remote Unit

Installing the Grounding Cable

1. According to the route, make a grounding cable with proper length, and install ring terminals at both ends of the cable.

The metal wires must be completely sealed, as shown in the figure below.

2. Connect one end of the cable to the ground connector at bottom of DS-9300 and the other end to the grounding bar.

3. Attach labels or tags to the installed cable.

Installing the RF Antenna

1. Remove protective caps from the antenna connector.

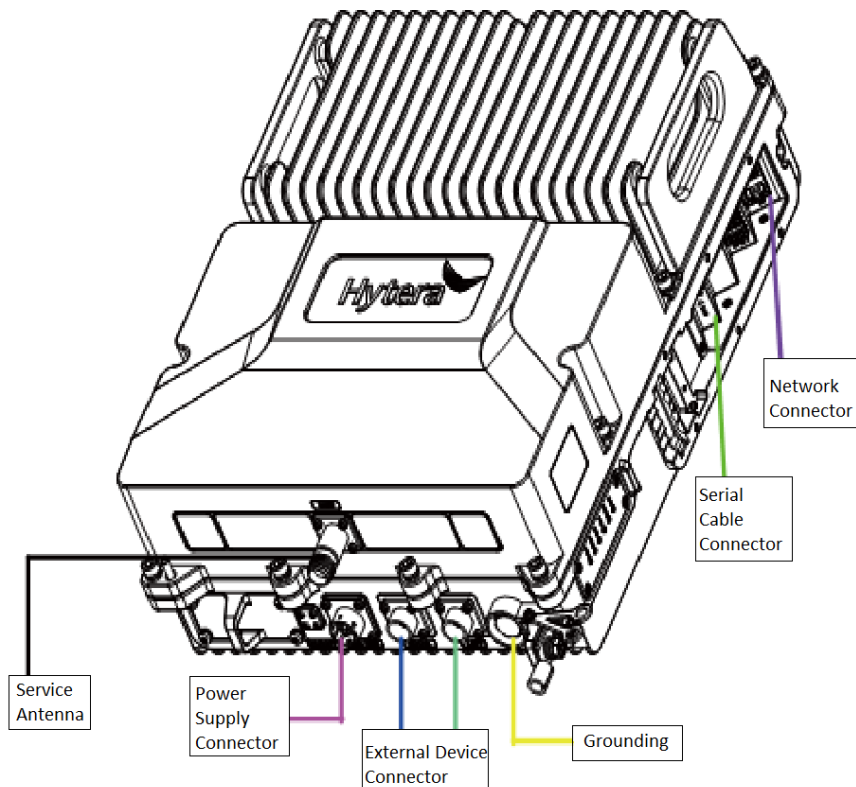2. Connect the male end of the RF cable to the BS interface of the donor unit or the MS interface of remote unit and tighten the connector using the torque wrench.
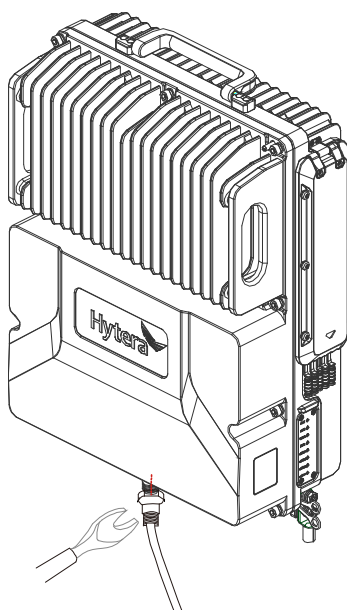
3. Connect the donor unit to the coupler, and connect the other end of the RF antenna from the remote unit to the service antenna.

 If the antenna is installed outdoor, it needs to be connected to a lightning arrestor. In this case, the other end of the RF antenna connects to the lightning arrestor.

4. Waterproof the cable connectors.

   a. Wrap a layer of PVC insulation tape around the cable connector from bottom to top.

   b. Wrap three-layer waterproof tape over the PVC insulation tape. Starting from 50 mm from the bottom of the antenna connector, wrap the three-layer waterproof tape in the following patterns:

bottom to top, top to bottom, and bottom to top again. Cut off the tape after the three-layer is done. Tighten the tape at each layer to ensure waterproof.

c. Wrap three-layer PVC insulation tape over the waterproof tape. Starting from 30 mm from the bottom of the waterproof tape, wrap the three-layer PVC insulation tape in the same method as introduced in step b.

d. Bundle cable ties at 3–5 mm from both ends of the tape.

5. Check the dustproof cap of the antenna connector, and waterproof it in the same method as introduced in step 4.

6. Waterproof idle connectors on the bottom of DS-9300 device without removing the protective caps, according to step 4.

7. Lay out the cable according to design requirements and fix the cable with cable ties.

8. Attach labels or tags to the installed cable.

Installing the Power Cable

Note

Power cable delivered with DS-9300 device is 3*18 AWG cable.

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1. Connect one end of the power cable to the PWR connector of DS-9300 device and the other end to the external power supply. Lay out the cable according to design requirements and fix the cable with cable ties.

3. Attach labels or tags to the installed cable.

Installing the Monitoring Cable

1. Remove protective cap from the EXM/LCT connector of DS-9300 device. Connect one end of the monitoring cable to the EXM/LCT connector of DS-9300 device and the other end to the external monitoring device.

3. Lay out the cable according to design requirements and fix the cable with cable ties.

4. Attach labels or tags to the installed cable.

Installing the Optical Fiber

The remote unit receives signals from the donor unit at CPRI 0 and outputs signals to the connected remote unit at CPRI 1, as shown in the following figure.
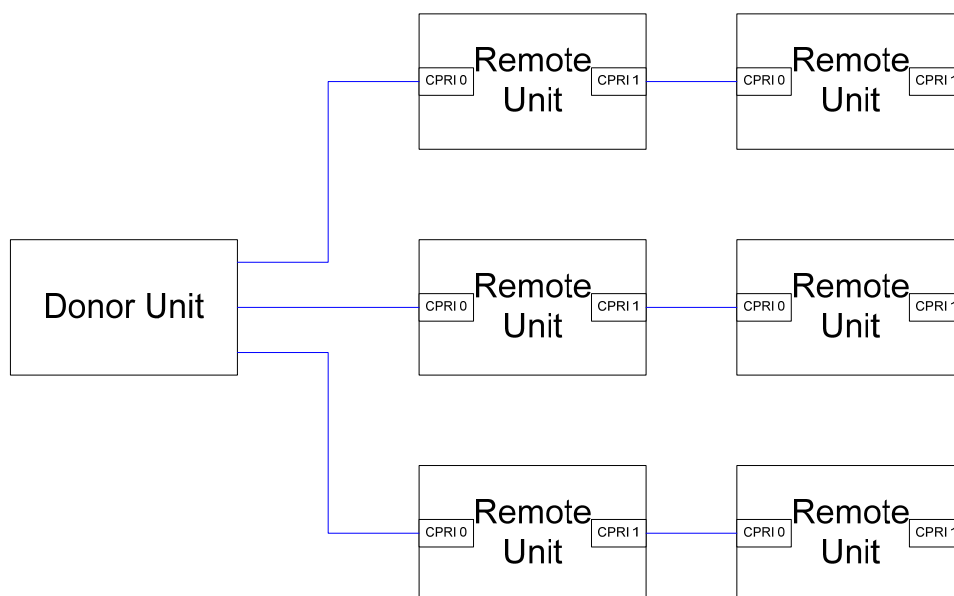
Procedure of installing the optical fiber is described as follows:

1. Connect the optical module to the SFP connector of DS-9300 device, as shown in the following figure.

    Note

    DS-9300 device adopts a dual-fiber single mode optical module with a transfer rate of 1.25 Gbps, a wavelength of 1,310 nm and a communication distance of 20 km.
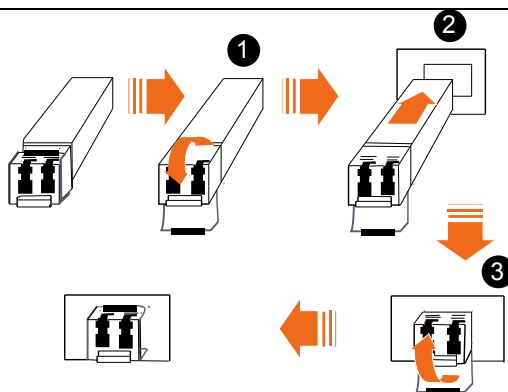
    a. Rotate the bail clasp latch down.

    b. Insert the optical module into the SFP connector.

    c. Rotate the bail clasp latch back.

2. Connect the fiber pigtail to the optical module and the other end of the fiber to the external transmission device, as shown in the figure below.
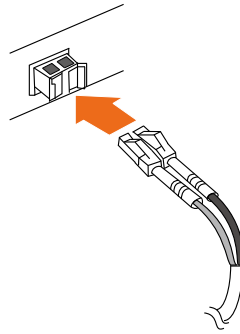
3. Lay out the cable according to design requirements and fix the cable with cable ties.

4. Attach labels or tags to the installed cable.

4.5 Post-installation Check

4.5.1 Checking the Installation

Check the cables according to the table below.

No.	Item
1	The device is installed by strictly following the design draft. The installing position meets space requirements with maintenance space reserved.
2	The device is securely installed.
3	Waterproof caps are installed on idle connectors and securely fastened.
4	All power cables or grounding cables are not short-circuited or reversely connected and must be intact with no damage.
5	The power cables and grounding cables are separated from other cables and bundled separately.
6	Connectors of all cables are complete, intact, and tightly connected. The cables are not damaged or broken.
7	Labels on cables, feeders and jumpers are clear and correct.

4.5.2 Checking the Device with Power On

After the installation is complete, observe indicators on DS-9300 device to determine the system running status.

Start

Check if the cable is
connected properly   No   Troubleshoot

Yes

Power On

Check if the indicators   No   Power Off and
are normal   Troubleshoot

Yes

End
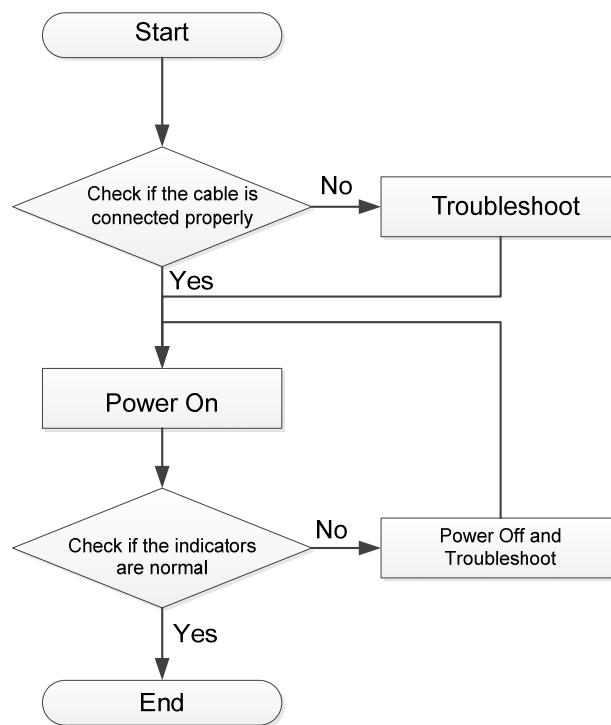
If the RUN indicator flashes green and the ALM indicator is off, the status of DS-9300 device is normal.

5. Power On and Power Off

5.1 Powering On

Toggle the power switch on DS-9300 device to the ON position to power it on. Wait a few minutes and check the status of LED indicators.

5.2 Powering Off

Toggle the power switch on DS-9300 device to the OFF position to power it off.

6. Debugging

Use the Product Support Software (PSS) to configure and upgrade the DS-9300 device.

6.1 Preparation

Before debugging, prepare the PSS tool, and connect the device to the computer. You can debug the device either locally through the cable or IP connection, or remotely through IP connection. The default IP address of the device is 192.168.1.100; the IP address of the computer must be set to the same network segment, 192.168.1. X (X cannot be 100).

The computer for running the PSS must meet requirements specified in the following table:

Item	Description
Operating system	Windows7 or above
CPU	PII300 or above
Memory	128 MB or above
Storage	2 GB or above
Display	14-inch or above, resolution 800x600 or above

6.2 Procedure

The process of local debugging and remote debugging is the same. In this document, local debugging is taken as example. For remote debugging, please refer to *Repeater Management System Operation Guide*.

1. Double-click "DS9300_PSS.exe" on the computer. The following main interface appears.
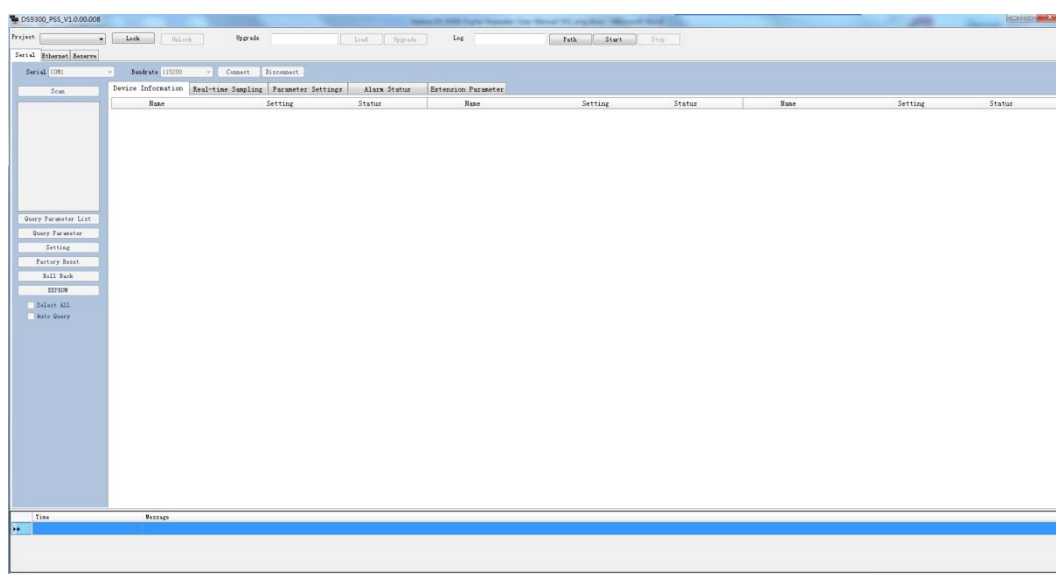
2. Click **Project**, select **DS_9300_CUSTOMER** and click **Lock**. A message indicating locking database succeeded will appear in the message pane.

3. Select **Ethernet** tab, set the **Destination** and **Port** and click **Connect**.

   📝**Note**

   For debugging through the serial cable, select the **Serial** tab, set the **Serial** and **Baudrate** (115200) and click **Connect**.
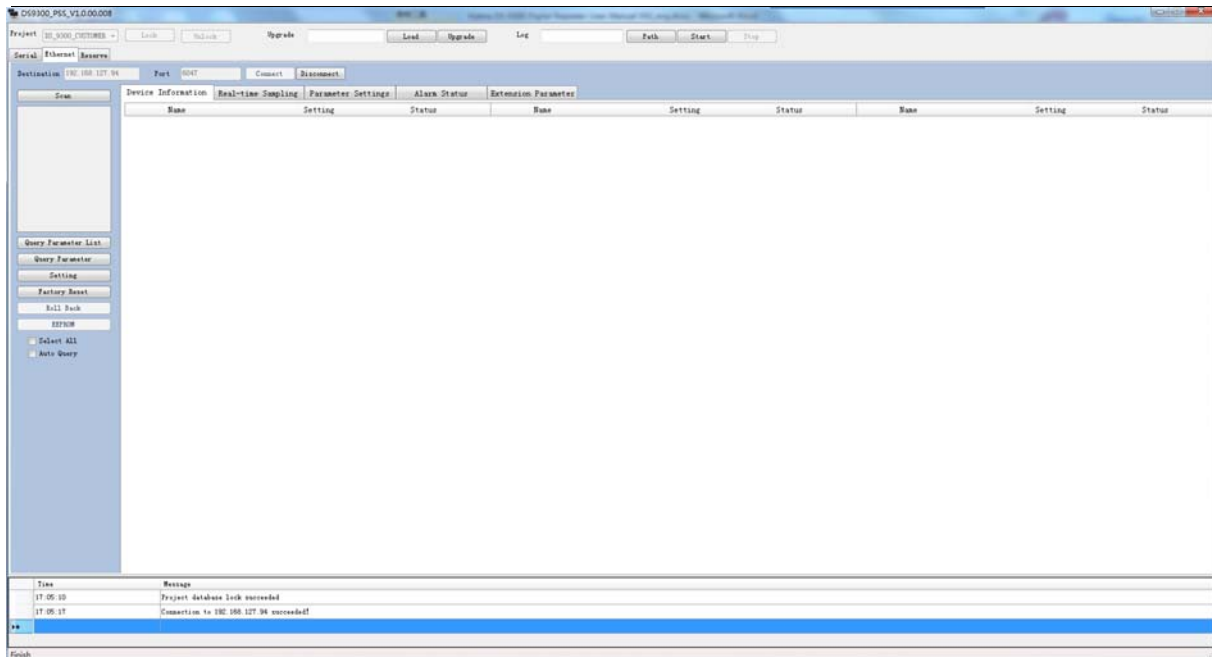
4. Click **Scan** and the following window appears.
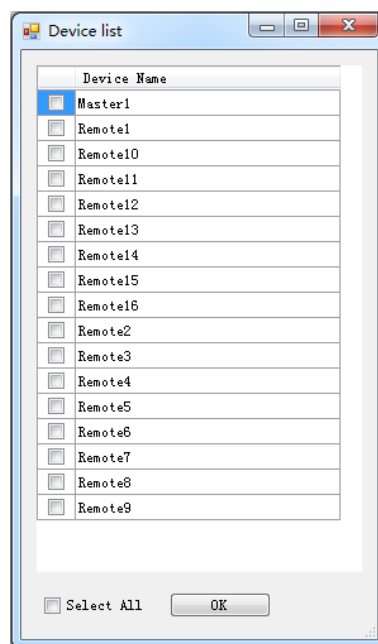
5. Select devices you want to display on the PSS and click **OK**.

6.2.1 Querying Parameters

● To manually query parameters of the selected device, click **Query Parameter**.

● If you click **Auto Query**, PSS will query all the parameters of the selected device every two seconds.

In the **Scan** list, click on the device and check **Select All**. Click **Query Parameter**, the parameter values will be displayed in **Status**.

📝Note

● To query a specific parameter, check the parameter name and click **Query Parameter**.

● To query all parameters on the line, click the blank tab above the checkbox as shown in the figure below.

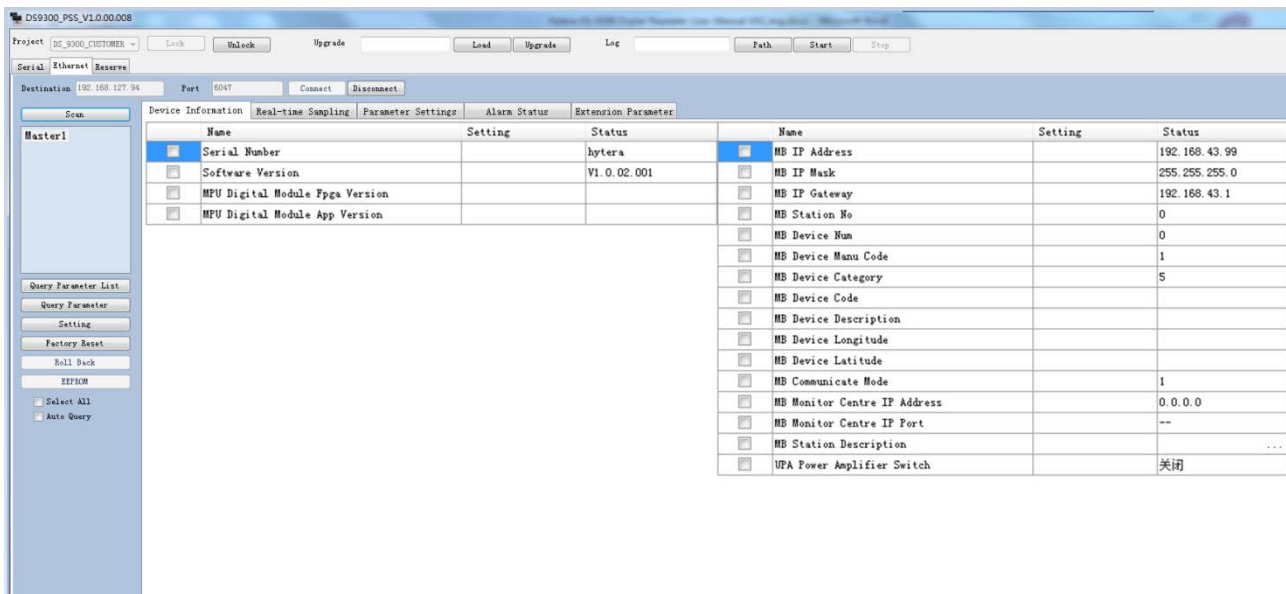# 6.2.2 Setting Parameters

1. In the parameter list, click the blank space under **Setting** tab from the same row the parameter locates (the parameter is thus checked by default), enter or select a value. For the detail description of each parameter, see chapter Appendix: Parameters.

    a. (Optional for channel-selective devices) Select **Parameter Settings** tab, and turn on the channel switch of the current BS, then set the corresponding uplink and downlink working channel frequencies. Other spare channel switches need to be turned off.

Note

For remote units, set the **Downlink Output Under-power Threshold** 10 dBm less than the actual output power in most cases.

b. Select **Real-time Sampling** tab, and view the **Downlink Input Power Level**. The value of this parameter should be around -13 dBm for a cable-access donor unit, and -58 dBm for a wireless-access donor unit. In case the differences are large, add attenuators to the power input port of the cable-access donor unit according to the difference value, or adjust the corresponding donor antenna of the wireless-access donor unit.

c. Select the **Device Information** tab, and modify the configuration according to the following table.

Parameter	Value
IP Address	This parameter is subject to actual requirements. The default value is 192.168.1.100.
IP Mask	This parameter is subject to actual requirements. The default value is 255.255.255.0.
IP Gateway	This parameter is subject to actual requirements. The default value is 192.168.1.1. The first three numbers must be consistent with that of the device IP address, the last number must be 1.
Device No.	The donor unit is 0; the range for remote unit in low configuration is 1 to 4; the range for remote unit in high configuration is 1 to 16.
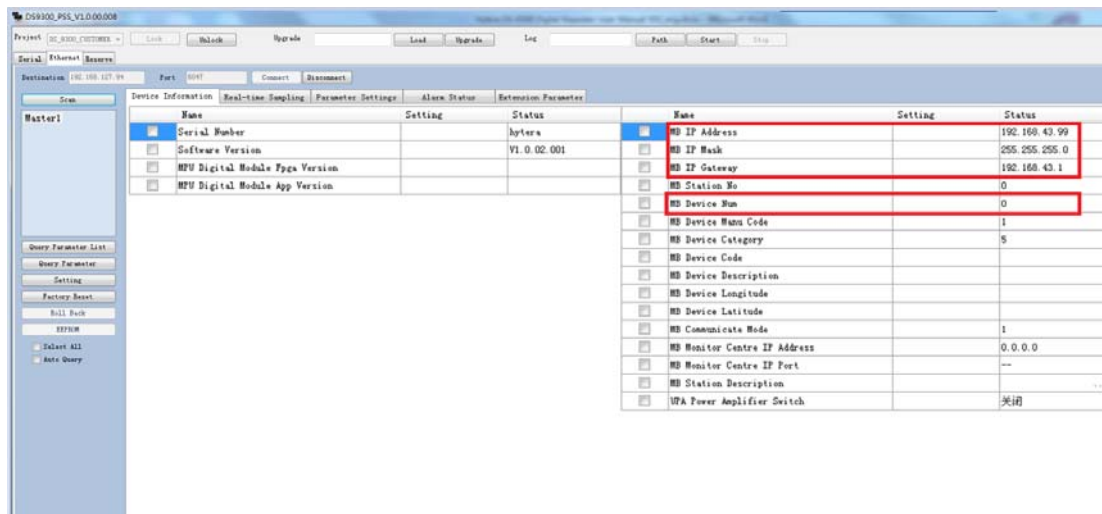
d. Select the **Alarm Status** tab, and turn on all switches if a repeater management system (RMS) is configured. When an alarm is generated, it will be alerted in red font and needs handling.
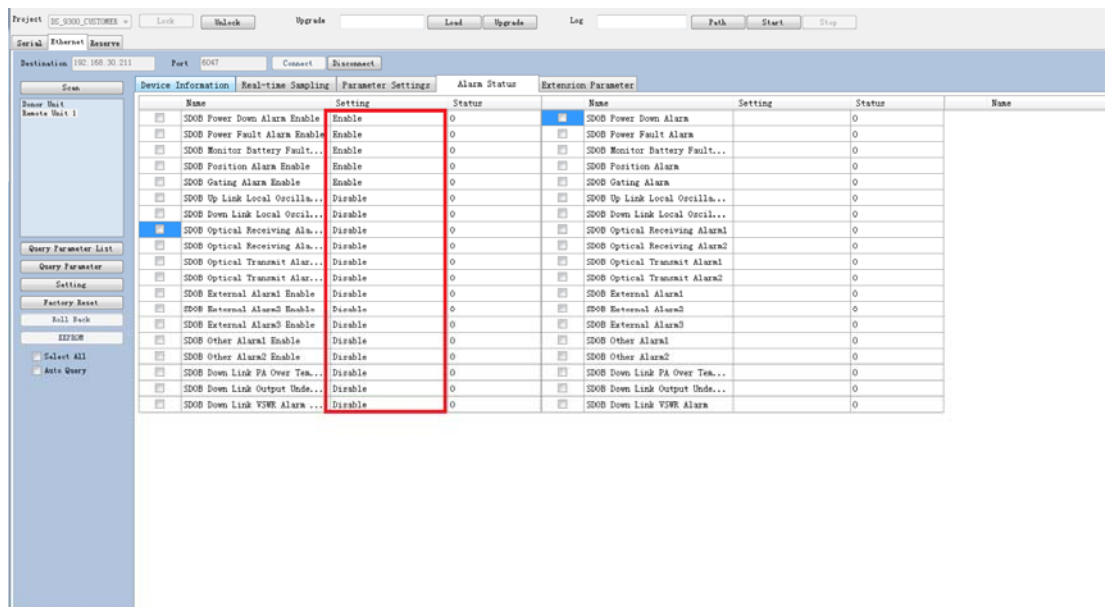
2. Click **Setting**, the result will be displayed in the message pane.

📝**Note**

To restore the factory settings, click **Factory Reset**.

6.2.3 Upgrade

PSS allows you to upgrade the main program of the monitor board and the main program and FPGA of the digital board.

1. In the **Upgrade** area, click **Load**.

2. Select the software and click **Upgrade**. The result will be displayed in the message pane.

Note

If the upgrade fails or you want to roll back to the former version, perform the upgrade using the old upgrade file.

6.2.4 Exporting the Logs

PSS allows you to export the operation logs.

1. In the **Log** area, click **Path**.

2. Specify the storage path and click **Start**.

7. System Maintenance

7.1 Care and Cleaning

To guarantee optimal performance as well as a long service life of the product, please follow the tips below.

⚠️**Caution**

    Be sure to turn off the product before cleaning.

Product Care

● Attach the connector cover with waterproof plug when the connector is not in use.

● Do not pierce, strike, throw or scrape the product.

● Keep the product away from substances that can corrode the circuitry.

● Keep the device dry.

● Keep this device far away from overheating, which may shorten lifespan of the electronic parts, or even distort or melt the plastic parts.

● Keep this device far away from extreme cold. Otherwise, the circuit board may be damaged by vapor generated when the device is used at normal temperature.

Product Cleaning

● Clean up the dust and fine particles on the product surface and charging piece with a clean and dry lint-free cloth or a brush regularly.

● Use a non-woven cloth with neutral cleanser to clean the device after long-time use. Do not use chemical preparations such as stain removers, alcohol, sprays or oil preparations, so as to avoid potential damage on the surface. Make sure the product is completely dry before use.

7.2 Routine Maintenance

To ensure reliable communication, it is recommended to perform the following check tasks on a regular basis:

● Check whether the return loss of the antenna feeder system is normal, whether the position and direction of the antenna are changed, and whether the RF cable connectors are properly sealed.

● Check whether the indoor cables are moved, whether the fixed devices are loosened, and whether the power connection is in good condition.

● Check whether the lightening arrestor and the grounding are in good condition.

● Check whether the power voltage of the device is normal.

- Regularly check and record the working status and main parameters such as receiving signal level, output noise level, and downlink output power.

- Check whether the coverage meets the requirements.

- Check whether the monitoring system works properly.

- Check whether the signs and labels on the devices are complete.

- If the device malfunctions, return it for repair.

7.3 Alarm Handling

Alarm Information	Solution
LNA and PA Alarm	Check whether the power supply and signal cable connection of the LNA and PA modules are in good condition. If the alarm still exists, replace the module.
Power Fault and Power Down Alarm	If the power down alarm is generated, check whether the AC power connection is in good condition, and whether the power supply is normal.
PA Over-temperature Alarm	Change the temperature threshold to clear the alarm. It's recommended to set the maximum temperature threshold to 90°C. If the alarm still exists, cool the device down.
Door Alarm	Check whether the cabinet door is properly closed. If the alarm still exists after the door is closed, check whether the door and the alarm cable are properly connected.
Location Alarm	Check whether the device is moved illegally. If not, check whether the alarm cable is properly grounded.
Downlink VSWR Alarm	Check whether the SWR threshold of the downlink PA is set correct. It is recommended to set the threshold as 3.0. If the alarm does not disappear, check whether the antenna system is connected well, or flooded with water. It is recommended to use a VSWR tester to test the actual SWR threshold.
Uplink/Downlink Input/Output Over-power/Under-power Alarm	Change the input/output over-power/under-power thresholds to clear the alarm. It is recommended to set the thresholds as follows: ● Uplink Output Over-power Threshold (Donor Unit): 0 dBm (nominal downlink output power) ● Downlink Input Over-power Threshold (Donor Unit): –5 dBm ● Downlink Output Under-power Threshold (Remote Unit): +25 dBm (nominal

Alarm Information	Solution
	downlink output power)

7.4 Troubleshooting

Phenomena	Possible Cause	Solution
The device fails to be powered on.	The power cable is not connected, or the contact with the socket is loose.	Connect the power cable properly and ensure good contact.
The RUN indicator glows green solidly.	The unit is powered, but a module is faulty.	Troubleshoot or replace the faulty module.
The RUN indicator is off.	The unit is not powered, or a module is faulty.	Check whether the power cable is properly connected, or troubleshoot the faulty module. Or replace the faulty module, if necessary.
The ALM indicator glows red solidly.	A module is faulty.	Replace the faulty module.
The ALM indicator flashes red.	A connector is faulty.	Check the connector.
The VSWR indicator flashes red rapidly.	One or more ports generate VSWR alarm during starting of the unit.	Check whether the connection of the antenna system is proper.
The VSWR indicator flashes red slowly.	One or more channels are abnormal after the cell is set up.	Check whether the connection of the antenna system is proper.
The SFP indicator is off.	The optical fiber link is faulty.	Check whether the fiber and the optical module are properly connected.

If the above solutions cannot fix your problem, please contact us.

8. Appendix: Parameters

Take the donor unit as example.

Device Information

Parameter	Configuration	Remarks
Electronic Serial Number (ESN)	Enter up to 10 characters, including digits and letters.	Serial number of the device.
Monitor Version	Keep the default value unchanged.	Version of the monitor board.
FPGA Version	Keep the default value unchanged.	Version of FPGA in the digital modules.
Application Version	Keep the default value unchanged.	Version of applications in the digital modules.
IP Address	This parameter is subject to actual requirements. The default value is 192.168.1.100.	/
Subnet Mask	This parameter is subject to actual requirements. The default value is 255.255.255.0.	/
Default Gateway	This parameter is subject to actual requirements. The default value is 192.168.1.1. The first three numbers must be consistent with that of the device IP address, the last number must be 1.	/
Site ID	The range is 0 to 4294967295. The site ID must end with the ID of its home BS. For example, if a donor unit has a site ID of 20001, then "2" represents the donor unit ID and "0001" represents the home BS ID; if the remote unit has a site ID of 160020001, then "16" represents the remote unit ID, "002" represents the home donor unit ID, and "0001" represents the	The only ID of the device, consistent with its configuration in the repeater management system (RMS).

	home BS ID.	
Device No.	The donor unit is 0; the range for remote unit in low configuration is 1 to 4; the range for remote unit in high configuration is 1 to 16.	Device number of corresponding donor or remote units.
Manufacturer ID	The range is 0 to 255. ● 1: Hytera ● 2: Reserved	/
Device Type	The range is 1 to 13. ● 1: DCCD ● 2: DCR ● 3: DICR ● 4: LA ● 5: DWCD ● 6: DCBD ● 7: DBR ● 8: DWBD ● 9: DCCD L ● 10: DWCD L ● 11: DCBD L ● 12: DWBD L ● 13: Reserved	/
Device Number	Enter up to 20 characters, including digits and letters.	Material number of the device.
Device Description	Enter up to 20 characters, including digits and letters.	Material description of the device.
Device Longitude	This parameter is subject to actual requirements. Negative number represents South	/

	Latitude or West Longitude.	
Device Latitude	This parameter is subject to actual requirements. Negative number represents South Latitude or West Longitude.	/
Communication Method for Reporting Alarms	The range is 0 to 2. ● 1: SNMP ● 2: Reserved	/
Monitor Center IP Address	This parameter is subject to actual requirements.	IP address of the RMS Monitor Center.
Monitor Center Port No.	The range is 0 to 65535. This parameter is subject to actual requirements.	Port number of the RMS Monitor Center.
Site Description	This parameter is subject to actual requirements.	/

Real-time Sampling

Parameter	Configuration	Remarks
Manufacturer ID	The range is 0 to 255.	/
Location Area ID	The range is 0 to 65535.	/
Source BS ID	The range is 0 to 4294967295.	/
BCCH Absolute Carrier No.	The range is 0 to 65535.	/
BCCH Receiving Level	The range is −127 to 127.	/
Signal Format	The range is 1 to 4. ● 1: PDT ● 2: DMR ● 3: TETRA ● 4: Others	/
Max. Working Channels	Keep the default value unchanged.	Only available on channel-selective devices.

Actual Number of Carriers	The range is 0 to 32.	Actual number of channels the device has opened.
Downlink Input Power Level (dBm)	The range is –110 to 10.	/
Uplink Output Power Level (dBm)	The range is –110 to 50.	/
Remote Unit Online Switch	● 0: Offline ● 1: Online	Whether the remote unit is online.
Remote Unit Connection Indicator	0: Not connected 1: Connected	Whether a remote unit is connected.
Donor Unit Connection Indicator	0: Not connected 1: Connected	Whether a donor unit is connected.

Setting Parameters

Parameter	Configuration	Remarks
Downlink Input Over-power Threshold (dBm)	The range is –110 to 10.	/
Uplink Output Over-power Threshold (dBm)	The range is –110 to 50.	/
System Uplink Gain (dB)	The range is 0 to 100.	/
System Downlink Gain (dB)	The range is 0 to 100.	/
Uplink Channel Reference Base Frequency (MHz)	This parameter is subject to actual requirements.	/
Downlink Channel Reference Base Frequency (MHz)	This parameter is subject to actual requirements.	/
Increment (kHz)	This parameter is subject to actual requirements.	/

Inspection Report	● 1: Report ● 0: Do not report	/
Troubleshooting Report	● 1: Report ● 0: Do not report	/
Configuration Change Report	● 1: Report ● 0: Do not report	/
Downlink PA Over-current threshold	The range is 0 to 65535.	/
Uplink/Downlink Squelch Threshold (dBm)	The range is –110 to 50.	/
Uplink/Downlink Squelch Switch	● 0: Enable ● 1: Disable	/
Remote Unit Delay Auto-compensation Switch	● 0: Enable ● 1: Disable	/
Uplink Digital Attenuation (dB)	The range is 0 to 20.	/
Downlink Digital Attenuation (dB)	The range is 0 to 20.	/
Monitor Board Software Version Switch	● 0: Do not switch ● 1: Switch	/
Digital Board Software Version Switch	● 0: Do not switch ● 1: Switch	/
FPGA Software Version Switch	● 0: Do not switch ● 1: Switch	/
Uplink Operating Channel (MHz)	This parameter is subject to actual requirements.	/
Downlink Operating Channel (MHz)	This parameter is subject to actual requirements.	/

Channel Switch	● 0: Disable ● 1: Enable	/

Alarm Status

Parameter	Configuration
Master-Slave Monitoring Link Fault Alarm Enable	● 0: Disable ● 1: Enable
Power Supply Disconnection Alarm Enable	● 0: Disable ● 1: Enable
Power Supply Fault Alarm Enable	● 0: Disable ● 1: Enable
Downlink Input Over-power Alarm Enable	● 0: Disable ● 1: Enable
Uplink Output Over-power Alarm Enable	● 0: Disable ● 1: Enable
Uplink Local Oscillator Unlock Alarm Enable	● 0: Disable ● 1: Enable
Downlink Local Oscillator Unlock Alarm Enable	● 0: Disable ● 1: Enable
Remote Digital Module Fault Alarm Enable	● 0: Disable ● 1: Enable
Downlink LNA Fault Alarm Enable	● 0: Disable ● 1: Enable
Optical Receiving Alarm Enable	● 0: Disable ● 1: Enable
Optical Transmission Alarm Enable	● 0: Disable ● 1: Enable
Downlink PA Over-current Alarm Enable	● 0: Disable

	• 1: Enable
Master-Slave Monitoring Link Fault Alarm	• 0: Normal • 1: Fault
Power Supply Disconnection Alarm	• 0: Normal • 1: Fault
Power Supply Fault Alarm	• 0: Normal • 1: Fault
Downlink Input Over-power Alarm	• 0: Normal • 1: Fault
Uplink Input Over-power Alarm	• 0: Normal • 1: Fault
Downlink PA Over-current Alarm	• 0: Normal • 1: Fault
Uplink Local Oscillator Unlock Alarm	• 0: Normal • 1: Fault
Downlink Local Oscillator Unlock Alarm	• 0: Normal • 1: Fault
Remote Digital Module Fault Alarm	• 0: Normal • 1: Fault
Downlink LNA Fault Alarm	• 0: Normal • 1: Fault
Optical Receiving Alarm	• 0: Normal • 1: Fault
Optical Transmission Alarm	• 0: Normal • 1: Fault