



RAN10.0 3900 Series NodeB

Product Description

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Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://www.huawei.com>

Email: support@huawei.com

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1 Introduction

1.1 3900 Series NodeBs

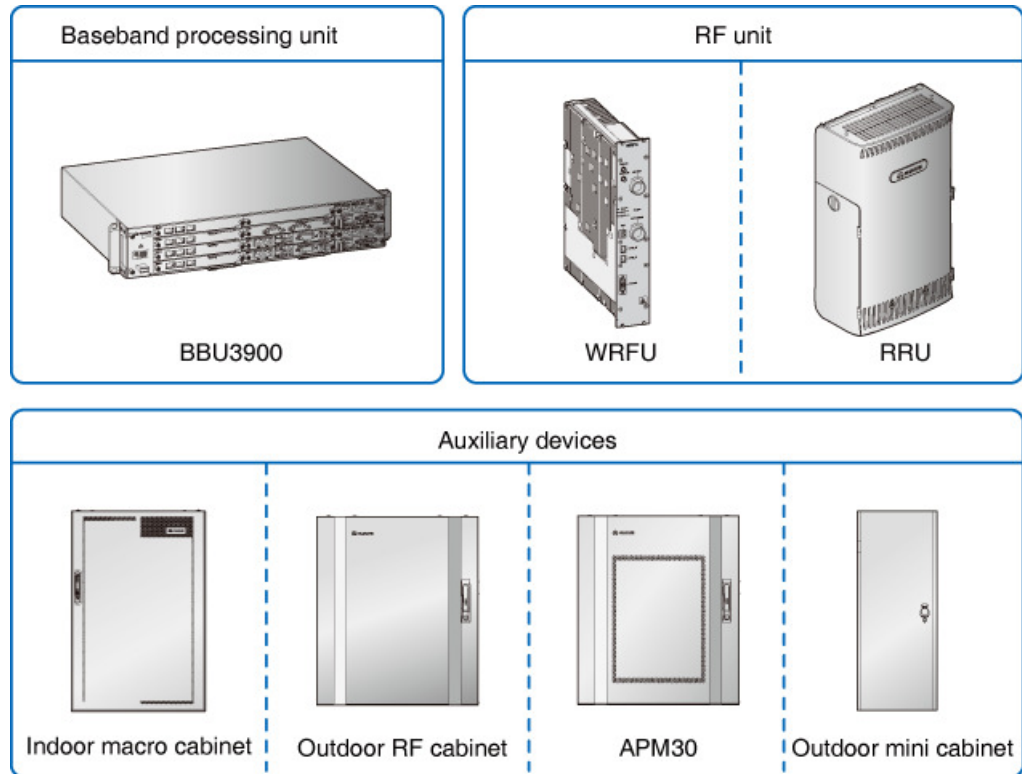
The mobile communications, which takes an ever-changing presence with each passing day, blazes a trail for the upgrade of technologies and products. The growing trend of mobile communications comprises a series of evolution, from GSM to EDGE to EDGE+ and from WCDMA to HSPA to HSPA+ and LTE, and it is worth mentioning that WiMAX also joins the 3G family. To follow the trend, the network operators have to devote more CAPEX and OPEX to the dramatic change of technologies, and therefore they are currently focusing on the merge of multiple network systems into a more cost-effective one.

Upon the transition of mobile networks, the network operators target at the Blue Ocean Strategy and invite innovative and responsive partners. Customer-oriented and innovative, Huawei advocates four basic technological concepts: green, merge, wideband, and evolution. Huawei will take the lead in developing the next-generation base stations and the 3900 series NodeBs, Huawei's fourth generation base stations, will outclass other base stations to benefit operators with future-oriented networks.

Huawei unveils cutting-edge techniques in the 3900 series NodeBs, such as wideband, multi-mode system, and modular design. The 3900 series NodeBs consist of only three basic functional modules, characterized by compact structure, high integration, low power consumption, and easy and quick deployment. Flexible combinations of functional modules and auxiliary devices encourage Huawei to diversify the products. More importantly, the modules for different modes of systems can be installed in one cabinet to work as a base station adapting to different scenarios. Huawei also actively introduces new frequency bands and technologies to well meet operators' requirement for a compact multi-mode mobile network system.

Figure 1-1 shows the basic functional modules and auxiliary devices of the 3900 series NodeBs.

Figure 1-1 Basic functional modules and auxiliary devices



1.2 Product Features

- Adaptable to diversified radio environments

Different combinations of functional modules and auxiliary devices diversify the NodeB products. For example, there are macro NodeB, distributed NodeB, and mini compact NodeB, which operate in different scenarios to better meet different network deployment requirements.

The 3900 series NodeBs provide a platform for the Huawei wireless products. To be specific, the base stations of different network systems such as GSM, WCDMA, CDMA, and WiMAX can share the same cabinet or even share one functional module at the same frequency band (based on the SDR technology), which makes it easy for network operators to choose a site type.
- Greatly reduced Total Cost of Operation (TCO)

The 3900 series NodeBs have many advantages, such as flexible installation, easy site selection, cost-effective solution, and fast network construction. The baseband module (BBU3900) is only 19 inches wide and 2 U high, taking a very small indoor space or taking a place in an outdoor cabinet. The RF module (RRU3900) can be installed close to the antenna without taking any space of the equipment room.

The RRU3804 supports up to four carriers with an output power of 60 W, known as the highest output power of the RRU in the telecom industry. The outstanding performance ensures wide coverage and high throughput. When two carriers are configured for the RRU3804, the number of sites can be reduced by 40%.

The 3900 series NodeBs use the high-efficiency digital Power Amplifier (PA), which greatly reduces power consumption and helps build a green communication network. Compared with the traditional NodeB, the macro NodeB (BTS3900) has its power consumption reduced by 30%; compared with the traditional macro NodeB, the BTS3900A cabinet, which is in direct-ventilation, has its power consumption reduced by 40%.

Based on the IP switch and multi-carrier technologies, the 3900 series NodeBs support the bandwidth of over 100 Mbit/s, which keeps up with the fast growing mobile data services and provides users with higher data transmission rate.

- Smooth evolution to future radio network systems

The 3900 series NodeBs support smooth evolution to HSPA+ and Long Term Evolution (LTE), thus fully protecting the investment of network operators.

2 System Architecture

2.1 Product Overview

The 3900 series NodeBs feature a modular design. The basic functional modules are the baseband unit (BBU3900) and the indoor RF unit (WRFU), and outdoor remote RF unit (RRU). The BBU is connected to the RRU or WRFU through CPRI ports and optical cables. The auxiliary devices for the BTS3900 are as follows:

- APM30 power cabinet
- Indoor macro cabinet
- Outdoor cabinet
- Outdoor mini cabinet

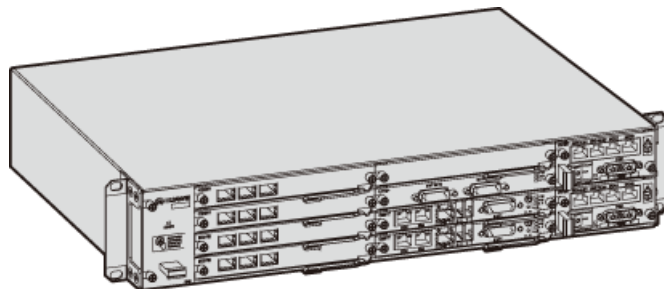
The variable combinations of functional modules and auxiliary devices provide flexible site solutions for different scenarios.

2.2 BBU3900

2.2.1 Physical Structure of the BBU3900

The BBU3900 is a compact case structure that requires a 19-inch-wide and 2-U-high space. It can be installed on a wall, on the staircase, in the storeroom, or in an outdoor cabinet on the existing network. It can be also installed in an outdoor cabinet of the existing network. Figure 2-1 shows the physical structure of the BBU3900.

Figure 2-1 Physical structure of the BBU3900



2.2.2 Hardware Units of the BBU3900

Basic Hardware Units

The basic hardware units of the BBU3900 are as follows:

- WCDMA Main Processing Transmission (WMPT) unit
- WCDMA BaseBand Processing (WBBP) unit
- Universal Fan (UFAN) unit
- Power module

All the boards support the plug-and-play function and can be configured in the slot as required.

Optional Hardware Units

The optional hardware units of the BBU3900 are as follows:

- Universal E1/T1 Lightning Protection (UELPL) unit
- Universal FE Lightning Protection (UFLP) unit
- Universal Satellite card and Clock Unit (USCU)
- Universal Transmission Processing (UTRP) unit
- Universal Environment Interface Unit (UEIU)

The BBU3900 supports diverse configurations from 1 x 1 to 6 x 4 or 3 x 8.


2.2.3 Ports on the BBU3900

Table 2-1 Ports on the basic hardware units of the BBU3900

Board	Port	Quantity	Connector Type	Remarks
WMPT	E1 port	1	DB26 connector	One port supporting four E1s
	FE electrical port	1	RJ45 connector	–
	FE optical port	1	SFP connector	–
	USB port for loading	1	USB connector	Software loading
	USB port for test	1	USB connector	Test port
	Serial port for commissioning	1	RJ45 connector	NodeB local maintenance
	GPS port	1	SMA connector	–
WBBP	CPRI	3	SFP connector	–
UPEU	PWR	1	3V3 connector	–48 V DC power input and +24 V DC power input
	MON0	1	RJ45 connector	Providing two RS485 monitoring ports; connecting to the external monitoring device
	MON1	1	RJ45 connector	

Board	Port	Quantity	Connector Type	Remarks
UPEU	EXT-ALM0	1	RJ45 connector	Providing eight dry contact alarm inputs; connecting to the external alarm device
	EXT-ALM1	1	RJ45 connector	

Table 2-2 Ports on the optional hardware units of the BBU3900

Board	Port	Quantity	Connector Type	Remarks
UELP	INSIDE	1	DB25 connector	Port for four E1/T1 signal inputs
	OUTSIDE	1	DB26 connector	Port for four E1/T1 signal outputs
UFLP	FE0 and FE1 (INSIDE)	2	RJ45 connector	Connecting to the NodeB
	FE0 and FE1 (OUTSIDE)	2	RJ45 connector	Connecting to the external device. The FE0 (OUTSIDE) connects to the FE0 (INSIDE) and the FE1 (OUTSIDE) connects to the FE1 (INSIDE).
USCU	RGPS port	3	DB8 connector	Connecting to the RGPS signal cable
	BITS port	1	SMA connector	Connecting to the BITS clock
	Clock test port	1	SMA connector	Port for testing clock signal output
	Antenna port for the satellite card	1	SMA connector	RF signal input port of the satellite card
UTRP	E1/T1 port	2	DB26 connector	Providing eight ATM over E1s/T1s or eight IP over E1s/T1s
UEIU	MON	1	RJ45 connector	Connecting to external monitoring devices
	MON1	1	RJ45 connector	
	EXT-ALM0	1	RJ45 connector	Connecting to external alarm devices
	EXT-ALM1	1	RJ45 connector	
	 NOTE The UEIU is a monitoring and dry contact extension board for the UPEU.			

2.3 RRU

2.3.1 Specifications of the RRU

The RRU is the outdoor RF remote unit that can be installed close to the antenna. The RRU is classified into RRU3804 and RRU3801C based on different output power and

processing capabilities. Table 2-3 describes the specifications of the RRU3804 and the RRU3801C.

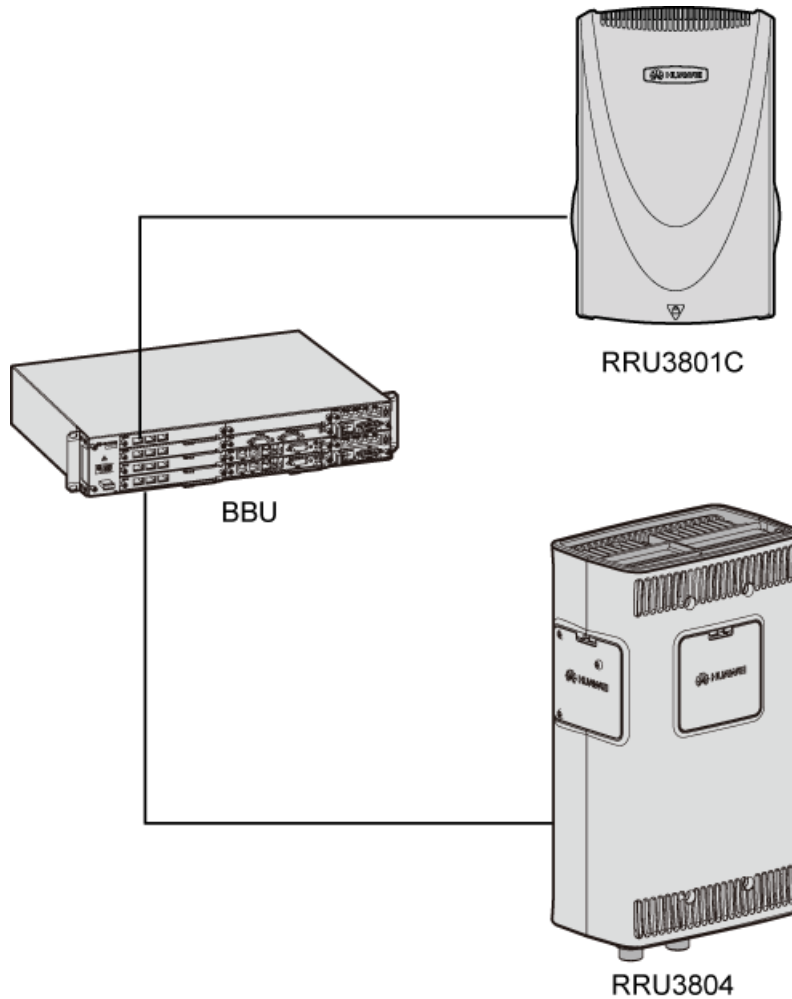
Table 2-3 Specifications of the RRU3801C and the RRU3804

RRU Type	RRU3801C	RRU3804
Maximum Output Power	40 W	40 W
Number of Carriers Supported	2	4

2.3.2 Physical Structure of the RRU

The BBU3900, together with either the RRU3801C or the RRU3804, can form the DBS3900 system. The RRU3801C and the RRU3804 have the same physical structure, as shown in Figure 2-2.

Figure 2-2 Physical structure of the RRU



2.3.3 Ports on the RRU

The ports of the RRU are located at the bottom of the module and in the cabling cavity. The RRU has the following ports:

- Grounding ports
- Power input ports
- Transmission ports
- Alarm ports

Table 2-4 Ports on the RRU3801C

Port	Connector Type	Quantity	Remarks
Power input port	9-pin, round, and waterproof connector	1	Ports for –48 V DC or 220 V AC power input
Optical ports	ESFP socket	2	Transmission ports
Port for 4-channel dry contact alarms	DB15 connector (shared by the fan)	1	Alarm port
Main TX/RX port	DIN, round, and waterproof connector	1	Other ports
RX diversity port	DIN, round, and waterproof connector	1	
Port for interconnection between combined modules	2W2 connector	1	
Port for the RET antenna	DB9 connector	1	
Commissioning port	RJ45 connector	1	

Table 2-5 Ports on the RRU3804

Port	Connector Type	Quantity	Remarks
Power input port	OT terminal	1	Port for –48 V DC power input
Optical ports	ESFP socket	2	Transmission ports
Port for 2-channel dry contact alarms and port for 1-channel RS485 signals	DB15 connector (shared by the fan)	1	Alarm port
Main TX/RX port	DIN, round, and waterproof connector	1	Other ports

Port	Connector Type	Quantity	Remarks
RX diversity port	DIN, round, and waterproof connector	1	
Port for interconnection between combined modules	2W2 connector	1	

2.4 WRFU

2.4.1 Specifications of the WRFU

The WRFU is categorized into 40 W WRFU and 80 W WRFU based on different output power and processing capabilities. The 40 W WRFU and 80 W WRFU have the same physical structure, dimensions, weight, and physical ports.

Table 2-6 Specifications of the WRFU

WRFU Type	80 W WRFU	40 W WRFU
Maximum Output Power	80 W	40 W
Number of Carriers Supported	4	2

2.4.2 Physical Structure of the WRFU

The WRFU can be housed in an indoor cabinet or an outdoor cabinet. Figure 2-3 shows the physical structure of the WRFU.

Figure 2-3 Physical structure of the WRFU



2.4.3 Ports on the WRFU

Table 2-7 Ports on the WRFU

Port	Connector Type	Quantity	Remarks
Power port	3V3 connector	1	Port for –48 V DC power input
Port for transceiving antenna signals	N female connector	2	Port for connecting the antenna system
CPRI ports	SFP female connector	2	Ports for connecting the BBU
Ports for transmitting diversity RX signals	QMA female connector	2	Ports for cascading WRFUs
Commissioning port	RJ45 connector	1	Commissioning port

2.5 Auxiliary Devices

2.5.1 APM

The Advanced Power Module (APM), an outdoor power backup system that provides –48 V DC power and backup power for the distributed NodeBs, outdoor macro NodeBs, and mini NodeBs. In addition, it provides installation space for the BBU3900 and other devices. The APM is categorized into APM30 and APM100.

The APM30 features a compact and lightweight design. It can be installed on a pole or on the ground. The 12 Ah, 24 Ah, and 36 Ah batteries can be installed in the APM30 cabinet. The APM100 can be installed on the ground. The 50 Ah or 100 Ah batteries can be configured in the APM100. The APM30 contains the following units:

- Power Supply Unit (PSU)
- Power Monitoring Unit (PMU)
- Power Distribution Unit (PDU)
- APM Power unit Interface Board (APMI)
- Temperature monitoring unit
- 24 Ah batteries

Figure 2-4 shows the internal structure of the APM30 and Figure 2-12 shows that of the APM100.

Figure 2-4 Internal structure of the APM30

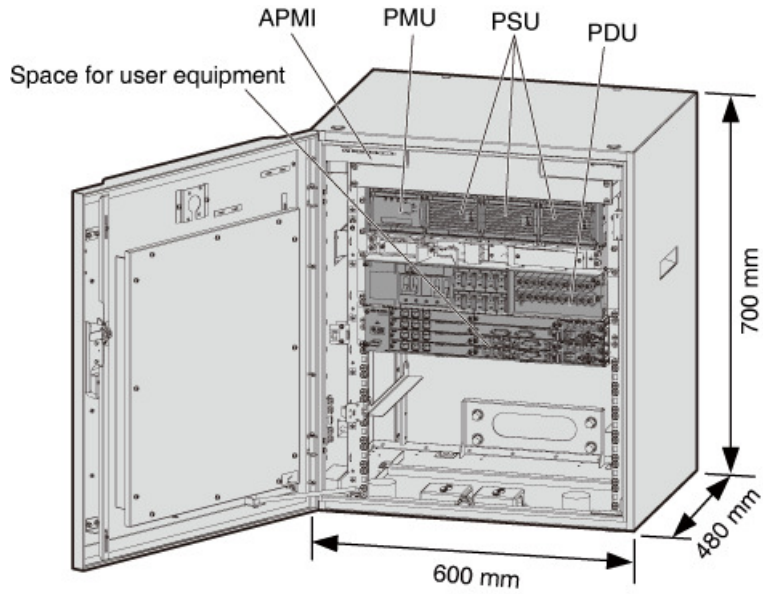


Figure 2-5 Internal structure of the APM100

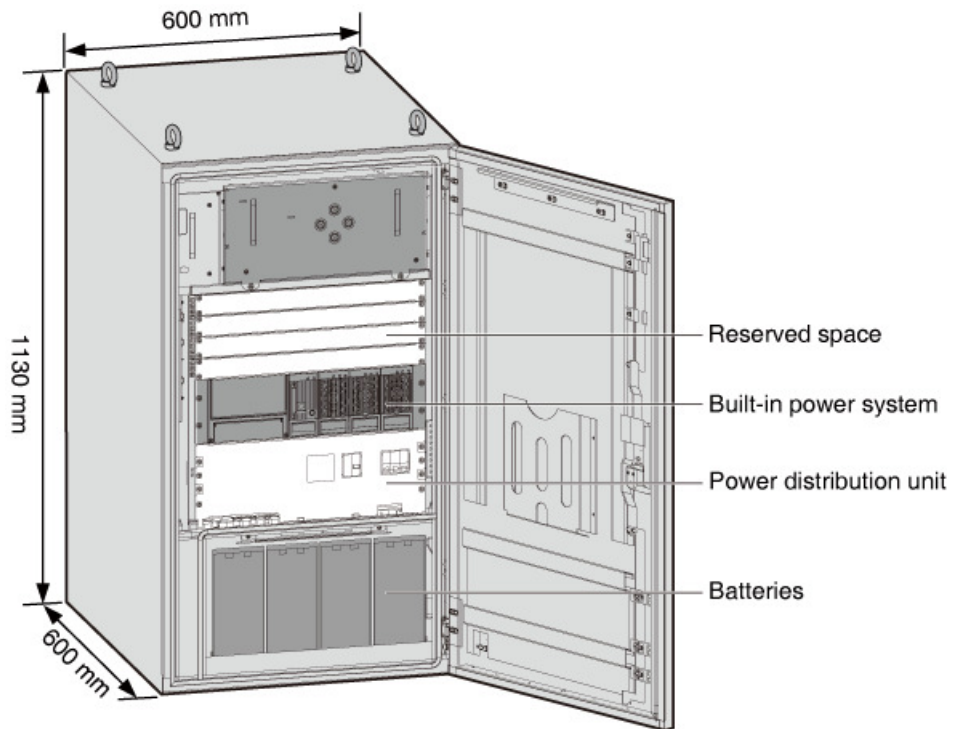


Table 2-8 Technical specifications of the APM

Item		APM30 Specification	APM100 Specification
Engineering specifications	Dimensions (width x height x depth) (with the base excluded)	600 mm x 700 mm x 480 mm	600 mm x 1130 mm x 600 mm
	Weight (with batteries and user equipment excluded)	< 65 kg	≤ 88 kg
	Working temperature	-40°C to +45°C (with 1120 W/m ² solar radiation) -40°C to +50°C (without solar radiation) When the ambient temperature is lower than -20°C, an AC heater is required.	Northern type: -40°C to +45°C Southern type: -5°C to +45°C
AC input	Input voltage	<ul style="list-style-type: none"> Rated voltage: 200 V AC to 240 V AC Permissible voltage range: 176 V AC to 290 V AC Rated voltage: 100/200 V AC to 120/240 V AC Permissible voltage range: 90/180 V AC to 135/270 Rated voltage: 120/208 V AC to 127/220 V AC Permissible voltage range: 105/176 V AC to 150/260 V AC 	
	Frequency of the rated voltage	50/60 Hz	
	Frequency of input voltage	45 Hz to 65 Hz	40 Hz to 65 Hz
DC output	Output voltage range	-58 V DC to -44 V DC	
	DC outputs	Working with the distributed NodeB: LLVD: 20 A x 6 BLVD: 12 A x 2; 4 A x 2 Maximum outputs (reserved): 4 A x 2 Working with the separated NodeB: LLVD: 30 A x 4 BLVD: 12 A x 2; 4 A x 4 Maximum outputs (reserved): 4 A x 4	16 A x 4: 4 outputs 32 A x 2: 2 outputs
Space for user equipment	-48 V 24 Ah built-in batteries	5 U	-
	No built-in batteries	7 U	-

Item		APM30 Specification	APM100 Specification
	48 V 100 Ah built-in batteries	–	–

2.5.2 Indoor Macro Cabinet

The indoor macro cabinet houses the BBU3900 and the WRFU. In addition, the indoor macro cabinet provides functions such as power distribution and surge protection. The indoor macro cabinet takes a small footprint and is easy to install. In addition, two cabinets can be installed in stack mode. All these features cater to the requirements of indoor centralized installation and fast network construction. An indoor macro cabinet accommodates up to six WRFUs. The indoor macro cabinet supports all the network systems (UMTS, GSM, and LTE) of the BTS3900, thus saving installation space and facilitating smooth evolution.

The indoor macro cabinet supports -48 V DC , $+24\text{ V DC}$, and 220 V AC power inputs. If configured with suitable power modules, the $+24\text{ V DC}$ or 220 V AC power is converted into -48 V DC power for the WRFU and BBU.

 **NOTE**

When two cabinets are installed in stack mode, the upper cabinet should be a -48 V DC cabinet, and the lower cabinet can be either a $+24\text{ V DC}$ cabinet or a 220 V AC cabinet, depending on power configuration.

The cabinet structure varies with the power input. Figure 2-6 shows the single indoor cabinet with -48 V DC power. Figure 2-7 shows the single indoor cabinet with $+24\text{ V DC}$ power. Figure 2-8 shows the single indoor cabinet with 220 V AC power. Figure 2-9 shows two cabinets in stack mode.

Figure 2-6 Single indoor cabinet (-48 V)

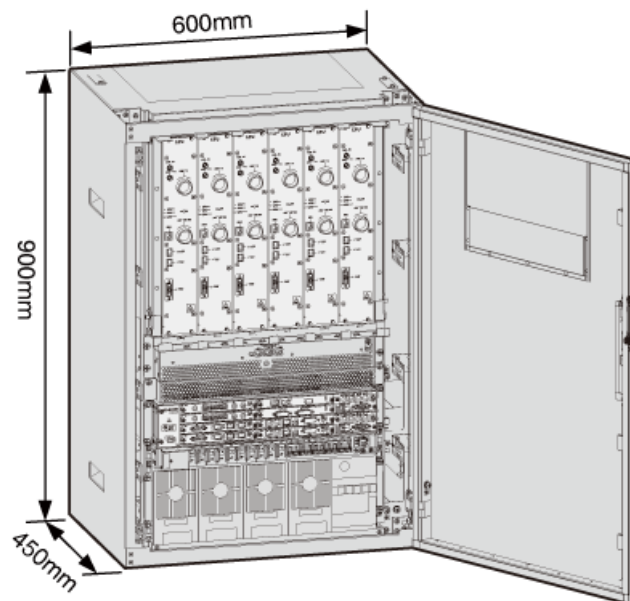


Figure 2-7 Single indoor cabinet (+24 V)

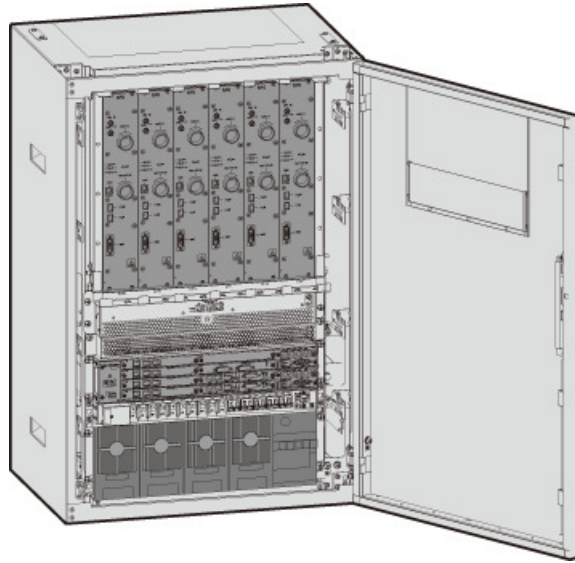


Figure 2-8 Single indoor cabinet (220 V)

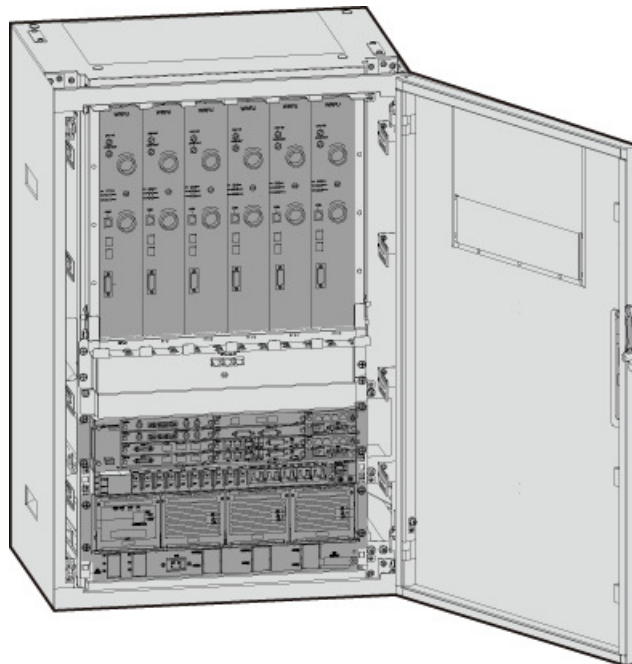
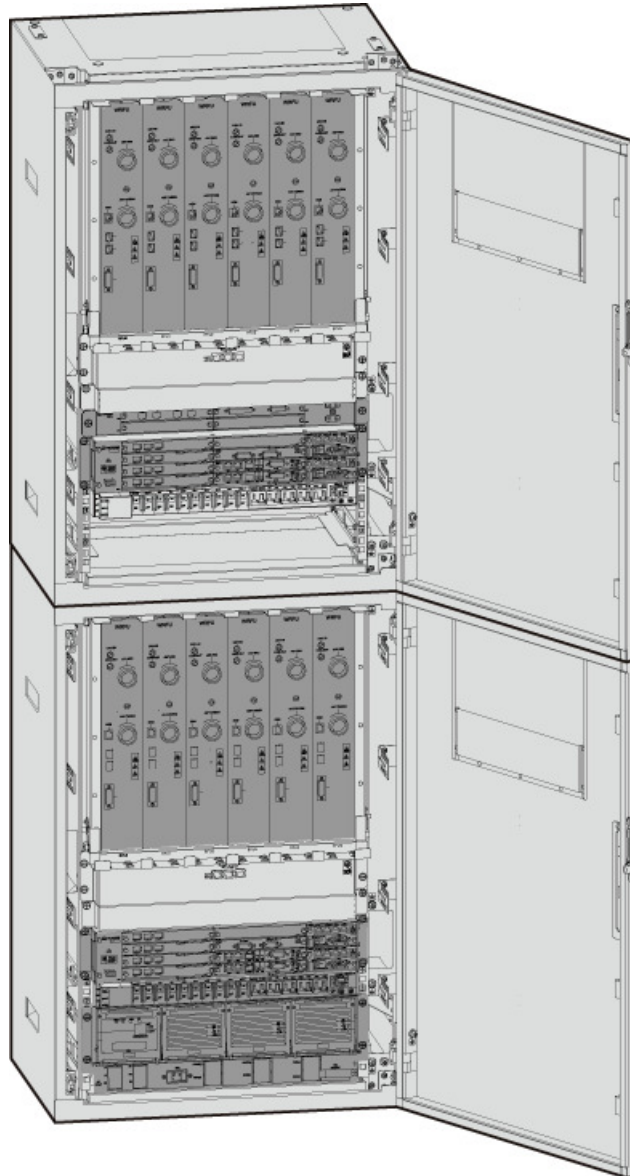


Figure 2-9 Two indoor cabinets in stack mode

2.5.3 Outdoor RF Cabinet

The outdoor RF cabinet, together with the APM30 cabinet in stack mode, performs functions such as power distribution, surge protection, and for the WRFU and the BBU3900. The outdoor RF cabinet works in direct-ventilation mode to dissipate heat. When the RF cabinet is configured with three WRFUs, 50 Ah or 100 Ah batteries can be installed in the spare space, as shown in Figure 2-10. When the RF cabinet is configured with six WRFUs, there is no space for the batteries, as shown in Figure 2-11.

Figure 2-10 Outdoor RF cabinet with three WRFUs

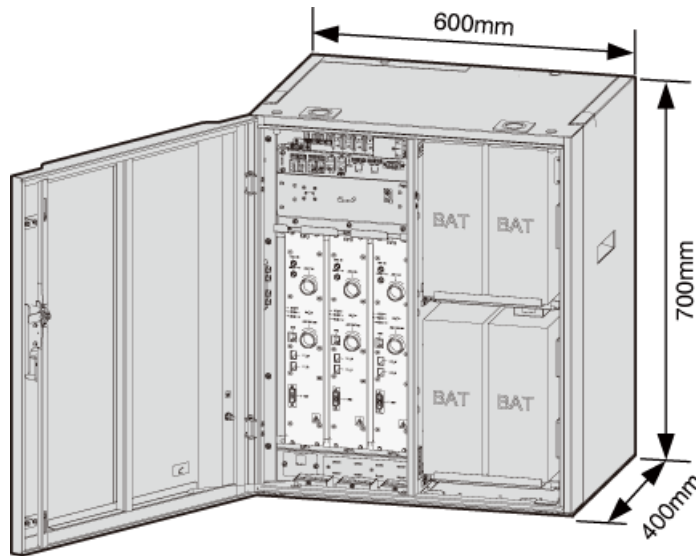
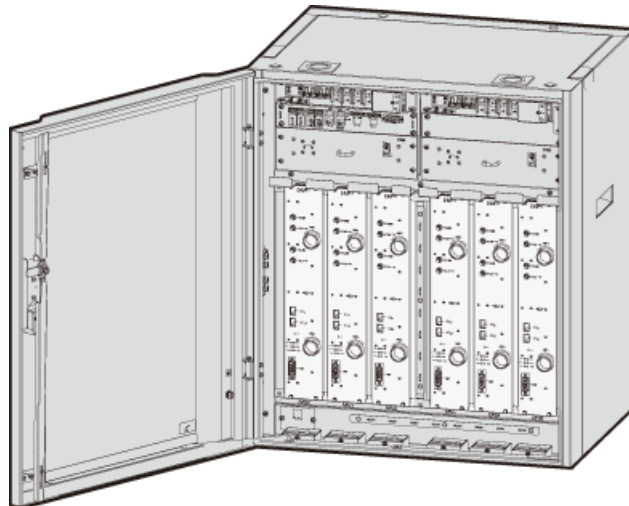


Figure 2-11 Outdoor RF cabinet with six WRFUs



2.5.4 Outdoor Mini Cabinet

The outdoor mini cabinet performs functions such as power distribution and surge protection for the BBU3900. The BBU3900 can be installed in an outdoor mini cabinet to work as an outdoor BBU, thus achieving the outdoor application of the compact mini NodeB.

The outdoor mini cabinet has a built-in heat exchanger. If the AC power is used, the cabinet must be configured with an EPS30-4815A and an SPD (AC); if the DC power is used, the cabinet must be configured with a DC power distribution box, as shown in Figure 2-12.

Figure 2-12 Internal structure of the outdoor mini cabinet

