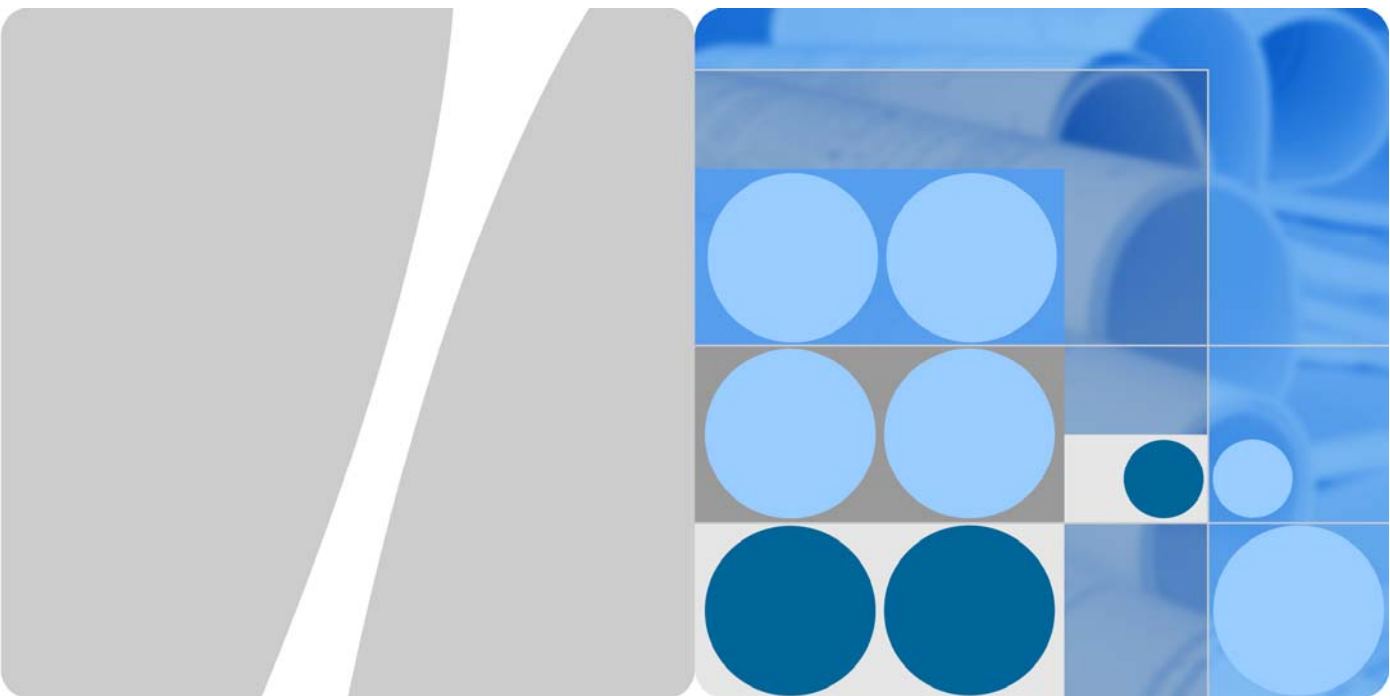




R230D&R240D

Product Description

Issue **02**
Date **2015-10-31**

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About This Document

Intended Audience

This document describes the positioning, characteristics, hardware structure, product features, and technical specifications of the RRU.

This document helps you understand the characteristics and features of the RRU.

This document is intended for:

- Network planning engineers
- Hardware installation engineers
- Commissioning engineer
- Data configuration engineers
- On-site maintenance engineers
- Network monitoring engineers
- System maintenance engineers

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

Symbol	Description
	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.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in previous issues.

Changes in Issue 02 (2015-10-31)

This version has the following updates:

Added the R230D.

Changes in Issue 01 (2015-08-31)

This is the initial commercial release.

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1 Product Positioning and Characteristics

1.1 Product Positioning

Product Overview

The R230D and R240D are remote radio units (RRUs) used in Huawei agile distributed Wi-Fi solution. They support PoE power supply, and are deployed indoors and connected to the central AP. The central AP and RRUs are connected through network cables, which greatly extends the coverage range, enhances flexibility in AP deployment and planning, and reduces the engineering construction costs. The central AP manages the RRUs and processes services in a centralized manner. The RRUs process radio signals independently. Such distributed architecture further improves the wireless access capability, creating optimal service experience for users.

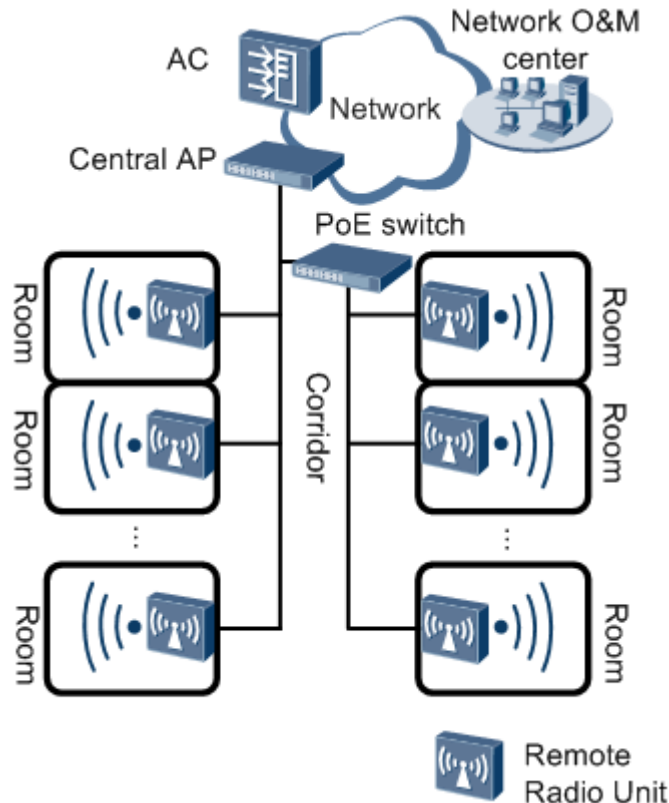
The RRU uses an 86 mm plate in compliance with international standards and can be easily installed into a junction box in a room. It is equipped with a built-in antenna and a hidden indicator; therefore, installation of the RRU does not affect indoor decorations and designs. It also has an IEEE 802.11a/b/g/n/ac wireless module and can work on both 5 GHz and 2.4 GHz frequency bands.

The RRU is recommended for environments with complex wall structures and high-density rooms, such as schools, hotels, hospitals, and office meeting rooms. Signals are transmitted through network cables without attenuation. The RRUs are deployed indoors and provide comprehensive signal coverage.

The RRUs are managed by the central AP. The central AP and RRUs are plug-and-play and can be managed and maintained in real time. Compared with traditional distributed AP solutions, the AC in Huawei agile distributed Wi-Fi solution needs to manage a smaller number of APs. A large number of RRUs can be deployed, which improves the overall performance and reduces network deployment costs.

Usage Scenario

Figure 1-1 Distributed wireless access



As shown in the figure, the downlink GE interfaces of the central AP support PoE power supply and can be directly connected to RRUs. The central AP can connect to more RRUs through a PoE switch. RRUs are deployed indoors and communicate with the central AP through network cables.

1.2 Product Characteristics

Long-Distance Network Coverage

Unlike the traditional distributed AP which allows for a maximum feeder length of 15 m, the central AP uses network cables to replace feeder cables and supports up to 100 m distance from the RRUs. The network coverage range is therefore expanded by several times.

No Wall Penetration Loss, No Coverage Hole

Restricted by feeder length or installation requirements, signals have to pass through walls in some scenarios, resulting in large signal attenuation. If rooms to be covered have complex structures, coverage holes may occur. To prevent these problems, lots of calculation and verification work needs to be carried out. Huawei distributed solution solves these problems. In this solution, RRUs are placed in rooms, and signals are transmitted over wired cables, without wall penetration loss, delivering high-quality wireless access services.

802.11ac Gigabit Wireless Rate

The RRU complies with IEEE 802.11a/b/g/n/ac, supports 2x2 MIMO, works on both 2.4 and 5 GHz frequency bands, and provides strong signals and gigabit wireless rate.

Unique, Graceful Plate Design

The RRU is white in appearance and has heat emission holes and interfaces at the side and bottom. The mounting screws are hidden under the slide panel. The overall design is simple but graceful and blends well with the layout of hotels and apartments.

Easy to Install in a Standard 86-type Box

The RRU uses an 86 mm plate in compliance with international standards and can be easily installed into a junction box in a room, requiring no drilling or cabling.

Flexible Installation Modes

The R230D can be embedded into an 86-type box or mounted to a ceiling or wall. Its installation positions can be flexibly planned.

Hidden Indicator, Zero Impact on Sleep

The RRU uses a hidden indicator design. When being turned on, the indicator has soft light. The AC controls the switch of the indicator and turns off the indicator at nights to prevent blinking lights from affecting sleep of guests.

Four Downlink Ethernet Interfaces, Supporting Wired Access from Multiple Users

The R240D has four downlink 100M Ethernet interfaces that can process data concurrently. The interfaces can be connected to multiple terminals through network cables, such as the IPTV, desktop computer, and laptop, meeting requirements of hotels and apartments.

Low Engineering Cost

Compared with traditional distributed APs, the central AP cuts down the following expenses:

- Construction: Network cables replace expensive feeder cables. The central AP can directly use the network cables originally routed in the rooms, without the need of deploying new cables.
- License: The maximum number of central APs in Fit AP mode allowed by the AC is controlled by licenses, but RRUs do not require licenses. Therefore, one central AP can use RRUs to cover dozens of rooms.

Hierarchical Processing Technology, High Wireless Forwarding Capability

Huawei distributed solution uses innovative hierarchical processing technology. The central AP manages RRUs in a centralized manner and concurrently forwards service traffic, while the RRUs only process radio signals. The hierarchical design makes the network structure clearer and reduces the processing burden on the central AP and RRUs, improving efficiency and optimizing the overall wireless forwarding performance.

2 Hardware Structure

2.1 R230D

Appearance

Figure 2-1 shows the appearance of the R230D.



NOTE

The actual device appearance may be different from the following device appearance; these differences will not affect device functions.

Figure 2-1 R230D appearance



Port

The following figure shows ports on the R230D.

Figure 2-2 R230D ports



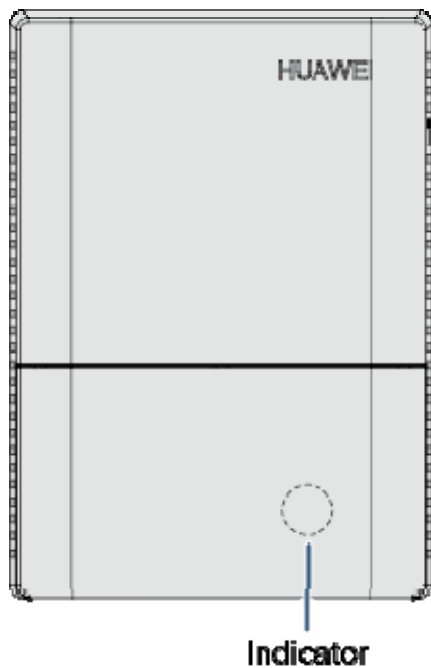
As shown in Figure 2-2, each port can be described as follows:

1. ETH/PoE: 10/100M port used to connect to the wired Ethernet. The port can connect to a PoE power supply to provide power for the RRU.
2. Default: Reset button used to restore factory settings if you hold down the button more than 3 seconds.

LED Indicator

The R230D provides only one indicator, as shown in Figure 2-3.

Figure 2-3 Indicator on the R230D



 NOTE

- The indicator is located inside the panel, which turns on after the AP is powered on.
- Indicator colors may vary slightly at different temperature.

Table 2-1 Description of the indicator on the R230D

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP.

Type	Color	Status	Description
		Blinking once every 5s (0.2 Hz)	The system is running properly, the Ethernet connection is normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once Alarm Green every 0.25s (4 Hz)	- The software is being upgraded. - After the software is uploaded and started, the AP working in Fit AP mode requests to go online on the AC and maintains this state until it goes online successfully on the AC (before the CAPWAP link is established). - The AP registration fails (the CAPWAP link is disconnected).
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

2.2 R240D

Appearance

Figure 2-4 shows the appearance of the device.



NOTE

The actual device appearance may be different from the following device appearance; these differences will not affect device functions.

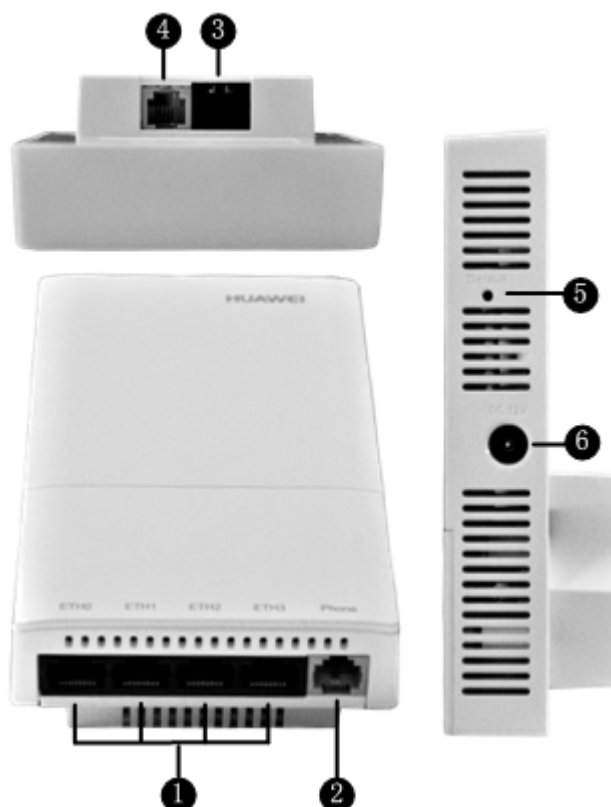
Figure 2-4 Appearance



Port

Figure 2-5 shows ports on the device.

Figure 2-5 Ports



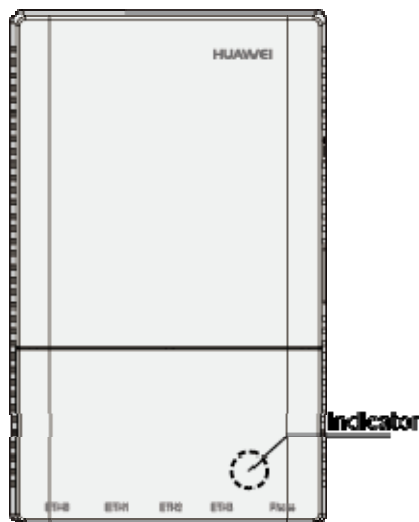
Each port can be described as follows:

1. ETH0~3: 10/100M port used to connect to the wired Ethernet.
2. Phone: Phone interface: connects to a POTS phone or modem device.
3. GE/PoE: 10/100/1000M port used to connect to the wired Ethernet. The port can connect to a PoE power supply to provide power for the device.
4. Phone: Phone interface: connects to a traditional PSTN.
5. Default: Reset button used to restore factory settings if you hold down the button more than 3 seconds.
6. Power input interface: 12 V DC.

LED Indicator

R240D provides only one indicator, as shown in Figure 2-6.

Figure 2-6 Indicator on the R240D



NOTE

- The indicator is located inside the panel, which turns on after the AP is powered on.
- Indicator colors may vary slightly at different temperature.

Table 2-2 Description of the indicator on the R240D

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP.
		Blinking once every 5s (0.2 Hz)	The system is running properly, the Ethernet connection is

Type	Color	Status	Description
			normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once Alarm Green every 0.25s (4 Hz)	- The software is being upgraded. - After the software is uploaded and started, the AP working in Fit AP mode requests to go online on the AC and maintains this state until it goes online successfully on the AC (before the CAPWAP link is established). - The AP registration fails (the CAPWAP link is disconnected).
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

3 Product Features

3.1 WLAN Features

WLAN features supported by the AP are as follows:

- Comply with IEEE 802.11a/b/g/n/ac
- The maximum rate of 1.16Gbit/s
- Maximum ratio combining (MRC)
- Space time block code (STBC)
- Beamforming
- Low-density parity-check (LDPC)
- Maximum-likelihood detection (MLD)
- Frame aggregation, including A-MPDU (Tx/Rx) and A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)
- Short GI in 20 MHz, 40 MHz and 80 MHz modes
- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- Automatic and manual rate adjustment
- WLAN channel management and channel rate adjustment



NOTE

For details about WLAN channel management, see the *Country Code & Channel Compliance Table*.

- Automatic channel scanning and interference avoidance
- Service set identifier (SSID) hiding
- Signal sustain technology (SST)
- Unscheduled automatic power save delivery (U-APSD)
- Control and Provisioning of Wireless Access Points (CAPWAP)
- Automatic login
- Extended Service Set (ESS)
- Multi-user CAC

3.2 Network Features

Network features supported by the AP are as follows:

- Compliance with IEEE 802.3u
- Auto-negotiation of the rate and duplex mode and automatic switchover between the Media Dependent Interface (MDI) and Media Dependent Interface Crossover (MDI-X)
- Compliance with IEEE 802.1q
- SSID-based VLAN assignment
- VLAN trunk on uplink Ethernet ports
- AP control channel in tagged and untagged mode
- DHCP client, obtaining IP addresses through DHCP
- Tunnel data forwarding and direct data forwarding
- STA isolation in the same VLAN
- Access control lists (ACLs)
- Link Layer Discovery Protocol (LLDP)
- Uninterrupted service forwarding upon CAPWAP channel disconnection
- Unified authentication on the AC
- AC dual-link backup
- IPv6

3.3 QoS Features

QoS features supported by the AP are as follows:

- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- WMM parameter management for each radio
- WMM power saving
- Priority mapping for upstream packets and flow-based mapping for downstream packets
- Queue mapping and scheduling
- User-based bandwidth limiting
- Adaptive bandwidth management (the system dynamically adjusts bandwidth based on the number of users and radio environment to improve user experience)
- Airtime scheduling

3.4 Security Features

Security features supported by the AP are as follows:

- Open system authentication
- WEP authentication/encryption using a 64-bit, 128-bit, or 152-bit encryption key
- WPA/WPA2-PSK authentication and encryption (WPA/WPA2 personal edition)
- WPA/WPA2-802.1x authentication and encryption (WPA/WPA2 enterprise edition)

- WPA-WPA2 hybrid authentication
- WAPI authentication and encryption
- Supports wireless intrusion detection system (WIDS) and wireless intrusion prevention system (WIPS), including rogue device detection and countermeasure, attack detection and dynamic blacklist, STA/AP blacklist and whitelist.
- 802.1x authentication, MAC address authentication, and Portal authentication
- DHCP Snooping
- DAI (Dynamic ARP Inspection)
- IPSG (IP Source Guard)

3.5 Maintenance Features

Maintenance features supported by the AP are as follows:

- Unified management and maintenance on the AC
- Automatic login and configuration loading, and plug-and-play (PnP)
- Batch upgrade
- Telnet
- STelnet using SSH v2
- Real-time configuration monitoring and fast fault location using the NMS
- System status alarm

3.6 BYOD

BYOD features supported by the AP are as follows:

- Identifies the device type according to the organizationally unique identifier (OUI) in the MAC address.
- Identifies the device type according to the user agent (UA) information in an HTTP packet.
- Identifies the device type according to DHCP options.
- The RADIUS server delivers packet forwarding, security, and QoS policies according to the device type carried in the RADIUS authentication and accounting packets.

3.7 Spectrum Analysis

Spectrum analysis features supported by the AP are as follows:

- Identifies interference sources such as baby monitors, Bluetooth devices, digital cordless phones (at 2.4 GHz frequency band only), wireless audio transmitters (at both the 2.4 GHz and 5 GHz frequency bands), wireless game controllers, and microwaves.
- Works with eSight to locate and perform spectrum analysis on interference sources.

4 Technical Specifications

4.1 Basic Specifications

Table 4-1 Basic specifications of the R230D

Item		Description
Technical specifications	Dimensions (H x W x D)	26 mm x 120 mm x 86 mm
	Weight	0.1 kg
	System memory	128 MB DDR2 32 MB flash memory
Power parameters	Power input	PoE power supply in compliance with IEEE 802.3af
	Maximum power consumption	5.1 W NOTE The actual maximum power consumption depends on local laws and regulations.
Environment specifications	Operating temperature and altitude	-60 m to 1800 m: 0°C to 40°C 1,800 m to 5,000 m: The highest operating temperature reduces by 1°C every time the altitude increases by 300 m.
	Storage temperature	-40°C to +70°C
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP20
	Atmospheric pressure	70 kPa to 106 kPa

Table 4-2 Basic specifications of the R240D

Item		Description
Technical specifications	Dimensions outside the wall (L × W × H)	140mm×86mm×25mm
	Dimensions inside the wall (L × W × H)	51.5mm×63.5mm×16.5mm
	Weight	0.2 kg
	System memory	128 MB DDR2 32 MB Flash
Power specifications	Power input	12 V±10% - PoE power: in compliance with IEEE 802.3af/at
	Maximum power consumption	8.7 W NOTE The actual maximum power consumption depends on local laws and regulations.
Environment specifications	Operating temperature and altitude	-60 m to +1800 m: 0°C to +40°C 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Storage temperature	-40°C to +70°C
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP20
	Atmospheric pressure	70 kPa to 106 kPa

4.2 Radio Specifications (R230D)

Table 4-3 Radio specifications

Item	Description
Antenna type	Built-in antenna
Antenna gain	2.4 GHz: 3 dBi 5 GHz: 4 dBi

Item	Description			
Maximum number of concurrent users	≤256			
Maximum number of VAPs for each radio	8			
Maximum transmit power	2.4 GHz: 20 dBm (combined power) 5 GHz: 18 dBm (combined power) NOTE The actual transmit power depends on local laws and regulations. You can adjust the transmit power from the maximum transmit power to 1 dBm, with a step of 1 dB.			
Maximum number of non-overlapping channels	2.4 GHz 802.11b/g 20 MHz: 3 802.11n 20 MHz: 3 40 MHz: 1	5 GHz 802.11a 20 MHz: 13 802.11n 20 MHz: 13 40 MHz: 6 802.11ac 20 MHz: 13 40 MHz: 6 80 MHz: 3	NOTE The table uses the number of non-overlapping channels supported by China as an example. The number of non-overlapping channels varies in different countries. For details, see the <i>Country Codes & Channels Compliance</i>	
Channel rate	802.11b: 1, 2, 5.5, and 11 Mbit/s 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s 802.11n: 6.5 to 300 Mbit/s 802.11ac: 6.5 to 867 Mbit/s			
Receiver sensitivity (Typical values)	2.4 GHz 802.11b (CCK) -102 dBm @ 1 Mb/s -97 dBm @ 2 Mb/s -94 dBm @ 5.5 Mb/s -91 dBm @	2.4 GHz 802.11g (non-HT20) -94 dBm @ 6 Mb/s -94 dBm @ 9 Mb/s -94 dBm @ 12 Mb/s	2.4 GHz 802.11n (HT20) -94 dBm @ MCS0 -94 dBm @ MCS1 -92 dBm @ MCS2 -88 dBm @	2.4 GHz 802.11n(HT40) -91 dBm @ MCS0 -91 dBm @ MCS1 -89 dBm @ MCS2 -85 dBm @

Item	Description			
	11 Mb/s	• -92 dBm @ 18 Mb/s • -89 dBm @ 24 Mb/s • -86 dBm @ 36 Mb/s • -82 dBm @ 48 Mb/s • -81 dBm @ 54 Mb/s	MCS3 • -85 dBm @ MCS4 • -81 dBm @ MCS5 • -79 dBm @ MCS6 • -77 dBm @ MCS7 • -92 dBm @ MCS8 • -92 dBm @ MCS9 • -90 dBm @ MCS10 • -86 dBm @ MCS11 • -83 dBm @ MCS12 • -79 dBm @ MCS13 • -77 dBm @ MCS14 • -75 dBm @ MCS15	MCS3 • -82 dBm @ MCS4 • -78 dBm @ MCS5 • -76 dBm @ MCS6 • -75 dBm @ MCS7 • -89 dBm @ MCS8 • -89 dBm @ MCS9 • -87 dBm @ MCS10 • -83 dBm @ MCS11 • -80 dBm @ MCS12 • -76 dBm @ MCS13 • -74 dBm @ MCS14 • -73 dBm @ MCS15
	5 GHz 802.11a (non-HT20) • -96 dBm @ 6 Mb/s • -95 dBm @ 9 Mb/s • -94 dBm @ 12 Mb/s • -92 dBm @ 18 Mb/s • -88 dBm @ 24 Mb/s • -85 dBm @ 36 Mb/s • -80 dBm @ 48 Mb/s • -79 dBm @ 54 Mb/s	5 GHz 802.11n (HT20) • -96 dBm @ MCS0 • -94 dBm @ MCS1 • -92 dBm @ MCS2 • -87 dBm @ MCS3 • -84 dBm @ MCS4 • -79 dBm @ MCS5 • -78 dBm @ MCS6 • -76 dBm @ MCS7 • -94 dBm @ MCS8	5 GHz 802.11n (HT40) • -93 dBm @ MCS0 • -91 dBm @ MCS1 • -89 dBm @ MCS2 • -84 dBm @ MCS3 • -81 dBm @ MCS4 • -77 dBm @ MCS5 • -76 dBm @ MCS6 • -74 dBm @ MCS7 • -91 dBm @ MCS8	-

Item	Description			
		• -92 dBm @ MCS9 • -90 dBm @ MCS10 • -85 dBm @ MCS11 • -82 dBm @ MCS12 • -77 dBm @ MCS13 • -76 dBm @ MCS14 • -74 dBm @ MCS15	• -89 dBm @ MCS9 • -87 dBm @ MCS10 • -82 dBm @ MCS11 • -79 dBm @ MCS12 • -75 dBm @ MCS13 • -74 dBm @ MCS14 • -72 dBm @ MCS15	
	5 GHz 802.11ac (VTH20) • -96 dBm @ MCS0NSS1 • -94 dBm @ MCS1NSS1 • -92 dBm @ MCS2NSS1 • -87 dBm @ MCS3NSS1 • -84 dBm @ MCS4NSS1 • -79 dBm @ MCS5NSS1 • -78 dBm @ MCS6NSS1 • -76 dBm @ MCS7NSS1 • -72 dBm @ MCS8NSS1 • -94 dBm @ MCS0NSS2 • -92 dBm @ MCS1NSS2 • -90 dBm @ MCS2NSS2 • -85 dBm @ MCS3NSS2 • -82 dBm @ MCS4NSS2	5 GHz 802.11ac (VTH40) • -93 dBm @ MCS0NSS1 • -91 dBm @ MCS1NSS1 • -89 dBm @ MCS2NSS1 • -84 dBm @ MCS3NSS1 • -81 dBm @ MCS4NSS1 • -77 dBm @ MCS5NSS1 • -75 dBm @ MCS6NSS1 • -74 dBm @ MCS7NSS1 • -69 dBm @ MCS8NSS1 • -67 dBm @ MCS9NSS1 • -91 dBm @ MCS0NSS2 • -89 dBm @ MCS1NSS2 • -87 dBm @ MCS2NSS2 • -82 dBm @ MCS3NSS2	5 GHz 802.11ac (VTH80) • -90 dBm @ MCS0NSS1 • -88 dBm @ MCS1NSS1 • -85 dBm @ MCS2NSS1 • -81 dBm @ MCS3NSS1 • -78 dBm @ MCS4NSS1 • -74 dBm @ MCS5NSS1 • -72 dBm @ MCS6NSS1 • -70 dBm @ MCS7NSS1 • -66 dBm @ MCS8NSS1 • -63 dBm @ MCS9NSS1 • -88 dBm @ MCS0NSS2 • -86 dBm @ MCS1NSS2 • -83 dBm @ MCS2NSS2 • -79 dBm @ MCS3NSS2	-

Item	Description			
	• -77 dBm @ MCS5NSS2 • -76 dBm @ MCS6NSS2 • -74 dBm @ MCS7NSS2 • -70 dBm @ MCS8NSS2	• -79 dBm @ MCS4NSS2 • -75 dBm @ MCS5NSS2 • -73 dBm @ MCS6NSS2 • -72 dBm @ MCS7NSS2 • -67 dBm @ MCS8NSS2 • -65 dBm @ MCS9NSS2	• -76 dBm @ MCS4NSS2 • -72 dBm @ MCS5NSS2 • -70 dBm @ MCS6NSS2 • -68 dBm @ MCS7NSS2 • -64 dBm @ MCS8NSS2 • -61 dBm @ MCS9NSS2	

4.3 Radio Specifications (R240D)

Table 4-4 Radio specifications

Item	Description		
Antenna type	Built-in antenna		
Antenna gain	• 2.4 GHz: 2 dBi (peak 3.7dBi) • 5 GHz: 3 dBi (peak 5.5dBi)		
Maximum number of concurrent users	≤256		
Maximum number of VAPs for each radio	8		
Maximum transmit power	• 2.4 GHz: 21 dBm (combined power) • 5 GHz: 20 dBm (combined power) NOTE The actual transmit power depends on local laws and regulations. The R240D uses a 86-type box and applies only to countries and regions that support 86-type boxes. You can adjust the transmit power from the maximum transmit power to 1 dBm, with a step of 1 dB.		
Maximum number of non-overlapping	2.4 GHz 802.11b/g • 20 MHz: 3	5 GHz • 802.11a – 20 MHz: 13	NOTE The table uses the number of non-overlapping channels supported by China as an example. The number of non-overlapping channels varies in

Item	Description			
channels	802.11n 20 MHz: 3 40 MHz: 1	802.11n 20 MHz: 13 40 MHz: 6 802.11ac 20 MHz: 13 40 MHz: 6 80 MHz: 3	different countries. For details, see the <i>Country Codes & Channels Compliance</i>	
Channel rate	802.11b: 1, 2, 5.5, and 11 Mbit/s 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s 802.11n: 6.5 to 300 Mbit/s 802.11ac: 6.5 to 867 Mbit/s			
Receiver sensitivity (Typical values)	2.4 GHz 802.11b (CCK) -101 dBm @ 1 Mbit/s -96 dBm @ 2 Mbit/s -94 dBm @ 5.5 Mbit/s -90 dBm @ 11 Mbit/s	2.4 GHz 802.11g (non-HT20) -95 dBm @ 6 Mbit/s -95 dBm @ 9 Mbit/s -94 dBm @ 12 Mbit/s -92 dBm @ 18 Mbit/s -88 dBm @ 24 Mbit/s -85 dBm @ 36 Mbit/s -81 dBm @ 48 Mbit/s -79 dBm @ 54 Mbit/s	2.4 GHz 802.11n (HT20) -95 dBm @ MCS0 -94 dBm @ MCS1 -92 dBm @ MCS2 -87 dBm @ MCS3 -84 dBm @ MCS4 -79 dBm @ MCS5 -78 dBm @ MCS6 -77 dBm @ MCS7 -93 dBm @ MCS8 -92 dBm @ MCS9 -90 dBm @ MCS10 -85 dBm @ MCS11 -82 dBm @ MCS12	2.4 GHz 802.11n(HT40) -93 dBm @ MCS0 -91 dBm @ MCS1 -89 dBm @ MCS2 -84 dBm @ MCS3 -81 dBm @ MCS4 -77 dBm @ MCS5 -75 dBm @ MCS6 -74 dBm @ MCS7 -91 dBm @ MCS8 -89 dBm @ MCS9 -87 dBm @ MCS10 -82 dBm @ MCS11 -79 dBm @ MCS12

Item	Description			
			• -77 dBm @ MCS13 • -76 dBm @ MCS14 • -75 dBm @ MCS15	• -75 dBm @ MCS13 • -73 dBm @ MCS14 • -72 dBm @ MCS15
	5 GHz 802.11a (non-HT20) • -94 dBm @ 6 Mbit/s • -94 dBm @ 9 Mbit/s • -93 dBm @ 12 Mbit/s • -91 dBm @ 18 Mbit/s • -87 dBm @ 24 Mbit/s • -84 dBm @ 36 Mbit/s • -79 dBm @ 48 Mbit/s • -78 dBm @ 54 Mbit/s	5 GHz 802.11n (HT20) • -94 dBm @ MCS0 • -93 dBm @ MCS1 • -90 dBm @ MCS2 • -86 dBm @ MCS3 • -83 dBm @ MCS4 • -78 dBm @ MCS5 • -77 dBm @ MCS6 • -76 dBm @ MCS7 • -92 dBm @ MCS8 • -91 dBm @ MCS9 • -88 dBm @ MCS10 • -84 dBm @ MCS11 • -81 dBm @ MCS12 • -76 dBm @ MCS13 • -75 dBm @ MCS14 • -74 dBm @ MCS15	5 GHz 802.11n (HT40) • -91 dBm @ MCS0 • -90 dBm @ MCS1 • -87 dBm @ MCS2 • -83 dBm @ MCS3 • -80 dBm @ MCS4 • -76 dBm @ MCS5 • -74 dBm @ MCS6 • -73 dBm @ MCS7 • -89 dBm @ MCS8 • -88 dBm @ MCS9 • -85 dBm @ MCS10 • -81 dBm @ MCS11 • -78 dBm @ MCS12 • -74 dBm @ MCS13 • -72 dBm @ MCS14 • -71 dBm @ MCS15	-
	5 GHz 802.11ac (VTH20) • -95 dBm @ MCS0NSS1	5 GHz 802.11ac (VTH40) • -91 dBm @ MCS0NSS1	5 GHz 802.11ac (VTH80) • -88 dBm @ MCS0NSS1	-

Item	Description			
	• -93 dBm @ MCS1NSS1 • -90 dBm @ MCS2NSS1 • -86 dBm @ MCS3NSS1 • -83 dBm @ MCS4NSS1 • -78 dBm @ MCS5NSS1 • -77 dBm @ MCS6NSS1 • -75 dBm @ MCS7NSS1 • -71 dBm @ MCS8NSS1 • -93 dBm @ MCS0NSS2 • -91 dBm @ MCS1NSS2 • -88 dBm @ MCS2NSS2 • -84 dBm @ MCS3NSS2 • -81 dBm @ MCS4NSS2 • -76 dBm @ MCS5NSS2 • -75 dBm @ MCS6NSS2 • -73 dBm @ MCS7NSS2 • -69 dBm @ MCS8NSS2	• -90 dBm @ MCS1NSS1 • -88 dBm @ MCS2NSS1 • -83 dBm @ MCS3NSS1 • -80 dBm @ MCS4NSS1 • -76 dBm @ MCS5NSS1 • -74 dBm @ MCS6NSS1 • -72 dBm @ MCS7NSS1 • -68 dBm @ MCS8NSS1 • -66 dBm @ MCS9NSS1 • -89 dBm @ MCS0NSS2 • -88 dBm @ MCS1NSS2 • -86 dBm @ MCS2NSS2 • -81 dBm @ MCS3NSS2 • -78 dBm @ MCS4NSS2 • -74 dBm @ MCS5NSS2 • -72 dBm @ MCS6NSS2 • -70 dBm @ MCS7NSS2 • -65 dBm @ MCS8NSS2 • -63 dBm @ MCS9NSS2	• -87 dBm @ MCS1NSS1 • -84 dBm @ MCS2NSS1 • -80 dBm @ MCS3NSS1 • -77 dBm @ MCS4NSS1 • -73 dBm @ MCS5NSS1 • -71 dBm @ MCS6NSS1 • -69 dBm @ MCS7NSS1 • -65 dBm @ MCS8NSS1 • -63 dBm @ MCS9NSS1 • -86 dBm @ MCS0NSS2 • -85 dBm @ MCS1NSS2 • -82 dBm @ MCS2NSS2 • -78 dBm @ MCS3NSS2 • -75 dBm @ MCS4NSS2 • -71 dBm @ MCS5NSS2 • -69 dBm @ MCS6NSS2 • -67 dBm @ MCS7NSS2 • -62 dBm @ MCS8NSS2 • -60 dBm @ MCS9NSS2	

4.4 Standards Compliance

Safety standards

- UL 60950–1
- IEC 60950–1
- EN 60950–1
- GB 4943

Radio standards

- ETSI EN 300 328
- ETSI EN 301 893
- RSS-210
- AS/NZS 4268

EMC standards

- EN 301 489–1
- EN 301 489–17
- ETSI EN 60601-1-2
- ICES-003
- YD/T 1312.2-2004
- ITU k.21
- GB 9254
- GB 17625.1
- EN 55022
- EN 55024
- CISPR 22
- CISPR 24
- IEC61000-4-6
- IEC61000-4-2

IEEE standards

- IEEE 802.11a/b/g
- IEEE 802.11n
- IEEE 802.11ac
- IEEE 802.11h
- IEEE 802.11d
- IEEE 802.11e

Security standards

- 802.11i, Wi-Fi Protected Access 2 (WPA2), and WPA
- 802.1X

- Advanced Encryption Standards (AES) and Temporal Key Integrity Protocol (TKIP)
- EAP Type (s)

Environment standards

- ETSI 300 019-2-1
- ETSI 300 019-2-2
- ETSI 300 019-2-3
- ETSI 300 019-1-1
- ETSI 300 019-1-2
- ETSI 300 019-1-3

EMF

- CENELEC EN 62311
- CENELEC EN 50385
- RSS-102

RoHS

- Directive 2002/95/EC & 2011/65/EU

Reach

- Regulation 1907/2006/EC

WEEE

- Directive 2002/96/EC & 2012/19/EU

FCC Statement

- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

- This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the

antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and consider removing the no-collocation statement.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution!

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.