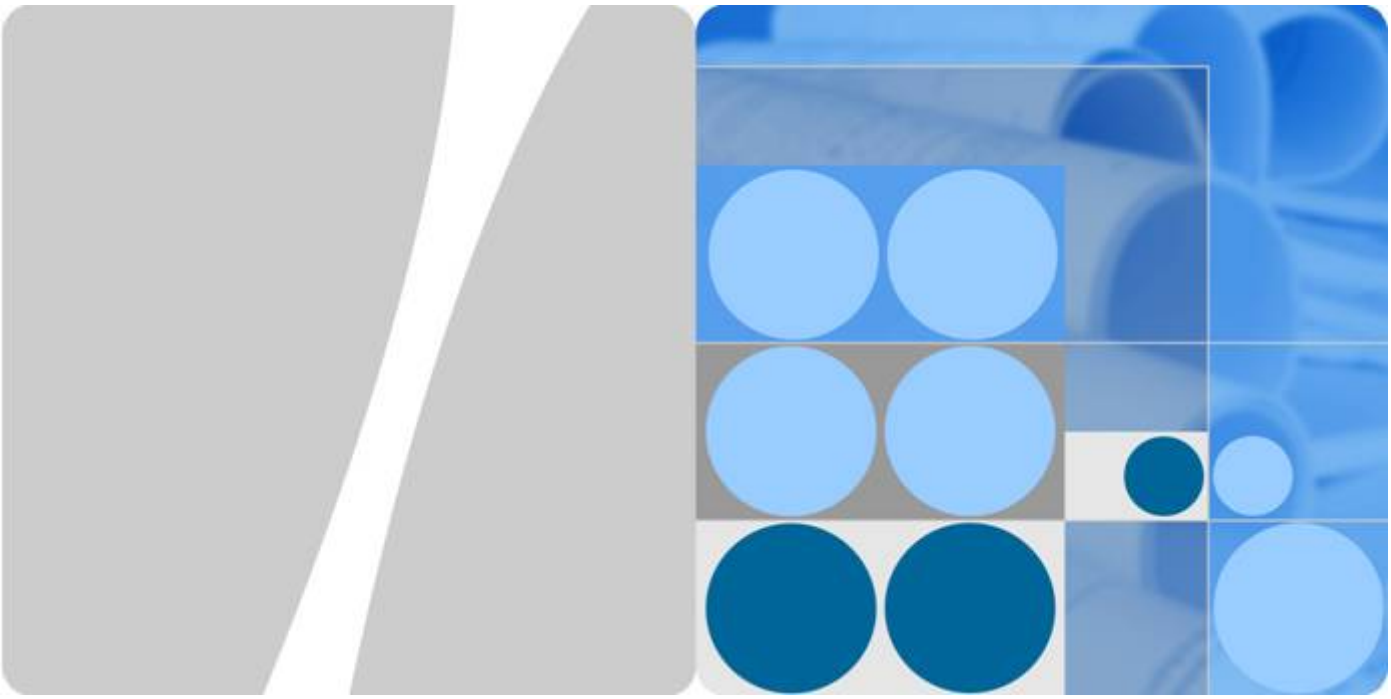

RTN XMC ODU

V100

Hardware Description

Issue 18

Date 2014-12-30

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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

About This Document

Overview

This document describes the RTN XMC ODU and related devices, which consist of the hybrid coupler, separate mounting components, antennas, antenna adapter, and cables.

Product Version

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

Product Name	Product Version
RTN XMC ODU	V100

Intended Audience

This document is intended for:

- Field engineers

Change History

This provides the changes of the RTN XMC ODU Hardware Description.

- Changes in Issue 18 (2014-12-30)
  This is the eighteenth commercial release.
  The detailed frequency information of the XMC-2 ODU are updated.
  The Hybrid coupler dimensions is updated; The antenna diameters is updated.
  The XMC-1 ODU is deleted.
- Changes in Issue 17 (2014-06-30)
  This is the seventeenth commercial release.

The channel spacing information about the 6GHz, 28GHz, and 32GHz are updated.

- Changes in Issue 16 (2013-12-20)

  This is the sixteenth commercial release.

  The frequency information about the 23 GHz is updated.

  The channel spacing information about the 7GHz, 8GHz, 10GHz, 11GHz, 13GHz, 15GHz, 18GHz, 23GHz, 26GHz, 38GHz,and 42GHz are updated.

  The integrated system dimensions information about the 7GHz, 8GHz, 13GHz, 15GHz, 18GHz, 23GHz,and 38GHz are updated.

  The information about dual polarized coupler is updated.

  The information about the antenna is updated.

- Changes in Issue 15 (2013-06-15)

  This is the fifteenth commercial release.

  The information about the 13 GHz is updated.

- Changes in Issue 14 (2013-03-31)

  This is the fourteenth commercial release.

  The information about the 7 GHz is updated.

- Changes in Issue 13 (2013-01-10)

  This is the thirteenth commercial release.

  The information about the 10 GHz is added.

  The information about the 7GHz-2E and 8GHz-2E is added.

  The information about the Dual Polarized Coupler is added.

  The information about the transceiver specifications of the ODU(XMC-2) is optimized.

- Changes in Issue 12 (2012-09-25)

  This is the twelfth commercial release.

  The information about the 6 GHz is added.

- Changes in Issue 11 (2011-11-30)

  This is the eleventh commercial release.

  The information about the 28 GHz, 32 GHz and 42 GHz is added.

- Changes in Issue 10 (2011-07-30)

  This is the tenth commercial release.

  The information about the 7 GHz and 18 GHz is updated.

- Changes in Issue 09 (2011-04-20)

  This is the ninth commercial release.

  The information about the diameter of the direct-mount dual-polarized antenna is added.

- Changes in Issue 08 (2011-03-10)

  This is the eighth commercial release.

  The information about the 11 GHz frequency band of the ODU is added.

- Changes in Issue 07 (2011-01-20)

  This is the seventh commercial release.

  The information about the 26 GHz and 38 GHz frequency band of the ODU is added.

- Changes in Issue 06 (2010-11-09)

  This is the sixth commercial release.

  The information about the 7 GHz and 23 GHz is updated.
- Changes in Issue 05 (2010-10-22)

  This is the fifth commercial release.

  The information about the 7 GHz , 8 GHz , 15 GHz and 23 GHz is updated.
- Changes in Issue 04 (2010-09-10)

  This is the fourth commercial release.

  The Nameplate Label of the ODU is updated.
- Changes in Issue 03 (2010-05-15)

  This is the third commercial release.

  The information about the 13 GHz and 18 GHz frequency band of the ODU is added.
- Changes in Issue 02 (2010-04-02)

  This is the second commercial release.

  The figure for interfaces of the ODU is updated.
- Changes in Issue 01 (2010-02-05)

  This is the initial commercial release.

Organization

This document is organized as follows.

1 Outdoor Unit (ODU)

The ODU is an outdoor unit of the digital microwave system. It is used to convert and amplify signals. The ODUs that are described in this document are the RTN XMC ODUs.

2 Hybrid coupler

Hybrid coupler is short for the RF signal combiner/divider. It is used to install two ODUs on one antenna. The hybrid couplers that are described in this document are the hybrid couplers adaptive to the RTN XMC ODUs.

3 OMT

The orthogonal mode transducer (OMT) is the short name for the polarized hybrid coupler. The OMT is used when two ODUs with different polarization directions need to be installed on the same antenna.

4 Dual-Polarized Coupler

A dual-polarized coupler helps install four ODUs directly on one dual-polarized antenna.

5 Separate Mounting Components

The separate mounting components consist of the ODU separate mounting bracket and flexible waveguide. The separate mounting components described in this document are the separate mounting components adaptive to the RTN XMC ODUs.

6 Antennas

The microwave device uses the parabolic antennas to transmit and receive electromagnetic waves. The antennas described in this document are the parabolic antennas adaptive to the RTN XMC ODUs.

7 Antenna Adapter

This describes the antenna adapter. In direct mounting mode, the antenna adapter is used for transfer if the antenna does not adaptive to the RTN XMC ODU.

8 Cables

This describes the cables of the ODU. The cables of the ODU which consist of the IF cable and ODU PGND cable.

Conventions

Symbol Conventions

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

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

General Conventions

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

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

Convention	Description
Boldface	Names of files, directories, folders, and users are in **boldface**. For example, log in as user **root**.
Italic	Book titles are in *italics*.
`Courier New`	Examples of information displayed on the screen are in Courier New.

Command Conventions

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

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

GUI Conventions

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

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

Keyboard Operations

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

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

Mouse Operations

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

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

Contents

1 Outdoor Unit (ODU)

About This Chapter

The ODU is an outdoor unit of the digital microwave system. It is used to convert and amplify signals. The ODUs that are described in this document are the RTN XMC ODUs.

1.1 Device Type
This describes the types of the ODU. The XMC-2 ODU is a type of ODU in high power.

1.2 Appearance
The ODU is an outdoor integrated device that adopts the unified design.

1.3 Functions
The ODU, a microwave RF unit, has the function of frequency conversion and power amplification. The ODU determines microwave frequencies of the transmitted and received signals and is not affected by transmission service types such as the TDM Serivce and Ethernet service.

1.4 Working Principles
This describes the working principles of the ODU. The working principles of different types of ODUs are similar.

1.5 Installation Mode
The ODU can be installed on the antenna in two modes: direct mounting mode and separate mounting mode.

1.6 Interfaces
The interfaces of the ODU consist of the antenna interface, IF interface, RSSI interface, and grounding screw.

1.7 Labels
The following labels are attached to the ODU: nameplate label, bar code, radiation label, and overtemperature label. These labels are used to identify the device information, radiation alarm, and overtemperature alarm of the ODU.

1.8 Technical Specifications

The technical specifications of the ODU consist of working formats, frequency bands, transceiver specifications, IF specifications, integrated system specifications, and frequency information.

1.1 Device Type

This describes the types of the ODU. The XMC-2 ODU is a type of ODU in high power.

Table 1-1 shows the performance and attributes of the ODU.

Table 1-1 Performance attributes of the ODU

Item	XMC-2 ODU
ODU type	ODU in high power
Frequency band	6 GHz, 7 GHz, 8 GHz, 10GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz, and 42 GHz
Microwave modulation format	QPSK, QPSK STRONG, 16QAM, 16QAM STRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAM LIGHT, 1024QAM, 1024QAM LIGHT
Channel spacing	3.5 MHz,7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz **NOTE** ● The channel spacings supported by the OptiX RTN 950 comply with ETSI standards. Channel spacings 14/28/56 MHz apply to most frequency bands; but channel spacings 13.75/27.5/55 MHz apply to the 18 GHz frequency band. ● Only the QPSK and 16QAM modulation modes can be used for the channel spacing of 3.5 MHz.

1.2 Appearance

The ODU is an outdoor integrated device that adopts the unified design.

Figure 1-1 shows the appearance of the ODU.

Figure 1-1 Appearance of the ODU

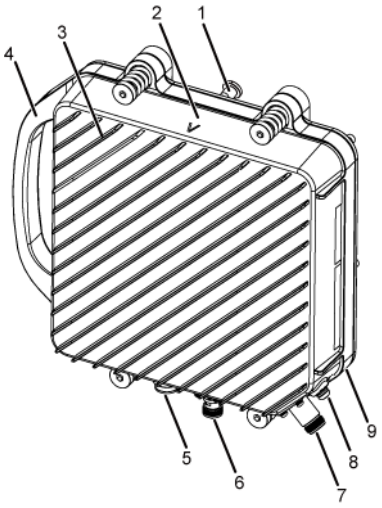


Table 1-2 describes the appearance of the ODU.

Table 1-2 Appearance description of the ODU

Serial No.	Item	Description
1	Guide pin	The guide pin is used together with the guide trough to facilitate the installation of the ODU.
2	Polarization direction identifier	H: Horizontal polarization V: Vertical polarization
3	Cooling fins	The 45°slant angle of the cooling fins ensures the ventilation of the ODU in horizontal-polarized and vertical-polarized conditions to facilitate heat dissipation.
4	Handle	The handle is used to facilitate the holding and installation of the ODU.
5	Pressure vent	Ensures that the pressure inside the ODU and that outside the ODU are the same, thus preventing explosion. In addition, the pressure vent valve can prevent moisture.
6	RSSI interface	See **Interfaces on the ODU**.
7	IF interface	
8	Grounding screw	
9	Cut corner	In horizontal and vertical conditions, cables are inclined from the cut corner to enhance waterproof reliability.

1.3 Functions

The ODU, a microwave RF unit, has the function of frequency conversion and power amplification. The ODU determines microwave frequencies of the transmitted and received signals and is not affected by transmission service types such as the TDM Serivce and Ethernet service.

The ODU supports the following features:

- Various channel spacing.
- Various modulation formats.
- Adaptive modulation (AM) function.
- Adjustment of TX/RX frequencies through software.
- Adjustment of TX power through software.

- Temperature detection.
- TX power detection.
- RX power detection.
- Received Signal Strength Indicator (RSSI) interface:

  The ODU has an RSSI interface, which indicates the RX power in voltage.
- Mute transmission.
- Automatic Transmit Power Control (ATPC).
- Remote Transmission Power Control (RTPC).
- Automatic Gain Control (AGC) function of received signals:

  The ODU automatically adjusts the channel gain according to the level of received signals.

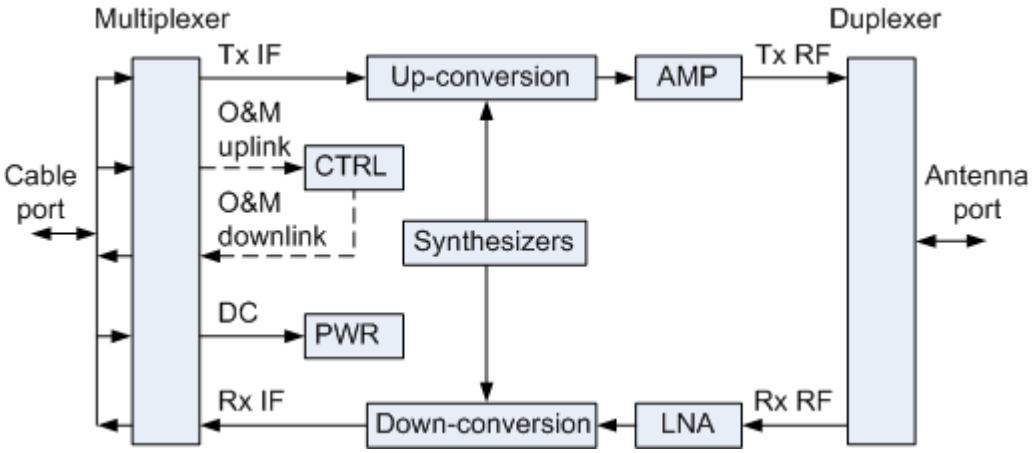
1.4 Working Principles

This describes the working principles of the ODU. The working principles of different types of ODUs are similar.

Working Principles

Figure 1-2 shows the working principles of the ODU.

Figure 1-2 Working principles of the ODU



The ODU is located between the IDU and the antenna system, implementing the functions of frequency conversion and amplification of signals. The working principles of the ODU are as follows:

- Processing of the signals to be transmitted

  The multiplexer unit divides the input signals transmitted through the IF cable into the 350 MHz IF TX signals, O&M uplink signals, and -48 V DC power signals.

  The IF TX signals are processed as follows:

1. The IF TX signals are up-converted, filtered, and amplified to RF TX signals. Then, the RF TX signals are sent to the AMP unit.
2. The AMP unit amplifies the power of the RF TX signals. The power of the RF TX signals can be controlled by the IDU software.
3. The amplified RF TX signals are sent to the antenna through the duplexer isolation unit.

The O&M uplink signals are the 5.5 MHz signals modulated in Amplitude Shift Keying (ASK) mode. The signals are sent to the CTRL unit and demodulated.

The -48 V DC power signals are sent to the PWR unit. The PWR generates secondary power supplies for each module of the ODU.

- Processing of the received signals

1. The duplexer isolation unit separates the RF input signals from other signals received by the antenna.
2. The RF signals are amplified through the Low Noise Amplifier (LNA) unit.
3. The amplified RF signals are down-converted, filtered, and amplified to 140 MHz IF RX signals and transmitted to the multiplexer unit.
4. The multiplexer unit combines the IF RX signals and O&M downlink signals and then transmits the combined signals to the IDU through IF cable.

The CTRL unit performs the ASK modulation on the O&M downlink signals to generate 10 MHz signals. The modulated signals are transmitted to the multiplexer unit. The CTRL unit provides the RSSI interface and monitors the RX level through the RSSI circuit.

1.5 Installation Mode

The ODU can be installed on the antenna in two modes: direct mounting mode and separate mounting mode.

Direct Mounting Mode

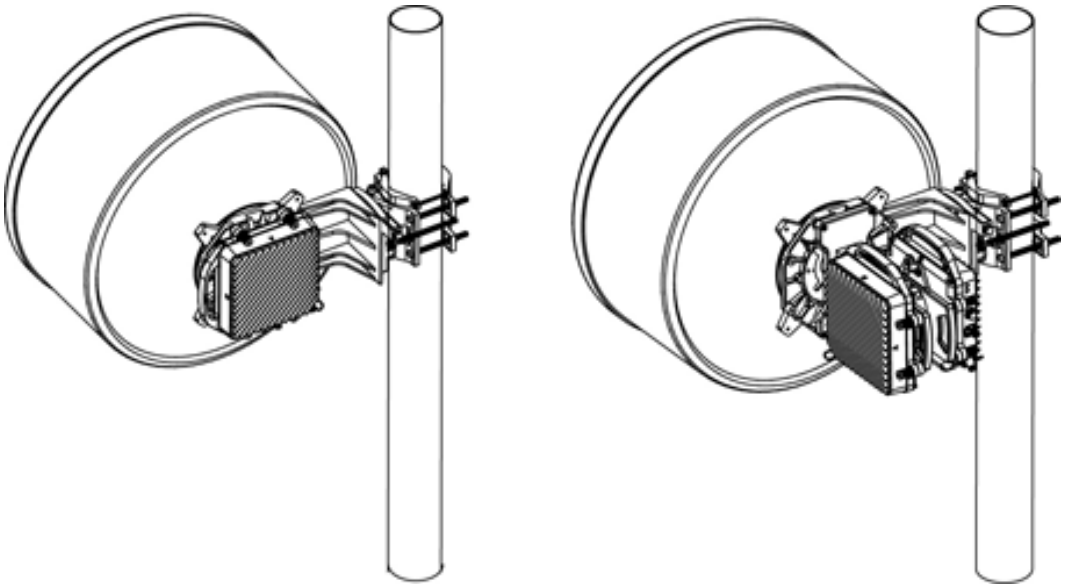
When the small-diameter and single-polarized antenna is used, the direct mounting mode is usually adopted. In this case, if one ODU uses one antenna, the ODU should be installed at the back of the antenna. If two ODUs share one antenna, one RF signal combiner-divider (hereinafter referred to as hybrid coupler) should be added between the antenna and the ODU.

NOTE

Use a hybrid coupler adaptive to the XMC ODU if two ODUs are configured with only one antenna installed in direct-mounting mode.

Figure 1-3 shows the direct mounting mode.

Figure 1-3 Direct mounting mode



Separate Mounting Mode

When the dual-polarized antenna or the large-diameter and single-polarized antenna is used, the separate mounting mode is adopted. In this case, two ODUs can share one feed boom by adding a hybrid coupler.

In separate mounting mode, the ODU separated mounting bracket is used to fix the ODU or hybrid coupler on the pole. The ODU or hybrid coupler and the antenna are connected through a flexible wave guide.

Figure 1-4 shows the separate mounting mode using a single-polarized antenna.

Figure 1-4 Separate mounting mode using a single-polarized antenna

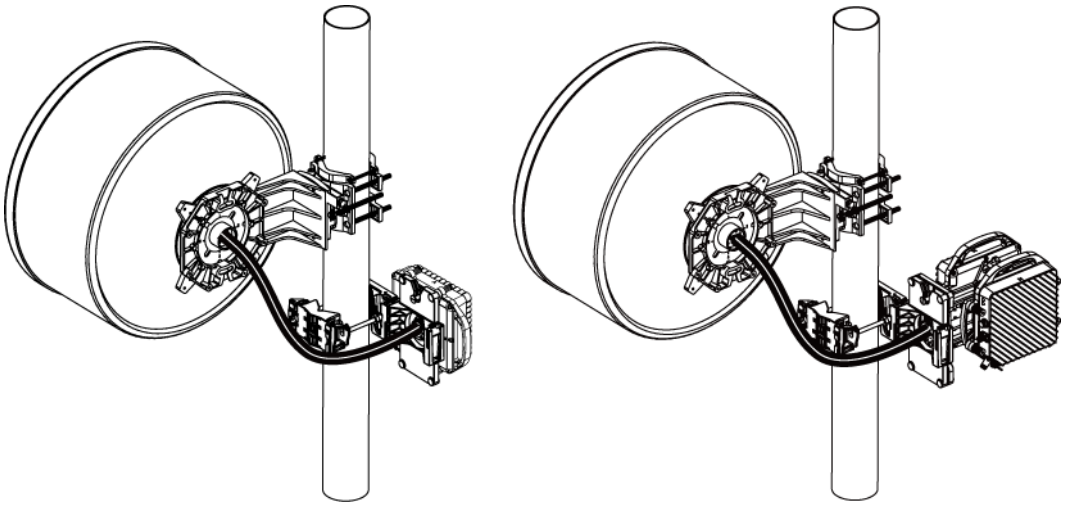
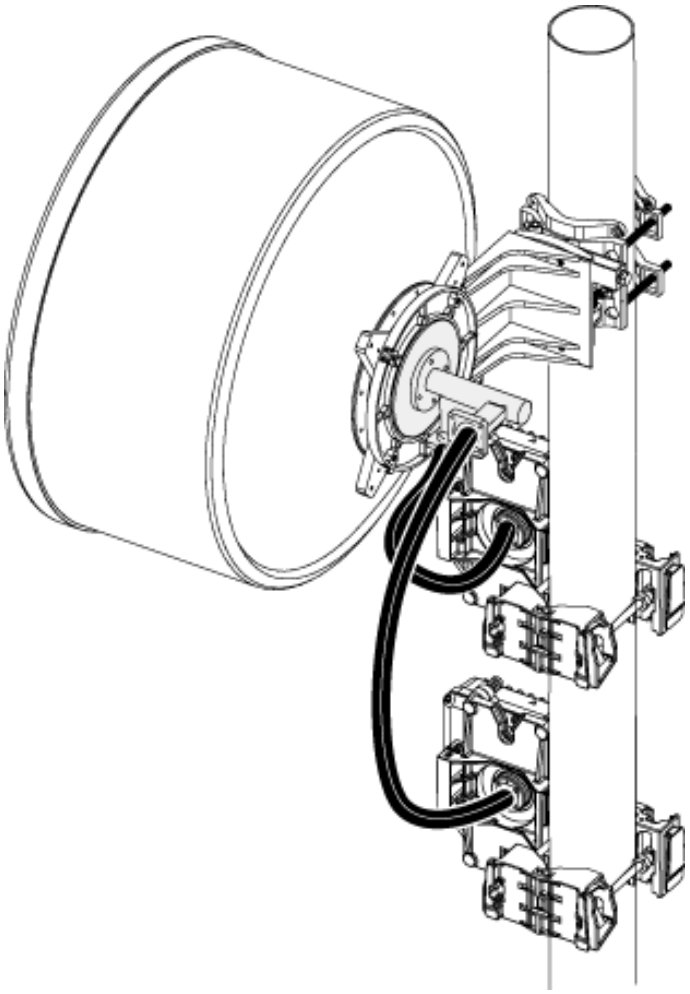


Figure 1-5 shows the separate mounting mode using a dual-polarized antenna.

Figure 1-5 Separate mounting mode using a dual-polarized antenna



1.6 Interfaces

The interfaces of the ODU consist of the antenna interface, IF interface, RSSI interface, and grounding screw.

Figure 1-6 shows the interfaces of the ODU.

Figure 1-6 Interfaces of the ODU

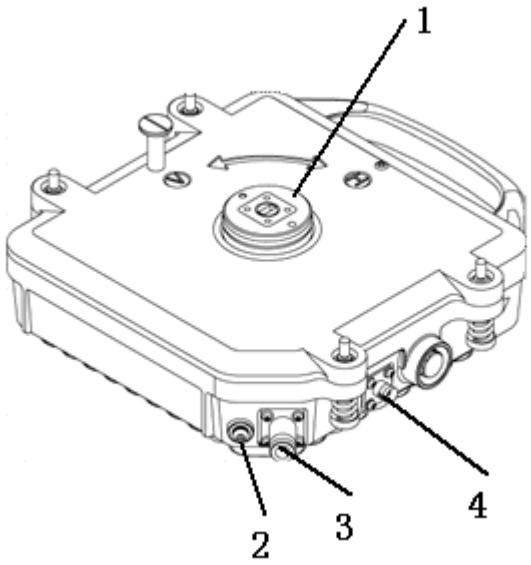


Table 1-3 describes the interfaces of the ODU.

Table 1-3 Interfaces of the ODU

Serial No.	Interface Name	Interface Type	Description
1	Antenna interface	153IEC-R70, can be interconnected with the PDR70 (6 GHz frequency band) 153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency band) 153IEC-R100, can be interconnected with the PBR100 (10G/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band) 153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18/23/26 GHz frequency band) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency band) UG 383/U-R400, can be interconnected with the UG 383/U-R400 (42 GHz frequency band)	The antenna interface is a waveguide interface that is connected to an antenna, a hybrid coupler, an antenna adapter, or a flexible waveguide.
2	Grounding screw	M5 screw	The grounding screw is connected to the **PGND cable**.
3	IF interface	N type (female)	The IF interface is connected to the IDU through an **IF cable**.
4	RSSI interface	BNC type (female)	The received signal strength of the ODU can be calculated based on the voltage of the interface that is measured through a multimeter.

1.7 Labels

The following labels are attached to the ODU: nameplate label, bar code, radiation label, and overtemperature label. These labels are used to identify the device information, radiation alarm, and overtemperature alarm of the ODU.

The ODU labels and the meanings of the labels are describes as follows:

- Nameplate Label

  Figure 1-7 shows the nameplate label of the ODU.

  Figure 1-7 Nameplate label of the ODU

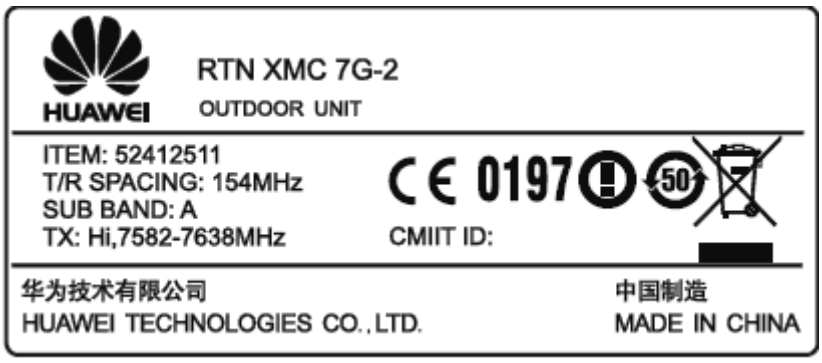


Table 1-4 describes the meanings of the parameters on the nameplate label.

Table 1-4 Meanings of the parameters on the nameplate label

Label Information	Content of the Label	Parameter	Meaning
ODU name	RTN XMC 7G-2 ① ② OUTDOOR UNIT ③	①: Frequency band	Working frequency of the ODU (GHz)
		②: ODU type	2: ODU in high power
		③: Component name	Indicates that the component is an ODU
ODU code (ITEM)	52412511	-	Used to identify the type of the ODU
ODU T/R spacing (T/R SPACING)	154MHz	-	Spacing between RX and TX frequencies (MHz)

Label Information	Content of the Label	Parameter	Meaning
ODU subband (SUB BAND)	A	-	Frequency subbands numbered with letters
TX status information about the ODU (TX)	Hi,7582-7638MHz ① ②	①: TX high/ low station	Hi: TX high station Lo: TX low station
		②: Range of the TX frequency	Range of the ODU TX frequency (MHz)
CMIIT ID	-	-	ID of Radio Transmission Equipment Type Approval Certificate (domestic)

- Bar Code, Radiation Label, and Overtemperature Label

  Table 1-5 shows the bar code, radiation label, and overtemperature label of the ODU and describes the meanings of the three labels.

  Table 1-5 Bar code, radiation label, and overtemperature label

Name	Appearance	Meaning
Bar code		Bar code of the ODU serial number, which is used to uniquely identify each ODU
Radiation label		Used to identify the radiation alarm
Overtemperature label		Used to identify the overtemperature alarm

1.8 Technical Specifications

The technical specifications of the ODU consist of working formats, frequency bands, transceiver specifications, IF specifications, integrated system specifications, and frequency information.

1.8.1 XMC-2 ODU

This describes the technical specifications of the XMC-2 ODU.

Working Formats

Table 1-6 lists the modulation format and the channel spacing of the ODU.

Table 1-6 Working formats of the ODU (XMC-2 ODU)

Item	Specification
Modulation format	QPSK, QPSK STRONG, 16QAM, 16QAM STRONG, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 512QAM LIGHT, 1024QAM and 1024QAM LIGHT
Channel spacing	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 40 MHz, and 56 MHz
NOTE ● The enhancement modes QPSK STRONG, 16QAM STRONG, 512QAM, 512QAM LIGHT, 1024QAM, and 1024QAM LIGHT can be implemented only when the IS3 mode of the intermediate frequency (IF) board is used in the 6 GHz, 7 GHz, 8 GHz, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 28 GHz, 32 GHz, 38 GHz, and 42 GHz working frequencies. ● The enhancement modes QPSK STRONG, 16QAM STRONG, 512QAM, 512QAM LIGHT, 1024QAM, and 1024QAM LIGHT for the 10 GHz frequency band must work in IS3 mode of the intermediate frequency (IF) board provided in RTN900 V100R005C01 or later. ● The duct interval supported by XMC-2 ODU complies with the ETSI standard. In the ETSI standard, the 18 GHz frequency band is planned based on the interval of 13.75/27.5/55 MHz, which corresponds to 14/28/56 MHz in most application scenarios. ● The 10 GHz(TR91MHz) frequency band does not support the 40 MHz and the 56 MHz channel spacing. ● Only the QPSK and 16QAM modulation modes can be used for the channel spacing of 3.5 MHz.	

Frequency Bands

Table 1-7 lists the working frequency bands of the ODU.

Table 1-7 Working frequency bands of the ODU (XMC-2 ODU)

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
6 GHz	From 5.925 to 7.125	252.04, 160/170, and 340/350
7 GHz	From 7.093 to 7.897	154, 160, 161, 168, 196, and 245
8 GHz	From 7.731 to 8.497	119/126, 151.614, 208, 266,303, 310 and 311.32 **NOTE** 310 is a sub-frequency band of the 8GHz-2E frequency band .
10 GHz	From 10.130 to 10.650	350

Frequency Band	Frequency Range (GHz)	Interval Between Center RX and TX Frequencies in a Channel (MHz)
	From 10.500 to 10.678	91
11 GHz	From 10.675 to 11.745	500/490, 530/520
13 GHz	From 12.751 to 13.248	266
15 GHz	From 14.400 to 15.358	315/322, 420, 490, 644, and 728
18 GHz	From 17.685 to 19.710	1010/1008, 1092.5, 1560
23 GHz	From 21.200 to 23.618	1008, 1050, 1200, and 1232
26 GHz	From 24.250 to 26.453	1008
28 GHz	From 27.520 to 29.481	1008
32 GHz	From 31.815 to 33.383	812
38 GHz	From 37.044 to 40.105	1260
42 GHz	From 40.522 to 43.464	1500

Transceiver Specifications

Table 1-8 and Table 1-9 list the transceiver specifications of the ODU.

NOTE

The maximum error between the actual transmit power of the ODU and the preset transmit power on the NMS is ±2 dB.

When the receive power of the ODU is between -70 dBm and -30 dBm, the maximum error between the actual receive power of the ODU and the receive power displayed on the NMS is ±2 dB.

Table 1-8 Transceiver specifications of the ODU (XMC-2 ODU,IS2/IF2)

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
Rated maximum TX power(dBm) **NOTE** ● When the working frequency is 7GHz or 8GHz and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format reduces by 3 dB. ● When the working frequency is 7GHz-2E or 8GHz-2E and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format do not reduces.						
6GHz	30dBm	28dBm	26.5dBm	25dBm	25dBm	23dBm
7GHz	26.5dBm	25.5dBm	25.5dBm	25dBm	25dBm	23dBm
8GHz	26.5dBm	25.5dBm	25.5dBm	25dBm	25dBm	23dBm

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
7GHz-2E	30dBm	26dBm	26dBm	25dBm	25dBm	23dBm
8GHz-2E	30dBm	26dBm	26dBm	25dBm	25dBm	23dBm
10GHz (TR350 MHz)	26.5dBm	23.5dBm	23.5dBm	21.5dBm	21.5dBm	19.5dBm
10GHz (TR91 MHz)	24.5dBm	22.5dBm	22.5dBm	20.5dBm	20.5dBm	18.5dBm
11GHz	26dBm	24dBm	24dBm	22dBm	22dBm	20dBm
13GHz	25dBm	22dBm	22dBm	20.5dBm	20.5dBm	17.5dBm
15GHz	25dBm	22dBm	22dBm	20.5dBm	20.5dBm	18.5dBm
18GHz	24dBm	21dBm	21dBm	19.5dBm	19.5dBm	16.5dBm
23GHz	24dBm	21dBm	21dBm	19.5dBm	19.5dBm	17.5dBm
26GHz	22dBm	20dBm	20dBm	18dBm	18dBm	16dBm
28GHz	25dBm	22dBm	21.5dBm	19dBm	19dBm	17dBm
32GHz	23dBm	21dBm	19.5dBm	17dBm	17dBm	15dBm
38GHz	20dBm	17dBm	17dBm	16dBm	16dBm	14dBm
42GHz	16dBm	12dBm	12dBm	11dBm	11dBm	9dBm
Rated minimum TX power(dBm)						
6 GHz	0 dBm					
7 GHz	6.5 dBm					
8 GHz	6.5 dBm					
10 GHz (TR350 MHz)	0 dBm					
10 GHz (TR91 MHz)	0 dBm					
11 GHz	0 dBm					
13 GHz	5 dBm					

Item	Specification					
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
15 GHz	5 dBm					
18 GHz	4 dBm					
23 GHz	4 dBm					
26 GHz	0 dBm					
28 GHz	-3 dBm					
32 GHz	-3 dBm					
38 GHz	0 dBm					
42 GHz	-5 dBm					
Maximum RF RX power	● 6/7/8/10/11/13/15/18/23/26/28/32/38 GHz QPSK/16QAM/32QAM/64QAM/128QAM/256QAM: -20 dBm ● 42 GHz QPSK/16QAM/32QAM: -20 dBm 64QAM/128QAM: -23 dBm 256QAM: -25 dBm					
Frequency stability	⩽ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.					

Table 1-9 Transceiver specifications of the ODU(XMC-2 ODU, IS3)

Item	Specification							
	QPSK/QPSK STRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/512QAMLIGHT	1024QAM/1024QAMLIGHT
Rated maximum TX power(dBm) **NOTE** ● When the working frequency is 7GHz or 8GHz and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format reduces by 3 dB. ● When the working frequency is 7GHz-2E or 8GHz-2E and the channel spacing is 40 MHz or 56 MHz, the value of this counter in each modulation format do not reduces. ● 7GHz-2E and 8GHz-2E are the new version, support QPSKSTRONG,16QAMSTRONG, 512QAM, 512QAMLIGHT,1024QAM, and 1024QAMLIGHT Modulation format.								

Item	Specification							
	QPSK/QPSK STRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/512QAMLIGHT	1024QAM/1024QAMLIGHT
6GHz	30dBm	28dBm	26.5dBm	25dBm	25dBm	23dBm	21dBm	19dBm
7GHz	26.5dBm	25.5dBm	25.5dBm	25dBm	25dBm	23dBm	-	-
8GHz	26.5dBm	25.5dBm	25.5dBm	25dBm	25dBm	23dBm	-	-
7GHz-2E	30dBm	28dBm	28dBm	26dBm	26dBm	24dBm	24dBm	23dBm
8GHz-2E	30dBm	28dBm	28dBm	26dBm	26dBm	24dBm	24dBm	23dBm
10GHz (TR350MHz)	26.5dBm	24.5dBm	24.5dBm	23.5dBm	23.5dBm	21.5dBm	21.5dBm	19.5dBm
10GHz (TR91MHz)	24.5dBm	23.5dBm	23.5dBm	22.5dBm	22.5dBm	20.5dBm	20.5dBm	18.5dBm
11GHz	26dBm	25dBm	25dBm	24dBm	24dBm	22dBm	22dBm	20dBm
13GHz	25dBm	24dBm	24dBm	23dBm	23dBm	21dBm	20dBm	18dBm
15GHz	25dBm	24dBm	24dBm	23dBm	23dBm	21dBm	21dBm	19dBm
18GHz	24dBm	23dBm	23dBm	22dBm	22dBm	20dBm	19dBm	17dBm
23GHz	24dBm	23dBm	23dBm	22dBm	22dBm	19.5dBm	19.5dBm	18dBm
26GHz	22dBm	21dBm	21dBm	20dBm	20dBm	17dBm	17dBm	15dBm
28GHz	25dBm	22dBm	21.5dBm	19dBm	19dBm	17dBm	15dBm	13dBm

Item	Specification							
	QPSK/QPSK STRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/512QAMLIGHT	1024QAM/1024QAMLIGHT
32GHz	23dBm	21dBm	19.5dBm	17dBm	17dBm	15dBm	13dBm	11dBm
38GHz	20dBm	18dBm	18dBm	17dBm	17dBm	16dBm	15dBm	13dBm
42GHz	16dBm	14dBm	14dBm	13dBm	13dBm	11dBm	10dBm	8dBm
Rated minimum TX power(dBm)								
6 GHz	0 dBm							
7 GHz	6.5 dBm							
8 GHz	6.5 dBm							
10 GHz (TR350MHz)	0 dBm							
10 GHz (TR91MHz)	0 dBm							
11 GHz	0 dBm							
13 GHz	5 dBm							
15 GHz	5 dBm							
18 GHz	4 dBm							
23 GHz	4 dBm							

Item	Specification							
	QPSK/QPSK STRONG	16QAM/16QAMSTRONG	32QAM	64QAM	128QAM	256QAM	512QAM/512QAMLIGHT	1024QAM/1024QAMLIGHT
26 GHz	0 dBm							
28 GHz	-3 dBm							
32 GHz	-3 dBm							
38 GHz	0 dBm							
42 GHz	-5 dBm							
Maximum RF RX power	● 6/7/8/10/11/13/15/18/23/26/28/32/38 GHz QPSK/QPSKSTRONG/16QAM/16QAMSTRONG/32QAM/64QAM/128QAM/256QAM: -20 dBm ● 42 GHz QPSK/QPSKSTRONG/16QAM/16QAMSTRONG/32QAM: -20 dBm 64QAM/128QAM: -23 dBm 256QAM: -25 dBm						-25dBm	
Frequency stability	⩽ ±5 ppm **NOTE** When the T/R spacing is 311.32 MHz or 151.614 MHz, the frequency tolerance meets the requirement of the ETSI.							

IF Specifications

Table 1-10 lists the IF specifications of the ODU.

Table 1-10 IF specifications of the ODU (XMC-2 ODU)

Item		Specification
IF signal	Center frequency of the input IF	350 MHz

Item		Specification
	Center frequency of the RX IF	140 MHz
	Return loss of the IF interface	< -15 dB
ODU O&M signal	Modulation mode	ASK
	Uplink signal	5.5 MHz
	Downlink signal	10 MHz

Integrated System Specifications

Table 1-11 lists the integrated system specifications of the ODU.

Table 1-11 Integrated system specifications of the ODU (XMC-2 ODU)

Item	Specification
Integrated system dimensions	6/10/11/26/28/32/42GHz:228 mm x 228 mm x 75 mm (width x depth x height) 7/8/13/15/18/23/38GHz:222 mm x 222 mm x 75 mm (width x depth x height)
Weight	≤ 4.5 kg
Power supply	-48 V (from -32 V to -72 V) DC
Power consumption	≤ 35 W (6 GHz frequency band) ≤ 33 W (7/8 GHz frequency band) ≤ 36 W (10//11 GHz frequency band) ≤ 27 W (13 GHz frequency band) ≤ 26 W (15 GHz frequency band) ≤ 30 W (18/28/32/42 GHz frequency band) ≤ 28 W (23/26/38 GHz frequency band)

Frequency Information

NOTE

- Instead of the upper/lower limits of the central frequency of channels, the upper/lower limits of the frequency that carries the TX signals are described as follows to indicate the scope of frequencies supported by the ODU. The lowest central frequency of channels is higher than the lower limit frequency by half of the channel spacing. The highest central frequency of channels is lower than the upper limit frequency by half of the channel spacing.
- The T/R spacing values listed in the following tables are default values. In special application scenarios and within the frequency range covered by the duplexer, the T/R spacing values within each band are configurable.

Table 1-12 lists the information about the 6 GHz frequency band.

Table 1-12 Information about the 6 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
252.04	A	5,925.00	6,025.00	6,175.00	6,275.00
252.04	B	6,000.00	6,100.00	6,250.00	6,350.00
252.04	C	6,075.00	6,175.00	6,325.00	6,425.00
160/170	A	6,540.00	6,600.00	6,700.00	6,760.00
160/170	B	6,580.00	6,640.00	6,740.00	6,800.00
160/170	C	6,620.00	6,680.00	6,780.00	6,840.00
160/170	D	6,660.00	6,710.00	6,820.00	6,870.00
340/350	A	6,425.00	6,540.00	6,765.00	6,880.00
340/350	B	6,520.00	6,630.00	6,860.00	6,970.00
340/350	C	6,600.00	6,710.00	6,940.00	7,050.00
340/350	D	6,670.00	6,785.00	7,010.00	7,125.00

Table 1-13 lists the information about the 7 GHz frequency band.

Table 1-13 Information about the 7 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	A	7,428.00	7,484.00	7,582.00	7,638.00
154	B	7,470.00	7,526.00	7,624.00	7,680.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
154	C	7,512.00	7,568.00	7,666.00	7,722.00
154	D	7,128.00	7,184.00	7,282.00	7,338.00
154	E	7,170.00	7,226.00	7,324.00	7,380.00
154	F	7,212.00	7,268.00	7,366.00	7,422.00
154 **NOTE** This is special requirements;	G	7,456.00	7,512.00	7,610.00	7,666.00
154 **NOTE** This is special requirements;	H	7,484.00	7,540.00	7,638.00	7,694.00
160	A	7,433.50	7,496.50	7,593.50	7,656.50
160	B	7,478.50	7,541.50	7,638.50	7,701.50
160	C	7,526.00	7,589.00	7,686.00	7,749.00
161	A	7,114.00	7,177.00	7,275.00	7,338.00
161	B	7,149.00	7,212.00	7,310.00	7,373.00
161	C	7,180.50	7,247.00	7,341.50	7,408.00
161	D	7,219.00	7,282.00	7,380.00	7,443.00
161	E	7,239.00	7,302.00	7,400.00	7,463.00
161	F	7,274.00	7,337.00	7,435.00	7,498.00
161	G	7,309.00	7,372.00	7,470.00	7,533.00
161	H	7,344.00	7,407.00	7,505.00	7,568.00
161	I	7,414.00	7,477.00	7,575.00	7,638.00
161	J	7,449.00	7,512.00	7,610.00	7,673.00
161	K	7,484.00	7,547.00	7,645.00	7,708.00
161	L	7,519.00	7,582.00	7,680.00	7,743.00
161	M	7,539.00	7,602.00	7,700.00	7,763.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
161	N	7,574.00	7,637.00	7,735.00	7,798.00
161	O	7,609.00	7,672.00	7,770.00	7,833.00
161	P	7,644.00	7,707.00	7,805.00	7,868.00
161 **NOTE** This is special requirements;	Q	7,128.00	7,184.00	7,289.00	7,345.00
161 **NOTE** This is special requirements;	R	7,212.00	7,268.00	7,373.00	7,429.00
161 **NOTE** This is special requirements;	S	7,428.00	7,484.00	7,589.00	7,645.00
161 **NOTE** This is special requirements;	T	7,512.00	7,568.00	7,673.00	7,729.00
161 **NOTE** This is special requirements;	U	7,208.50	7,264.50	7,369.50	7,425.50
161 **NOTE** This is special requirements;	V	7,508.50	7,564.50	7,669.50	7,725.50
168	A	7,443.00	7,499.00	7,611.00	7,667.00
168	B	7,485.00	7,541.00	7,653.00	7,709.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
168	C	7,527.00	7,583.00	7,695.00	7,751.00
168	D	7,110.50	7,170.00	7,278.50	7,338.00
168	E	7,163.00	7,205.00	7,331.00	7,373.00
168	F	7,198.00	7,236.50	7,366.00	7,404.50
168	G	7,226.00	7,261.00	7,394.00	7,429.00
196	A	7,093.00	7,177.00	7,289.00	7,373.00
196	B	7,149.00	7,233.00	7,345.00	7,429.00
196	C	7,205.00	7,261.00	7,401.00	7,457.00
245	A	7,400.00	7,484.00	7,645.00	7,729.00
245	B	7,484.00	7,568.00	7,729.00	7,813.00
245	C	7,568.00	7,652.00	7,813.00	7,897.00

Table 1-14 lists the information about the 8 GHz frequency band.

Table 1-14 Information about the 8 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
119/126	A	8,279.00	8,321.00	8,398.00	8,440.00
119/126	B	8,307.00	8,349.00	8,426.00	8,468.00
119/126	C	8,335.00	8,377.00	8,454.00	8,496.00
119/126	D	8,321.00	8,349.00	8,440.00	8,468.00
119/126	E	8,335.00	8,363.00	8,454.00	8,482.00
119/126	F	8,349.00	8,377.00	8,468.00	8,496.00
151.614	A	8,203.00	8,271.00	8,355.00	8,423.00
151.614	B	8,240.00	8,308.00	8,392.00	8,460.00
151.614	C	8,277.00	8,345.00	8,429.00	8,497.00
208	A	8,043.00	8,113.00	8,251.00	8,321.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
208	B	8,099.00	8,169.00	8,307.00	8,377.00
208	C	8,155.00	8,225.00	8,363.00	8,433.00
208	D	8,211.00	8,281.00	8,419.00	8,489.00
266	A	7,905.00	8,024.00	8,171.00	8,290.00
266	B	8,017.00	8,136.00	8,283.00	8,402.00
310	A	7,905.00	8,017.00	8,215.00	8,327.00
310	B	8,017.00	8,129.00	8,327.00	8,439.00
310	C	8,129.00	8,185.00	8,439.00	8,495.00
311.32	A	7,731.00	7,867.00	8,042.00	8,178.00
311.32	B	7,835.00	7,971.00	8,146.00	8,282.00

Table 1-15 lists the information about the 10 GHz frequency band.

Table 1-15 Information about the 10 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
350	A	10,130.00	10,300.00	10,480.00	10,650.00
91	A	10,500.00	10,531.00	10,591.00	10,622.00
91	B	10,528.00	10,559.00	10,619.00	10,650.00
91	C	10,556.00	10,587.00	10,647.00	10,678.00

Table 1-16 lists the information about the 11 GHz frequency band.

Table 1-16 Information about the 11 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
500/490	A	10,700.00	10,980.00	11,200.00	11,480.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
500/490	B	10,920.00	11,200.00	11,420.00	11,700.00
530/520	A	10,675.00	10,975.00	11,205.00	11,505.00
530/520	B	10,915.00	11,215.00	11,445.00	11,745.00

Table 1-17 lists the information about the 13 GHz frequency band.

Table 1-17 Information about the 13 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
266	A	12,751.00	12,870.00	13,017.00	13,136.00
266	B	12,863.00	12,982.00	13,129.00	13,248.00
266	C	12,751.00	12,891.00	13,017.00	13,157.00

Table 1-18 lists the information about the 15 GHz frequency band.

Table 1-18 Information about the 15 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
315/322	A	14,627.00	14,746.00	14,942.00	15,061.00
315/322	B	14,725.00	14,844.00	15,040.00	15,159.00
315/322	C	14,823.00	14,942.00	15,138.00	15,257.00
420	A	14,501.00	14,725.00	14,921.00	15,145.00
420	B	14,718.00	14,928.00	15,138.00	15,348.00
490	A	14,403.00	14,634.00	14,893.00	15,124.00
490	B	14,627.00	14,858.00	15,117.00	15,348.00
644	A	14,400.00	14,708.00	15,044.00	15,352.00
728	A	14,500.00	14,625.00	15,228.00	15,353.00

Table 1-19 lists the information about the 18 GHz frequency band.

Table 1-19 Information about the 18 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1010/1008	A	17,685.00	18,230.00	18,695.00	19,240.00
1010/1008	B	18,180.00	18,700.00	19,190.00	19,710.00
1560	C	17,700.00	18,140.00	19,260.00	19,700.00
1092.5	A	17,712.50	18,060.00	18,805.00	19,152.50
1092.5	B	17,987.50	18,595.00	19,080.00	19,687.50

Table 1-20 lists the information about the 23 GHz frequency band.

Table 1-20 Information about the 23 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	21,990.50	22,330.00	22,998.50	23,338.00
1008	B	22,274.00	22,610.00	23,282.00	23,618.00
1008	C	22,260.00	22,610.00	23,268.00	23,618.00
1050 **NOTE** This is special requirements;	A	21,950.25	22,498.00	23,000.25	23,548.00
1200	A	21,200.00	21,600.00	22,400.00	22,800.00
1200	B	21,600.00	22,000.00	22,800.00	23,200.00
1200	C	21,950.00	22,400.00	23,150.00	23,600.00
1232	A	21,200.00	21,786.00	22,432.00	23,018.00
1232	B	21,779.00	22,386.00	23,011.00	23,618.00

Table 1-21 lists the information about the 26 GHz frequency band.

Table 1-21 Information about the 26 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	24,549.00	24,885.00	25,557.00	25,893.00
1008	B	24,829.00	25,165.00	25,837.00	26,173.00
1008	C	25,109.00	25,445.00	26,117.00	26,453.00

Table 1-22 lists the information about the 28 GHz frequency band.

Table 1-22 Information about the 28 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1008	A	27,520.00	28,025.00	28,528.00	29,033.00
1008	B	27,968.00	28,473.00	28,976.00	29,481.00

Table 1-23 lists the information about the 32 GHz frequency band.

Table 1-23 Information about the 32 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
812	A	31,815.00	32,207.00	32,627.00	33,019.00
812	B	32,179.00	32,571.00	32,991.00	33,383.00

Table 1-24 lists the information about the 38 GHz frequency band.

Table 1-24 Information about the 38 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	A	37,044.00	37,632.00	38,304.00	38,892.00

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1260	B	37,604.00	38,192.00	38,864.00	39,452.00

Table 1-25 lists the information about the 42 GHz frequency band.

Table 1-25 Information about the 42 GHz frequency band (XMC-2 ODU)

T/R Spacing (MHz)	Sub-Band	Lower Sub-band TX Frequency (MHz)		Higher Sub-band TX Frequency (MHz)	
		Lower Limit	Upper Limit	Lower Limit	Upper Limit
1500	A	40,522.00	41,306.00	42,022.00	42,806.00
1500	B	41,194.00	41,964.00	42,694.00	43,464.00

2 Hybrid coupler

About This Chapter

Hybrid coupler is short for the RF signal combiner/divider. It is used to install two ODUs on one antenna. The hybrid couplers that are described in this document are the hybrid couplers adaptive to the RTN XMC ODUs.

2.1 Device Type

The hybrid couplers is available in two series: balanced hybrid coupler and unbalanced hybrid coupler.

Hybrid couplers are classified based on the attenuation values of tributary signals. The attenuation values are the same in the transmit and receive directions. The differences between the two types of hybrid coupler are as follows:

- A balanced hybrid coupler is also called a 3 dB hybrid coupler.

  The 3 dB hybrid coupler divides one channel of RF signals into two channels of RF signals of the similar power. The power of each divided channel of RF signals is approximately 50% of the original channel of RF signals. That is, the power attenuation value of each divided channel of RF signals is approximately 3 dB, as compared with the original channel of RF signals.
- An unbalanced hybrid coupler is also called a 6 dB hybrid coupler.

  The 6 dB hybrid coupler divides one channel of RF signals into two channels of RF signals of different power. The power of the channel of extension tributary signals is approximately 25% of the original channel of RF signals. That is, the power attenuation value of the channel of extension tributary signals is approximately 6 dB, as compared with the original channel of RF signals. The power of the channel of main tributary signals is approximately 75% of the original channel of RF signals. That is, the power attenuation value of the channel of main tributary signals is approximately 1.5 dB, as compared with the original channel of RF signals.

2.2 Appearance

The hybrid coupler is an outdoor three-interface network component of the wireless transmission products.

Figure 2-1 shows the appearance of the hybrid coupler.

Figure 2-1 Appearance of the hybrid coupler

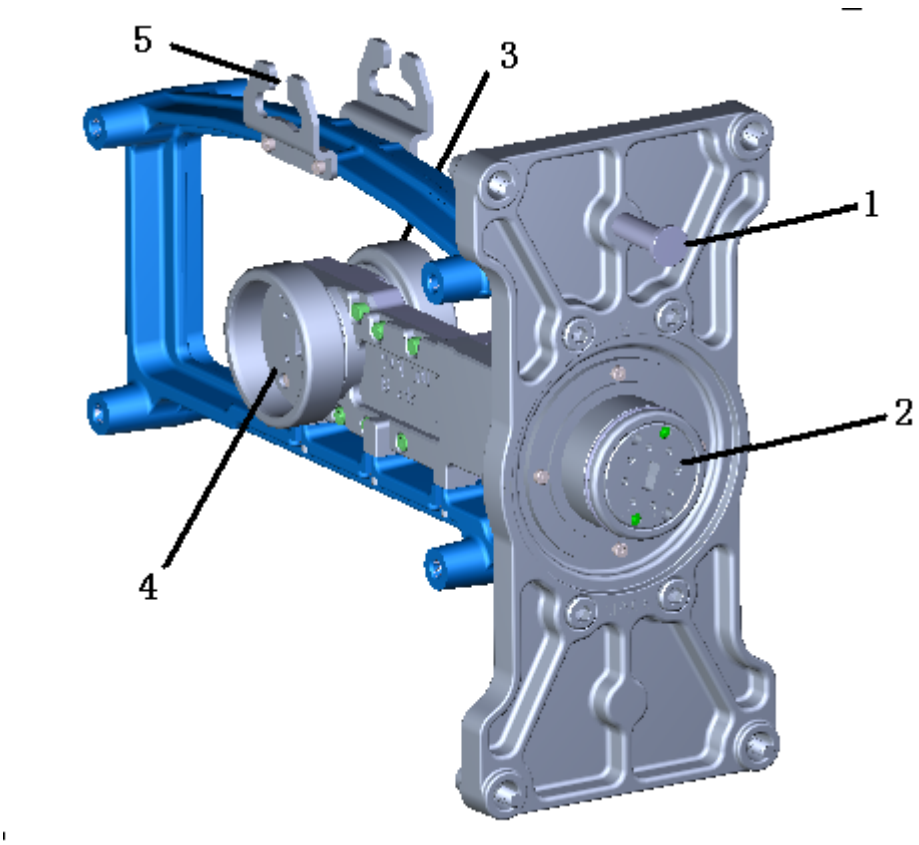


Table 2-1 describes the appearance of the hybrid coupler.

Table 2-1 Appearance description of the hybrid coupler

Number	Item	Description
1	Guide pin	Used together with the guide trough of the component connected to it to facilitate the installation of the hybrid coupler.
2	Antenna interface	See **Interfaces on the Hybrid coupler**.
3	Main tributary interface	
4	Extension tributary interface	
5	Guide trough	Used together with the ODU guide pin to facilitate the installation of the ODU.

2.3 Functions

The hybrid coupler is used to combine and divide RF signals.

The hybrid coupler has the following functions and features:

- In the TX direction, the hybrid coupler combines two routes of RF signals into one route and transmits the signals to the antenna.
- In the RX direction, the hybrid coupler divides the RF signals received from the antenna into two routes and transmits the signals to the ODU.

2.4 Working Principles

The hybrid coupler is mainly composed of waveguide cavities.

The waveguide cavity is the main component of the hybrid coupler. It has three interfaces: common interface, main tributary interface, and extension tributary interface.

The working principles of the hybrid coupler are as follows:

- In the TX direction, the RF signals received from the main tributary interface and extension tributary interface are combined into one route in the waveguide cavity and transmitted from the common interface.
- In the RX direction, the RF signals received from the common interface are divided into two routes in the waveguide cavity and transmitted from the two tributary interfaces.

2.5 Interfaces

The interfaces of the hybrid coupler consist of the antenna interface, main tributary interface, and extension tributary interface.

Figure 2-2 shows the interfaces of the hybrid coupler.

Figure 2-2 Interfaces of the hybrid coupler

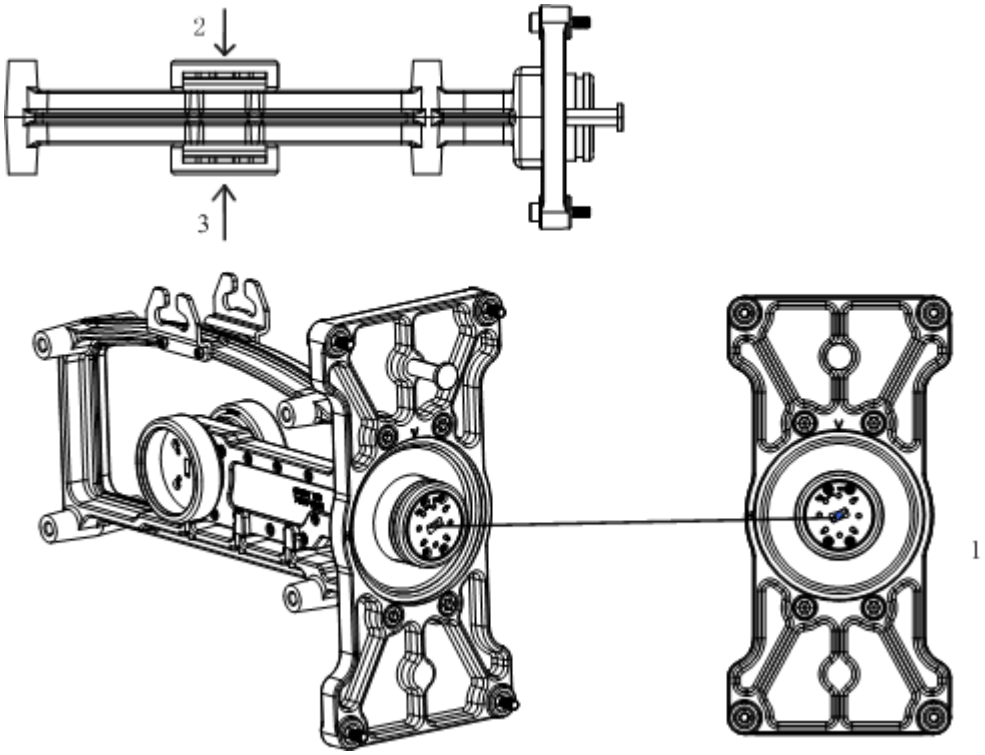


Table 2-2 describes the interfaces of the hybrid coupler.

Table 2-2 Interface description of the hybrid coupler

Serial No.	Interface Name	Interface Label	Function	Interface Type
1	Antenna interface	-	Used to connect with the antenna, antenna adapter, or flexible waveguide.	153IEC-R70, can be interconnected with the PDR70 (6 GHz frequency bands) 153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency bands) 153IEC-R100, can be interconnected with the PBR100 (10/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band)
2	Main tributary interface	MAIN	Used to connect with the main ODU.	

Serial No.	Interface Name	Interface Label	Function	Interface Type
3	Extension tributary interface	STANDBY	Used to connect with the standby ODU.	153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18 /23/26 GHz frequency bands) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency bands) UG 383/U-R400, can be interconnected with the UG 383/U-R400 (42 GHz frequency band)

2.6 Label

The label of the hybrid coupler is attached to the hybrid coupler and packing case to identify the basic information of the hybrid coupler.

Figure 2-3 shows the label of the hybrid coupler.

Figure 2-3 Label of the hybrid coupler

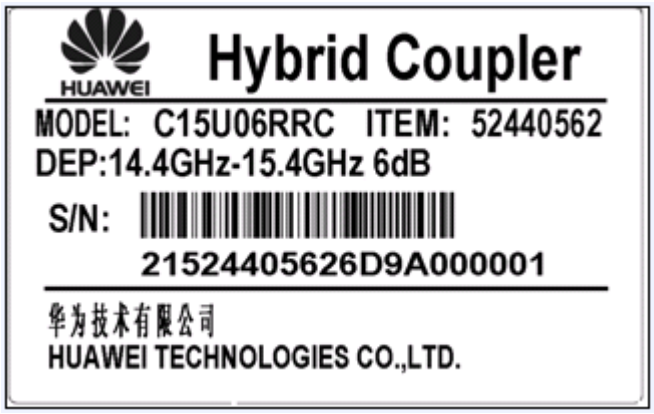


Table 2-3 describes the parameters on the label.

Table 2-3 Meaning of the hybrid coupler label

Label Information	Content of the Label	Parameter	Meaning
Hybrid coupler name	Hybrid Coupler	-	Indicates that the component is a hybrid coupler.
Hybrid coupler model	C 15 U 06 R R C ① ② ③ ④ ⑤ ⑥ ⑦	①: Component type	C indicates the hybrid coupler.
		②: Frequency band	Indicates the working frequency of the hybrid coupler (GHz). The Range of the working frequency is as follows: 6/07/10/11/13/15/18/23/26/28/32/38/42. **NOTE** 07 indicates that the working frequency of the hybrid coupler is 7 GHz or 8 GHz.
		③: Tributary features	B: Balanced U: Unbalanced
		④: Coupling	03 indicates that the coupling of the tributary is 3 dB. 06 indicates that the coupling of the tributary is 6 dB.
		⑤: Type of the antenna interface	C: Circle waveguide R: Rectangular waveguide

Label Information	Content of the Label	Parameter	Meaning
		⑥: Type of the ODU interface	C: Circle waveguide R: Rectangular waveguide
		⑦: Type of the installation interface	Matches with the RTN XMC ODU.
Hybrid coupler code (ITEM)	52440562	-	Used to uniquely identify the model of each hybrid coupler.
Hybrid coupler description (DEP)	14.4GHz-15.4GHz 6dB ① ②	①: Range of the working frequency	Indicates the range of the working frequency of the hybrid coupler. (GHz)
		②: Coupling	Coupling of the main and extension tributaries (dB)
Hybrid coupler serial number	21524405626D9A000001	-	Used to uniquely identify each hybrid coupler.
Bar code area		-	Bar code of the hybrid coupler serial number

2.7 Technical Specifications

The technical specifications of the hybrid coupler consist of the electrical specifications and mechanical specifications.

Table 2-4 lists the technical specifications of the hybrid coupler.

Table 2-4 Technical specifications of the hybrid coupler

	Frequency Band	Attenuation of the main path typical (dB)	Attenuation of the standby path typical (dB)	Minimum Isolation (dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
3 dB hybrid coupler	6 GHz	3.4	3.4	20	1.3	Can be interconnected with the PDR70
	7/8 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR84
	10GHz	3.8	3.8	20	1.3	Can be interconnected with the PBR100
	11 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR100
	13 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR120
	15 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR140
	18 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR220
	23 GHz	3.6	3.6	20	1.3	Can be interconnected with the PBR220
	26 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR220

	Frequency Band	Attenuation of the main path typical (dB)	Attenuation of the standby path typical (dB)	Minimum Isolation (dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
	28 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	32 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	38 GHz	3.9	3.9	20	1.4	Can be interconnected with the PBR320
	42 GHz	4.4	4.4	20	1.4	Can be interconnected with the UG383/U-R400
6 dB hybrid coupler	6 GHz	1.5	6.3	20	1.3	Can be interconnected with the PDR70
	7/8 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR84
	10GHz	1.9	7.0	20	1.3	Can be interconnected with the PBR100
	11 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR100
	13 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR120

	Frequency Band	Attenuation of the main path typical (dB)	Attenuation of the standby path typical (dB)	Minimum Isolation (dB)	Voltage Standing Wave Ratio (VSWR)	Interface Type
	15 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR140
	18 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR220
	23 GHz	1.7	6.5	20	1.3	Can be interconnected with the PBR220
	26 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR220
	28 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	32 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	38 GHz	1.9	7.5	20	1.4	Can be interconnected with the PBR320
	42 GHz	2.1	7.5	20	1.4	Can be interconnected with the UG383/U-R400

Table 2-5 lists the mechanical specifications of the hybrid coupler.

Table 2-5 Mechanical specifications of the hybrid coupler

Power capacity (W)	8
Dimensions (mm)	420 x 300 x 180 (width x depth x height)
Weight (kg)	≤ 5

3 OMT

About This Chapter

The orthogonal mode transducer (OMT) is the short name for the polarized hybrid coupler. The OMT is used when two ODUs with different polarization directions need to be installed on the same antenna.

NOTE

The OMT must be used by UHP S2D Antenna.

3.1 Functions and Features

The OMT separates V polarization from H polarization for RF signals.

- In the transmit direction, the OMT combines two ODU RF signals into one RF signal which is then transmitted to the antenna.
- In the receive direction, the OMT divides the RF signal received from the antenna into two RF signals which are then transmitted to the ODUs.

3.2 Working Principle

The OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity for dual-polarized waves, and combines/separates V-polarized waves and H-polarized waves with/from each other.

- In the transmit direction, the OMT performs conversion between a rectangular waveguide cavity and a round waveguide cavity, so that V/H-polarized waves separately from two rectangular waveguide cavities can be transmitted in the round waveguide cavity and then sent to free space by means of an antenna with a round waveguide interface.
- In the receive direction, the OMT receives V/H-polarized waves from the round waveguide interface of an antenna, separates V-polarized waves from H-polarized waves, and transmits the separated waves to appropriate rectangular waveguide cavities.

3.3 Interfaces

The OMT has three types of interfaces: antenna interface, V-polarized ODU interface, and H-polarized ODU interface.

- The antenna interface of the OMT is a round recessed waveguide interface.
- The ODU interface of the OMT is a rectangular protruding waveguide interface.

Figure 3-1 Interfaces of the Polarized Coupler

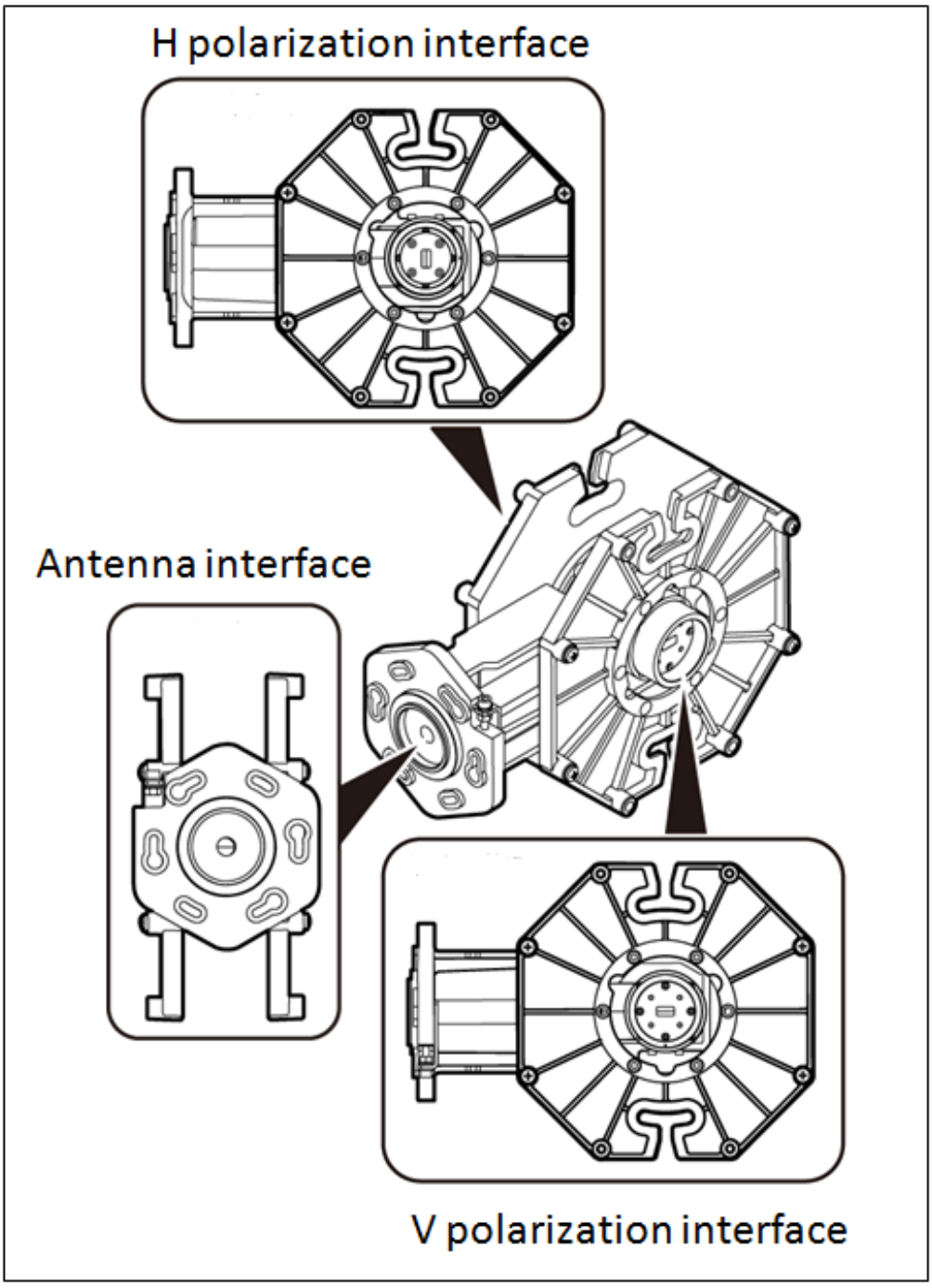


Table 3-1 Description of the interfaces of the OMT

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to the antenna.	153IEC-R84 (7/8 GHz frequency band)

Interface	Mark	Function	Type of Connector
V-polarized ODU interface	V	Connects to the V-polarized ODU.	153IEC-R100 (10/11 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32/38 GHz frequency band)
H-polarized ODU interface	H	Connects to the H-polarized ODU.	
NOTE In the dual polarized coupler, two V-polarized ODU interface and H-polarized ODU interface back up each other respectively.			

3.4 Technical Specifications

The technical specifications of the OMT include electrical and mechanical specifications.

Table 3-2 Electrical specifications of the OMT

	Frequency Band (GHz)	Frequency Range (GHz)	Maximum Loss (dB)	VSWR	Polarization Isolation (dB)
Polarized Coupler	7/8	7.125 to 8.5	0.6	1.3	35
	10	10.125 to 11.7	0.4	1.3	35
	11	10.7 to 11.7	0.6	1.3	35
	13	12.75 to 13.25	0.6	1.3	35
	15	14.4 to 15.35	0.6	1.3	35
	18	17.7 to 19.7	0.6	1.3	35
	23	21.2 to 23.6	0.6	1.3	35
	26	24.25 to 26.5	0.8	1.3	35
	28	27.5 to 29.5	0.8	1.3	35
	32	31.8 to 33.4	1	1.3	35
	38	37.0 to 40.0	1	1.3	35

Table 3-3 Mechanical specifications of the OMT

	Parameter	Value
Polarized Coupler	Dimensions	≤360 mm x 269 mm x 450mm (W x D x H)
	Weight (kg)	≤5.8

4 Dual-Polarized Coupler

About This Chapter

A dual-polarized coupler helps install four ODUs directly on one dual-polarized antenna.

4.1 Functions and Features

A dual-polarized coupler combines two channels of H-polarized or V-polarized RF signals into one channel and combines the channel of H-polarized RF signals with the channel of V-polarized RF signals.

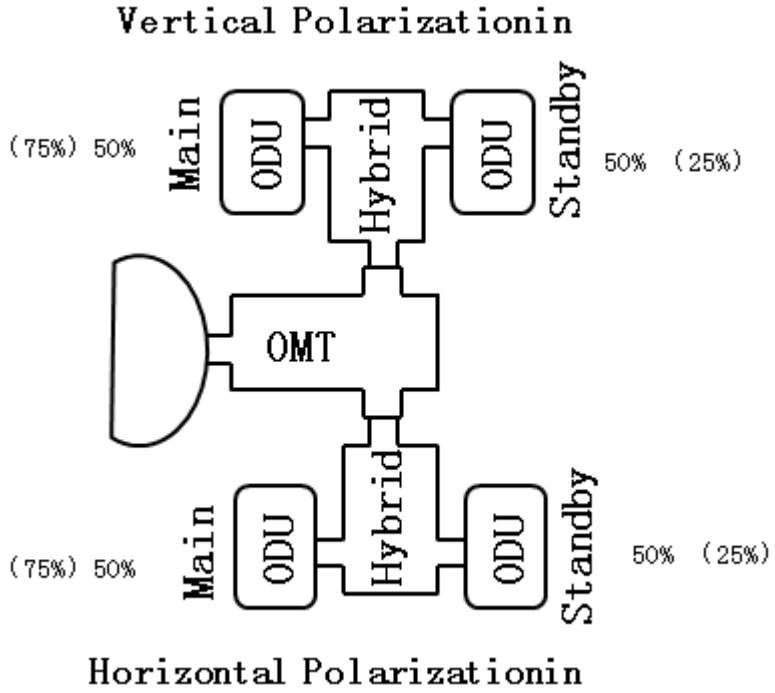
- In the transmit direction, a dual-polarized coupler combines two channels of H-polarized RF signals received from two H-polarized ODUs into one channel and two channels of V-polarized RF signals received from two V-polarized ODUs into one channel, then combines the channel of H-polarized RF signals with the channel of V-polarized RF signals, and finally sends the combined signals to an antenna.
- In the receive direction, a dual-polarized coupler splits the signals received from an antenna into H-polarized RF signals and V-polarized RF signals, splits the H-polarized RF signals into two channels and sends the two channels of signals to two H-polarized ODUs, and splits the V-polarized RF signals into two channels and sends the two channels of signals to two V-polarized ODUs.

4.2 Working Principle

A dual-polarized coupler has five ports and comprises an orthogonal mode transducer (OMT) and two hybrid couplers.

The OMT combines H-polarized and V-polarized waves into dual-polarized waves in transmission direct, and splits dual-polarized waves into H-polarized and V-polarized waves in receive direct, by performing conversion between a rectangular waveguide cavity and a round waveguide cavity. Either hybrid coupler combines/splits H- or V-polarized signals using the coupler in the rectangular waveguide. **Figure 4-1** illustrates the working principle of a dual-polarized coupler.

Figure 4-1 Working principle of a dual-polarized coupler



4.3 Interfaces

The Dual Polarized Coupler has three types of interfaces: antenna interface, V-polarized ODU interface, and H-polarized ODU interface.

- The antenna interface of the Dual Polarized Coupler is a round recessed waveguide interface.
- The ODU interface of the Dual Polarized Coupler is a rectangular protruding waveguide interface.

NOTE

Take waterproof and dustproof measures when the ODU interface is not used.

Figure 4-2 Interfaces of the Dual Polarized Coupler

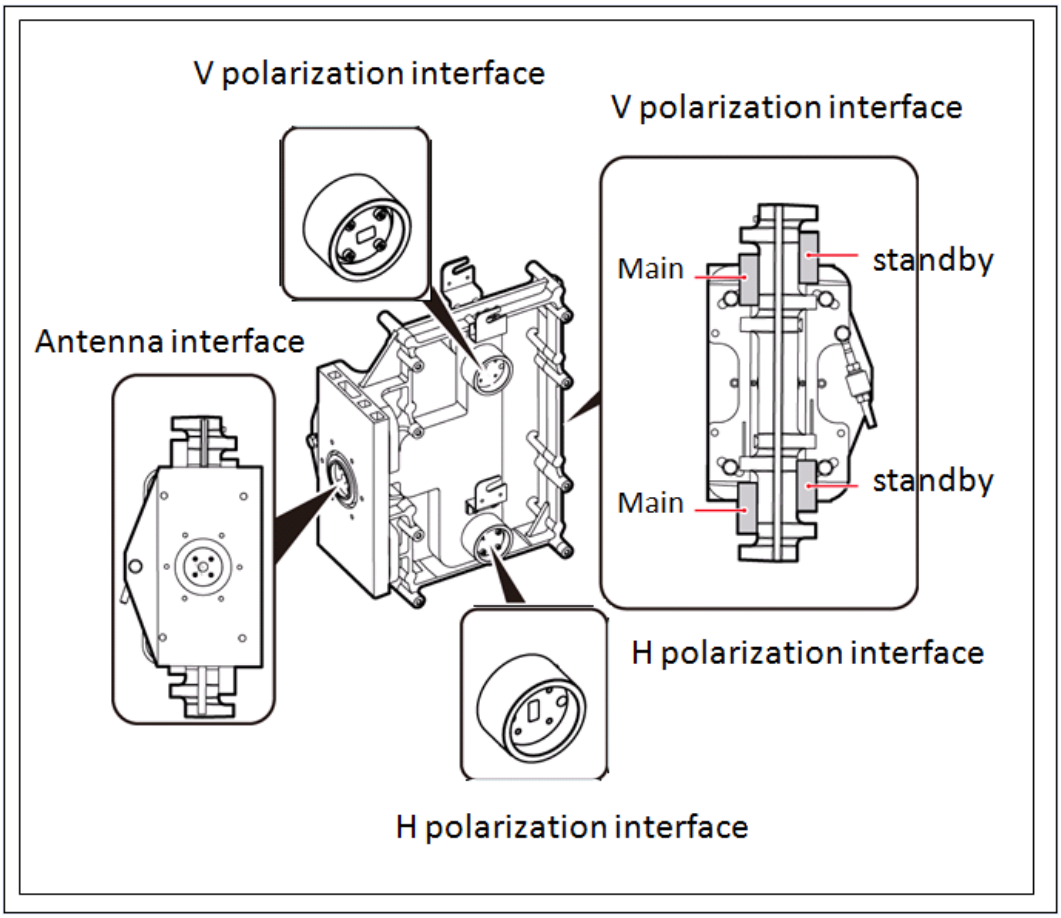


Table 4-1 Description of the interfaces of the Dual Polarized Coupler

Interface	Mark	Function	Type of Connector
Antenna interface	-	Connects to the antenna.	153IEC-R84 (7/8 GHz frequency band) 153IEC-R100 (10/11 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32/38 GHz frequency band)
Main tributary interface of V-polarized	Main.V	Connects to the main ODU of V-polarized.	
Extension tributary interface of V-polarized	STB.V	Connects to the standby ODU of V-polarized.	
Main tributary interface of H-polarized	Main.H	Connects to the main ODU of H-polarized.	

Interface	Mark	Function	Type of Connector
Extension tributary interface of H-polarized	STB.H	Connects to the standby ODU of H-polarized.	

4.4 Technical Specifications

The technical specifications of the Dual Polarized Coupler include electrical and mechanical specifications.

Table 4-2 Electrical specifications of the Dual Polarized Coupler

	Frequency Band (GHz)	Frequency Range (GHz)	6dB series		3dB series		VSWR	Polarization Isolation (dB)	Coupling Isolation(dB)
			Loss of the main tributary (dB)	Loss of the extension tributary (dB)	Loss of the main tributary (dB)	Loss of the extension tributary (dB)			
Dual Polarized Coupler	7/8	7.125 to 8.5	2.0 ±0.3	6.8 ±0.5	3.7 ±0.5	3.7 ±0.5	1.3	35	20
	10	10.125 to 11.7	2.0 ±0.3	6.8 ±0.5	3.7 ±0.5	3.7 ±0.5	1.3	35	20
	11	10.7 to 11.7	2.0 ±0.3	6.8 ±0.5	3.7 ±0.5	3.7 ±0.5	1.3	35	20
	13	12.7 to 13.3	2.0 ±0.3	6.8 ±0.5	3.7 ±0.5	3.7 ±0.5	1.3	35	20
	15	14.4 to 15.4	2.2 ±0.3	6.8 ±0.5	3.7 ±0.5	3.7 ±0.5	1.3	35	20
	18	17.7 to 19.7	2.2 ±0.3	7.0 ±0.5	3.9 ±0.5	3.9 ±0.5	1.3	35	20
	23	21.2 to 23.6	2.2 ±0.3	7.0 ±0.5	3.9 ±0.5	3.9 ±0.5	1.3	35	20
	26	24.25 to 26.5	2.2 ±0.3	7.0 ±0.5	3.9 ±0.5	3.9 ±0.5	1.4	35	20
	28	27.5 to 29.5	2.4 ±0.3	7.7 ±0.5	4.2 ±0.5	4.2 ±0.5	1.4	35	20
	32	31.8 to 33.4	2.4 ±0.3	7.7 ±0.5	4.2 ±0.5	4.2 ±0.5	1.4	35	20

	Frequency Band (GHz)	Frequency Range (GHz)	6dB series		3dB series		VSWR	Polarization Isolation (dB)	Coupling Isolation(dB)
			Loss of the main tributary (dB)	Loss of the extension tributary (dB)	Loss of the main tributary (dB)	Loss of the extension tributary (dB)			
	38	37.0 to 40.0	2.4 ±0.3	7.7 ±0.5	4.2 ±0.5	4.2 ±0.5	1.4	35	20

Table 4-3 Mechanical specifications of the Dual Polarized Coupler

	Parameter	Value
Dual Polarized Coupler	Dimensions	≤240mm×500mm×410mm (W x D x H)
	Weight (kg)	≤12.9

5 Separate Mounting Components

About This Chapter

The separate mounting components consist of the ODU separate mounting bracket and flexible waveguide. The separate mounting components described in this document are the separate mounting components adaptive to the RTN XMC ODUs.

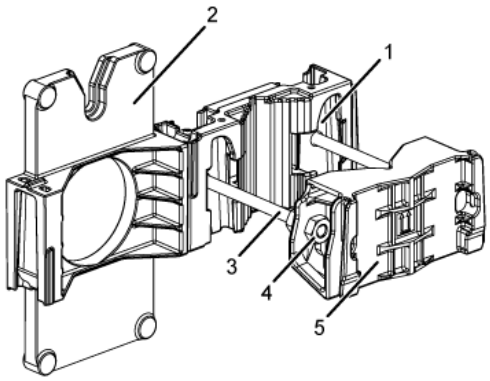
5.1 ODU Separate Mounting Bracket

When the ODU or hybrid coupler is installed with the antenna separately, the ODU separate mounting bracket can be used to fix the ODU or hybrid coupler on the pole.

Appearance

Figure 5-1 shows the appearance of the ODU separate mounting bracket.

Figure 5-1 Appearance of the ODU separate mounting bracket



1. Main bracket 2. Transfer component 3. Long bolt 4. Dual-port nut 5. Auxiliary bracket

The ODU separate mounting bracket can be used to secure an ODU to a pole with a diameter of 51 mm to 114 mm.

The main bracket is used together with the auxiliary bracket, long bolt, and dual-port nut to fix the whole bracket on the pole. The ODU and hybrid coupler can be installed on the transfer component. The transfer component is connected with the main bracket in clamping mode.

5.2 Flexible Waveguide

A flexible waveguide is rectangular. It is used to connect the flange interface of the ODU or hybrid coupler with the flange interface of the antenna.

Appearance

Figure 5-2 shows the appearance of the flexible waveguide.

Figure 5-2 Appearance of the flexible waveguide

Technical Specifications

Table 5-1 lists the technical specifications of the flexible waveguide.

Table 5-1 Technical specifications of the flexible waveguide

Frequency Band	Length(m)	Maximum Attenuation (dB)	Maximum twist degree (°)	Minimum E-bend radius (mm)	Minimum H-bend radius (mm)	Minimum Voltage Standing Wave Ratio	Interface (Antenna side)	Interface (ODU/hybrid coupler side)
6 GHz	0.9/1.2/1.8	0.2/0.3/0.4	195	102	204	1.1	PDR70	PDR70
7/8GHz	0.9/1.2/1.8	0.3/0.4/0.6	240/320/480	76	152	1.1	PBR84	PBR84
10GHz	0.6/0.9/1.2/1.8	0.24/0.4/0.5/0.8	280	64	127	1.1	PBR100	PBR100
11GHz	0.6/0.9/1.2/1.8	0.24/0.4/0.5/0.8	190/280/380/560	64	127	1.1	PBR100	PBR100
15GHz	0.6/0.9	0.4/0.8	270/405	52	102	1.1	PBR140	PBR140

Frequency Band	Length(m)	Maximum Attenuation (dB)	Maximum twist degree (°)	Minimum E-bend radius (mm)	Minimum H-bend radius (mm)	Minimum Voltage Standing Wave Ratio	Interface (Antenna side)	Interface (ODU/hybrid coupler side)
18/23/26GHz	0.6/0.9	0.75/1.2	310/465	38	76	1.2	PBR220	PBR220
28/32/38GHz	0.6/0.9	1.2/1.8	310/465	38	76	1.2	PBR320	PBR320
42GHz	0.6/0.9	2.1/2.4	530	26	52	1.4	UG383/U-R400	UG383/U-R400

6 Antennas

About This Chapter

The microwave device uses the parabolic antennas to transmit and receive electromagnetic waves. The antennas described in this document are the parabolic antennas adaptive to the RTN XMC ODUs.

6.1 Device Type

Antennas are classified into two types, namely, the single-polarized antenna and dual-polarized antenna.

- The single-polarized antenna transmits or receives electromagnetic waves in a specific polarization direction. The single-polarized antenna provides a feed boom interface. The feed boom interface can be set to be vertically polarized or horizontally polarized.

  According to the mode of installing the ODU on the antenna, the single-polarized antenna is classified into two types, namely, the direct mounting mode and separate mounting mode. The single-polarized antenna with the diameter less than or equal to 1.8 m supports the direct mounting mode and separate mounting mode. The single-polarized antenna with the diameter greater than 1.8 m supports the separate mounting mode.

  Figure 6-1 and **Figure 6-2** show the feed booms of the single-polarized antennas.

  Figure 6-1 Feed boom of the single-polarized antenna with the diameter less than or equal to 1.8 m

Figure 6-2 Feed boom of the single-polarized antenna with the diameter greater than 1.8 m

- The dual-polarized antenna transmits and receives horizontally-polarized and vertically-polarized electromagnetic waves at the same time. According to the mode of installing the ODU to the antenna, the dual-polarized antenna is classified into two types, namely, direct-mount antenna and separate-mount antenna.

  Figure 6-3 and **Figure 6-4** show the feed booms of the separate-mount dual-polarized antenna and the direct-mount dual-polarized antenna.

Figure 6-3 Feed boom of the separate-mount dual-polarized antenna

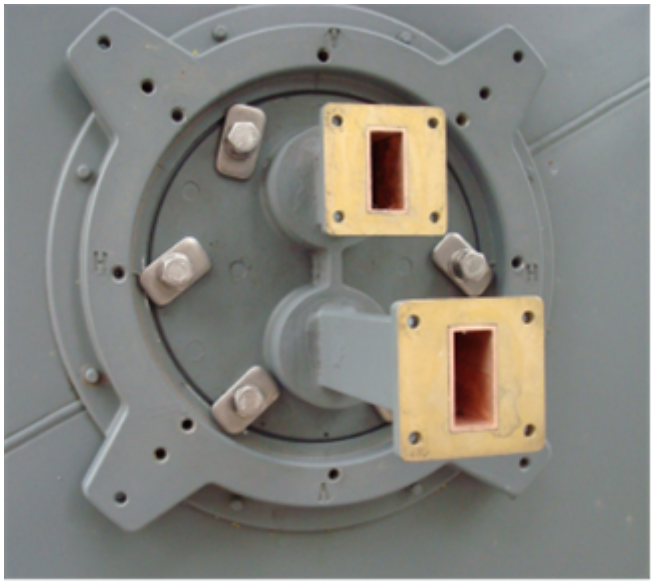
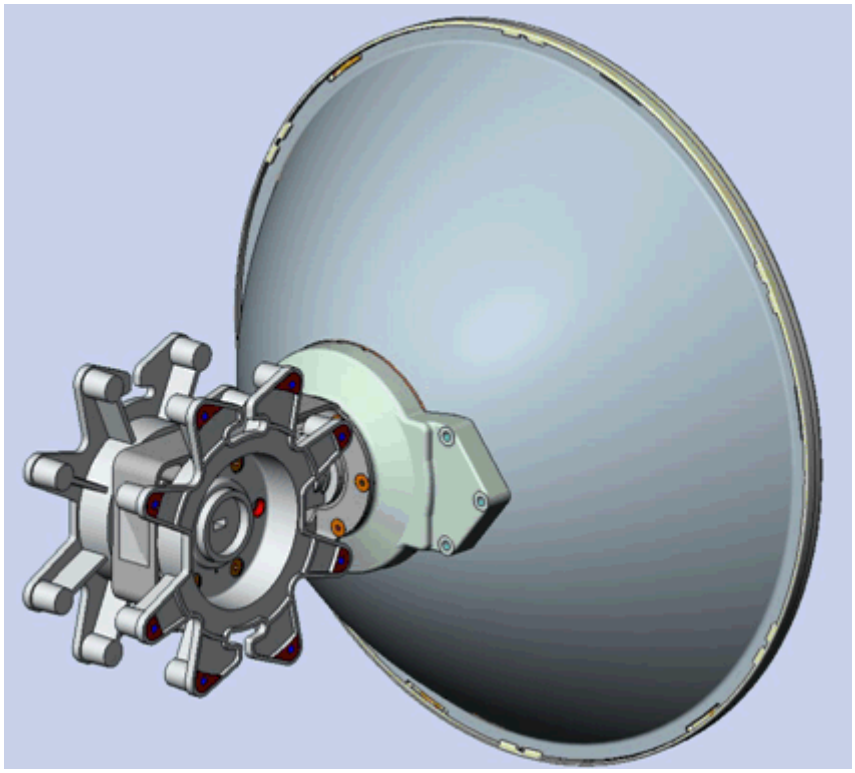


Figure 6-4 Feed boom of the direct-mount dual-polarized antenna



- The UHP S2D antenna is a multi-function antenna. It has the following functions:
  - A single-polarized antenna is used by default, which can be transformed to a dual-polarized antenna installed in direct-mounting mode.
  - If a single-polarized antenna is transformed to a dual-polarized antenna, the OMT or dual-polarized combiner can be used to allow multiple ODUs to be installed in direct-mounting mode. In this way, the configuration of **XPIC/1+1** or ACAP/CCDP 4+0 can be achieved.

6.2 Functions

The microwave antenna is used to convert between the RF signals transmitted from the ODU and electromagnetic waves radiated in the air.

- In the TX direction, the antenna converts the RF signals transmitted from the ODU into directional electromagnetic waves and then radiates electromagnetic waves in the air.
- In the RX direction, the antenna receives and assembles electromagnetic waves from the air, converts electromagnetic waves into the RF signals, and then transmits the RF signals to the ODU.

6.3 Working Principles

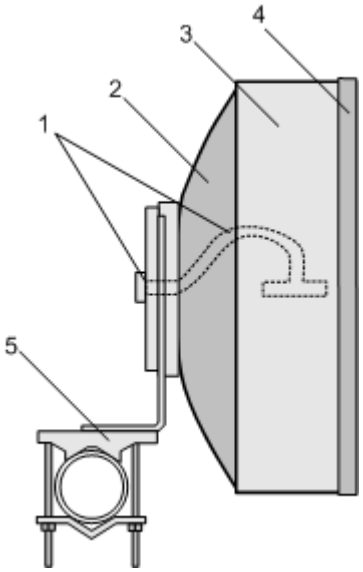
The antenna consists of the reflector, feed boom, radome, shield, and mounting bracket.

Figure 6-5 shows the structure of the antenna.

NOTE

This section takes the single-polarized antenna as an example to describe the working principles of antennas. The dual-polarized antenna has two feed boom interfaces and thus can transmit and receive electromagnetic waves in the vertical and horizontal polarization directions at the same time. The working principles of each component of the dual-polarized antenna are similar to the working principles of each component of the single-polarized antenna.

Figure 6-5 Structure of the antenna



1. Feed boom
2. Reflector
3. Shield
4. Radome
5. Mounting bracket

The functions of each component of the antenna are described as follows:

- Feed boom

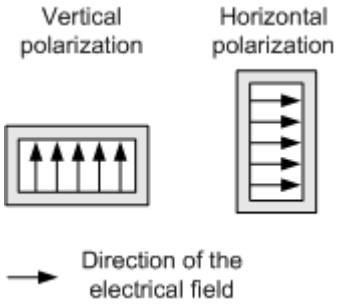
  The input interface of the feed boom receives the RF signals transmitted from the ODU. The received RF signals are transmitted through the waveguide to the output interface of the feed boom, which is located at the focal spot of the reflector. The output interface of the feed boom is equivalent to a preliminary horn antenna. It radiates electromagnetic waves towards the antenna reflector.

  You can change the polarization direction of the antenna by rotating the feed boom. The polarization direction of the antenna is the polarization of electromagnetic waves radiated by the antenna. The polarization direction of electromagnetic waves is the direction of the electrical field. **Figure 6-6** shows the polarization directions supported by the rectangular waveguide.

  NOTE

  The polarization direction of the antenna must be the same as the polarization direction of the ODU or hybrid coupler. The feed booms of certain types use the round waveguide. In this case, see installation instructions of the antenna to adjust the polarization direction of the antenna according to the polarization identifier.

Figure 6-6 Polarization directions supported by the rectangular waveguide



- Reflector

  Normally, the reflector of the microwave antenna is a rotatable paraboloid. The reflector is mainly used for reflecting electromagnetic waves and providing the directive gain.

  - In the TX direction, the reflector reflects electromagnetic waves radiated from the feed boom so that electromagnetic waves are directional.
  - In the RX direction, the reflector reflects electromagnetic waves received from a wider space, and then assembles electromagnetic waves to the output interface of the feed boom.

- Radome

  The radome protects the antenna from damages caused by the wind, rain, and ice. Electromagnetic waves can be radiated through the radome.

- Shield

  The shield is installed on the HP antenna. The shield is mainly used for suppressing the radiation of the side lobes.

- Mounting bracket

  The mounting bracket is used for fixing the antenna onto the pole and for adjusting the azimuth and elevation slightly. In addition to the mounting bracket, a reinforcing rod is required for fixing the antenna with a larger diameter. For details, see the instructions for the antenna.

6.4 Interfaces

The feed boom interface of the single-polarized antenna in direct mounting mode is a waveguide interface. The feed boom interfaces of the single-polarized antenna in separate mounting mode and of the dual-polarized antenna are flange interfaces.

Table 6-1 lists the specifications for the feed boom interface of the antenna adaptive to the XMC ODU.

Table 6-1 Specifications for the feed boom interface of an antenna

Frequency Band	Interface Type			
	Direct-Mount Single-Polarized Antenna	Direct-Mount Dual-Polarized Antenna	Separate-mount Single-Polarized Antenna	Separate-mount Dual-Polarized Antenna
6 GHz	153IEC-R70, can be interconnected with the PDR70	153IEC-R70	154IEC-PDR70	154IEC-PDR70
7/8 GHz	153IEC-R84, can be interconnected with the PBR84	153IEC-R84	154IEC-UBR84	154IEC-UBR84
10/11 GHz	153IEC-R100, can be interconnected with the PBR100	153IEC-R100	154IEC-UBR100	154IEC-UBR100
13 GHz	153IEC-R120, can be interconnected with the PBR120	153IEC-R120	154IEC-UBR120	154IEC-UBR120
15 GHz	153IEC-R140, can be interconnected with the PBR140	153IEC-R140	NA	154IEC-UBR140
18/23/26 GHz	153IEC-R220, can be interconnected with the PBR220	153IEC-R220	NA	154IEC-UBR220
28/32/38 GHz	154IEC-R320, can be interconnected with the PBR320	153IEC-R320	NA	154IEC-UBR320
42 GHz	UG 383/U-R400, can be interconnected with the UG 383/U-R400	UG383	NA	UG383

6.5 Antenna Diameters

The antenna diameters vary according to the antenna type and the frequency band where the antenna operates.

Table 6-2 and **Table 6-3** list the diameters supported by different types of antennas. "Y" indicates that the corresponding antenna diameter is supported. "NA" indicates that the corresponding antenna diameter is not supported.

Table 6-2 Diameter of the single-polarized antenna

Frequency Band	Antenna Diameter									
	0.2 m	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
6 GHz	NA	NA	NA	Y	Y	Y	Y	Y	Y	Y
7/8 GHz	NA	NA	Y	Y	Y	Y	Y	Y	Y	Y
10/11GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
13 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA
15 GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
18 GHz	NA	Y	Y	Y	Y	Y	Y	NA	NA	NA
23 GHz	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA
26 GHz	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA
28 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA
32 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA
38 GHz	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA
42 GHz	NA	Y	Y	NA	NA	NA	NA	NA	NA	NA

Table 6-3 Diameter of the separate-mount dual-polarized antenna

Frequency Band	Antenna Diameter								
	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
6 GHz	NA	NA	NA	Y	Y	Y	Y	Y	Y
7/8 GHz	NA	Y	Y	Y	Y	Y	Y	Y	Y
10GHz	NA	Y	Y	Y	Y	Y	NA	NA	NA
11GHz	NA	Y	Y	Y	Y	Y	Y	Y	NA
13 GHz	NA	Y	Y	NA	Y	Y	Y	Y	Y
15 GHz	NA	Y	Y	NA	Y	Y	NA	NA	NA
18 GHz	NA	Y	Y	NA	Y	Y	NA	NA	NA
23 GHz	NA	Y	Y	NA	Y	Y	NA	NA	NA
26 GHz	Y	Y	Y	NA	Y	NA	NA	NA	NA
28 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA

Frequency Band	Antenna Diameter								
	0.3 m	0.6 m	0.9 m	1.0 m	1.2 m	1.8 m	2.4 m	3.0 m	3.7 m
32 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA
38 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA
42 GHz	Y	Y	NA	NA	NA	NA	NA	NA	NA

Table 6-4 Diameter of the direct-mount dual-polarized antenna

Frequency Band	Antenna Diameter					
	0.3 m	0.6 m	0.9 m	1 m	1.2 m	1.8 m
6 GHz	NA	NA	NA	NA	NA	NA
7/8 GHz	NA	Y	Y	Y	Y	Y
10GHz	NA	Y	Y	Y	Y	Y
11GHz	NA	Y	Y	Y	Y	Y
13 GHz	Y	Y	Y	Y	Y	Y
15 GHz	Y	Y	Y	Y	Y	Y
18 GHz	Y	Y	Y	Y	Y	Y
23 GHz	Y	Y	Y	Y	Y	Y
26 GHz	Y	Y	Y	Y	Y	NA
28 GHz	Y	Y	NA	NA	NA	NA
32 GHz	Y	Y	NA	NA	NA	NA
38 GHz	Y	Y	NA	NA	NA	NA
42 GHz	NA	NA	NA	NA	NA	NA

6.6 Technical Specifications

The technical specifications of the antenna include the electrical indexes and mechanical indexes. The electrical indexes of the antenna include the antenna gain, half-power beamwidth, VSWR, and front-to-back ratio. The mechanical indexes of the antenna include the size, weight, wind-protective feature, and ice/snow-protective feature.

Huawei provides a complete series of antennas. To obtain the technical documents about the specifications of a specific antenna, contact Huawei.

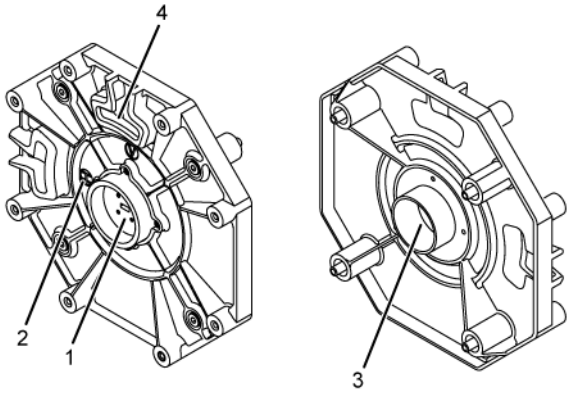
7 Antenna Adapter

This describes the antenna adapter. In direct mounting mode, the antenna adapter is used for transfer if the antenna does not adaptive to the RTN XMC ODU.

Appearance and Interfaces

Figure 7-1 shows the appearance and interfaces of the antenna adapter.

Figure 7-1 Appearance and interfaces of the antenna adapter



1. Interface on the ODU/ hybrid coupler side 2. Polarization identifier 3. Interface on the antenna side 4. Guide trough

Technical Specifications

Table 7-1 lists the technical specifications of the antenna adapter.

Table 7-1 Technical specifications of the antenna adapter

Item	Specification
Loss	≤ 0.2 dB (7/8/10/11/13/15/18/23/26/28/32/38/42 GHz frequency band)

Item		Specification
Voltage Standing Wave Ratio (VSWR)		≤ 1.3 (7/8/10/11/13/15/18/23/26/28/32/38/42 GHz frequency band)
Interfaces	Antenna side	1.025 inch dia circular (7/8 GHz frequency band) 153IEC-R100 (10/11 GHz frequency band) 153IEC-R120 (13 GHz frequency band) 153IEC-R140 (15 GHz frequency band) 153IEC-R220 (18/23/26 GHz frequency band) 153IEC-R320 (28/32 GHz frequency band) 0.219 inch dia Circular (38 GHz frequency band) UG 383/U-R400 (42 GHz frequency band)
	ODU/hybrid coupler side	153IEC-R84, can be interconnected with the PBR84 (7/8 GHz frequency band) 153IEC-R100, can be interconnected with the PBR100 (10/11 GHz frequency band) 153IEC-R120, can be interconnected with the PBR120 (13 GHz frequency band) 153IEC-R140, can be interconnected with the PBR140 (15 GHz frequency band) 153IEC-R220, can be interconnected with the PBR220 (18/23/26 GHz frequency band) 153IEC-R320, can be interconnected with the PBR320 (28/32/38 GHz frequency band) UG 383/U-R400, can be interconnected with the UG 383/U-R400 (42 GHz frequency band)
Weight		≤ 2.5 kg

Labels

The following labels are attached to the antenna adapter: nameplate label, and bar code. These labels are used to identify the basic information of the antenna adapter.

- Nameplate Label

  Figure 7-2 shows the nameplate label of the antenna adapter.

Figure 7-2 Nameplate label of the antenna adapter

Table 7-2 describes the meanings of the parameters on the nameplate label.

Table 7-2 Meanings of the parameters on the nameplate label

Label Information	Content of the Label	Parameter	Meaning
Antenna adapter name	15G Antenna adapter ① ②	①: Frequency band	Working frequency of the antenna adapter: 7/8/10/11/13/15/18/23/26/32/38/42 (GHz)
		②: Component name	Indicates that the component is an antenna adapter
Antenna adapter code (ITEM)	21211379	-	Used to identify the type of the antenna adapter

- Bar Code

  Table 7-3 shows the bar code of the antenna adapter and describes the meanings of the label.

Table 7-3 Bar code

Name	Appearance	Meaning
Bar code		Bar code of the antenna adapter serial number, which is used to uniquely identify each antenna adapter

8 Cables

About This Chapter

This describes the cables of the ODU. The cables of the ODU which consist of the IF cable and ODU PGND cable.

8.1 IF Cable
The IF cable is used to connect the ODU with the IDU and transmits the IF signals O&M signals and -48 V power between the ODU and the IDU.

8.2 PGND Cable of the ODU
The ODU PGND cable is used to connect the grounding screw of the ODU to the outdoor ground point such as the ground point on the tower so that the ODU can be connected to the outdoor grounding grid.

8.1 IF Cable

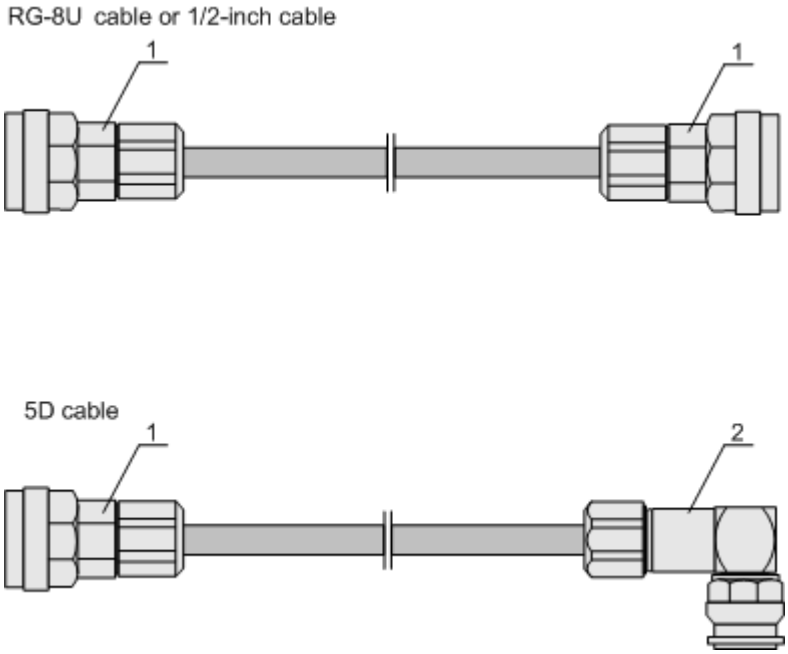
The IF cable is used to connect the ODU with the IDU and transmits the IF signals O&M signals and -48 V power between the ODU and the IDU.

The IF cable can be categorized into three types: 5D cable, RG-8U cable, and 1/2-inch cable.

- If the distance between the IDU and the ODU is shorter than 120 m, the 5D cable is used. The 5D cable has an N-type connector at one end connected to the IF interface of the ODU and a TNC connector at the other end connected to the IF interface of the IDU.
- If the distance between the IDU and the ODU is from 120 m to 180 m, the RG-8U cable is used. The RG-8U cable has an N-type connector at each end. One end is connected to the IF interface of the ODU and the other end is connected with the IF jumper of the IDU.
- If the distance between the IDU and the ODU is from 180 m to 300 m, the 1/2-inch cable is used. The 1/2-inch cable has an N-type connector at each end. One end is connected to the IF interface of the ODU and the other end is connected with the IF jumper of the IDU.

Cable Diagram

Figure 8-1 Diagram of the IF cable



1. RF coaxial cable connector, N-type, male
2. RF coaxial cable connector, TNC-type, male

Cable Connection Table

None.

Technical Specifications

Table 8-1 Performance of the IF cable

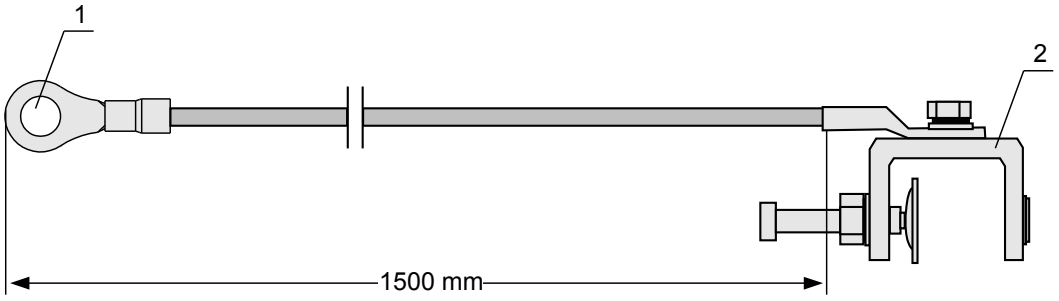
Item	Performance		
	5D Cable	RG-8U Cable	1/2-Inch Cable
Characteristic impedance (ohm)	50	50	50
Attenuation (dB/100 m)	⩽ 10.0 (140 MHz) ⩽ 15.0 (350 MHz)	⩽ 6.0 (140 MHz) ⩽ 9.0 (350 MHz)	⩽ 5.0 (140 MHz) ⩽ 7.8 (350 MHz)
DC resistance (ohm/km at 20°C)	⩽11.0	⩽4.9	⩽4.3
Outside diameter of the cable (mm)	7.60	10.16	13.40

8.2 PGND Cable of the ODU

The ODU PGND cable is used to connect the grounding screw of the ODU to the outdoor ground point such as the ground point on the tower so that the ODU can be connected to the outdoor grounding grid.

Cable Diagram

Figure 8-2 Diagram of the ODU protection ground cable



1. Naked crimping connector (OT type) 2. Grounding bar

Cable Connection Table

None.