



Operator Logo

ZXSDR R8881 Product Description

UR13



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Version	Date	Author	Reviewer	Notes
V1.00	2014-05-30	Yang Lisha	Chen Yong, Yang Xu	First release, information of GSM, UMTS dual-mode are all included

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TABLE OF CONTENTS

1	Overview	5
1.1	Introduction	5
1.2	Benefits.....	5
1.3	Application Scenarios	6
2	Product Architecture.....	7
2.1	Physical Structure	7
2.2	Hardware Structure.....	7
2.2.1	Transceiver (RTR)	8
2.2.2	Power Amplifier (PA).....	10
2.2.3	Duplexer (DFL)	10
2.2.4	Power Supply (PWR)	11
2.2.5	Lightning Protection Module (PIB).....	11
2.3	External Interfaces	11
2.4	Software Architecture.....	13
2.5	Functionality.....	14
3	Technical Specifications.....	15
3.1	Physical Indices	15
3.2	Performance Indices	16
3.2.1	Operation Frequency Band	16
3.2.2	Capacity.....	16
3.2.3	Receiver Sensitivity.....	16
3.2.4	TOC Output Power	17
3.3	Power Indices	17
3.3.1	Power Supply.....	17
3.3.2	Power Consumption.....	17
3.4	Transmission	18
3.5	Working Environment.....	18
3.6	Electromagnetic Compatibility	18
3.7	Reliability	19
4	Installation	19
5	Configurations.....	20
6	Warning and Note.....	20
7	Abbreviation	21

FIGURES

Figure 1-1	R8881 Physical Structure	5
Figure 2-1	R8881 System Structure.....	7
Figure 2-2	R8881 External Interfaces	12
Figure 2-3	SDR BTS Software Structure.....	13

TABLES

Table 2-1	R8881 Modules.....	7
Table 2-2	R8881 External Interfaces Description	12
Table 3-1	R8881 80W Physical Indices.....	15
Table 3-2	R8881 80W Operation Frequency Band	16
Table 3-3	R8881 80W Capacity	16
Table 3-4	R8881 Static Receiver Sensitivity	16
Table 3-5	R8881 TOC Output Power	17
Table 3-6	R8881 Power Supply	17
Table 3-7	R8881 80W Power Consumption in UMTS Single Mode.....	17
Table 3-8	R8881 80W Power Consumption in GSM Single Mode.....	17
Table 3-9	R8881 80W Power Consumption in G/U Dual-Mode.....	18
Table 3-10	R8881 CPRI Interfaces	18
Table 3-11	R8881 Environment Condition Compatibility	18
Table 3-12	R8881 Reliability Characteristics.....	19

1 Overview

1.1 Introduction

With the multi-mode era coming, ZTE, who is dedicated to providing comprehensive network solutions and delivering the future-oriented quality network for the operators, developed the ground breaking SDR unified platform with the essential feature to support multi-mode and multi-band radio access.

Based on this innovative SDR platform, ZTE promotes a series of products to satisfy different scenario requirements, including the indoor macro, outdoor macro, distributed, outdoor micro, mini and pico base station. In this document, R8881 is introduced.

ZTE ZXSDR R8881 (hereinafter referred to as R8881) is a distributed Remote Radio Unit (RRU) used in ZTE Uni-RAN solution, with 1-way transmitting and 2-way receiving. R8881 80W works in GSM or UMTS single mode or multi-mode.

Figure 1-1 R8881 Physical Structure



1.2 Benefits

R8881 is one of the most widely used remote radio units in ZTE SDR base station series. The following part lists the key benefits for operators.

- **High performance**

To meet with the growing demands for wide working bandwidth, R8881 modules with full working bandwidth are released. Maximum working bandwidth of R8881 is 75MHz for 1800M band and 35MHz for 900M band. For frequency spectrums become scarce, resources allocated for operators tend to be characterized with fragmentation and large span. RRUs with full working bandwidth integrate more spectrum resources and help to decrease hardware investment exponentially. (This is the maximum bandwidth of the RF modules. Please make the actual module as the standard.)

- **Clearer and simpler network**

R8881 supports GSM, UMTS, or mixed technologies. Instead of running hardware on independent platforms for each technology, operators can implement various wireless technologies in software on the same hardware platform.

Since hardware platforms can be reused, there is significantly less investment risk for deploying hardware. Wireless technologies are developing so fast, and investing on one technology may bring risks to operators. SDR-based solutions will decrease the investment risk since SDR platform can support various technologies.

- **High PA Efficiency, Low Power Consumption**

The PA of R8881 achieves high efficiency with ZTE patent Doherty, Digital Pre-Distortion (DPD) and Dynamic Power Trace (D-PT) technologies. The PA power supply voltage is dynamically adapted to the output power, reducing RU's power consumption.

1.3 Application Scenarios

The R8881s and one base band unit (BBU) form a complete BTS/NodeB. It implements radio transmission in the covered area, controls radio channels and communicates with the Base Station Controller (BSC/RNC). It supports indoor and outdoor applications.

2 Product Architecture

2.1 Physical Structure

R8881 is the SDR based multi-carrier remote RF unit (RRU). It has one transmitter. R8881 80W is 370mm*320mm*170mm (H*W*D) in dimension and 18 kg in weight.

2.2 Hardware Structure

R8881 consists of transceiver (RTR), power amplifier (PA), duplexer (DFL), power (PWR) and lightning protection module (PIB), as introduced below. The hardware structure of R8881 is shown below.

Figure 2-1 R8881 System Structure

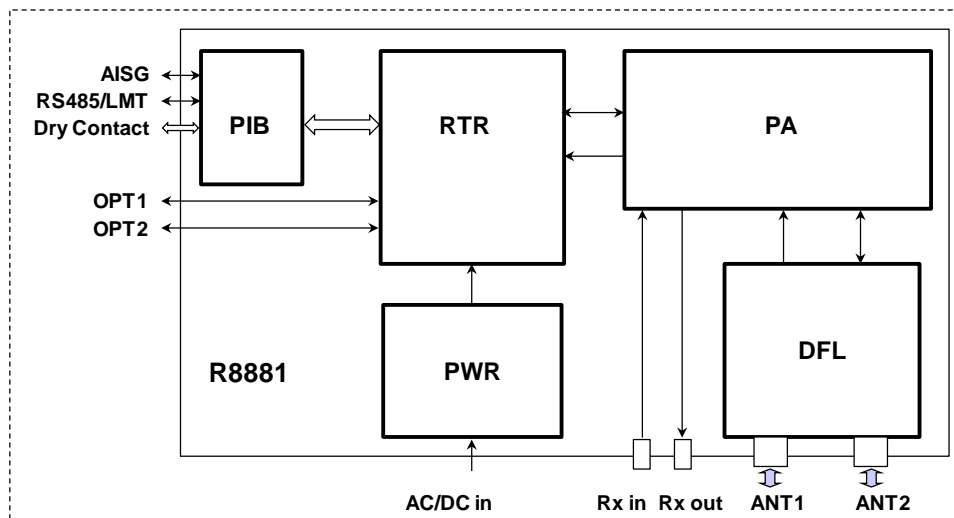


Table 2-1 R8881 Modules

Code	Function
RTR	Receives and transmits the signals of panel interfaces, digital intermediate frequency and RF, and controls clock, power and power amplification.
PA	Amplifies downlink RF signals and outputs them to the duplexer.

Code	Function
DFL	Consists of a duplexer, filter and their own low-noise amplifier subsystems. It can receive diversities.
PWR	Provides EMC protection for the power interface, monitoring interface, and the AISG interface.
PIB	Provides lightning protection for the AISG, RS485 and dry contacts

2.2.1 Transceiver (RTR)

- Optical interface processing function
 - Supports RRU cascading.
 - Exchanges IQ data with the baseband resource pool.
 - Implements message interaction such as management, maintenance and signaling.
- Clock processing function
 - Recovers clock for data on the optical interface to generate reference clock source.
 - Generates work clock based on the local reference clock of high-stability clock phase locked.
- Downlink processing function
 - Format conversion for downlink output IQ data
 - Downlink power calibration
 - Downlink peak clipping
 - Pre-distortion processing for downlink digits
 - Downlink single transfer channel
 - TCPW detection

- Uplink processing function
 - Format conversion for uplink output IQ data
 - Uplink power calibration
- RCPW detection function
- RF hopping function
- Rate adaptation modulation function
- Monitoring function
 - PA Forward power detection — when the forward power exceeds the power alarm threshold, the TRM reports an alarm and controls PA output by the signal of enabling PA output shutoff.
 - PA reverse power (SWR) detection — when the reverse power exceeds the SWR alarm threshold, the TRM reports an alarm and controls PA output by the signal of enabling PA output shutoff.
 - PA temperature detection — when the temperature exceeds the over-temperature alarm threshold, the TRM reports an alarm and controls PA output by the signal of enabling PA output shutoff.
 - Enabling PA output shutoff
- Transmit output power detection function
 - Power input under-voltage alarm detection and report
 - Power output under-voltage alarm detection and report
- System environment supervision function
- TCPW message report function
- RCPW message report function
- PLL unlocked alarm function

- CPRI self-detection alarm function
- Hardware configuration information for all RRU modules
- Indicator function
- Interfaces connecting with external equipment
 - Two CPRI
 - Four input dry contacts
 - One RS485 serial port, communicating with external monitoring equipment
 - One network port for local debugging
 - One AISG electrically - tuned antenna interface
 - Two interfaces for combining cabinets

2.2.2 Power Amplifier (PA)

- Amplifies downlink RF signals and outputs them to the duplexer.
- Provides a pre-distortion feedback interface for the RTR.
- Provides an SWR detection interface for the RTR.
- Provides a read-write interface for module asset management.
- Provides individual switch-off control.
- Detects the module internal temperature.

2.2.3 Duplexer (DFL)

- Lightning protection
- Receives diversities
- Expands ports for frequency points

2.2.4 Power Supply (PWR)

DC power supply:

- Converts voltage for the system power supply
- Provides the lightning protection for -48 V power supply
- Provides -48 V power filter

AC power supply:

- Converts voltage for the system power supply
- Supports 110V/220V AC power supply

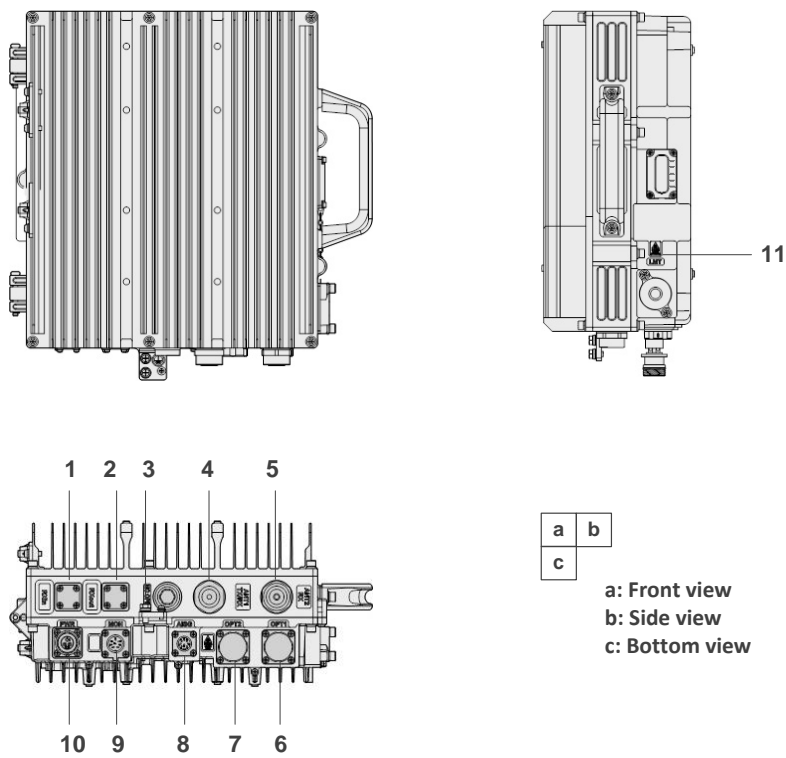
2.2.5 Lightning Protection Module (PIB)

- Provides lightning protection for the AISG, RS485 and dry contacts

2.3 External Interfaces

R8881's external interfaces are located at the bottom and side, as shown in the following figure.

Figure 2-2 R8881 External Interfaces



The interfaces are described in the following table.

Table 2-2 R8881 External Interfaces Description

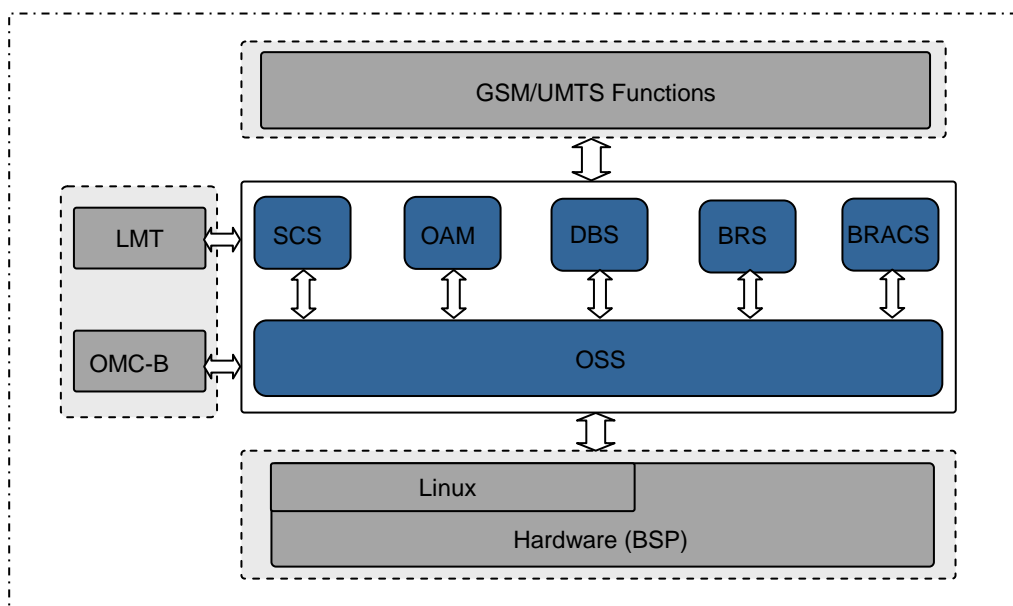
S.N.	Label	Interface	Interface Type/Connector
1	RXin	Combined cabinet interface	N-mode connector
2	RXout	Combined cabinet interface	N-mode connector
3	GND	Protection ground interface	16 mm ² yellow/green round terminal
4	ANT1 (TX/RX)	Transmit/receive antenna feeder interface	50Ω DIN-mode Connector
5	ANT2 (RX)	Receive antenna feeder interface	50Ω DIN-mode Connector

6	OPT1	BBU and RRU Interfaces/RRU cascading interface	LC-mode optical interface (IEC 874)
7	OPT2	RRU cascading interface	LC-mode optical interface (IEC 874)
8	AISG	AISG equipment interface	8-pin circle connector (IEC 60130-9-ED) (female)
9	MON	External monitoring interface	8-pin circle connector (male)
10	PWR	Power input interface	DC: 2-pin round connector (pin) AC: 3-pin round connector (pin)
11	LMT	O&M Ethernet interface	8P8C angle socket, PCB shielded welding, LED phone (LED indicators: yellow for left indicator and green for right indicator)

2.4 Software Architecture

The software system of R8881 can be divided into operating support layer and application layer.

Figure 2-3 SDR BTS Software Structure



The operating support layer provides the functions of OSS, while OAM, DBS, BRS, BRACS and SCS serve different BTS modes.

- Operating and Maintenance (OAM) provides the configuration, alarm and performance measurement function.
- Database Sub-system (DBS) is the database system.
- Bearer Sub-system (BRS) processes the protocol stack.
- Bearer Access Control Sub-system (BRACS) controls the access to bear layer.
- System Control Sub-system (SCS) controls the power supplying and active/standby switching.

Operation Support Sub-system (OSS) is the support layer in this entire framework, which is a hardware platform for running software and provides basic functions like scheduling, timer, memory management, communication, sequencing control, monitoring, alarming and logging.

Board Support Package (BSP) is the software closely connected with the board hardware and supports Real Time Operation Support Sub-system (RT OSS) to work on the board.

2.5 Functionality

R8881 supports functionalities as follows.

- Supports multi-band of 850M/900M/1800M/1900M/2100MHz/AWS.
- Supports the configuration of 5MHz/4.8MHz/4.6MHz/4.4MHz/4.2MHz channel interval for UMTS carrier.
- Supports the configuration of 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz scalable bandwidth.
- Supports one way transmitting and two-way receiving.

- R8881 80W supports GSM, UMTS single mode or GSM/UMTS dual-mode.
- Supports combination of two R8881 units to achieve same receiving sensitivity without adding antenna.
- Supports RTWP report interval at 100ms and 2ms.
- Supports transmit power reporting function for every carrier.
- Supports over loading protection function for power amplifier.
- Supports measurement, compensation and adjustment function for channel delay.
- Supports dynamic PA voltage adjustment to achieve best efficiency in different system loads.
- Supports transmitting channel switching on/off function.
- Supports built-in lightning protection function for DC power supply.

3 Technical Specifications

3.1 Physical Indices

R8881 employs the compact design, whose physical indices are listed below.

Table 3-1 R8881 80W Physical Indices

Item	Index
Dimension (H*W*D)	370 mm * 320 mm * 170 mm
Weight	18 Kg
Color	Silver gray

3.2 Performance Indices

3.2.1 Operation Frequency Band

Table 3-2 R8881 80W Operation Frequency Band

Mode	RRU Frequency Spectrum (MHz)
GSM single mode	850/900/1800/1900
UMTS single mode	850/900/1900/2100
G/U dual-mode	850/900/1900

3.2.2 Capacity

Table 3-3 R8881 80W Capacity

Mode	Capacity
GSM single mode	6 TRXs
UMTS single mode	4 CSs
G/U dual-mode	4 GSM TRXs + 1 UMTS carriers, or 2 GSM TRXs + 2 UMTS carriers

3.2.3 Receiver Sensitivity

The receiver sensitivity of R8881 is shown as following table:

Table 3-4 R8881 Static Receiver Sensitivity

Mode	Frequency Spectrum(MHz)	Single Antenna (dBm)	Dual Antennas (dBm)	Four Antennas (dBm)
GSM	900/1800	-113.5	-115.5	N/A
UMTS	2100	-126.5	-129.2	N/A
	900	-126.4	-129.1	N/A

3.2.4 TOC Output Power

Table 3-5 R8881 TOC Output Power

Mode	TOC Output Power
R8881	80W

Note: When “ZGO-04-01-011 Power Boost for 8PSK” is applied in GSM mode, the TOC output power achieves the same in 8PSK modulation as in GMSK.

3.3 Power Indices

3.3.1 Power Supply

Table 3-6 R8881 Power Supply

RRU Type	Index
R8881 80W	DC: -48 V (-37 V – -60 V DC) AC: 220 V / 110 V (90 V – 290 V AC)

3.3.2 Power Consumption

Table 3-7 R8881 80W Power Consumption in UMTS Single Mode

Item	Power Consumption (W)	
	Average	Peak
2C/TOC 40W (900MHz)	130	175
2C/TOC 40W (2100MHz)	125	180

Table 3-8 R8881 80W Power Consumption in GSM Single Mode

Item	Power Consumption (W)	
	Average	Peak
900MHz S6/TOC 80W	185	305
1800MHz S6/TOC 80W	190	310

Table 3-9 R8881 80W Power Consumption in G/U Dual-Mode

Item	Power Consumption (W)	
	Average	Peak
900MHz 4G1U/ TOC 15W/TRX+20W/Carrier	205	305

3.4 Transmission

R8881 is connected to BBU through CPRI interfaces.

Table 3-10 R8881 CPRI Interfaces

Item	Value	Interface Type	Speed
CPRI interface	2	SFP (LC)	1.25Gbps

3.5 Working Environment

Table 3-11 R8881 Environment Condition Compatibility

Item	Index
Temperature	-40 – +55 °C
Relative humidity	5% – 95%
Waterproof/dustproof	IP65
Ground	$\leq 5 \Omega$; earth resistance can be less than 10 Ω in thunder-less area where there less than 20 thunderstorm days per year.
Storage	Indoor pack deposited
	Temperature: -40 °C – 70 °C
	Relative Humidity: 5% – 100%

3.6 Electromagnetic Compatibility

YD/T 1595.2-2007

ETSI EN 301 489-01, ETSI EN 301 489-23

ETSI EN 300 386–V1.3.2

(CISPR22) Class B

Directive 1999/5/EC (R&TTE)

3.7 Reliability

Table 3-12 R8881 Reliability Characteristics

Item	Index
MTBF	DC: ≥554,000 hours AC: ≥540,000 hours
MTTR	1 hour
Availability index	DC: ≥99.999819% AC: ≥99.999815%
Down duration	DC: ≤0.949 min/year AC: ≤0.973 min/year

4 Installation

R8881 is easy to be deployed.

- It is portable to transport and flexible to install on the pole, tower and against wall.
- Only fibers, power cables, RF cable antennas and AISG cables need to be connected.
- It suits any weather condition with water resistance and dust proof case, which reaches IP65.

5 Configurations

R8881 80W can be configured in GSM single mode, UMTS single mode or GSM/UMTS dual-mod through software. One R8881 supports one cell and three R8881 modules form one three-sector site.

6 Warning and Note

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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 radiofrequency 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.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 10m between the radiator & your body.

7 Abbreviation

Abbreviation	Full Name
3GPP	3 rd Generation Partnership Project
BBU	Base Band processing Unit
BRACS	Barrier Access Control Sub-system
BRS	Barrier Sub-system
BSP	Board Support Package
CAPEX	Capital Expenditure
CPRI	Common Public Radio Interface
DBS	Data Base Sub-system
DL	Downlink
DSP	Digital Signal Processing/Processor
DTX	Discontinuous transmission
GSM	Global System for Mobile communications
HSPA	High Speed Packet Access
LMT	Local Maintenance Terminal
MIMO	Multi Input Multi Output
MTBF	Mean Time Between Failures
MTTR	Mean Time To Recovery
OAM	Operating And Maintenance
OPEX	Operation Expenditure
OSS	Operation Support Sub-system
PLL	Phase Locked Loop
RCPW	Received Carrier Power

RF	Radio Frequency
RRU	Remote Radio Unit
RTWP	Received Total Wideband Power
SCS	System Control Sub-system
SDR	Software Defined Radio
TCPW	Transmitted Carrier Power
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network