



# **ZXSDR B8200 Product Description**

**UR12**

**Section 13.2.1.1**





## ZXSDR B8200 Product Description

Version	Date	Author	Reviewer	Notes
V1.0	2013	ZTE		

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# 1 Product 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.

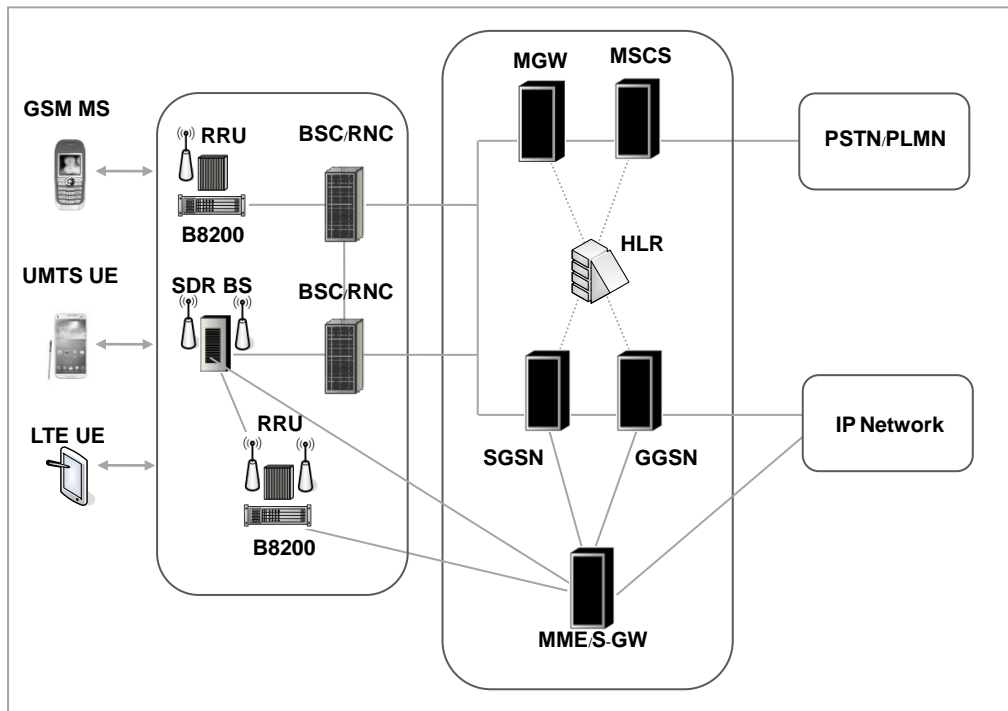
Based on this innovative SDR platform, ZTE promotes a series of base stations to satisfy different scenario requirements, including the Indoor macro, outdoor macro, distributed, outdoor micro, mini and pico base station.

These SDR based series base stations aim to design a unified network which can bring seamless experience to operators. In GSM, UMTS, LTE or mixed mode, it enables operators to make significant CAPEX and OPEX savings because they only need to deploy one Uni-Radio Access Network, compared to the costs involved with independent GSM, UMTS or LTE networks.

This document introduces baseband processing unit (BBU) ZXSDR B8200 (hereafter B8200) used in ZTE SDR base station series. The description includes its key benefits, hardware and software architecture, functionality and major technical indices.

The networking diagram of B8200 is shown below

Figure 1-1 ZTE SDR BS Composed GSM/UMTS/LTE Network with B8200



## 1.2 Benefits

- **Multi-Mode Baseband Unit**

B8200 supports all kinds of wireless access technologies simultaneously, including GSM, UMTS, CDMA, WiMAX and LTE, which share the common control function and transmission. It fully satisfies operators' need with the minimum hardware change of dedicated baseband processing boards.

- **Large Capacity**

With large capacity of baseband processing boards for different system, one set of B8200 supports up to 120 GSM TRXs, 48 UMTS carriers, or 900Mbps DL / 450Mbps UL for LTE system. B8200 system capacity can be further increased with baseband pooling function.

- **Plug-in Design for Shelf, Zero Footprint, Convenient Deployment**



With plug-in design, light weight and standard 19-inch width, B8200 can be conveniently mounted against the wall, on the ground, or in the 19-inch rack, etc.

- Flexible Networking

B8200 provides GE/FE interfaces and IP networking.

It also supports flexible radio unit networking modes, like star and chain connection to satisfy different requirements of operators in various scenarios.

- Shared Baseband Resources, Dynamic Traffic Adjustment

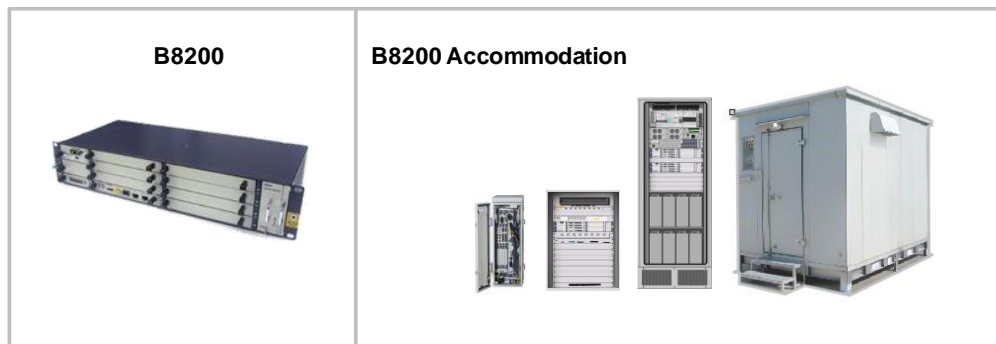
It is suitable for dynamic traffic transferring or outburst areas, such as CBD, uptown or sightseeing spots, avoiding resources waste.

## 1.3 Application Scenarios

B8200 and radio unit comprise one complete base station. For different scenarios, indoor or outdoor, large capacity or small capacity, there is always a most appropriate accommodation solution for B8200, e.g. macro indoor cabinet, outdoor cabinet or compact cabinet. With the standard 19-inch width design, B8200 can be mounted against the wall, on the ground, or in the existing 19-inch rack from the third party, if there is no enough space for another BBU cabinet in the equipment room.

Typical BBU accommodations are shown in the following figure:

Figure 1-2 ZXSDR BS8200 Accommodation

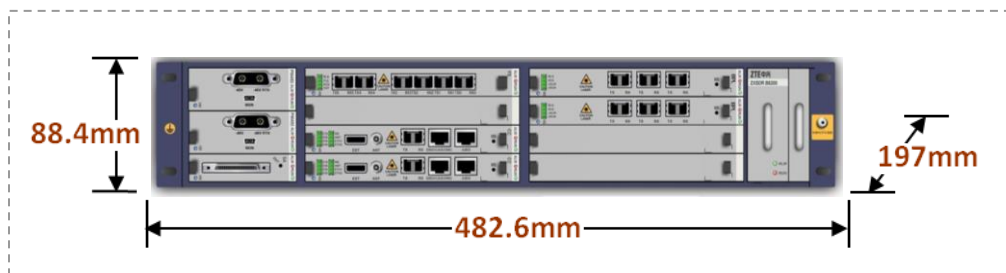


## 2 Product Architecture

### 2.1 Physical Structure

Physical structure of B8200 is shown below.

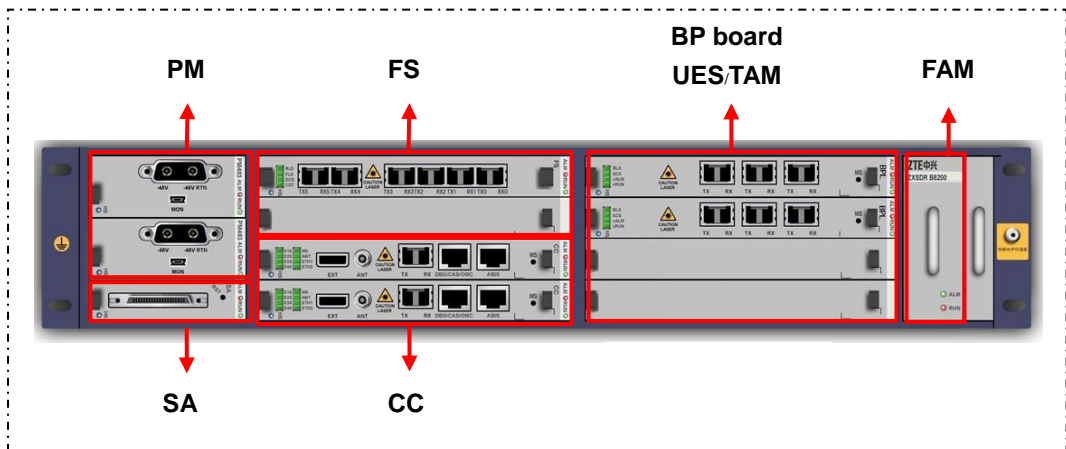
Figure 2-1 ZXSDR B8200 Physical Structure



### 2.2 Hardware Architecture

The baseband unit is named ZXSDR B8200 which can be inserted into integrated macro base station or be separated from RRU in distributed base station. It is responsible for baseband signal processing.

Figure 2-2 ZXSDR B8200 Board Indication



The baseband unit consists of control & clock board, fabric switch board, baseband processing board, site alarm board, site alarm extension board (optional), universal Ethernet switch (optional), Tower mounted Amplifier control Module (optional), power module, and fan module.

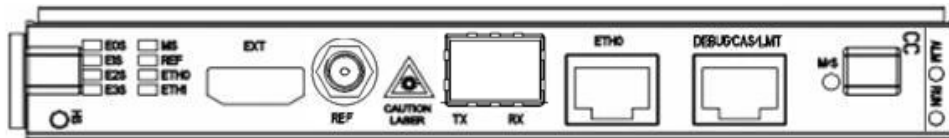
Table 2-1 Board List of ZXSDR B8200

Board Name		Function Description
CC		Control & Clock Board
FS		Fabric Switch Board
Baseband Processing Board	UBPG/UBPG2/ UBPG3	Universal Baseband Processing board for GSM
	BPK_e/BPK_e1/ BPK_d	Base band Processing board for UMTS
	BPL/BPL1	Base band Processing for LTE
Site Alarm Board	SA/SE	Site Alarm Board
UES		Universal Ethernet Switch Board
TAM		Tower mounted Amplifier control Module
PM		Power Module
FAM		FAN Module

### 2.2.1 Control & Clock Board (CC)

CC is control & clock board, used for control and management of baseband unit, providing Ethernet and system clock. The CC panel is illustrated in Figure 2-3.

Figure 2-3 CC Panel



Description of CC panel interfaces is shown in the following table.

Table 2-2 CC Panel Interfaces

Interface Name	Description
ETH0	Ethernet interface between BTS and BSC/RNC/EPC, self-adaptive 10M/100M/1000M electrical interface.
ETH1	Ethernet interface used for cascading, debugging or local maintenance, self-adaptive electrical interface of 10M/100M/1000M.
TX/RX	Ethernet interface between BTS and BSC/RNC/EPC, self-adaptive 100M/1000M Ethernet optical interface.
EXT	External communication port, connected to external receiver (Mainly RJ485 interface).
REF	Connected to GPS signal interface, or 2 MHz BITS signal interface.

The CC board provides the following functions:

- Supports Ethernet switching function, and implements data switching for service and control flow within the system
- Processes Abis/Iub/S1/X2 interface protocol
- Manages software versions of boards and programmable components, and supports local and remote software upgrade

- Reads various hardware management marks in the system, including the rack number, backplane type number, slot number, board function type, board version, and board function configuration mark
- Monitors, controls and maintains the base station system with LMT interface
- Supervises the running status of each board within the system
- Supports primary/slave switchover
- Synchronizes with various external reference clocks, including the Abis/lub interface recovery clock, the GPS clock, Synchronous Ethernet clock and the clock provided by BITS; The CC can select one according to the actual configuration
- Generates and delivers the clock signal demanded by each part
- Provides GPS receiver interface and manages the GPS receiver
- Provides a real-time clock for system operation and maintenance and calibrates the real-time clock
- Supports MicroTCA protocol based module management function

### 2.2.2 Fabric Switch Board (FS)

FS is fabric switch board which provide baseband optical interface between BBU and radio unit and process the IQ signal. FS panel is illustrated in Figure 2-4.

Figure 2-4 FS Panel

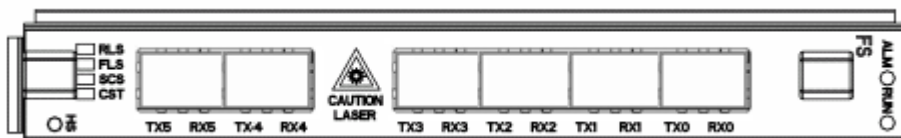


Table 2-3 FS Panel Interfaces

Interface Name	Description
----------------	-------------

Interface Name	Description
TX0 RX0-TX5 RX5	6 pairs optical/electrical interfaces, connected to radio unit

It provides the following functions:

- Receives the signal from the rear board in the downlink and retrieves the data and timing.
- Multiplexes the received data and retrieves I/Q signal
- Supports I/Q mapping in the downlink and multiplexes I/Q signal to the optical signals
- Receives the I/Q in uplink and de-multiplexes/maps into I/Q signal
- Transmits the multiplexed I/Q signal to baseband processing board
- Exchanges the CPU interface signaling through HDLC interface with RU module

### 2.2.3 Baseband Processing Board

There are 3 categories of baseband processing boards in order to meet different application requirements:

#### 1. **UBPG/UBPG2/UBPG3**

UBPG, UBPG2 and UBPG3 are all **GSM baseband processing boards**, processing the physical layer protocol and frame protocol specified by 3GPP. Compared to UBPG, UBPG2 has 3 CPRI interfaces used for radio unit and UBPG3 has twice capacity of UBPG.

UBPG/UBPG3 panel is illustrated in the following figure.

Figure 2-5 UBPG/UBPG3 Panel



UBPG2 panel is illustrated in the following figure.

Figure 2-6 UBPG2 Panel

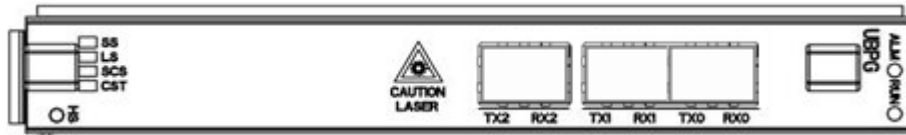


Table 2-4 UBPG2 Panel Interfaces

Interface Name	Description
TX0 RX0 - TX2 RX2	3 pairs of optical/electrical interfaces that connect with radio units.

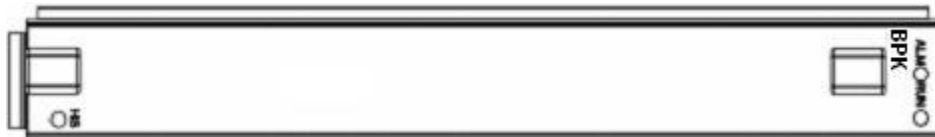
UBPG/UBPG2/UBPG3 has the following functions:

- Supports rate adaptation, channel coding, interleaving, encryption, TDMA shock burst generation, GMSK/8PSK modulation, and IQ baseband digital signals output
- Supports uplink IQ data receiving, receiver diversity combination, digital demodulation (GMSK&8PSK, equilibrium), decryption, deinterleaving, demodulator, rate adaptation, and transmits signals from GE Ethernet interfaces to CC board for processing
- Synchronizes radio link and processes transmission frame
- Measures parameters required in power control and handover
- Supports diversified transmission and receiving
- Communicates with CC via Ethernet interface
- Reads all the hardware management identifiers, including the backplane type number, slot number, board function type, board version, board function configuration identifier, and the CPU serial number

2. **BPK\_e/BPK\_e1/BPK\_d**

BPK\_e1, BPK\_e and BPK\_d are **all UMTS baseband processing boards**, processing the physical layer protocol and frame protocol specified by 3GPP. They provide the same functions but with different CE capability and data throughput. The panel is illustrated in the following figure.

Figure 2-7 BPK\_e1/BPK\_e/BPK\_d Panel



BPK\_e1/BPK\_e/BPK\_d provides the following functions:

- Achieves downlink baseband signal processing, including downlink data coding, multiplexing, rate adaptation, channel mapping, spread spectrum and scrambling power regulation and channel compositing
- Achieves uplink baseband signal processing, including uplink data RAKE receiving, demodulator, and transmits data to lub interface for processing
- Supports A-RAKE receiving and UL interface cancellation
- Supports radio link synchronization and Frame processing
- Measures parameters required in power control and handover
- Supports softer handover and carrier diversity
- Communicates with the CC via the Ethernet interface
- Reads all the hardware management identifiers, including the backplane type number, slot number, board function type, board version, board function configuration identifier, and the CPU serial number

### 3. **BPL/BPL1**

BPL and BPL1 are both **LTE baseband processing boards**, processing the physical layer protocol and frame protocol specified by 3GPP. BPL1 is the new generation board, with twice of the BPL capability.



One BPL can deal 3 cells with 20MHz LTE in 2\*2 MIMO (or any equivalent configuration in terms of throughput), and this configuration can match the requirements of most operators.

One BPL1 can support 6 cells with 20MHz in 2\*2 MIMO or 3 cells with 20MHz in 4\*4 MIMO. Concerning BBU's capability 3 BPL1 would be maximum configuration at present.

The functions of BPL/BPL1 are listed as follows:

- Processes physical layer protocol
- Provides uplink/downlink I/Q signal
- Supports MAC, RLC and PDCP protocol

\*UL = 2 channels Modulation (2Rx)  
 1 BPL1 = support 12 channels  
 1 sector (2x2) = 2 channels (6 sector/BPL1)  
 1 sector (4x4) = 4 channels (3 sector/BPL1)

Figure 2-8 BPL/BPL1 Panel



Table 2-5 BPL/BPL1 Panel Interfaces

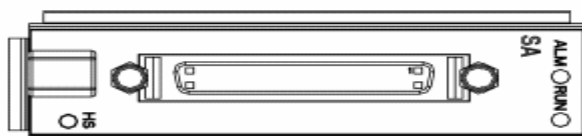
Board Type	Interface	Description
BPL	TX0 RX0 to TX2 RX2	3 pairs of 2.5Gbps (MIMO 2*2)/5.0Gbps (MIMO 4*4) CPRI optical/electrical interfaces, connected to radio unit
BPL1	TX0 RX0 to TX2 RX2	3 pairs of 6.144Gbps CPRI optical/electrical interfaces, connected to radio unit.

## 2.2.4 Site Alarm Board

### 1. Site Alarm Board (SA)

SA is a site alarm board, illustrated in the following figure.

Figure 2-9 SA Panel



Description of SA panel interface is shown in the following table.

Table 2-6 SA Panel Interfaces

Interface Name	Description
-	8 E1/T1 interfaces, 1 RS485, 1 RS232 interface, 6+2 dry contacts (6 input interfaces, 2 bidirectional interfaces)

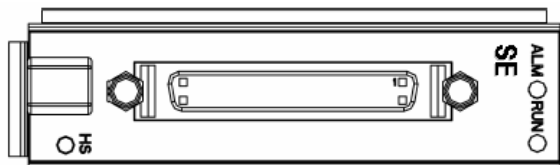
The SA has the following functions:

- Provides E1/T1 transmission interfaces for Abis/lub
- Provides site alarm monitoring interfaces
- Provides FAM's alarm and rate control
- Supports signal monitoring and interface lightning protection

## 2. Site alarm Extension Board (SE)

SE is site alarm extension board, and shares the bottom-right slot with Baseband processing board. It is used to extend the port number if SA cannot fulfill the requirements. There are two types of SE boards: one with 8 E1/T1 interfaces and 6+2 dry contacts and the other with 4 E1/T1 interfaces and 14+2 dry contacts. The SE panel is illustrated in the following figure.

Figure 2-10 SE Panel



Description of SE panel interfaces is shown in the following table.

Table 2-7 SE Panel Interfaces

Interface Name	Description
-	8 E1/T1 interfaces and 6+2 dry contacts (6 input interfaces, 2 bidirectional interfaces) Or 4 E1/T1 interfaces and 14+2 dry contacts (14 input interfaces, 2 bidirectional interfaces) 1 RS485 1 RS232 interface

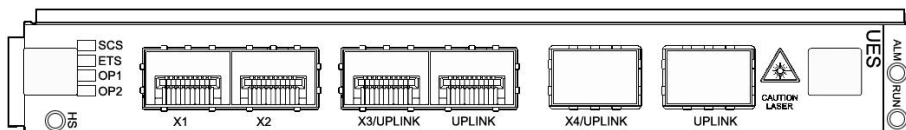
SE board can provide the following functions:

- Provides E1/T1 transmission interfaces for Abis/lub
- Provides site alarm monitoring interfaces

### 2.2.5 Universal Ethernet Switch Board (UES)

UES is used for synchronized Ethernet, and the panel is illustrated in the following figure.

Figure 2-11 UES Panel



Description of UES panel interfaces is shown in the table below:

Table 2-8 UES Panel Interfaces

Interface Name	Description
X1-X2	The electrical interfaces for <b>cascaded connection</b> .
X3/ULPINK	A compatible electrical interface for both cascaded connection and uplink connection for link aggregation.
UPLINK	An electrical or optical interface.
X4/UPLINK	A compatible optical interface for both cascaded connection and uplink connection for link aggregation.

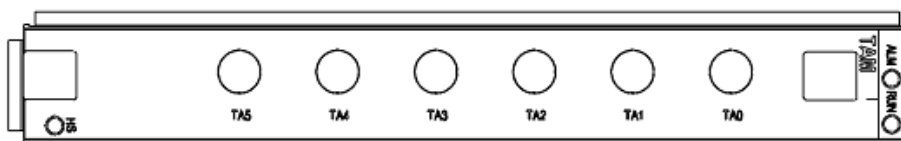
UES provides 6 Ethernet interface, including 4 electrical interfaces and 2 optical interfaces. It has the following functions:

- Supports L2 Ethernet switch
- Supports synchronous Ethernet clock

### 2.2.6 Tower mounted Amplifier control Module (TAM)

TAM is used for tower amplifier control when TMA is needed. Panel of TAM is shown as following figure.

Figure 2-12 TAM Panel



Description of the Interfaces on the TAM panel is shown in the table below.

Table 2-9 TAM Panel Interfaces

Interface Name	Description
TA0	DC output voltage channel 0
TA1	DC output voltage channel 1
TA2	DC output voltage channel 2

TA3	DC output voltage channel 3
TA4	DC output voltage channel 4
TA5	DC output voltage channel 5

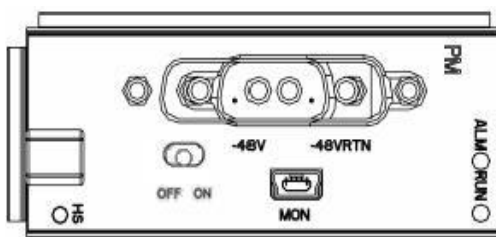
The board provides the following functions:

- Supports working status detection of tower amplifier and reports alarm signals to CC board
- Provides power on and off for tower amplifier with +28V, +12V or +13V power supply
- Realizes the communication with CC board
- Implements conversion, protection and filtering of power supply
- Provides anti-lightning for power supply circuit
- Implements software remote downloading and current threshold setting

### 2.2.7 Power Module (PM)

PM is power module, and PM panel is illustrated in the following figure.

Figure 2-13 PM Panel



Description of PM panel interface is shown in the following table.

Table 2-10 PM Panel Interfaces

Interface Name	Description
MON	Debugging interface, RS232 serial interface

-48V/-48VRTN	-48V input
ON/OFF	Power switch, turning on/off 12V power to/from BBU

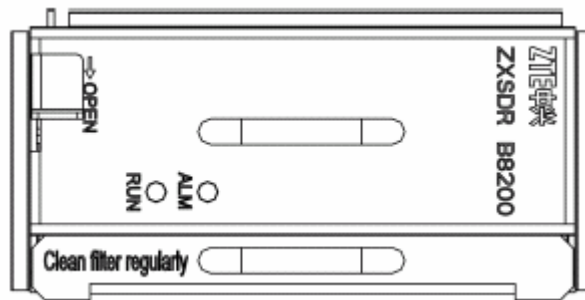
The PM has the following functions:

- 16 internal interfaces for +12 V load power
- 16 internal interfaces for +3.3 V management power
- EMMC management
- Measurement and protection of input over-voltage/under-voltage
- Output over-current protection and load power management

## 2.2.8 Fan Array Module (FAM)

FAM is fan array module which panel is illustrated in the following figure.

Figure 2-14 FAM Panel

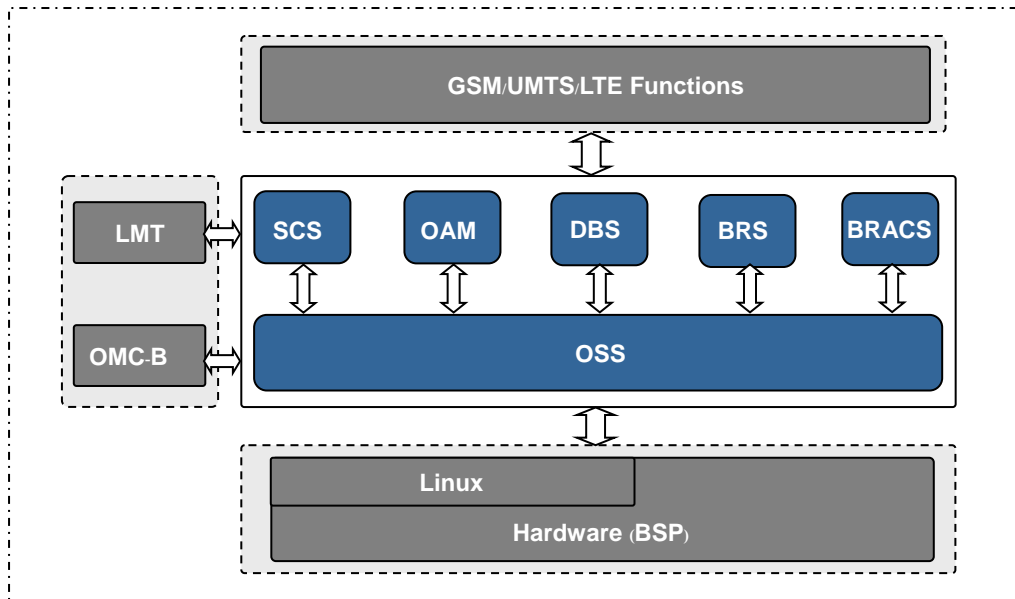


The main functions of FAM are as follows:

- System temperature monitor and control
- Monitor, control, and report of fan state

## 2.3 Software Architecture

The software system of R8700 can be divided into operating support layer and application layer.



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

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

OSS (Operation Support Sub-system) 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.

## 2.4 Functionality

ZXSDR B8200 implements the following basic functions on Abis/lub/S1/X2 and O&M interfaces:

- Channel coding and decoding
- Channel multiplexing and de-multiplexing
- Baseband resource pooling
- Measurement and report
- Power control
- Spatial multiplexing, transmit diversity and receive diversity
- Synchronization
- Frequency hopping
- Operation and Maintenance
- DTX



### 3 Technical Specifications

#### 3.1 Physical Indices

Table 3-1 Physical Indices

Item	Indices
Size (H*W*D)(mm)	88.4*482.6*197
Weight (kg)	8.75

#### 3.2 Capacity

Table 3-2 ZXSDR B8200 Capacity

Item	Indices
Maximum Capacity	GSM: 120 TRXs
	UMTS: 48 CSs
	LTE: 12 20M 2*2 MIMO Cells or 6 20M 4*4 MIMO Cells (BPL1*2)
	G/U dual-mode: GSM 72 TRXs + UMTS 24 CSs (UBPG3*2+BPK_d*2)
	GSM 48 TRXs + UMTS 24 CSs + LTE 6 20M Cells (UBPG3*2+BPK_d*2+BPL1*1)
Maximum CE No.	3072 CEs UL/3072 CEs DL (BPK_d*3+BPK_e*2) 1920 CEs UL/1920 CEs DL (BPK_e*5)
Maximum Throughput	345 Mbps UL / 1000 Mbps DL* (BPK_e*5) 552 Mbps UL / 1000 Mbps DL* (BPK_d*3+BPK_e*2) 600 Mbps UL / 1000 Mbps DL* (BPL1*2)

\* Limited to the maximum data throughput 1000Mbps of CC board.

## 3.3 Power Indices

### 3.3.1 Power Supply

Table 3-3 Power supply indices

Modules	Input Power
B8200	DC: -48 V (-40 V ~ -57 V DC)

### 3.3.2 Power Consumption

Table 3-4 ZXSDR B8200 Power consumption

Items	Power Consumption (W)
B8200 12 TRXs/1 UBPG/UBPG2	70
B8200 24 TRXs/1 UBPG3	75
B8200 6CS/3 BPK_e/BPK_e1	85
B8200 12CS/1 BPK_d	105
B8200 3 cells BPL1	140

## 3.4 Interface Indices

Table 3-5 ZXSDR B8200 Interface Indices

Interface	Item	Index	Interface Type	Standard
	E1/T1	16 (8 pairs of optional)	DB44	ITU G.703/G.704
	Abis/Iub/S1/X2 Ethernet	1 (10M/100M/1000M electrical) Auto-Negotiation Auto-MDI/MDIX	RJ45	10/100/1000BASE-T IEEE 802.3 compatible

		1 (1000M optical) or 1 (100M optical)	SFP (LC)	1000BASE-LX IEEE 802.3 compatible 100BASE-FX IEEE 802.3 compatible
Clock	GPS	1	SMA	GPS Antenna Interface NMEA 0183 V3.0
B8200 Monitor & Alarm	Dry Contacts	6 (Input), 2 (Input / Output)	DB44	-
	RS485	1	DB44	-

### 3.5 Environment Indices

Table 3-6 ZXSDR B8200 Environment Indices

Item	Requirement
Temperature	-20°C - +50°C
Relative Humidity	5% - 95%
Waterproof /Dustproof	Compliant with IP20
Ground	□5Ω. Earth resistance can be less than 10Ω in thunder less area where there are less than 20 thunderstorm days in a year.
Storage	Indoor pack deposited
	Temperature: -45 °C to 70 °C
	Relative Humidity: 10% to 90%
Mechanical vibration	ETSI 300019-1-4 ClassM4.1

## 3.6 Electromagnetic Compatibility Indices

Table 3-7 ZXSDR B8200 Electromagnetic Compatibility Characteristics

Item	Requirement
Anti-static protection	Capable of protecting against a contact discharge of $\pm 6000\text{V}$ , Air discharge of $\pm 8000\text{V}$ .
Surge anti-interference	$\pm 2000\text{V}$ between lines and ground.

## 3.7 Reliability Indices

Table 3-8 ZXSDR B8200 Reliability Indices

Item	Value
MTBF	$\square 232,000$ hours
MTTR	0.5 hours
Availability	$\square 99.999784\%$
Down Duration	$\square 1.133$ min/year

# 4 Configurations

## 4.1 Baseband Unit Configuration Principles

As the essential part of ZTE SDR base station series, B8200 is composed of these boards including CC, baseband processing boards, FS, SA/SE, UES, TAM, PM, FAM, etc. Configuration principles of these boards are described in the following table:

Table 4-1 ZXSDR B8200 Configuration

Board	Configuration Principles
CC	At least 1 board is configured by default. Maximum 2 boards can be configured for 1+1 backup.

<b>Baseband Processing Board</b>	<b>UBPG</b>	12 GSM TRXs/board. Maximum 5 boards can be configured.
	<b>UBPG2</b>	12 GSM TRXs/board, with 3 pairs of CPRI interfaces. Maximum 5 boards can be configured.
	<b>UBPG3</b>	24 GSM TRXs/board. Maximum 5 boards can be configured.
	<b>BPK_e1</b>	6 UMTS CSs/board, with 192CEs UL/192CEs DL simultaneously. 34.5 Mbps UL and 129.6 Mbps DL simultaneously. Maximally 5 boards can be configured.
	<b>BPK_e</b>	6 UMTS CSs/board, with 384CEs UL/384CEs DL simultaneously. 69 Mbps UL and 259.2 Mbps DL simultaneously. Maximally 5 boards can be configured.
	<b>BPK_d</b>	12 UMTS CSs/board, with 768CEs UL/768CEs DL simultaneously. 138 Mbps UL and 518.4 Mbps DL simultaneously. Maximally 3 boards can be configured.
	<b>BPL</b>	3 LTE 20MHz cells (2*2 MIMO)/board DL/UL: 300Mbps/150Mbps Maximum 3 boards can be configured
	<b>BPL1</b>	6 LTE 20MHz 2*2 MIMO cells/board or 3 LTE 20MHz 4*4 MIMO cells/board DL/UL: 600Mbps/300Mbps Maximum 3 boards can be configured
<b>FS</b>	6 pairs of CPRI interfaces/board, optical or electrical. At least 1 board is configured by default for GSM mode (with UBPG), UMTS mode or G/U dual-modes. Not required for GSM mode with UBPG2. Maximum 2 boards can be configured.	
<b>UES</b>	4 electrical and 2 optical Ethernet interfaces per board. It is configured when L2 Ethernet switch or Synchronous Ethernet clock is required.	
<b>Site Alarm Board</b>	<b>SA</b> 6-2 dry contacts and 8 pairs of E1/T1 per board. It is configured by default.	

	<b>SE</b>	6+2 dry contacts and 8 pairs of E1/T1 per board Or 14+2 dry contacts and 4 pairs of E1/T1 per board. This board is configured only when the requirements of dry contacts or E1/T1 exceed SA capacity.
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## 5 Abbreviation

Abbreviations	Full Characteristics
3GPP	3 <sup>rd</sup> Generation Partnership Project
BBU	Base Band processing Unit
BITS	Building Integrated Timing Supply
BP	Baseband Processing
BPK	Base band Processing type K for UMTS
BPL	Base band Processing for LTE
BRACS	Barrier Access Control Sub-system
BRS	Barrier Sub-system
BSC	Base Station Controller
BSP	Board Support Package
BTS	Base Transceiver Station
CAPEX	Capital Expenditure
CC	Control & Clock
CE	Channel Element
CPRI	Common Public Radio Interface
CS	Carrier Sector
DBS	Data Base Sub-system
DL	Down Link
FAM	Fan Module
FE	Fast Ethernet
FS	Fabric Switch
GE	Gigabit Ethernet
GPS	Global Positioning System
GSM	Global System for Mobile communications
HR	Half Rate
LTE	Long Term Evolution
MicroTCA	Micro Telecommunications Computing Architecture
MIMO	Multi Input Multi Output
MS/UE	Mobile Station/User Equipment
MTBF	Mean Time Between Failures

MTTR	Mean Time To Recovery
OAM	Operating And Maintenance
OPEX	Operation Expenditure
OSS	Operation Support Sub-system
PM	Power Module
RNC	Radio Network Controller
RRU	Remote Radio Unit
SA	Site Alarm
SCS	System Control Sub-system
SDR	Software Defined Radio
SE	Site Alarm Extension
TAM	Tower mounted Amplifier control Module
TMA	Tower Mounted Amplifier
UBPG	Universal Baseband Processing board for GSM
UL	Up Link
WiMAX	Worldwide Interoperability for Microwave Access