



# ZXSDR BS8900

## Product Description



## ZXSDR BS8900 Product Description

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# TABLE OF CONTENTS

<b>1</b>	<b>Overview</b> .....	<b>1</b>
<b>2</b>	<b>Product Highlights</b> .....	<b>3</b>
2.1	Smooth Evolution .....	3
2.2	Easy Installation .....	3
2.3	Evolution to IP RAN.....	3
2.4	Smooth Expansion .....	3
2.5	Low Power Consumption.....	4
2.6	Rich Interfaces .....	4
2.7	Flexible Dual-mode Networking.....	4
2.8	Flexible Configuration.....	4
2.9	Excellent Outdoor Environment Adaptability.....	5
<b>3</b>	<b>Functionality</b> .....	<b>6</b>
3.1	Basic Functions .....	6
3.2	Service Functions.....	7
<b>4</b>	<b>System Architecture</b> .....	<b>9</b>
4.1	Product Physical Structure .....	9
4.2	Hardware Architecture.....	9
4.2.1	Site Support Cabinet BC8910.....	10
4.2.2	Outdoor Radio Cabinet RC8910.....	18
4.2.3	Outdoor Radio Cabinet RC8911.....	21
4.2.4	Battery Cabinet PC8910.....	21
4.3	Software Architecture .....	22
<b>5</b>	<b>Technical Specifications</b> .....	<b>24</b>
5.1	Physical Indices.....	24
5.2	Capacity Indices .....	25
5.3	Performance Indices.....	25
5.3.1	Operation Frequency Band .....	25
5.3.2	Receiver sensitivity.....	26
5.3.3	Output Power .....	26
5.4	Power Indices .....	26
5.4.1	Power Supply .....	26
5.4.2	Power Consumption .....	26
5.5	Interface Indices.....	28
5.6	Environment Indices.....	28
5.7	Electromagnetic Compatibility Indices .....	29
5.8	Reliability Indices.....	29
<b>6</b>	<b>Operation and Maintenance</b> .....	<b>30</b>
<b>7</b>	<b>Configuration Mode</b> .....	<b>33</b>
7.1	Baseband Unit Configuration.....	33
7.2	Radio Unit Configuration .....	33
7.3	GSM Single Mode Configuration .....	34
7.3.1	RSU82 configuration .....	34
7.3.2	RSU60 Configuration.....	34
7.4	UMTS Single Mode Configuration .....	35
7.4.1	RSU80 configuration .....	35
7.4.2	RSU40 configuration .....	35

7.4.3	RSU60 configuration .....	35
7.5	GSM/UMTS Dual-Mode Configuration.....	36
7.5.1	GSM 850M/900M/1800M/1900M and UMTS 850M/900M/1800M/1900M Dual-Mode Network in Same Spectrum .....	36
7.5.2	GSM 850M/900M/1800M/1900M and UMTS2100M Dual-Mode Network with Different Spectrum .....	36
<b>8</b>	<b>Acronyms and Abbreviation .....</b>	<b>38</b>

## FIGURES

Figure 1	Conventional GSM/EDGE/UMTS Network System .....	1
Figure 2	ZTE SDR BS Composed GSM/UMTS Network .....	1
Figure 3	Physical Architecture of BS8900V2.0 (Complete Style).....	9
Figure 4	BS8900V2.0 Hardware Structure .....	10
Figure 5	Site Support Cabinet BC8910.....	10
Figure 6	Baseband Unit of BS8900V2.0 .....	11
Figure 7	CC Panel .....	11
Figure 8	UBPG Panel .....	13
Figure 9	BPC Panel.....	13
Figure 10	FS Panel.....	14
Figure 11	SA Panel .....	15
Figure 12	SE Panel .....	15
Figure 13	NIS Panel .....	16
Figure 14	PM Panel.....	17
Figure 15	FAM Panel.....	17
Figure 16	Outdoor Radio Cabinet RC8910 .....	18
Figure 17	Radio Unit RSU40 of BS8900V2.0 .....	18
Figure 18	Radio Unit RSU60 of BS8900V2.0 .....	19
Figure 19	Radio Unit RSU82 of BS8900V2.0 .....	20
Figure 20	Radio Unit RSU80 of BS8900V2.0 .....	20
Figure 21	Outdoor Radio Cabinet RC8911 .....	21
Figure 22	Battery cabinet PC8910.....	21
Figure 23	BS8900V2.0 Software Structure .....	22
Figure 24	NetNumen M31 Management System.....	30

## TABLES

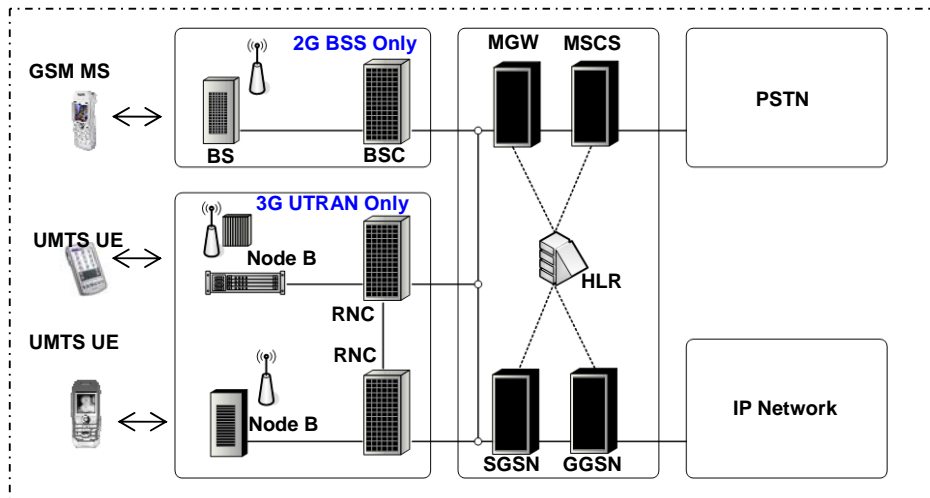
Table 1	Main Board List of Baseband Unit .....	11
Table 2	CC Panel Interfaces .....	11
Table 3	FS Panel Interfaces .....	14
Table 4	SA Panel Interfaces.....	15
Table 5	SE Panel Interfaces.....	16
Table 6	NIS Panel Interfaces.....	16
Table 7	PM Panel Interfaces .....	17
Table 8	RF Module Brief List.....	20
Table 9	BS8900V2.0 Physical Indices.....	24
Table 10	Different Combination of BS8900V2.0 .....	24
Table 11	BS8900V2.0 Capacity Indices .....	25
Table 12	BS8900V2.0 Operation Frequency Band.....	25
Table 13	BS8900V2.0 Receiver Sensitivity .....	26
Table 14	BS8900V2.0 Output Power.....	26
Table 15	BS8900V2.0 Power Supply Indices .....	26

Table 16	BS8900V2.0 GSM Configuration Power Consumption List (Unit: W, 20W per TRX, RSU82, DC Power Supply).....	27
Table 17	BS8900V2.0 GSM Configuration Power Consumption List (Unit: W, 13W per TRX, RSU60, DC Power Supply).....	27
Table 18	BS8900V2.0 UMTS Configuration Power Consumption List (Unit: W, 20W per carrier, DC Power Supply).....	27
Table 19	BS8900V2.0 G/U Dual-mode Configuration Power Consumption (Unit: W, 15W per TRX, 20W per carrier, DC Power Supply) .....	27
Table 20	BS8900V2.0 Interface Indices .....	28
Table 21	BS8900V2.0 Working Environment Indices .....	28
Table 22	BS8900V2.0 EMC Indices .....	29
Table 23	BS8900V2.0 Reliability Indices (RSU82 Configured, DC Power Supply).....	29
Table 24	BS8900V2.0 Configuration on GSM Mode (Multi-carrier) .....	34
Table 25	BS8900V2.0 Configuration on GSM Mode (Multi-carrier) .....	34
Table 26	BS8900V2.0 Configuration on UMTS 850/900M/1800M/1900MHz .....	35
Table 27	BS8900V2.0 Configuration on UMTS 2100M .....	35
Table 28	BS8900V2.0 Configuration on UMTS 850/900M/1800M/1900M.....	35
Table 29	BS8900V2.0 Configuration on G/U Dual-Mode (Same Spectrum).....	36
Table 30	BS8900V2.0 Configuration on G/U Dual-Mode (900MHz).....	36
Table 31	BS8900V2.0 Configuration on G/U Dual-Mode(Different Spectrum).....	36
Table 32	BS8900V2.0 Configuration on G/U Dual-Mode (Different Spectrum).....	37

# 1 Overview

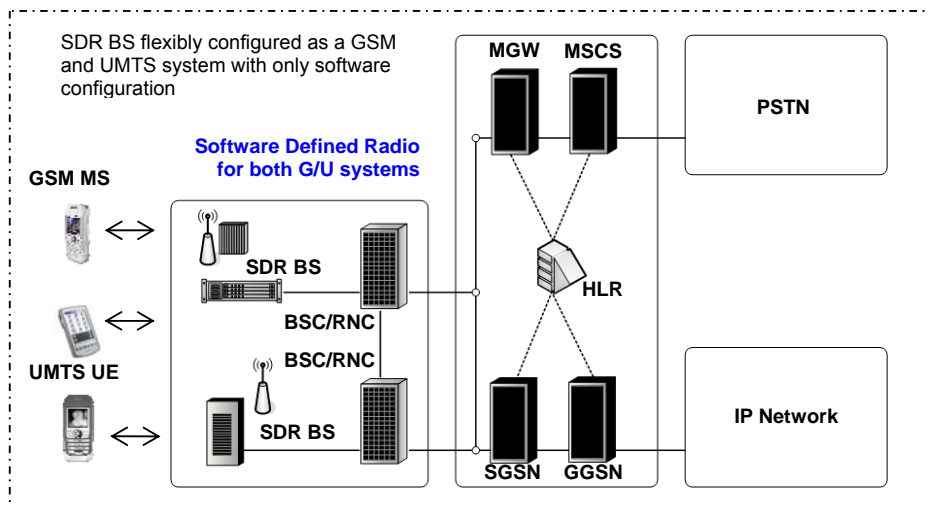
In general, GSM/EDGE/UMTS system consists of Core Network (CN), Radio Network (GERAN/UTRAN) and Mobile Station/User Equipment (MS/UE). GERAN/UTRAN includes 2 network elements, base station and BSC/RNC. The conventional 2G/3G BS connects to BSC/RNC via Abis/lub interface. Figure 1 shows a conventional GSM/EDGE/UMTS network system.

Figure 1 Conventional GSM/EDGE/UMTS Network System



In Figure 1, GPRS/EDGE and UTRAN are two separated radio networks. When ZTE 2G/3G dual-mode base station is introduced, the 2G/3G radio networks will be converged into one and this will decrease the network construction cost greatly. The GSM/UMTS integrated network is shown in the following Figure 2.

Figure 2 ZTE SDR BS Composed GSM/UMTS Network



The purpose of this document is to describe the Software Defined Radio (SDR) base station – ZXSDR BS8800, which is based on the ZTE unified MicroTCA platform and the radio part adopting MIPA technology, to be the new generation of ZTE mobile BS. This revolutionary BS platform supports all kinds of wireless access technology including GSM, UMTS, CDMA2000, WiMAX and LTE.

In the following chapters, a general description will be given to GSM/UMTS dual mode Base Station – ZXSDR BS8900V2.0.



## 2 Product Highlights

ZXSDR BS8900V2.0 (hereafter BS8900V2.0) is one multi-carrier, UMTS mode outdoor macro base station in ZXSDR BS series. By applying advanced MicroTCA platform and SDR technology, BS8900V2.0 can support GPRS/EDGE/Enhanced EDGE and UMTS/HSPA/HSPA+ simultaneously. Its main advantage is that it can be configured as a GERAN BTS, or a UTRAN Node B, or a G/W dual-mode BS by software reconfiguration only.

BS8900V2.0 develops a new solution for GSM/UMTS integrated network and network evolution. BS8900V2.0 can be applied in dense urban, urban, suburban, rural area, highway or outdoor environment. Furthermore it can fully meet operators' requirements in different stages and scenarios. BS8900V2.0 can be some combination of 4 basic cabinets and be a flexible and customized solution for outdoor application scenario. With IP55 protection capability and -40~55°C working temperature, BS8900V2.0 can be used in tough environment.

BS8900V2.0 has the following characteristics:

### 2.1 Smooth Evolution

BS8900V2.0 software and hardware support all the features of UMTS/HSPA and satisfy operators' future needs for data service. Only software upgrade is needed for the future evolution to HSPA+.

The MicroTCA architecture supports up to 10Gbps data throughput, enabling BS8900V2.0 to be also capable for LTE application.

### 2.2 Easy Installation

Typical configuration dimension of BS8900V2.0 is 1600mm \* 600mm \* 600mm (H\*W\*D). Front wiring design enables against wall installation and conveniently maintenance. The sub cabinets of BS8900V2.0 can be combined flexibly to cater for different scenarios.

### 2.3 Evolution to IP RAN

BS8900V2.0 is developed based on ZTE unified MicroTCA platform. Iub interfaces based on GE/FE or IP over E1 are provided. IP RAN can be conveniently achieved.

### 2.4 Smooth Expansion

BS8900V2.0 dual-mode Radio Unit (RSU82) has the capability to support 8 GSM TRX or 8 UMTS carriers. If GSM and UMTS are configured at the same time, each radio unit supports 8 GSM TRX and 2 UMTS carrier.

## 2.5 Low Power Consumption

BS8900V2.0 applies Doherty, DPD and MCPA technologies to power amplifier module which improves PA efficiency.

With S666 GSM configuration, mean power consumption of BS8900V2.0 is 725W (900M)/755W (1800MHz), and S222 UMTS configuration, that of BS8900V2.0 is 460W (2100MHz) – less than half of conventional macro base station.

## 2.6 Rich Interfaces

BS8900V2.0 provides E1/T1, STM-1 and GE/FE interfaces for lub connection and supports various transmission networking schemes such as SDH network, IP networking and splitting transmission.

## 2.7 Flexible Dual-mode Networking

BS8900V2.0 meets GSM/UMTS dual mode networking requirements in different scenarios. BS8900V2.0 supports GSM900+GSM1800 dual band networking, and GSM900+UMTS900 dual mode networking which can be supported with corresponding software configuration. BS8900V2.0 also supports only GSM in the initial stage. UMTS 2100M can be supported by adding RF modules. In this way, GSM/UMTS co-existence can be realized perfectly.

- Network upgrade from GSM900 to GSM900+GSM1800

BS8900V2.0 supports 6 RF modules. Assuming that there are 3 RF-900 modules in one cabinet originally, by adding 3 RF-1800 modules, GSM900+GSM1800 can be supported and the capacity is GSM900 S888 and GSM1800 S888 in one cabinet.

- Network upgrade from GSM900 to GSM900+UMTS2100

In network evolution, based on the existing GSM900 network, UMTS2100 network can be constructed by adding RF-2100 modules and corresponding baseband resource. This is the most economical upgrading from 2G to 3G in which main control modules, transmission modules and power modules are shared.

- Network upgrade from GSM900/1800 to GSM900/1800+UMTS900/1800

BS8900V2.0 can support SDR, designed to support UMTS, GSM or G/U with different software configuration in the same frequency range. So in this network evolution, only UMTS baseband processing boards need to be added.

## 2.8 Flexible Configuration

BS8900V2.0 has 4 kinds of cabinets. They are site support cabinet BC8910, outdoor radio cabinet RC8910, outdoor radio cabinet RC8911, and battery cabinet PC8910. Following chapter will give details of the 4 cabinets.

Operators can choose some sub-racks for best fit of their own application scenario. It is a flexible and customized solution.

## 2.9 Excellent Outdoor Environment Adaptability

Outdoor Macro BS BS8900V2.0 adopts hermetic rack. It can be water proof, dust proof, EMC compatible to suit the outdoor application scenario.

BS8900V2.0 provides IP55 protection capability, -40~55° C working temperature, and C class lightning protection.

It is designed with heat exchanger technology to meet the requirements of forced cooling, as to improve the reliability of components. It uses an internal heater to make sure that non-industrial components can work normally at low temperature. The equipment is functional when the ambient temperature is between -40°C and +55°C.

BS8900V2.0 is neatly structured and reasonably laid out, featured with good ventilation and cooling system. It is designed in full consideration of security and convenience of installation, operation and maintenance.

With these features, BS8900V2.0 can provide a fast deployment, low cost and equipment room free solution.

## 3 Functionality

### 3.1 Basic Functions

BS8900V2.0 accomplishes the following basic functions with Um/Uu, Abis/Iub and O&M interfaces.

- With Um/Uu interface, BS8900V2.0 accomplishes UE access and radio link transmission including RF processing, channel coding and decoding, channel multiplexing and de-multiplexing, measuring and reporting, power control, transmit diversity, receiving diversity, calibration and synchronization.
- With Abis/Iub interface, BS8900V2.0 connects with BSC/RNC and accomplishes the following functions including cell management, reporting BS measurement information, broadcasting system Information, implementing access control from BSC/RNC, mobility management, radio resource management and controlling, FP processing and ATM transmission management.
- With operating and maintenance interface, BS8900V2.0 provides system management functions including configuration management, alarm management, status checking and system monitoring.

Besides, BS8900V2.0 also provides some other functions as follows:

- Supporting GSM Phase I/GSM Phase II/GSM Phase II plus standards.
- Supporting UMTS R99, R4, R5, R6, R7,R8.
- Supporting GSM/UMTS 900, EGSM 900, GSM/UMTS 850, GSM/UMTS 1800 and GSM/UMTS 1900, UMTS 2100. Supporting mixed installation of boards with different frequencies in the same cabinet.
- Supporting CS1~CS4 of GPRS, MCS1~MCS9 of EDGE. Supporting dynamically changing channel coding according to monitoring and measurement results.
- Supporting space diversity, frequency diversity, time diversity, polarization diversity and maximum ratio combination diversity.
- The receiving part adopts Viterbi algorithm for coding. Channel decoding capability and system receiving sensitivity is improved.
- Supporting frequency hopping.
- Supporting DTX sending and decreasing transmitting power, lowering the total interference in the air.

- Supporting TA (Time Advance) calculation and out-of-sight coverage, theoretically coverage radius of a single cell can reach up to 120 Km.
- Supporting common BCCH. Different carriers can be used for different services and they share the same BCCH.

## 3.2 Service Functions

BS8900V2.0 supports the following services currently:

- GSM/EDGE:
  - FR: Full Rate voice service
  - EFR: Enhanced Full Rate voice service
  - HR: Half Rate voice service
  - AMR: Adaptive Multi Rate voice service
  - F9.6: 9.6Kbit/s CS domain data service
  - GPRS/EDGE
- Location service
  - Cell ID, Cell ID+RTT and AGPS location services
- R99 service:
  - CS domain service: 8 Kinds of AMR voice service, CS 64Kbps
  - PS domain service: UL/DL 64Kbps, UL/DL 128Kbps, UL/DL 384Kbps
  - Concurrent service: CS domain (AMR 12.2Kbps, CS 64Kbps) + PS domain(64Kbps, 128Kbps, 384Kbps)
- HSDPA Service:
  - Data rate 14.4Mbps
  - 15 codes
  - HSDPA and R99 on different carriers
  - Intra-frequency, inter-frequency handover and handover between HSDPA and R99
  - Concurrent services
  - Streaming services

- HSUPA Service:
  - Data rate 5.76Mbps
- MBMS Service:
  - Broadcast and multicast functions, multicast supports PtP and PtM
  - Mobility management
  - Streaming, background MBMS services
- HSPA+ Service:
  - 21.6Mbps Downlink data with 64QAM
  - 28.8Mbps Downlink data with 16QAM + 2\*2 MIMO
  - 43.2Mbps Downlink data with 64QAM + Dual Cell combination

## 4 System Architecture

### 4.1 Product Physical Structure

BS8900V2.0 adopts standard 19 inches rack structure. It is composed of site support cabinet BC8910, outdoor radio cabinet RC8910, outdoor radio cabinet RC8911, and battery cabinet PC8910

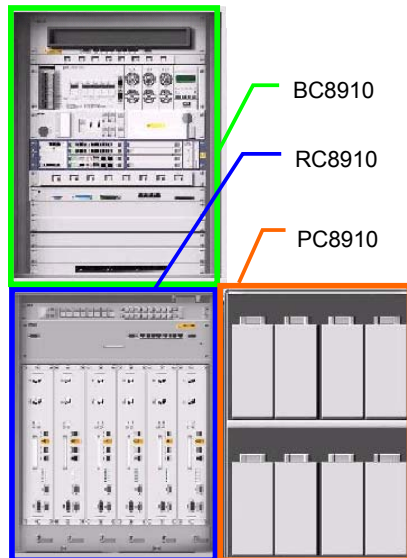
Typical configuration dimension of BS8900V2.0 is 1600mm \* 600mm \* 600mm (H\*W\*D). With the 200mm bottom base and 16mm top cover, the total height should be 1816mm. Front wiring design enables installation against wall and convenient maintenance. The sub racks of BS8900V2.0 can be combined flexibly to cater for different scenarios.

Site support cabinet includes Power Distribution shelf, FAN shelf, Baseband Unit shelf, Ventilation shelf, and additional 6U space reserved for transmission or other equipments. Outdoor RF cabinets are used for Radio Unit, maximum support 6 RSUs. Battery cabinet supports maximum 2×150AH battery.

BS8900V2.0 includes Radio Unit plug-in shelf, Power Distribution shelf, Fan shelf, Baseband Unit shelf, and Ventilation shelf. The full configuration is shown in the following figure. BS8900V2.0 single cabinet supports up to 48TRX GSM or 30CS UMTS.

Following is the physical architecture of the BS8900V2.0 complete style, consisting of one BC8910, one RC8910 and one PC8910, shown in the following figure.

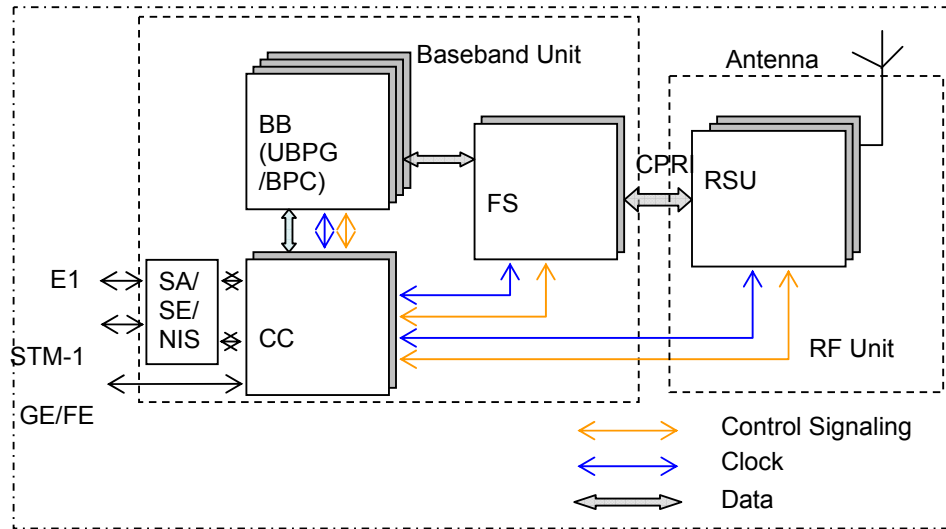
Figure 3 Physical Architecture of BS8900V2.0 (Complete Style)



### 4.2 Hardware Architecture

BS8900V2.0 consists of two main parts: baseband unit and radio unit as shown in the following figure.

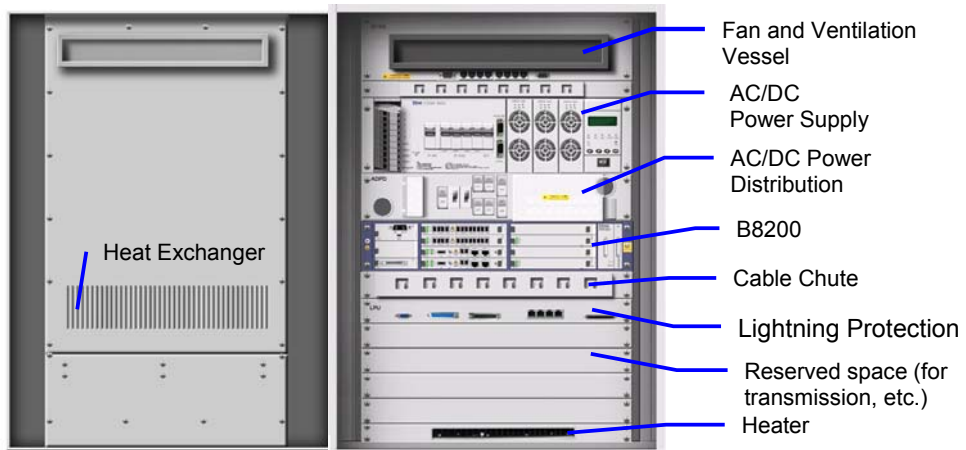
Figure 4 BS8900V2.0 Hardware Structure



### 4.2.1 Site Support Cabinet BC8910

There are mainly five parts in BC8910: baseband unit, power supply system, power distribution module, heat exchanging system and space for transmission or other equipments. Together with the fan and ventilation vessel, the heat exchanger, located in the cabinet door, makes the heat exchanging system. BC8910 hardware architecture is shown in the following figure. Cable chute, lightning protection and heater are not mandatory.

Figure 5 Site Support Cabinet BC8910

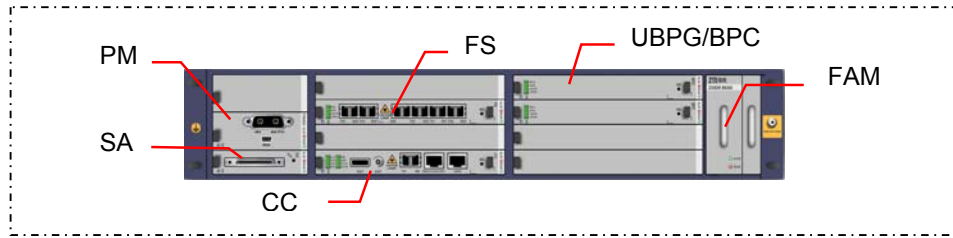


#### 4.2.1.1 Baseband Unit

Baseband unit in BS8900V2.0 is responsible for processing the baseband signals.



Figure 6 Baseband Unit of BS8900V2.0



The Baseband unit consists of control & clock board, fabric switch board, baseband processing board, site alarm board (optional), site alarm extension board, network Interface of STM-1 board (optional), power module, and fan module.

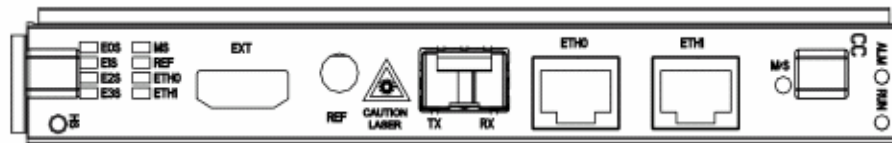
Table 1 Main Board List of Baseband Unit

Board Name	Function Description
CC	Control & Clock Board
FS	Fabric Switch Board
UBPG	Universal Baseband Processing board for GSM
BPC	Base band Processing type C for UMTS
SA	Site Alarm Board
SE	Site alarm Extension Board
NIS	Network Interface of STM-1 Board
PM	Power Module
FAM	FAN Module

4.2.1.1.1 Control & Clock Board (CC)

CC is control and clock board, used for control and management of baseband unit, providing Ethernet interface and system clock. The CC panel is illustrated in the following figure.

Figure 7 CC Panel



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

Table 2 CC Panel Interfaces

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

ETH0	Ethernet interface between BS8900V2.0 and RNC, adapting interface of 10M/100M/1000M.
ETH1	Ethernet interface used for cascading, debugging or local maintenance, adapting interface of 10M/100M/1000M.
TX/RX	Used for Ethernet interface connection between BS8900V2.0 and BSC/RNC. This interface is 100M/1000M Ethernet optical interface.
EXT	External communication port, connected to external receiver, Mainly 485、PP1S+/2M+ interfaces.
REF	External connection GPS antenna, SMA(F) interface

Control & clock board functions are as follows:

- Ethernet switching function, implementing data switching for service and control flow within the system
- lub interface protocol processing
- Monitoring, controlling and maintaining of the base station system, providing LMT interface
- Managing software versions of boards and programmable components, and supporting local and remote software upgrade
- Supervising the running status of each board within the system
- Synchronizing with various external reference clocks, including the lub interface recovery clock, the GPS clock and the clock provided by BITS. The CS service can select one according to the actual configuration.
- Generating and delivering the clock signal demanded by each part
- Providing GPS receiver interface and managing the GPS receiver
- Providing a real-time clock for system operation and maintenance. The real-time clock can be calibrated
- Board power interface (-48V, -48V ground, protection ground, digital ground) with reverse connection protection function
- Reading various hardware management identifiers in the system, including the rack number, backplane type number, slot number, board function type, board version, and board function configuration mark
- Supporting primary/slave switchover

#### 4.2.1.1.2 UBPG Board

UBPG is the GSM baseband processing board. It processes the physical layer protocol and frame protocol specified by 3GPP. UBPG panel is illustrated in the following figure.

Figure 8 UBPG Panel



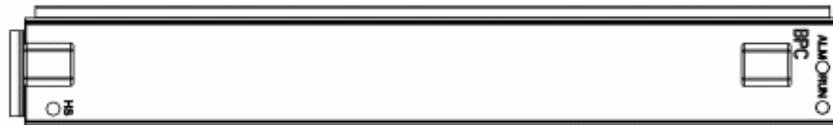
UBPG has the following main functions:

- Achieving rate adaptation, channel coding, interleaving, encryption, generate TDMA shock burst, GMSK/8PSK modulation, IQ baseband digital signals output.
- Achieving uplink IQ data receiving, receiver diversity combiner, digital demodulation (GMSK&8PSK, equilibrium), decryption, deinterleaving, demodulator, rate adaptation, GE Ethernet interface transmit it to CC board for processing.
- Radio link synchronization, transmission frame processing
- Measuring parameters required in power control and handover
- Diversified transmission and receiving
- Communicating with CS via Ethernet interface
- Reading 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.

#### 4.2.1.1.3 BPC Board

BPC is the UMTS baseband processing board. It processes the physical layer protocol and frame protocol specified by 3GPP. BPC panel is illustrated in the following figure.

Figure 9 BPC Panel



BPC hasn't external interface. Its main functions are as follows:

- Implementing downlink baseband signal processing, including downlink data coding, multiplexing, rate adaptation, channel mapping, spread spectrum and scrambling power regulation and channel compositing.
- Implementing uplink baseband signal processing, including uplink data RAKE receiving, demodulation, and transmitting the data to lub interface for processing.

- Downlink data coding/multiplexing, rate matching, channel mapping, spreading and scrambling, power adjusting, and channel compositing.
- Uplink signal RAKE receiving and channel decoding
- Radio link synchronization and Frame processing
- Measuring parameters required in power control and handover
- Softer handover and carrier diversity.
- Communicating with the CS domain via the Ethernet interface
- Reading 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

4.2.1.1.4 Fabric Switch Board (FS)

FS is fabric switch board which provides baseband optical interface between BBU and RRU and processes the IQ signal. FS panel is illustrated in the following figure.

Figure 10 FS Panel



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

Table 3 FS Panel Interfaces

Interface Name	Description
TX0 RX0~TX5 RX5	6 pairs optical interfaces, connected to RRU

The FS has the following functions:

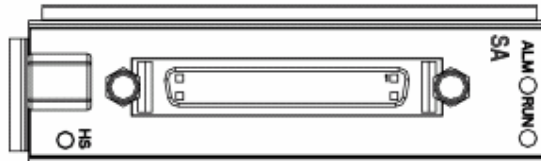
- Receive the signal from the rear board in the downlink and retrieve the data and timing.
- Multiplex the received data and retrieve I/Q signal
- I/Q mapping in the downlink and multiplex I/Q signal to the optical signals.
- Receive the I/Q in uplink and demultiplex/mapping into I/Q signal
- The multiplexed I/Q signal transmit to BP

- Exchange CPU interface signaling through HDLC interface with RF module
- MicroTCA protocol based module management function

4.2.1.1.5 Site Alarm Board (SA)

SA is a site alarm board, illustrated in Figure 11.

Figure 11 SA Panel



- Description of SA panel interface is shown in Table 5.

Table 4 SA Panel Interfaces

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

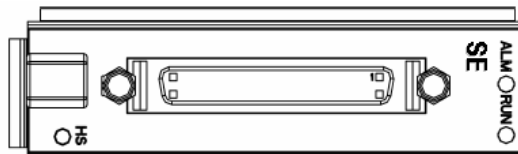
The SA has the following functions:

- Provide E1/T1 transmission interfaces for lub.
- Provide site alarm monitoring interfaces.
- Provide FAM's alarm and rate control.

4.2.1.1.6 Site alarm Extension Board (SE)

SE is site alarm extension board, and SE panel is illustrated in Figure 12.

Figure 12 SE Panel



Description of SE panel interfaces is shown in Table 6.

Table 5 SE Panel Interfaces

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

SE shares the bottom-right slot with UBPG/BPC and has the following functions:

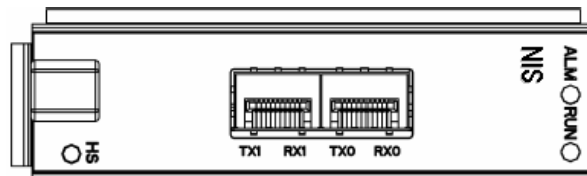
- Provide E1/T1 transmission interfaces for lub.
- Provide site alarm monitoring interfaces.

It is used to extend the port number if SA can not fulfill the requirements.

4.2.1.1.7 Network Interface of STM-1 board (NIS)

NIS is STM-1 network interface board, and NIS panel is illustrated in the following figure.

Figure 13 NIS Panel



Description of NIS panel interfaces is shown in Table 6

Table 6 NIS Panel Interfaces

Interface Name	Description
-	2 STM-1

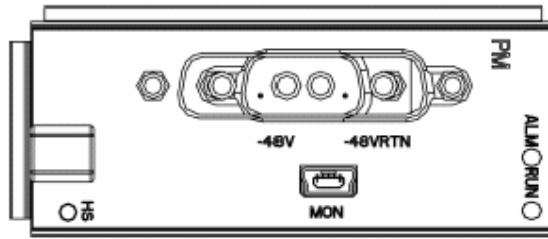
The NIS has the following functions:

- 2 STM-1fiber interfaces, support spending processing, mapping, space-division overlapping, support 21 E1 or 28 T1 most greatly to the STM-1 mapping.
- Support the ADM/TM working.
- Support the AU3/AU4 mapping way.
- Support the APS protection function.

4.2.1.1.8 Power Module (PM)

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

Figure 14 PM Panel



Description of PM panel interface is shown in Table 7 .

Table 7 PM Panel Interfaces

Interface Name	Description
MON	Debugging interface, RS232 interface
-48V/-48VRTN	-48V input

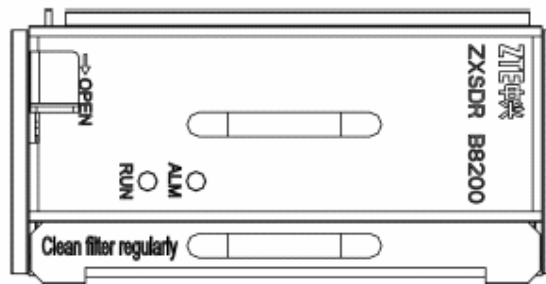
The PM has the following functions:

- 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.

#### 4.2.1.1.9 Fan Array Module (FAM)

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

Figure 15 FAM Panel



The FAM main functions are as follows:

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

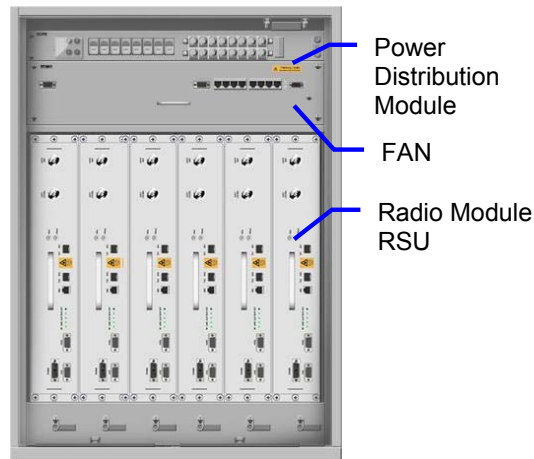
4.2.1.1.10 AC/DC Power System

The power system of BC8910 contains 3 AC/DC rectifiers. Its configuration depends on the load and the backup battery capacity.

4.2.2 Outdoor Radio Cabinet RC8910

RC8910 consists of 6 RF modules and fan control system. Its physical appearance is shown in the following figure.

Figure 16 Outdoor Radio Cabinet RC8910



Radio unit mainly process the conversion between baseband signals and RF signals.

In the BS8900V2.0, there are three kinds of radio unit, respectively: RSU40, RSU60, and RSU82. RSU40 is a UMTS only radio frequency module, which works in UMTS only on 2100MHz/AWS. RSU60 is a multi-carrier radio frequency module, which can work in GSM only, UMTS only or G/U dual mode via software configuration on 850/900/1800/1900MHz. RSU82 is a multi-carrier radio frequency module, which can work in GSM only, UMTS only or G/U dual mode via software configuration and support 2 sectors on 900/1800/2100MHz or 1 sector with 2\*2 MIMO in HSPA+ mode. The following will show the details.

4.2.2.1 RSU40

RSU40 is UMTS multi-carrier radio unit, working on 2100MHz/AWS. RSU40 supports maximum 4 carriers, and the output power is 60W. RSU40 module consists of MCPA (multi-carrier power module) module, transceiver module, and duplex filter LNA. There are one TX/RX port and one RX port for connecting antenna.

Figure 17 Radio Unit RSU40 of BS8900V2.0





#### 4.2.2.2 RSU60

RSU60 is a multi-carrier RF module, working on 850/900/1800/1900MHz. It can be configured as GSM only, UMTS only or dual mode module. RSU60 can be configured to 1 to 6 TRX in GSM mode. In case of GMSK modulation, 80W TOC output power can be provided. If 8PSK is used, the TOC output power is 50W. If RSU60 is used as UMTS mode, it can support 4 carriers with 80W TOC output power. In mixed mode, RSU60 can support 4 GSM TRX and 1 UMTS carriers or 2 GSM TRX and 2 UMTS carriers.

RSU60 module consists of MCPA module, transceiver module, and duplex filter LNA. There are one TX/RX port and one RX port for connecting antenna.

Figure 18 Radio Unit RSU60 of BS8900V2.0

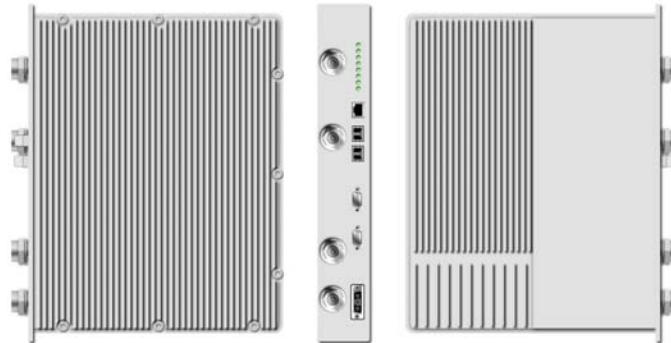


#### 4.2.2.3 RSU82

RSU82 is a multi-carrier and multi-mode RF module, working on 900/1800MHz. One RSU82 can process 2 transmit paths and 4 received paths and thus support 2 sectors in GSM/UMTS or 1 sector with 2\*2 MIMO in HSPA+ mode. RSU82 can be configured as GSM only, UMTS only, or mixed mode. RSU82 can be configured to support maximum 8 TRX in GSM mode. In case of GMSK modulation, 2\*60W TOC output power can be provided. If 8PSK is used, the TOC output power is 2\*40W. When RSU82 is used in

UMTS mode, it can support 2\*20MHz with TOC output power 2\*60W on 900MHz. In dual mode, RSU82 can support 8 GSM TRX + 2 UMTS carriers or 4 GSM TRX + 4 UMTS carriers.

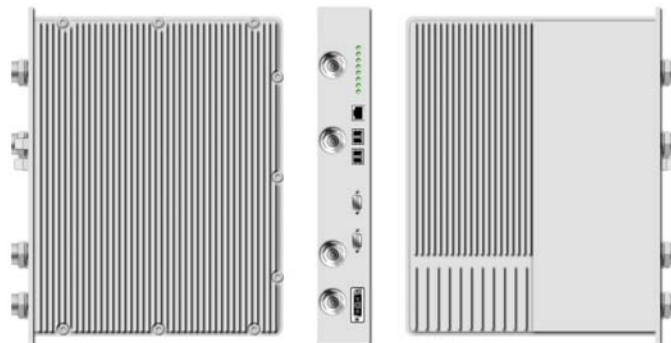
Figure 19 Radio Unit RSU82 of BS8900V2.0



4.2.2.4 RSU80

RSU80 is a UMTS multi-carrier RF module, working on 2100MHz. One RSU80 can process 2 transmit paths and 2 received paths and thus support 1 sector with 2\*2 MIMO in HSPA+ mode. RSU80 can be configured as UMTS only. When RSU80 is used in UMTS mode, it can support 2\*20MHz with TOC output power 2\*60W on 2100MHz.

Figure 20 Radio Unit RSU80 of BS8900V2.0



All the above RF modules can be inserted into BS8900V2.0 for different applications. The following table gives a brief summary of all the RF modules.

Table 8 RF Module Brief List

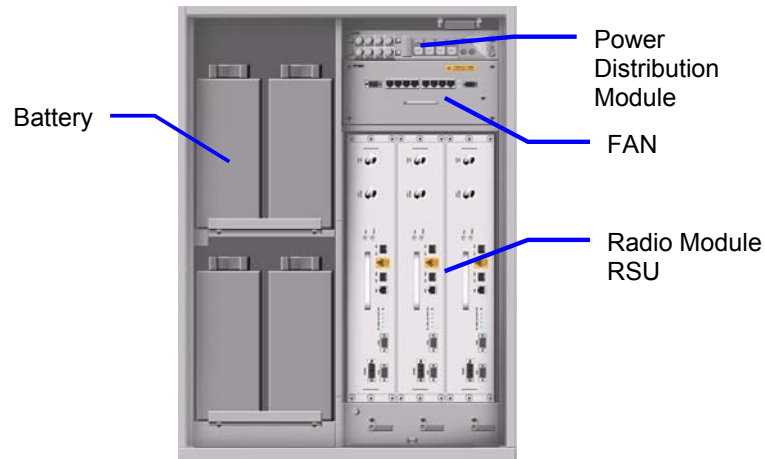
Frequency (Hz)	1T2R	2T2R/2T4R
850M	RSU60/GU: 80W	N/A

900M	RSU60/GU: 80W	RSU82/GU: 2*60W
1800M	RSU60/GU: 80W	RSU82/GU: 2*60W
1900M	RSU60/GU: 80W	N/A
2.1G	RSU40/U: 60W	RSU80/U: 2*60W
AWS	RSU40/U: 60W	N/A

### 4.2.3 Outdoor Radio Cabinet RC8911

RC8911 accommodates 3 RF modules, 4 batteries and fan control subsystem. Its physical appearance is shown in the following figure. RC8911 can be divided into left and right part. In the right part 3 RSUs can be installed, and in the left part 4 batteries can be installed. The capacity of the 4 batteries is 150AH. For details of RF Modules please refer to chapter 4.2.2.

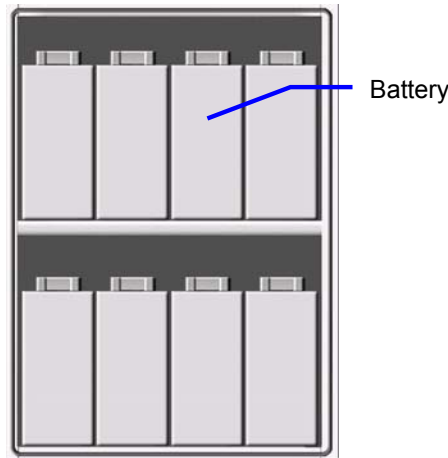
Figure 21 Outdoor Radio Cabinet RC8911



### 4.2.4 Battery Cabinet PC8910

PC8910 is an outdoor battery cabinet, and it works with BC8910 and RC8910 . The following figure shows the structure of PC8910 and it contains 8 batteries, with the capacity of 2\*150AH.

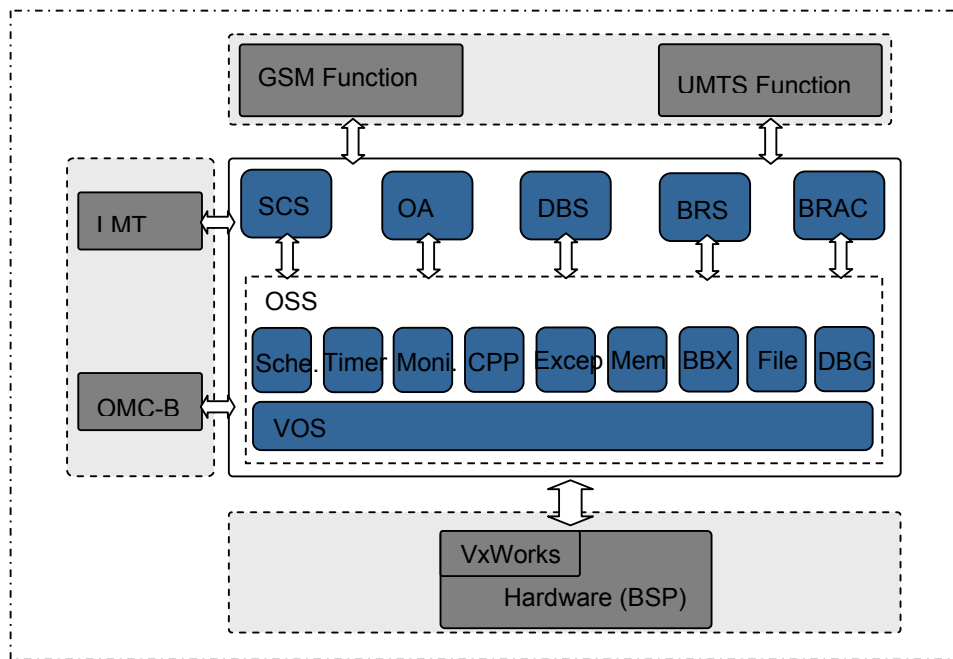
Figure 22 Battery cabinet PC8910



### 4.3 Software Architecture

The software system of BS8900V2.0 can be divided into operating support layer and application layer.

Figure 23 BS8900V2.0 Software Structure



The operating support layer provides the functions of OSS, OAM, DBS, BRS, BRACS, and SCS to serve to different BS 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.

BSP (Board Support Package) supports the data routing to the GSM, UMTS and public parts in the application layer.

## 5 Technical Specifications

### 5.1 Physical Indices

Table 9 BS8900V2.0 Physical Indices








<b>Note:</b> <b>1. BS8900V2.0 has a total of 4 basic cabinets. 2. The basic structure of all kinds can be combined together according to the actual needs.</b>					
	Name	BC8910	RC8910	RC8911	PC8910
	Dimension(H*W*D) ( mm*mm*mm)	800*600*600	800*600*600	800*600*600	800*600*600
	Weight of full configuration without battery(Kg)	82Kg	Full configuration: 127Kg (RSU40,RSU60) 139Kg (RSU82)	Without battery: 93Kg (RSU40/RSU60) 99Kg (RSU82) With battery: 277Kg (RSU40/RSU60) 283 Kg (RSU82)	Without battery: 47Kg With battery: 415Kg
	Notes	Reserved 6U space for transmission etc.	6*RSUs	3*RSUs+150AH	2*150AH

Table 10 Different Combination of BS8900V2.0

<b>AC Integrative BaseStation (Complete Style)</b> <b>BC8910 + RC8910+ PC8910</b>	<b>DC Split BaseStation (Standard Style)</b> <b>BC8910+ RC8910</b>	<b>AC Integrative BaseStation (Compact Style)</b> <b>BC8910+RC8911</b>
--	---	---

		
Full configuration without battery: 260Kg (RSU40, RSU60) 270Kg (RSU80,RSU82) Dimension(H*W*D): 1600*1200*600(mm)	Full configuration without battery: 195Kg (RSU40, RSU60) 205Kg (RSU80,RSU82) Dimension(H*W*D): 1600*600*600(mm)	Full configuration without battery: 180Kg (RSU40, RSU60) 185Kg (RSU80,RSU82) Dimension(H*W*D): 1600*600*600(mm)
Expanded from solution 1: 6*RSUs+2*150AH	Capacity is same as solution2.	Typical configuration: 3*RSUs+150AH

## 5.2 Capacity Indices

Table 11 BS8900V2.0 Capacity Indices

Item (Single Cabinet)	Indices
Maximum GSM TRX	48TRX
Maximum UMTS CS	30CS
Maximum GSM/UMTS dual-mode carriers	GSM 36 TRX + UMTS 12CS
Maximum Pure tone channel CE	Uplink: 960CE, Downlink:960CE
Maximum cell channel (UMTS)	123
Maximum throughput	75Mbps UL / 216Mbps DL

## 5.3 Performance Indices

### 5.3.1 Operation Frequency Band

Table 12 BS8900V2.0 Operation Frequency Band

Item	Indices
Frequency Band	GSM: 850M/EGSM/900M/1800M/1900 MHz UMTS: 850M/900M/1800M/1900M//2100MHz/AWS

### 5.3.2 Receiver sensitivity

Table 13 BS8900V2.0 Receiver Sensitivity

Item	Indices
Receiver sensitivity	-113.5dBm@GSM single antenna -126.5dBm@UMTS single antenna -129.2dBm@UMTS double antennas -131.9dBm@UMTS four antennas

### 5.3.3 Output Power

Table 14 BS8900V2.0 Output Power

Radio Unit Type	TOC Output Power
RSU40	60W
RSU60	80W
RSU82	2*60W
RSU80	2*60W

## 5.4 Power Indices

### 5.4.1 Power Supply

Table 15 BS8900V2.0 Power Supply Indices

Item	Indices
Power supply, voltage range of variation	-48V DC(-57V DC~ -40V DC) 220V AC ( 176V AC~264V AC )
Battery back-up	2*150AH

### 5.4.2 Power Consumption

#### 5.4.2.1 GSM Configuration

##### 5.4.2.1.1 RSU82 configuration

RSU82 is based on MCPA technology. It supports maximum 8 TRX for GSM. In baseband unit, one UBPG board supports 12 GSM TRX.



Table 16 BS8900V2.0 GSM Configuration Power Consumption List (Unit: W, 15W per TRX, RSU82, DC Power Supply)

Radio Module	Station	S4/4/4		S8/8/8	
		Average	Peak	Average	Peak
RSU82	900M	750	1285	1230	2230
	1800M	760	1305	1245	2275

5.4.2.1.2 RSU60 configuration

RSU60 is based on MCPA technology. It supports maximum 6 TRX for GSM. In baseband unit, one UBPG board supports 12 GSM TRX.

Table 17 BS8900V2.0 GSM Configuration Power Consumption List (Unit: W, 13W per TRX, RSU60, DC Power Supply)

Radio Module	Station	S6/6/6		S12/12/12	
		Average	Peak	Average	Peak
RSU60	850M/900M	725	1300	1295	2440
	1800M/1900M	755	1340	1340	2520

5.4.2.2 UMTS Configuration

Table 18 BS8900V2.0 UMTS Configuration Power Consumption List (Unit: W, 15W per carrier, DC Power Supply)

Radio Module	Station	S111		S222		S333		S444	
		Average	Peak	Average	Peak	Average	Peak	Average	Peak
RSU40	2100M	500	680	690	865	830	1060	-	-
RSU60	850/900M	670	870	870	1005	975	1170	1040	1340
RSU80	2100MHz	460	670	675	855	800	1035	-	-
RSU82	900MHz	870	1005	1005	1305	-	-	-	-

5.4.2.3 GSM/UMTS Dual-mode Configuration

Table 19 BS8900V2.0 G/U Dual-mode Configuration Power Consumption (Unit: W, 10W per TRX, 20W per carrier, DC Power Supply)

Radio Module Name	S444(G)+S111(U)	
	Average	Peak
RSU60 (850/900M)	800W	1320W
RSU82 (900M)	865W	1395W

## 5.5 Interface Indices

Table 20 BS8900V2.0 Interface Indices

Interface	Item	Indices	Type	Standard
lub	E1/T1	16 pairs(8pairs optional)	DB44	ITU G.703/G.704
	Ethernet (either or)	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
	STM-1	2 pairs(optional)	SFP (LC)	ITU G.957 ITU G.707
Cascading, Debugging or Local Maintenance	Ethernet	1 10M/100M/1000M electrical Auto-Negotiation. Auto-MDI/MDIX	RJ45	10/100/1000BASE-T IEEE 802.3 compatible
Baseband/Radio	CPRI	12 pairs	SFP (LC)	CPRI 2.0
Clock	GPS	1	SMA	GPS TX/RX Port NMEA 0183 V3.0

## 5.6 Environment Indices

Table 21 BS8900V2.0 Working Environment Indices

Item	Indices
Temperature	-40~55°C (AC Power Supply) -20~55°C (DC Power Supply)
Relative Humidity	5%~100%
Waterproof/Dustproof	IP55
Ground	$\leq 5 \Omega$ ;earth resistance can be less than $10 \Omega$ in thunderless area and less than $20 \Omega$ in thunderstorm days.
Mechanical vibration	ETSI 300019-1-4 ClassM4.1

## 5.7 Electromagnetic Compatibility Indices

Table 22 BS8900V2.0 EMC Indices

Item	Indices
Anti-static protection	Capable of protecting against the contact discharge of $\pm 6000V$ , Air discharge of $\pm 8000V$ .
Surge anti-interference requirement	$\pm 2000V$ between lines and the ground.

## 5.8 Reliability Indices

In ZXSDR BS8900V2.0, the algorithm of system reliability is based on the national military GJB/Z299B Electronic Equipment Reliability Estimation Manual and US military handbook MIL-HDBK-217F Electronic Equipment Reliability Estimation.

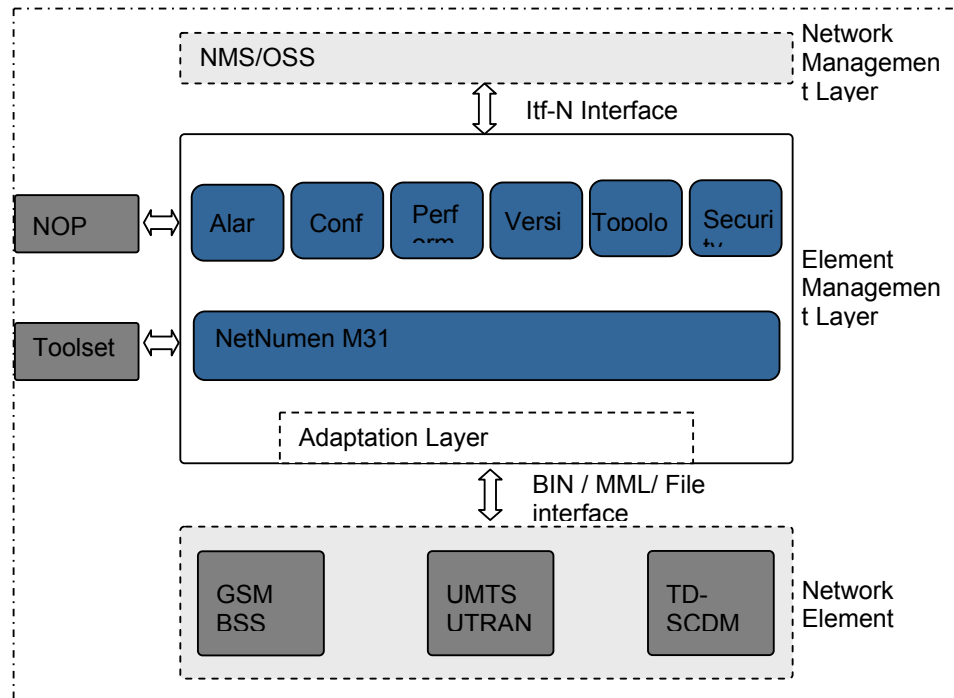
Table 23 BS8900V2.0 Reliability Indices (RSU82 Configured, DC Power Supply)

Item	Indices
MTBF	$\geq 140,000$ hours
MTTR	0.5 hours
Availability index:	$\geq 99.999643\%$
Down duration	$< 1.877$ min/year

## 6 Operation and Maintenance

The operation and management of BS8900V2.0 is performed by the ZTE unified network management system, NetNumen M31. NetNumen M31 is the unified NMS for GSM/UMTS network, adopting the client/server architecture. The server background is based on the Oracle database, and the client adopts the Windows system, enabling human-machine management for the network element.

Figure 24 NetNumen M31 Management System



The BSS/UTRAN provides a transparent channel to implement operation and maintenance information interaction between NetNumen M31 and the radio network. Management of the BSC/RNC and the BTS/Node B adopt unified client interface for unified security management and operation log. NetNumen M31 also supports CORBA/SNMP Itf-N interface to be integrated with third-part NMS.

BS8900V2.0 operation and maintenance system has the following functions:

- Version Management

With this function, users can view versions of the software and hardware running at the foreground. The hardware version includes the BOOT version number and its generation time. The software version includes the software version number, download time and its current running state.

The background provides a software downloading system for software upgrade at the foreground. Before downloading, warehousing processing is required, that is, copying the version file to the server and registering to the server.

Software versions existing in the base station can be activated directly by the software or through software test.

- Alarm Management

The alarm management system monitors the running states of the base stations; displays dynamically the rack structure of the foreground module; collects abnormal information of the boards, links, database and server in real time. These functions make it convenient for operation and maintenance personnel to analyze, make judgment, and implement maintenance and repair.

Information collected by the alarm management system includes notification, alarm and alarm recovery.

The alarm management system synchronizes alarms, reports historical alarms and current alarms, and sets and queries alarm shielding.

- Configuration Management

Configuration management implements equipment configuration and radio configuration.

- Log Management

NetNumen M31 system provides the log management function. Any operation performed by an operator is recorded automatically in some modes by the system. Thus, the operation maintenance personnel can query historical operation records in some special cases (such as abnormal system operations). Log records are saved in the NM database server.

- Security Management

Security management includes two elements: user and user group. Security management is implemented through user management and user group management. The user element includes the user name and password, as well as which user groups the user belongs to. The user group element includes the user group name and authority information (indicating authorities the user group has).

- Performance Management

Performance management is to measure, report and make statistics of the performances of base stations.

- Diagnosis and Test

Diagnosis and test is an important task. Through it, the maintenance personnel can check whether system hardware is working properly, so that they can trace and remove the faults in time to guarantee a normal operation of the system.

Base station diagnosis and test cover the following items:

- Running information reporting
- Board link testing
- Receiving field strength testing
- Environment monitoring information viewing
- Supplementary Functions

The operation and maintenance system also provides many supplementary functions to facilitate base station maintenance, including signaling tracing, channel viewing, abnormal record reporting and viewing.

## 7 Configuration Mode

### 7.1 Baseband Unit Configuration

B8200 is the baseband unit of BS8900V2.0, B8200 is composed of these boards: CC, BPC, FS, SA, SE, NIS, PM and FAM. Configuration principles of these boards will be described below:

CC: Control and Clock board. 1 CC board for default configuration, if needed, 1+1 configuration is an available option.

UBPG/BPC: baseband processing board, UBPG board is configured in GSM while BPC board in UMTS. The processing capability of UBPG and BPC is shown as follows:

- Single UBPG board supports 12TRX;
- Single BPC supports 6CS, 192CE uplink and 192CE downlink simultaneously;

According to the standard configuration, BS8900V2.0 baseband unit provides 4 baseband processing board slots. If only one optical switch board is configured, then it may configure maximal 5 baseband processing boards.

FS: Fabric Switch board. There are 6 pairs of CPRI interface in each FS board, 2 FS boards can be configured in B8200 maximally.

SA: Site Alarm board. It supports 6+2 dry contacts and 8 pairs of E1/T1, 1 SA board for each B8200 is mandatory configuration.

SE: Site Alarm Extension board. It supports 6+2 dry contacts and 8 pairs of E1/T1, 1 SE board can be configured if the requirements of dry contacts or E1/T1 exceed the SA capacity.

NIS: Network Interface of STM-1 board. It is configured when lub adopts STM-1 interface.

PM: Power Module. 1 PM board is configured for default configuration. If needed, 1+1 configuration is an available option.

FAM: Fan array Module. 1 FAM board for each B8200 is mandatory configuration.

### 7.2 Radio Unit Configuration

BS8900V2.0 radio unit cabinet can be equipped with 6 RF modules, 6 RF modules are corresponding to 6 sectors. Each of that can be configured as GSM or UMTS or GSM/UMTS together by software.

By choosing different frequencies and software configuration, BS8900V2.0 can support various GSM/UMTS configurations:

- In GSM single mode, RSU60 maximum supports 6 TRX and RSU82 maximum supports 8 TRX;
- In UMTS single mode, RSU40/RSU60 maximum supports 4 carriers. RSU80 maximum supports 2\*20MHz;
- If GSM/UMTS are in the dual mode, single RSU82 can support 8 GSM TRX + 2 UMTS Carriers or + 4 GSM TRX + 4 UMTS Carriers at maximum;
- Support different spectrum configuration such as UMTS2100 + UMTS900, GSM900 + GSM1800, UMTS2100 + UMTS/GSM900, etc.

## 7.3 GSM Single Mode Configuration

### 7.3.1 RSU82 configuration

RSU82 is based on MCPA technology. It supports maximum 8 TRX for GSM. In baseband unit, one UBPG board supports 12 GSM TRX.

Table 24 BS8900V2.0 Configuration on GSM Mode (Multi-carrier)

Site Type	Number of RSU	Number of UBPG	Number of Rack
S4/4/4	2	1	1
S8/8/8	3	2	1
S16/16/16	6	4	1

### 7.3.2 RSU60 Configuration

RSU60 is based on multi-carrier technology. In GSM mode, it can support 1 to 6 TRX. For baseband part, one UBPG board can support 12 TRX.

Table 25 BS8900V2.0 Configuration on GSM Mode (Multi-carrier)

Site Type	Number of RSU	Number of UBPG	Number of Rack
S4/4/4	3	1	1
S6/6/6	3	2	1
S12/12/12	6	3	1



## 7.4 UMTS Single Mode Configuration

### 7.4.1 RSU80 configuration

One RSU80 supports maximum 6 carriers in UMTS single mode on 2100MHz when ensuring 20W per carrier. For baseband unit, one BP board can support UMTS 6CS.

Table 26 BS8900V2.0 Configuration on UMTS 850/900M/1800M/1900MHz

Site Type	Number of RSU	Number of BPC	Number of Rack
S1/1/1	2	1	1
S2/2/2	2	1	1
S3/3/3	2	2	1
S4/4/4	3	2	1
S2/2/2/2/2/2	3	2	1

### 7.4.2 RSU40 configuration

RSU40 maximum output power is 60W in UMTS 2100M. One RSU40 supports 3 carriers when it ensures the 20W output power for each carrier. For baseband part, one BPC board can support 6 CS.

Table 27 BS8900V2.0 Configuration on UMTS 2100M

Site Type	Number of RSU	Number of BPC	Number of Rack
S1/1/1	3	1	1
S2/2/2	3	1	1
S3/3/3	3	2	1
S4/4/4	6	2	1
S2/2/2/2/2/2	6	2	1

### 7.4.3 RSU60 configuration

RSU60 maximum output power is 80W in UMTS 850M/900M/1800M/1900M. One RSU60 supports 4 carriers when it ensures the 20W output power for each carrier. For baseband part, one BPC board can support 6CS.

Table 28 BS8900V2.0 Configuration on UMTS 850/900M/1800M/1900M

Site Type	Number of RSU	Number of BPC	Number of Rack
S1/1/1	3	1	1
S2/2/2	3	1	1
S3/3/3	3	2	1

S4/4/4	3	2	1
S2/2/2/2/2/2	6	2	1

## 7.5 GSM/UMTS Dual-Mode Configuration

There are two scenarios for GSM/UMTS dual-mode networking: GSM/UMTS dual mode network in same spectrum; GSM/UMTS dual mode network with different spectrum

### 7.5.1 GSM 850M/900M/1800M/1900M and UMTS 850M/900M/1800M/1900M Dual-Mode Network in Same Spectrum

If one RSU60 is configured in this scenario, the configuration is shown in the following table. One RSU60 supports 4 GSM TRX + 1 UMTS carriers or 2 GSM TRX + 2 UMTS carriers simultaneously.

Table 29 BS8900V2.0 Configuration on G/U Dual-Mode (Same Spectrum)

Site Type	Number of RSU	Number of UBPG	Number of BPC	Number of Rack
G:S888+U:S222	6	2	1	1
G:S444+U:S444	6	1	2	1

If the working frequency lies in 900MHz, RSU82 is adopted, with configuration shown in the following table. One RSU82 supports 8 GSM TRX + 2 UMTS carriers or 4 GSM TRX + 4 UMTS carriers simultaneously.

Table 30 BS8900V2.0 Configuration on G/U Dual-Mode (900MHz)

Site Type	Number of RSU	Number of UBPG	Number of BPC	Number of Rack
G:S888+U:S222	3	2	1	1
G:S444+U:S444	3	1	2	1

### 7.5.2 GSM 850M/900M/1800M/1900M and UMTS2100M Dual-Mode Network with Different Spectrum

If RSU40 and RSU60 are configured simultaneously in this scenario, RSU40 is used for UMTS2100MHz, and RSU60 is used for GSM850/900/1800/1900MHz.

Wideband combiner is needed in the mode of community feeder line and community antenna.

Table 31 BS8900V2.0 Configuration on G/U Dual-Mode(Different Spectrum)

Site Type	Number of RSU	Number	Number	Number
-----------	---------------	--------	--------	--------

		<b>of UBPG</b>	<b>of BPC</b>	<b>of Rack</b>
G:S666(850/900/1800/1900M) +U:S333(2100M)	3 RSU60-850/900/1800/1900M + 3 RSU40-2100M	2	2	1

If RSU82 is configured simultaneously in this scenario, the configuration is shown in the following table.

Table 32 BS8900V2.0 Configuration on G/U Dual-Mode (Different Spectrum)

<b>Typical Site Type</b>	<b>Number of RSU</b>	<b>Number of UBPG</b>	<b>Number of BP</b>	<b>Number of Rack</b>
G:S444(900/1800MHz) +U:S222(2100MHz)	2 RSU82-900/1800MHz + 3 RSU80-2100MHz	1	1	1

## 8 Acronyms and Abbreviation

Abbreviations	Full Characteristics
3GPP	3 <sup>rd</sup> Generation Partnership Project
64QAM	64 grade Quadrature Amplitude Modulation
AGPS	Assisted GPS
AMR	Adaptive Multi Rate
BB	Base Band
BBS	Base Band Sub-system
BBU	Base Band processing Unit
BCCH	Broadcast Control Channel
BITS	Building Integrated Timing Supply
BPC	Base band Processing type C for UMTS
BRACS	Bearer Access Control Sub-system
BRS	Bearer Sub-system
BSC	Base Station Controller
BSP	Board Support Package
BTS	Base Transceiver Station
CAPEX	CAPital EXpenditure
CC	Control & Clock
CE	Channel Element
CN	Core Network
CORBA	Common Object Request Broker Architecture
CPRI	Common Public Radio Interface
CS	Circuit Switch
CS	Carrier Sector
DBS	Data Base Sub-system
DL	Down Link
DTX	Discontinuous transmission
EDGE	Enhanced Data rates for GSM Evolution
E-EDGE	Enhanced EDGE
EFR	Enhanced Full Rate

<b>Abbreviations</b>	<b>Full Characteristics</b>
FAM	FAn Module
FE	Fast Ethernet
FP	Frame Protocol
FR	Full Rate
FS	Fabric Switch
GE	Gigabit Ethernet
GERAN	GSM Edge Radio Access Network
GPS	Global Positioning System
GSM	Global System for Mobile communications
HR	Half Rate
HSPA+	HSPA Evolution
LMT	Local Maintenance Terminal
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
NBAP	Node B Application Part
NIS	Network Interface of STM-1
NM	NetNumen
NMS	Network Management System
NOP	Network Optimization & Planning
OAM	Operating And Maintenance
OPEX	Operation EXpenditure
OSS	Operation Support Sub-system
PM	Power Module
PS	Packet Switch
PtM	Point to Multi-point
PtP	Point to Point
RCS	Radio Control Sub-system

<b>Abbreviations</b>	<b>Full Characteristics</b>
RF	Radio Frequency
RNC	Radio Network Controller
RRU	Remote Radio Unit
RTT	Round Trip Time
SA	Site Alarm
SCS	System Control Sub-system
SDH	Synchronous Digital Hierarchy
SDR	Software Defined Radio
SE	Site Alarm Extension
SNMP	Simple Network Management Protocol
TA	Time Advance
TNS	Transport Network Sub-system
UL	Up Link
USB	Universal Serial Bus
UTRAN	UMTS Terrestrial Radio Access Network
VxWorks	Winder River provided OS
WCDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access