



# RSU82

## User Manual

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Hardware Version: HV2.0

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## **Revision History**

<b>Revision No.</b>	<b>Revision Date</b>	<b>Revision Reason</b>
R1.5	2012-12-20	The following sections are added to About This Manul: <ul style="list-style-type: none"><li>● Related Documentation</li><li>● Convention</li></ul>
R1.4	2012-11-21	The Product Specifications and the technica specifications have been updated.
R1.3	2012-10-19	The technical Specifications have been updated.
R1.2	2012-05-30	Modified the following sections: <ul style="list-style-type: none"><li>● 1.1 Position of the RSU82 in the Radio Network</li><li>● 1.3 Services and Functions</li><li>● 1.4 Product Specifications</li><li>● 3.1 Physical Specifications</li><li>● 3.2 Radio Performance Specifications</li><li>● 4.2 Installing a RSU82</li></ul>

Revision No.	Revision Date	Revision Reason
R1.1	2012-01-30	<ul style="list-style-type: none"> <li>● 1.1 Position of the RSU82 in the Radio Network</li> <li>● 1.3 Services and Functions</li> <li>● 1.4 Product Specifications</li> <li>● 2.1 Hardware Architecture</li> <li>● 3.1 Physical Parameters</li> <li>● 3.2 Radio Performance Specification</li> <li>● 4.2 Installing RSU82</li> </ul>
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# About This Manual

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## 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.

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## Purpose

This manual provides information about the RSU82, including the product introduction, system principle, technical specifications, and hardware installation.

## Intended Audience

This manual is applicable to all personnel who work with the RSU82.

## What Is in This Manual

This manual contains the following chapters:

Chapter	Summary
1, Product Introduction	Describes the position of the RSU82 in the radio network, product features, services and functions, external interfaces and indicators.
2, System Architecture	Describes the hardware and software structures of the RSU82 and the functions.
3, Technical Specifications	Describes the technical specifications of the RSU82.
4, Hardware Installation	Describes installation procedures of the RSU82.
5, International Authentication	Describes the international authentications that the RSU82 has gained.

## Related Documents

The following documents must be read and understood before installation:

- Personal Health and Safety Information
- System Security Information





# Chapter 1

## Product Introduction

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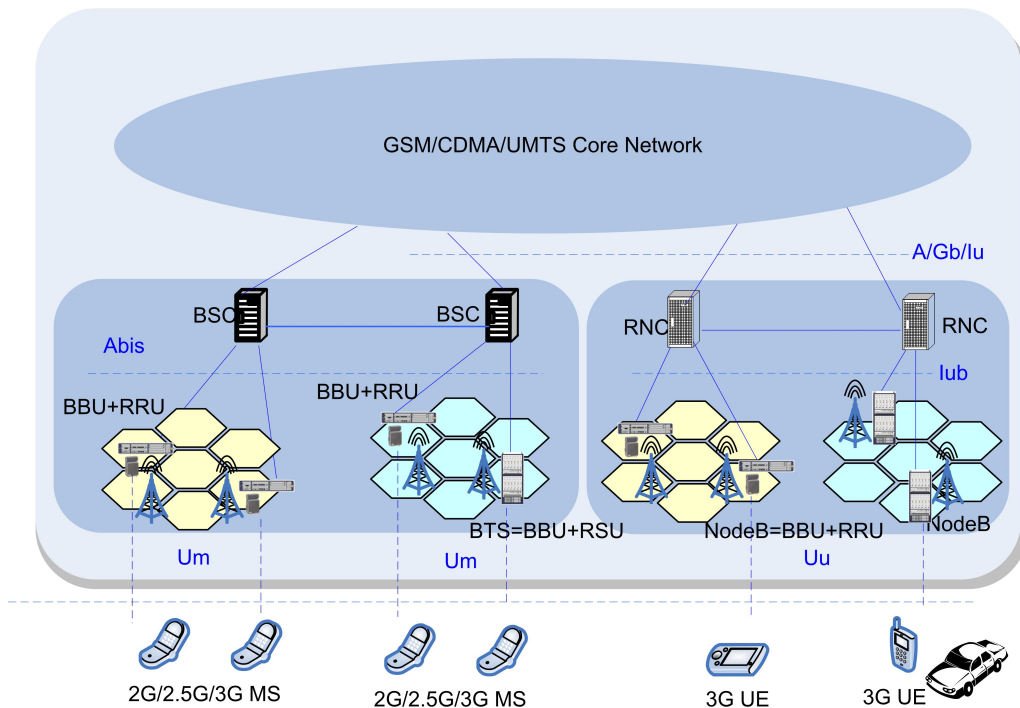
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## 1.1 Position of the RSU82 in the Radio Network

The RSU82 is the indoor remote Radio Frequency (RF) unit of the ZTE Base Transceiver Station (BTS). The RSU82 and a Base Band Unit (BBU) form a complete BTS/NodeB, implementing radio transmission in the covered area, controlling radio channels and realizing the communication with the Base Station Controller (BSC/RNC).

Figure 1-1 shows the position of the RSU82 (RRU) in the radio network.

Figure 1-1 Position of the RSU82 in the Radio Network



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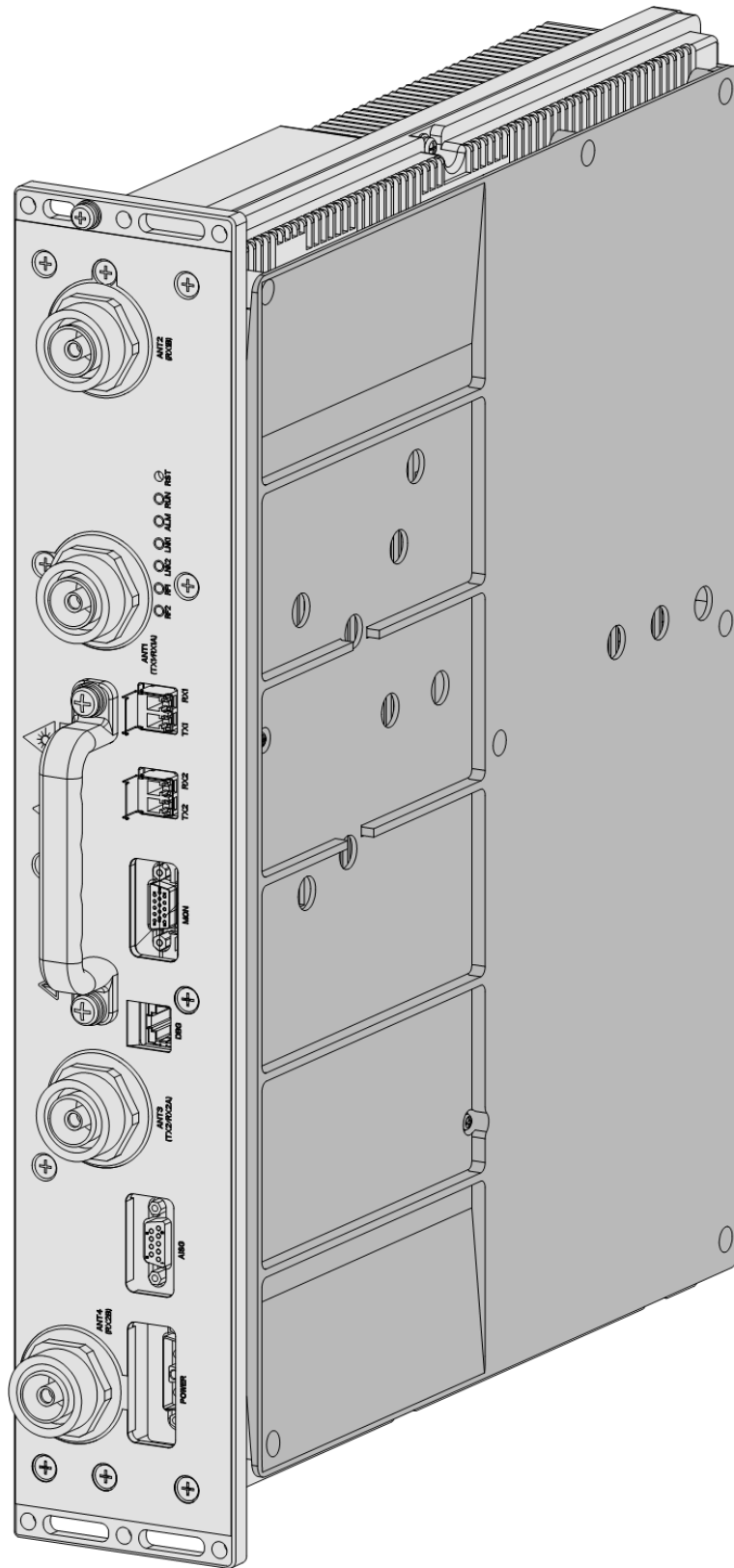
## 1.2 Product Appearance

The RSU82 is an indoor multi-carrier RF unit.

The RSU82 is designed based on multi-carrier digital intermediate frequency technology. It supports dual-transmission/four-reception of data signals, and supports the evolution to UMTS/LTE.

Figure 1-2 illustrates the RSU82 appearance.

Figure 1-2 RSU82 Appearance



## 1.3 Services and Functions

### Services

The RSU82 works with BBUs to provide the following services:

- GSM
  - Full Rate (FR) voice service.
  - Enhanced Full Rate (EFR) voice service.
  - Half Rate (HR) voice service.
  - Adaptive Multiple Rate (AMR) voice service.
  - 9.6 Kbps Circuit Switched (CS) domain data service.
  - General Packet Radio Service (GPRS).
- UMTS
  - R99 services.
  - High Speed Downlink Packet Access (HSDPA) services.
  - High Speed Uplink Packet Access (HSUPA) services.
  - Evolved High-Speed Packet Access (HSPA+) services.
- CDMA
  - 1X service
  - Evolution-Data Optimized (EVDO) service
  - Push-To-Talk (PTT) service
- LTE
  - The capacity and data transmission speed of mobile networks are greatly improved, and the service latency is lessened. The peak data transmission rates are 50 Mbps (uplink) and 100 Mbps (downlink).
  - LTE is based on an all-IP network, and it supports both IPv4 and IPv6.
  - LTE supports the configuration of 5 MHz, 10 MHz, 15 MHz and 20 MHz scalable bandwidth.
- Positioning services
  - Cell ID, Cell ID + Round Trip Time (RTT), and Assisted Global Positioning System (AGPS) positioning
- Multimedia Broadcast/Multicast Service (MBMS) services
  - Supports broadcast and multicast functions, and supports the Point-To-Point (PTP) and Point-To-Multipoint (PTM) multicast modes.
  - Supports mobility management.
  - Supports the multimedia streaming and background MBMS services.

## Functions

- Common Functions

The RSU82 operates with a BBU to constitute an integrated BS8800 or BS8900. The RSU82 forwards RF signals from antennas to the BBU for further processing. The RSU82 provides the following functions by connecting to the BBU:

- Terminal access and RF link transmission through antennas, including RF receiving/transmission duplex, low-noise amplification for received or transmitted RF signals, modulation/demodulation, measurement and report, power control, calibration, and synchronization.
- Hybrid networking of radio systems.
- Connection with the BBU through electrical interfaces or optical interfaces. The interface implements clock synchronization, transmission delay measurement and delay compensation, IQ data transmission, operation, maintenance, and configuration.
- Power amplification control and protection, including overpower, over-temperature, and standing wave alarm.
- Power protection against inverted connection.
- Alarm query during operation and maintenance.
- System management, including configuration management, alarm management, status check, and monitoring through local operation and maintenance interfaces.
- Local or remote software/hardware version query, software version upgrade, board reset, power query, auto-calibration, and alignment for electrically tuned antennas.

- GSM Mode

- Operating frequency band: 850 MHz/900 MHz/1800 MHz/1900 MHz.
- Supports GSM Phase I/Phase II/Phase II +.
- Supports encoding modes of GPRS CS1 to CS4.
- Supports space diversity, frequency diversity, time diversity, and polarization diversity.
- Supports frequency hopping, and Discontinuous Transmission (DTX).
- Supports Timing Advance (TA) calculation and super-distance coverage. The maximum coverage distance is 120 km.
- Supports Co-Broadcast Control Channel (Co-BCCH).
- The receiving end supports the Viterbi demodulation algorithm to improve a system receiving sensitivity and channel decoding capability.

- UMTS Mode

- Operating frequency band: 850 MHz/900 MHz/1900 MHz/2100 MHz.

- Supports UMTS R99, R4, R5, R6, R7, and R8.
- CDMA Mode
  - Operating frequency band: 800 MHz / 1900 MHz / 2100 MHz.
  - Received Signal Strength Indicator (RSSI) query.
  - Reverse spectrum query.
  - The air interfaces comply with the IS-2000 ReleaseA series standards and IS-856-A standard.
- LTE Mode
  - Operating frequency band: DD/1.8 MHz/2.6 MHz.
  - Supports uplink/downlink QPSK, 16-QAM, and 64-QAM for modulation.
  - Supports Multiple Input Multiple Output (MIMO).
  - The air interfaces comply with the 3GPP series standards.
- Hybrid Modes
  - Supports multi-mode configuration of GU, GL, and CL.
  - The air interfaces comply with the 3GPP and 3GPP2 series multi-mode standards.

## 1.4 Product Specifications

For a description of the RSU82 specifications and systems, refer to [Table 1-1](#).

**Table 1-1 Specification and System**

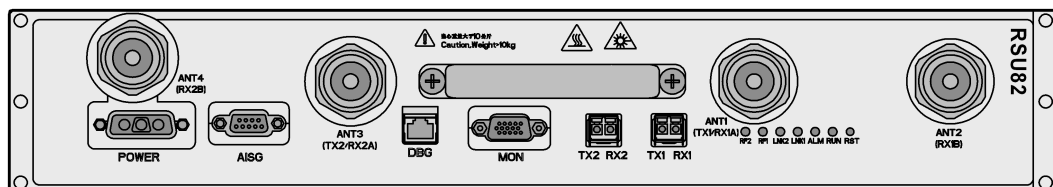
Specification	System
RSU82 S9000 (B8A)	Two optical interfaces/3Gbps at most, G single-mode/GU dual-mode, 900 MHz frequency band, 2 × 80 W
RSU82 S9000 (B8C)	Two optical interfaces/3Gbps at most, G single-mode, 900 MHz frequency band, 35MHz bandwidth for duplexer, 2 × 80 W
RSU82 S1800 (B8A)	Two optical interfaces/3Gbps at most, G single-mode/GL dual-mode, 1800 MHz frequency band, 2×80 W
	Two optical interfaces/3Gbps at most, G single-mode, 1800 MHz frequency band, 2 × 80 W
RSU82 S1800 (B8B)	Two optical interfaces/3Gbps at most, 2T2R, GL50M, 1800 MHz frequency band, 2 × 80 W
	Two optical interfaces/3Gbps at most, 2T4R, G single-mode, 1800 MHz frequency band, 2 × 80 W, 35M DPD
RSU82 S2100 (B6A)	Two optical interfaces/3Gbps at most, U single-mode, 2100 MHz frequency band, 2 × 60 W

Specification	System
RSU82 S2100 (B8A)	Two optical interfaces/3Gbps at most, U single-mode, 2100 MHz frequency band, 2 × 80 W, no NSBTUL 1L+2U
RSU82 S2100 (B8B)	Two optical interfaces/3Gbps at most, U single-mode, 2100 MHz frequency band, 2 × 80 W, NSBTUL 1L+2U
RSU82 S8500 (B8B)	Two optical interfaces/3Gbps at most, C single-mode/G single-mode/GU dual-mode/CL dual-mode, 850 MHz frequency band, 2 × 80 W
	Two optical interfaces/3Gbps at most, CL dual-mode, 850 MHz frequency band, 2 × 80 W
RSU82 S1900 (B6A)	Two optical interfaces/3Gbps at most, CL dual-mode, 1900 MHz frequency band, 2 × 60 W
RSU82 S1900 (B6B)	Two optical interfaces/3Gbps at most, C single-mode/G single-mode/GU dual-mode/CL dual-mode, 1900 MHz frequency band, 2 × 60 W
	Two optical interfaces/3Gbps at most, G single-mode/GU dual-mode, 1900 MHz frequency band, 2 × 60 W
RSU82C196	Two optical interfaces/3Gbps at most, CL dual-mode, 1900 MHz frequency band, 2 × 80 W
RSU82 S8000 (B6A)	Two optical interfaces/3Gbps at most, L single-mode, DD frequency band, 2 Carrier, 2 × 60 W, CEPT
RSU82 S7200 (B6A)	Two optical interfaces/3Gbps at most, L single-mode, AP700M frequency band, single Carrier, 2 × 60 W

## 1.5 External Interfaces

Figure 1-3 illustrates the RSU82 external interfaces.

Figure 1-3 RSU82 External Interfaces



For a description of the RSU82 external interfaces, refer to [Table 1-2](#).

**Table 1-2 RSU82 External Interfaces**

Interface	End-A Entity	End-B Entity	Description
ANT1(TX/RX)	Receiving and transmitting antenna	RSU82	Connects with the receiving and transmitting antenna on the TX/RX main channel.
ANT2(RX) (Optional)	Receiving antenna	RSU82	Connects with the antenna on the receiving diversity channel.
ANT3(TX/RX)	Receiving and transmitting antenna	RSU82	Connects with the receiving and transmitting antenna on the TX/RX main channel.
ANT4(RX) (Optional)	Receiving antenna	RSU82	Connects with the antenna on the receiving diversity channel.
POWER	The RF power supply in the power distribution subrack	RSU82	-48 V DC input power interface
AISG (Optional)	AISG antenna feeder	RSU82	Connects with the AISG interface of the antenna feeder.
DBG	PC and test equipment	RSU82	Debugging network port and test interface
MON	External equipment of the system	RSU82	Provides the interface of 4 dry-contact inputs, and the RS485 environment monitoring interface.
TX1 RX1	BBU or the upper-level cascading RSU82	RSU82	Connects with a BBU, or the CPRI optical interface of the upper-level cascading RSU82.
TX2 RX2	Lower-level cascading RSU82	RSU82	Connects with the CPRI interface of the lower-level cascading RSU82.
RST	-	-	Reset button
PE Grounding point	Grounding point	RSU82	Protective grounding interface

## 1.6 Indicators

For a description of the indicators on the RSU82 panel, refer to [Table 1-3](#).



Table 1-3 Indicators on the RSU82 Panel

Indicator	Color	Meaning	Description
RUN	Green	Running indicator	<ul style="list-style-type: none"> <li>● Slowly flashing (1 Hz): The system is operating properly.</li> <li>● Lit: The system is being reset, started, or loaded.</li> <li>● Unlit: The power supply is switched off or the system self-detection fails.</li> </ul>
ALM	Red	Alarm indicator	<ul style="list-style-type: none"> <li>● Unlit: There is no alarm.</li> <li>● Quickly flashing (5 Hz): There are critical alarms, indicating that services may be interrupted and faults should be resolved immediately, such as power failure, PLL unlocked, self detection failure, and link disconnection at the optical interface.</li> <li>● Slowly flashing (1 Hz): There are minor alarms, indicating that the system's performance is degraded even if it operates continuously.</li> </ul>
LNK1	Green	Connection indicator of the first-channel optical interfaces/electrical interfaces	<ul style="list-style-type: none"> <li>● Flashing: Optical/electrical interface 1 is operating properly.</li> <li>● Lit: Optical/electrical interface 1 is not operating properly (with optical signals).</li> <li>● Unlit: Optical/electrical interface 1 is not operating properly (without optical signals).</li> </ul>
LNK2	Green	Connection indicator of the second-channel optical interfaces/electrical interfaces	<ul style="list-style-type: none"> <li>● Flashing: Optical/electrical interface 2 is operating properly.</li> <li>● Lit: Optical/electrical interface 2 is not operating properly (with optical signals).</li> <li>● Unlit: Optical/electrical interface 2 is not operating properly (without optical signals).</li> </ul>
RF1	Red, Green	Indicator of the first-channel transmission link status, and the standing wave status at the antenna interface	<ul style="list-style-type: none"> <li>● Lit (green): RF output is normal.</li> <li>● Lit (red): There are alarms on the standing wave of antenna.</li> <li>● Unlit: There is no RF output or the power amplifier is switched off.</li> </ul>

Indicator	Color	Meaning	Description
RF2	Red, Green	Indicator of the second-channel transmission link status, and the standing wave status at the antenna interface	<ul style="list-style-type: none"><li>● Lit (green): RF output is normal.</li><li>● Lit (red): There are alarms on the standing wave of antenna.</li><li>● Unlit: There is no RF output or the power amplifier is switched off.</li></ul>

# Chapter 2

## System Architecture

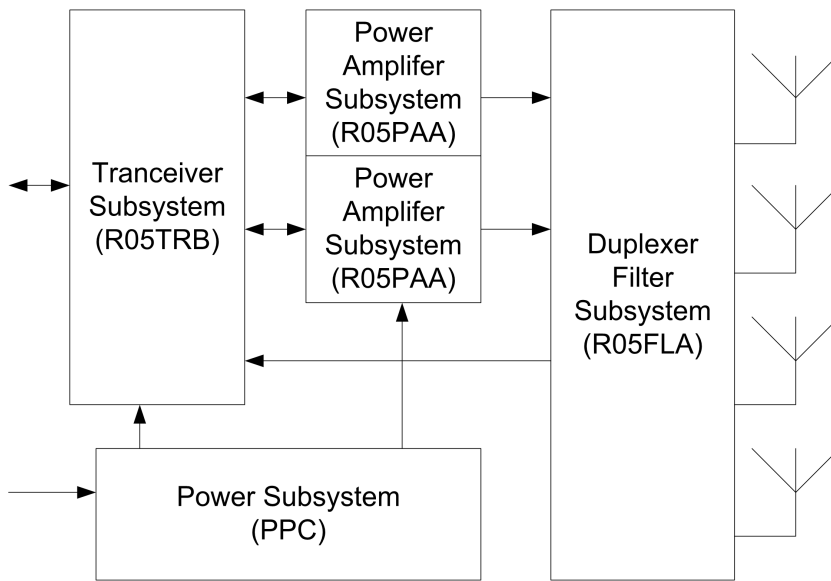
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## 2.1 Hardware Architecture

Figure 2-1 illustrates the RSU82 hardware architecture that consists of the transceiver subsystem (R05TRB), power amplifier subsystem (R05PAA), power subsystem (PPC), and the RF front-end subsystem (R05FLA).

Figure 2-1 Hardware Architecture



For a description of the subsystem functions of the RSU82, refer to Table 2-1.

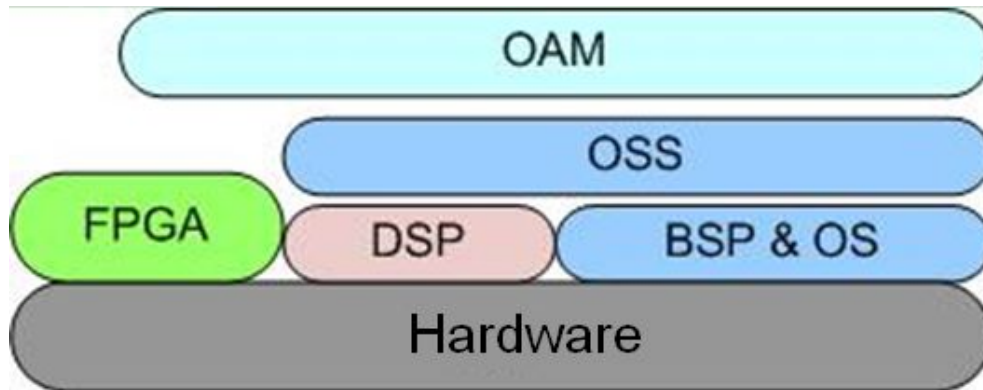
Table 2-1 Description for the Subsystem Functions of the RSU82

Name	Function
R05TRB	Implements the functions of 2-channel of transmitters and 4-channel of receivers, provides interfaces, and controls the transmitted signals.
R05PAA	Provides the amplification of 2-channel of transmitted RF signals.
PPC	Provides the 28 V (16 V to 32 V adjustable) power supply, 5.5 V power supply, power lightning protection and alarms.
R05FLA	Provides 2-channel of duplexers.

## 2.2 Software Architecture

The software subsystem of the RSU82 includes the software module at the bottom layer of a board, L2/L3 based on the Linux operating system, and the application software, as shown in Figure 2-2.

Figure 2-2 Software Architecture



- The software modules at the bottom layer of a board include the Board Support Package (BSP), Digital Signal Processing (DSP), and Field Programmable Gate Array (FPGA) modules.
  - The BSP&OS module initializes the system hardware, and provides the driving interface function.
  - The DSP module interacts with CPU module, interacts control and data with the FPGA module, extracts and updates pre-distortion parameters, tests on faults, and provides alarms.
  - The FPGA module transmits and receives control and data streams with the BSP or DSP.
- The Operation Support Subsystem (OSS) is the support layer of the whole software architecture, providing such software functions as scheduling, timer, memory management, inter-module communication, sequence control, monitoring, alarms, and logs, and a hardware-unrelated platform to run the system software.
- The Operation, Administration and Maintenance (OAM) provides such functions as version management, alarm management, diagnosis management, configuration management, tool management, performance management, system management, dynamic data management, and communication management.

# Chapter 3

## Technical Specifications

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## 3.1 Physical Specification

### Dimensions and Weight

Item	Specification
Dimensions	482 mm × 88 mm × 360 mm (Height × Width × Depth)
Weight	15 kg

### Power Supply and Power Consumption

Frequency Band	Consumption	Power
900 MHz	540 W	-40V DC to -57V DC
1800 MHz	635 W	
2100 MHz	445 W	

### Environment Requirements

Item	Specification
Operating temperature	-40 °C to +45 °C
Relative humidity	5% to 95%
Storage environment temperature	-40 °C to +70 °C
Relative storage humidity	10% to 100%
Solar radiation	1120 W/m <sup>2</sup>
Air speed	50 m/s
Atmospheric pressure	70 Kpa to 106 Kpa
Waterproof and dustproof level	IP65
Oscillation index	Complies with the ETS1300019 and NEBS standards

Item	Specification
Heat dissipation mode	Self-cooling
Noise level	No noise

### Reliability

Item	Specification
Availability	99.999689%
MTBF	≥150,000 hours
MTTR	0.5 hour
System service interruption time	Whole system interruption ≤1.632 minutes/year

## 3.2 Radio Performance Specifications

### Capacity Specifications

Item	Specification
GSM single-module carriers (900 MHz/1800 MHz)	2×6TRX
CDMA	8C/2S-2T
UMTS	2×4 C
LTE	Support one carrier of 20MHz/15MHz/10MHz/5MHz

### RF Specifications (GSM)

Item	Specification
Operating band	850 MHz/900 MHz/1800 MHz/1900 MHz
Output power at the cabinet top (850 MHz/900 MHz/1800 MHz)	2×80 W(GMSK)2×50 W(8PSK)
Output power at the cabinet top (1900 MHz)	2×60 W(GMSK)2×50 W(8PSK)
Static receiving sensitivity	-113.5 dBm

### RF Specifications (CDMA)

Item	Specification
Operating band	800 MHz/1900 MHz/2100 MHz
Output power at the cabinet top	2×60 W
Static receiving sensitivity	<-115 dBm

**RF Specifications (UMTS)**

Item	Specification
Operating band	850 MHz/900 MHz/1900 MHz/2100 MHz
Output power at the cabinet top (850 MHz/900 MHz)	2×80 W
Output power at the cabinet top (1900 MHz/2100 MHz)	2×60 W
Static receiving sensitivity	-126.5 dBm (single antenna) -129.2 dBm (double antenna)

**RF Specifications (LTE)**

Item	Specification
Operating band	DD/1.8 MHz/2.6 MHz
Output power at the cabinet top	2×40 W/2×40 W/2×60 W
Static receiving sensitivity	-105 dBm/single transmit/20 M bandwidth

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# Chapter 4

## Hardware Installation

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## 4.1 Overview

The RSU82 can be installed in such ZTE SDR-series base stations as BS8800, BS8900A, and BS8906E.

## 4.2 Installing an RSU82

This procedure describes how to vertically install an RSU82 in the RF support cabinet.

### Prerequisite

- The RF support cabinet is installed successfully.

### Steps

1.

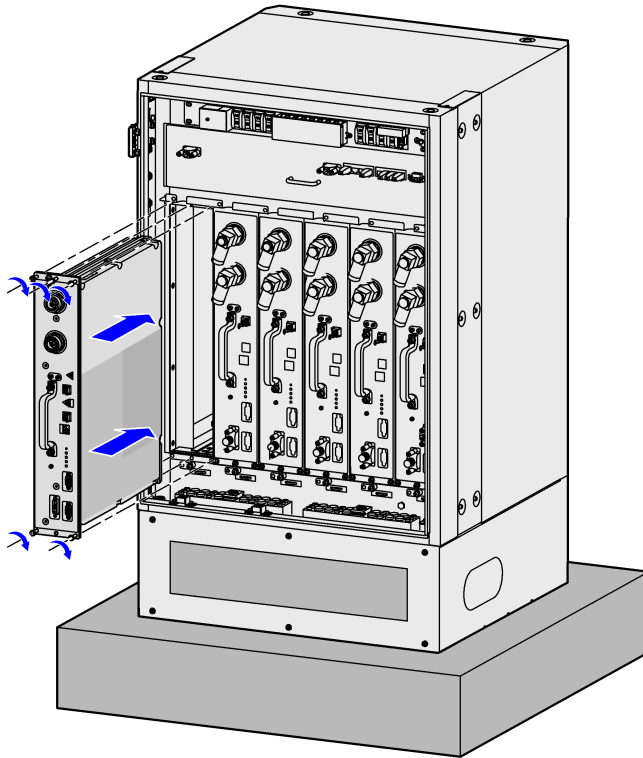


#### Caution!

- The weight of the RSU82 is 15 Kg. Therefore, during installation, you should hold its bottom firmly to prevent it from falling.
  - The handle of the RSU82 is used for installation/uninstallation in the cabinet rather than transportation.
- 

Wear an ESD wrist strap to hold the handle of the RSU82 with one hand, and hold the bottom of the RSU82 with the other hand to slowly push the RSU82 into the corresponding slot in the cabinet, as illustrated in [Figure 4-1](#).

Figure 4-1 Installing the RSU82



2. Fasten five cross recessed head screws M5×20 on the RSU82 panel.
3. Connect the protective grounding busbar under the panel of the RSU82 with the protective grounding bolt, and fasten the protective grounding bolt.

– End of Steps –

## 4.3 Cables Installation

### 4.3.1 Installing Power Cables

This procedure describes how to install power cables for all modules in the RSU82. –48 V DC input power is provided.

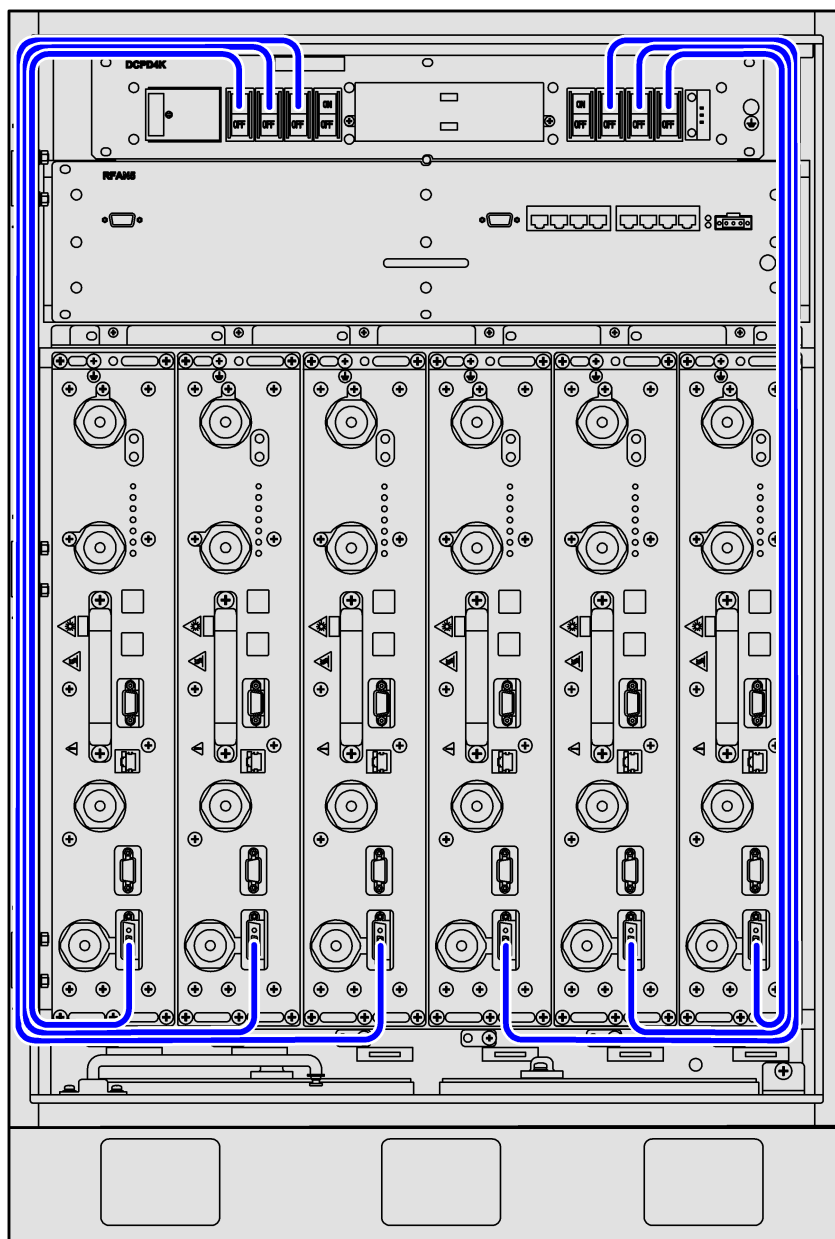
#### Prerequisite

- The ESD wrist strap is worn.
- The power supply is cut off successfully.
- The RSU82 is installed successfully.

#### Steps

- Connect the power plug of the corresponding slot to the POWER interface on the RSU82, as shown in [Figure 4-2](#).

Figure 4-2 Installing Power Cables



– End of Steps –

### 4.3.2 Installing a Monitoring Cable

This procedure describes how to install a monitoring cable for the RSU82.

When multiple RSU82s are used, the monitoring cable should be connected to the RSU82 at the right-most side of the cabinet.

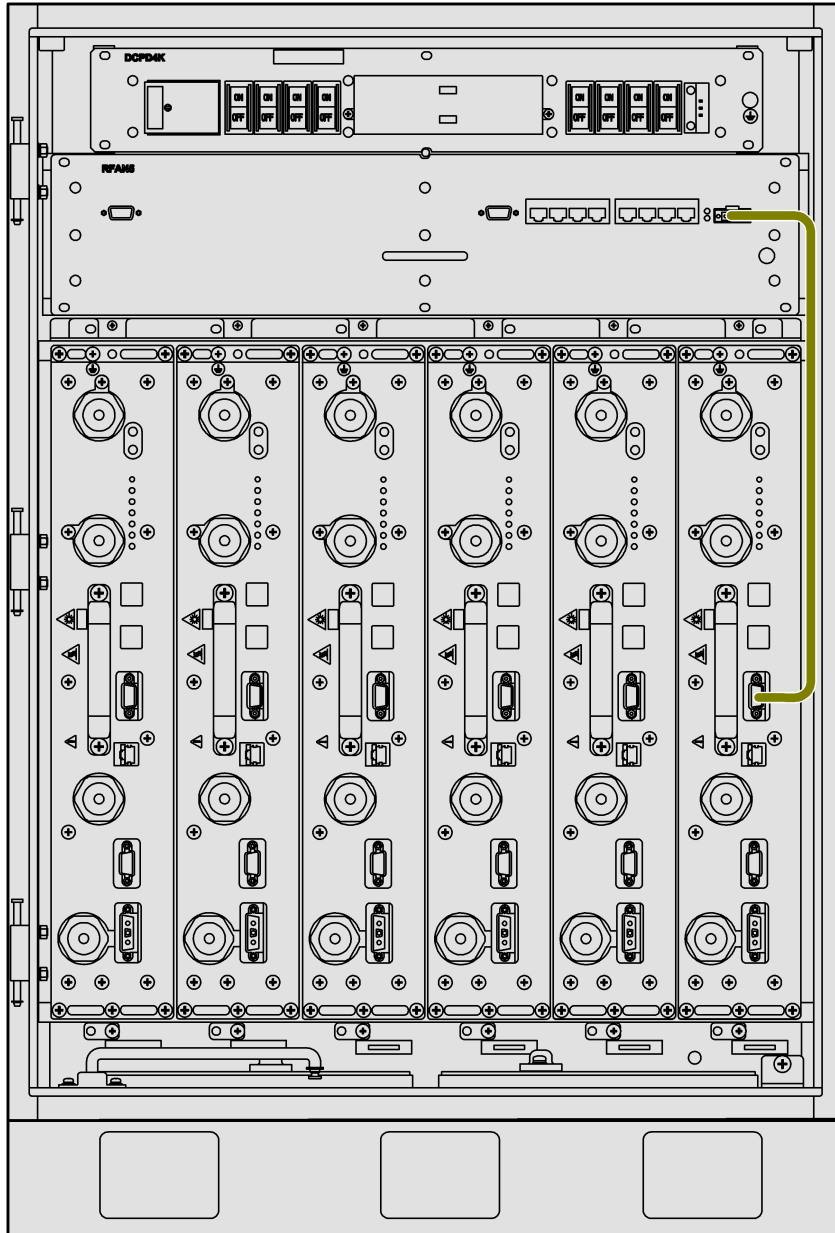
#### Prerequisite

- The ESD wrist strap is worn.
- The RSU82 is installed successfully.

**Steps**

- Connect the monitoring cable's plug to the MON interface on the RSU82, as shown in Figure 4-3.

**Figure 4-3 Installing the Monitoring Cable**



– End of Steps –

### 4.3.3 Installing an Antenna Feeder

This procedure describes how to install an antenna feeder. When the main feeder uses a 7/8" or 5/4" coaxial cable, an RF jumper is required for relay.

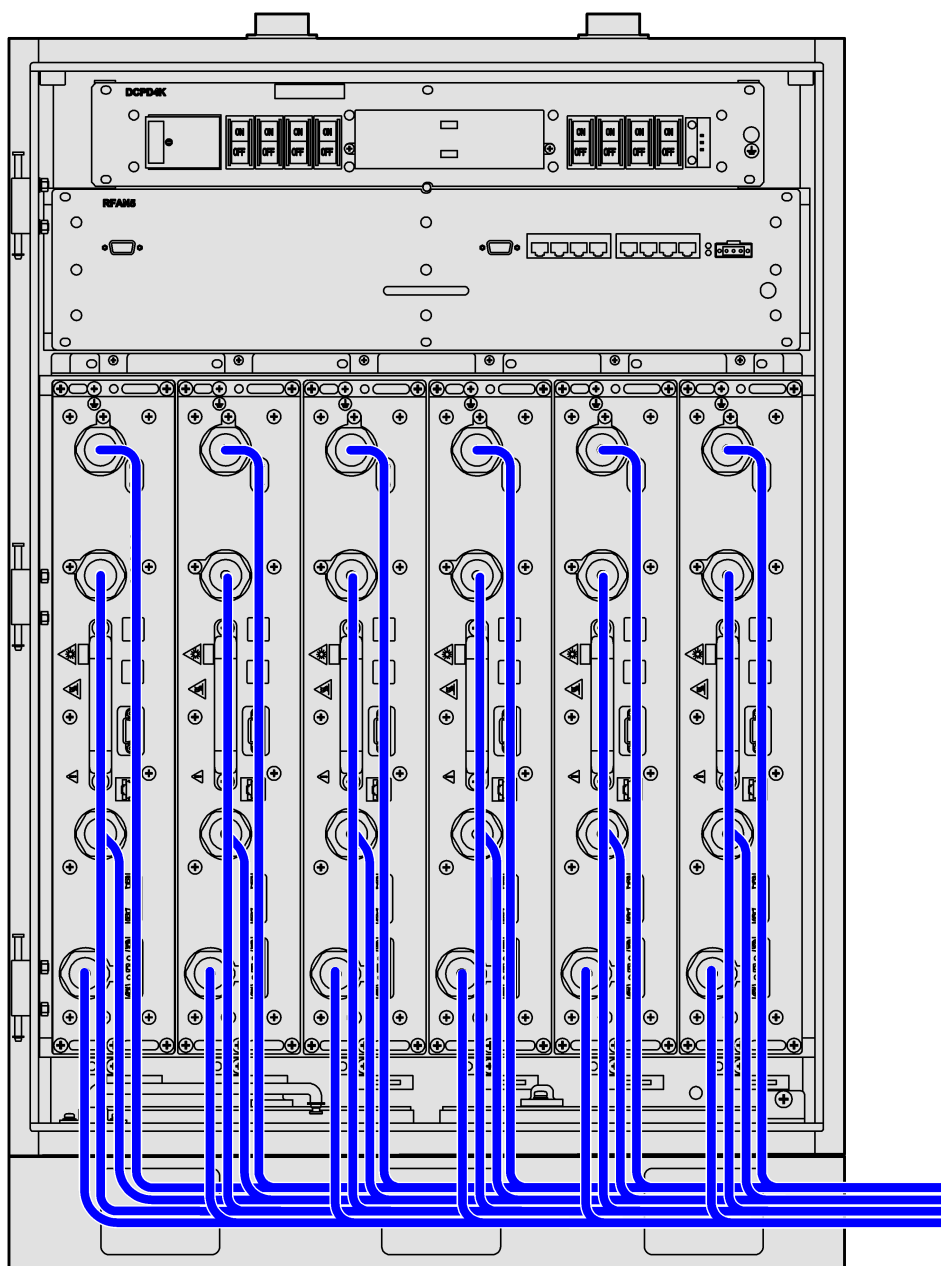
### Prerequisite

- The ESD wrist strap is worn.
- The RSU82 is installed successfully.

### Steps

- Connect the antenna feeder to the RF interface on the RSU82, as shown in [Figure 4-4](#).

**Figure 4-4** Installing the Antenna Feeder



**Note:**

- If the RSU82 is installed in the BS8800 cabinet, the feeder is led out from the cabling trough at the cabinet top.
- If the RSU82 is installed in the BS8900 cabinet, the feeder is led out from the cabling hole at the cabinet bottom.

– End of Steps –

## 4.3.4 Installing an SFP High-Speed Cable

This procedure describes how to install an SFP high-speed cable. The SFP high-speed cable is used to exchange signals between the RRUs and BBU or cascade the RRUs.

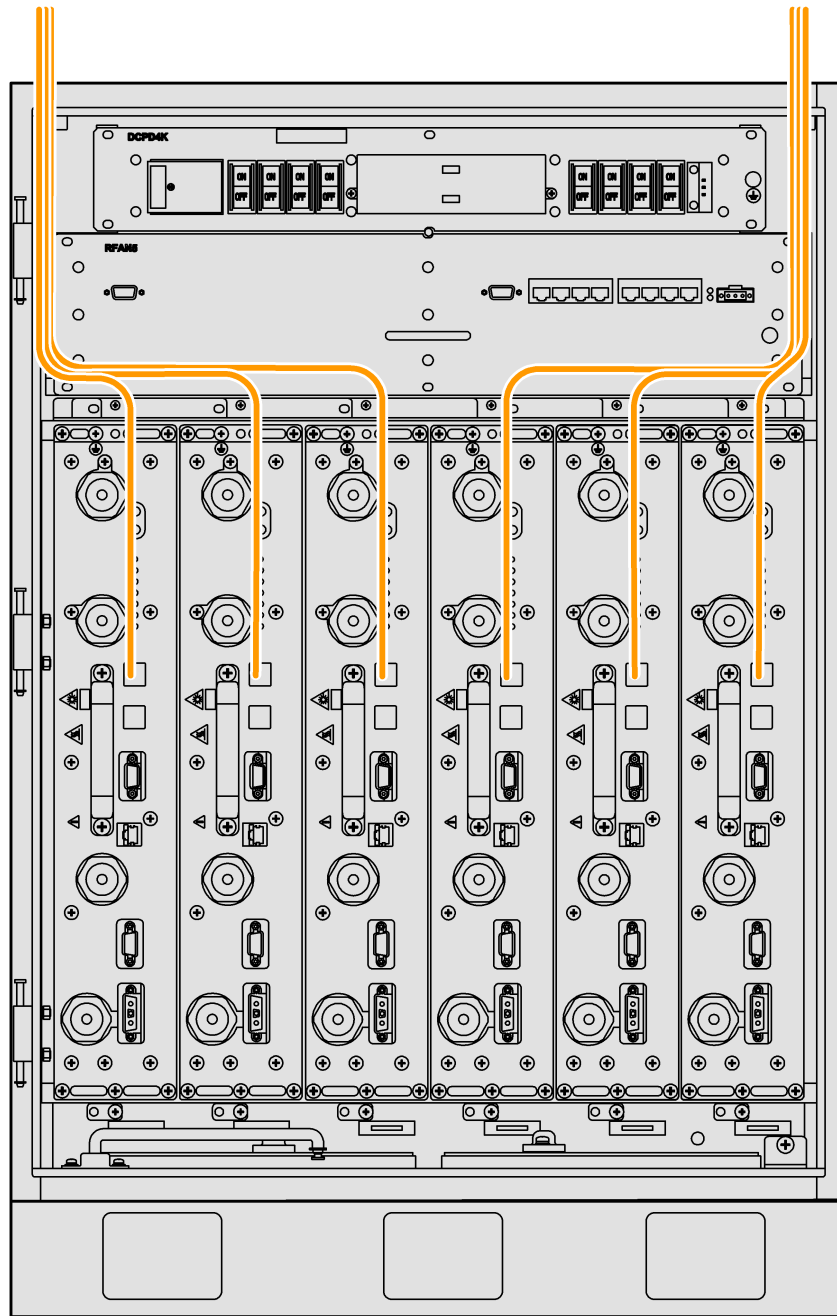
### Prerequisite

- The ESD wrist strap is worn.
- The RSU82 is installed successfully.

### Steps

- Remove the dustproof cap from the TX1/RX1 interface on the RSU82 module, and insert the SFP high-speed cable into the TX1/RX1 interface until a "click" sound is heard, as shown in [Figure 4-5](#).

Figure 4-5 Installing the SFP High-Speed Cable



- End of Steps -

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# Chapter 5

## International Authentication

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.



**Note:**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

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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.

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# Glossary

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- AGPS**  
- Assisted Global Positioning System
- AMR**  
- Adaptive Multiple Rate
- BBU**  
- BaseBand Unit
- BCCH**  
- Broadcast Control Channel
- BSC**  
- Base Station Controller
- BSP**  
- Board Support Package
- BTS**  
- Base Transceiver Station
- CS**  
- Circuit Switched
- DSP**  
- Digital Signal Processing
- DTX**  
- Discontinuous Transmission
- EFR**  
- Enhanced Full Rate
- EVDO**  
- Evolution-Data Optimized
- FPGA**  
- Field Programmable Gate Array
- FR**  
- Full Rate
- GPRS**  
- General Packet Radio Service
- HR**  
- Half Rate
- HSDPA**  
- High Speed Downlink Packet Access

**HSPA**

- High Speed Packet Access

**HSUPA**

- High Speed Uplink Packet Access

**MBMS**

- Multimedia Broadcast/Multicast Service

**MTBF**

- Mean Time Between Failures

**MTTR**

- Mean Time To Recovery

**OAM**

- Operation, Administration and Maintenance

**OSS**

- Operation Support Subsystem

**PTM**

- Point To Multipoint

**PTP**

- Point-To-Point

**PTT**

- Push-To-Talk

**RF**

- Radio Frequency

**RRU**

- Remote Radio Unit

**RSSI**

- Received Signal Strength Indicator

**RTT**

- Round Trip Time

**TA**

- Timing Advance