## Notice to the user

Government law prohibits the operation of unlicensed radio transmitters within the territories under government control.

Illegal operation is punishable by fine or imprisonment or both.

## Acknowledgement

Thank you for choosing BelFone series professional radio communication products!

Since 1989, BelFone has been dedicating to research and exploration in radio communication technology, and has developed leading smart technologies in the industry. Underpinned by research, development and design geared towards modern complicated and changeable communication environment, it is capable of tailoring specific communication solutions to your needs based on features of your industry. Superior products with outstanding performance may help you control the overall situation, while providing you with the best choice for smart scheduling dispatching and communicating.

**This User Manual is applicable to:**

**BF-TR8500 Series all frequency band**

**Fujian BelFone Communications Technology Co.,Ltd**

ADD：A-15 Huaqiao Economic Development Zone，Shuangyang，Luojiang，Quanzhou，Fujian，China

## Instructions befone Use

Following the safety precautions below may prevent damage to this product and personal injuries. To avoid potential risks, please read these instructions carefully before using the product, and operate the product as instructed.

◆ The repeater shall be protected from long-time direct exposure to the sun, kept in a place away from high temperature, high humidity, high dustiness or water splashes, and put on a stable surface;

◆ Where use of the repeater is prohibited or use of intercommunication may cause interference or danger, the repeater shall have its power turned off as required by relevant regulations;

◆If you find any fault of the product, please turn off the power directly, and then contact the local distributor of BelFone; unless otherwise specified in this Manual, maintenance should only be performed by any person other than a maintenance worker authorized by BelFone Company;

◆ If this product is needed for further development, please contact BelFone Company or BelFone's distributor;

◆Keep the product surface clean and dry; for cleaning, use a piece of soft cloth dipped with mild detergent or clear water (without water dripping) to wipe the product surface.

# Contents

# Unpacking and Device Inspection

**Note: The following instructions regarding unpacking are only for BelFone's distributors, and service agencies or factories authorized by BelFone.**

Please carefully unpacking the box. Strongly recommend to count the accessories against the following list before discarding the packaging. If you find any item is missing or damaged, please contact the local distributor of BelFone or directly contact BelFone Communication immediately.

## Standard Accessory

| Item | Quantity |
|---|---|
| Main Equipment | 1 |
| Power Cable | 1 |
| Operation Manual | 1 |
| Warranty Card | 1 |
| Conformity Certificate | 1 |

## Optional Accessory

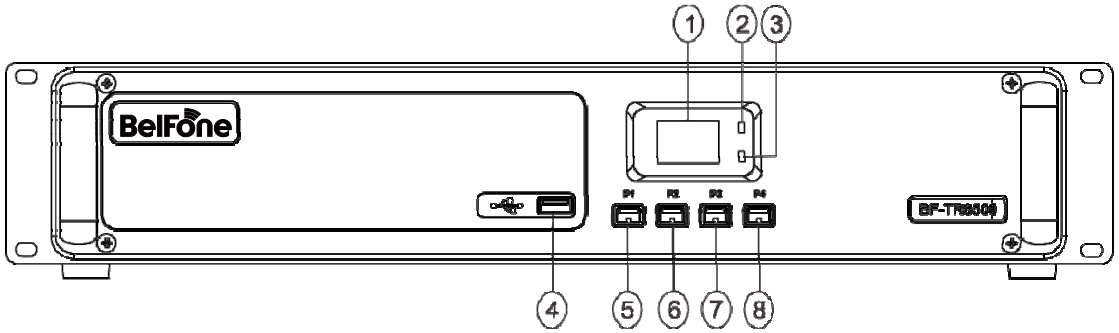
| Item | Quantity |
|---|---|
| Duplexer | 1 |
| DC Power Cable | 1 |
| Positioning Antenna | 1 |
| programming Cable | 1 |

# Features

- Digital Repeater Function
- Support customization, work with BelFone Intelligent IP interconnection system
- Support customization, IP Multi-site Connect
- Support customization, work as Simulcast Base Station
- Over voltage, over temperature alarm and protection
- Switching High, Middle and Low TX power.

# Get Familiar with the Device

## Front Panel View



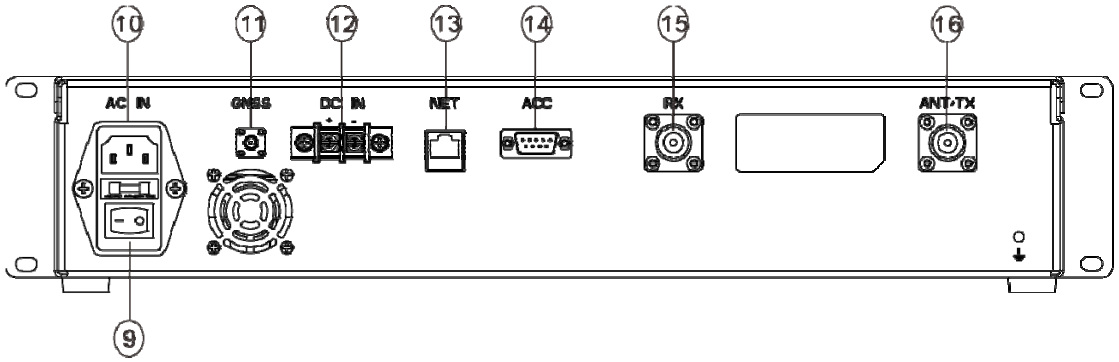

| | | | |
|---|---|---|---|
| ① | LCD | ⑤ | P1: Short press to decrease the channel number, long press to display IP address; (programming supported) |
| ② | A Indicator: Timeslot 1 working state indication | ⑥ | P2: Short press to increase the channel number, long press to display version (programming supported) |
| ③ | B Indicator: Timeslot 2 working state indication | ⑦ | P3: Short press to display TX frequency, long press to display IP internet site type; (programming supported) |
| ④ | USB Port | ⑧ | P4: Short press to display RX frequency, long press to display IP interconnection status. (programming supported) |

## Indicator Status

| LED Indication | | LCD Display | Device State |
|---|---|---|---|
| A Indicator | B Indicator | | |
| Normally on | / | Channel Number | Timeslot 1 emission |

| | | | |
|---|---|---|---|
| in orange | | | |
| Green light flickers (1s) | / | Channel Number | / |
| / | Normally on in orange | Channel Number | Timeslot 2 emission |
| / | Flashing in red (1s) | Channel Number | / |
| Orange light flickers (1s) | Green light flashes quickly (0.5s) | E0 | PLL receiving abnormality |
| Orange light flickers (1s) | Red light flickers quickly (0.5s) | E1 | PLL transmitting abnormality |
| Orange light flickers (1s) | Red light flickers slowly (2s) | E2 | Excessively high voltage |
| Orange light flickers (1s) | Green light flickers slowly (2s) | E3 | Excessively low voltage |
| / | / | E4 | Excessively high temperature |
| / | / | E5 | Fan working abnormality |
| / | / | E6 | The network is unconnected or abnormal |

## Back Panel view




| | | | |
|---|---|---|---|
| ⑨ | Power Switch | ⑭ | ACC Accessory Unit Port |

| | | | |
|---|---|---|---|
| ⑩ | AC Power Input Port | ⑮ | RX RF Input Port |
| ⑫ | DC Power Input Port | ⑯ | TX RF Output Port |
| ⑬ | Network Port | | |

# Basic Operations

## Power on/off

Press the [power switch] on the back of the repeater, the screen will light up and the LCD will display the channel number; and press the [power switch] again, the screen will go dark and the device is shut down.

## Button Configuration

Use the programming software to configure P1~P4 key, while corresponding the P1,P2,P3,P4 key to short pressing and holding-down operations.

**Programmable buttons include the following functions:**

1. Undefined: No function is assigned to the programmable button;

2. Power Switch: Press it to quickly switch the transmitting power: Low, Meddle, High, user-defined, when switching to high power, the LCD will display icon:  ; when switching to meddle power, the LCD will display icon:  , when switching to low power, the LCD will display icon:  , when switching to Self-Defined power, the LCD will display icon:  ;

3. Low Power: Press this button to switch to lower power, the LCD will display icon:  ;

4. Middle Power: Press this button to switch to medium power, the LCD will display icon: 

5. High Power: Press this button to switch to high power, the LCD will display icon: 

6. Self-Define Power: Press this button to switch to a Self-Defined power, the LCD will display icon:  ;

7. Tone Alerts: Press this button to turn on or off the prompt tone, when turn on the prompt tone, the LCD will show the following icon:  , when turn off the prompt tone, the LCD will show the following icon:  ;

8. Channel+ : Press this button to switch the channel - the channel number will progressively increase

9. Channel- : Press this button to switch the channel - the channel number will progressively decrease

10. Back-to-Back Switch : Press this button to turn on/off the back-to-back switch, when turn on the Back-to-Back, the LCD will show the following icon:  , when turn off the Back-to-Back, the LCD will show the following icon:  ;

11. Satellite Positioning Switch: Press this button to turn on/off the position switch, when turn on the satellite positioning, the LCD will show the following icon:  , when turn off the satellite positioning, the LCD will show the

following icon:  ;

12. Display Version: Press this button to view the version, the LCD will scroll show the version number;

13. Display IP Address: Press this button to view IP address, the LCD will scroll show the IP address;

14. Display IP internet site type: Press this button to view the IP internet site type, if the connection type is None, the LCD show the icon: -  ; if the connection type is: Peer, the LCD show the icon: -  ; if the connection type is: Backup Main Site, the LCD show the icon: -  ; if the connection type is: Home Station, the LCD show the icon: -  .

15. Display IP interconnection status: Press this button to view the IP interconnection status, if the interconnection function disable, the LCD show the icon: -  , if the connection type is Home Station, the LCD show the number of connected slave repeater; if the connection type is Backup main site, the LCD show the icon:-  .

16. Display TX Frequency: Press this button to view TX Frequency of current channel;

17. Display RX Frequency: Press this button to view RX Frequency of current channel;

18. Squelch Adjustment -: Press this button to adjust squelch level, the LCD show the squelch level of current channel, and then press again the value progressively increase;

19. Squelch Adjustment +: Press this button to adjust squelch level, the LCD show the squelch level of current channel, and then press again the value progressively decrease.

Note: While the LCD scroll shows the values and last digit will show repeatedly.

# Functions and operation instructions

## Digital Mode

### 1. Digital Repeater Mode

In the repeater mode, if the repeater is transmitting in timeslot 1, indicator A will glow orange, and if the repeater is transmitting in timeslot 2, indicator B will glow orange.

### 2. IP Interconnection Mode

Digital mode supports IP multi-site connection, and may realize interconnection between IP sites of multiple repeaters. When programming software is used to configure network services with one master repeater and multiple slave repeaters, it is required to configure a timeslot to the IP interconnection mode, so that after the network is connected, services may be transmitted from one repeater to the other repeaters.

Network Setting

Connection Type

| Connection type | Function |
|---|---|

| | |
|---|---|
| None | IP interconnection function is disabled |
| Peer | Set to slave (registration of the master repeater required) |
| Master Station | Set to master (waiting for slave repeater registration) |
| Master Repeater Backup | A type of slave repeater that will automatically become a master repeater when the master repeater fails. |

**Master Station:**

In IP multi-site connect system, it is permitted to configure only one master repeater, while other repeaters shall be configured as slave repeater, with IP addresses registered with the master repeater for IP interconnection.

**Backup Master Repeater:**

The backup master repeater is a slave repeater. In a system, it is permitted to configure a backup master repeater, which in normal operating conditions is the same with other slave repeaters. Only when the master repeater fails and cannot be connected, the backup master repeater will act to play the role of a master repeater in lieu of the original master repeater for registration of other slave repeaters.

**Peer:**

The peer is a slave repeater, in a system, it is permitted to configure multiple slave repeaters. Upon programming software, it is required to configure slave repeaters, the backup master repeater and the current repeater's IP address for successful registration with the master repeater.

**Authorization Code:** Peers should have consistent authorization codes with the master repeater for successful registration. For an authorization code, it is allowed to enter a maximum of 16 digits and letters from 0~9 and A~F; it can be null if nothing is entered.

**DHCP:** When a peer is set to DHCP, the router will act as the DHCP server and automatically assign one IP address to the peer.

(The router shall support DHCP, and the IP address assigned should be within the same network segment of the master repeater's IP).

- When the current repeater is connected as a master repeater, it is required to configure its IP, UDP port, gateway IP, network mask, NDS server IP, UDP port;
- When the current repeater is connected as a backup master repeater, it is required to configure its IP, UDP port, gateway IP, network mask, DNS server IP, UDP port and master repeater IP, master repeater UDP port;
- When the current repeater is connected as an peer, it is required to configure its IP, UDP port, gateway IP, network mask, DNS server IP, UDP port and master repeater IP, master repeater UDP port, backup master repeater IP, backup master repeater UDP port.

**Note: In one system, only one "master repeater" and one "backup master repeater" are permitted; other repeaters shall be configured as "peers".**

**The function is optional.**

## 3. System Networking Function

The repeater can be connected to BelFone intelligent interconnection system (SDC), and supports access to the system network for repeating DMR digital voice and data services, so as to realize interconnected communication in the networked mode.

Note: System networking is optional.

## Back-to-Back Function

The repeater supports the back-to-back function to realize back-to-back connection between a single repeater and other device for repeating voice. The current device supports back-to-back connection of digital channels. The back-to-back function can be set via the programming software or the preprogrammed [Back to back Switch] key.

## Simulcast Function

The repeater supports Simulcast function. When the Simulcast function is enabled, the repeater can be registered as a peer with the base station controller of BelFone intelligent interconnection system to realize Simulcast networking.

**Note: Simulcast function is optional.**

# Technical Specifications

| General | |
|---|---|
| Frequency Range | 400-480MHz |
| Channel Spacing | 12.5KHz |
| Antenna Impedance | 50Ω |
| Master Power Supply | 85~264VAC, 47-63Hz<br>3A/115VAC,1.7A/230VAC |
| Backup Power Supply | 11-13.8VDC，9A |
| Current Consumption | < 9A |
| Operating Environment | -30℃ ~ +70℃ |
| Storage Temperature | -40℃ ~ +85℃ |
| Sizes | 441mm(L)*327.5 mm(W)* 88(H) |
| Weight | 11.8Kg |
| Maximum antenna gain | 3.5dBi |
| **Emission** | |
| RF Power | 5-20W（Continuous Emission） |
| Frequency Stability | ≤±0.5ppm（Without Positioning） |

| | |
|---|---|
| | ≤±0.02ppm（With Positioning） |
| 4FSK Digital Modulation | 12.5KHz only data：7K60F1D<br>12.5KHz data and voice：7K60F1E |
| Power of Adjacent Channel | ≤60dB |
| Spurious Emission | -36dBm<1GHz<br>-30dBm>1GHz |
| Receiving | |
| Sensitivity | 3%BER≤0.35μV |
| Frequency Stability | ≤±0.5ppm（Without Positioning）<br>≤±0.02ppm（With Positioning） |
| Adjacent Channel Selectivity | ≥60dB |
| Intermodulation Immunity | ≥70dB |
| Spurious Response | ≥70dB |
| Blocking | ≥95dB |

# Statement

To the best of our knowledge, this Manual has been prepared in an accurate and complete manner. For any doubt, please contact us timely for specific explanation. Considering the fast development of wireless communication technology, BelFone reserves the right to modify the product design and specification without any further notification. Your understanding in this respect will be much appreciated!

## FCC Caution:

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

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## IMPORTANT NOTE:

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. 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.

## Operational Instruction and Training Guidelines:

To ensure optimal performance and compliance with the occupational/controlled environment RF energy exposure limits in the above standards and guidelines, users should transmit not more than 50% of the time and always adhere to the following procedures:

Antenna gain must not exceed 3.5dBi.
The antenna must be installed complying with the requirements of manufacturer or supplier, and it must be at least 55cm away from human body.