HR106X Digital Repeater

User Manual

Hytera Communications Corporation Limited

Preface

Welcome to the world of Hytera and thank you for purchasing this product. This manual includes a description of the functions and step-by-step procedures for use.

To avoid bodily injury or property loss caused by incorrect operation, please carefully read the *Safety Information Booklet* before use.

This manual is applicable to the following product:

HR106X Digital Repeater (X may represent 2, 5, 6 or 8)

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RF Radiation Information

This product must be restricted to operations in an Occupational/Controlled RF exposure Environments. Users must be fully aware of the hazards of the exposure and able to exercise control over their RF exposure to qualify for the higher exposure limits.

RF Radiation Profile

Radio Frequency (RF) is a frequency of electromagnetic radiation in the range at which radio signals are transmitted. RF technology is widely used in communication, medicine, food processing and other fields. It may generate radiation during use.

RF Radiation Safety

In order to ensure user health, experts from relevant industries including science, engineering, medicine and health work with international organizations to develop standards for safe exposure to RF radiation. These standards consist of:

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR § 1.1307, 1.1310

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and 2.1091

- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1:2005; Canada RSS102 Issue 5 March 2015
- Institute of Electrical and Electronic Engineers (IEEE) C95.1:2005 Edition

Compliance with RF Exposure Standards

To control your exposure and ensure compliance with the occupational/controlled environment exposure limits, this equipment should be operated with minimum distance 45 cm between the radiator & your body.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Verification of harmful interference by this equipment to radio or television reception can be determined by turning it off and then on. The user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna. Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a different circuit to that of the receiver's outlet.
- Consult the dealer or an experienced radio/TV technician for help.

Operation is subject to the following two conditions:

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

Note: 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.

FCC Regulations

Federal Communication Commission (FCC) requires that all radio communication products should meet the requirements set forth in the above standards before they can be marketed in the U.S, and the manufacturer shall post a RF label on the product to inform users of operational instructions, so as to enhance their occupational health against exposure to RF energy.

Operational Instructions 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 always adhere to the followings:

- Gain of antenna must not exceed 5 dBi (indoor) or 10 dBi (outdoor).
- Install the antenna at least 105 cm (indoor) or 180 cm (outdoor) away from your body, in accordance with the requirements of the antenna manufacturer/supplier.

EU Regulatory Conformance

As certified by the qualified laboratory, the product is in compliance with the essential requirements and other relevant provisions of 2014/53/EU.

Please note that the above information is applicable to EU countries only.

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Documentation Information

Instruction Conventions

Icon	Description
TIP	Indicates information that can help you make better use of your product.
NOTE	Indicates references that can further describe the related topics.
CAUTION	Indicates situations that could cause data loss or equipment damage.
WARNING	Indicates situations that could cause minor personal injury.
DANGER	Indicates situations that could cause major personal injury or even death.

Notation Conventions

Item	Description	Example
Boldface	Denotes menus, tabs, parameter names, window names, dialogue names, and hardware buttons.	To save the configuration, click **Apply**.
		The **Log Level Settings** dialogue box appears.
		Press the **PTT** key.
" "	Denotes messages, directories, file names, folder names, and parameter values.	The screen displays "Invalid Battery!".
		Open "PSS.exe".
		Go to "D:/opt/local".
		In the **Port** text box, enter "22".
>	Directs you to access a multi-level menu.	Go to **File** > **New**.
Italic	Denotes document titles.	For details about using the DWS, refer to *Dispatch Workstation User Guide*.
`Courier New`	Denotes commands and their execution results.	To set the IP address, run the following command: `vos-cmd - m name IP`

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1. Packing List

Please unpack carefully and check that you have received the following items. If any item is missing or damaged, contact your dealer.

Item	Quantity (PCS)	Item	Quantity (PCS)
Repeater	1	Documentation Kit	1
Power Cord	1	/	/

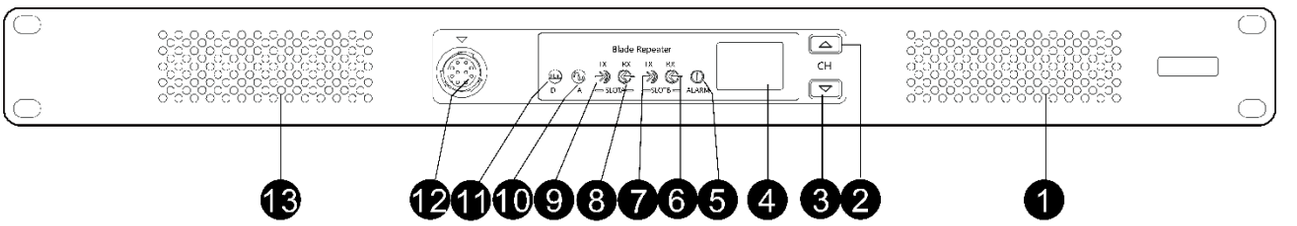
NOTE

- Figures in this manual are for reference only.
- Check the main unit label to ensure that the purchased product is correct.

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2. Product Overview

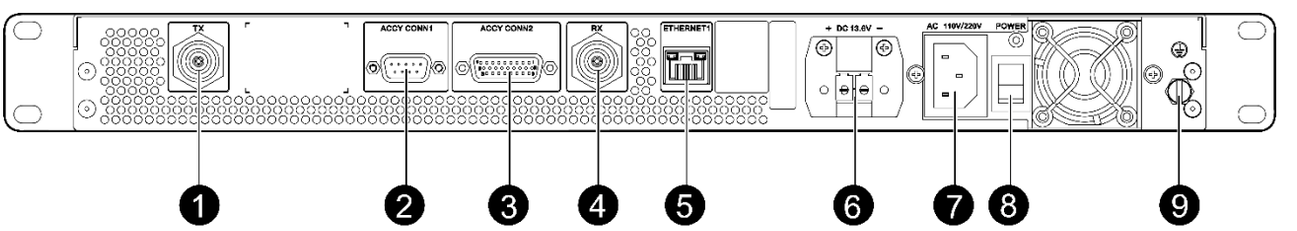
2.1 Front Panel



No.	Part Name	No.	Part Name
1	Air Inlet for PA	8	Timeslot A RX Indicator
2	Volume/Channel + Key	9	Timeslot A TX Indicator
3	Volume/Channel – Key	10	Analog Mode Indicator
4	Seven-segment Display	11	Digital Mode Indicator
5	Alarm Indicator	12	Audio/Programming Interface
6	Timeslot B RX Indicator	13	Air Inlet for Power Supply
7	Timeslot B TX Indicator	/	/

2.2 Rear Panel

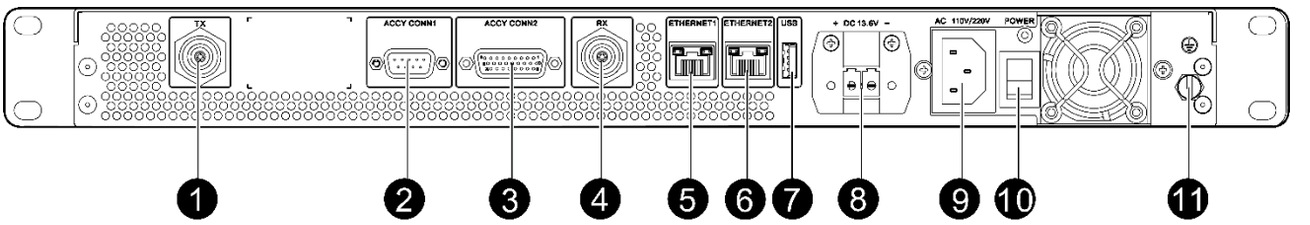
2.2.1 Basic Version



No.	Part Name	No.	Part Name
1	TX Antenna Connector	6	DC Power Inlet
2	Monitor/Tuning Interface	7	AC Power Inlet
3	Accessory Connector	8	AC Power Switch
4	RX Antenna Connector	9	Ground Screw
5	Ethernet Interface	/	/

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2.2.2 Advanced Version



No.	Part Name	No.	Part Name
1	TX Antenna Connector	7	USB Connector
2	Monitor/Tuning Interface	8	DC Power Inlet
3	Accessory Connector	9	AC Power Inlet
4	RX Antenna Connector	10	AC Power Switch
5	Ethernet Interface 1	11	Ground Screw
6	Ethernet Interface 2	/	/

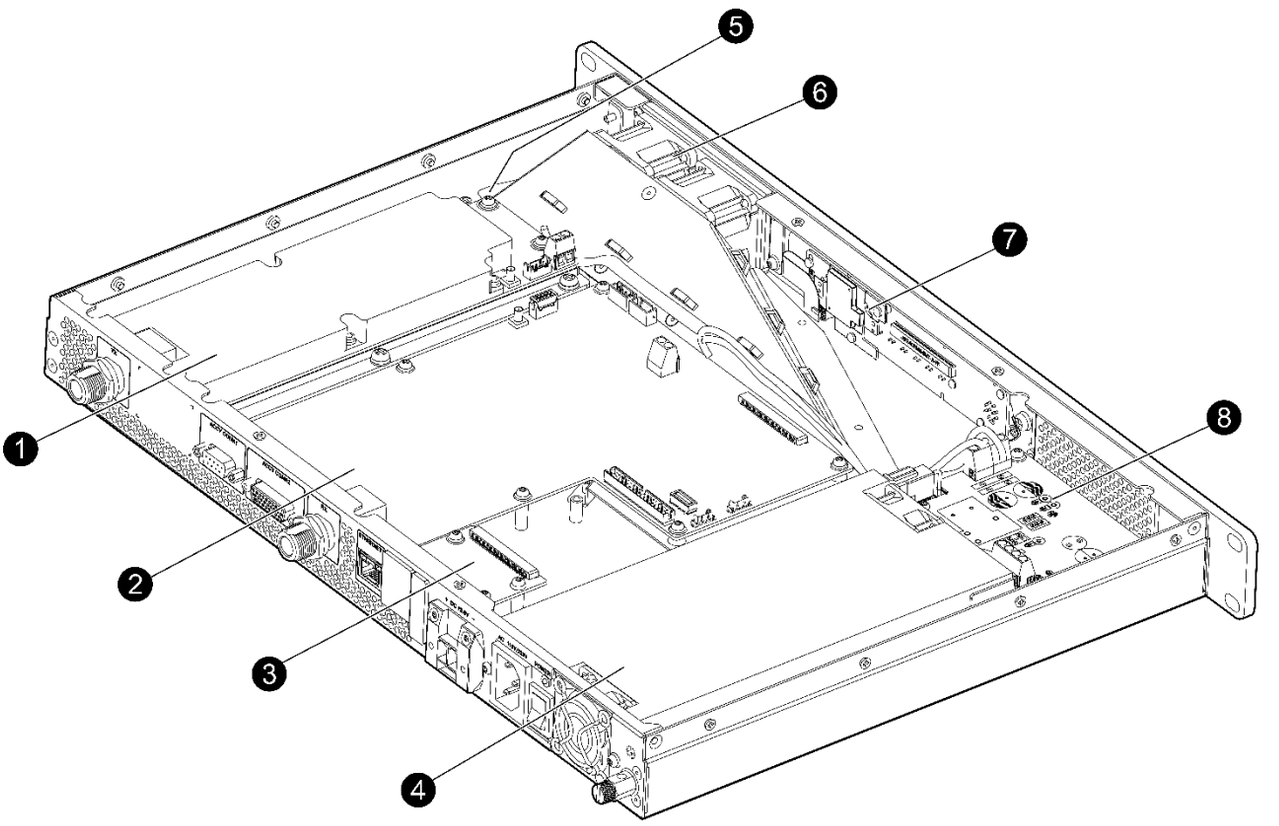
NOTE

When the repeater works in routing mode, the Ethernet interface 1 and Ethernet interface 2 must serve as LAN port and WAN port respectively.

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2.3 Internal Parts

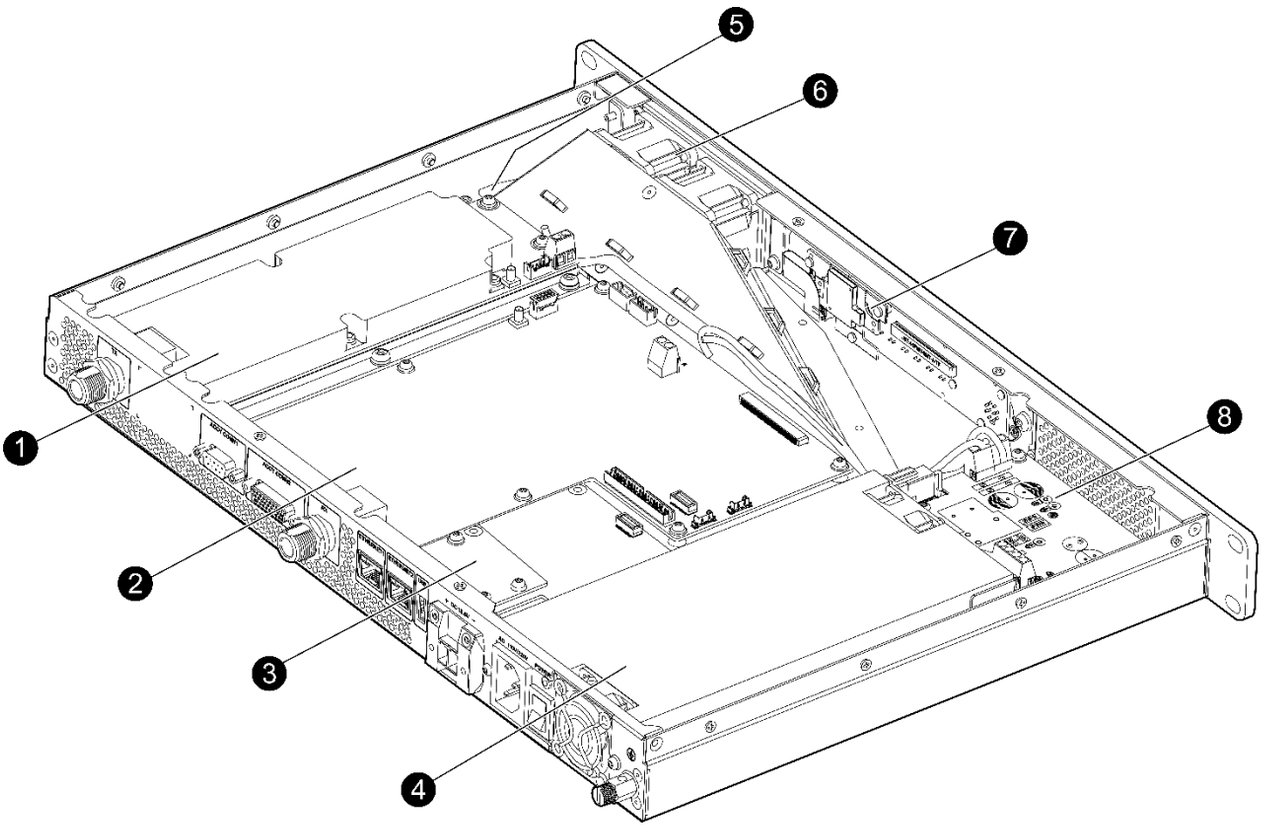
2.3.1 Basic Version



No.	Part Name	No.	Part Name
1	PA Module	5	Wind Scooper
2	Main Board	6	Fan
3	Network Board	7	Control Panel
4	Power Supply Module	8	Float Charging Board

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2.3.2 Advanced Version



No.	Part Name	No.	Part Name
1	PA Module	5	Wind Scooper
2	Main Board	6	Fan
3	Coprocessor	7	Control Panel
4	Power Supply Module	8	Float Charging Board

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3. Installation

To ensure optimum performance and reliability of the repeater, read the following instructions carefully.

3.1 Installation Requirements

3.1.1 Environmental Conditions

The repeater must be installed in a dry and well-ventilated place. The operating temperature ranges from –30°C to +60°C, and the relative humidity is no higher than 95%.

3.1.2 Installation Site

The repeater can be installed in a rack, bracket, and cabinet, or on a desk.

NOTE

For more information, refer to the *Safety Information Booklet*.

3.2 Pre-installation Tasks

3.2.1 Preparing the Tools

- Phillips screwdriver
- T-10 torx screwdriver
- Spanner
- Anti-static gloves
- Multimeter

3.2.2 Checking the Power Supply

Before you install the repeater, make sure that the power supply meets the following requirements:

- DC power voltage: 13.6±15% V
- AC power voltage: 100–240 V

3.3 Installation Procedure

To install the repeater, do as follows:

1. Wear the anti-static gloves.
2. Place the repeater to a proper location.

NOTE

If the repeater is installed in outdoor environments with frequent thunderstorms, such as the top of mountains or buildings, you must install an external lightning protection module (optional) on the network interface.

3. Connect the antenna, feed line, ground cable, and power cord to the repeater.

NOTE

- You must purchase the antenna and feed lines separately.
- You must prepare a ground cable.

4. Ground the repeater through the ground screw located on the rear panel.

3.4 Post-installation Check

To check whether the repeater works properly, do as follows:

1. Turn the repeater on.
2. Observe the LED indicators and the display in the front panel.
   - If the repeater works properly, the power supply indicator on the float charging board glows yellow or blue, and the display shows the current channel.
   - If not, the power supply indicator glows red, and the display shows the alarm code.

NOTE

For details, see 4.4 Checking the Status.

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4. Basic Operations

4.1 Turning On or Off the Repeater

- If the repeater is connected to a DC power supply, press the power switch on the DC power supply to turn on or off the repeater.

  After turn-on, if the power supply indicator turns red, the repeater occurs errors during power-on. You must switch off the DC power supply for four seconds, and then switch on the power supply again.

- If the repeater is connected to an AC power supply, press the **AC Power Switch** in the rear panel to turn on or off the repeater.

  After turn-on, the power supply indicator turns yellow.

4.2 Changing the Channel

Press the **Volume/Channel +** or **Volume/Channel –** key to change the channel.

The current channel number appears on the display of the repeater.

4.3 Adjusting the Volume

1. Long press the **Volume/Channel +** key for five seconds to switch the repeater from channel mode to volume mode.
2. Press the **Volume/Channel +** or **Volume/Channel –** key to increase or decrease the volume.

NOTE

If you do not have any operation for greater than five seconds or if you long press the **Volume/Channel +** key again within five seconds, the repeater switches to channel mode.

4.4 Checking the Status

4.4.1 Repeater

Indicator	Description	Repeater Status
Digital Mode	Blue	The repeater is operating in digital mode.
Analog Mode	Yellow	The repeater is operating in analog mode.
Alarm	Red	The repeater is not working properly, and the display shows the alarm code.

Indicator	Description	Repeater Status
Timeslot A TX	Red	● Analog mode: The repeater is transmitting. ● Digital mode: The repeater is transmitting on timeslot A.
Timeslot A RX	Green	● Analog mode: The repeater is receiving. ● Digital mode: The repeater is receiving on timeslot A.
Timeslot B TX	Red	Digital mode: The repeater is transmitting on timeslot B.
Timeslot B RX	Green	Digital mode: The repeater is receiving on timeslot B.

4.4.2 Network Interface

Indicator		Description	Repeater Status
Ethernet Interface	LED 1	Flashing	The network interface card is transmitting data.
	LED 2	Glowing	The data transmission rate is 1000 Mbps/100 Mbps.
		Off	The data transmission rate is 10 Mbps.

4.4.3 Power Supply

Indicator	Description	Repeater Status
Power Supply (Visible through the Air Inlet for Power Supply)	Yellow	The repeater is supplied by an AC power.
	Blue	The repeater is supplied by a DC power.
	Red	The repeater cannot be turned on.

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5. Alarm Information

With the Alarm feature enabled by your dealer, the repeater can automatically trigger an alarm if it does not work well. When the alarm is active, the alarm indicator glows red and the alarm code appears on the display.

The following table describes alarms in detail.

Alarm Code	Alarm Name	Description
E3	Under-voltage alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E4	TX unlocked alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E5	RX unlocked alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E6	Power amplifier (PA) over-temperature alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E7	Voltage standing wave ratio (VSWR) Alarm	The repeater automatically works at lower TX power.
E8	Off-lease alarm	The repeater fails to work.
E9	Slave unregistered alarm	The repeater cannot repeat the signal or data in the IP multisite connect network.
EE	Repeater disabled alarm	The repeater fails to work.
Eb	Low forward power alarm	The repeater stops transmission.
EH	Over-voltage alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.

Alarm Code	Alarm Name	Description
H1	Coprocessor over-temperature alarm	The repeater fails to work. At this time, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
H3	Network IP conflict alarm	Network services of the repeater are unavailable.
H5	Invalid IP address alarm	Network services of the repeater are unavailable.
bP	Backup alarm	The repeater works as a standby repeater.

5.1 Low Forward Power Alarm

5.1.1 Description

When the repeater detects that the TX power is below the preset value of forward power, the alarm indicator glows red and the alarm code Eb appears on the display.

Only when the TX power is 0 W, the repeater stops transmission. Except the above, even when the alarm occurs, the repeater works normally.

5.1.2 Solution

Check whether the RF adapter cable, antenna, or feed line is properly connected.

- If yes, contact your local dealer for technical support.
- If no, re-connect or replace the cable, antenna, or feed line.

5.2 TX/RX Unlocked Alarm

5.2.1 Description

When the repeater detects that the TX PLL or RX PLL is unlocked, the alarm indicator glows red and the alarm code E4 or E5 appears on the display.

At this time, the repeater automatically fails to provide certain features.

5.2.2 Solution

1. Disconnect the power supply, and then open the housing.

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2. Check whether all the cables are properly connected.

   - If yes, contact your local dealer for technical support.
   - If no, re-connect or replace the cable.

5.3 PA Over-Temperature Alarm

5.3.1 Description

When the repeater detects that the internal temperature of the PA module exceeds the upper threshold, the alarm indicator glows red and the alarm code E6 appears on the display.

At this time, the repeater stops transmission.

5.3.2 Solution

1. Check whether the surface temperature of the PA module is over 120°C.

   - If yes, go to Step 2.
   - If no, go to Step 3.

⚠ CAUTION

Do not touch the repeater to avoid risk of burns. You can use a digital thermometer with thermocouple to measure the temperature.

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2. Check whether the ambient temperature and ventilation conditions of the repeater meet the installation requirements.

   - If yes, go to Step 3.
   - If no, take the appropriate measure (e.g. air conditioner) to reduce the ambient temperature and improve ventilation.

3. Check whether the TX power is too high and the temperature of heat sink is rising too fast.

   - If yes, go to Step 4.
   - If no, contact your local dealer for support.

4. Check whether the RF adapter cable, antenna, or feed line is properly connected.

   - If yes, contact your local dealer for support.
   - If no, re-connect or replace the cable, antenna, or feed line.

5.4 Over-Voltage or Under-Voltage Alarm

5.4.1 Description

When the repeater detects that the voltage of the external power supply is out of the range, the alarm indicator glows red and the alarm code EH (over voltage) or E3 (low voltage) appears on the display.

At this time, the repeater disables all features and does not supply power for all circuits excerpt the baseband board circuit.

5.4.2 Solution

1. Use a voltmeter to check whether the DC or AC power ranges from 11 V to 15.6 V.
   - If yes, go to Step 2.
   - If no, replace the DC or AC power supply.
2. Check whether the power cord is properly connected.
   - If yes, contact your local dealer for technical support.
   - If no, re-connect or replace the power cord.

NOTE

When the voltage is too low, do either of the followings:

- If the repeater is powered by the AC power supply, connect the repeater to the DC power supply.
- If the repeater is powered by the DC power supply, replace the DC power supply or connect the repeater to the DC power supply.

5.5 VSWR Alarm

5.5.1 Description

When the repeater detects the VSWR at the TX antenna of the PA module exceeds the threshold, the alarm indicator glows red and the alarm code E7 appears on the display.

At this time, the repeater automatically works at lower TX power.

5.5.2 Solution

1. Check whether the TX frequency is within the frequency range of the antenna.
   - If yes, go to Step 2.
   - If no, contact your local dealer to replace the antenna.

2. Check whether the RF adapter cable, antenna, or feed line is properly connected.

   - If yes, contact your local dealer for technical support.
   - If no, re-connect or replace the cable, antenna, or feed line.

5.6 Coprocessor Over-Temperature Alarm

5.6.1 Description

When the advanced repeater detects that the temperature of the coprocessor exceeds 110°C, the alarm indicator glows red and the alarm code H1 appears on the display.

At this time, the repeater fails to work. Until the temperature of the coprocessor is below 110°C, the repeater works again.

5.6.2 Solution

1. Check whether the fan works normally.

   - If yes, go to Step 2.
   - If no, contact your local dealer to replace the fan.

2. Check whether the heat sink works normally.

   - If yes, contact your local dealer for technical support.
   - If no, contact your local dealer to replace the heat sink.

5.7 Network IP Conflict Alarm

5.7.1 Description

When a network IP conflict occurs between the repeater and other network devices in the same network segment, the alarm indicator glows red and the alarm code H3 appears on the display.

At this time, network services of the repeater are unavailable.

5.7.2 Solution

Check and modify the network configuration.

5.8 Slave Unregistered Alarm

5.8.1 Description

In the IP multisite connect network, if the repeater works as a slave one and fails to send a registration request to the

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master repeater due to improper network configuration, the alarm indicator glows red and the alarm code E9 appears on the display.

At this time, the repeater cannot repeat the signal or data in the IP multisite connect network.

5.8.2 Solution

Check and modify the network configuration.

5.9 Repeater Disabled Alarm

5.9.1 Description

With the Repeater Disable feature enabled by your dealer, when the repeater detects the active level, the alarm indicator glows red and the alarm code EE appears on the display.

At this time, the repeater fails to work.

NOTE

- When the repeater detects the invalid level, the repeater returns to normal use.
- When the level transforms between active and invalid status, the repeater restarts.

5.9.2 Solution

Contact your local dealer for technical support.

5.10 Off-lease Alarm

5.10.1 Description

When the rental time of the repeater expires, the alarm indicator glows red and the alarm code E8 appears on the display.

At this time, the repeater fails to work.

5.10.2 Solution

Contact your local dealer for technical support.

5.11 Invalid IP Address Alarm

5.11.1 Description

In network mode, if the repeater does not get the valid IP address through the dynamic host configuration protocol

(DHCP), the alarm indicator glows red and the alarm code H5 appears on the display.

At this time, the repeater fails to provide network services but continues to forward local services.

5.11.2 Solution

Check whether the network cable is properly connected.

- If yes, contact your local dealer for technical support.
- If no, re-connect or replace the network cable.

5.12 Backup Alarm

5.12.1 Description

When the repeater works as a standby repeater for an active repeater, the alarm indicator glows red and the alarm code bP appears on the display.

5.12.2 Solution

Ignore the alarm.

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6. Troubleshooting

Phenomena	Analysis	Solution
The repeater cannot be turned on.	The power cord may be disconnected or get loose.	Re-connect the power cord properly.
	The fuse in the DC power cord may be damaged.	Replace the fuse.
The repeater cannot communicate with a radio.	The TX/RX frequency of the repeater may be inconsistent with that of the radio.	Reset the frequencies.
	The repeater may suffer severe interference.	Keep away from the interference source, or change the frequencies.
	The radio may be out of the communication coverage of the repeater.	Move towards the communication coverage of the repeater.
The repeater works properly, but the radio cannot communicate with the other radios in the same group even though the RX indication is given.	The CTCSS/CDCSS of the repeater may be inconsistent with that of the radio.	Reset the CTCSS/CDCSS.
Within the communication coverage of the repeater, the radio suffers short communication distance and poor audio quality.	The cable may be damaged.	Repair the cable, or replace the cable if necessary.
	The antenna may get loose or be disconnected.	Re-connect the antenna properly, or replace it if necessary.

If the above solutions cannot fix your problems, or you may have some other queries, please contact the Company or your local dealer for more technical support.

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7. Care and Cleaning

To guarantee optimum performance as well as a long service life of the product, please follow the tips below.

7.1 Product Care

- Keep the product at a place of good ventilation and heat dissipation to facilitate normal work.
- Do not place irrelevant articles on top of the product to ensure optimal heat dissipation.
- Do not pierce or scrape the product.
- Keep the product away from substances that can corrode the circuitry.
- Do not place the product in corrosive agents, solutions or water.

7.2 Product Cleaning

⚠ CAUTION

Turn off the product before cleaning.

- Clean up the dust and fine particles on the product surface with a clean and dry lint-free cloth or a brush regularly.
- Use neutral cleanser and a non-woven fabric with neutral cleanser to clean the keys, knobs, display, and connectors after long-time use. Do not use chemical preparations such as stain removers, alcohol, sprays or oil preparations, so as to avoid surface case damage.
- Make sure the product is completely dry before use.

8. Optional Accessories

⚠ CAUTION

Use the accessories specified by the Company only. Otherwise, we will not be liable for any loss or damage arising out of use of unauthorized accessories.

Contact your local dealer for the optional accessories used with the product.

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9. Abbreviations

Abbreviation	Full Name
DHCP	Dynamic Host Configuration Protocol
GPIO	General Purpose Input/Output
LAN	Local Area Network
LED	Light-emitting Diode
UPS	Uninterruptible Power Supply
USB	Universal Serial BUS
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network

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