HR65X 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:

HR65X Digital Repeater (X may represent 2, 5, 6, 8, or 9)

SyncComms

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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:

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

Note: Any 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.

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 transmit not more than 50% of the time and always adhere to the following procedures:

- Antenna gain must not exceed 10 dBi.
- The antenna must be installed complying with the requirements of manufacturer or supplier, and it must be at least 86 cm away from human body.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an occupational/controlled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 86 cm between the radiator and your body.

ISEDC Radiation Exposure Statement

This equipment complies with ISEDC RF radiation exposure limits set forth for an occupational/controlled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 86 cm between the radiator and your body.

IC Exposition Aux Radiations

Cet équipement est conforme avec ISEDC les limites d'exposition aux rayonnements définies pour un environnement professionnel/contrôlé. Cet émetteur ne doit pas être co-localisés ou fonctionner en conjonction avec une autre antenne ou émetteur. Cet équipement doit être installé et utilisé avec une distance minimale de 86 cm entre leradiateur & votre corps.

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.

The maximum antenna gain is 10 dBi. The minimum safety distance is 103 cm.

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

Specifications

Parameter	Description
Frequency	• Digital Repeater: 400–470 MHz • GPS L1 C/A, BDS B1I: 1559–1610 MHz
Output Power	• High: 44 dBm • Middle: 40 dBm • Low: 30 dBm

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Documentation Information

Documentation Conventions

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

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

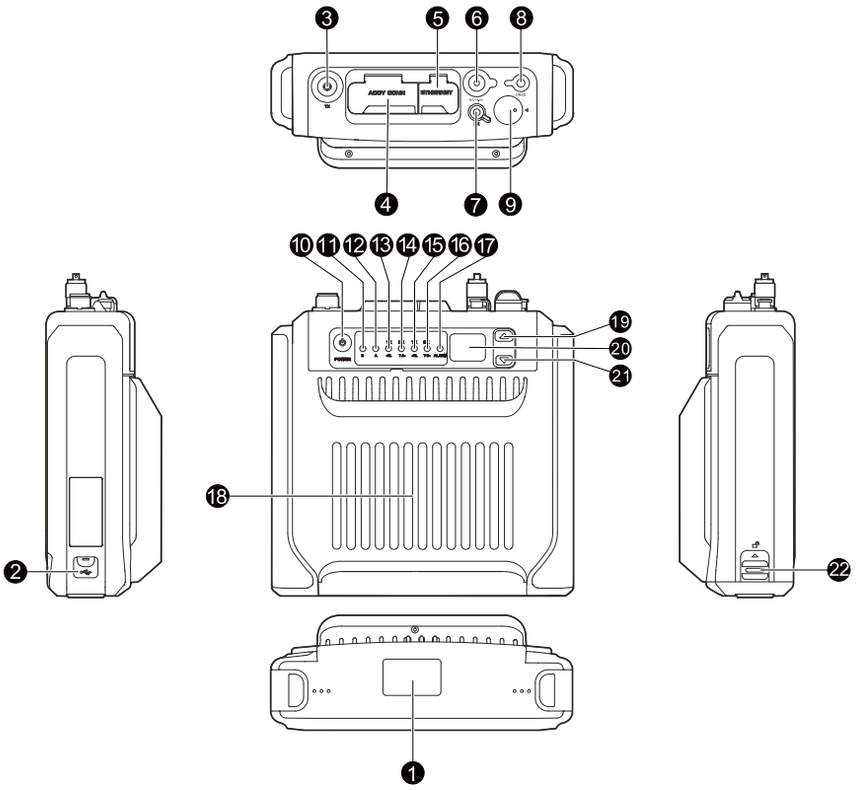
Item	Quantity (PCS)	Item	Quantity (PCS)
Repeater	1	Documentation Kit	1
Power Cord	1	/	/

NOTE

Figures in this document are for reference only.

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2. Product Layout



No.	Part Name	No.	Part Name
1	Bottom cover	12	Analog mode indicator
2	USB port	13	Timeslot A TX indicator
3	TX/Duplexer antenna connector (UHF female)	14	Timeslot A RX indicator
4	Accessory connector	15	Timeslot B TX indicator
5	Ethernet port	16	Timeslot B RX indicator
6	Power inlet	17	Alarm indicator
7	RX antenna connector (SMA female)	18	Fan
8	GNSS antenna connector (SMA female)	19	Volume/Channel up key
9	Aviation port	20	Seven-segment LED
10	On-Off key	21	Volume/Channel down key
11	Digital mode indicator	22	Battery latch

NOTE

Except that the low-power HR65X features no fan but the high-power HR65X features one, the other hardware of the two types is the same.

3. Precaution

Before installation and use, read the following instructions carefully.

- Install the repeater in a dry and well-ventilated place.
- Use the repeater in an environment where the temperature is between –30°C and +60°C and the relative humidity is equal to or lower than 95%.
- Ensure that the operating voltage is 12–16.8 V DC.

NOTE

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

4. Installation

You can place the repeater on the desk, or install the repeater on the wall.

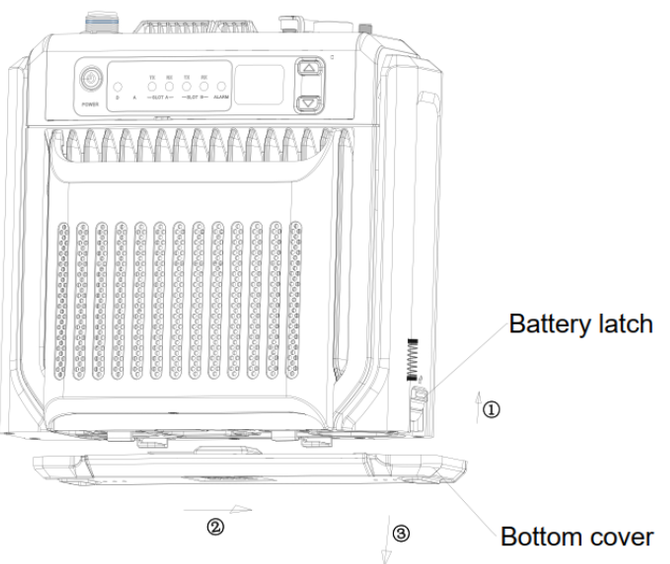
4.1 Tools

- Electric drill
- Screwdriver
- Wrench
- Anti-static gloves

4.2 Procedure

4.2.1 (Optional) Install the Duplexer

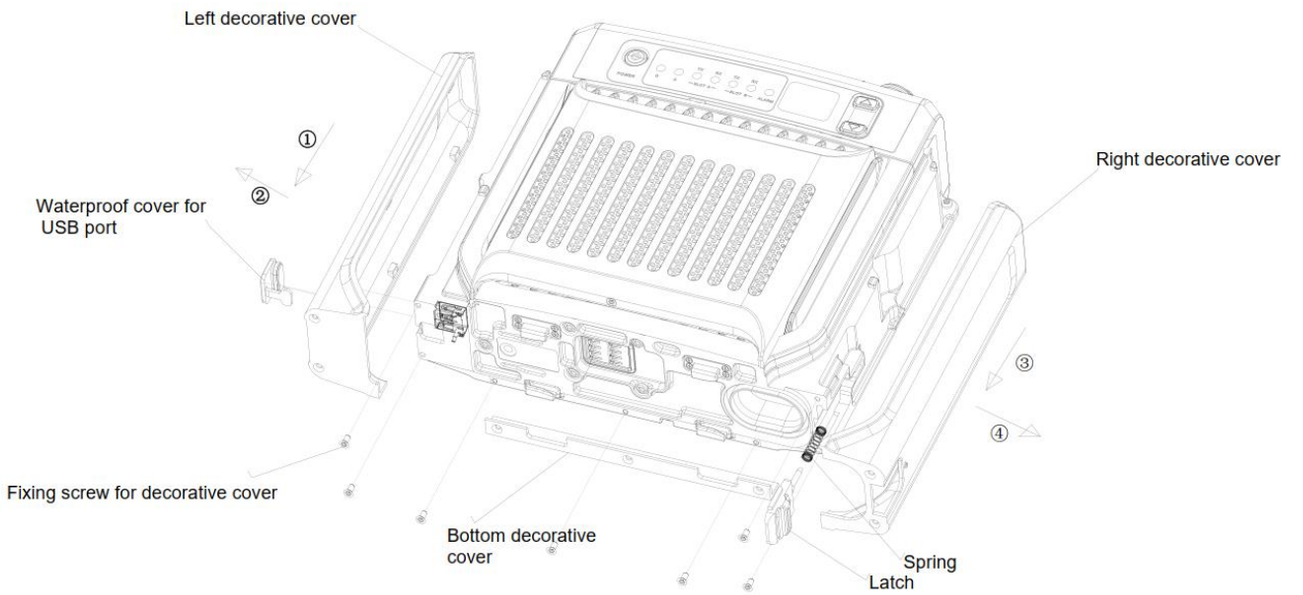
1. Remove the bottom cover.
   a. Push the battery latch upwards ①, and then hold it.
   b. Push the bottom cover rightwards ②, and then remove it ③.



2. Remove the decorative cover.
   a. Use the torx screwdriver to remove the three screws fixing the bottom decorative cover, and then remove the bottom decorative cover.
   b. Use the torx screwdriver to remove the two screws fixing the left decorative cover.
   c. Push the left decorative cover downwards ①, and then remove the left decorative cover ② and the waterproof cover for USB port.

d. Use the torx screwdriver to remove the two screws fixing the right decorative cover.

e. Push the right decorative cover downwards ③, and then remove the left decorative cover ④, battery latch, and spring.

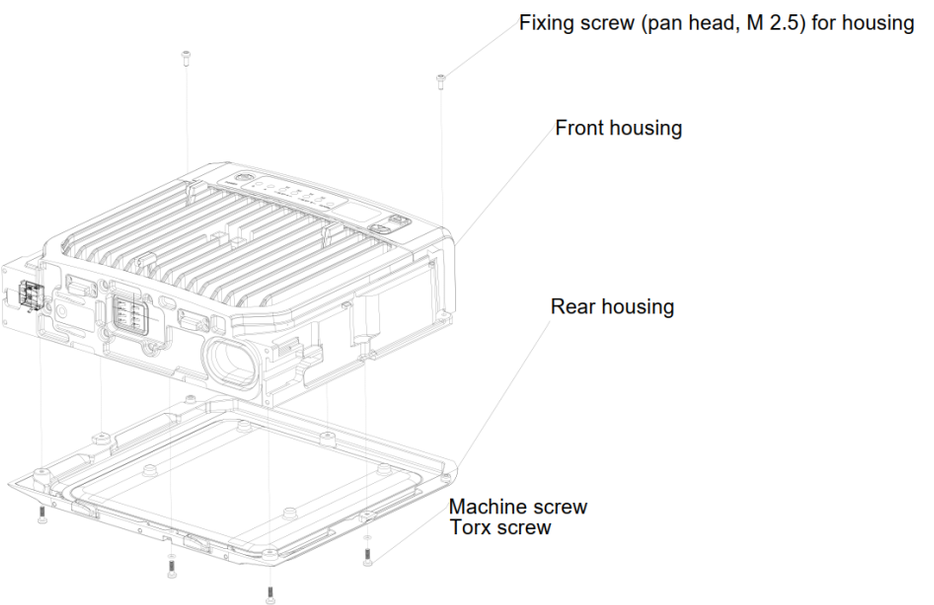


3. Remove the rear housing.

a. Use the Phillips screwdriver to remove the pan head screw.

b. Use the torx screwdriver to remove the torx screw.

c. Remove the rear housing.

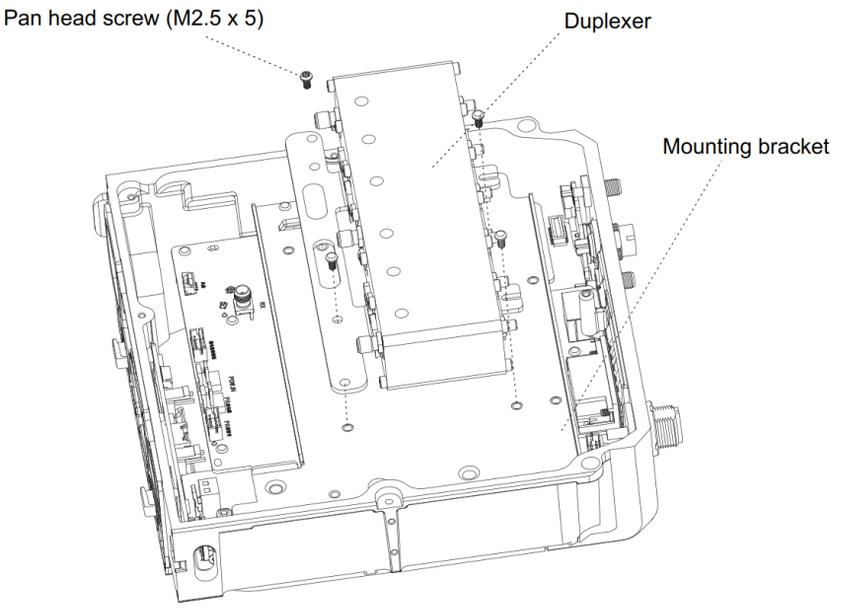


4. Install the duplexer.

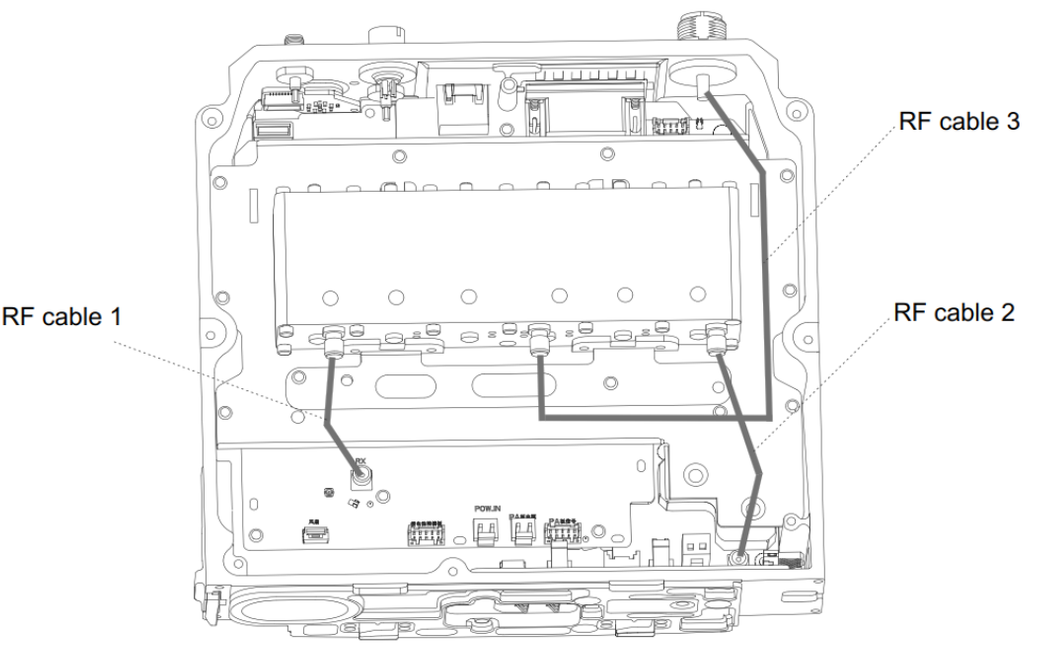
a. Align the mounting holes on the duplexer with the screw holes on the mounting bracket of the repeater.

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b. Secure the duplexer to the mounting bracket with pan head screws (M 2.5 x 5).

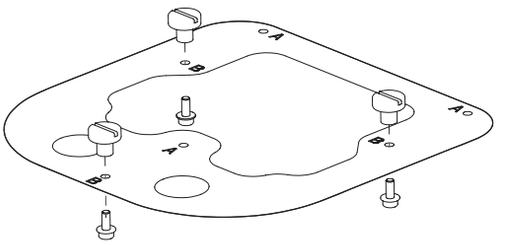


5. Connect the RF cable.

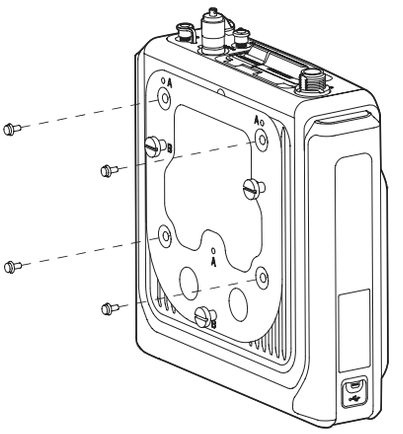


4.2.2 Install the Repeater

1. Install the three pegs onto the fixing plate with three M3 screws at holes marked with "B".



2. Fix the fixing plate to the back of the repeater with four M4 screws.



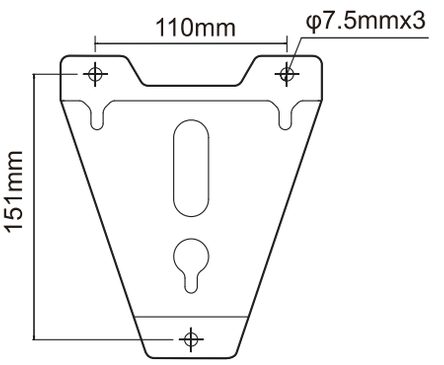
3. Install the repeater on the wall.

NOTE

Before installation, make sure the weight of the repeater is within the load bearing capacity of the wall.

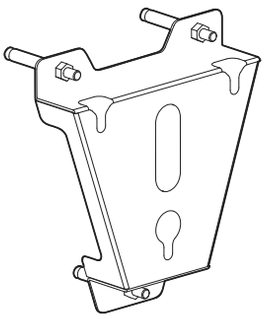
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a. Hold the bracket horizontally to a proper position on the wall, and then mark the locations of the three holes (Φ = 8 mm, h = 60 mm) as anchor points.

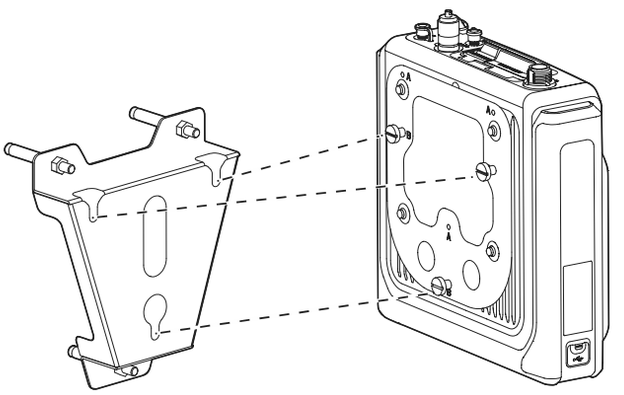


b. Drill three holes at the anchor points with an electric drill.

c. Fix the bracket onto the wall with three M6 expansion bolts.



d. Dock the three holes on the bracket with the three pegs on the back of the repeater.



5. Basic Operation

5.1 Turn On or Off the Repeater

- Automatically Turn On

  When connected to external power supply, the repeater automatically turns on.

- Manually Turn On or Off

  When connected to external power supply, long press the **On-Off** key to turn on or off the repeater.

5.2 Switch the Channel

In the standby mode, press the **Volume/Channel Up** key or the **Volume/Channel Down** key.

The seven-segment LED displays the current channel number.

5.3 Adjust the Volume

1. To switch the **Volume/Channel Up** key to the volume mode, press the key for five seconds.

NOTE

If you do not have any operation or you long press the **Volume/Channel Up** key within five seconds, the key will switch to the channel mode.

2. Press the **Volume/Channel Up** key to increase or the **Volume/Channel Down** key to decrease the volume.

5.4 (Optional) Transmit

1. Connect the remote speaker microphone (RSM) to the repeater.
2. Press the push-to-talk (PTT) key on the RSM.

   You can learn about the repeater status from LED indicators. For details, see 6 Status Indication.

NOTE

- The RSM is optional.
- Use the RSM specified by Hytera.
- **PTT TX Channel Type** and **TX Contact Name** are configured by the dealer.
- The repeater gives no indication or response if it detects no TX contact name on the current channel (digital or hybrid) after **PTT** is pressed.

6. Status Indication

6.1 LED Indicator

Indicator	Status	Description
Digital mode indicator	Glows blue	The repeater is in the digital mode.
Analog mode indicator	Glows orange	The repeater is in the analog mode.
Alarm indicator	Glows red	An exception occurs (The seven-segment LED displays the corresponding alarm code).
Timeslot A TX indicator	Glows red	● Analog mode: transmitting ● Digital mode: Timeslot A is transmitting.
Timeslot A RX indicator	Glows green	● Analog mode: receiving ● Digital mode: Timeslot A is receiving.
Timeslot B TX indicator	Glows red	Timeslot B is transmitting in the digital mode.
Timeslot B RX indicator	Glows green	Timeslot B is receiving in the digital mode.

6.2 Seven-Segment LED

Alarm Code

Alarm Code	Description	Alarm Code	Description
E1	Battery unmatched alarm	E9	Secondary repeater unregistered alarm
E2	Low battery alarm	EE	Repeater disabled alarm
E3	External power under-voltage alarm	Eb	Low forward power alarm
E4	TX unlocked alarm	EH	External power over-voltage alarm
E5	RX unlocked alarm	H3	Network IP conflict alarm
E6	Over-temperature alarm	H5	Invalid network IP alarm
E7	Voltage standing wave ratio (VSWR) alarm	bP	Backup alarm
E8	Off-lease alarm	/	/

Channel Code

Channel Code	Description
N	Indicates the current channel number, for example, 1, 2, 3, or more.

7. Alarm Information

With the Alarm feature enabled by your dealer, the repeater automatically triggers an alarm if any exception occurs. When the alarm is active, the LED displays the corresponding alarm code and the alarm indicator glows red.

The following table describes alarms in detail.

Alarm Code	Alarm Name	Description
E1	Battery unmatched alarm	The repeater fails to work.
E2	Low battery alarm	The repeater automatically turns off when the battery runs out.
E3	External power under-voltage alarm	The repeater fails to work. In this case, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E4	TX unlocked alarm	The repeater fails to work. In this case, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E5	RX unlocked alarm	The repeater fails to work. In this case, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.
E6	PA over-temperature alarm	The repeater fails to work. In this case, 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	Secondary repeater 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 when the TX power is 0 W.
EH	External power over-voltage alarm	The repeater fails to work. In this case, if the Repeater Backup feature is enabled on the CPS, the repeater starts a backup.

Alarm Code	Alarm Name	Description
H3	Network IP conflict alarm	Network services of the repeater are unavailable.
H5	Invalid network IP alarm	Network services of the repeater are unavailable.
bP	Backup alarm	The repeater works as a standby repeater.

7.1 Battery Unmatched Alarm

NOTE

The battery is an optional accessory, and can be purchased separately from your dealer or the Company.

7.1.1 Description

When the repeater detects that the attached battery is unmatched, the alarm indicator glows red and the LED displays "E1".

In this case, the repeater fails to work and automatically turns off in 10s.

7.1.2 Solution

- Contact your dealer to replace the battery or for technical support.
- Remove the battery, and then power the repeater with the external power supply.

7.2 Low Battery Alarm

NOTE

The battery is an optional accessory, and can be purchased separately from your dealer or the Company.

7.2.1 Description

When the repeater detects that the battery level of the matched battery is lower than threshold (15% of total battery capacity), the alarm indicator glows red and the LED displays "E2".

In this case, the repeater works normally but automatically turns off when the battery runs out.

7.2.2 Solution

Check whether the battery level is low through the battery indicator.

- If yes, charge or replace the battery.
- If no, contact your dealer for technical support.

NOTE

When the repeater is connected to the external power supply, the repeater is automatically powered with the external power supply.

When the battery level is higher than threshold or the repeater is powered with the external power supply, the alarm is cleared, and the LED and alarm indicator go off.

7.3 External Power Under-voltage or Over-voltage Alarm

7.3.1 Description

When the repeater detects that the voltage of the external power supply is out of range, the alarm indicator glows red and the LED displays "E3" for under-voltage alarm or "EH" for over-voltage alarm.

In this case, the repeater fails to work.

7.3.2 Solution

1. Check whether the power adapter is damaged.
   - If yes, replace the power adapter.
   - If no, go to step 2.
2. Check whether the input voltage of external power supply is beyond the repeater's operating voltage range with a voltmeter.
   - If yes, replace the power adapter.
   - If no, contact your dealer for technical support.

7.4 TX/RX Unlocked Alarm

7.4.1 Description

When the TX/RX phase-locked loop unlocks, the alarm indicator glows red and the LED displays "E4" for TX unlock or "E5" for RX unlock.

In this case, the repeater automatically fails to provide certain features.

7.4.2 Solution

Contact your dealer for technical support.

7.5 PA Over-temperature Alarm

7.5.1 Description

When the repeater detects that the internal temperature of the PA module exceeds the upper threshold, the alarm indicator glows red and the LED displays "E6".

In this case, the repeater stops transmission.

7.5.2 Solution

CAUTION

When the repeater triggers this alarm, to avoid risk of burns, DO NOT touch the repeater.

1. Use the digital thermometer with thermocouple to check whether the surface temperature of the PA module is over 90 ℃.
   - If yes, go to step 2.
   - If no, go to step 3.
2. Check whether the ambient temperature and ventilation conditions of the repeater meet the installation requirements.

NOTE

For the high-power HR65X, besides the temperature and ventilation conditions, check whether the fan works and the heat exhaust duct is clean.

   - If yes, go to step 3.
   - If no, take appropriate measures (for example, install more heat sink devices, replace fans, or clean the duct) 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 technical support.
4. Check whether the RF adapter cable, antenna, or feed line is properly connected.
   - If yes, contact your dealer for technical support.

- If no, re-connect or replace the cable, antenna, or feed line.

7.6 VSWR Alarm

7.6.1 Description

When the repeater detects the VSWR at the TX antenna of the PA module exceeds the upper threshold, the alarm indicator glows red and the LED displays "E7".

In this case, the repeater automatically works at lower TX power.

7.6.2 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 dealer to replace the antenna.
2. Check whether the RF adapter cable, antenna, or feed line is properly connected.
   - If yes, contact your dealer for technical help.
   - If no, re-connect or replace the cable, antenna, or feed line.

7.7 Off-lease Alarm

7.7.1 Description

When the rental time of the repeater expires, the alarm indicator glows red and the LED displays "E8".

In this case, the repeater fails to work.

7.7.2 Solution

Contact your dealer to extend the rental lease.

7.8 Secondary Repeater Unregistered Alarm

7.8.1 Description

In the IP multi-site connect network, if the repeater works as a secondary one and fails to send a registration request to the primary repeater, the alarm indicator glows red and the LED displays "E9".

In this case, the repeater cannot repeat the signal or data in the IP multi-site connect network.

7.8.2 Solution

Check and modify the network configuration.

7.9 Repeater Disabled Alarm

7.9.1 Description

With the Repeater Disable feature enabled by your dealer, when the repeater detects the active level, the alarm indicator glows red and the LED displays "EE".

In this case, the repeater fails to work.

NOTE

- When the repeater detects the invalid level, the repeater restarts and returns to the normal state.
- The repeater restarts every time the level changes.

7.9.2 Solution

Contact your dealer for technical support.

7.10 Low Forward Power Alarm

7.10.1 Description

When the repeater detects that the TX power is below the preset value of forward power, the alarm indicator glows red and the LED displays "Eb".

When the TX power is 0 W, the repeater stops transmission.

7.10.2 Solution

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

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

7.11 Network IP Conflict Alarm

7.11.1 Description

When the IP address of the repeater conflicts with that of other devices in the same network segment, the alarm indicator glows red and the LED displays "H3".

In this case, network services of the repeater are unavailable.

7.11.2 Solution

Check and modify the network configuration.

7.12 Invalid Network IP Alarm

7.12.1 Description

When the repeater fails to acquire valid IP address with DHCP, the alarm indicator glows red and the LED displays "H5".

In this case, network services of the repeater are unavailable.

7.12.2 Solution

Check whether the network cable is properly connected.

- If yes, check whether the DHCP server is deployed.
- If no, reconnect the network cable.

8. Troubleshooting

Phenomena	Analysis	Solution
The repeater cannot be turned on.	The power cord may be disconnected or get loose.	Re-connect the power cord.
	The fuse in the DC power cord may be damaged.	Replace the fuse.
The repeater cannot communicate with a radio.	The TX/RX frequencies or the color code of the repeater may be inconsistent with that of the radio.	Reset the frequencies or color code.
	The continuous tone controlled squelch system (CTCSS)/continuous digital controlled squelch system (CDCSS) of the repeater may be inconsistent with that of the radio.	Reset the CTCSS or CDCSS.
	The repeater may suffer severe interference.	Keep the repeater away from the interference source, or change the frequencies.
	The radio may be out of the communication coverage of the repeater.	Move the radio towards the communication coverage of the repeater.
	The antenna is disconnected.	Reconnect the antenna.
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 the antenna if necessary.

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

9. Care and Cleaning

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

9.1 Product Care

- Do not pierce or scrape the product.
- Keep the product away from substances that can corrode the circuitry.

9.2 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.

10. 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 dealer for the optional accessories used with the product.

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11. Abbreviations

Abbreviation	Full Name
C	
CDCSS	Continuous Digital Controlled Squelch System
CTCSS	Continuous Tone Controlled Squelch System
D	
DHCP	Dynamic Host Configuration Protocol
G	
GPIO	General Purpose Input/Output
L	
LED	Light-Emitting Diode
P	
PA	Power Amplifier
V	
VSWR	Voltage Standing Wave Ratio

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