

Preface

Thanks for your favor in our product. To derive optimum performance from the product, please read this manual and the supplied Safety Information Booklet carefully before use.

This manual is applicable to the following model:

RD96X (X may represent 2, 5, 6 or 8)

Instructional Icons

The following icons are available through this manual:

The radio is not intended for use by general population in an uncontrolled environment. It is only for occupational use and only applied to work-related conditions. The radio must be only used by users, who are fully aware of the hazards of the exposure and who are able to exercise control over their RF exposure to qualify for the higher exposure limits.

Alert Icons



Caution: indicates situations that could cause damage to your product or bodily injury.



Note: indicates tips that can help you make better use of your product.

*: indicates functions available in later version.

Term Explanation

Key Operation

- Short press: to press a key and release it quickly.
- Long press: to press a key and remain holding it down for a predefined period (2 seconds by default).

Hold down: to press a key and remain holding it down.

Duplexer

Duplexer is a device that allows bi-directional communication. Its role is to isolate the TX signal from the RX signal to ensure that the transmitter and receiver can work normally. It consists of two groups of band-stop filters with different frequencies, to prevent it from transmitting the signals to the receiver.

Feed Line

Feed Line is the cable or transmission line that connects the antenna with the radio transmitter or receiver.

Voltage Standing Wave Ratio (VSWR)

Voltage Standing Wave Ratio (VSWR) is a value that measures how well a load is impedance-matched to a source.

Squelch

Squelch is a circuit function that acts to suppress the audio output of a receiver in the absence of a sufficiently strong desired input signal.

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U.S. Patent No: #6,912,495 B2, #6,199,037 B1, #5,870,405, #5,826,222, #5,754,974, #5,701,390, #5,715,365, #5,649,050, #5,630,011, #5,581,656, #5,517,511, #5,491,772, #5,247,579, #5,226,084 and #5,195,166.

Disclaimer

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If you have any suggestions or would like to learn more details, please visit our website at:

<http://www.hytera.com>.

RF Radiation Information

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; 47CFR part 2 sub-part J;
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992;
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999;
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998.

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 no more than 50% of the time and always adhere to the following procedures when in PTT mode and transmit should no more than 100% of time when in repeater mode.

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 the optimal performance and the compliance with occupational/controlled environment RF radiance limits in the above standards, please adhere to the following requirements:

- When you are carrying this product on your back, ensure the Gain of the antenna is not more than 3.5dBi, and the output power is within 5W.
- When you are installing the repeater antenna outside, set up the antenna according to the supplier's requirements with its Gain within 6.5dBi and keep it at least 0.5 meters away from human body.

EU Regulatory Conformance

As certified by the qualified laboratory, the product is in compliance with the essential requirements and other relevant provisions of the Directive 1999/5/EC. Please note that the above information is applicable to EU countries only.

CE0678 

Mobile repeater station

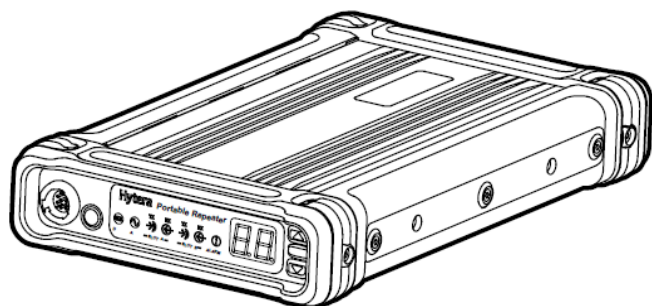
When automatically retransmitting messages originated by or destined for hand-carried units, each mobile station shall activate the mobile transmitter only with a continuous access signal, the absence of which will deactivate the mobile transmitter. The continuous access signal is not required when the mobile unit is equipped with a switch that activates the automatic mode of the mobile unit and an automatic time-delay device that deactivates the transmitter after any uninterrupted transmission period in excess of 3 minutes. For the purposes of this rule section the continuous access signal can be achieved by use of digital or analog methods.

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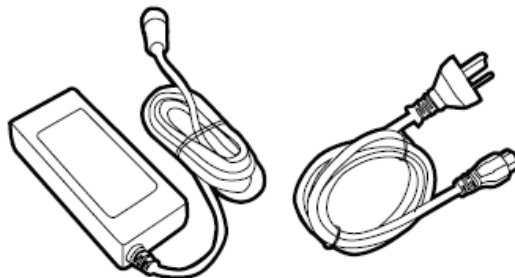
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1. Checking Items in the Package

Please unpack carefully and check that all items listed below are received. If any item is missing or damaged, please contact your local dealer.



Repeater



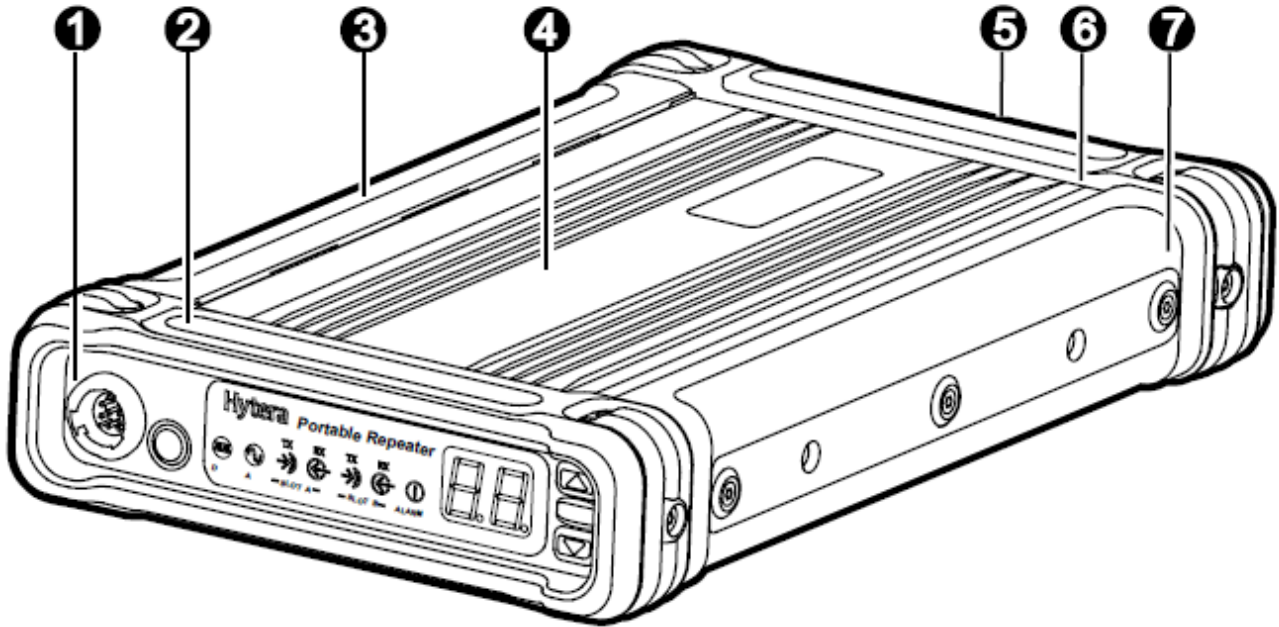
Power Adapter



Documentation Kit

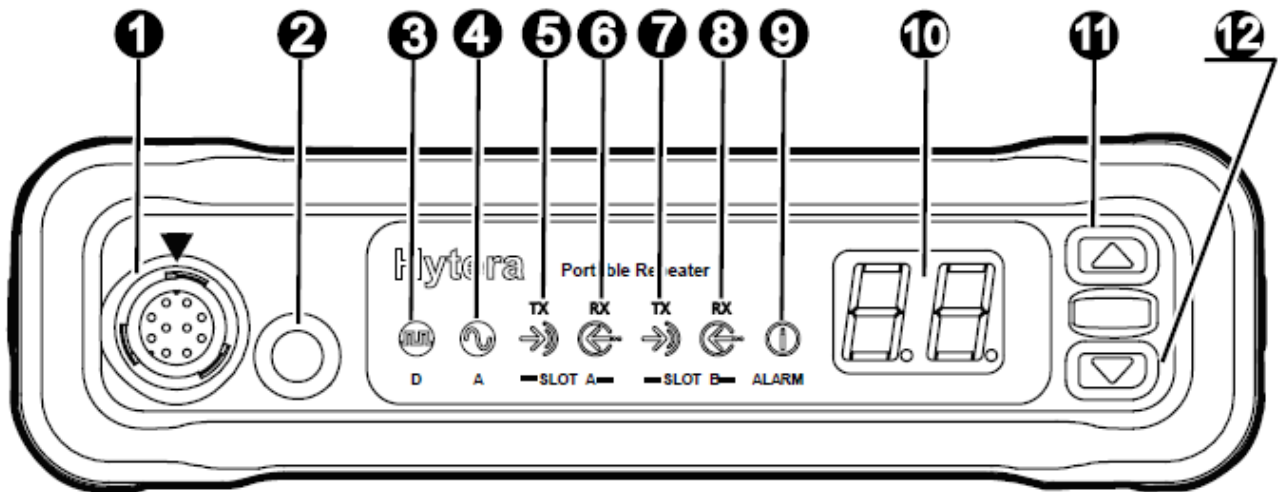
2. Product Overview

2.1 Parts



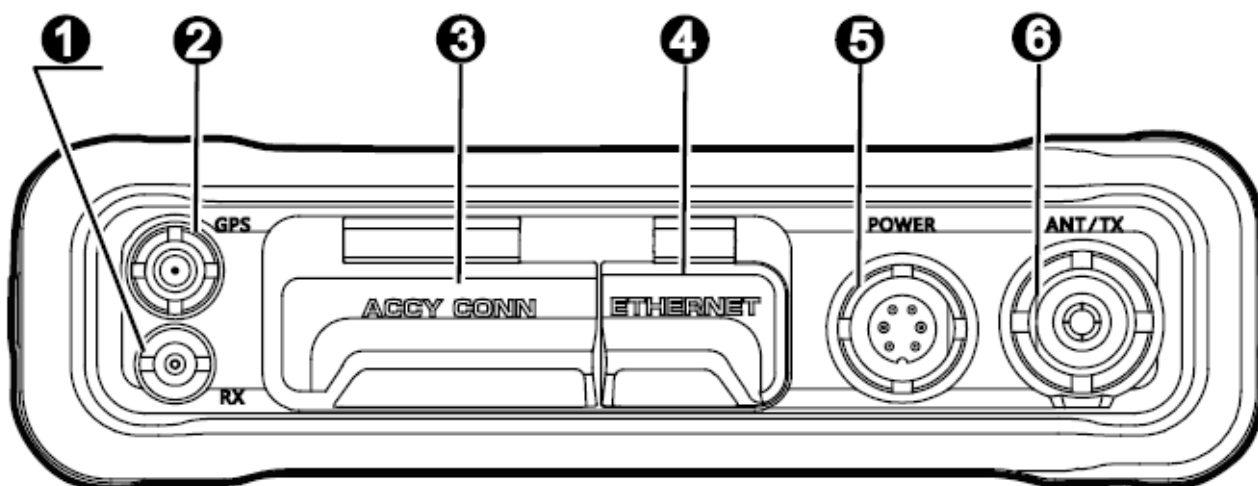
No.	Part Name	No.	Part Name
1	Front Panel	2	Protective Cover of Front Panel
3	Left Protective Cover	4	Aluminum Chassis
5	Rear Panel	6	Protective Cover of Rear Panel
7	Right Protective Cover	/	/

2.2 Front Panel




No.	Part Name	No.	Part Name
1	Microphone Jack	7	Slot B Tx Indicator
2	Power On/Off Key	8	Slot B Rx Indicator
3	Digital Mode Indicator	9	Alarm Indicator
4	Analog Mode Indicator	10	LED Segment Display
5	Slot A Tx Indicator	11	Channel Up Key
6	Slot A Rx Indicator	12	Channel Down Key

2.3 Rear Panel



No.	Part Name	No.	Part Name
1	External Duplexer Jack/Rubber Stopple	4	Ethernet Port
2	GPS Antenna Port	5	Power Inlet
3	Accessory Jack	6	Antenna Connector

 **Note:** If the repeater is manufactured without internal duplexer, then part ① will be an external duplexer port; if it is produced with internal duplexer, then part ① will be a rubber stopple.

2.4 Status Indication

2.4.1 LED Segment Display Indication

There will be different segments shown on the LED segment display. See their indications listed below:

LED Segment	Repeater Status
E1	Battery Mismatch
E2	Low Battery
E3	External Power Abnormal
E4	Tx Unlock
E5	Rx Unlock

LED Segment	Repeater Status
E6	Over Temperature
E7	VSWR Alarm
CHn	Current Channel Number (e.g.: CH1, CH2, ...CHn)

2.4.2 LED

Indicator	LED Indication	Repeater Status
Digital Mode Indicator	Blue	Working in Digital mode
Analog Mode Indicator	Yellow	Working in Analog mode
Slot A Tx Indicator	Red	<ul style="list-style-type: none"> ● Analog Mode: transmitting ● Digital Mode: Slot A transmitting
Slot A Rx Indicator	Green	<ul style="list-style-type: none"> ● Analog Mode: receiving ● Digital Mode: Slot A is receiving
Slot B Tx Indicator	Red	Digital Mode: Slot B transmitting
Slot B Rx Indicator	Green	Digital Mode: Slot B receiving
Alarm Indicator	Red	Abnormal operation and prompt pops up

3. Before Use

3.1 Instruction

Operation Environment

The repeater must be installed in a dry and well-ventilated place with ambient temperature of -30°C – $+60^{\circ}\text{C}$ and relative humidity of not more than 95%.

Location

The repeater can be placed on the table or installed on the backpack with multi-functional brackets.

Voltage Check

Check whether the input voltage is within the operating voltage of the repeater (external power supply: $13.6\text{V} \pm 15\%$; battery: 14.8V).



Note: To ensure the waterproof performance of the repeater, please do not disassemble it without authorization. You can refer to *Safety Information Booklet* for more information.

3.2 Assembling Power Supply Management System (Optional)

If outdoor backpack power supply management system (model: PV3001, with internal battery) is needed, ensure you've purchased it and the multi-functional bracket (model: BRK17). You can contact your dealer for purchasing them.

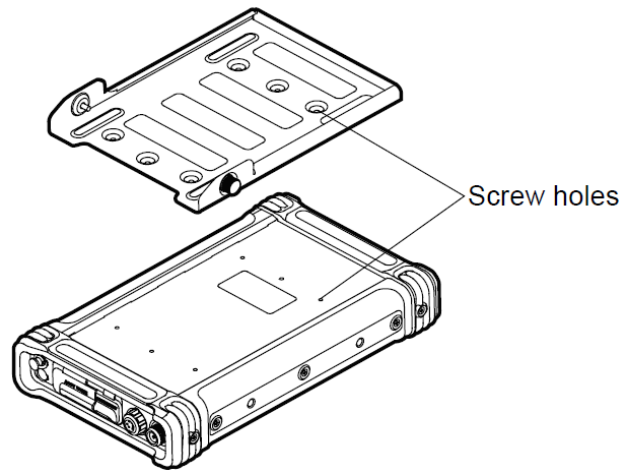
3.2.1 Installation Tools

Tools required for installing the portable repeater include a cross head screwdriver and a T10 torx screwdriver.


3.2.2 Assembling Steps

Step 1 Assemble the multi-functional bracket.

1. Place the repeater horizontally with its back (the side with the product information label) upwards.
2. Put the multi-functional bracket horizontally on the back of the repeater as shown in the figure below, and align the screw holes on the bracket to those of the repeater.

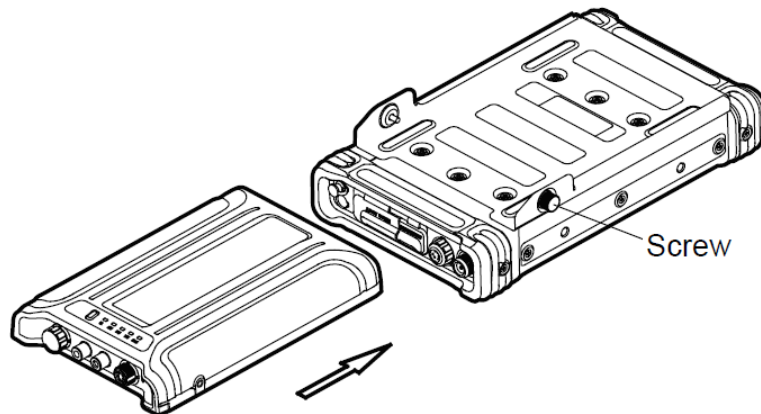


3. Secure the bracket with six M3*6 screws.

 **Note:** Make sure the M3*6 screws are with spring washer to secure the screws before use.

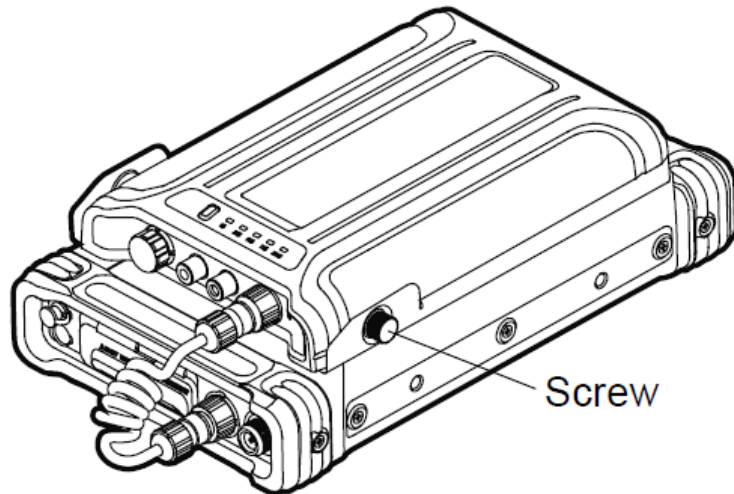
Step 2 Assemble the power supply management system.

1. Push the power supply management system along the slots of the bracket slowly to the bottom of the bracket, with the front of the system upwards. See the following figure.



2. Fasten the screws on the bracket to secure the system.

Step 3 Connect the system to the repeater with the power cord as shown in the following figure.



1. Plug the aviation plug (female) of the power cord into the power input of the repeater and fasten the screws on the plug.
2. Plug the aviation plug (male) of the power cord into the power output of the system and fasten the screws on the plug.

3.2.3 Product Check

Please check whether the repeater works properly by observing the seven LEDs and the LED segment display located in the front panel.

3.3 Mounting the Products on the Backpack (Optional)

If you need to install the repeater and the power supply management system into the backpack (NCN010), please make sure to purchase the backpack dedicated for this repeater. You can contact your dealer for purchasing it.

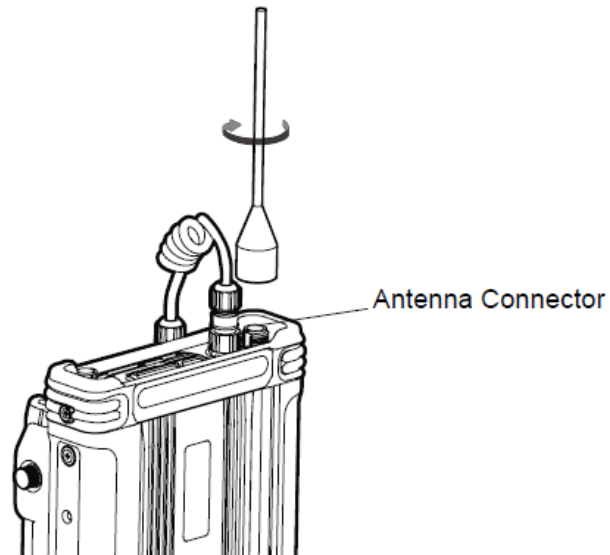
The following steps show how to install the repeater and the power supply management system into the backpack.

Step 1 Assemble the system on the repeater.

Please refer to “3.2 [Assembling Power Supply Management System \(Optional\)](#)~~Assembling Power Supply Management System (Optional)~~” for detail operation.

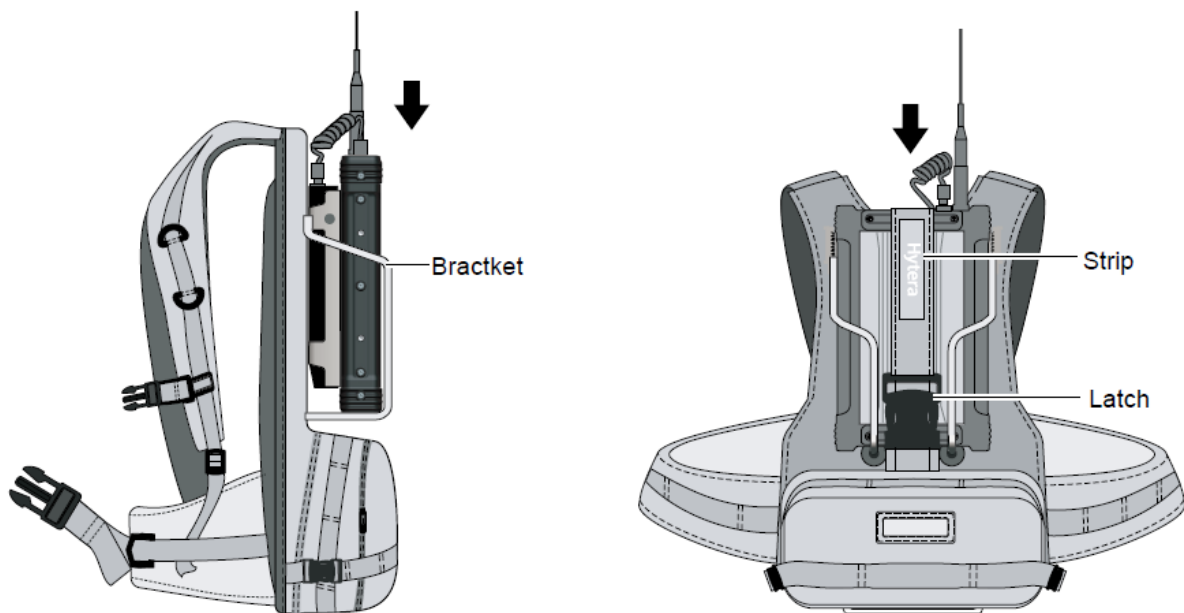
Step 2 Connect the antenna (optional).

If you have purchased the antenna, please connect it to the antenna connector of the repeater.



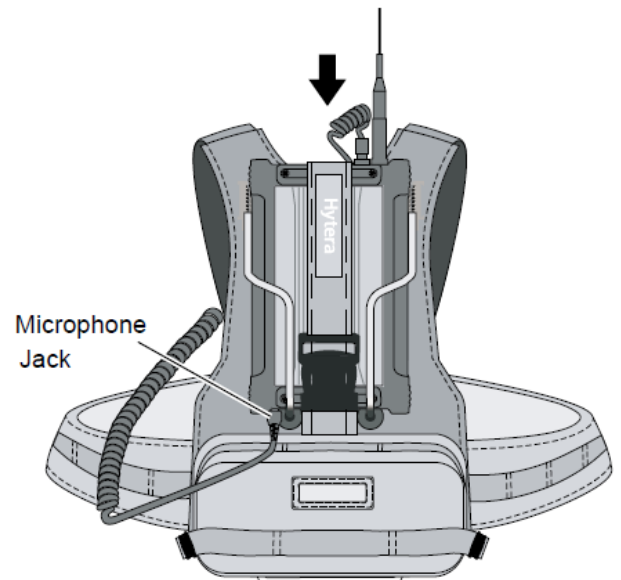
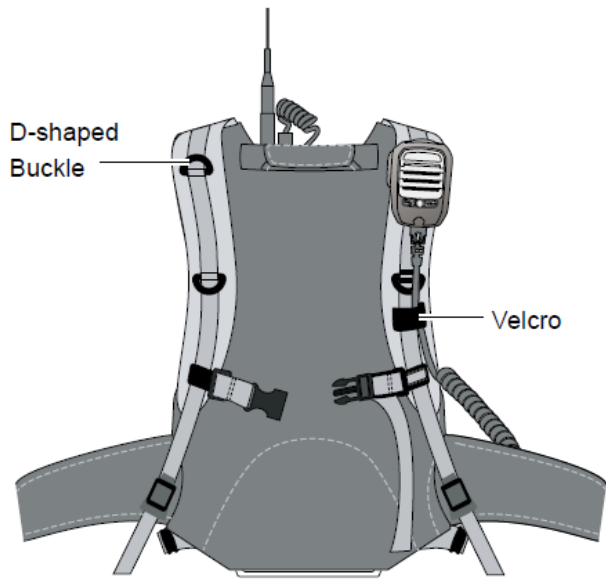
Step 3 Fix the repeater and the system into the backpack.

Insert the repeater and the power supply management system slowly into the bracket on the backpack with the repeater outwards. Then adjust the strip of the backpack and latch it. See the following figures:



Step 4 Hang the remote speaker microphone (SM18A1) on the strap of the backpack (optional) as shown in the following figure.

1. Hang the microphone on the D-shaped buckle on the strap.
2. Fasten the microphone wire by the Velcro.
3. Connect the microphone connector to the microphone jack of the repeater.



4. Basic Operations

4.1 Powering On/Off

Powering on/off manually

- To power on, long press the **Power On/Off** key for about 2s after connecting the power supply with the power adapter.
- To power off, press the **Power On/Off** key.

Auto Power On

If the power of the adapter happens to be cut off or the power adapter runs out of the battery power when in use, the repeater will be powered off forcibly. After that, when the power adapter restarts to supply power, the repeater will power on automatically.



Note: The Auto Power on feature is set via the programming software by the dealer.

4.2 Adjusting the Power Level

You can request your dealer to set the Tx power to High or Low. High power can extend the repeater coverage, enabling you to communicate with farther radios.

4.3 Changing the Channel

You can switch the channels by pressing the **Channel Up/Down** keys on the front panel. The **Channel Up** key is for the former channel and the **Channel Down** key for the latter one. The alias of the current channel is displayed on the LED segment display.

4.4 PTT Transmitting

If you have purchased the remote speaker microphone, you can press the **PTT** key on it to communicate with other radios. Then the LED on the front panel will indicate the repeater status. Please refer to

“[LEDLED](#)”.

When the repeater is in a digital or mixed channel (“PTT Tx Channel Type” will be “Digital” then), if “Tx Contact Name” is not defined, Slot A Tx Indicator will flash red rapidly when you press the **PTT** key.



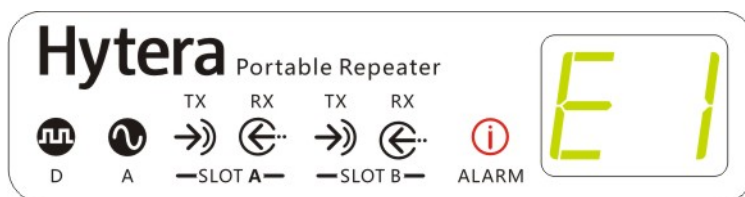
Note: “PTT Tx Channel Type” and “Tx Contact Name” are set via the programming software by the dealer.

5. Alarm Information

The repeater will have real-time detection of its status automatically. If the relative alarms are enabled, when the repeater is working improperly, the LED segment display will show the corresponding sign and the alarm indicator on the front panel will glow red.

5.1 Battery Mismatch

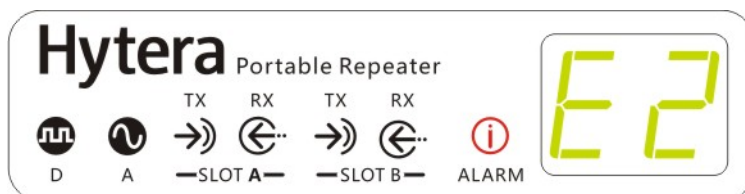
When powered by a battery box, the repeater will examine whether the battery in the box matches its requirements in a real-time way. When the battery does not match the requirement, the alarm indicator will glow red and the LED segment display will show “E1”.



When this alarm is given, the repeater cannot work properly and will power off automatically in 3s. Then please ask your local dealer to replace the power supply management system or for further help. If you switch to an external power supply, this alarm will be eliminated with the segment disappearing and the alarm indicator going out.

5.2 Low Battery

When powered by battery, the repeater will have real-time detection of the output voltage of the power supply management system. When the output voltage falls below the under-voltage alarm threshold (12% of the battery capacity by default), the alarm indicator will glow red and the LED segment display will show “E2”.



When this alarm segment is displayed, the repeater will still work properly and will power off automatically when running out of power.

In this case, you need to take the following measures:

1. Check the power indicator on the power supply management system to see if the power is low. If the power is low, please charge the power supply management system or replace it.

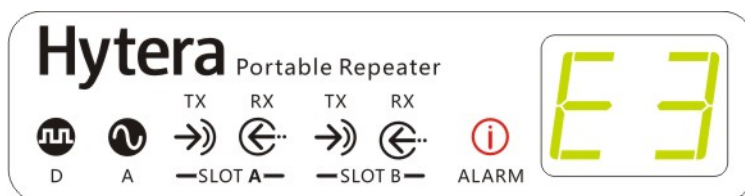
⚠ Caution: After fully charging the system, please press the **Power On/Off** key to power on the repeater, as it will not power on automatically.

2. If you cannot solve the problem, contact your local dealer for technical support.

When the battery voltage is higher than the under-voltage alarm threshold, the alarm will be eliminated with the segment disappearing and the alarm indicator going out.

5.3 External Power Abnormal

When powered by a power adapter, the repeater will have real-time detection of the output voltage of the power adapter. When the output voltage falls off the range of the operating voltage, the alarm indicator will glow red and the LED segment display will show “E3”.



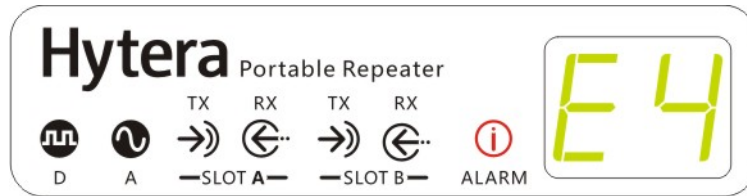
When this alarm is given, the repeater cannot work properly and will power off automatically in 3s. If the repeater returns to normal operation within the 3s, the alarm will be eliminated so that the repeater will not power off.

In this case, you need to take the following measures:

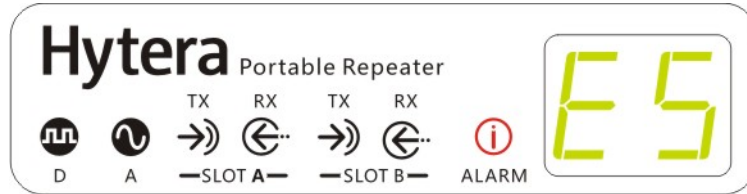
1. Check whether the power adapter is damaged. If it is damaged, please replace it.
2. Check through the voltmeter whether the voltage inputted by the external power supply is over low or over high. If it is over low or over high, please replace it.
3. If you cannot solve the problem, contact your local dealer for technical support.

5.4 TX/RX Unlock

Normally, after being powered on, the repeater has its Tx and Rx work properly in locked status. Once the repeater detects that the Tx/Rx PLL is unlocked, its alarm indicator will glow red and there will be a sign (“E4” for Tx Unlock, “E5” for Rx Unlock) on the LED segment display.



Tx Unlock Alarm



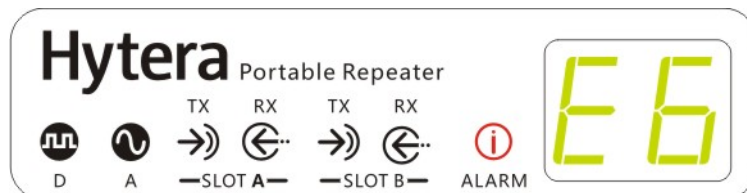
Rx Unlock Alarm

When such alarm is given, the repeater will terminate part of its features automatically. Now you will need to contact your local dealer for technical support.

When Tx/Rx returns to the locked status, the alarm will be eliminated with the segment disappearing and the alarm indicator going out.

5.5 Over Temperature

When the temperature of the PA module exceeds the normal range, the alarm indicator will glow red and the LED segment display will show “E6”.



When this alarm is given, the repeater can still work properly. During a rise in ambient temperature, the repeater will keep track of the Tx power with adjustments in order to lower the temperature.

And you need to take the following measures:

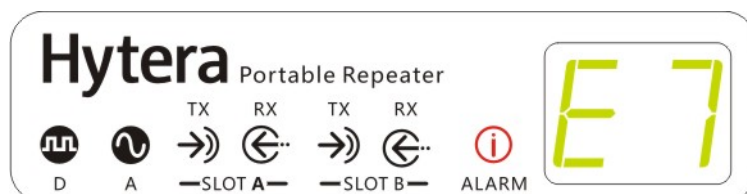
1. Check whether the ambient temperature and ventilation conditions of the repeater satisfy the foregoing installation requirements. If not, please make improvements as soon as possible.
2. Check if connection between the transmitter and RF cable or antenna/feed line is loose or damaged. Poor connection between them could cause high Tx power, which would make the temperature of the heat sink rise quickly. If yes, secure or replace the cable or antenna/feed line.
3. If the above measures fail to solve the problem, contact your local dealer for technical support.

When the temperature of the repeater returns to the normal range, the alarm will be eliminated with the

segment disappearing and the alarm indicator going out.

5.6 VSWR Alarm

When transmitting, the repeater will detect the voltage standing wave ratio (VSWR) of the Tx antenna of the PA module. Over-high VSWR will damage the PA module or even disable it. When the VSWR exceeds the normal range, the alarm indicator will glow red and the LED segment display will show “E7”:



When this alarm is given, the repeater can still work properly.

And you need to take the following measures:

1. Check if the Tx frequency is within the frequency range of the antenna, as improper antenna will result in poor transmitting performance or even damage to the transmitter. If not, please contact your local dealer to replace the antenna.
2. Check if the connection between the transmitter and RF adapter cable or antenna/feed line is loose or damaged. If yes, please replace the cable.
3. If you cannot solve the problem, contact your local dealer for technical support.

When the VSWR returns to the operation range, the alarm will be eliminated with the segment disappearing and the alarm indicator going out.

6. Troubleshooting

Phenomena	Analysis	Solution
Power-on failure	The power cord may be unconnected or not securely connected to the outlet.	Properly connect the power cord and ensure secure connection.
	The fuse in the power cord may be damaged.	Please replace the fuse.
	The battery may have low power when supplying.	Please charge the battery or contact the dealer to replace the power supply management system.
	The power adapter may output improper voltage.	Check if the power adapter outputs the voltage within the required range ($13.6V \pm 15\%$). If not, replace the power adapter.
Group members cannot talk to each other, or the repeater cannot communicate with a radio.	Tx/Rx frequency of the repeater is inconsistent with that of portable/mobile radios.	Check if the Tx/Rx frequencies are consistent with each other, and re-set the frequencies if necessary.
	Failed to repeat useful signal due to strong interference signal.	If you cannot remove or bypass the interference source, change to operate at other frequencies.
	The group member is out of the coverage of the repeater.	Go within the coverage of the repeater.
Group members cannot talk to each other, even though Rx indication is given.	The radio ID is inconsistent with that of the other group members.	Set the subscriber ID to the same as that of the other members.
	Inconsistent CTCSS/CDCSS.	Re-set CTCSS/CDCSS.
Short communication range or poor audio.	The connection cable is damaged, and the signal energy leaks.	Replace the cable with a new one if necessary.
	The antenna connector and the cable may get loose connection or even disconnected.	Secure the cable connector, or replace it if necessary.

Phenomena	Analysis	Solution
	Invisible damage may occur to the cable.	Replace the cable with a new one.
	Duplexer is not properly set (if the duplexer is mounted).	Contact the manufacturer or your dealer to re-set the duplexer.

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

7. Care and Cleaning

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

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 far away from substances that can corrode the circuit.
- Do not place the product in corrosive agents, solutions or water.

Product Cleaning




Caution: Be sure to power off the product before cleaning.

- Remove the dust and fine particles on the repeater surface with a clean and dry lint-free cloth or a brush regularly.
- Use a non-woven fabric with neutral cleanser to clean the keys, control knobs, LCD and jacks after long-time use. Do not use chemical preparations such as stain removers, alcohol, sprays or oil preparations. Make sure the product is completely dry before use.

8. Optional Accessories

The following items are the main optional accessories for the repeater, and please consult your local dealer for more information of other accessories.

		
<p>Remote Speaker Microphone SM18A1</p>	<p>Backpack NCN010</p>	<p>Outdoor Backpack Power Supply Management System PV3001 (Internal Battery: BL9901)</p>
		
<p>Multi-functional Bracket BRK17</p>	<p>Vehicle Antenna</p>	
		/
<p>Duplexer (Frequency: 136-174MHz; RX-TX spacing: 5MHz) DT11 Duplexer (Frequency: 350-400MHz; RX-TX spacing: 10MHz) DT12 Duplexer (Frequency: 400-470MHz; RX-TX spacing: 10MHz) DT13</p>		/

 **Caution:** Use the accessories specified by the Company only. If not, Hytera shall not be liable for any loss or damage arising out of use of unauthorized accessories.