



DMR Conventional Repeater and Mobile Radio

Wireless Link Communication

Application Notes



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Preface

This section describes the conventions and revision history of this document.

Conventions

Icons

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.

Notations

Item	Description
" "	The quotation marks enclose the name of a software interface element. For example, click "OK".
Boldface	The text in boldface denotes the name of a hardware button. For example, press the PTT key.
->	The symbol directs you to access a multi-level menu. For example, to select "New" from the "File" menu, we will describe it as follows: "File -> New".

Revision History

Version	Date	Description
R1.0	September 2018	Initial release.

1. Overview

1.1 Introduction

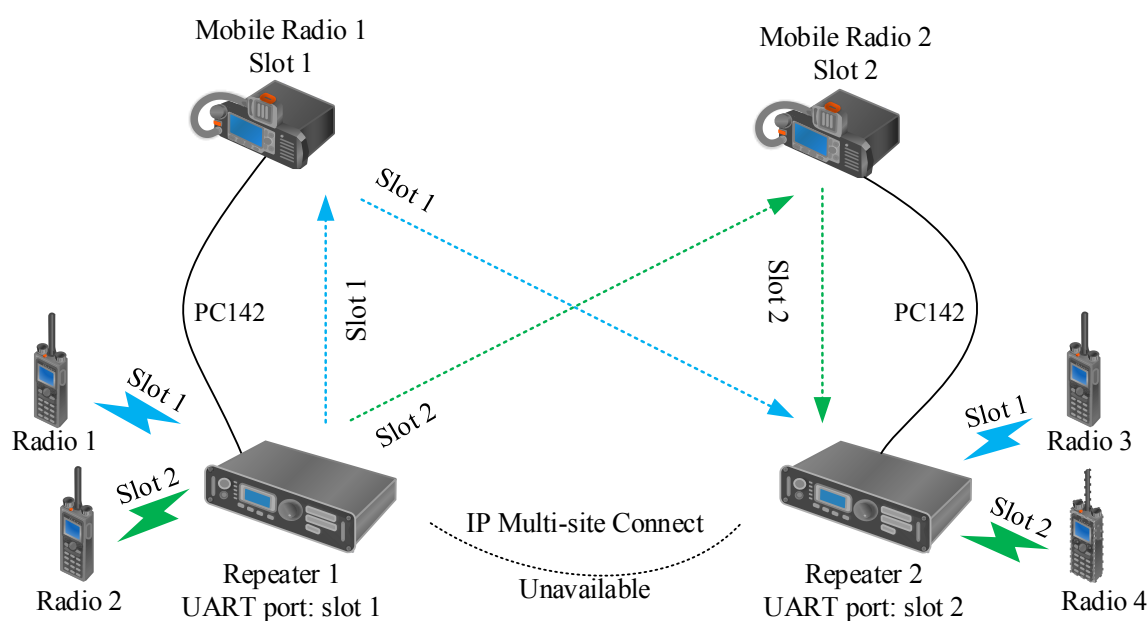
The wireless link communication is a solution to establish wireless link for voice, data, and signaling transmission over the air. With this solution, you can connect repeaters and mobile radios through the cable to expand communication coverage. It is applicable to the area where the repeaters at dispersed locations cannot be connected through IP Multi-site Connect due to network restrictions.

1.2 Principle

The wireless link communication solution consists of two pairs of the repeater and mobile radio, each of which are connected through the PC142 cable. One pair of repeater and mobile radio are set to Slot 1, and the other are set to Slot 2.

- When a repeater receives a service over the air or through IP network on the slot as configured, it transfers the service to the connected mobile radio through the cable. Afterwards, the mobile radio transmits the received services to a neighboring repeater over the air.
- When a mobile radio receives a service over the air on the slot as configured, it transfers this service to the connected repeater through the cable. Afterwards, the repeater transmits the received services to other radios within its communication range over the air.

The following figure illustrates how the air services are transferred through the wireless link communication.



As the above figure shown, both Repeater 1 and Mobile Radio 1 are connected by the PC142 cable and work in

Slot 1. Meanwhile, both Repeater 2 and Mobile Radio 2 are also connected by the PC142 cable and work in Slot 2.

2. The following describes the procedure of intercommunication from Radio 1 and Radio 2 to Radio 3 and Radio 4.

Radio 1 in Slot 1

1. The Radio 1 initials a group call in Slot 1.
2. The Repeater 1 receives the group call and transmits it to the Mobile Radio 1 through the cable and to other radios over the air.
3. The Mobile Radio 1 transfers the group call to the Repeater 2 over the air.
4. The Repeater 2 forwards the group call to the Radio 3 and Radio 4.

If both the Radio 3 and Radio 4 work in Slot 1 and include the Radio 1 in their group call contact list, they can communicate with the Radio 1.

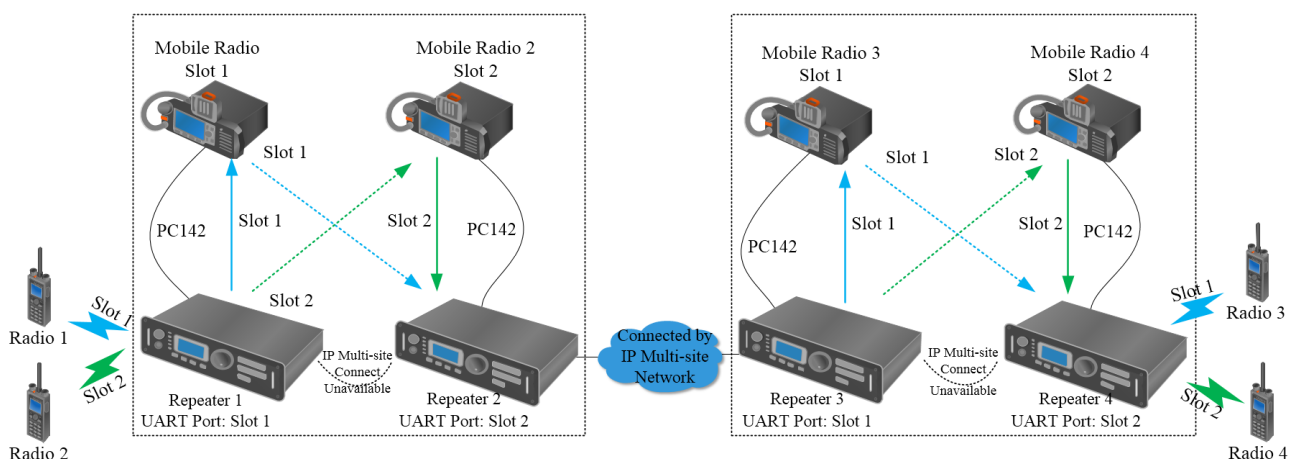
Radio 2 in Slot 2

1. The Radio 2 initials a group call in Slot 2.
2. The Repeater 1 receives the group call and transmits it to the Mobile Radio 2 over the air.
3. The Mobile Radio 2 transfers the group call to the Repeater 2 through the cable.
4. The Repeater 2 forwards the group call to the Radio 3 and Radio 4.

If both the Radio 3 and Radio 4 work in Slot 2 and include the Radio 2 in their group call contact list, they can communicate with the Radio 2.

1.3 Application

The wireless link communication is applicable for forests, highway, and other areas where the wired network is difficult to be deployed. It can work with IP Multi-site Connect feature to extend the communication coverage.



1.4 Restrictions

- Only digital services (including voice, data and signaling) can be transferred through the wireless link.
- Only the repeater and mobile radio of R9.0 or later support the wireless link communication.
 - RD 98XS and RD106X: firmware V9.00.08.508.iM or later.
 - MD78Xi: firmware V9.00.04.405.iM or later.
- The mobile radio MD78X requires a hardware modification to support the wireless link communication. For details, please contact Hytera.
- To ensure communication quality and avoid signal interference, it is recommended that a pair of repeater and mobile radio only connect to another pair of repeater and mobile radio.
- Transferring services with acknowledgement through the wireless link may cause time delay. To receive the services successfully, it is recommended to prolong the Wait Ack Delay of the radios to at least 1200 ms.
- The Wireless Link Communication cannot work with Back-to-Back feature and SIP Phone feature.
- The current accessory port is only used to connect one repeater and one mobile radio.
- In the wireless link communication, the mobile radio enables the UART Transfer feature. At this time, it can only transfer service from the repeater. Except On-Off/Volume Control Knob, all its keys are invalid.
- To encrypt services, ensure Over the Air Encryption of the repeater are the same as that of the mobile radio.

1.5 Version

R9.0: Wireless Link Communicaiton feature available.

2. Requirements

- The repeater and mobile radio of R9.0 or later:
 - RD 98XS or RD106X: firmware V9.00.08.508.iM or later.
 - MD78Xi: firmware V9.00.04.405.iM or later.
- Cable: PC142.

3. Configuration

Before using the wireless link communication feature, you need to configure the corresponding parameters through the CPS for the repeater and mobile radio.

For details, refer to the CPS Help.

3.1 Tool

CPS of V9.00.07.712.iM or later is required.

3.2 Procedure

3.2.1 Repeater

Step 1 Configure the parameters for communication, such as the Receive frequency and Transmit frequency.

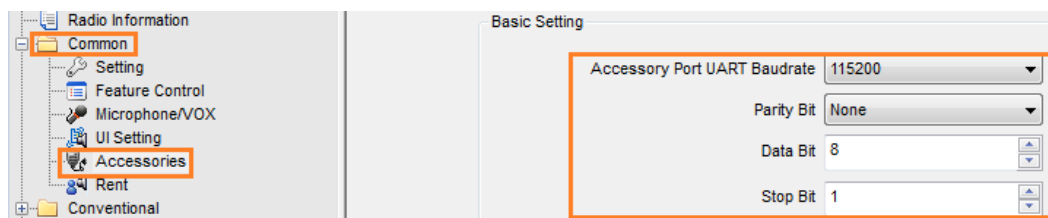
Ensure the two neighboring repeaters have different frequencies to avoid signal interference.

Step 2 Configure the parameters for the UART port.

Ensure the UART port at the repeater and the mobile radio are the same.

CPS path: Common -> Accessories -> Basic Setting -> Accessory Port UART Baudrate/ Parity Bit/ Data Bit/ Stop Bit.

For details, refer to the CPS Help.



Step 3 Select the "UART Transfer".

CPS path: Conventional -> General Setting -> Accessories -> GPIO Pins -> UART Transfer

For details, refer to the CPS Help.



Step 4 Select "PTT Request" from the "Path Priority" drop-down list to ensure a real-time transmission of digital services at the UART port.

CPS path: Conventional -> General Setting -> Accessories -> Priority Control -> Path Priority

For details, refer to the CPS Help.

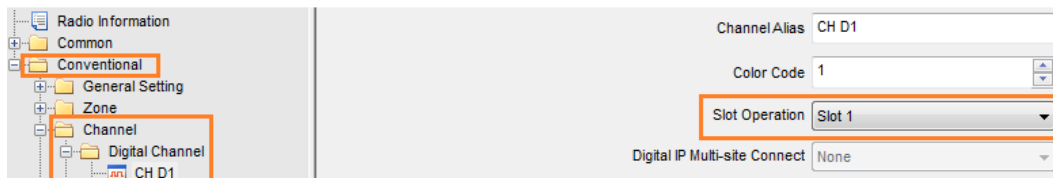


Step 5 Set the slot used at the UART port.

Ensure each pair of the repeater and the mobile radio is with a same slot at UART port, but different slot from neighboring pair to avoid signal interference.

CPS path: Conventional -> Channel -> Digital Channel -> CH DX -> Slot Operation.

For details, refer to the CPS Help.



Note

For a successful transmission over the air, ensure the repeater and mobile radio are configured with the same color code.

3.2.2 Mobile Radio

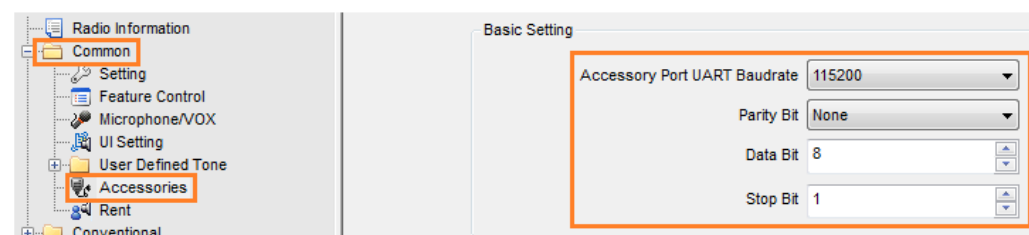
Step 1 Configure the parameters for communication, such as the Receive frequency and Transmit frequency.

Step 2 Configure the parameters for the UART port.

Ensure the UART port at the repeater and the mobile radio are the same.

CPS path: Common -> Accessories -> Basic Setting -> Accessory Port UART Baudrate/ Parity Bit/ Data Bit/ Stop Bit.

For details, refer to the CPS Help.



Step 3 Select "UART Transfer".

CPS path: Conventional -> General Setting -> Network -> Radio to PC Network -> Accessory Port Communication.

For details, refer to the CPS Help.



Note

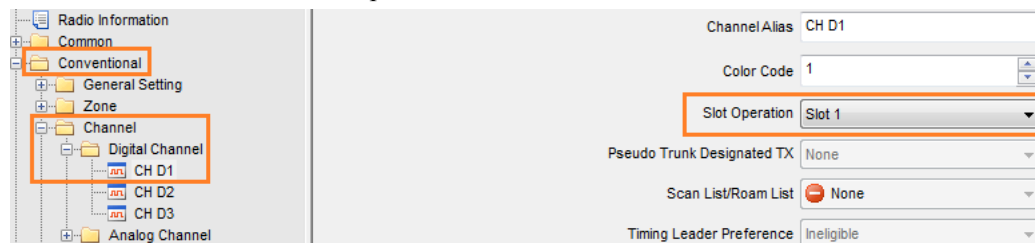
When "UART Transfer" is selected, Forward To PC, Lone Worker and the parameters in digital channel Scan List/Roam List, RX Only, Priority Interrupt Encode, Priority Interrupt Decode, Enhanced Channel Access, TDMA Direct Mode, Mix Receive, Location Info Revert Channel and RRS Revert Channel will be disabled.

Step 4 Set the slot used at the UART port.

Ensure each pair of the repeater and the mobile radio is with a same slot at UART port, but different slot from neighboring pair to avoid signal interference.

CPS path: Conventional -> Channel -> Digital Channel -> CH DX -> Slot Operation

For details, refer to the CPS Help.



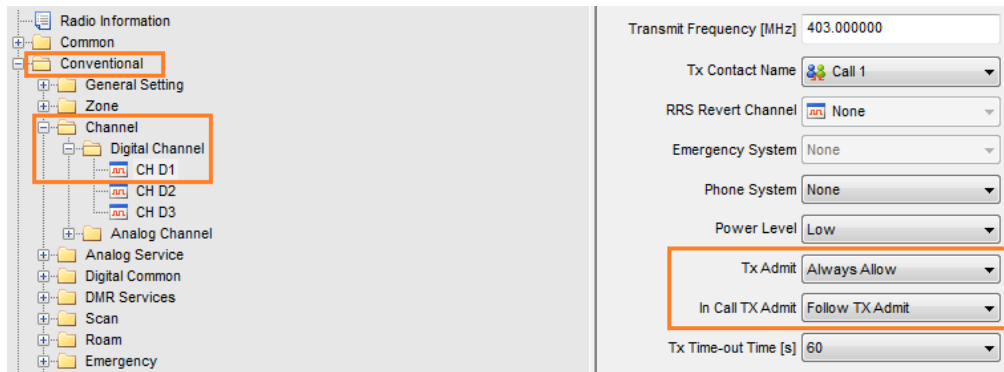
Note

- Pseudo Trunk in the Slot Operation is disabled when the mobile radio enables the UART Port feature.
- For a successful transmission over the air, ensure the repeater and mobile radio are configured with the same color code.

Step 5 Select "Always Allow" in the "TX Admit" drop-down list and "Follow TX Admit" in the "In Call TX Admit" drop-down list, to ensure a real-time transmission of digital services at the UART port.

CPS path: Conventional -> Channel -> Digital Channel -> CH DX -> TX -> TX Admit/ In Call TX Admit.

For details, refer to the CPS Help.



3.3 Operations

The following describes the operation procedures:

Step 1 Power on repeaters and mobile radios.

The mobile radios automatically enable UART Transfer feature and prompts "Back2Back".



The prompt will not disappear until UART Transfer feature is disabled.

Step 2 When the repeater 1 receives a digital service on slot 1, it transmits the service to the mobile radio 1 through the cable and to other radios over the air.

On the repeater 1, Slot 1 TX Indicator and Slot 2 TX Indicator grow red; Digital Mode Indicator grows blue; Operation Status Indicator and Slot 1 RX Indicator glow green. On the mobile radio 1, the LED Indicator glows green.



RD106X has no Operation Status Indicator.

Step 3 The mobile radio 1 sends the service to the repeater 2 over the air on slot 1. Then the repeater 2 transfers the service.

On the repeater 2, Slot 1 TX Indicator grows red; Digital Mode Indicator grows blue; Slot 1 RX Indicator and Operation Status Indicator glow green. On the mobile radio 1, the LED Indicator glows red.

Step 4 When the repeater 1 receives a digital service on slot 2, it transfers the service to the mobile radio 2 over the air.

On the repeater 1, Slot 2 TX Indicator grows red; Digital Mode Indicator glows blue; Slot 2 RX Indicator and Operation Status Indicator glow green. On the mobile radio 2, the LED indicator glows green.

Step 5 The mobile radio 2 sends the service to the repeater 2 through the UART port. Then the repeater 2 transfers the services.

On the repeater 2, Slot 2 TX Indicator grows red; Digital Mode Indicator glows blue; Slot 2 RX Indicator and Operation Status Indicator glow green. On the mobile radio 2, the LED indicator glows red.

Abbreviations

Abbreviation	Full Name
CPS	Customer Programming Software
DMR	Digital Mobile Radio



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