Hytera DMR Conventional Series

Back-to-Back Mobile Radio Application Notes

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Application Notes

Version 1.0

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Revision History

Version	Date	Description	Remarks
R1.0	01-28-2011	Initial release	

Contents

1. Overview

1.1 Definition

The “back-to-back” is a system solution on accessory pins. It is used to achieve cross-band communication among analog and digital radios.

1.2 Principle

1.2.1 Back-to-Back Mobile Radio

The back-to-back function realizes communication between analog and digital mobile radios. It works as below:

1) When the portable radio R1 transmits, the portable radio R2, R3 and the mobile radio1 will receive the signals from R1 simultaneously.

2) During retransmitting, the mobile radio 1 will output the audio signals to the mobile radio 2 via accessory pin and activate its Mic PTT, triggering the mobile radio 2 to transmit. This operation is not subject to the working mode and frequency of two mobile radios.

3) The radios R4, R5 and R6 receive the same audio signals from mobile radio 2. In this way, R1 achieves communication with R2, R3, R4, R5 and R6 successfully.

4) The mobile radio 2 can also output the audio signal to mobile radio 1 via accessory pin, enabling all portable radios within the coverage of two mobile radios to communicate with others.

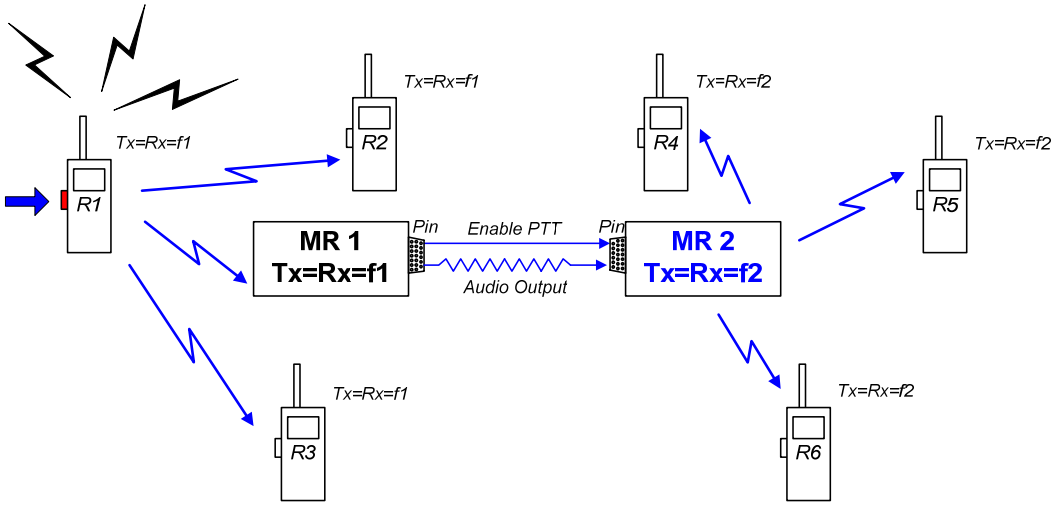

Figure 1.2.1-1 Back-to-Back Work Principle

1.2.2 Accessory Pin

1.2.2.1 Input

On both analog and digital channels, the mobile radio can trigger or terminate the transmission via the accessory pin, and the audio signals to be transmitted will be sampled via the input pin as well.

Function	Type	Applicable Mode	Definition
EXT Mic PTT (via accessory PTT)	A fixed function	Analog and Digital	When a valid level is input, the mobile radio will trigger its external PTT and transmit the audio signal sampled from Codec. However, the transmission will be stopped in case of invalid level.
Tx Audio (via external MIC signal)	A fixed function	Analog and Digital	When the external PTT is enabled, the mobile radio will transmit the audio signals.

Table 1.2.2.1-1 Definition of Accessory Pin Input

1.2.2.2 Output

On both analog channel and digital channels, the mobile radio can output (in level form) the status of call request as well as the call contents from the portable radio via the accessory pin. The definition of involved pins is given below:

Function	Type	Applicable Mode	Definition
Speaker Open Detect (for speaker detection)	Programmable	Analog and Digital	When the speaker is detected unmuted, the mobile radio will output a valid level. However, it will output an invalid level when the speaker is muted.
Rx Audio Output (for audio output)	A fixed function	Analog and Digital	When any audio signal is received, the mobile radio will output such signal via the accessory pin.

Table 1.2.2.2-1 Definition of Accessory Pin Output

1.3 Version

1) DMR Conventional Series R2.5: Back-to-Back mobile radio available (A/D conversion).

2. Required Equipment

1) Mobile radio (see Hytera device list for details)

2) Accessory pin cable

**** Please refer to Hytera DMR Conventional Series Terminal List. You can contact your dealer for specific model.***

**** The cable is provided by the third-party supplier.***

3. References

N/A

4. Equipment Connection

At present, you can connect two terminals using the appropriate accessory pin cable. For any customized or expansion design, the method may vary.

4.1 Back-to-Back

The mobile radios can be connected in a back-to-back manner as below (Figure 4.1-1):

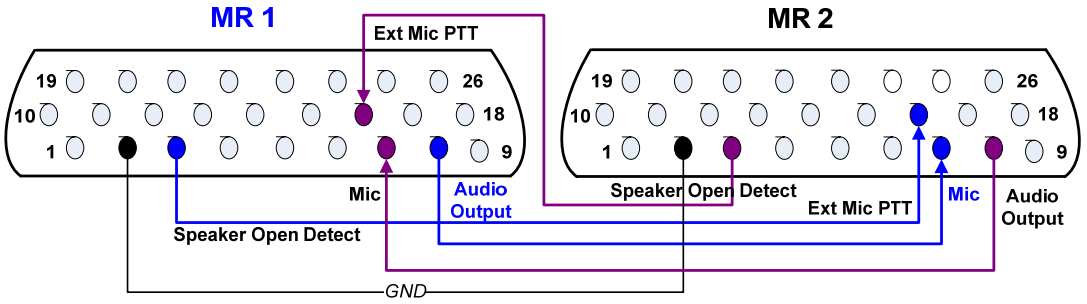

Figure 4.1-1 Back-to-Back Connection

1) Ground wire

To connect Pin2 of mobile radio1 and that of mobile radio 2.

2) Activation of mobile radio transmission

To connect Pin3 of mobile radio 1 and Pin16 of mobile radio 2.

To connect Pin16 of mobile radio1and Pin3 of mobile radio 2.

3) Audio signal output

To connect Pin8 of mobile radio 1 and Pin7 of mobile radio 2.

To connect Pin7 of mobile radio 1 and Pin8 of mobile radio 2.

Note: Pin3 is programmable and can be replaced by Pin12, Pin20, Pin22 or Pin23. All other pins must be connected.

5. Equipment Configuration

5.1 Tools

DMR CPS V2.5 or above.

**** Contact your dealer for details.***

5.2 Configuring an Analog Mobile Radio

1) Run the CPS and read the existing configuration data.

2) Go to "General Setting -> Accessories". See Figure 5.2-1.

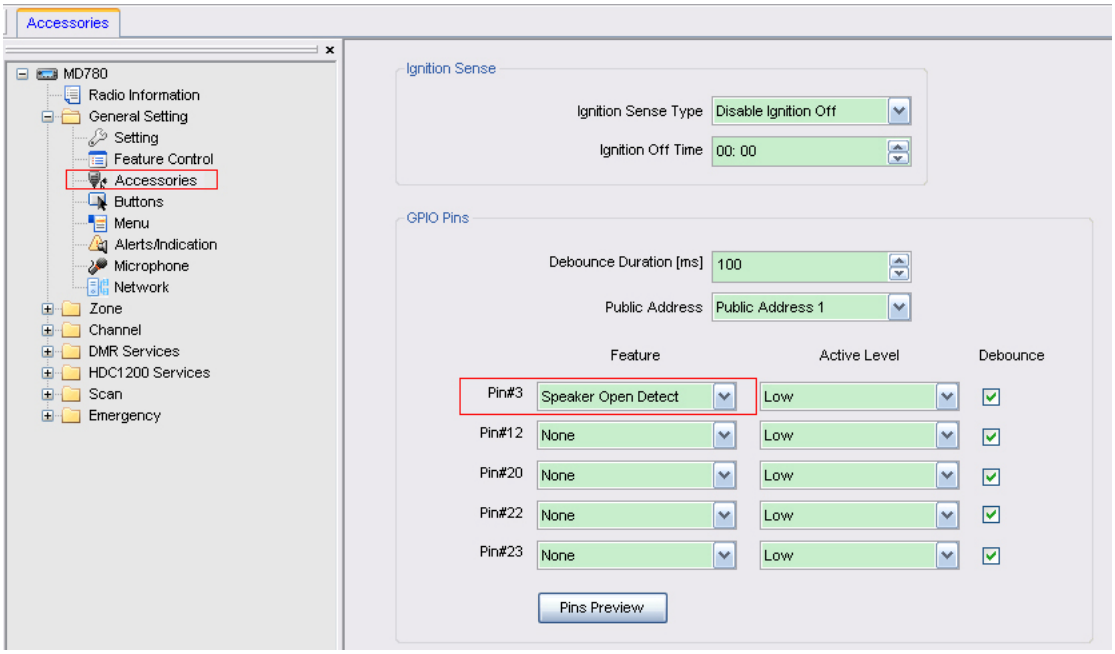

Figure 5.2-1 Accessories Configuration for Analog Mobile Radio 1

3) In the "GPIO Pins" box, set the option"Pin#3" to "Speaker Open Detect". See Figure 5.2-1.

4) Go to "Channel -> Analog Channel" and select the channel which the mobile radio is working on. See Figure 5.2-2.

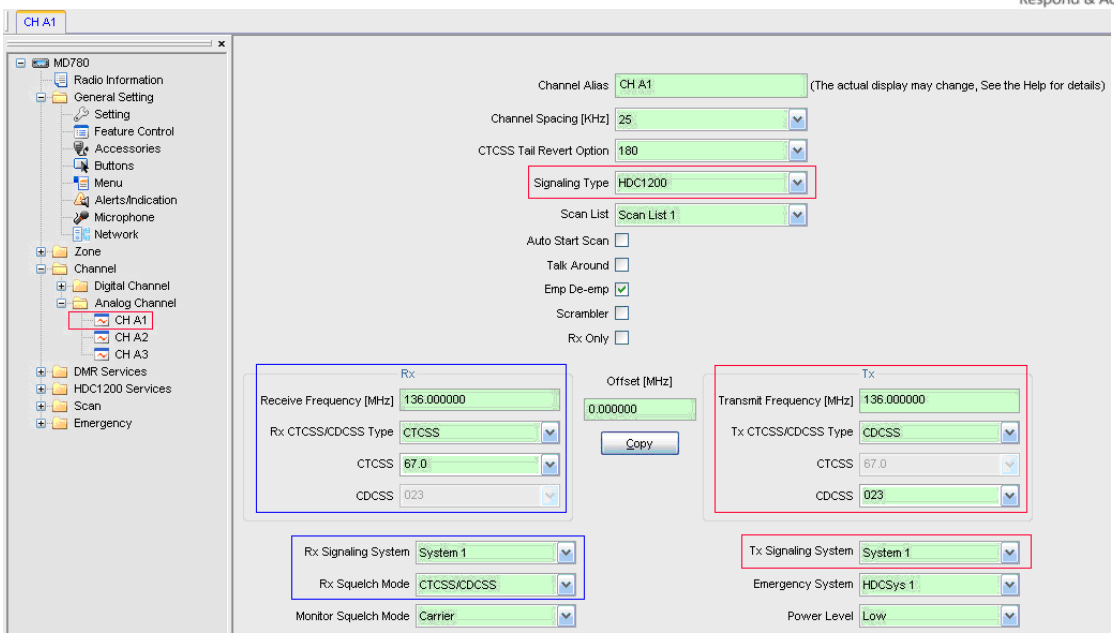

Figure 5.2-2 Analog Mobile Radio Configuration 2

5) Configure the Rx and Tx parameters. Make sure that the option "Signaling Type" is defined before configuration. See Figure 5.2-2.

The Rx and Tx parameters can specify the conditions for receiving and transmitting.

6) After the above steps are finished, write the configuration data into the mobile radio.

5.3 Configuring a Digital Mobile Radio

1) Go to "General Setting -> Accessories" and set the parameters (refer to step 3 in 5.2).

2) Go to "Channel -> Digital Channel" and select the channel which the mobile radio is working on. See Figure 5.3-1.

3) In the "Rx" and "Tx" box, set the option "Rx Group List" and "Tx Contact Name". The former defines the groups that can be responded (not required for private call and all call), and the latter defines the target address. See Figure 5.3-1.

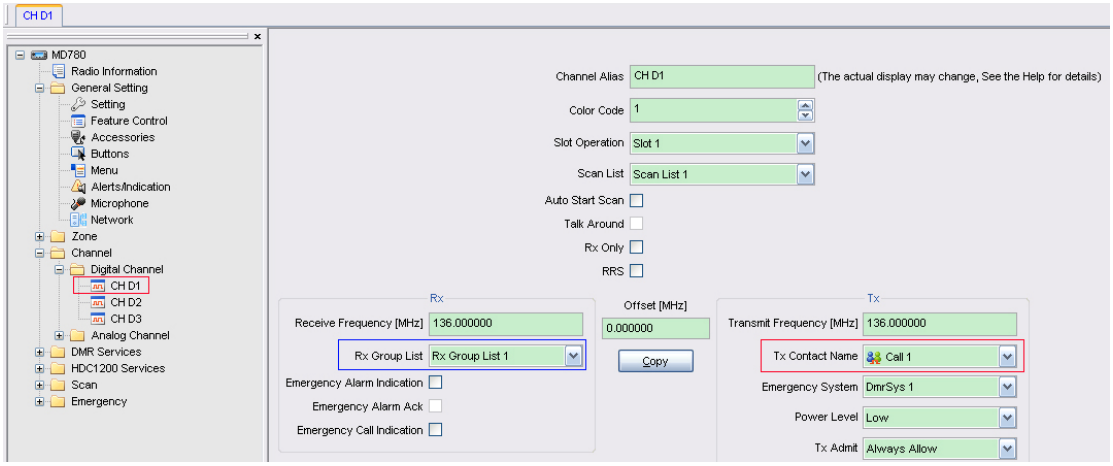

Figure 5.3-1 Digital Mobile Radio Configuration

4) After the above steps are finished, write the configuration data into the mobile radio.

6. Application Demo

The back-to-back function can realize cross-band communication among analog and digital mobile radios.

6.1 Communication among Analog-Digital Mobile Radio

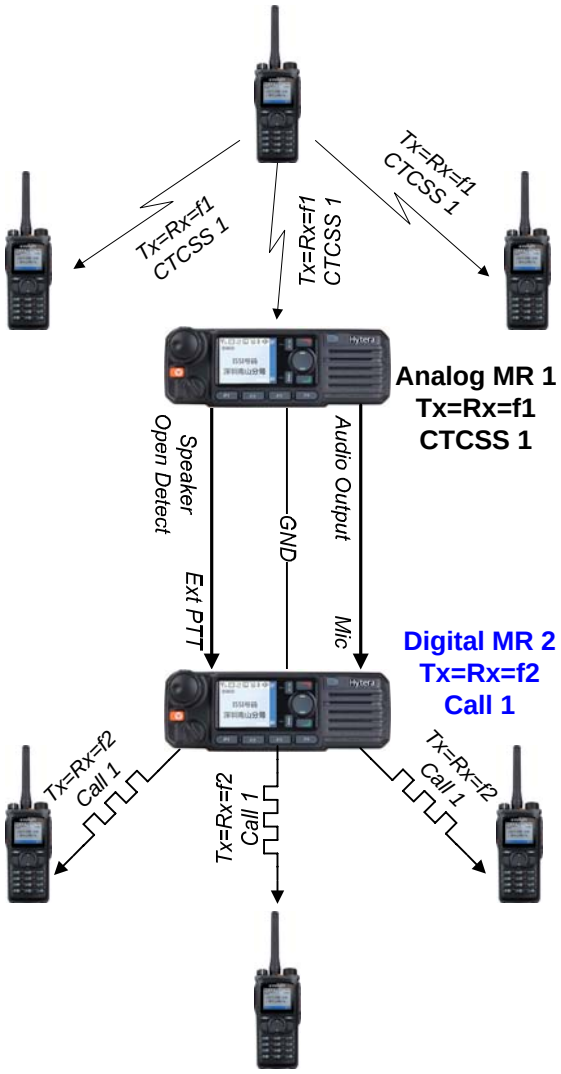

Figure 6.1-1 Communication among Analog-Digital Mobile Radio 1

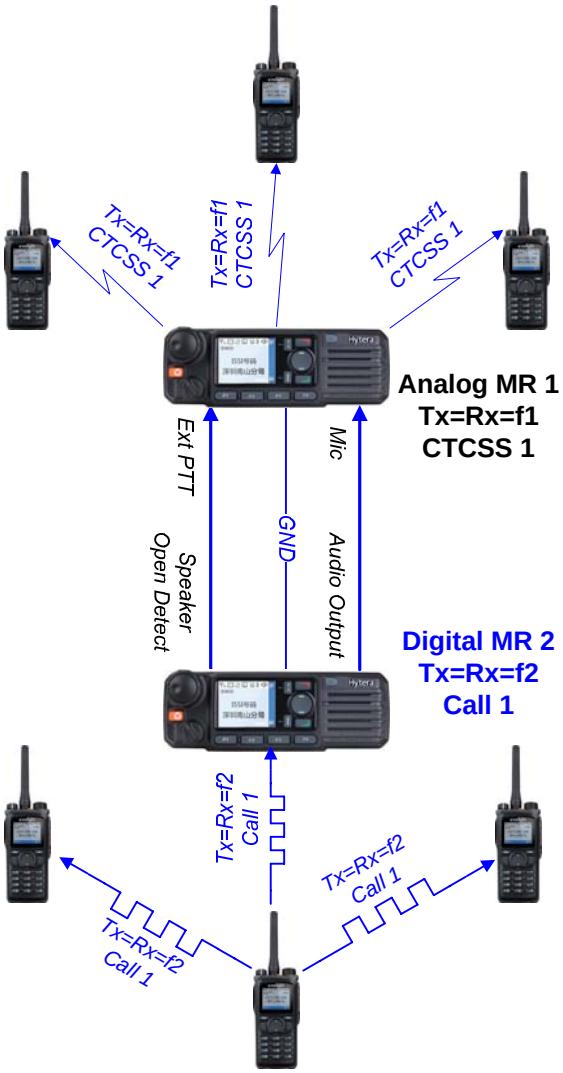

Figure 6.1-2 Communication among Analog-Digital Mobile Radio 2

7. FAQ

7.1 How many mobile radios can be connected in the back-to-back way?

To ensure an optimal performance, only two mobile radios are supported at present.

7.2 Can the communication go with the same frequency?

It is recommended to use different frequencies to avoid signal interference.

7.3 Is there any suggestion for configuring the frequency?

To ensure communication performance, it is recommended to maintain the frequency space at 100 KHz or more.

7.4 Is there any requirement on the bandwidth?

The bandwidths of two mobile radios can be different. For example, the bandwidth of digital mobile radio is12.5KHz and the bandwidth of analog mobile radio is 12.5 KHz, 20 KHz, or 25 KHz. The bandwidth difference does not affect the back-to-back performance.

7.5 How long is the accessory pin cable?

It is recommended to keep the cable length within one meter.

7.6 Why does the prompt “Service Rejected” appear frequently?

The reason is that the mobile radio is transmitting via the external Mic PTT, making it unable to handle other call requests. You can try it again later.

7.7 How to deal with back-to-back function failure?

When the back-to-back function does not work, take steps below:

1) Check whether the accessory pin cable is connected properly;

2) If the cable gets loose, reconnect it;

3) Restart the mobile radio;

4) If the above steps do not help, please contact your dealer.