# Hytera

## XPT System

## Application Notes

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## Copyright Information



## Disclaimer

# Revision History

| Version | Release Date | Description |
|---|---|---|
| R1.0 | 02-2015 | Initial release. |
| R1.1 | 03-2015 | Update “2.1 A System with Hytera RDAC” and “XPT System with Hytera RDAC” of “3.2.1 Diagram of Device Connection”, deleting remote RDAC. |

# Contents

# 1. Overview

## 1.1 System Definition

XPT (Extended Pseudo Trunk) is a new distributed trunking system solution developed solely by Hytera, which is further developed based on self-developed Pseudo Trunk technology by Hytera and combined with advantages of digital trunking system. XPT system has three main advantages: No Central Controller, low cost of platform building and load balance.

## 1.2 System Background

Digital conventional communication system combines the advantages of two-way radio communication and digital technology, and also has many strengths and functions of analog system. But in conventional communication system, the channel resource utilization is restricted due to one channel only support two call at a time at most. Thus, multiple radios communication is restricted in digital conventional communication system. Digital trunking system has larger coverage, stronger noise cancelling capability and its channel resource can be allocated automatically. But the platform building of trunking system is complex and it is inconvenient to upgrade the conventional system to trunking system. Moreover, trunking system will require a large amount of equipments and cost to support.

XPT system is an economical and practical digital upgrading solution, which can build an extended pseudo trunking system using multiple repeaters. It is suitable for professional customer whose digital key business is based on digital conventional communication system. XPT system has the scale and efficiency of trunking technology, clearer voice quality, and extended communication capacity realized by sharing the logic channel resource of the repeater. It can support high density voice and data communication of more people using only one single base station.

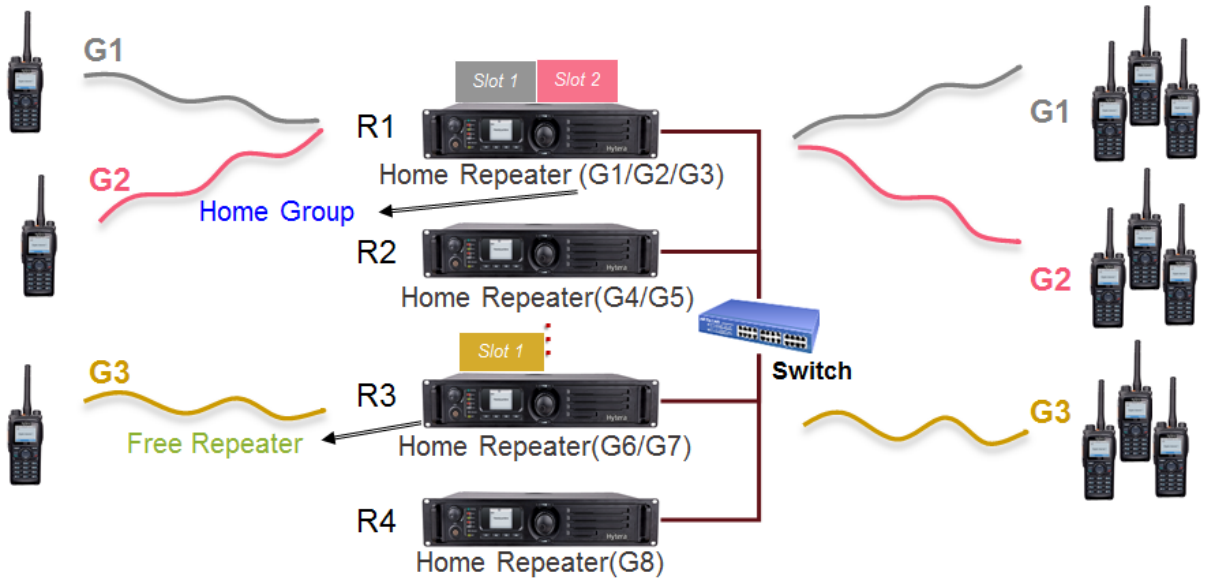
## 1.3 Operating Principle

XPT system can integrate multiple repeaters which are operating under digital repeating mode in the same zone to build a XPT site. By sharing the logic channels in the site, the radios can communicate via all the repeaters in the site without specific control channels, so as to increase the channel utilization.

In XPT system, the calls are always initiated in the home repeater of the radio first. When the repeater which the radio belongs to (Home Repeater) is busy, the radio will initiate voice or data service in other free repeaters (Free Repeater). In this way, the system access time will be shortened and communication capacity can be extended at a max level while guaranteeing the service quality.

Moreover, there is little chance that the logic channels will be occupied at the same time. Thus, the call rejection chance in XPT system is far less than in conventional system. This can help the customers to conduct voice and data communication swiftly and efficiently in a same system.

### 1.3.1 XPT Trunking Protocol




- Home Repeater

  All radios have one of the site repeaters assigned as its "home repeater ". For example, we allocate home repeater R1 for G1,G2,G3.

  When the Home Repeater is idle, the radio will keep monitoring its Home Repeater, and determine whether there is incoming call in XPT system according to the broadcast signal of Home Repeater. When there is idle slot in Home Repeater, the radio will always initiate calls in its Home Repeater first.

- Home Group

  In one XPT site, one repeater can assign one or more home groups and specify the radio user group under the repeater. One user group can be the home group of one repeater only, and the home group of different repeaters in one XPT site must be unique. For example, G1, G2 and G3 have already been set as the home group of Repeater R1, they cannot be set as the home group of other repeaters.

  - When an idle repeater receives a group call, the repeater will determine whether the group call belongs to the home group of the repeater in the site. If the group call belongs to the home group

of this repeater, the repeater will inform other repeaters of its updated status (repeating a group call), and broadcast signals to inform the monitoring radio, so as to allow the home group members to receive the group call. If the radio initiates a group call request which is not within the site (does not belong to the home group of the repeater in the site), the repeater will reject the request, and the radio will not be able to initiate the group call.

- When an idle repeater receives group call repeating message from other repeaters, the repeater will determine whether the group call belongs to the home group of the repeater. If the group call belongs to the home group of the repeater, the repeater will broadcast signals to inform the monitoring radio, so as to allow the home group members to switch to the repeating repeater to receive the group call.

- Free Repeater

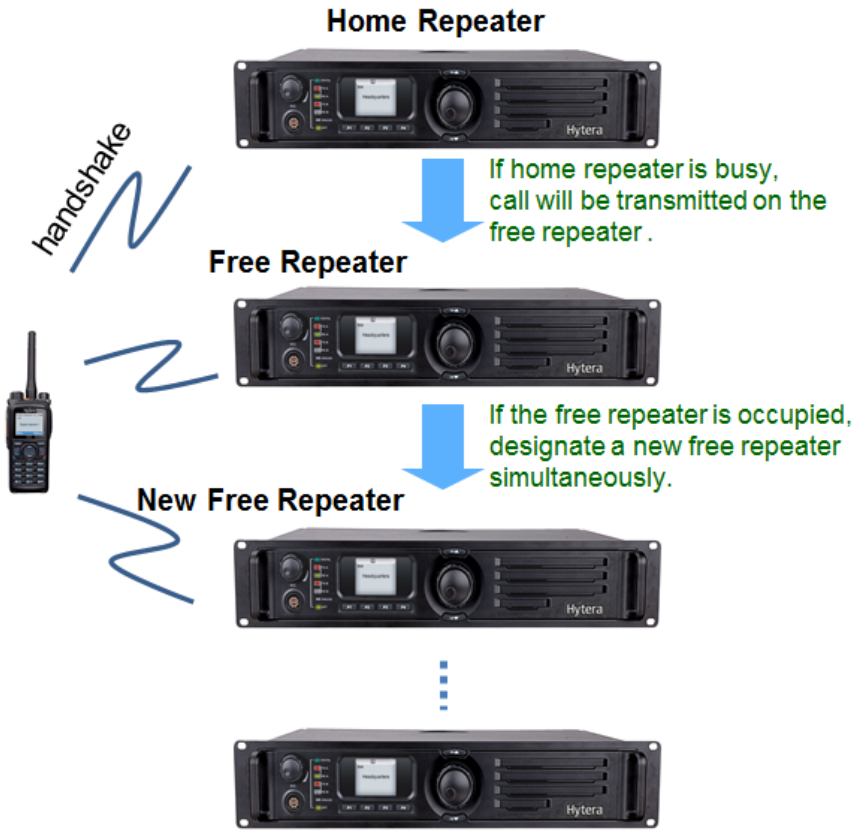
  When the home repeater of the radio is busy, the radio will switch to monitor the free repeater and initiate calls in the free slot of the free repeater. For example, G1 and G2 calls are ongoing on slot1 and slot2 of R1. The Group members of G3 will switch to free repeater R3 to monitor and transmit call.

  One free repeater should be specified in each XPT site at any moment, unless all the repeaters in the site are occupied. In each LAN site, any registered and idle repeater can be specified as free repeater of the site. Only one free repeater can be specified at a time for each LAN site.

## 1.3.2 Home Repeater Allocation


- Radios must to be programmed to be homed to be a specific repeater under the site.
- All sites will also need the radios to be allocated its home repeater. Doing this will ensure that the radios can operate with the best System Access Timing performance.
- A group that is not configured to be in any of the sites is not allowed to transmit in the system.

### 1.3.3 Free Repeater Assignment




- Only one free repeater for each site at the same time.
- Any successful registration state is sleep or idle repeaters are eligible to be elected as the free repeater of site.
- When free repeater is busy，the current free repeater will assign new free repeater from idle repeater list before it switch to traffic repeater.

## 1.4 Typical Network Topological Structure

The Typical Network Topological Structure of XPT system consists of radios, repeaters, Ethernet switch, router, IPPBX, third-party application, RDAC and telephone network. The radio makes call to other communication devices via the repeater; the repeaters connects to each other via switch; XPT site connects to WAN, third-party application and RDAC via router; XPT system connects to telephone network via IPPBX. See the figure below.

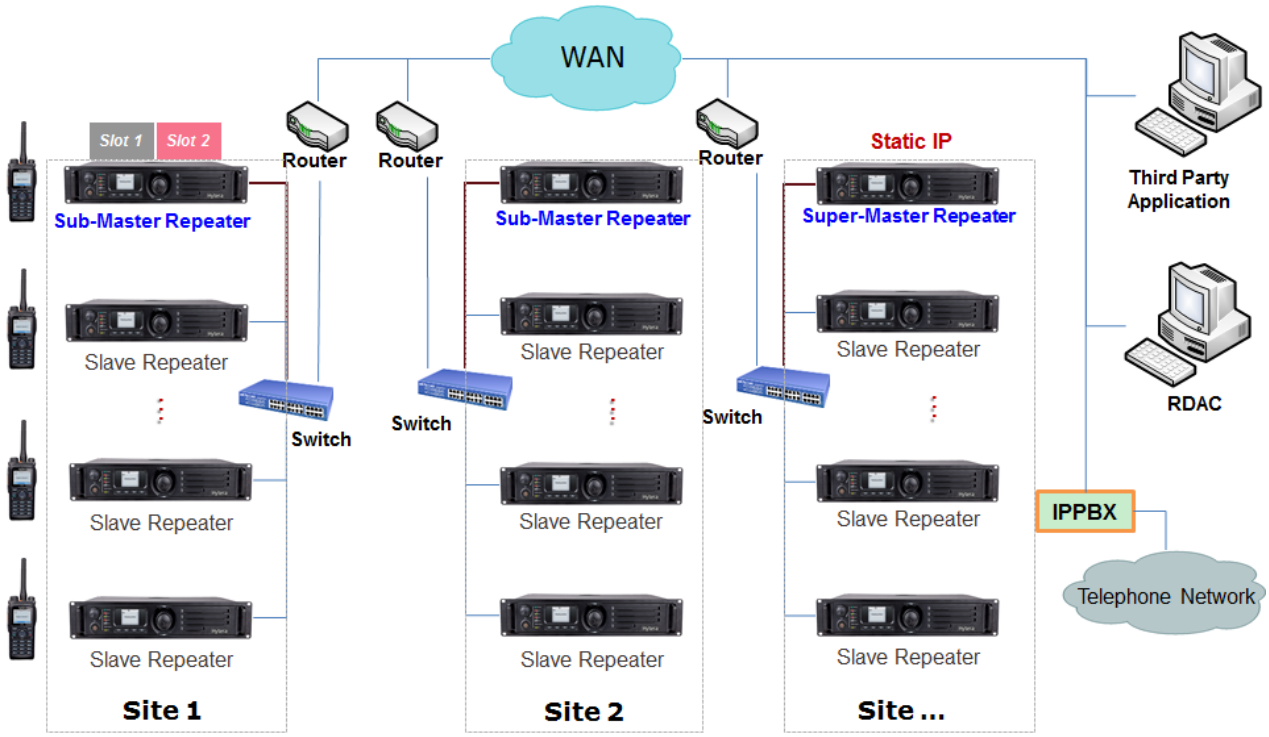



Figure 1–1 Network Structure of XPT System

XPT system includes Single-site Trunking System and IP Multi-site Interconnect Trunking System. The XPT single-site system consists of one master repeater and multiple slave repeaters. When configuring XPT single site system, the radios will be allocated with specific frequency and slot in advance. An idle radio always monitors its idle home repeater. The home repeater will broadcast the XPT system status information in each frequency via beacon signal, so as to inform the radio of available channel resource. In such case, the radio can switch to an available channel and slot to communicate.

XPT IP Multi-site Interconnect Trunking System connects multiple XPT Single-site systems via IP network to build an IP interconnect digital repeating system. This Multi-site system not only can ensure the channel resource sharing of XPT single-site system, but also can extend the communication coverage of XPT system. (**Note**: **XPT IP Multi-site Interconnect Trunking System will be available in later version. Please refer to Feature List released by Hytera for more information**)

XPT system can directly upgrade the software modules of radios and repeaters on the basis of the current digital conventional system. In such case, the enterprises can extend the communication capacity in existing system without purchasing plenty of extra equipments, which can greatly reduce the upgrade cost. Moreover, XPT system also supports the digital functions of conventional system. It can provide high capacity, large coverage, affordable and cost-efficient digital trunking solution by using entry level multi-site digital repeater configuration.

## 1.5 Restriction

- XPT system is only supported by RD98XS series repeaters of the Company.
- XPT system is only supported by PD6 and above series, MD6 and above series, X1 series radios of the Company. For detailed models, please refer to 3.1.1 Radio Devices.
- Each frequency in XPT system should satisfy certain conditions. If the frequency configuration is inappropriate, the generated intermodulation component will interfere with the operation of the system. Please see Frequency Configuration Requirement in 5.1 System Planning for details.

## 1.6 Version

- The XPT system is supported in repeaters and radios with firmware version of R7.0 and above. Please upgrade the firmware version of repeaters and radios to R7.0 and above for proper operation.

# 2. Application Scenario

Currently, XPT system is mainly used in the following scenarios:

## 2.1 A System with Hytera RDAC

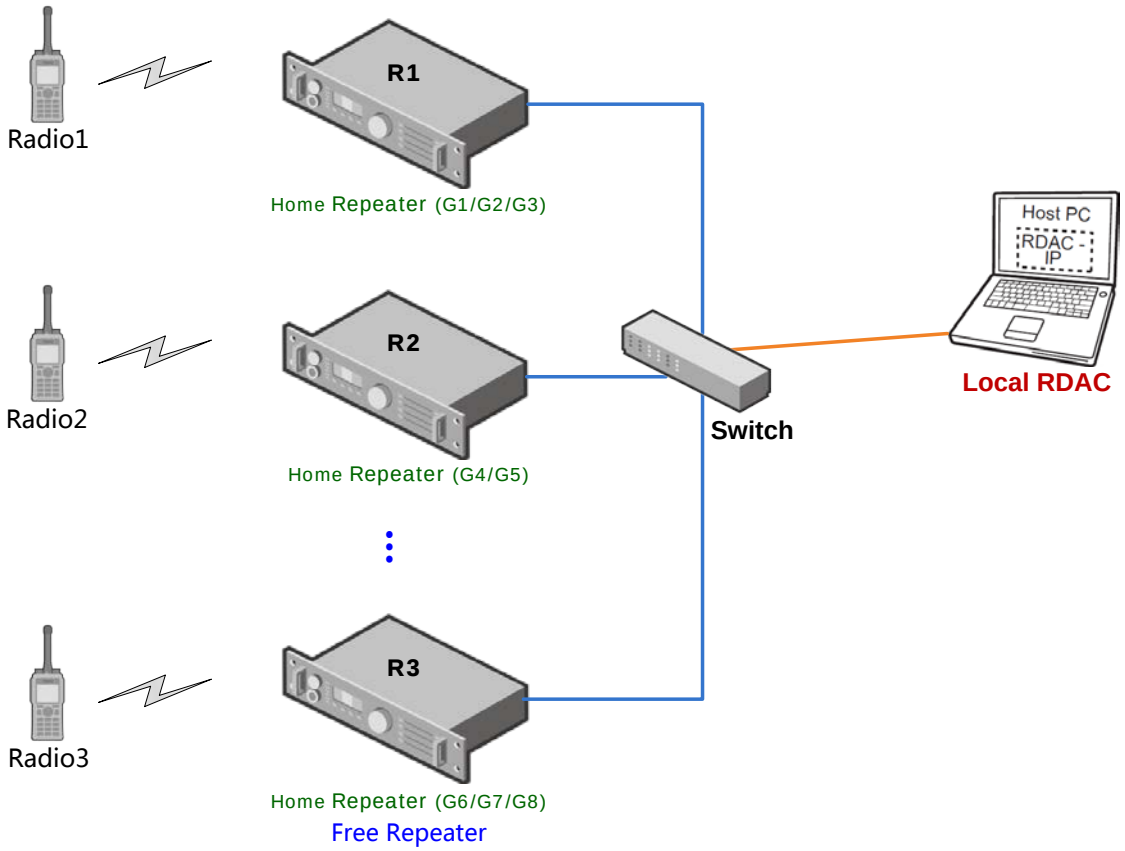



Figure 2‑1 A System with Hytera RDAC

One of the repeaters has an additional role of **Master**; a broker for discovering repeaters. The Master has a static address (i.e. IPv4 address and UDP port number), which is configured in all the repeaters and RDAC. Static address is an address that does not change with time. If the address of the Master changes, then all the repeaters and RDAC must be reconfigured with the new address.

## 2.2 A System with Dispatcher of Mobile Radio

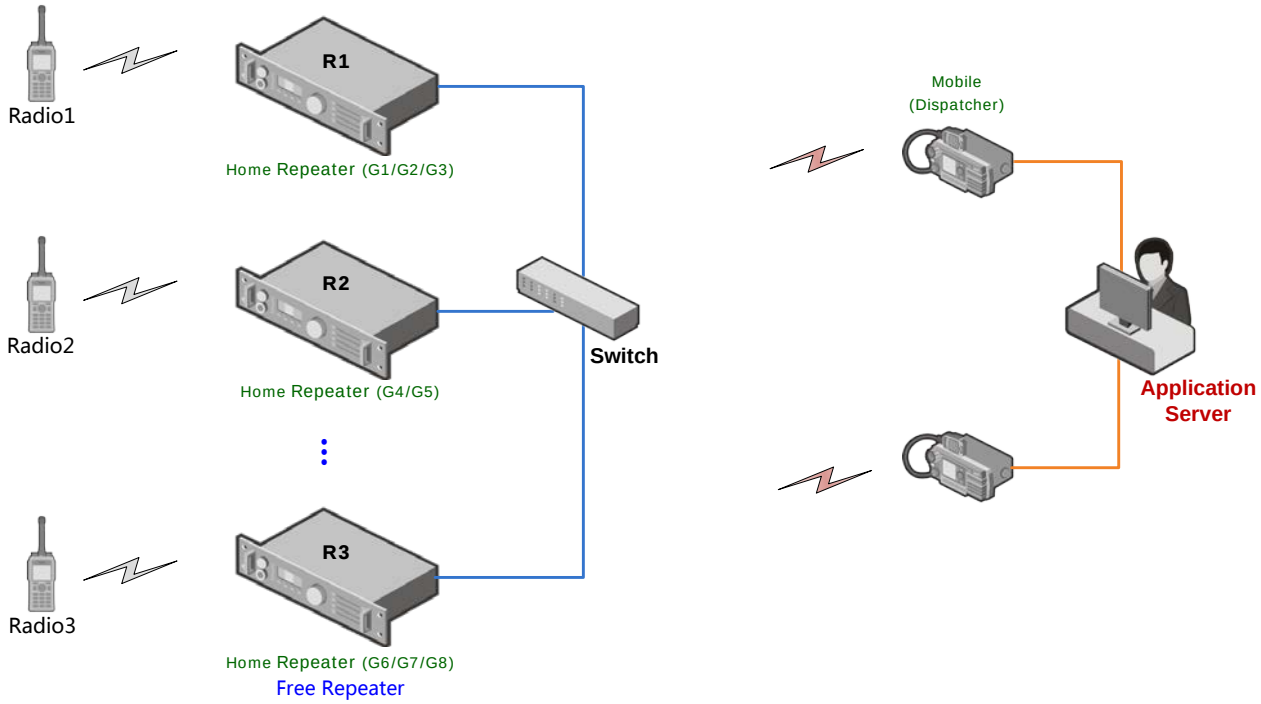



Figure 2－2 A System with Dispatcher of Mobile Radio

- Support services：Radio Registration Service (RRS), GPS, Radio Call Control (CC), Telemetry, Text Message (TMS), Data Transfer, Work Order, **Over the Air Programming** (OTAP), Radio Control (RC), Supplementary Control
- Only support mobile dispatcher on the first release version
- Use shared voice channel to transmit normal GPS while no data revert channel on the first release version

**Note**: Only supported two Mobile radios as dispatcher in current XPT system.

# 3. Application Conditions

## 3.1 Device Requirements

### 3.1.1 Radio Devices

#### Radio

Radios are used as calling and called terminals in XPT system. Currently, the supported DMR radios and PDT radios of the Company are listed in the table below. Here takes DMR PD78X as example for illustration.

| Supported Radio | VHF (136-174MHz) | UHF1 (400-470MHz) | UHF2 (450-520MHz) | UHF3 (350-400MHz) | Um (400-527MHz) |
|---|---|---|---|---|---|
| PD60X | √ | √ | √ | × | √ |
| PD66X | √ | √ | √ | × | √ |
| PD68X (G) | √ | √ | √ | × | √ |
| PD70X (G) | √ | √ | √ | √ | × |
| PD70X L | √ | √ | √ | √ | × |
| PD70X CQST IIB | √ | √ | × | √ | × |
| PD70X UL913 | √ | √ | √ | × | × |
| PD71XEx | √ | √ | × | × | × |
| PD75X L | √ | √ | √ | × | × |
| PD78X (G) | √ | √ | √ | √ | × |
| PD78X L | √ | √ | √ | √ | × |
| PD78XC (L) | √ | √ | × | √ | × |
| PD78X CQST IIB | √ | √ | × | √ | × |
| PD79XEx IIC | √ | √ | √ | √ | × |
| PD79XIS ia | × | √ | × | × | × |

| Supported Radio | VHF (136-174MHz) | UHF1 (400-470MHz) | UHF2 (450-520MHz) | UHF3 (350-400MHz) | Um (400-527MHz) |
|---|---|---|---|---|---|
| PD78X UL913 | √ | √ | √ | × | × |
| X1e | √ | √ | √ | √ | × |
| X1p | √ | √ | √ | √ | × |
| X1p UL913 | √ | √ | √ | × | × |
| MD65X | √ | √ | √ | × | × |
| MD78X (G) | √ | √ | √ | √ | × |
| MD78X 1W | √ | × | × | × | × |

## Repeater

Repeater is core device in XPT system, which is mainly used to repeat the TX and RX requests of the radio. Currently, only RD98XS series repeaters (supported frequencies: VHF, UHF1, UHF2 and UHF3) of the Company are supported.

## Combiner

In XPT site, the combiner can collect signals in different frequencies output by each XPT repeater and send all the signals via one antenna. In this way, fewer antennas are needed, and there is no need to switch between different antennas.

In one XPT site, it is recommended to use a combiner with a frequency corresponding to the repeater. And the combiner, the divider and the duplexer should be used together.

The combiner is an optional device, and it is recommended to use the combiner provided by the Company. Please contact your local dealer or us for more information.

## Divider

The divider used in XPT system is the receiver divider, which can receive signals from multiple frequencies via one antenna at a time, and divide these signals into single frequency to allocate them to different XPT repeaters.

The divider is an optional device, and it is recommended to use the divider provided by the Company. Please contact your local dealer or us for more information.

#### Duplexer

Duplexer is the pilot frequency duplex radio station or diplexer, which is the main part of the repeater. Duplexer is used to isolate the TX and RX frequency signals to ensure that TX and RX can operate properly at the same time.

The duplexer is an optional device, and it is recommended to use the duplexer provided by the Company. Please contact your local dealer or us for more information.

#### Antenna

Antenna is used to transmit repeater signals and receive external signals. When the repeater is connected to antenna feeder, two antennas are needed for connection to RX and TX connectors, the isolation between the antennas must be larger than 60 dB. If the duplexer is used, the RX and TX connectors can be connected using one antenna.

The antenna is an optional device, and it is recommended to use the antenna provided by the Company. Please contact your local dealer or us for more information.

### 3.1.2 Network Devices

#### Switch Device

Include Ethernet switch and optical fiber switch. Please contact the supplier for detailed information.

#### Router Device

Include firewall, NAT and router (such as CISCO 1841). Please consult the supplier for detailed information.

#### PC or Server

PC is mainly used for the corresponding configuration, such as XPT site information, XPT repeater CPS configuration, and network configuration.

Server is mainly used by third-party software and RDAC software.

## 3.2 Network Requirements

### 3.2.1 Diagram of Device Connection

#### XPT System with Hytera RDAC

In XPT site, XPT repeaters are connected to each other via one switch, and then connected to local

RDAC client (PC installed with RDAC software) via switch, so as to make sure that the users can diagnose and control each repeater via RDAC at any time and in any place.

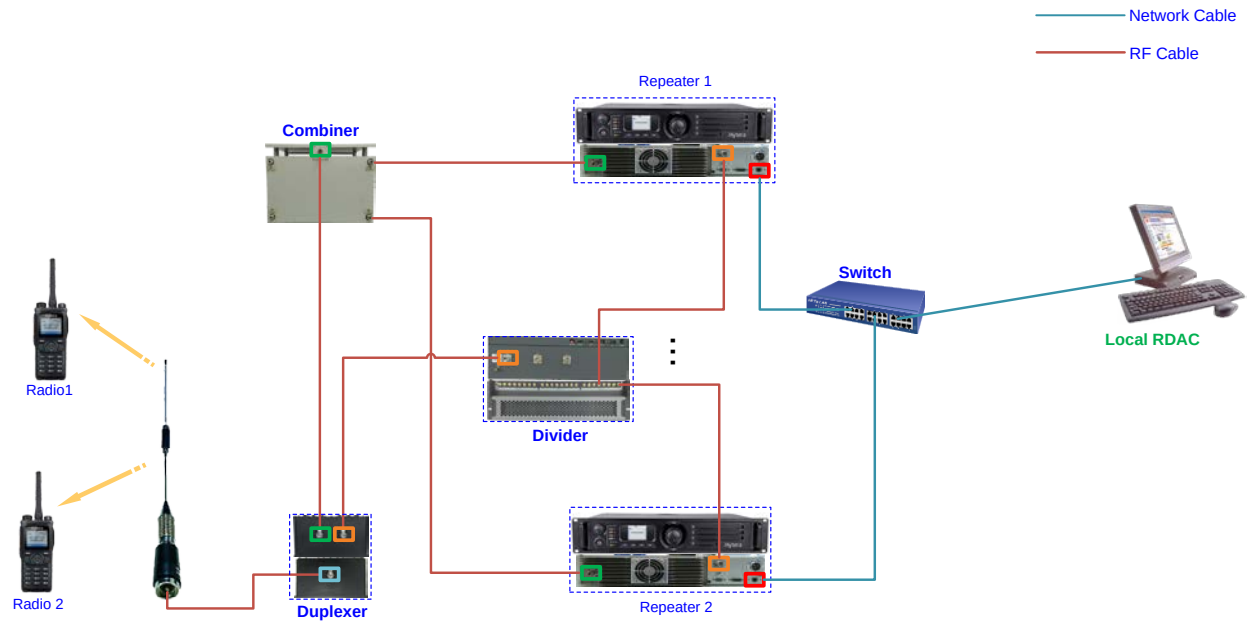



Figure 3‑1 XPT System with Hytera RDAC

## XPT System with Dispatcher of Mobile Radio

In XPT site, XPT repeaters are connected to each other via one switch, and the mobile radio is connected to third-party application server via USB dispatching cable. Third-party server sends the dispatch command to the repeater via mobile radio, and then the repeater repeats the command to the corresponding target radios.

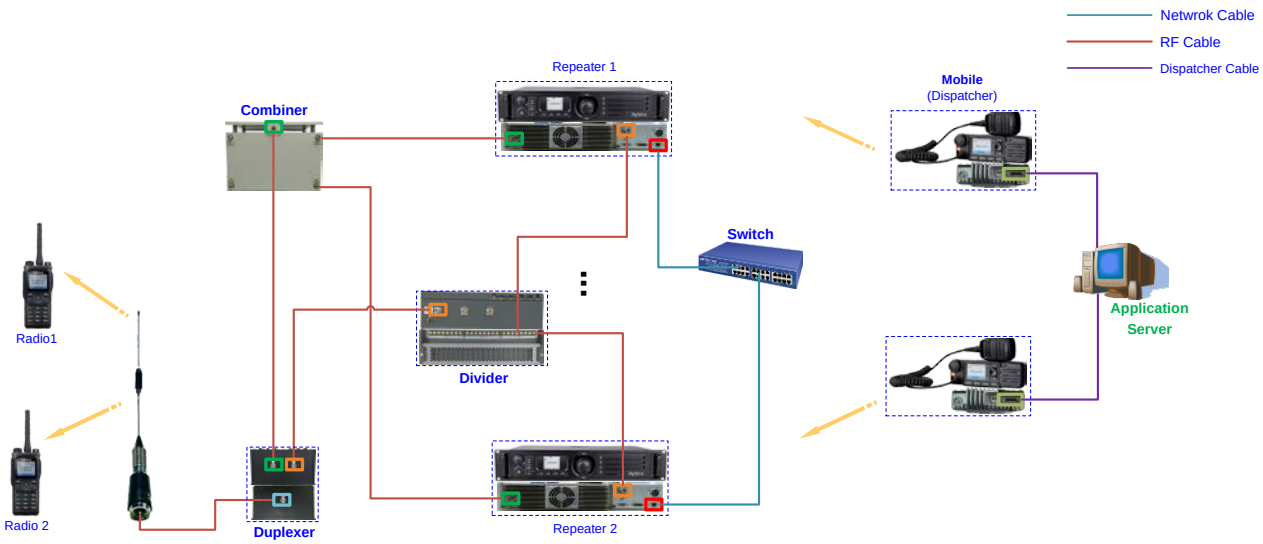



Figure 3‑2 XPT System with Dispatcher of Mobile Radio

### 3.2.2 Instructions on Device Connection

The radio and repeater transfer data to each other via air interface protocol.

- Repeater and switch are connected to each other via Ethernet port (See **Red Boxes** in 3.2.1 Diagram of Device Connection). Switch is connected to router, RDAC client and WAN via Ethernet port and transfers voice or data via network cable.
- Repeater and combiner are connected to each other via TX port (See **Green Boxes** in 3.2.1 Diagram of Device Connection). Repeater and divider are connected to each other via RX port (See **Orange Boxes** in 3.2.1 Diagram of Device Connection). They both transfer voice or data via RF cable.
- TX port of duplexer is connected to ANT port of combiner (See **Green Boxes** in 3.2.1 Diagram of Device Connection) via RF cable. RX port of duplexer is connected to RX port of divider. ANT port of duplexer (See **Blue Boxes** in 3.2.1 Diagram of Device Connection) is connected to external antenna via RF cable.
- Accessory connector of mobile radio (See **Light Green Boxes** in 3.2.1 Diagram of Device Connection) is connected to USB port of third-party application server and transfers dispatching commands via dispatch cable. Radio Control Station IP of different mobile radios involved in dispatching must be unique; otherwise, the dispatch station cannot identify different mobile radios. CPS configuration path: XPT Trunking -> General Setting -> Network -> Radio to PC Network -> Radio Control Station IP
- Please refer to corresponding references or consult the device operators for detailed information of different devices.

### 3.2.3 Instructions on Network Configuration

- In the LAN, all the repeaters under one XPT site must be configured with the different static Ethernet IP, but they are in same network segment.
- Different repeaters under the same site must be connected to the same switch. It is not recommended to connect this switch to other equipment outside the XPT System.
- The switch connected to the repeaters will access the WLAN via the router.
- Each router must be configured with the NAT port mapping to allocate an extranet port for each repeater. This extranet port will be bound and mapped to the **Ethernet IP** and the configured ports of the repeater (please see **IP Connect Configuration** in Configure XPT Network).

## 3.3 Software Requirements

### XPT Site Configuration Tool - XptAps

XptAps is the configuration tool for XPT sites, which can improve the configuration efficiency. Users can configure the common XPT site information in XptAps and save it into *.xml format file, and then import the configuration file to each repeater and radio via CPS. In this way, XPT site information of all repeaters or radios in the same XPT site can be consistent. If the information is configured via CPS respectively, it will take more time and errors may occur. It is also hard to identify system failure via configuration items, such as repeated repeater index number, repeated radio ID, inconsistent frequency of radio and repeater.

**Note**: This tool needs not be installed individually. It will be installed when CPS 7.0 and above is installed.

### Customer Programming Software (CPS)

The dealer can configure the radio and repeater via Customer Programming Software (CPS).

CPS version must be R7.0 or above. For detailed software version information, please contact device supplier. For better configuration, please refer to the help file of CPS for details.

### RDAC Software

**RDAC** Software is the Repeater Diagnosis and Control application. This software is a PC software developed by the Company for repeater operation status monitoring. With this software, the parameters and emergency status of all registered repeaters in the system can be monitored on real-time basis. Moreover, operators can perform basic control and configurations on the repeaters, so as to monitor and maintain the repeaters. Please contact your nearest salesperson or customer service for more details on operation of RDAC software.

### Other Software

For example, third-party application software.

# 4. Reference

None.

# 5. System Planning and Parameter Configuration

## 5.1 System Planning

One XPT single-site system must at least include two repeaters (one master and one slave) and can include up to eight repeaters. Each repeater can be used as voice sharing channel (specific data channel will be supported in later version), and there will be 16 logic channels in total. Theoretically, up to 16 voice channels or data channels can be supported at the same time. Each XPT system can support digital communication of up to 1200 users.

XPT system can provide different function supports for 65535 users per their actual needs, which is far more than conventional repeater system. In XPT system, radio ID range is 1 to 65535 (16 digits), while group ID range is 1 to 254 (8 digits). Group ID 255 is reserved for all calls (All Call).

For XPT single-site system, the frequency of all repeaters must be different, but their color codes can the same or different. XPT system can share transmission channel with other systems. But please make sure that all the channels in the overlapping system have unique frequency pair and color code combination.

If XPT repeaters need to be removed for upgrading or repairing, the radios need not to be configured again. XPT system still can operate like there is only one conventional repeater in the system. Moreover, there is no need to shut down the whole communication system when removing or adding a repeater in XPT system.

### 5.1.1 Planning Channel Frequencies

When planning the channel frequencies of XPT system, the following important aspects must be concerned about:

- System Property: Is this a new system? Or there is a conventional system?
- Frequency Requirement: Are the frequencies being used new? Or need to add frequencies?
- Conflict Management: Are there any interference issues that need to be addressed?

#### Frequency Configuration Requirement

Assume that the RX frequencies for repeater Channel 1 to Channel 4 are rf1, rf2, rf3, rf4; frequency

spacing between RX frequencies are △rf1, △rf2, △rf3; TX frequencies are tf1, tf2, tf3, tf4; frequency spacing between TX frequencies are △tf1, △tf2, △tf3; Channel bandwidth is BW.

To avoid intermodulation interference, all frequencies must satisfy the following conditions at the same time:

- The difference between any two value of △rf1, △rf2, △rf3, △tf1, △tf2 and △tf3 must be larger than or equal to BW.
- Among △rf1, △rf2 and △rf3, (Minimum Value) – (Difference between any two value) ⩾ BW.
- Among △tf1, △tf2 and △tf3, (Minimum Value) – (Difference between any two value) ⩾ BW.
- TX frequency must be different from RX frequency of the same channel.
- TX frequency spacing of different channel must be different. Also, RX frequency spacing of different channel must be different.

## Configuration Example

Assume that XPT system has three channels, with BW=12.5 kHz. During frequency selection, frequency spacing of each channel is set to increase according to bandwidth. This configuration can avoid intermodulation interference and complies with the design of duplexer and combiner. See the figure below.

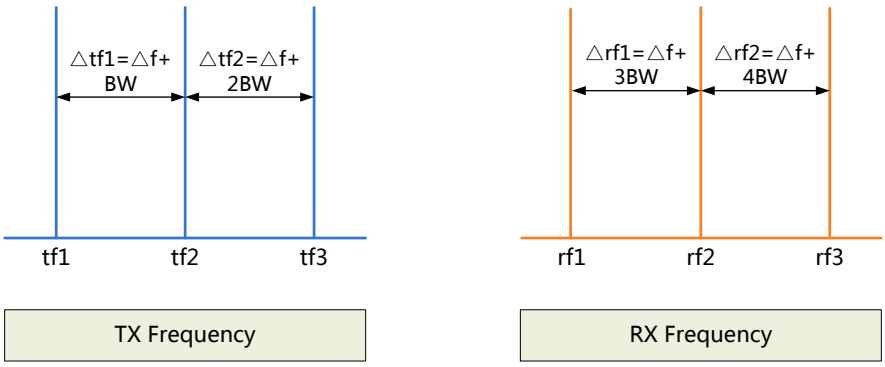



Figure 5–1 Frequency Configuration Reference

Frequency configuration procedures of the XPT system are as follows:

1. Set frequency of Channel 1 (in UHF3): TX tf=353 MHz, RX rf=363 MHz;

2. Set TX frequency spacing between Channel 2 and Channel 3 to frequently used frequency spacing △tf2=250 kHz of UHF3 combiner;

3. Calculate the frequency fixed spacing △f=225kHz according to △tf2=△f+2BW in Step 2;

4. Calculate other frequencies according to △tf, △rf, BW and frequency of Channel 1. The calculation

formula is as follows.

Assume that N channels need to be set in XPT system, the TX frequency spacing between Channel (M-1) and Channel M is set to frequently used frequency spacing △tfm of combiner in certain frequency band.

Then, Frequency fixed spacing △f = Combiner frequency spacing △tfm – (M-1) x BW, and

- **TX Frequency = Channel 1 TX Frequency (TX Reference Frequency) + (Channel No. - 1) x Combiner frequency spacing △tfm + (Channel No. - 1) x (Channel No./2 – M + 1) x BW**
- **RX Frequency = Channel 1 RX Frequency (RX Reference Frequency) + (Channel No. - 1) x 【Combiner frequency spacing △tfm + (Channel No. + 6 – 2M)/2 x BW】**

According to the calculation formula, the calculation results of Channel 2 and Channel 3 are listed in the table below.

| Channel No. | TX tf (MHz) | RX rf (MHz) | Frequency Spacing with Previous Channel (MHz) |
|---|---|---|---|
| Channel 1 | 353 | 363 | / |
| Channel 2 | 353.2375 | 363.2625 | TX frequency spacing △tf=0.2375<br>RX frequency spacing △rf=0.2625 |
| Channel 3 | 353.4875 | 363.5375 | TX frequency spacing △tf=0.25<br>RX frequency spacing △rf=0.275 |

## 5.1.2 Loading Considerations

When planning the load balancing of XPT system, the following important aspects must be considered:

- How many users will be on the system?
- Will the system add new users in the future? System planners should design the system to accommodate future users that may be added.
- It is possible that more channels may need to be added if a great lot of subscribers are added.

- XPT system ideally can support 100 subscribers per slot
- If attempting to put 300 subscribers on a 2 slot voice system and the system will be busy often

- Adding more data radios or shortening the GPS update period could also drive the need for more revert slots on the system.

### 5.1.3 Future Considerations

When planning the XPT system, the expansibility of the system must be considered:

- What's the maximum number of users the system can support?
- The number of users and talk patterns should drive the amount of voice slots required.
  - High traffic patterns will require more channels in the system to ensure a good QoS (Quality of Service)
- Will the system add new channels, talk groups in the future? Applies to voice and data revert channels.
- It is important to note that all subscribers will need to be reprogrammed if new channels or TGs are added in the future.

### 5.1.4 Programming methodology

Please Plan the system in advance, then Programmers need to follow the same logic as programming a conventional system:

1. What are / how many voice channels do I need to program?
2. What are the Talk groups that I need to program?
3. What TalkGroups do I need to hear on my radio?
4. Will I be using a data application?
5. If using data revert, what are the channels?
6. Do I need more than 1 zone?
   - Do I need to access an IP Site Connect system
   - Do I need to access a other systems (such as PSTN/PABX system, Dispatch system)

## 5.2 Fail Soft Mode

XPT system is a distributed trunking system. It has no controlling center, thus the system can tolerate certain failure. XPT system can automatically detect most of the failures, such as abnormality auto detection, physical connection break-up, network card looseness, network off-line and switch abnormality. XPT system will deal with different failures according to actual situation to weakening the adverse impacts, so as to ensure that the repeater can still work when it is in Fail Soft Mode. When the abnormal problem is solved, the repeater will exit Fail Soft Mode and support XPT services again.

- When the master repeater and slave repeater malfunction:
  - The XPT repeater will enter Fail Soft Mode and broadcast corresponding beacon signal periodically. After then, the repeater will become a trunking system which only supports two trunking channels like pseudo trunking mode of conventional system, and only supports basic digital conventional functions.
  - The repeater in Fail Soft Mode cannot be assigned as free repeater of XPT system.
  - Radios staying on the repeater will start hunting automatically after receiving the beacon signal, and switch to home repeater or free repeater for monitoring.
- When switch malfunctions:
  - The repeaters in XPT site cannot be connected to each other. The XPT single-site system will enter Fail Soft Mode, and each repeater will become a trunking system which only supports two trunking channels.
  - Logic channels in XPT single-site system will be reduced significantly. Radios on different channels cannot communicate with each other.
  - Radios will stay on their own home repeater and transmit and receive services in free slot of home repeater.

## 5.3 Example: Simple System Design

We will suggest a good example case that can be learnt from.

The XPT contacts information as follows:

| Talk Group Name | Talk Group ID | Users | Activity | Applications |
|---|---|---|---|---|
| XPT Group A | 100 | 60 | High | NO |

| Talk Group Name | Talk Group ID | Users | Activity | Applications |
|---|---|---|---|---|
| XPT Group B | 110 | 20 | Low | NO |
| XPT Group C | 120 | 25 | Low | NO |
| XPT Group D | 130 | 20 | Low | NO |
| XPT Group E | 140 | 40 | High | NO |
| XPT Group F | 150 | 25 | Low | NO |
| XPT Group G | 160 | 50 | High | NO |

- This system will have 240 users and 7 talk groups.
- In the following example we will program 3 voice repeaters (6 voice slots).
- Assign Group A, B to be homed to repeater 1, Group C, D, E to be homed to repeater 2, and Group F, G to be homed to repeater 3.

The XPT repeaters information as follows:

| Rpt. Name | Radio ID | Rpt. Type | Home Group | Power Level | TX/RX Freq. |
|---|---|---|---|---|---|
| Repeater1 | 100 | Voice (Master) | A, B, | High | 353 / 363 (CH X1) |
| Repeater2 | 101 | Voice (Slave) | C, D, E, | High | 353.2375 / 363.2625 (CH X2) |
| Repeater3 | 102 | Voice (Slave) | F, G | Low | 353.4875 / 363.5375 (CH X3) |

### 5.3.1 XPT Site Configuration

XPT site information configuration tool XptAps can ensure that site information of all the radios and repeaters in XPT system will be consistent, and can improve configuration efficiency magnificently.

XPT site parameters mainly consist of Site Common Parameters and Key Parameters of Individual Repeater.

To configure XPT site parameters in XptAps, do as follow:

**Step 1** Run XptAps tool in any of the following ways:

- Start menu. Path: Hytera RCPs -> Customer Programming Software -> XptAps;
- CPS installation directory. Default directory: C:\Program Files\Hytera\Customer Programming Software\XptAps.exe

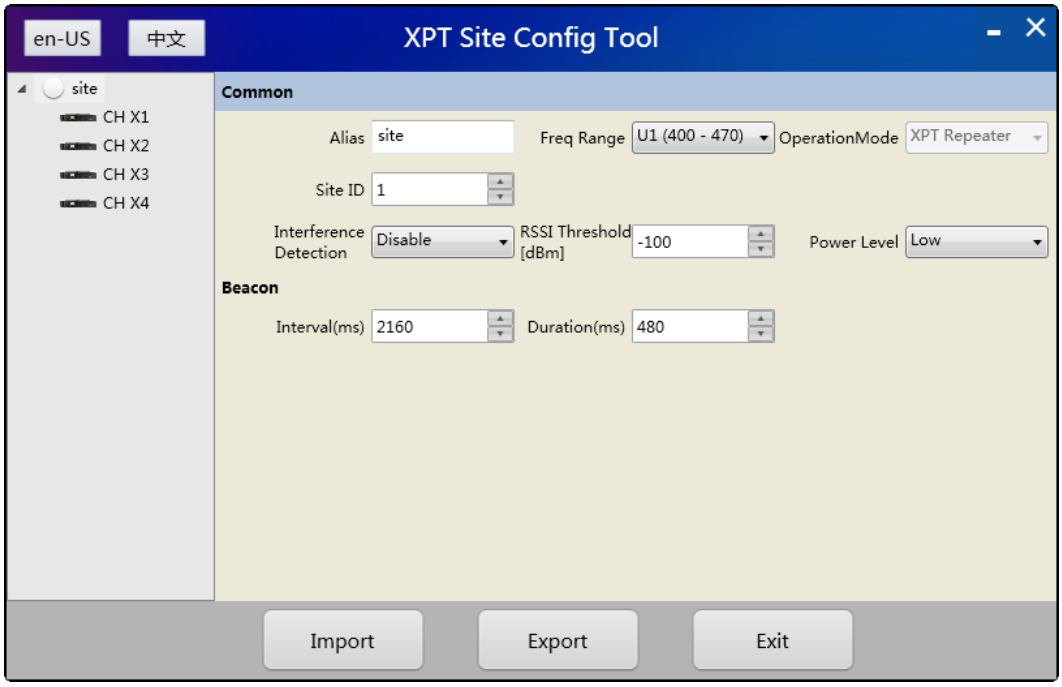



Figure 5–2 XPT Site Config Tool Main Interface

**Step 2** Click “site” to configure common parameters of XPT site.

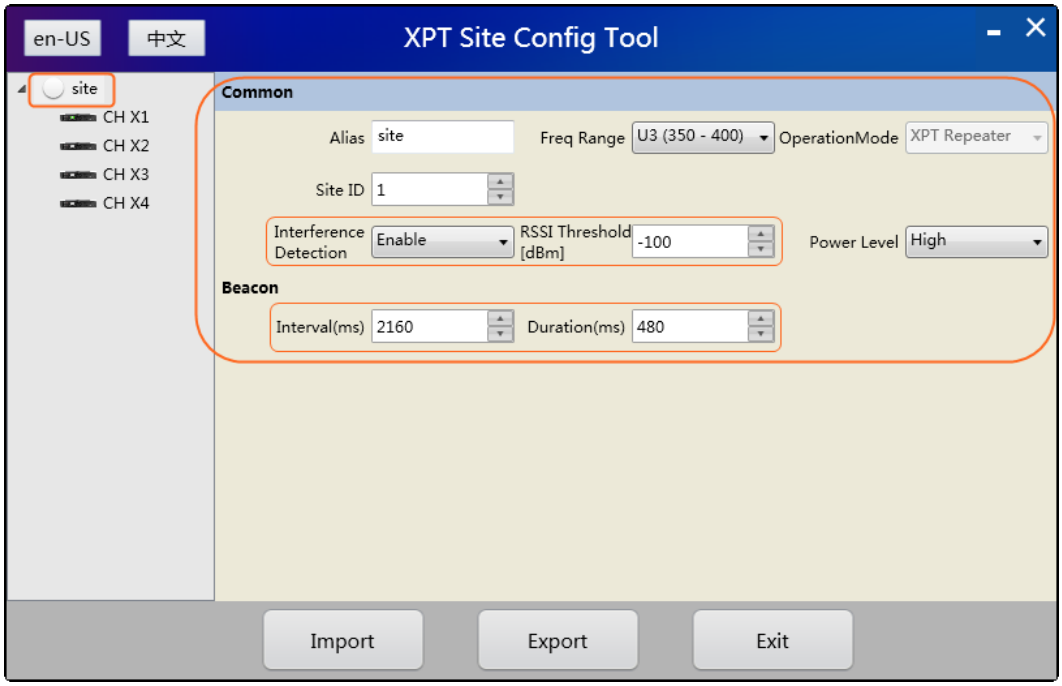



Figure 5–3 XPT Site Common Parameter Configuration Interface

| Parameters | Description | Setting |
|---|---|---|
| Alias | Alias of the site. | **Range:** A string consisting of 1-16 characters. |
| Freq Range | Frequency range for each repeater in the site. After then, frequency of each repeater must be set within this range. | Select from the drop down list.<br>U3 frequency band is selected in example. |
| OperationMode | There are two modes for repeater: Conventional Repeater and XPT Repeater. The repeater can only operate in one mode for each time. | Read-only and XPT Repeater only |
| Site ID | ID for current XPT site. | **Range:** 1-30 |
| Interference Detection | If you enable **Interference Detection**, when the carrier RSSI of repeater no less than the value of **RSSI Threshold** parameter, the repeater cannot transmit on current | To enable this feature, select Enable. |

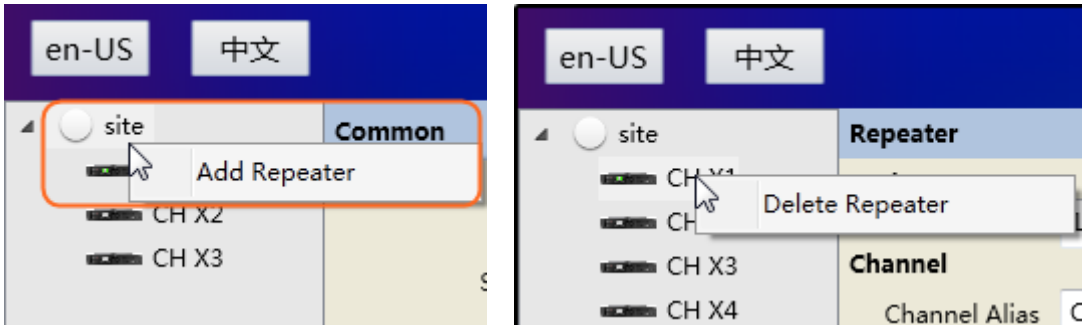
| Parameters | Description | Setting |
|---|---|---|
| RSSI Threshold | channel. Then the repeater will broadcast subscribers to monitor other repeater.<br>We need to make sure the **Interference Detection** and **RSSI Threshold** of all repeaters in XPT system are same. | **Range:** -130 to -40dBm<br>**Default:** -100dBm |
| Power Level | TX power of repeater under the site.<br>● High: High power can extend the signal coverage, enabling you to communicate with farther radios.<br>● Low: Generally, we recommend you to adopt low power for battery saving. However, if you cannot communicate with radios located at a distant place with low power, please select high power. | Please select according to actual conditions.<br>**Default:** Low |
| **Beacon**<br>Idle repeater will broadcast beacon signals periodically. Radio can find the repeater according to the beacon signals and detect the signal strength of the repeater.<br>If the XPT Network is LAN, we need to make sure the **Beacon Duration** and **Beacon Interval** of all repeaters and subscribers in XPT system are same. | | |
| Interval | Sets the interval time for repeater beacon signal transmission. | Sets according to actual conditions.<br>**Range:** 960-18000 ms<br>**Default:** 2160 ms |
| Duration | Sets the duration for repeater beacon signal transmission.<br>It is recommended to configure proper duration according to the repeater numbers in the site. See the table below.<br>Repeater numbers in Site Recommended Beacon Duration<br>● 1-3 ≥240 ms<br>● 4-6 ≥360 ms<br>● 7-8 ≥480 ms | Sets according to actual conditions.<br>**Range:** 240-1800 ms<br>**Default:** 480 ms |

Table 5–1 Configuration Descriptions on XPT Site Common Parameter

**Step 3** Select the repeater under the site to configure the key information of master repeater and slave repeater.

- Please add or delete the repeaters according to actual situations. In planning example, we need three repeaters, thus CH X4 will be deleted.

  There is four repeater under one site by default. To add a repeater, select the site alias (Site by default) and right click to select "**Add Repeater**"; to delete a repeater, select the repeater alias and right click to select "Delete Repeater".




- Sets key information of repeaters. In planning example, we need one master repeater (CH X1) and two slave repeaters (CH X2 and CH X3).

  Under one site, there must be at least two repeaters (one master repeater and one slave repeater). Each site can include up to eight repeaters, but can only have one master repeater.

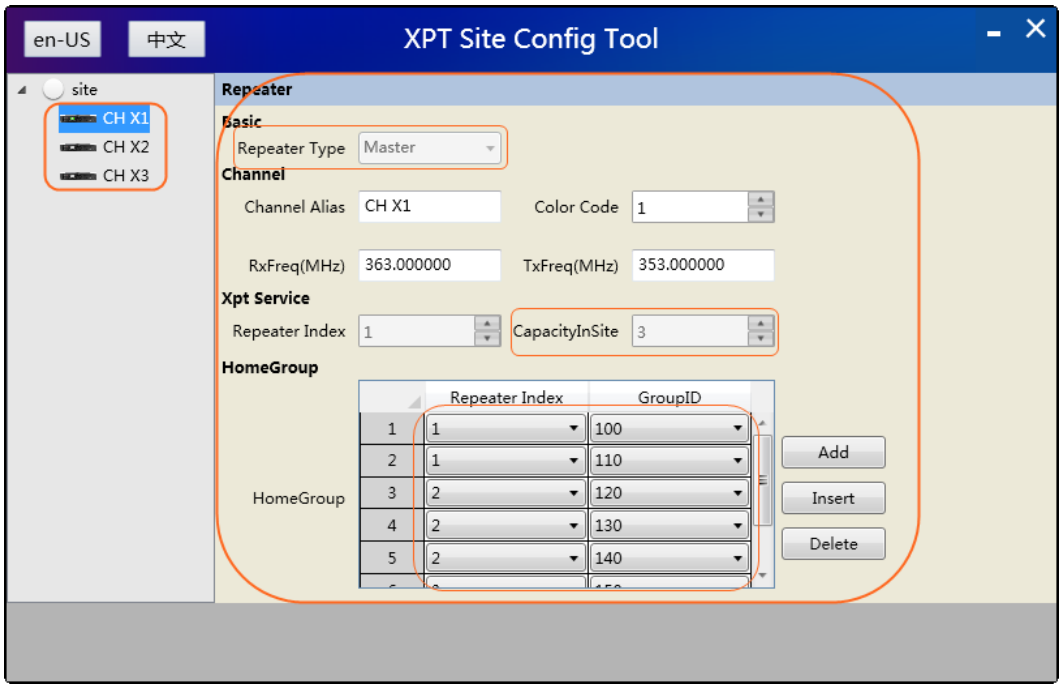



Figure 5–4 Master Repeater Parameter Configuration Interface-CH X1

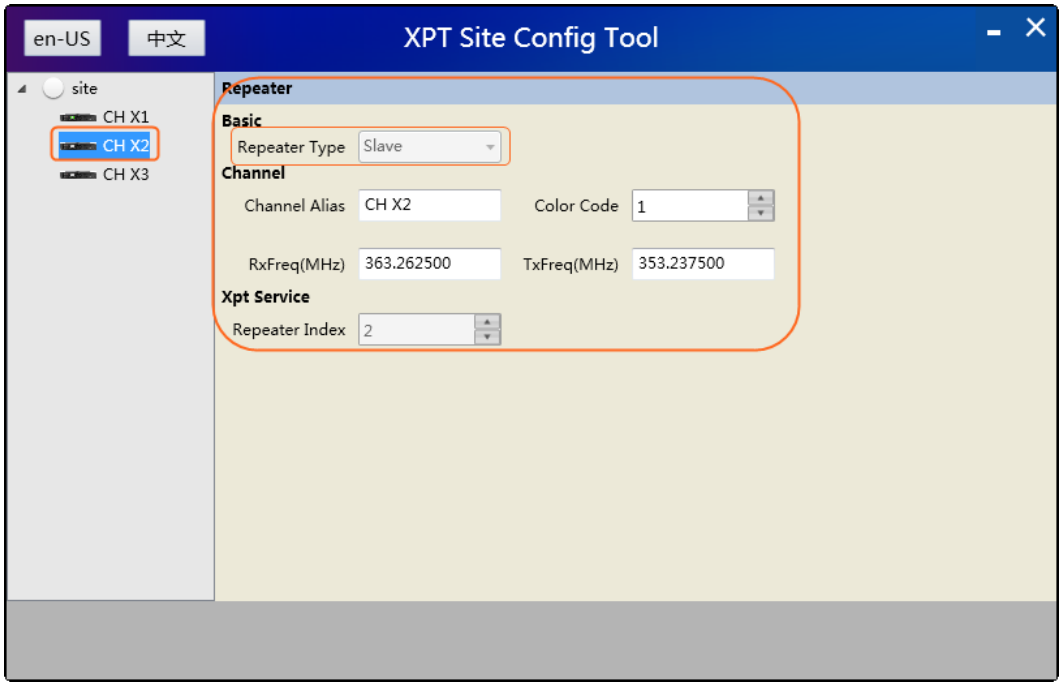



Figure 5‑5 Slave Repeater Parameter Configuration Interface-CH X2

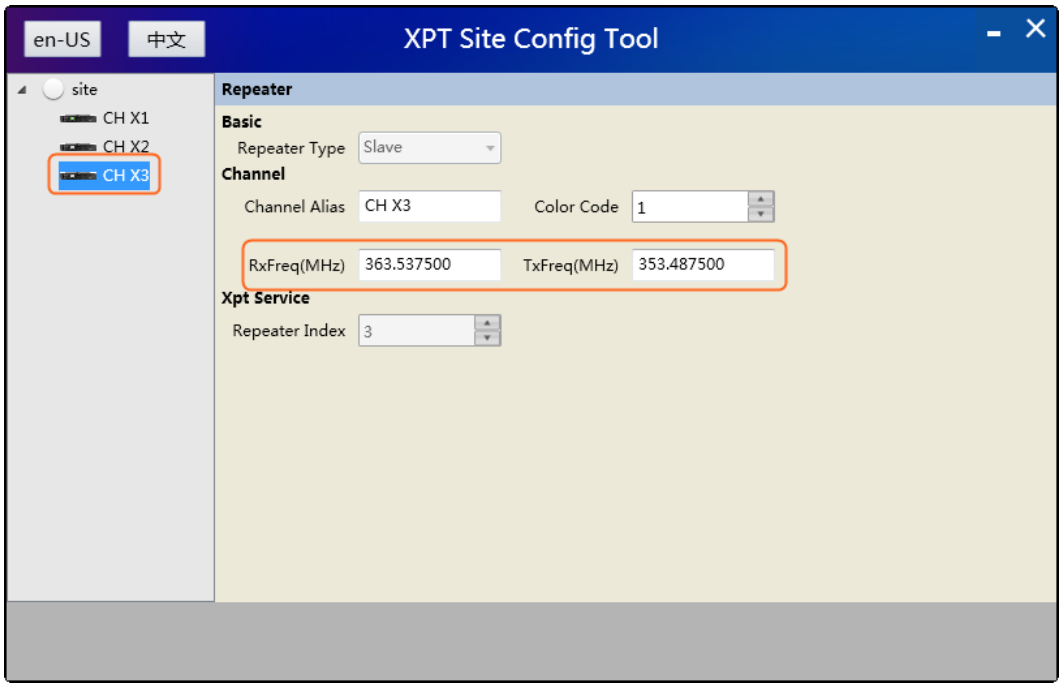



Figure 5‑6 Slave Repeater Parameter Configuration Interface-CH X3

| Parameters | Description | Setting |
|---|---|---|
| **Basic** | | |

| Parameters | Description | Setting |
|---|---|---|
| Repeater Type | ● Master: One repeater must be assigned as Master Repeater in each site. It is used to manage other repeaters in the same site and configure the Home Group for each repeater.<br>● Slave: Repeaters except for Master Repeater are slave repeaters. Slave repeaters are connected to the Master Repeater to build the XPT site. | Sets according to actual conditions.<br>In planning example, CH X1 is Master Repeater while CH X2 and CH X3 are Slave Repeaters. |
| **Channel**<br>Configure the default channel CH X1 of the repeater. After importing the configuration into CPS, write the configuration to CH X1, CH X2 and CH X3. | | |
| Channel Alias | Alias of the channel. | **Range:** A string consisting of 1-16 characters. |
| Color Code | Color code can indicate a system. Different repeaters in the same site can be set with different color codes, but repeaters and radios with the same frequency in the same site must be set with the same color code; otherwise, they cannot communicate with each other. | **Range:** 0-15<br>**Default:** 1 |
| RxFreq(MHz) | Sets RX frequency of the channel. | In planning example, TX frequency of Master Repeater (CH X1) is 353 MHz, while RX frequency is 363 MHz. |
| TxFreq(MHz) | Sets TX frequency of the channel.<br>**Note**: The RX Frequency and TX Frequency for different repeaters must be set different in one XPT site. | |
| **Xpt Service** | | |
| Repeater Index | The unique identification number of repeater in the site.<br>In a single site, index number of each repeater must be unique and is consecutive number starting from 1. | Read-only. The index number of each repeater is assigned by the tool automatically. You can view it but cannot change it.<br>**Range:** 1-8 |

| Parameters | Description | Setting |
|---|---|---|
| CapacityInSite | The number of repeaters of the current site. This parameter will be available only when Repeater Type is set to Master. | Read-only. The capacity is configured according to the current site by the tool automatically. The number of repeaters of the current site will be displayed.<br>**Range:** 1-8 |
| **HomeGroup**<br>Sets the Home Group for each repeater under the current site. Home Group for different repeaters must be unique. This parameter will be available only when Repeater Type is set to Master. | | |
| Repeater Index | The unique identification number of repeater in the site. | **Range:** 1-CapacityInSite |
| GroupID | Sets the Home Group ID of the repeaters. One repeater can be set with up to 30 Home Group IDs. | **Range:** 1-240 |

Table 5–2 Configuration Descriptions on Repeater Parameters

**Note:** The configurations are different for Master Repeater and Slave Repeater. See orange boxes in Figure 5–4 and Figure 5–5 for details.

**Step 4** Save the XPT site parameter configurations.

After finishing XPT information configuration, you can export and save the configuration into files (.xml format by default) by clicking “**Export**” button. Also, you can import the existing configuration file by clicking “**Import**“ button to view and modify the configurations.

**Note:** “**Import**” and “**Export**” buttons are available only in Common interface. Click site alias on left screen to open Common interface.

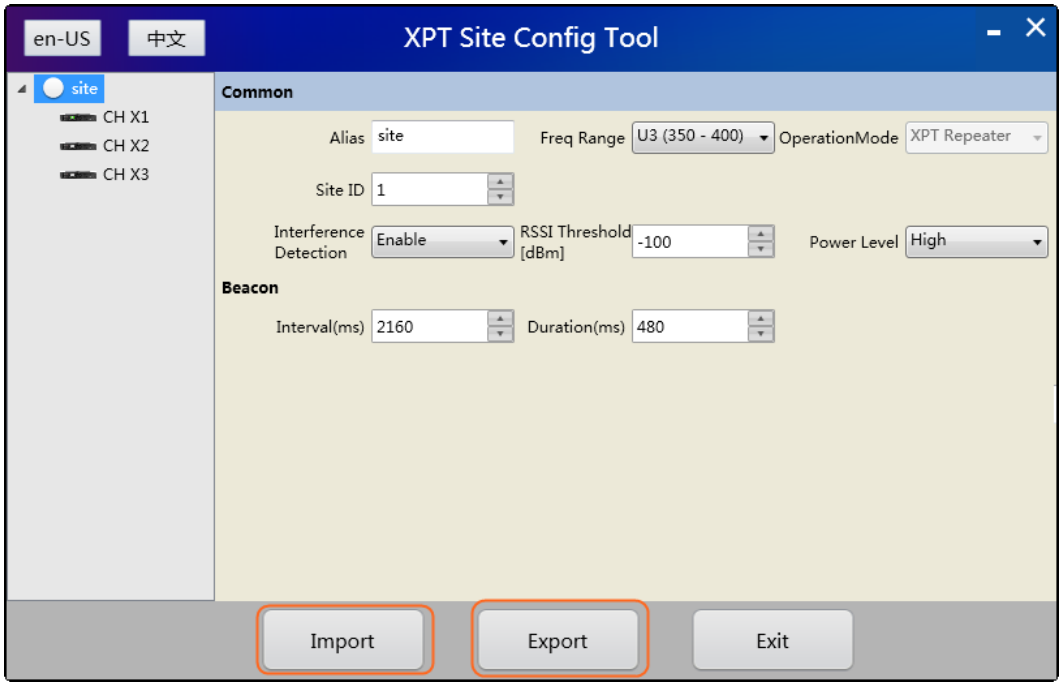



Figure 5–7 Exporting XPT Site Configuration

## 5.3.2 Repeater Configuration Guidance

After configuring the site parameters via XPT tool, you need to configure other parameters of repeaters and radios via CPS respectively.

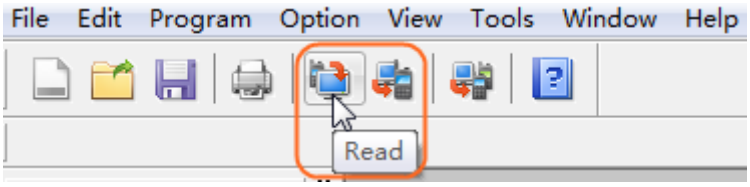
**Caution:**

- When the configuration file import successfully, name of the parameter which has been configured in file will turn **blue** in CPS please see Figure 5–11.
- If the parameters in CPS was configured by “XPT Site Config Tool”， you need not to set again, and we suggest strongly that do not modify in CPS.

### Import XPT Site Configuration

Import the site information and repeater information configured via XPT tool into repeater CPS.

**Step 1** Read the repeater to be configured.




**Step 2** Set the repeater index.

CPS will import the corresponding repeater configuration according to the repeater index. For example, the index number of the repeater is 3, and CPS will import repeater configuration of Repeater Index 3 from the configuration file. The default index is 1.

**CPS path**: XPT Trunking -> XPT Service -> Setting -> Site Setting -> Repeater Index

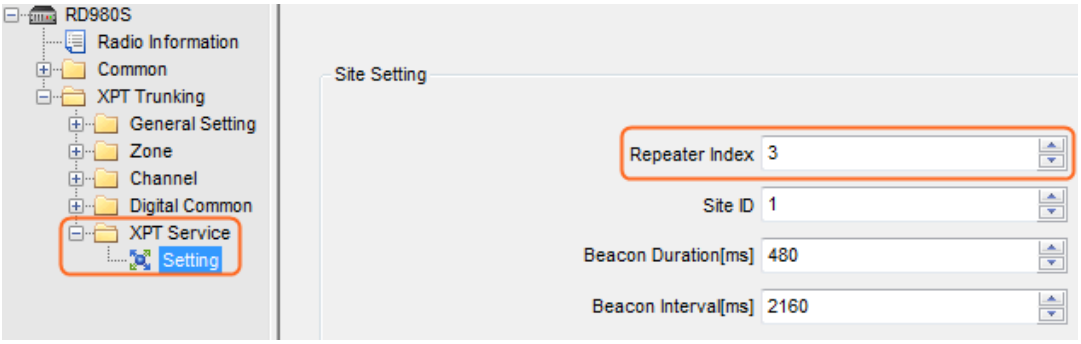
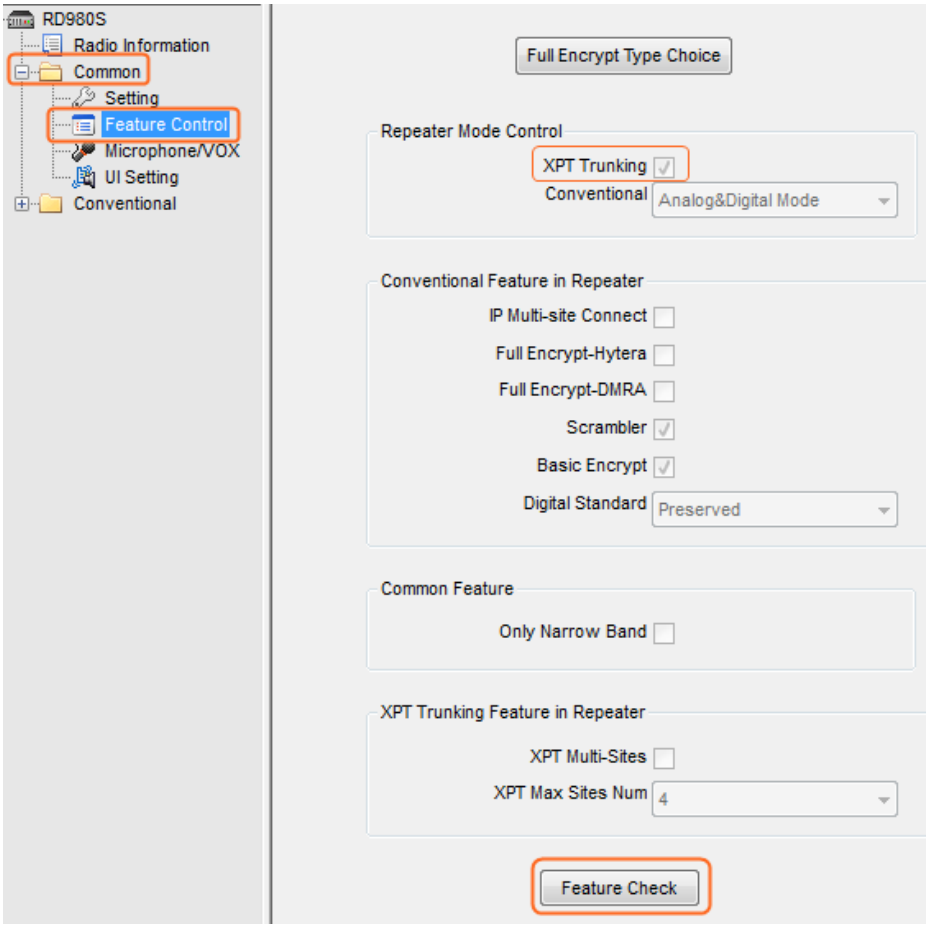
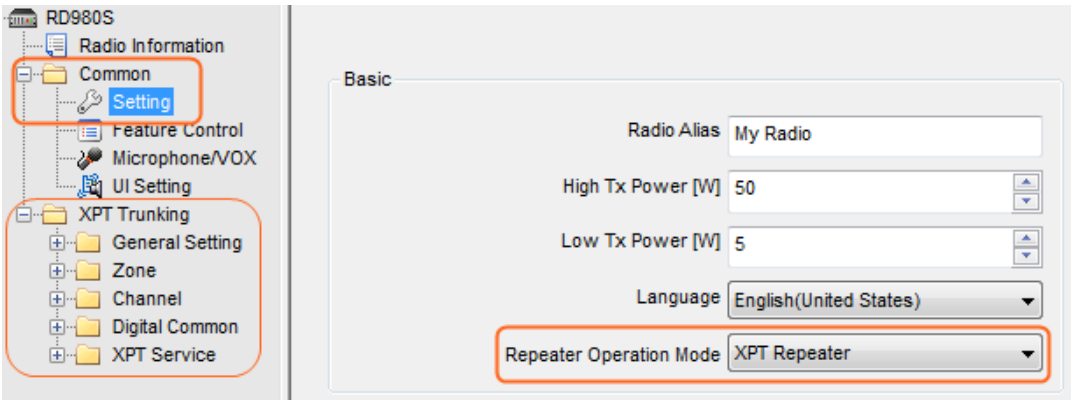



Figure 5‑8 Set the repeater index

**Caution:** XPT trunking functions need to be authorized by acquiring License. After being authorized, if the XPT trunking menu is not displayed in CPS, go to “Common -> Feature Control” to enable XPT Trunking, and then go to “Common -> Setting -> Basic” to set Repeater Operation Mode to XPT Repeater. See below:




**Step 3** Import XPT setting file.

CPS path: Tools -> Import XPT setting -> Select File -> Import

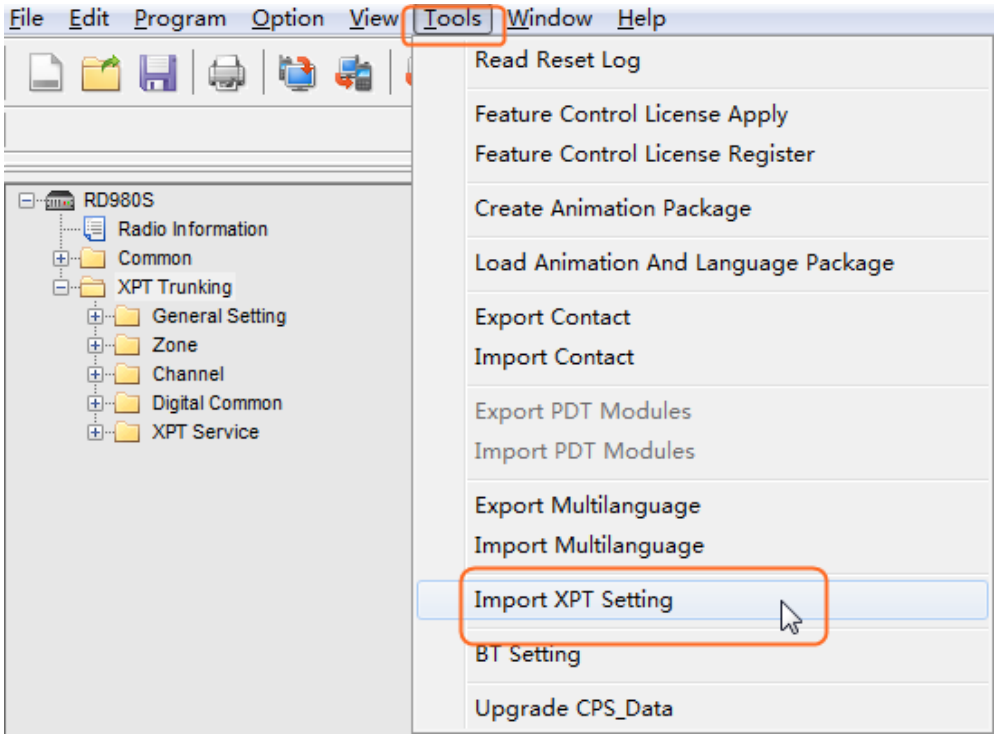



Figure 5–9 Import XPT Setting Interface

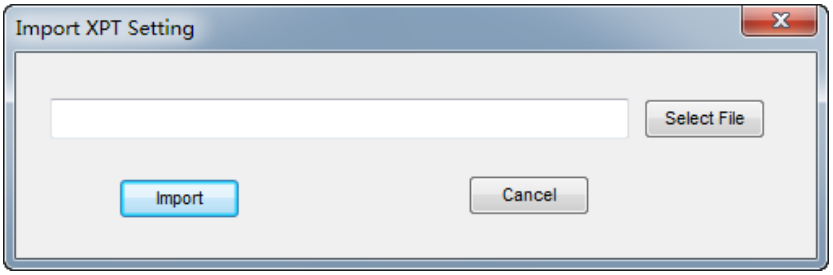



Figure 5–10 Selecting and Importing Configuration File

## Set Operation Mode

Sets Repeater Operation Mode to XPT Repeater. Currently, conventional repeaters are not supported by XPT system.

**Path:** Common -> Setting -> Basic -> Repeater Operation Mode. See Figure 5‑11.

**Parameters:** Repeater Operation Mode

**Description:** The repeater can operate in **XPT Repeater** mode only in XPT system.


Figure 5–11 Set Repeater Operation Mode

## Configure XPT Network

- Basic Setting of Network

  **Path:** XPT Trunking -> General Setting -> Network -> Basc Setting. See Figure 5–12.

  **Parameters:** All parameters in Figure 5–12.

  **Description:** Refer Table 5–3 to for parameter descriptions.

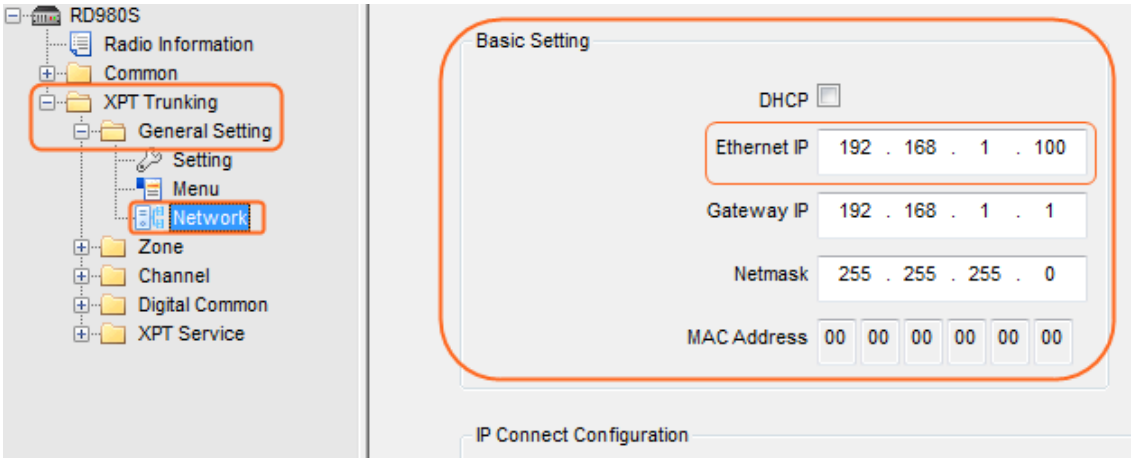



Figure 5–12 Basic Setting of Network

| Parameters | Description | Setting |
|---|---|---|
| Ethernet IP | This parameter is used to set the Ethernet IP for the repeater.<br>The **Ethernet IP** for each repeater of all XPT sites in LAN Network must be fixed and unique.<br>So please uncheck the “DHCP”. | **Method：** Manual input<br>**Range:** 0.0.0.0 - 255.255.255.255 |

| Parameters | Description | Setting |
|---|---|---|
| Gateway IP | This parameter is used to set the gateway IP under TCP/IP protocol for the repeater or transceiver. | |
| Netmask | This parameter is used to set the subnet mask for the repeater or transceiver. | |

Table 5–3 Configuration Descriptions on Basic Setting of Network

- IP Connect Configuration of Network

  **Path:** XPT Trunking -> General Setting -> Network -> IP Connect Configuration. See Figure 5–13 and Figure 5–14.

  **Parameters:** See orange boxes in Figure 5–13 for master repeater configurations; See orange boxes in Figure 5–14 for slave repeater configurations.

  **Description:** Refer to Table 5–4 for descriptions on key paratemers of IP Connect Configuration. For other related paramters, please refer to CPS Help.

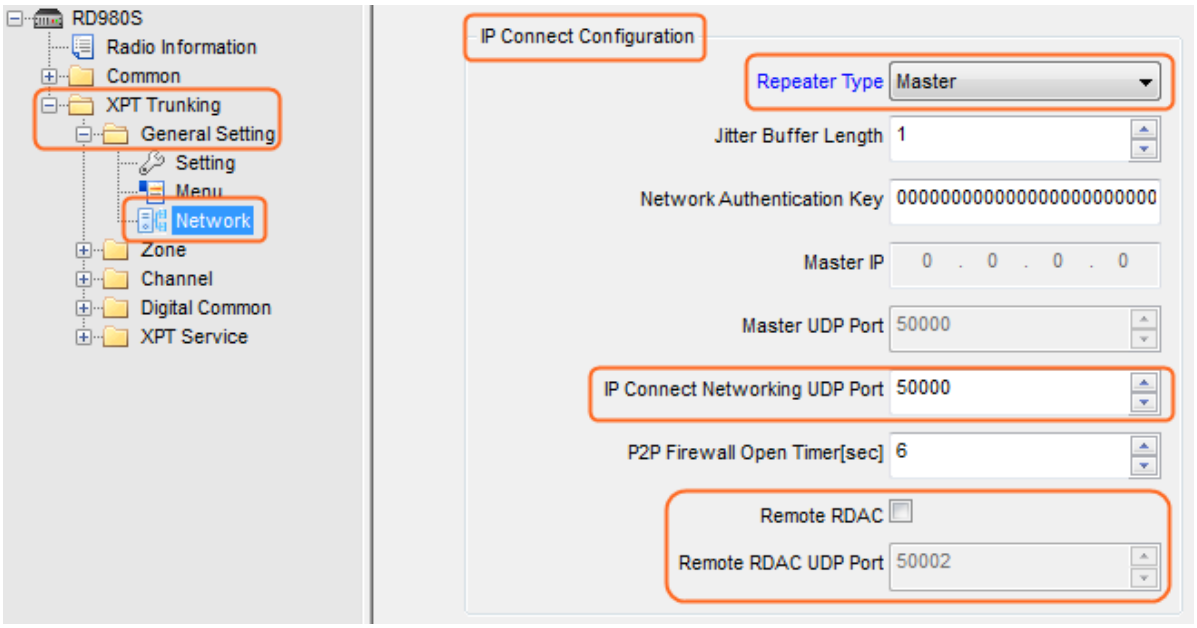



Figure 5–13 IP Connect Configuration of Network-Mater Repeater

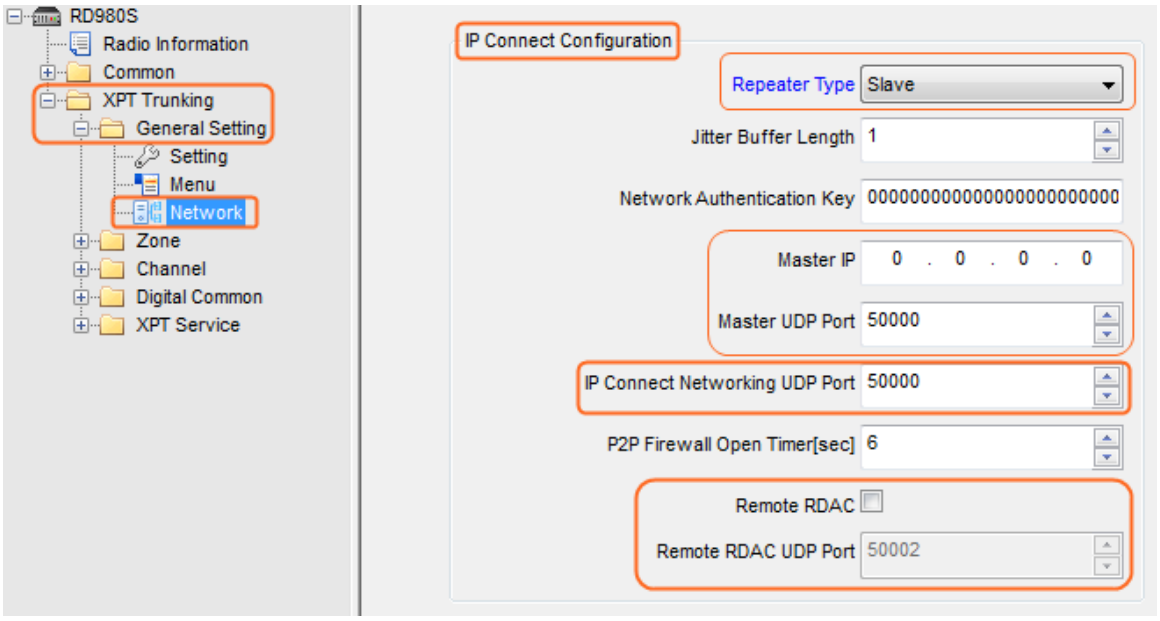



Figure 5–14 IP Connect Configuration of Network-Slave Repeater

| Parameters | Description | Setting |
|---|---|---|
| Repeater Type | This parameter allows the user to configure the operation mode of the repeater.<br>● Mater: The repeater serves as the master of the XPT system and manages other repeaters in the same site. Only one master is allowed in one site.<br>● Slave: The repeater serves as the slave and connects to the master to build up the XPT system. Multiple slave repeaters are allowed in one site. | **Method:** Select from the drop down list. |
| Master IP | This parameter is used to specify the IP Address of the master in the IP Multi-site Connect system.<br>Enter the IP Address of the master in the XPT site. | **Method:** Manual input<br>**Range:** 0.0.0.0 - 255.255.255.255<br>**Note**: This parameter is only for **Slave** repeater. |
| Master UDP Port | This feature allows the user to specify the User Datagram Protocol (UDP) port number of the master repeater within the IP network. UDP is a protocol used for peer-to-peer services within the IP network. | **Method:** Manual input<br>**Range:** 1024 – 65535<br>**Note**: The **Master UDP** |

| Parameters | Description | Setting |
|---|---|---|
| IP Connect Networking UDP Port | This port is used to establish and maintain the network connection between repeaters connected to each other via IP address.<br>This port must be different from **Remote RDAC UDP Port** parameter. | **Port** parameter is only for **Slave** repeater.<br>**Caution**：The **IP Connect Networking UDP Port** must be same form **Master UDP Port** parameter and The two parameters of all repeaters in XPT System must be same. |
| Remote RDAC | This option allows the user to enable Remote RDAC (Repeater Diagnostic and Control) function.<br>If the XPT system connects with the Hytera RDAC, please check Remote RDAC and set UDP Port. | **Method:** Check |
| Remote RDAC UDP Port | This option allows the user to configure the UDP port used for Remote RDAC function.<br>This port must be different from **IP Connect Networking UDP Port** parameter. | **Method:** Manual input<br>**Range:** 1024 - 65535 |

Table 5–4 Configuration Descriptions on IP Connect Configuration of Network

- Other Network parameters

  **Path:** XPT Trunking -> General Setting -> Network -> Remote Upgrade Service，and XPT Trunking -> General Setting -> Network -> SNMP. See Figure 5–15

  **Parameters:** All parameters in Figure 5–15

  **Description:** Please refer to the CPS help file for related parameter descriptions.

  - If enable the **Remote Upgrade** feature, the repeater to be upgraded will be connected to the IP Network and upgraded remotely via the tools.
  - **SNMP** feature allows setting the IP address for third party application which supports SNMP, so as to establish a connection between the third party application and the repeater.

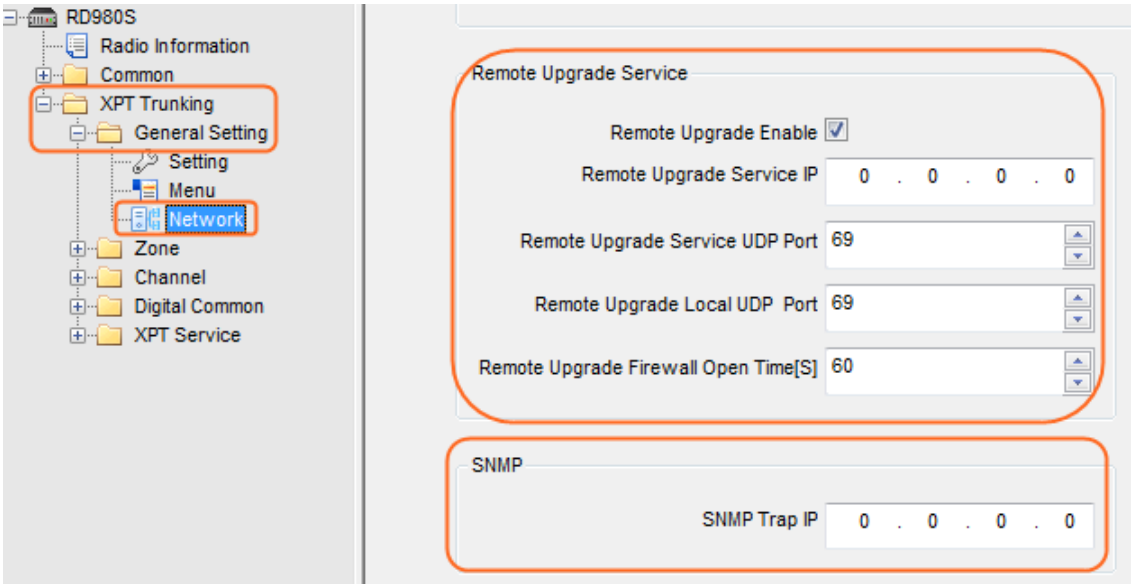



Figure 5–15 Other Network parameters

## Configure XPT Service

- XPT Site Parameters

  **Path:** XPT Trunking -> XPT Service -> Setting. See Figure 5–16.

  **Parameters:** See orange boxes in Figure 5–16.

  **Description:** For key parameters description of Site Setting module, please see Table 5–1 and Table 5–2, or refer to CPS Help. It is recommended not to modify, but can configure via XPT tool. For key parameters description of Authentication module, please see Table 5–5.

  **Note:** The **Repeater Capacity in Site** is the number of XPT repeaters in one XPT site. And this parameter is only for **Master** repeater.

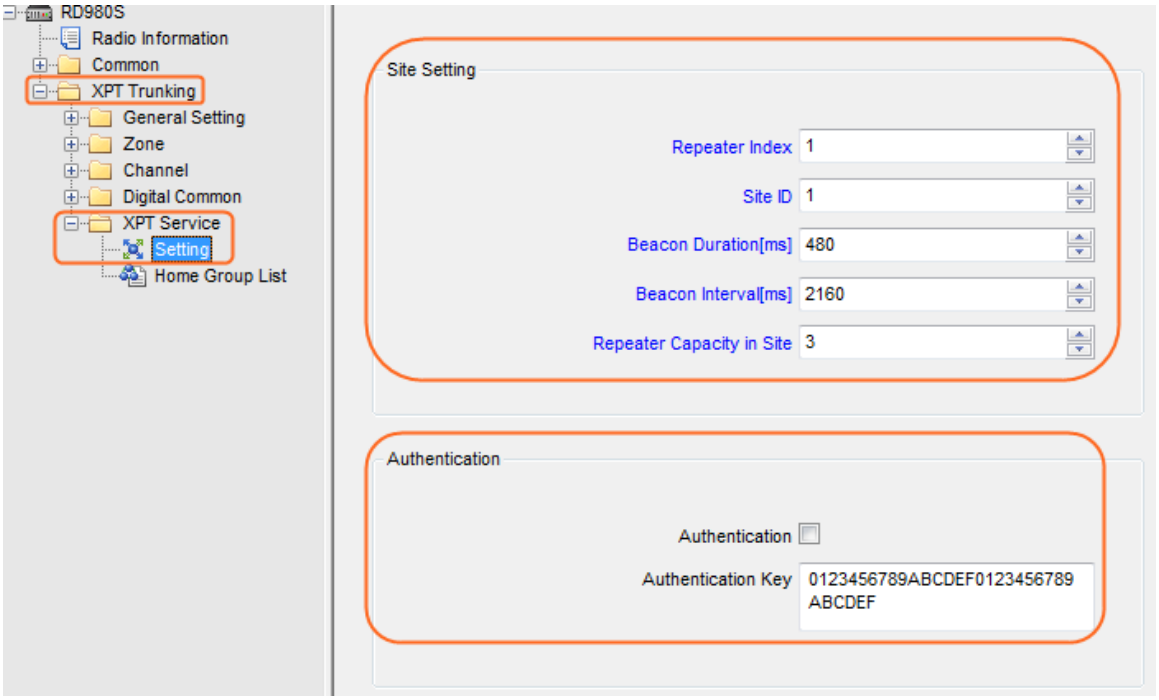



Figure 5–16 XPT Site Setting Parameters

| Parameters | Description | Setting |
|---|---|---|
| Authentication | This parameter allows you to enable or disable the Authentication feature to prevent illegal radio into XPT system. If the XPT system requires authentication between the repeater and radio, all the repeaters and subscribers will need to be enabled with this feature and be set with the same **Authentication Key** in XPT system are same. | **Method:** Check |
| Authentication Key | This parameter allows you to set the Authentication Key used in XPT authentication. | **Method:** Manual input<br>**Range:** A string of 32 hex characters, each character can be 0 to F. |

Table 5–5 Configuration Descriptions on XPT Authentication Parameters

- Home Group List

  **Path:** XPT Trunking -> XPT Service -> Home Group List. See Figure 5–17.

  **Parameters:** See orange boxes in Figure 5–17.

  **Description:** See **HomeGroup** in Table 5–2, or refer to CPS Help. The **Home Goup ID List** is only for **Master** repeater and if you want to modify, please use the XptAps tool.

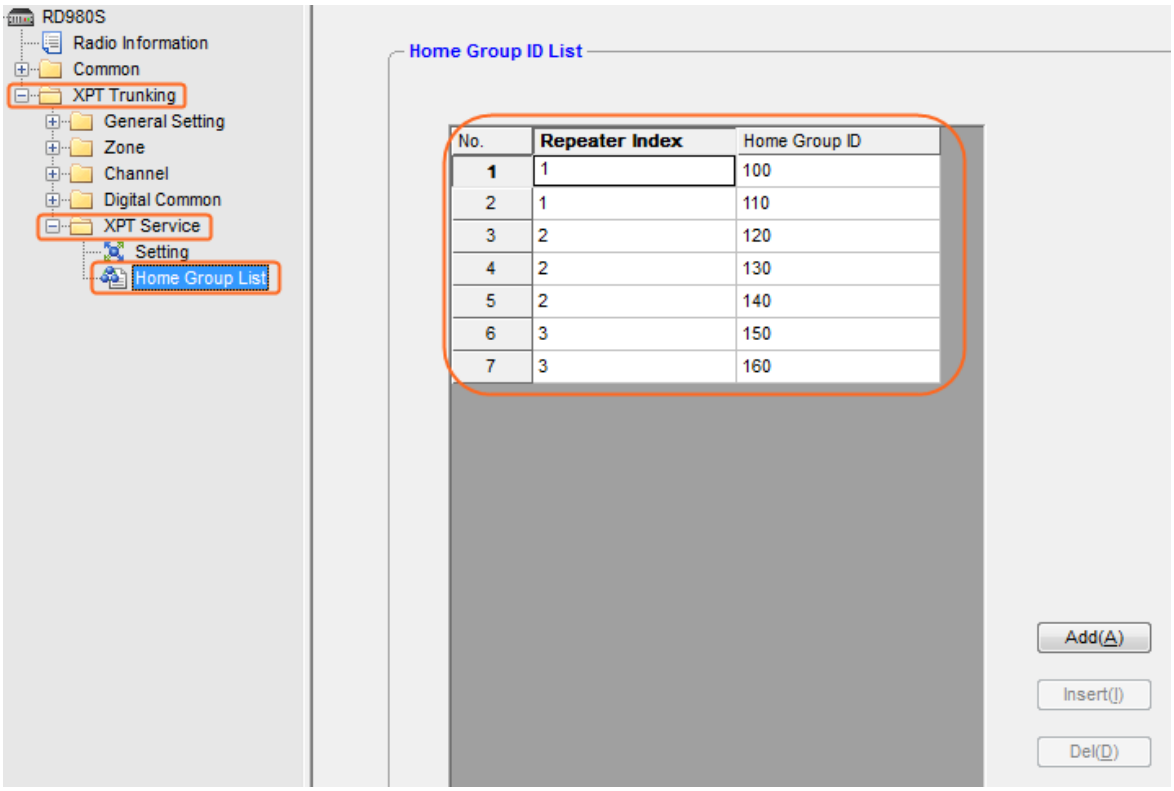



Figure 5–17 Home Group List

## Configure XPT Channel

XPT channel is the operating frequency of XPT repeater. One repeater can only operate on one channel at a time.

- Configure XPT Master repeater channel

  **Path:** XPT Trunking -> Channel -> XPT Channel, See Figure 5–18.

  **Parameters:** All parameters in Figure 5–18.

  **Description: Refer to corresponding parameters in** Table 5–2, or refer to CPS Help.

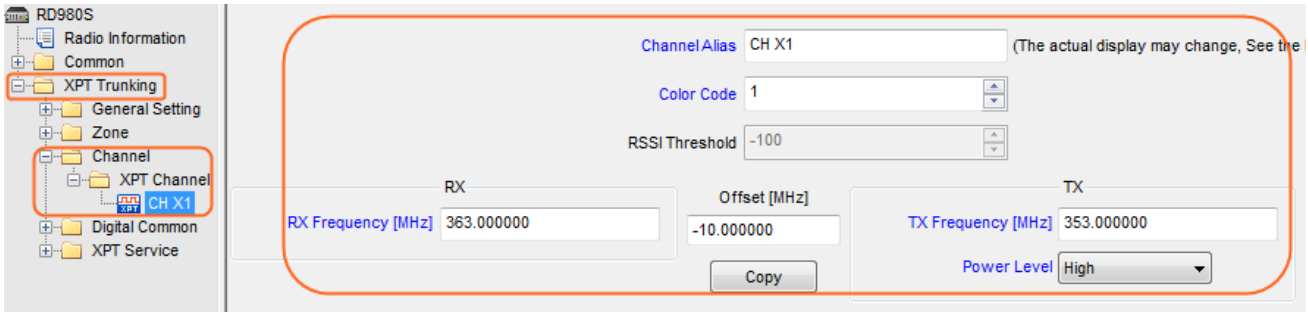
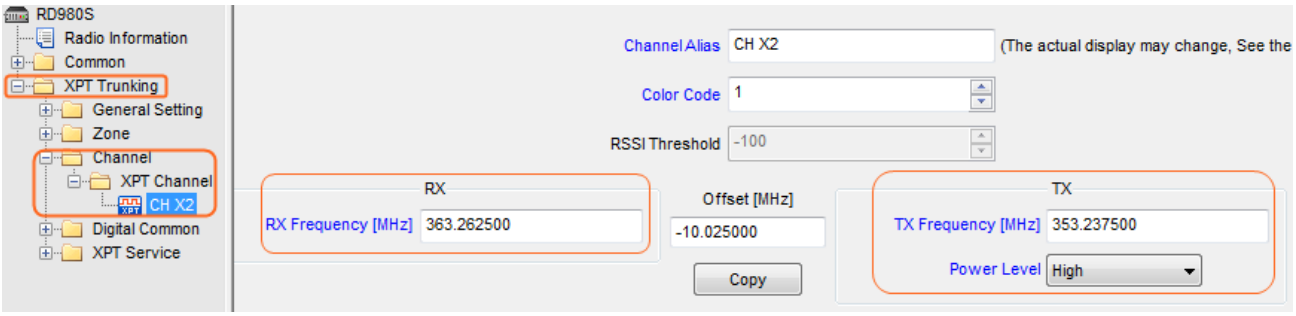
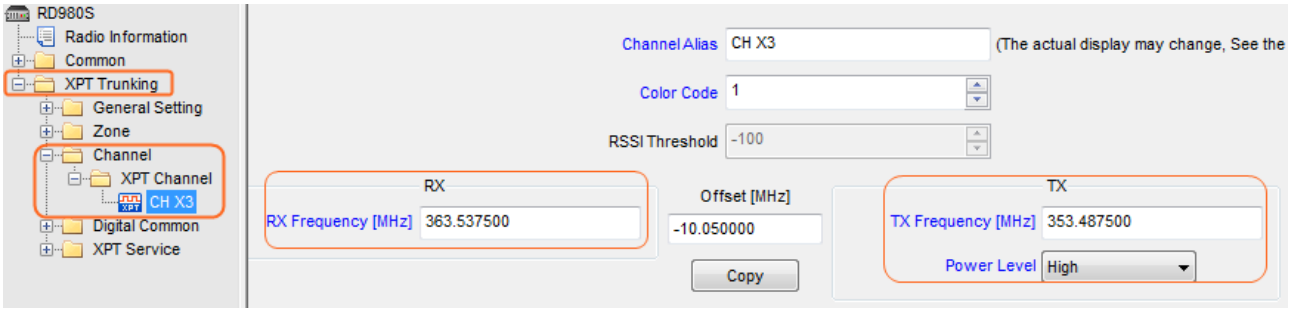



Figure 5–18 XPT Channel Configuration Interface

- Configure Slave repeaters channels

Change the repeater index and import XPT setting files to configuration Repeater 2 (CH X2) and Repeater 3 (CH X2).




## 5.3.3 Subscriber Configuration Guidance

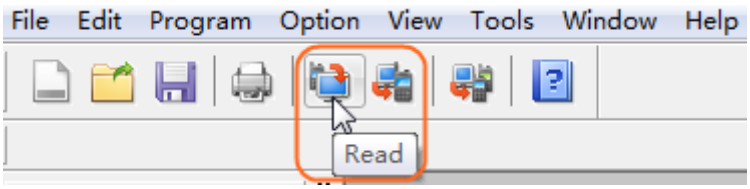
⚠Caution:

- When the configuration file import successfully, name of the parameter which has been configured in file will turn blue in CPS please see Figure 5–21.
- If the parameters in CPS was configured by “XPT Site Config Tool” , you need not to set again, and we suggest strongly that do not modify in CPS.

### Import XPT Site Configuration

Import the site configuration configured via XPT tool into radio CPS.

**Step 1** Read the radio to be configured.




**Step 2** Import XPT setting file.

CPS path: Tools -> Import XPT setting -> Select File -> Import

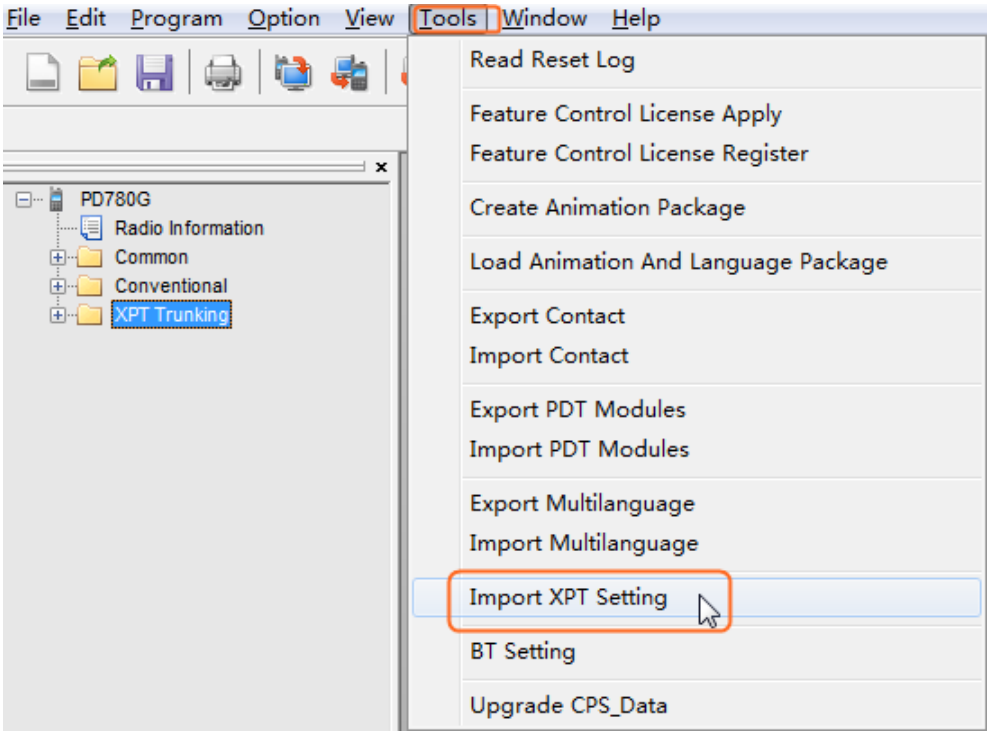



Figure 5–19 Import XPT Setting Interface

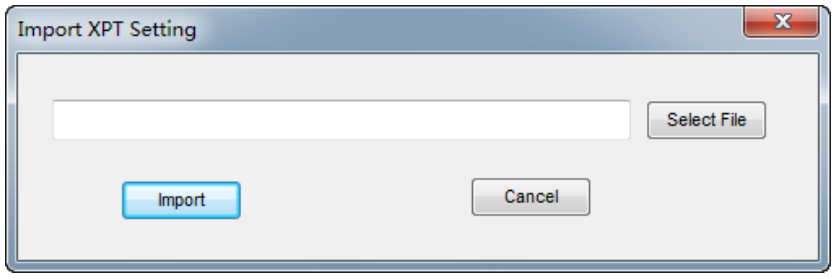



Figure 5–20 Selecting and Importing Configuration File

## Configure XPT Contact

Configure the contacts whom do you want to be able to talk to or which Talk Groups do you need access to.

**Path:** XPT Trunking -> XPT Service -> Contact -> Contact List. See Figure 5–21.

**Parameters:** Parameters in Contact List module in Figure 5–21. We need add XPT private call (call ID from 1 to 240) and the XPT group call、Group A (100)、Group B (110)、Group C(120)、Group D (130)、Group E (140)、Group F (150)、Group G (160)

**Description:** Please refer to the CPS help file for related parameter descriptions.

**Caution:** The XPT group of **Group ID List** is configured in **XPT Site Config Tool**. If the group that

you add in left table (**Contact List**) is not in the **Group ID List**, the subscriber cannot call the XPT group.

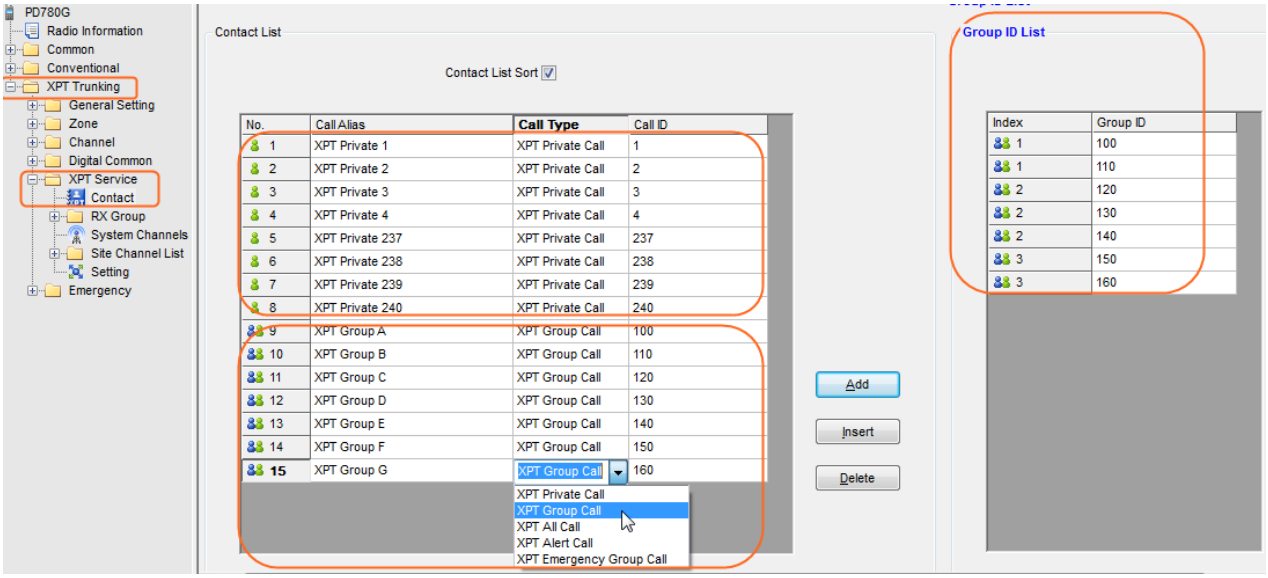



Figure 5–21 XPT Contact Configuration Interface

## Configure XPT RX Group

Configure the RX Group which Talk groups do you need to hear. RX Group List feature is helpful to receive more than one group call on a XPT site.

**Path:** XPT Trunking -> XPT Service -> RX Group -> Group List N. See Figure 5–22.

**Parameters:** All parameters in Figure 5–22.

**Description:** Please refer to the CPS help file for related parameter descriptions.

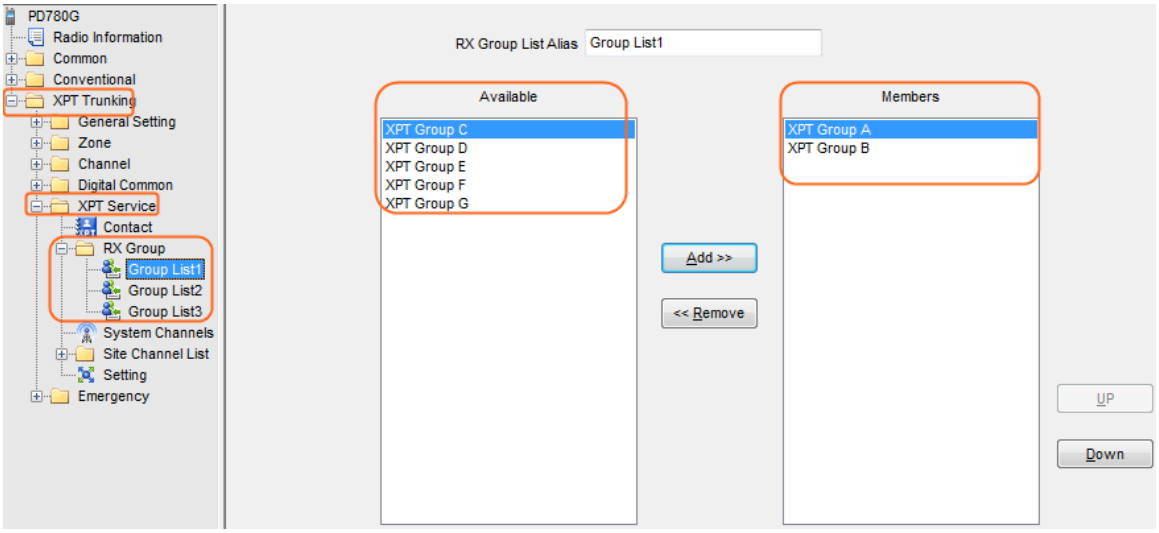



Figure 5–22 XPT RX Group List Configuration Interface

## Configure XPT System Channels

Sets all available frequencies supported by the radio in XPT system.

**Path:** XPT Trunking -> XPT Service -> System Channels -> Repeater Frequency List. See Figure 5–23.

**Parameters:** All parameters in Figure 5–23. The system channels are configured in “XPT Site Config Tool”: the “CH X1” is the frequency information of repeater1 of “XPT Site Config Tool”, the “CH X2” is for the repeater2, the “CH X3” is for the repeater3.

**Description:** Repeaters and radios with the same frequency in the same site must be set with the same color code; otherwise, they cannot communicate with each other. Please refer to the CPS help file for related parameter descriptions.

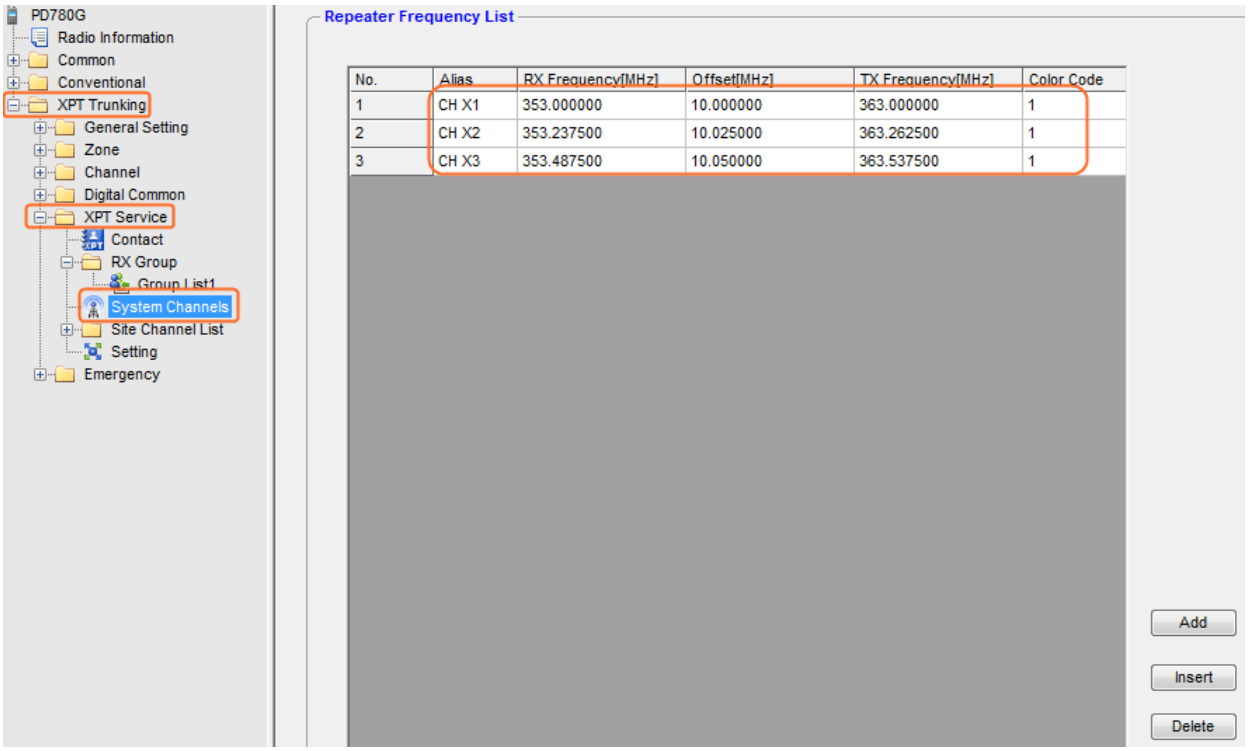



Figure 5–23 XPT System Repeater Frequency List Configuration Interface

## Configure XPT Site Channel List

To add XPT Site Channels in order.

**Path:** XPT Trunking -> XPT Service -> Site Channel List. See Figure 5–24.

**Parameters:** All parameters in Figure 5–24.

**Description:** Please refer to the CPS help file for related parameter descriptions.

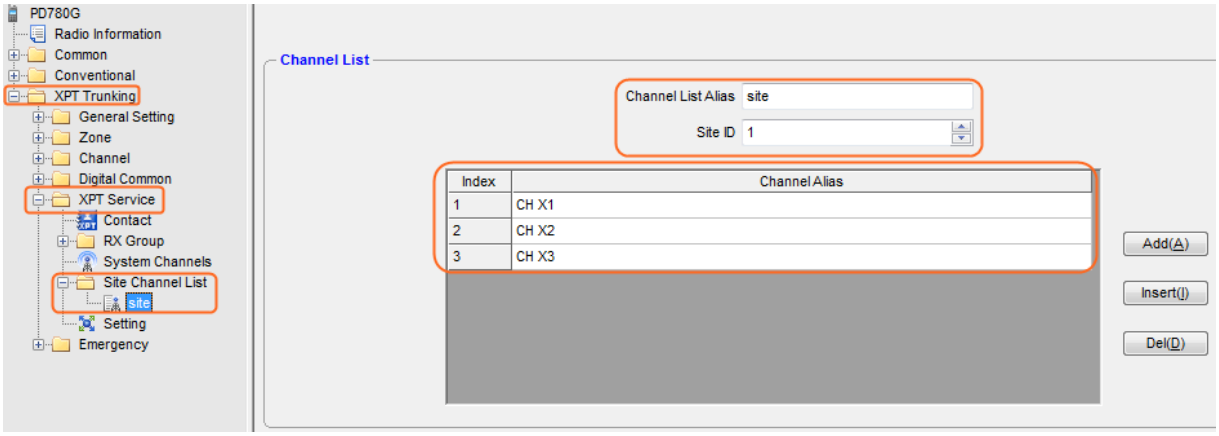



Figure 5–24 XPT Channel List Configuration Interface

## XPT Common Setting

Configure the common parameters of XPT site.

**Path:** XPT Trunking -> XPT Service -> Setting. See Figure 5–25.

**Parameters:** All parameters in Figure 5–25.

**Description:** Please refer to the CPS help file for related parameter descriptions. We need to make sure the **Authentication** and **Authentication Key** of all repeaters and subscribers in XPT system are same.


Figure 5–25 XPT Common Parameter Configuration Interface

## Configure XPT Emergency

Emergency is used to summon help in emergency situations. When an Emergency system is associated to a personality, the radio user can activate emergency through the programmed key.

**Path:** XPT Trunking -> Emergency -> XPT Emergency. See Figure 5–26.

**Parameters:** All parameters in Figure 5–26.

**Description:** Please refer to the CPS help file for related parameter descriptions.

**Note**：The difference between XPT Emergency system and Digital Emergency system as follow:

- For XPT Emergency, there is no need **Emergency Revert Channel**.
- For XPT Emergency, we need to configure **Emergency Contact**, and this contact is configured in "XPT Trunking -> XPT Service -> Contact -> Contact List" , please see **Configure XPT Contact** in 5.3.3 Subscriber Configuration Guidance.
- When there is no emergence contact, the **Emergency Mode** is read-only.

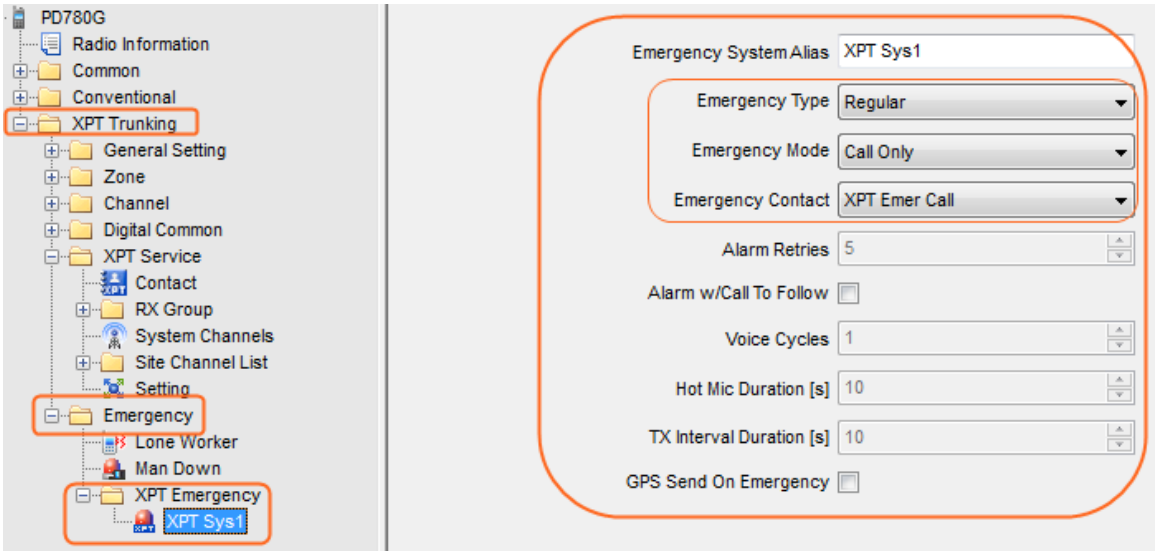



Figure 5–26 XPT Emergency Parameter Configuration Interface

## Configure XPT Personality

XPT Personality defines the common attributes of multiple channels by setting the attributes of the Channel List. One channel list is related to one site under XPT system, thus one personality is related to one XPT site. Unlike conventional series radios, the radios in XPT trunking system switch the personality (XPT site) instead of channel via the **Channel Selector Knob**. XPT trunking system has a larger capacity than conventional system.

**Path:** XPT Trunking -> Channel -> XPT Personality. See Figure 5–27.

**Parameters:** All parameters in Figure 5–27.

**Description:** Please refer to Table 5–6 for key parameters of XPT Personality and refer to the CPS help file for other parameter descriptions. Also, you can add multiple personalities in this interface per actual needs.

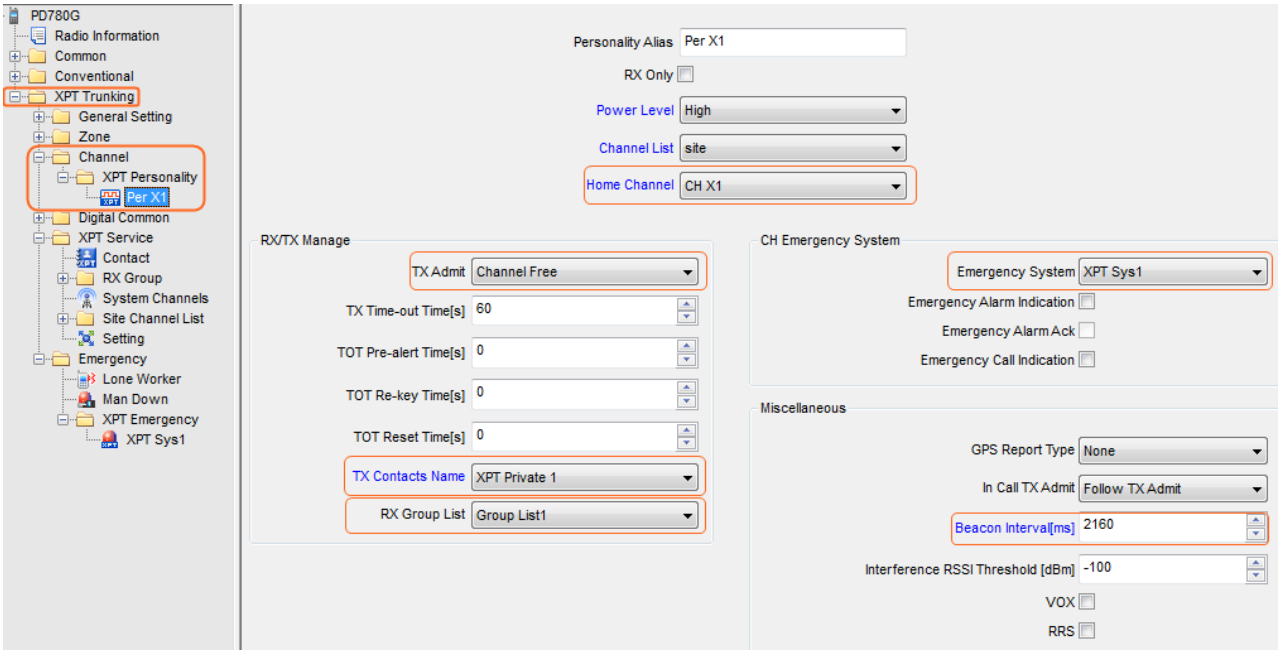



Figure 5–27 XPT Personality Parameter Configuration Interface

| Parameters | Description | Setting |
|---|---|---|
| Home Channel | This parameter allows you to set a home channel for the channel list, which is corresponding to the home repeater. The radio will transmit in the home channel first.<br>The options in the drop down list are set in **System Channel** (please see Configure XPT System Channels in 5.3.3 Subscriber Configuration Guidance). | **Method:** Select from the drop down list. In the example, the home channel for each radio is CH X1 (Repeater 1). |
| TX Admit | This parameter allows you to control the transmission when there are ongoing activities on the channel.<br>● Channel Free: The radio is allowed to transmit when the channel is free.<br>● Code Color Free: The radio can transmit only when the channel is free or the color code is not matched. | **Method:** Select from the drop down list. |

| Parameters | Description | Setting |
|---|---|---|
| TX Contacts Name | This parameter allows you to set a regular contact for the XPT site. The radio sends a call to this contact if the radio user holds down the PTT key in standby mode. However, after a group call is received, holding down the PTT key within the **Group Call Hang Time** can talk back to the group, but not initiate a new call.<br>If the selected TX Contacts Name is a group call contact, it must be a contact set in **Home Group List** of its home repeaters. | **Method:** Select from the drop down list.<br>**Note**: The **TX Contacts Name** is from contact list (please see **Configure XPT Contact** in 5.3.3 Subscriber Configuration Guidance) |
| RX Group List | This parameter allows you to associate a **RX Group List** with the current XPT site. In presence of any activity that match the talkgroup ID in the RX Group List , the radio unmutes and allows radio user to respond and talkback within the defined Group Call Hang Time. | **Method:** Method: Select from the drop down list.<br>**Note**: The **RX Group List** is from **RX Group**, please see Configure XPT RX Group in 5.3.3 Subscriber Configuration Guidance. |
| Emergency System | This parameter allows you to associate a XPT emergency system to the current XPT site.<br>The **Emergency System** is from **XPT Emergency**, please see Configure XPT Emergency in 5.3.3 Subscriber Configuration Guidance. | **Method:** Method: Select from the drop down list. |
| Beacon Interval | The **Beacon Interval** of the subscriber must be same as the repeater in one XPT site. | **Method:** Manual input<br>**Note**: Not recommended to modify. |

Table 5‑6 Configuration Descriptions on XPT Personality Key Parameters

## Add XPT Personality to Zone

The zone allows users to organize XPT personality conveniently, and each zone can support up to 16 personalities.

**Path:** XPT Trunking -> Zone. See Figure 5–28.

**Parameters:** All parameters in Figure 5–28.

**Description:** All XPT personalities of the radio must be added to a certain zone; otherwise, the radio cannot use the personalities. Please refer to the CPS help file for related parameter descriptions.

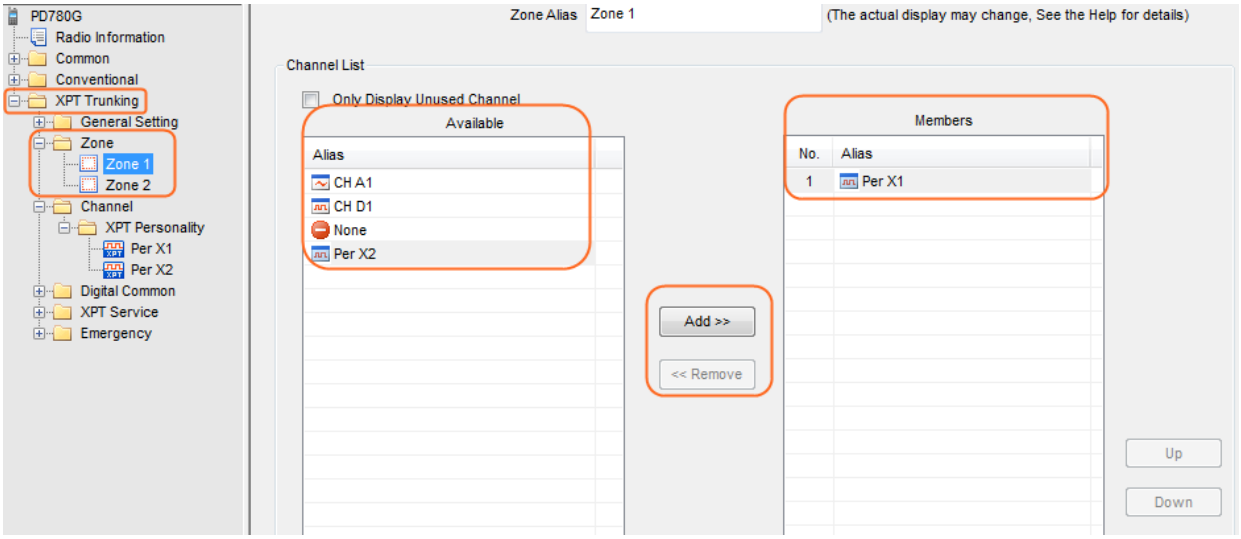



Figure 5–28 Adding XPT Personality into Zone

# 6. FAQ

**Q: In XPT mode, the network icon of the slave repeater is displayed as  . The connected repeater is 0 when viewing from "Network -> Port Information" menu.**

**A: When this icon appears, it indicates abnormal network connection of the repeater. The repeater cannot make connection to the control center (Master Repeater). Possible reasons are as follows:**

- Repeater IP Address and UDP Port of master repeater is configured improperly for slave repeater.
- "Network Authentication Code" of the slave repeater is inconsistent with that of the master repeater.
- Other repeater in XPT system has configured with a same index number with the slave repeater.

**Q: When the calling radio initiates a call, the called radio always joins the call with delay.**

**A: Possible reasons are as follows:**

- TX or RX antenna of the repeater is attached improperly.
- Master UDP Port of slave repeater is different from IP Connect Networking UDP Port, causing the slave repeater fail to receive network status updating message from other repeaters.
- Beacon Interval of the radio is different with that of the repeater.
- Network connection of the repeater is abnormal.
- When initiating a group call, if the target group exists in the Home Group List of the master repeater, also it is the home group of the repeating repeater, then Late Entry is a normal situation.

**Q: When initiating a call, the radio displays Authentication Failure.**

**A: Radio or repeater has not enable the Authentication feature, or radio and repeater have configured with different authentication codes.**

**Q: When initiating a call, the radio displays no available channels for the moment.**

**A: Possible reasons are as follows:**

- The frequencies of repeater and radio do not match.

- Abnormal network connection or incorrect network connection number of the repeater.
- TX or RX antenna of the repeater is attached improperly.
- There is no free repeater in the current system, or there is no available channel after searching for all the channels.

**Q: Radio fails to initiate a group call, displaying the called party cannot be reached.**

**A: Target group ID is not configured in the Home Group List of master repeater in XPT system.**

**Q: When initiating a call, the radio displays the call is rejected by the system.**

**A: Possible reasons are as follows:**

- The system is performing an all call.
- The system has just ended an all call, and the repeating repeater of radio call is disconnected from network or is powered off. In such situation, the system will return to normal after about 140 seconds.

**Q: During private call or group call, the radio is interrupted and receives an all call.**

**A: It is a normal situation. XPT system has enabled the Priority Call feature, the radio will receive call with higher priority first. Currently, the call priority is: XPT Emergency Call > XPT All Call > XPT Private Call or XPT Group Call** (XPT Private Call and XPT Group Call have the same priority).

**Q: The radio is registered successfully and the network connection number of the repeater monitored by the radio is normal. When the radio initiates a call, other repeaters cannot receive it.**

**A: IP Connect Networking UDP of the current repeater is different with that of other repeaters in the XPT system, causing the repeaters fail to transfer information in network via broadcasting pack.**

**Q: After power-on, the radio displays “Hunting, Please Wait!”.**

**A: After power-on, if the radio does not receive the system broadcasting message, it will be in hunting status.**

**Q: When initiating a call, the radio displays abnormal configuration.**

**A: The channel of the free repeater assigned by XPT system is not within the sharing channel list of the radio, or the member order of the sharing channel list is not consistent with that of operating channel of the repeater.**

**Q: When initiating a call, the radio displays abnormal network connection.**

**A: The repeater assigned to the radio by XPT system is disconnected from the network.**