TELEX
RADIO DISPATCH PRODUCTS

Application Guide

Hytera TETRA
Interface for IP-224

VOIProven

TELEX
Radio Dispatch

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Factory Service Center

Factory Service Center
Bosch Security Systems, Inc.
Radio Dispatch Products
8601 East Cornhusker Highway
Lincoln, Nebraska, 68507

Contact Information

Sales:

Phone .....(800) 752-7560

Fax .....(402) 467-3279

E-mail..... TelexDispatch@us.bosch.com

Customer Service Repair:

E-mail..... repair@us.bosch.com

Phone.....(800) 553-5992

Technical Support:

Knowledge Database .. http://knowledge.boschsecurity.com/

LiveChat ..... www.telex.com/us/dispatch/support

E-mail ..... TelexDispatchtechsupport@us.bosch.com

Web ..... www.telex.com

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OpenSSL Project

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/). This product includes cryptographic software written by Eric Young (eay@cryptosoft.com). This product includes cryptographic software written by Tim Hudson (tjh@cryptsoft.com).

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1.0 Introduction

The Hytera TETRA radio interface is designed as an add-on option in the Telex Radio Dispatch system. This application guide describes the Telex Radio Dispatch Hytera TETRA feature set and how to configure the interface for the IP-224 and C-Soft.

NOTE: For more information, see the IP-224 Technical Manual (P/N F.01U.218.562), the C-Soft Software Console Administrator's Guide (P/N F.01U.218.561), and the radio manufacturer's technical documentation.

2.0 Hardware Requirements

- IP-224 Ethernet Adapter Panel (P/N F.01U.306.547)
- IP-224 to Hytera TETRA Interface Cable (P/N F.01U.306.539)
- Hytera MT680 TETRA Radio

NOTE: See IP-224 Firmware Release Notes for the radio firmware revision tested.

3.0 Software Requirements

- C-Soft version 6.500 or later
- IP-224 version 2.300 or later
- IP-224 Advanced Interface Option (Export) or Advanced Interface Option (North American) Access Key
- Telex System Manager (TSM) 2.300 or later
- Windows 7 (32-bit or 64-bit)
- Windows 8.1
- Windows 10
- Hytera MT680 Customer Programming Software

4.0 Supported Features

Hytera TETRA Supported Features					
Feature	**DMO Support**	**TMO Support**	**Feature**	**DMO Support**	**TMO Support**
Channel/Talkgroup Change	Yes	Yes	ANI Decode	Yes	Yes
Zone Change	No	No	Emergency Decode	Yes	Yes
			Status Message Decode	Yes	Yes
Group Call	Yes	Yes	Text Message Decode	No	No
Private Call	No	Yes	User Defined Scan List	No	No

NOTE: The above list of features are supported when using the latest version of C-Soft. Hardware IP Consoles only support the following:

- Channel/Talkgroup Change
- ANI Decode
- Emergency Decode
- Status Message Decode
- Encryption On/Off
- Monitor On/Off
- Scan On/Off
- Talk Around On/Off

5.0 Cable Diagram

The IP-224 to Hytera TETRA Interface Cable allows the IP-224 to serially control a Hytera MT680 TETRA radio.

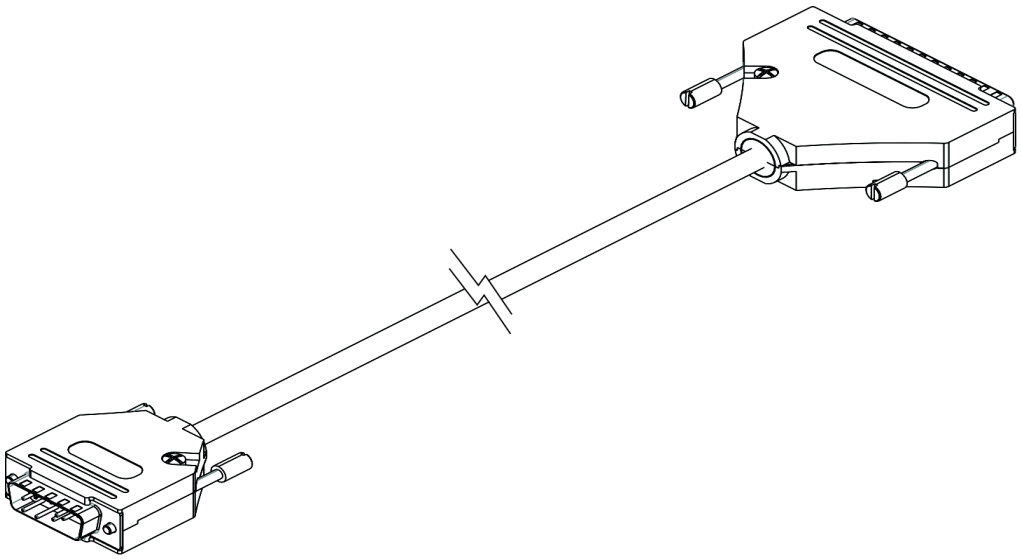


FIGURE 1. Hytera TETRA Serial Interface Cable

IP-224 to Hytera MT680 TETRA Radio Interface Cable			
Function	**Hytera**	**IP-224**	**Function**
UART_RX	PIN 20	PIN 17	RS-232/TTL TXD
UART_TX	PIN 22	PIN 36	RS-232/TTL RXD
GROUND	PIN 2	PIN 29	GROUND
GROUND	PIN 2	PIN 5	PTT RELAY COM CONTACT
Analog Input Ext_MIC	PIN 7	PIN 1	TX+ AUDIO
Analog output RX_AUDIO	PIN 8	PIN 20	RX+ AUDIO
PRGM/PTT	PIN 16	PIN 24	PTT RELAY N.O CONTACT
IO3	PIN 3	PIN 15	COR INPUT

6.0 Radio Programming Application Setup

The Hytera MT680 Customer Programming Software is used to configure the Hytera TETRA radio to interface properly with the IP-224.

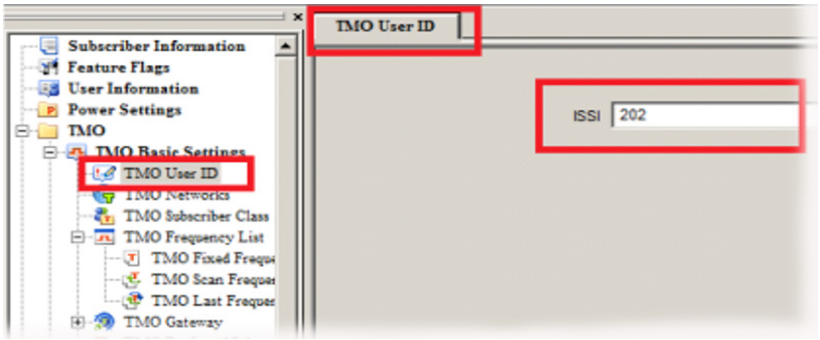
6.1 Trunked Mode Setup

Trunked mode allows the Hytera radio to communicate with other radios using a repeater.

To **configure Trunked Mode**, do the following:

TMO User ID

1. From the left navigation, select **TMO**.
   The TMO Basic Settings appear.
2. From the TMO Basic Settings, select **TMO User ID**.
   The TMO User ID window appears.

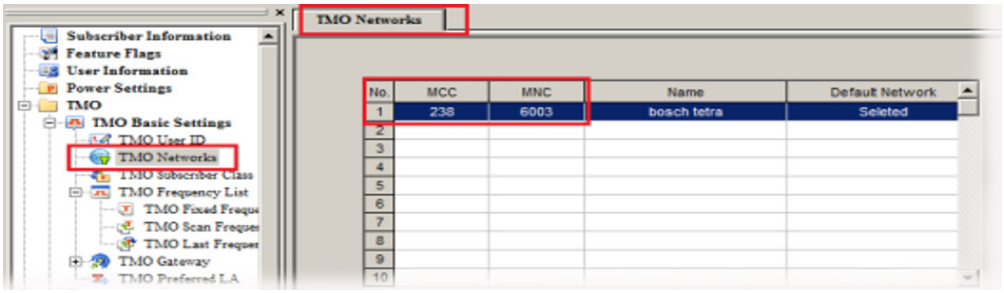


3. In the **ISSI** (Individual Short Subscriber Identifier) field, enter the **ISSI number**.

NOTE: The **TMO User ID** is a unique ID of the Hytera terminal in trunked mode.

TMO Networks

1. From the left navigation, select **TMO**.
   The TMO Basic Settings appear.
2. From the TMO Basic Settings, select **TMO Networks**.
   The TMO Networks window appears.



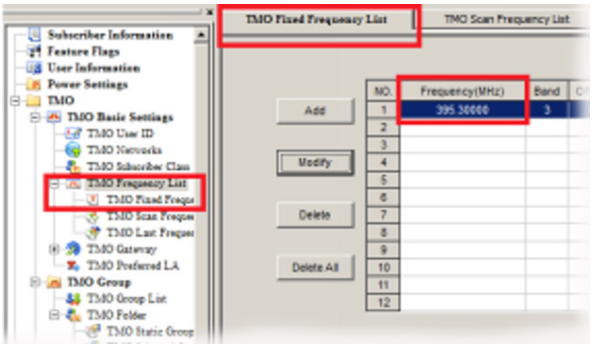
3. Click the **Add button**.
4. In the **MCC** (Mobile Country Code) column, enter the **MCC**.
   The MCC is a 3-digit number determined by country and region.

5. In the **MNC** (Mobile Network Code) column, enter the **MNC**.
   The MNC is 2- to 4-digit number determined by the network carrier.

NOTE: The MCC and MNC numbers must match the TETRA network for the mobile radio to connect to the system and work in trunked mode.

TMO Frequency

1. From the left navigation, select **TMO**.
   The TMO Basic Settings appear.
2. From the TMO Basic Settings, select **TMO Frequency List**.
   The TMO Frequency List appears.
3. From the TMO Frequency List, select **TMO Fixed Frequency List**.
   The TMO Fixed Frequency List window appears.

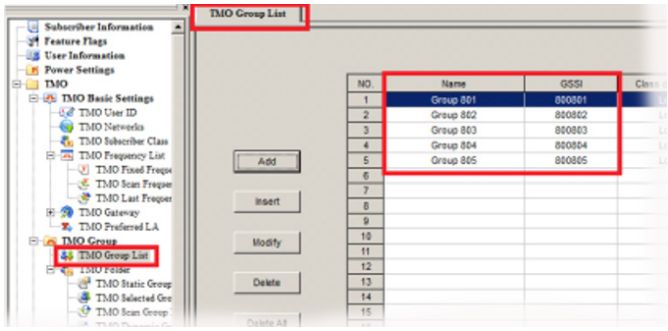


4. Click the **Add button**.
5. In the **Frequency (MHz)** column, enter the **frequency**.

NOTE: The frequency must match the TETRA network for the mobile radio to connect to the system.

TMO Group

1. From left navigation, select **TMO Group**.
   The TMO Group appears.
2. From the TMO Group, select **TMO Group List**.
   The TMO Group List window appears.

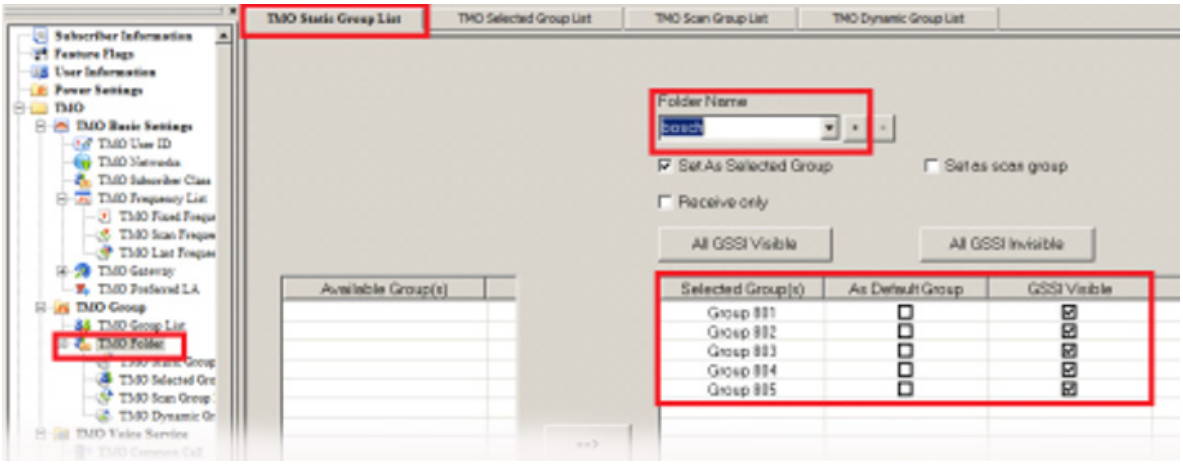


3. Click the **Add button**.
4. In the **Name** column, enter the **Group name**.
5. In the **GSSI** (Group Short Subscriber Identity) column, enter the **GSSI number**.

NOTE: The Hytera terminal must have at least one group in the group list to affiliate and operate on the TETRA network. Each group needs a unique GSSI number.

TMO Folders

1. From the left navigation, select **TMO Group**.
   The TMO Group appears.
2. From the TMO Group, select **TMO Folder**.
   The TMO Static Group List window appears.



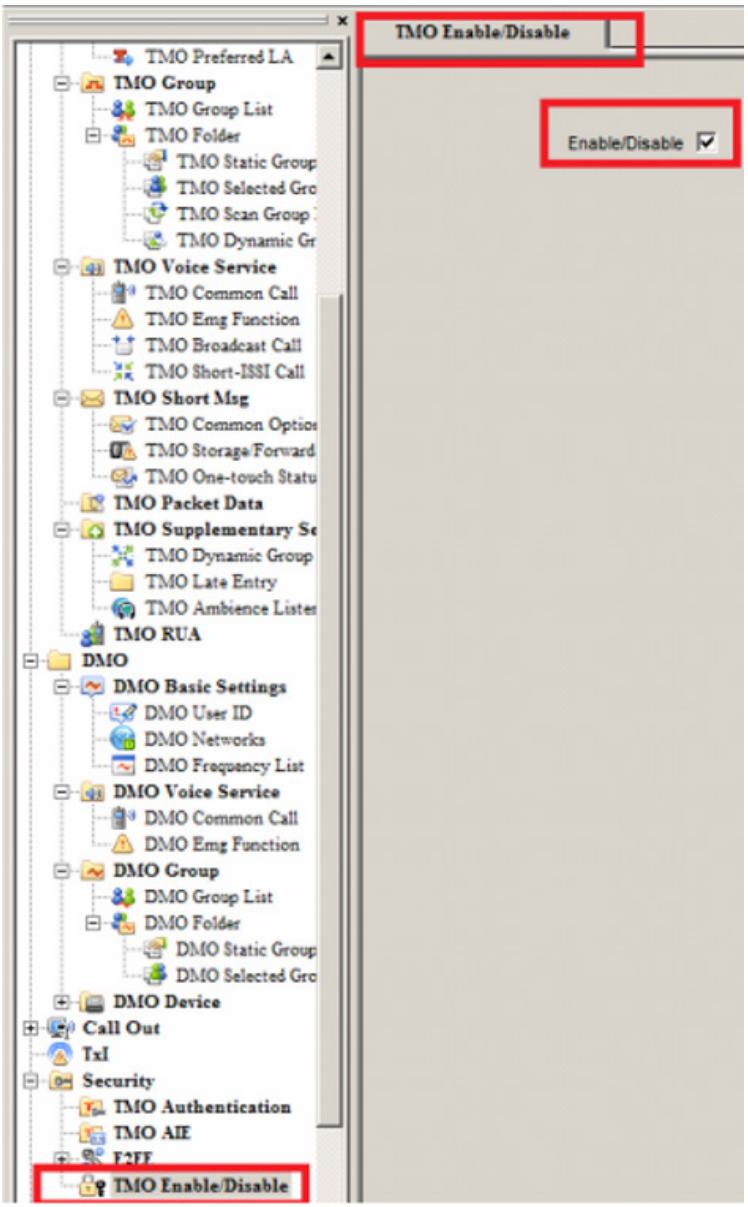
3. In the **Folder Name** field, enter the **name of the folder**
   OR
   use the drop down menu to select a **previously created folder**.

NOTE: The Hytera terminal must have a folder to serve as a container for the groups.

4. From the Available Group(s) panel, select **desired group or groups**.
5. Click the → **button**.
   The selected group(s) will appear in Selected Group(s) panel.

TMO Enable/Disable

1. From the left navigation, select **Security**.
   Security appears.
2. From Security, select **TMO Enable/Disable**.
   The TMO Enable/Disable window appears.



3. Select the **Enable/Disable check box**.

NOTE: The Hytera terminal only works in trunked mode if the TMO Enable/Disable is enabled.

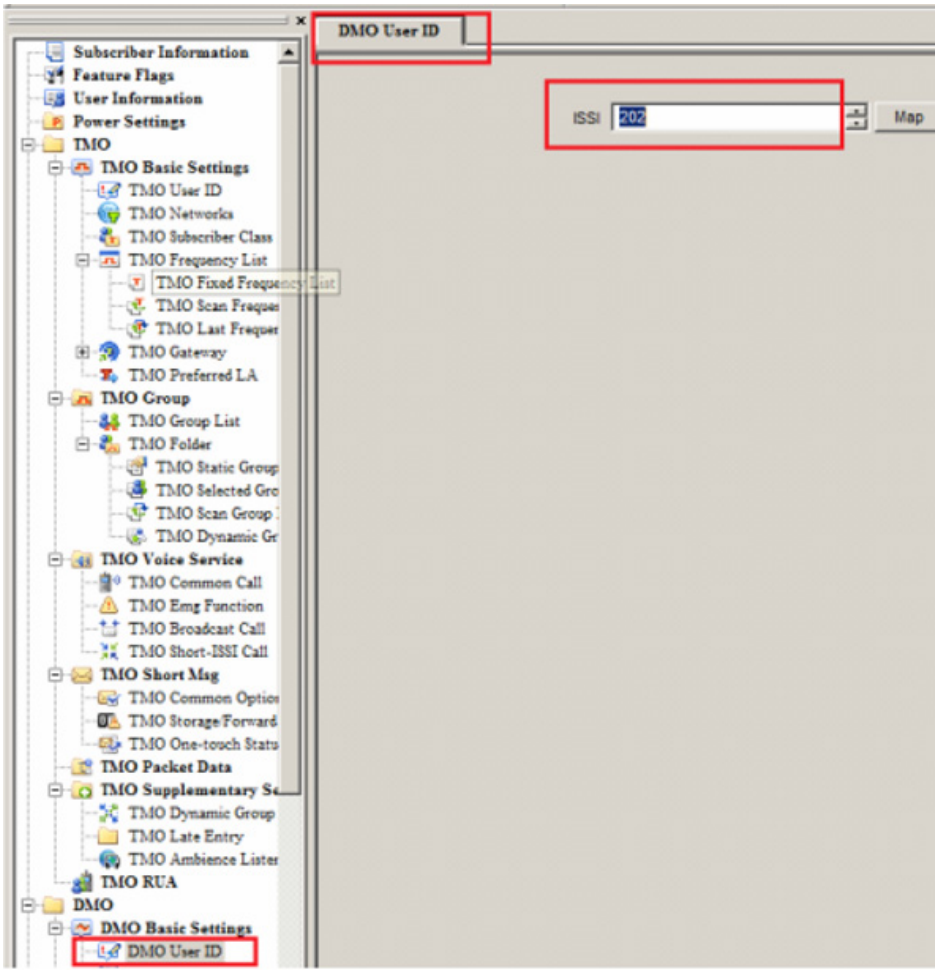
6.2 Direct Mode Setup

Direct Mode allows the Hytera radio to communicate with other radios directly when no repeater is available.

To **configure Direct Mode**, do the following:

DMO User ID

1. From the left navigation, select **DMO**.
   The DMO Basic Settings appear.
2. From the DMO Basic Settings, select **DMO User ID**.
   The DMO User ID window appears.

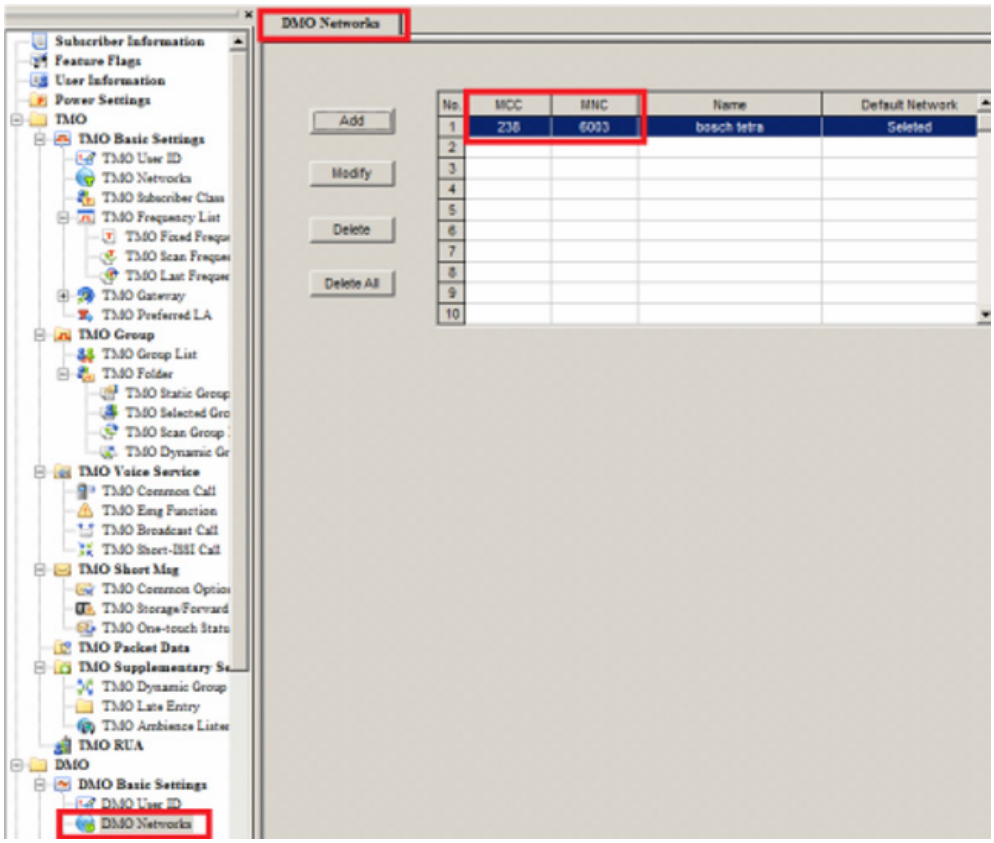


3. In the **ISSI** (Individual Short Subscriber Identifier) field, enter the **ISSI number**.

NOTE: The **DMO User ID** is the unique ID of the Hytera terminal in direct mode.

DMO Networks

1. From the left navigation, select **DMO**.
   The DMO Basic Settings appear.
2. From the DMO Basic Settings, select **DMO Networks**.
   The DMO Networks window appears.

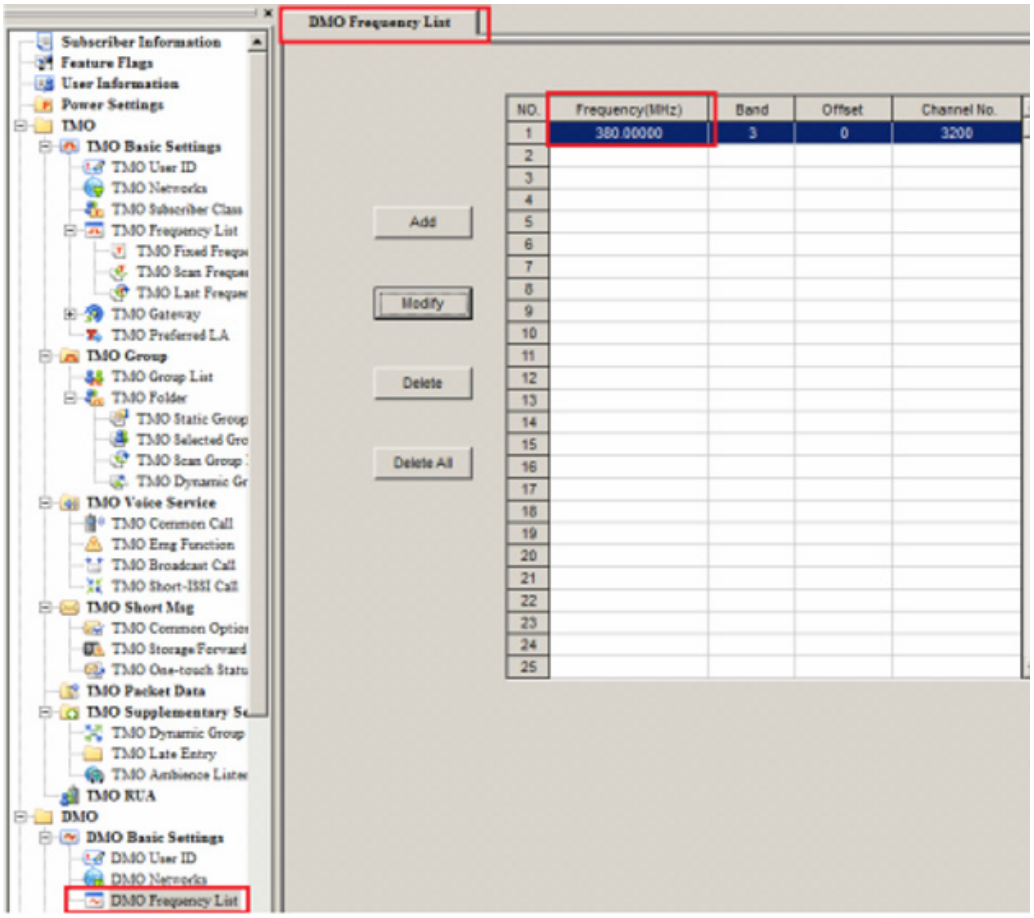


3. Click the **Add button**.
4. In the **MCC** (Mobile Country Code) column, enter the **MCC**.
   The MCC is a 3-digit number determined by country and region.
5. In the **MNC** (Mobile Network Code) column, enter the **MNC**.
   The MNC is 2- to 4-digit number determined by network carrier.

NOTE: The MCC and MNC number must match the other Hytera TETRA radios to work with them in direct mode.

DMO Frequency Lists

1. From the left navigation, select **DMO**.
   The DMO Basic Settings appear.
2. From the DMO Basic Settings, select **DMO Frequency List**.
   The DMO Frequency List window appears.

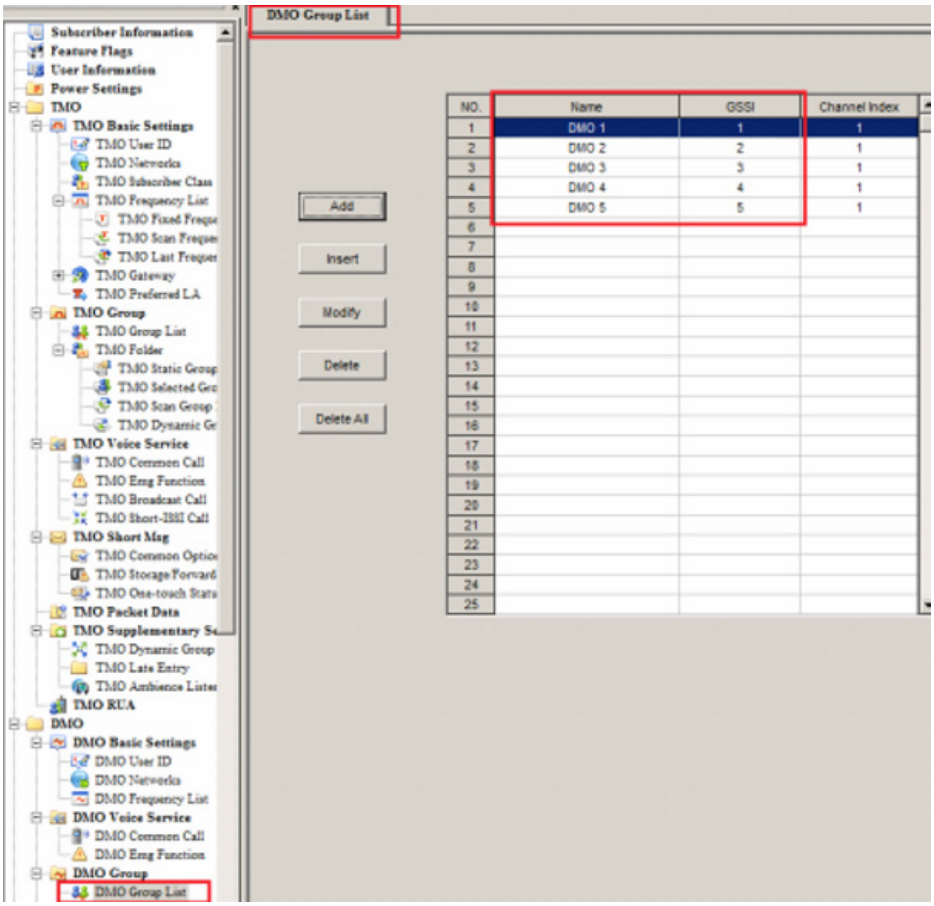


3. Click the **Add button**.
4. In the **Frequency (MHz)** column, enter the **frequency**.

NOTE: The frequency must match the other Hytera TETRA radios to work with them in direct mode.

DMO Group

1. From the left navigation, select **DMO**.
   The DMO Group appears.
2. From the DMO Group, select **DMO Group List**.
   The DMO Group List window appears.

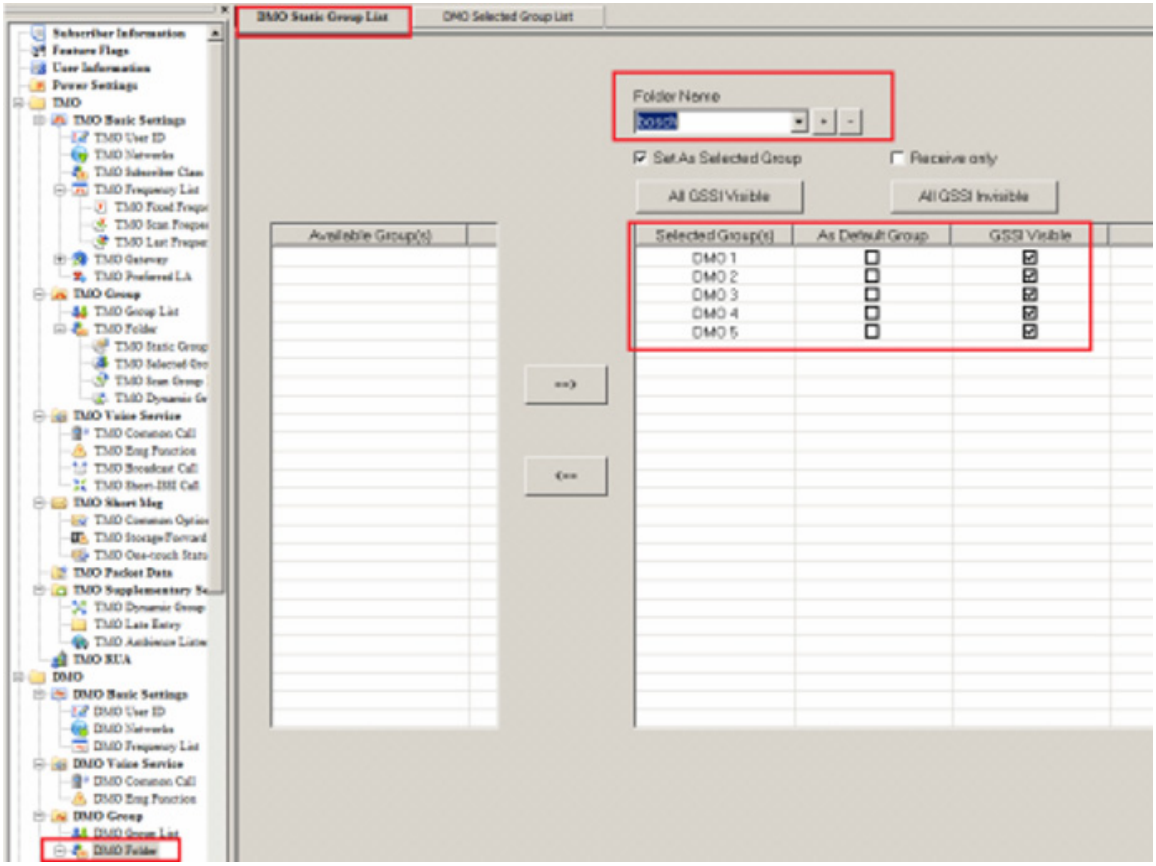


3. Click the **Add button**.
4. In the **Name** column, enter the **Group name**.
5. In the **GSSI** (Group Short Subscriber Identity) column, enter the **GSSI number**.

NOTE: The Hytera terminal must have at least one group in the group list. Each group needs a unique GSSI number.

DMO Folder

1. From the left navigation, select **DMO**.
   The DMO Group appears.
2. From the DMO Group, select the **DMO Folder**.
   The DMO Static Group List window appears.



3. In the **Folder Name** field, enter the **name of the folder**
   OR
   use the drop down menu to select a **previously created folder**.

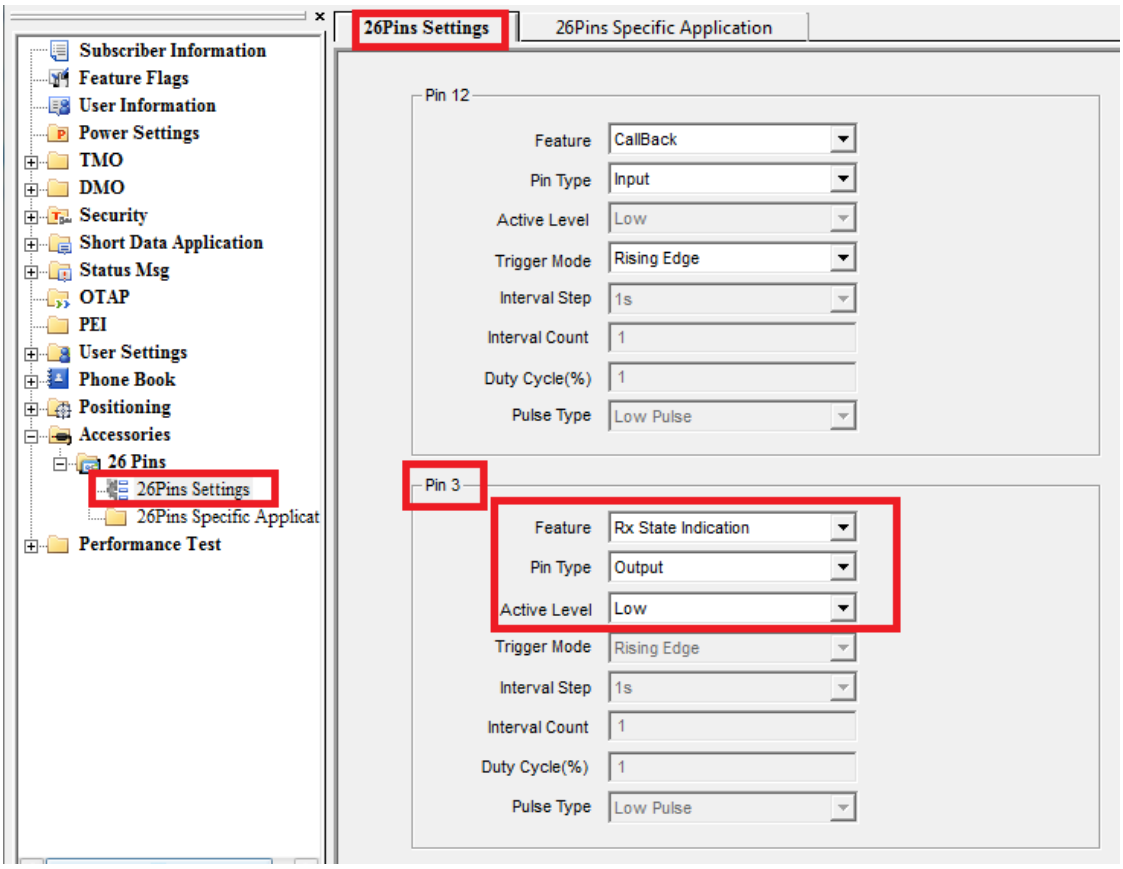
NOTE: The Hytera terminal must have a folder to serve as a container for the groups.

4. From the **Available Group(s)** panel, select desired group or groups.
5. Click the → **button**.
   The selected group(s) appear in Selected Group(s) window.

6.3 COR Setup

To configure **COR**, do the following:

1. From the left navigation, select **Accessories**.
   26 Pins appears.
2. From 26 Pins, select **26Pins Settings**.
   The 26Pins Settings window appears.



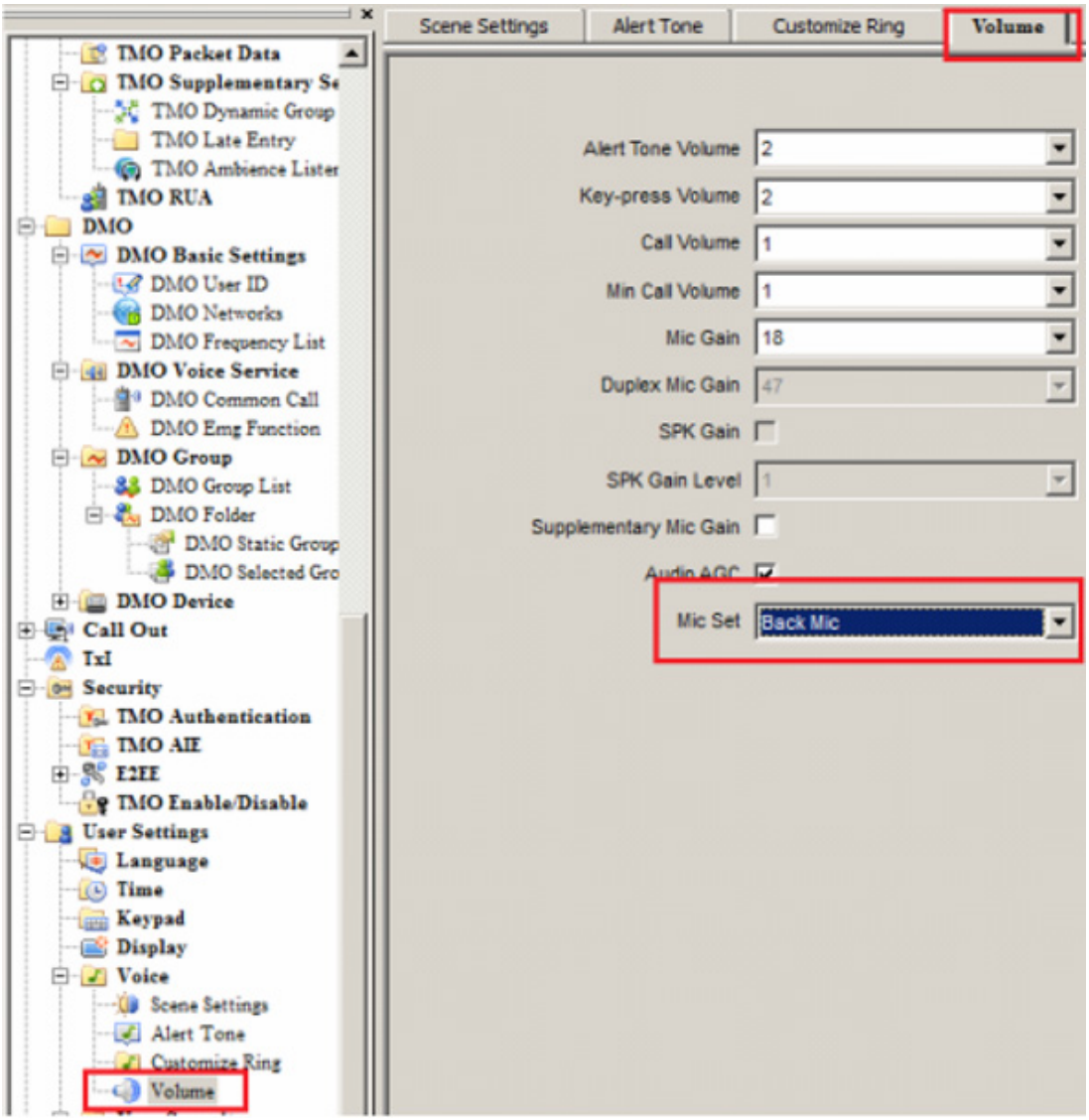
From Pin 3 Group Box

3. In the Feature drop down menu, select **RX State Indication**.
4. In the Pin Type drop down menu, select **Output**.
5. In the Active Level drop down menu, select **Low**.

6.4 Transmit Audio Setup

To configure **Transmit Audio**, do the following:

1. From the left navigation, select **User Settings**.
   The Voice folder appears.
2. From the Voice folder, select **Volume**.
   The Volume window appears.



3. In the Mic Set drop down menu, select **Back Mic**.

NOTE: For the terminal to use the mic on the back connector, the Mic Set drop down menu must be set to Back Mic. This allows the terminal to use audio from the IP-224 for transmitting.

7.0 IP-224 Access Key Installation

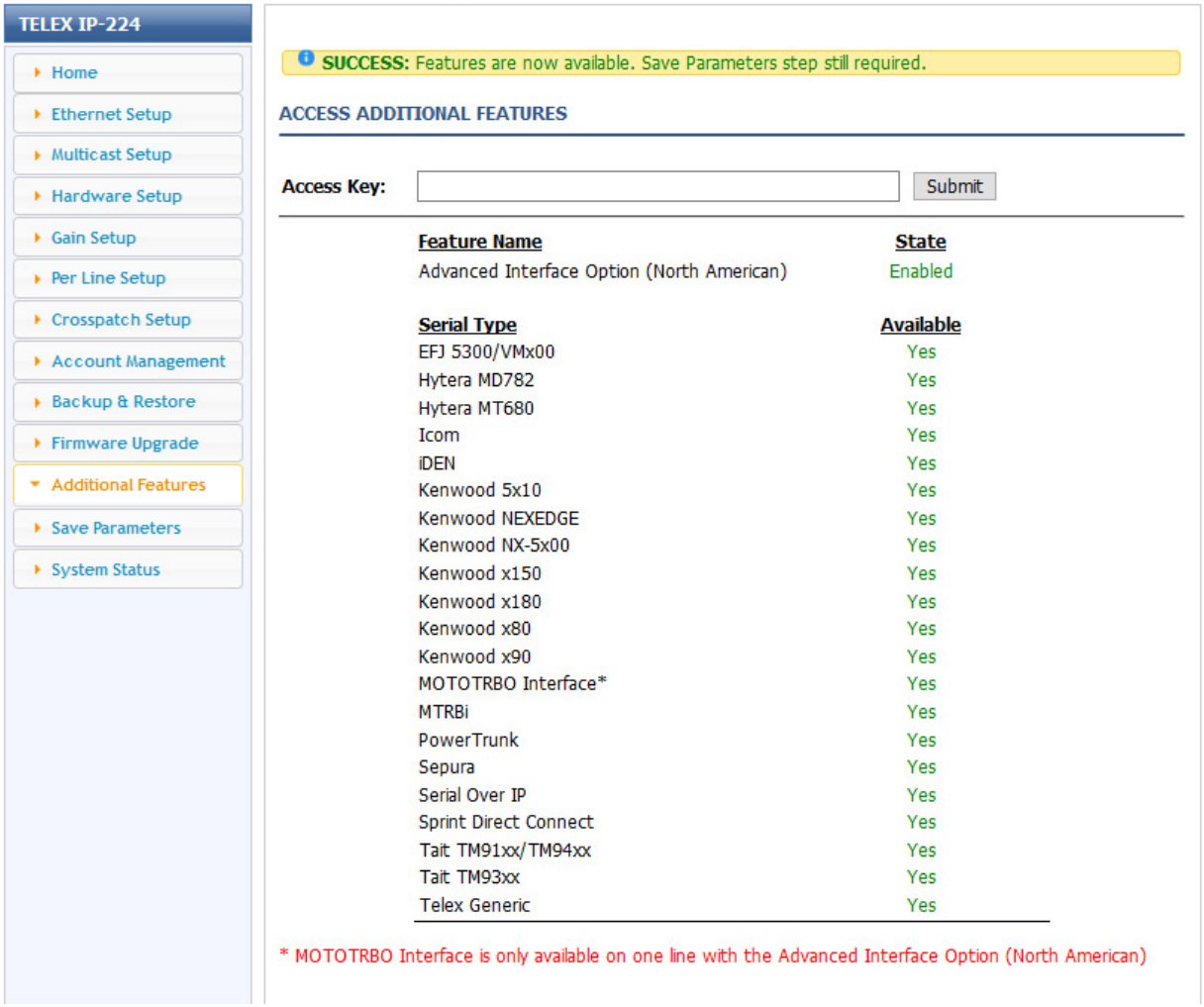
The Hytera TETRA radio interface requires an additional Advanced Interface Option (Export) or Advanced Interface Option (North American) on the IP-224.

NOTE:

- The Advanced Interface Option (Export) or Advanced Interface Option (North American) Access Key must be purchased before you can select the Hytera MT680 Serial Type. The Advanced Interface Option (Export) or Advanced Interface Option (North American) requires an access key to be generated specifically for each IP-224.
- If the Advanced Interface Option (Export) or Advanced Interface Option (North American) Access Key was purchased as a factory installation [(F.01U.347.906) IP-224 Radio Gateway Advanced Options Export or (F.01U.347.907) IP-224 Radio Gateway Advanced Options NA (factory installed)] the access key was activated by the factory prior to shipping.
- Activating the Advanced Interface Option (Export) or Advanced Interface Option (North American) via the IP-224 web interface is only required if this is a field installation [(F.01U.343.868) IP-224 Field Code Advanced Options Export or (F.01U.343.869) Field Code Advanced Options NA (customer purchased option)].

To **activate the Advanced Interface Option (Export) or Advanced Interface Option (North American) Access Key**, do the following:

1. Open the **IP-224 webpage**.
2. From the left navigation, select **Additional Features**.
   The Additional Features page appears.

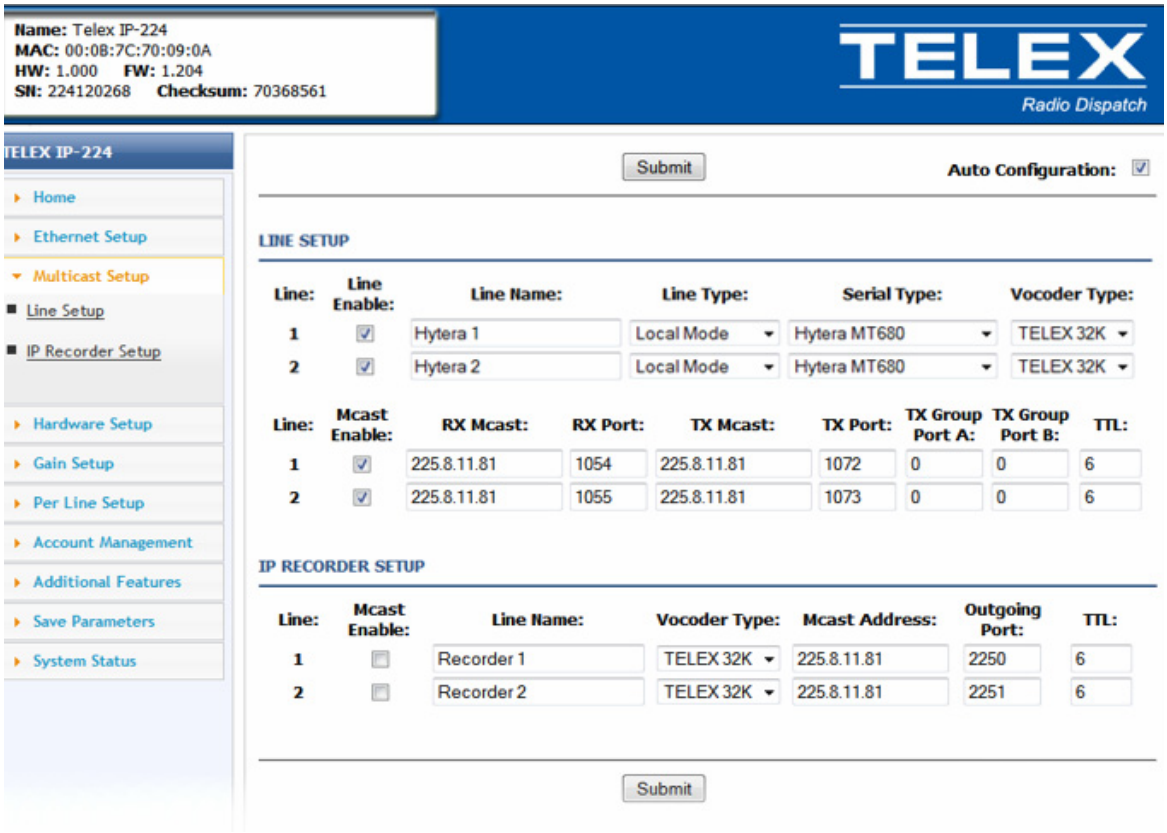


3. In the Access Key field, enter the **32-character access key**.
4. Click the **Submit button**.
   The changes are sent to the IP-224 in temporary storage.
5. From the left navigation, select **Save Parameters**.
   The Save Parameters page appears.
6. Click the **Save Parameters button**.
   Changes are now permanently saved to the IP-224 console.

8.0 IP-224 Setup

To **configure the IP-224**, do the following:

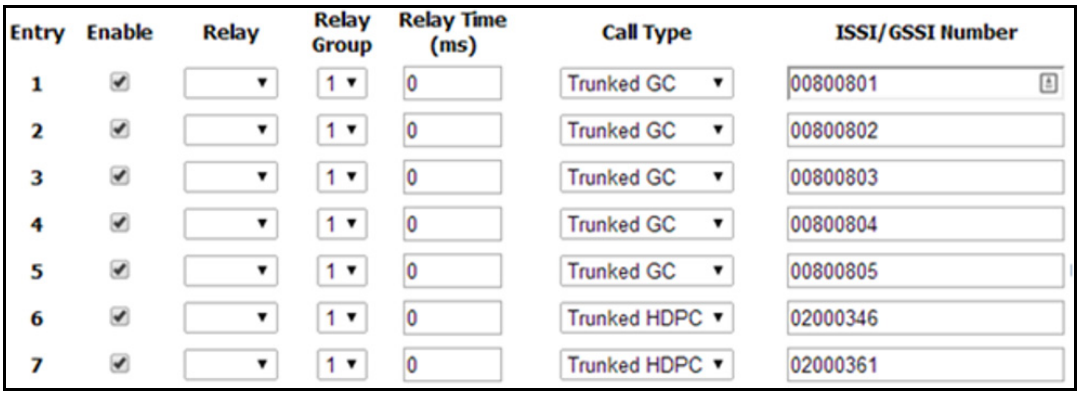
1. Open the **IP-224 web application**.
   The IP-224 web page appears.
2. From the left navigation, select **Multicast Setup**.



3. Select the **Auto Configuration check box**.

Under LINE SETUP

4. From the Serial Type drop down menu, select **Hytera MT680**.
5. In the RX Mcast field, enter **Receive Multicast IP Address**.
6. In the RX Port field, enter the **Receive Multicast Port number**.
7. In the TX Mcast field, enter the **Transmit Multicast IP Address**.
8. In the TX Port field, enter the **Transmit Multicast Port number**.
9. Click the **Submit button**.
   The changes are sent to the IP-224 in temporary storage.
10. From the left navigation, select **Per Line Setup**.
    The Per Line Setup window appears.



Entry	Enable	Relay	Relay Group	Relay Time (ms)	Call Type	ISSI/GSSI Number
1	☑		1	0	Trunked GC	00800801
2	☑		1	0	Trunked GC	00800802
3	☑		1	0	Trunked GC	00800803
4	☑		1	0	Trunked GC	00800804
5	☑		1	0	Trunked GC	00800805
6	☑		1	0	Trunked HDPC	02000346
7	☑		1	0	Trunked HDPC	02000361

Under FUNCTION TONE SETUP

11. From the Call Type drop down menu, select the desired **Call Type**.
12. In the ISSI/GSSI Number field, enter the 8 digit **ISSI/GSSI number**.
13. Click the **Submit button**.
    The changes are sent to the IP-224 in temporary storage.
14. From the left navigation, select **Save Parameters**.
    The Save Parameters page appears.
15. Click the **Save Parameters button**.
    Changes are now permanently saved to the IP-224 console.

NOTE: The Hytera radio is currently unable to support Trunked UDSL.

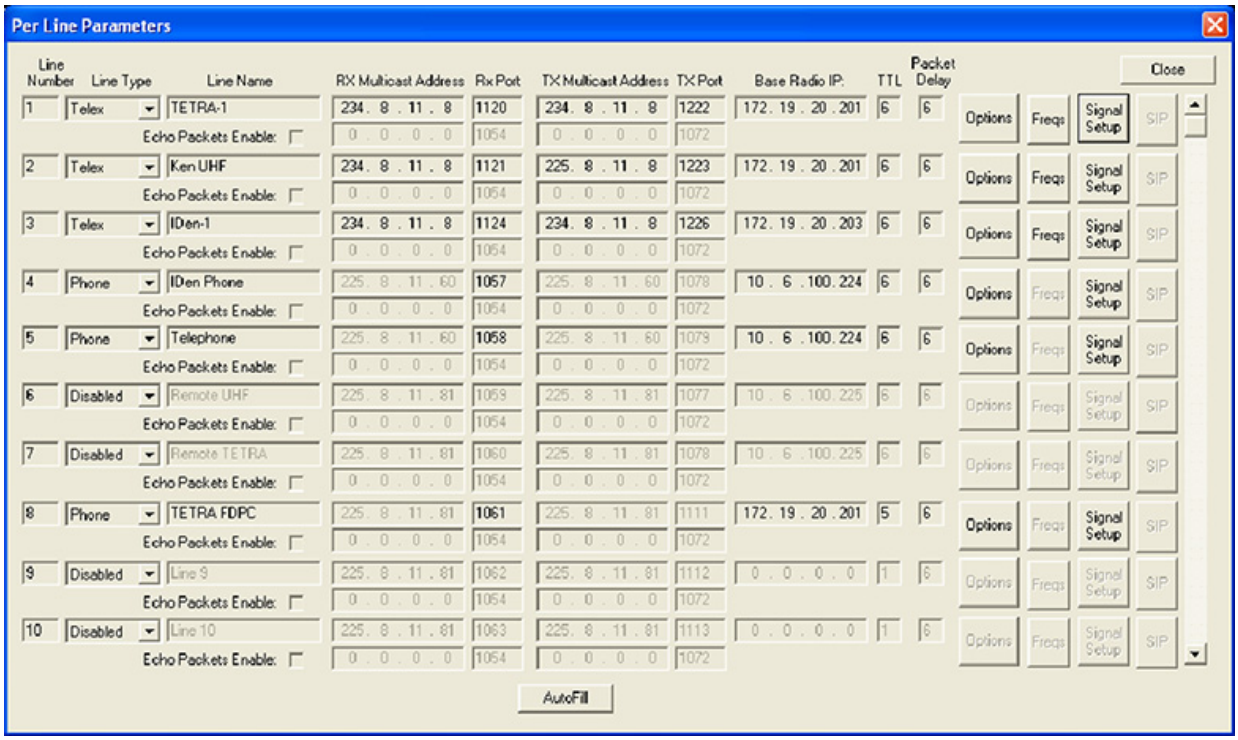
9.0 C-Soft Designer Setup

9.1 Configure Per Line Parameters

The Per Line Parameters window is used to configure C-Soft to IP-224 communications.

To **configure Per Line Parameters**, do the following:

1. Open **C-Soft Designer**.
2. From the Edit menu, select **Setup Per Line Parameters**.
   The Per Line Parameters window appears.



3. In the Rx Multicast Address field, enter the **Receive Multicast IP Address** of the connected IP-224.
4. In the Rx Port field, enter the **Receive Multicast Port number** of the connected IP-224.
5. In the Tx Multicast Address field, enter the **Transmit Multicast IP Address** of the connected IP-224.
6. In the Tx Port field, enter the **Transmit Multicast Port number** of the connected IP-224.
7. In the Base Radio IP field, enter the **IP address** of the connected IP-224.
8. Click the **Close button**.

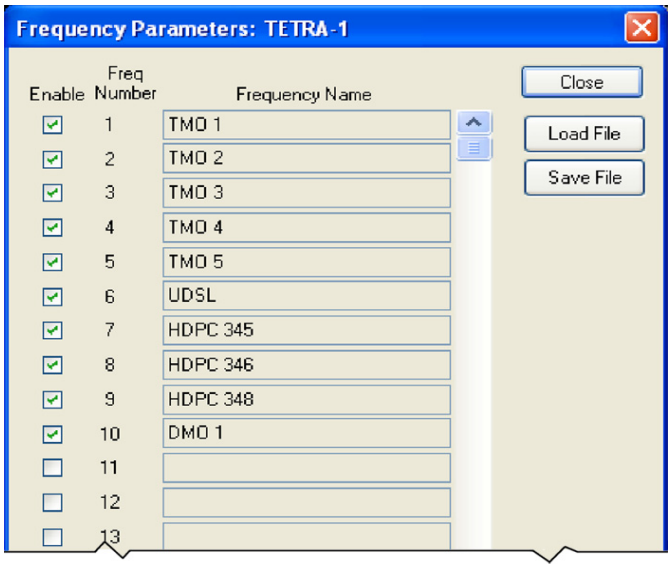
NOTE: The Multicast settings of the IP-224 and C-Soft must match for the interface to function properly. Verify that the RX and TX Multicast Addresses match, as well as the RX and TX Ports.

9.2 Configure Frequencies

To **configure frequencies**, do the following:

1. From the Per Line Parameters window, select the **Freqs button** for the TETRA Radio line. 

The Frequency Parameters window appears.



2. Select the **Enable check box** for each frequency.
3. In the Frequency Name field for each frequency, enter a **name** to be associated with the IP-224's function tone allocation.

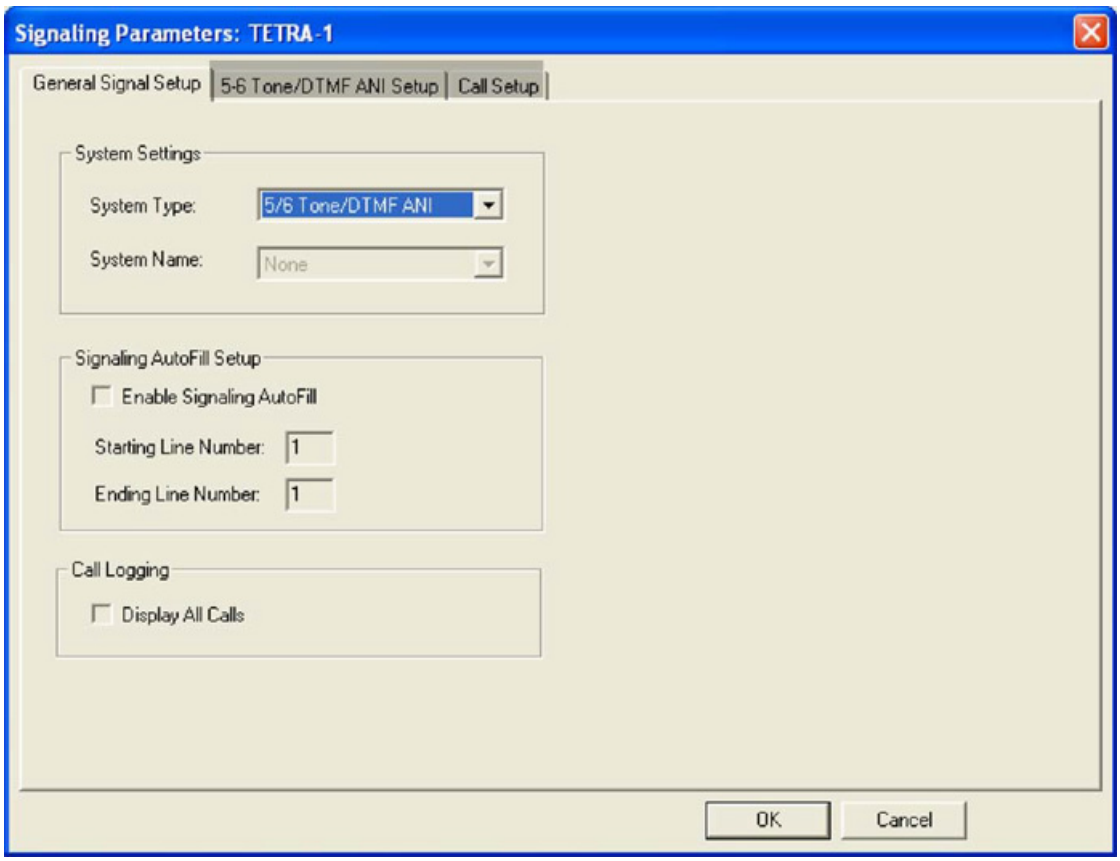
NOTE: The console operator is able to select the various call types defined within the IP-224 Per Line Setup.

4. Click the **Close button**.

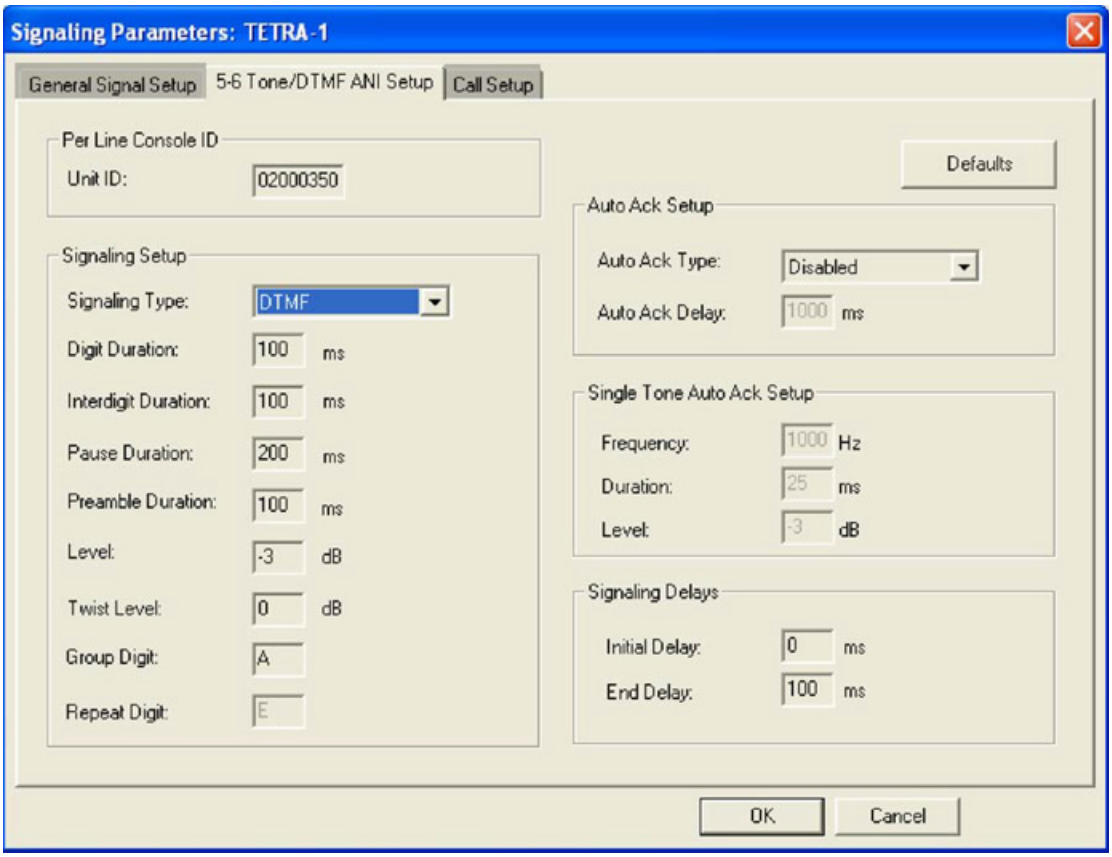
NOTE: The C-Soft frequency list has a maximum of *1000 entries*, so all 1000 IP-224 function tones/calls can be addressed.

9.3 Signal Setup

1. From the Per Line Parameters Setup window, click **Signal Setup**.
   The General Signal Setup page appears in the Signaling Parameters window.
2. From the System Type drop down menu, select **5/6 Tone/DTMF ANI**.



3. From the Signaling Parameters window, click the **5-6 Tone/DTMF ANI Setup tab**. *The 5-6 Tone/DTMF ANI Setup tab appears.*



4. In the Unit ID field, enter the **8-digit unit ID** of the TETRA terminal connected to the associated IP-224.
5. From the Signaling Type drop down menu, select **DTMF**.
6. In the Digit Duration field, enter **100ms**.
7. In the Interdigit Duration field, enter **100ms**.
8. In the Pause Duration field, enter **200ms**.
9. In the Preamble Duration field, enter **100ms**.
10. In the Level field, enter **-3dB**.
11. In the Twist Level field, enter **0dB**.
12. In the Group Digit field, enter **A**.
13. From the Auto Ack Type drop down menu, select **Disabled**.
14. In the Initial Delay field, enter **0ms** (required).
15. In the End Delay field, enter **100ms**.
16. Click the **OK button**.

9.4 Call Setup

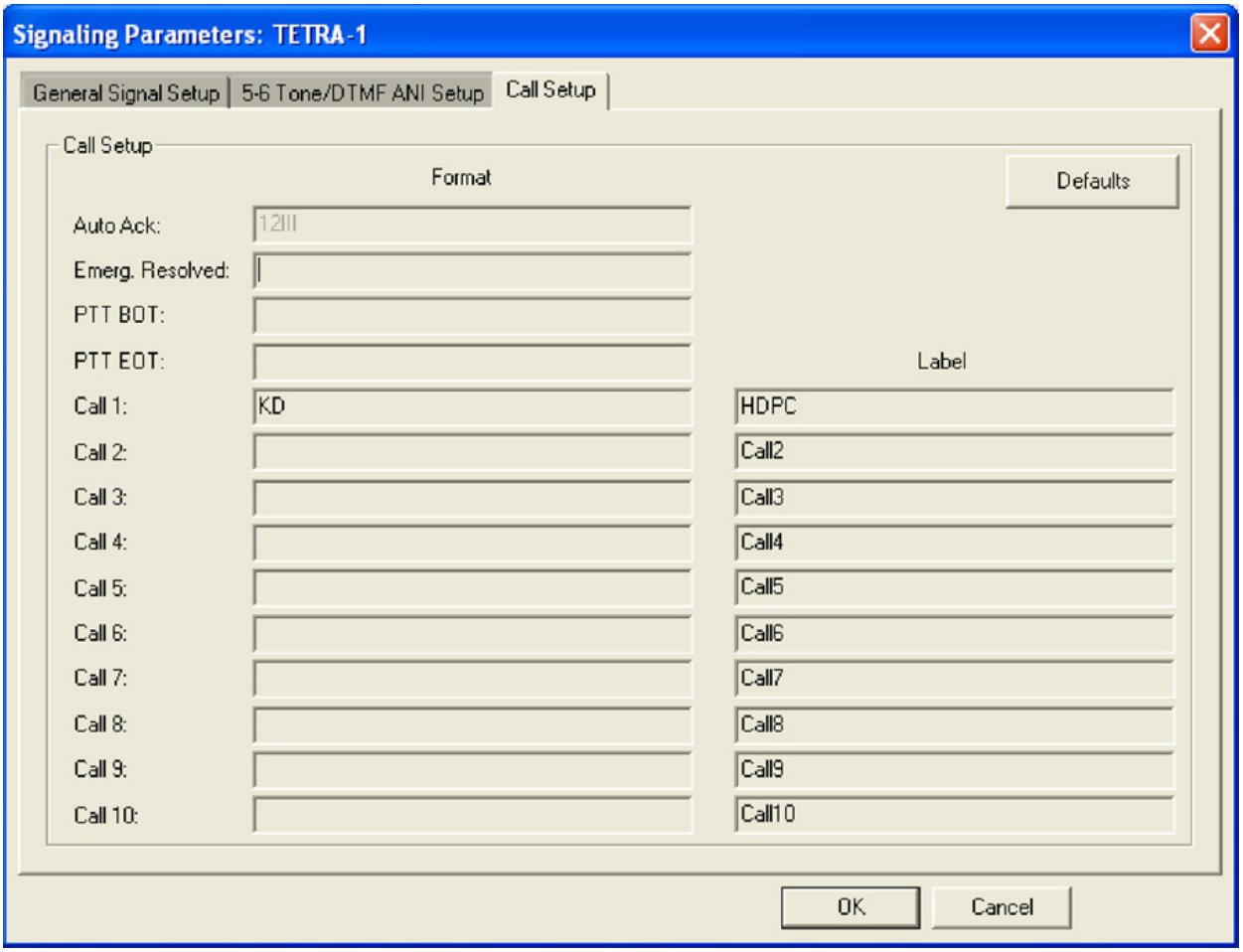
The Call Setup page is used to define a call button to make a Half-Duplex Private Call (HDPC) on the TETRA radio line. The button appears in the Call History, Manual Call List, and Call List windows when the appropriate line is selected.

To **setup a call button for HDPC**, do the following:

1. From the Signaling Parameters window, click the **Call Setup tab**.
   The Call Setup window appears.
2. In the Call 1 Format field, enter **KD**.

NOTE: When this button is activated, the *K* loads the contents of the currently selected User ID and the *D* creates the HDPC.

3. In the Call 1 Label field, enter **HDPC**.
4. Click the **OK button**.

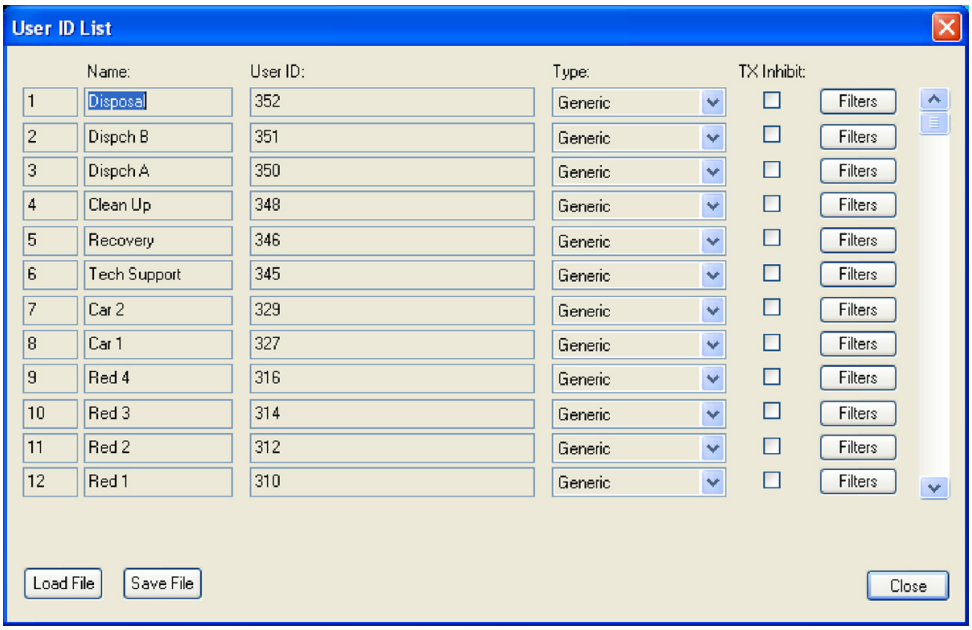


9.5 User ID List

The User ID List is used to translate IDs and aliases for ANI display and call history logging, in addition to forming the console's call directory.

To **configure a TETRA User ID List**, do the following:

1. From the Edit drop down menu, select **Edit User ID List**.
   The User ID List window appears.



2. In the Name field, enter a **Name** for the User ID.
3. In the User ID, enter the **ID number**.
4. In the Type drop down menu, select **Generic**.
5. Click the **Close button**.

NOTE:

- The User ID List can contain up to *6000 entries*.

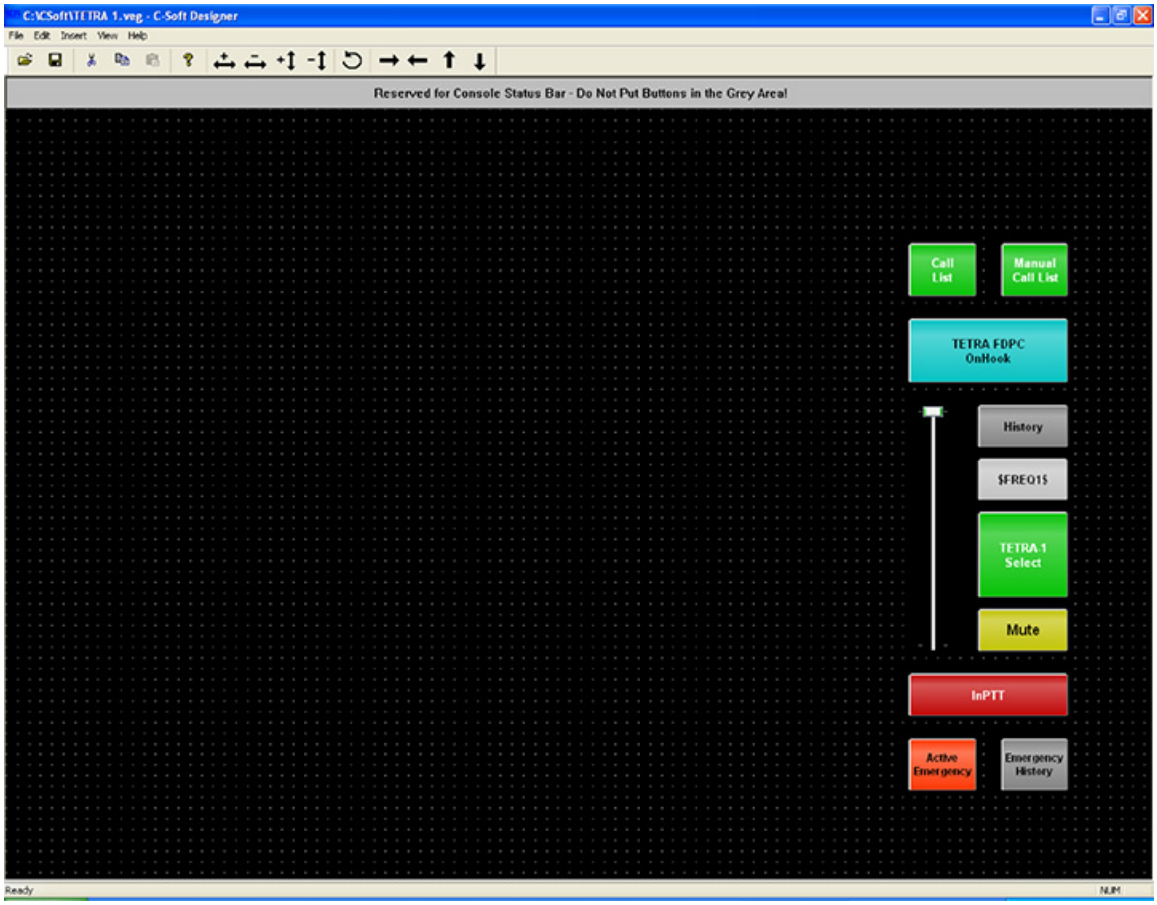
9.6 Console Design Overview

The console operator requires relevant buttons associated with the TETRA radio line to use TETRA radio functions.

The console example contains per line user interface elements, such as Select, Mute, Call History, Frequency Change, Individual PTT, and Volume Control.

The console operator should use the Call List to make calls. If a user is not contained in the User ID List, the console operator can use the Manual Call List.

Active Emergency and Emergency History buttons, used to access the emergency windows, have also been added so the console operator can manage emergency calls.



Notes:

Suggestions or comments:

Contact technical support with suggestions or comments concerning this application note.

Technical Support:

Email: TelexDispatchtechsupport@us.bosch.com

Fax: 1-402-467-3279

Phone: 1-800-898-6723

Bosch Security Systems, Inc

8601 East Cornhusker Highway

Lincoln, Nebraska 68507