

## **PowerTrunk TETRA Interface for IP-224**

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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 ([ey@cryptosoft.com](mailto:ey@cryptosoft.com)). This product includes cryptographic software written by Tim Hudson ([tjh@cryptosoft.com](mailto:tjh@cryptosoft.com)).

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## 1.0 Introduction

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

## 2.0 Hardware Requirements

- IP-224 Ethernet Adapter Panel (P.N. F.01U.306.547)
- IP-224 to PowerTrunk TETRA Interface Cable (P/N F.01U.306.540)
- PowerTrunk DT-410 TETRA Radio

## 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

## 4.0 Supported Features

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

## 5.0 Cable Diagram

The IP-224 to PowerTrunk TETRA Interface Cable allows the IP-224 to serially control a PowerTrunk DT-410 TETRA radio.

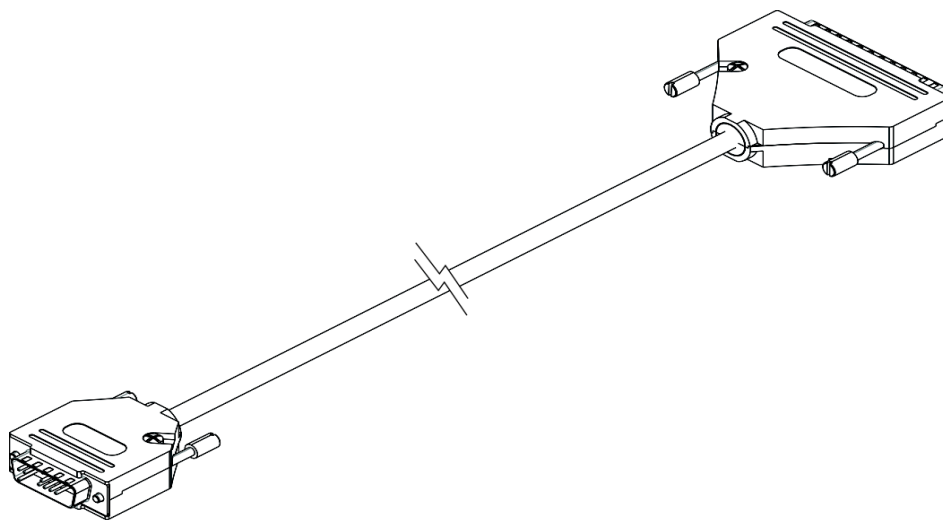


FIGURE 1. PowerTrunk TETRA Serial Interface Cable

Cable diagram for PowerTrunk TETRA Radio and IP-224 Interface			
Function	PowerTrunk	IP-224	Function
RXD_PEI	PIN 1	PIN 17	RS-232/TTL TXD
TXD_PEI	PIN 2	PIN 36	RS-232/TTL RXD
GND_PEI	PIN 5	PIN 29	GROUND
GND_PEI	PIN 5	PIN 5	PTT RELAY COM CONTACT
IN_LINE_1	PIN 14	PIN 1	TX+ AUDIO
IN_LINE_1	PIN 15	PIN 2	TX- AUDIO
OUT_LINE_1	PIN 16	PIN 20	RX+ AUDIO
OUT_LINE_2	PIN 17	PIN 21	RX- AUDIO
IN4-2	PIN 19	PIN 24	PTT RELAY N.O CONTACT

## 6.0 Radio Programming Application Setup

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

### 6.1 Radio System Parameters Setup

To **configure the Radio System Parameters**, do the following:

1. From the left navigation, select **Radio identifier**.  
*The Radio identifier window appears.*

The screenshot shows the 'Radio identifier' window. On the left is a navigation tree with 'Radio identifier' selected. The main area contains several sections:

- TEI (Tetra Equipment Identity):** Fields for TAC (000003), FAC (03), ESN (192714), and SP (0). Below these are labels: TAC: Type Approval Code, ESN: Electronic Serial Number, FAC: Final Assembly Code, SP: Spare Digit.
- TMI (Tetra Management Identity):** This section is highlighted with a red box. It contains:
  - MCC (Mobile Country Code): 238
  - MNC (Mobile Network Code): 6003
  - SMI (Short Management Identity): 101
- Programming data:** Fields for Model (MDT-400), Version (22.00.04), and Date (28-06-2013).
- Equipment data:** Fields for Software Code (-----), Version (21.01.01), and Product Configuration Code (CCP) (1 . 11 . 21 . 02 . 00).

#### Under TMI (TETRA Management Identity)

2. In **MCC (Mobile Country Code)** field, enter the **MCC number**.  
*The MCC is a 3-digit number determined by country and region.*
3. In **MNC (Mobile Network Code)** field, enter the **MNC number**.  
*The MNC is 2- to 4-digit number determined by network carrier.*
4. In **SMI (Short Management Identity)** field, enter the **SMI number**.

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

## 6.2 ANI Setup

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

1. From the left navigation, select **User configuration**.
2. From the User configuration options, select **User identity**.

*The User identity window appears.*

The screenshot displays the configuration interface for PowerTrunk TETRA. On the left is a navigation tree with the following structure:

- Radio identifier
  - Hardware configuration
    - Hardware parameters
    - MS Class
  - User configuration
    - Initial parameters
    - User identity** (highlighted with a red box)
    - Services
    - Audio
    - User interface
    - Audio management for duplex
    - Special MMI access
    - Special features
  - System parameters
  - Call parameters
  - Messages
  - Options
  - Protocol stack parameters
  - Engineering mode
  - PEI

The main window on the right is titled 'User identity' and contains the following fields:

- User name:
- ISSI (Individual Short Subscriber Identity):  (highlighted with a red box)
- Equipment status:
- Subscriber class: 0x
- Control channel information:

### Under User identity

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

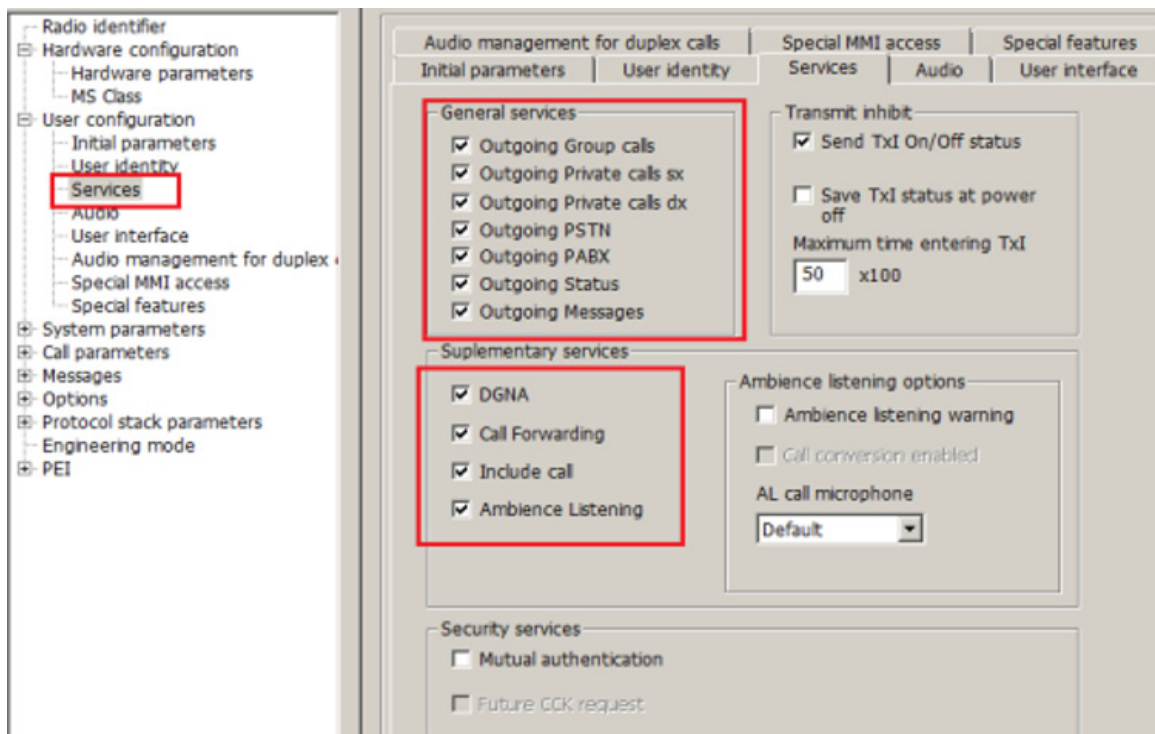
**NOTE:** The ISSI number is a unique ID of the PowerTrunk terminal within a TETRA network. This ID should match the SMI number.



### 6.3 Radio Services Setup

To **configure the Radio Services**, do the following:

1. From the left navigation, select **User configuration**.
2. From the User configuration options, select **Services**.  
*The Services window appears.*



#### Under General services

3. Select **ALL** the General services check boxes.

#### Under Supplementary services

4. Select **ALL** the Supplementary services check boxes.

## 6.4 Scan Setup

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

1. From the left navigation, select **Call parameters**.  
*The Call parameters options appear.*
2. From the Call parameters options, select **Phone books**.  
*The Phone books options appear.*
3. From the Phone books options, select **Scan lists**.  
*The Scan lists window appears.*

External gateways | Emergency calls | PSTN calls | PABX calls

Range list | Group calls | Scan lists | Private calls

**Scan status**

☐ Off ☐ On ☒ User configuration

**Mode**

☒ Group list

Scan list selected: None ☐ Scan list change allowed

**User scan-lists**

N...	Name	Editable	N. of groups

Add Modify Delete

**User scan-lists edition**

Scan list to edit groups: None

N...	Group	Range	CoU	Life...	GSSI

Add Modify Delete

**Fixed list groups**

N...	Group	Range	CoU	Life...	GSSI

Add Modify Delete

☐ Range mode

Number	Name	Scan
1	Group	No
2	DGNA	No

Modify Scan all Scan none

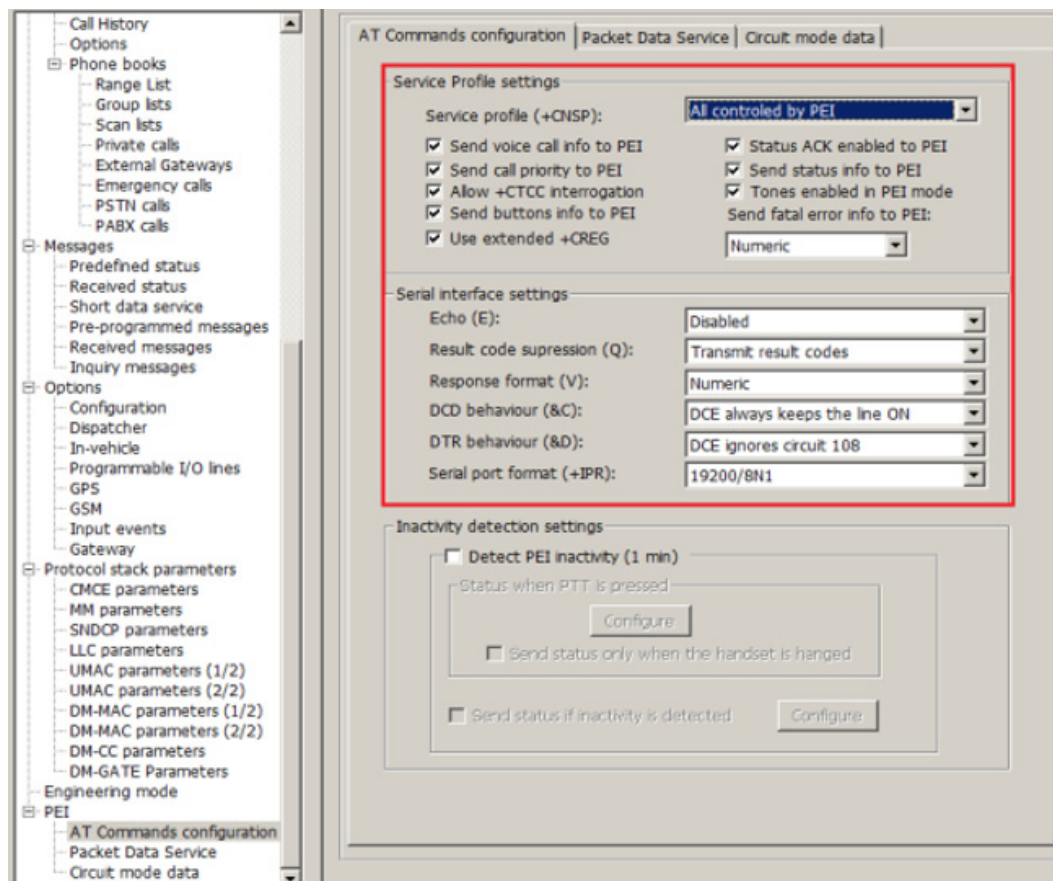
### Under Scan status

4. Select the **Off** radio button.
5. Select the **User configuration** check box.

## 6.5 Serial Communications Setup

To **configure the Serial Communications**, do the following:

1. From the left navigation, select **PEI**.  
*The PEI options appear.*
2. From the PEI options, select **AT Commands configuration**.  
*The AT Commands configuration window appears.*



### Under Service Profile settings

3. From the Service profile (+CNSP) drop down menu, select **All controlled by PEI**.
4. Select **ALL the Service Profile settings check boxes**.
5. From the Send fatal error info to PEI drop down menu, select **Numeric**.

### Under Serial interface settings

6. From the Echo (E) drop down menu, select **Disabled**.
7. From the Result code suppression (Q) drop down menu, select **Transmit result codes**.
8. From the Respond format (V) drop down menu, select **Numeric**.
9. From the DCD behaviour (&C) drop down menu, select **DCE always keeps the line ON**.
10. From the DTR behaviour (&D) drop down menu, select **DCE ignores circuit 108**.
11. From the Serial port format (+IPR) drop down menu, select **19200/8N1**.

## 7.0 IP-224 Access Key Installation

The PowerTrunk 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 activate the PowerTrunk 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) IP-224 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.*

**TELEX IP-224**

- Home
- Ethernet Setup
- Multicast Setup
- Hardware Setup
- Gain Setup
- Per Line Setup
- Crosspatch Setup
- Account Management
- Backup & Restore
- Firmware Upgrade
- Additional Features**
- Save Parameters
- System Status

**SUCCESS:** Features are now available. Save Parameters step still required.

### ACCESS ADDITIONAL FEATURES

Access Key:

Feature Name	State
Advanced Interface Option (North American)	Enabled

Serial Type	Available
EFJ 5300/VMx00	Yes
Hytera MD782	Yes
Hytera MT680	Yes
Icom	Yes
IDEN	Yes
Kenwood 5x10	Yes
Kenwood NEXEDGE	Yes
Kenwood NX-5x00	Yes
Kenwood x150	Yes
Kenwood x180	Yes
Kenwood x80	Yes
Kenwood x90	Yes
MOTOTRBO Interface*	Yes
MTRBi	Yes
PowerTrunk	Yes
Sepura	Yes
Serial Over IP	Yes
Sprint Direct Connect	Yes
Tait TM91xx/TM94xx	Yes
Tait TM93xx	Yes
Telex Generic	Yes

\* MOTOTRBO Interface is only available on one line with the Advanced Interface Option (North American)

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 Window appears.*
2. From the left navigation, select **Multicast Setup**.  
*The Multicast Setup window appears.*

**TELEX IP-224**

Name: Telex IP-224  
MAC: 00:08:7C:70:09:0A  
HW: 1.000 FW: 1.204  
SN: 224120268 Checksum: 70368561

**TELEX**  
Radio Dispatch

Submit Auto Configuration: ☒

### LINE SETUP

Line:	Line Enable:	Line Name:	Line Type:	Serial Type:	Vocoder Type:
1	<input checked="" type="checkbox"/>	PTrunk	Local Mode	PowerTrunk	TELEX 32K
2	<input checked="" type="checkbox"/>	PTrunk	Local Mode	PowerTrunk	TELEX 32K

Line:	Mcast Enable:	RX Mcast:	RX Port:	TX Mcast:	TX Port:	TX Group Port A:	TX Group Port B:	TTL:
1	<input checked="" type="checkbox"/>	225.8.11.81	1054	225.8.11.81	1072	0	0	6
2	<input checked="" type="checkbox"/>	225.8.11.81	1055	225.8.11.81	1073	0	0	6

### IP RECORDER SETUP


Line:	Mcast Enable:	Line Name:	Vocoder Type:	Mcast Address:	Outgoing Port:	TTL:
1	<input type="checkbox"/>	Recorder 1	TELEX 32K	225.8.11.81	2250	6
2	<input type="checkbox"/>	Recorder 2	TELEX 32K	225.8.11.81	2251	6

Submit

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

### Under LINE SETUP

4. From the Serial Type drop down menu, select **PowerTrunk**.
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 page appears*

Entry	Enable	Relay	Relay Group	Relay Time (ms)	Call Type	ISSI/GSSI Number
1	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked GC ▼	00800801 
2	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked GC ▼	00800802
3	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked GC ▼	00800803
4	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked GC ▼	00800804
5	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked GC ▼	00800805
6	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked HDPC ▼	02000346
7	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked HDPC ▼	02000361
8	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked UDSL ▼	1;2;3;4;5
9	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked UDSL ▼	1;2
10	<input checked="" type="checkbox"/>	<input type="text"/>	1 ▼	0	Trunked UDSL ▼	2;3

### Under FUNCTION TONE SETUP

11. From the Call Type drop down menu, select desired **Call Type**.
12. In the ISSI/GSSI Number field, enter the **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 ISSI/GSSI Number is an 8-digit number. This field only accepts numbers and is cleared if the user enters alpha characters and then clicks Submit.



## 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 drop down menu, select **Setup Per Line Parameters**.

*The Per Line Parameters window appears.*

Line Number	Line Type	Line Name	Rx Multicast Address	Rx Port	Tx Multicast Address	Tx Port	Base Radio IP	TTL	Packet Delay
1	Telex	Line 1	225.8.11.81	1054	225.8.11.81	1254	0.0.0.0	6	10
2	Disabled	Line 2	225.8.11.81	1055	225.8.11.81	1255	0.0.0.0	6	10
3	Disabled	Line 3	225.8.11.81	1056	225.8.11.81	1256	0.0.0.0	6	10

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.



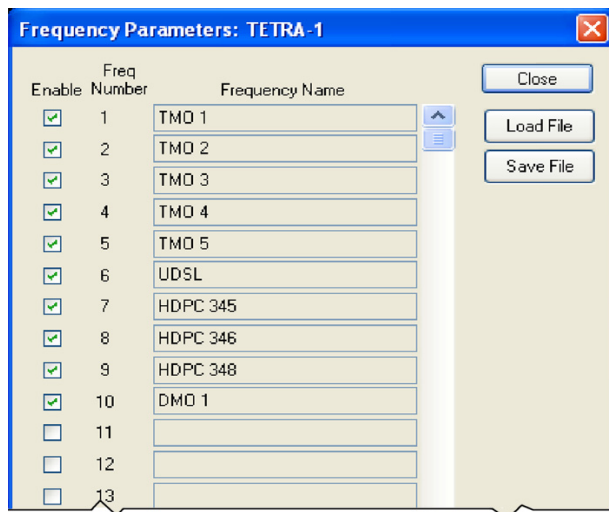
## 9.2 Configure Frequencies

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**.

The screenshot shows the 'Signaling Parameters: TETRA-1' window with the 'General Signal Setup' tab selected. The window has three sub-tabs: 'General Signal Setup', '5/6 Tone/DTMF ANI Setup', and 'Call Setup'. The 'General Signal Setup' tab contains three sections: 'System Settings', 'Signaling AutoFill Setup', and 'Call Logging'. In 'System Settings', 'System Type' is set to '5/6 Tone/DTMF ANI' and 'System Name' is set to 'None'. In 'Signaling AutoFill Setup', 'Enable Signaling AutoFill' is unchecked, and both 'Starting Line Number' and 'Ending Line Number' are set to '1'. In 'Call Logging', 'Display All Calls' is unchecked.

Signaling Parameters: TETRA-1

General Signal Setup | 5/6 Tone/DTMF ANI Setup | Call Setup

System Settings:

System Type: 5/6 Tone/DTMF ANI

System Name: None

Signaling AutoFill Setup:

☐ Enable Signaling AutoFill

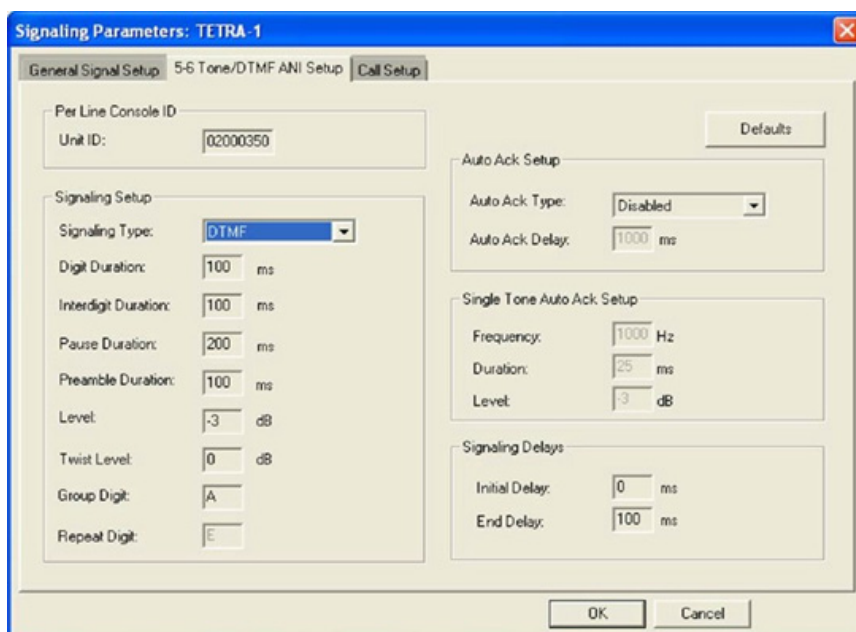
Starting Line Number: 1

Ending Line Number: 1

Call Logging:

☐ Display All Calls

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.

The screenshot shows the 'Signaling Parameters: TETRA-1' window with the 'Call Setup' tab selected. The window has three tabs: 'General Signal Setup', '5-6 Tone/DTMF ANI Setup', and 'Call Setup'. The 'Call Setup' tab is active, showing a 'Call Setup' section with a 'Format' column and a 'Label' column. The 'Format' column has fields for 'Auto Ack:', 'Emerg. Resolved:', 'PTT BOT:', 'PTT EOT:', 'Call 1:', 'Call 2:', and 'Call 3:'. The 'Label' column has fields for 'Call 1:', 'Call 2:', and 'Call 3:'. The 'Auto Ack:' field contains '12III'. The 'Call 1:' field in the 'Format' column contains 'KD'. The 'Call 1:' field in the 'Label' column contains 'HDPC'. The 'Call 2:' field in the 'Label' column contains 'Call2'. The 'Call 3:' field in the 'Label' column contains 'Call3'. There is a 'Defaults' button in the top right corner of the 'Call Setup' section.

Call Setup		Defaults
	Format	Label
Auto Ack:	12III	
Emerg. Resolved:		
PTT BOT:		
PTT EOT:		
Call 1:	KD	HDPC
Call 2:		Call2
Call 3:		Call3

## 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.*

The screenshot shows the 'User ID List' window with a table containing 12 rows of user data. The table has four columns: Name, User ID, Type, and TX Inhibit. Each row also has a 'Filters' button. At the bottom of the window are 'Load File', 'Save File', and 'Close' buttons.

	Name:	User ID:	Type:	TX Inhibit:	
1	Disposal	352	Generic	<input type="checkbox"/>	Filters
2	Dispch B	351	Generic	<input type="checkbox"/>	Filters
3	Dispch A	350	Generic	<input type="checkbox"/>	Filters
4	Clean Up	348	Generic	<input type="checkbox"/>	Filters
5	Recovery	346	Generic	<input type="checkbox"/>	Filters
6	Tech Support	345	Generic	<input type="checkbox"/>	Filters
7	Car 2	329	Generic	<input type="checkbox"/>	Filters
8	Car 1	327	Generic	<input type="checkbox"/>	Filters
9	Red 4	316	Generic	<input type="checkbox"/>	Filters
10	Red 3	314	Generic	<input type="checkbox"/>	Filters
11	Red 2	312	Generic	<input type="checkbox"/>	Filters
12	Red 1	310	Generic	<input type="checkbox"/>	Filters

Buttons: Load File, Save File, Close

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*.

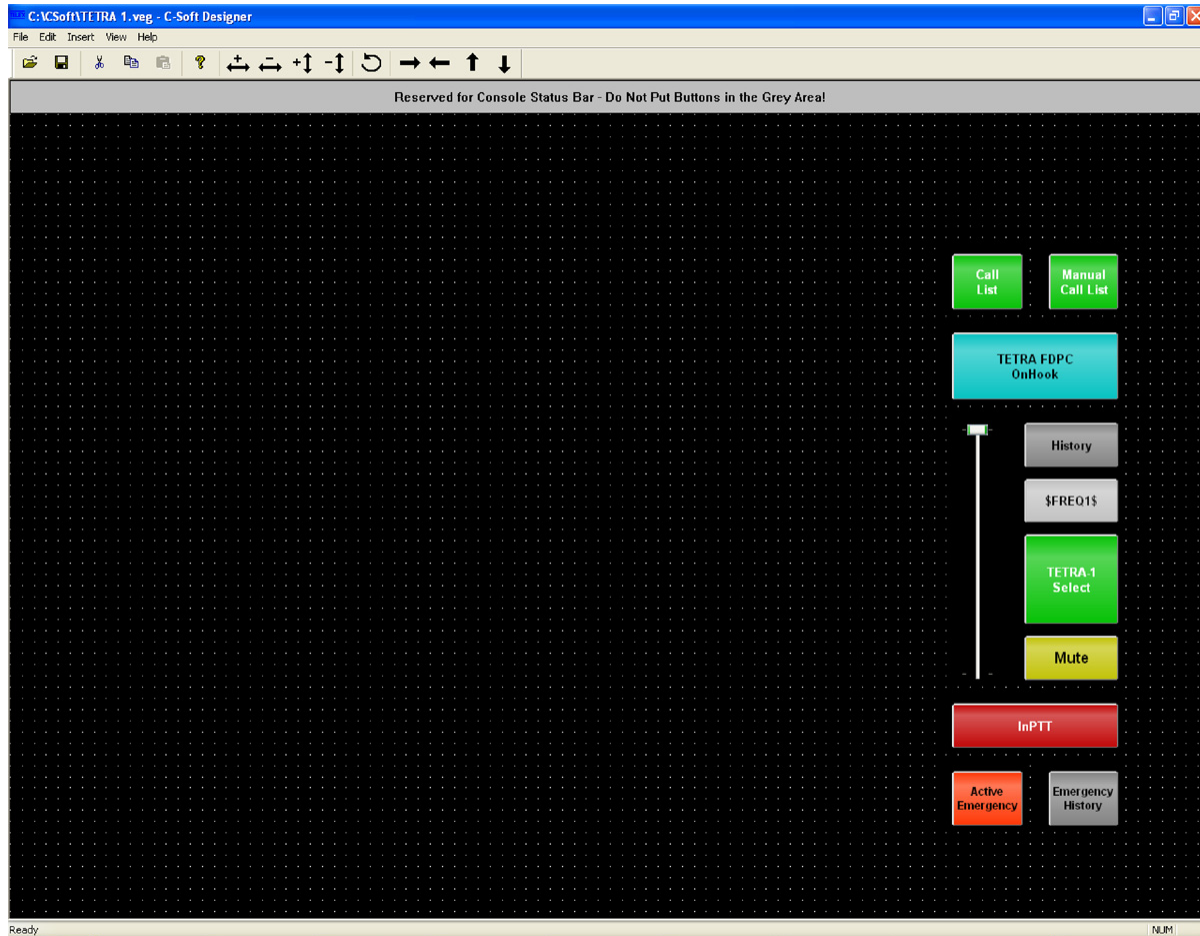
## 9.6 Console Design Overview

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 guide.

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