TELEX Application Note

TETRA

Dispatch Solutions Using Power Trunk Terminal Interface

VOIProven

TELEX Radio Dispatch

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TETRA Dispatch Solutions using PowerTrunk Terminal Interface

1.0 General

This application note describes Telex Dispatch solutions available via direct interface to PowerTrunk TETRA terminal equipment. a detailed description of the interface between the Telex IP-223 Remote Radio Adapter Panel and the PowerTrunk terminal is included using the MDT-400 Mobile TETRA radio terminal as an example.

Physical connections and diagrams for IP-223 Remote Radio Adapter's setup and configuration, MDT-400 basic setup, and Telex Dispatch console setup are all covered. Information pertinent to all interface implementations is covered early in this application note using the MDT as an example.

The IP-223 to PowerTrunk TETRA terminal interface gives the console operator the ability to control a TETRA radio asset from a remote IP-based hardware or PC dispatch console. This Telex Dispatch solution provides console operator access to TETRA digital trunked systems, via an air-interface. This is ideal for tactical mobile operation, or small scale dispatch requirements, where an infrastructure interface would be inappropriate.

We recommend you read through this entire application note before starting to work.

1.1 PowerTrunk Licensing

The ability to select the PowerTrunk TETRA radio in the serial menu drop down menu is controlled by a valued added option in the IP-223. Contact the order entry desk to purchase and install the Fleetsync Encode/Decode option (P/N F01U144660).

NOTE: IP-223 version 4.505 and higher supports PowerTrunk Licensing.

2.0 Cable Assembly Requirements

2.1 MDT-400 Interface

Using the following chart, assemble the required cable to connect IP-223 to the MDT-400 device:

TABLE 1. Radio to IP Gateway Cable Assembly Chart

Signal	IP-223 DB-25	MDT-400 DB-26
Ground	7	5
PTT Common	2	5
PTT	14	19 Aux Input (Programmable)
RX+	24	16
RX-	12	17
TX+	25	14
TX-	13	15
TXD_PEI	see Table X	1
RXD_PEI	see Table X	2

TABLE 2. IP-223 Serial Pin-out Chart

IP-223 Serial Signal	IP-223 DB-9[a]		MDT-400 DB-26
	Line 1	Line 2	
TXD	2	8	1
RXD	3	7	2

a. The IP-223 offers serial data connectivity to two (2) separate radio devices via a single DB-9 port connector. If both IP-223 radio ports are interfaced to serial data controlled devices such as the MDT-400, the DB-9 splitter cable (PN F01U117818) is required to distribute data from the DB-9 port.

3.0 IP-223 Configuration

3.1 IP-223 Jumper Settings

TABLE 3. IP-223 Jumper Settings

Line 1	Jumper Setting	Line 2
J33, J34	B=4-Wire	J5,J6
J16. J21	B=Balanced	J19, J20
J14	A=600 Ohms	J24
J3, J9, J11	B = Balanced	J25, J28, J29
J13	B = High	J27
J17, J22	B = 600 Ohms	J10, J15
J35	A = RS232 Serial Data	J26

3.2 IP-223 Software Set Up

The IP-223 configuration is shown using the standard web browser configuration windows. Interrogation and configuration of this unit can also be carried out using the TSM (Telex System Manager) version 1.501 or higher.

REFERENCE:

- For more information, see the IP-223 Technical Manual (P/N 803641). This document is available for download at http://www.telex.com/us/dispatch/downloads/d.
- For more information, see the Telex System Manager Technical Manual (P/N LIT000259000). This document is available for download at http://www.telex.com/us/dispatch/downloads/d.
- The Telex System Manager is This document is available for download at http://www.telex.com/us/dispatch/downloads/d.

3.2.1 IP-223 Multicast Address Set Up

To **enable the line for TETRA**, do the following:

1. From the IP-223's web browser, select **Multicast Setup**.
2. From the Line Type drop down menu, select **Tetra Radio** for the appropriate line.
3. Click **Submit**.
   The configuration is temporarily saved.
4. Click **Save to EEPROM**.
   The EEPROM window appears.
5. Click **Save Parameters**.
   The configuration is sent and permanently saved to the IP-223.

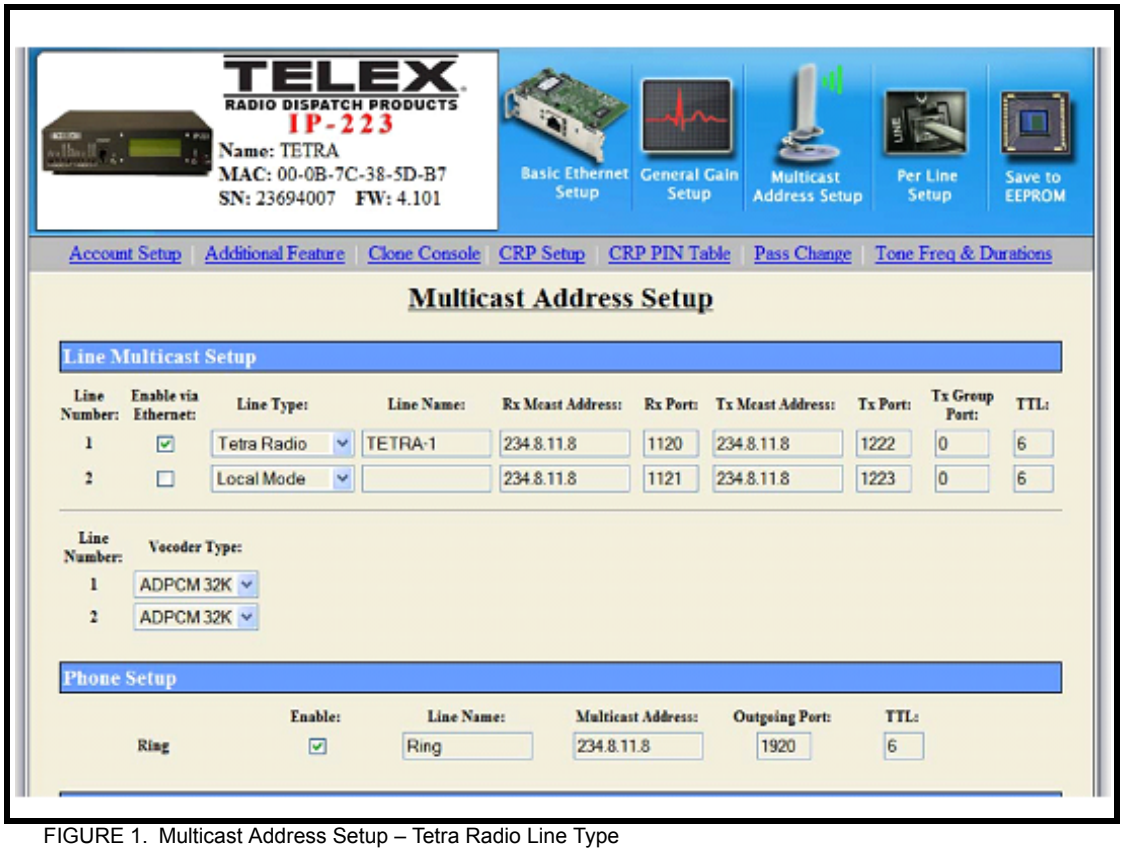

FIGURE 1. Multicast Address Setup – Tetra Radio Line Type

3.2.2 IP-223 Per-Line Setup Overview

Once the Tetra Radio line type is enabled in the Multicast Setup page, the Per Line Setup window, shown in Figure 2) displays only those items necessary to configure the IP-223 for a TETRA radio interface.

The IP-223 associates a call to a function tone. Function tones are used to control remote radio resources in conventional analog radio systems. A dispatch console sends a function tone (or an IP [Internet Protocol] representation of a function tone), to an IP-223 in order to set up the desired call.

The IP-223 can respond up to 100 function tones, each accommodating four (4) call types; Trunked or Direct GCs (Group Calls) and HDPCs (Half Duplex Private Call). If one (1) or more UDSLs (User Defined Scan List) are specified, then those lists occupy a call location (function tone allocation). However, no call is made on a UDSL, just on one (1) of its contained talk groups.

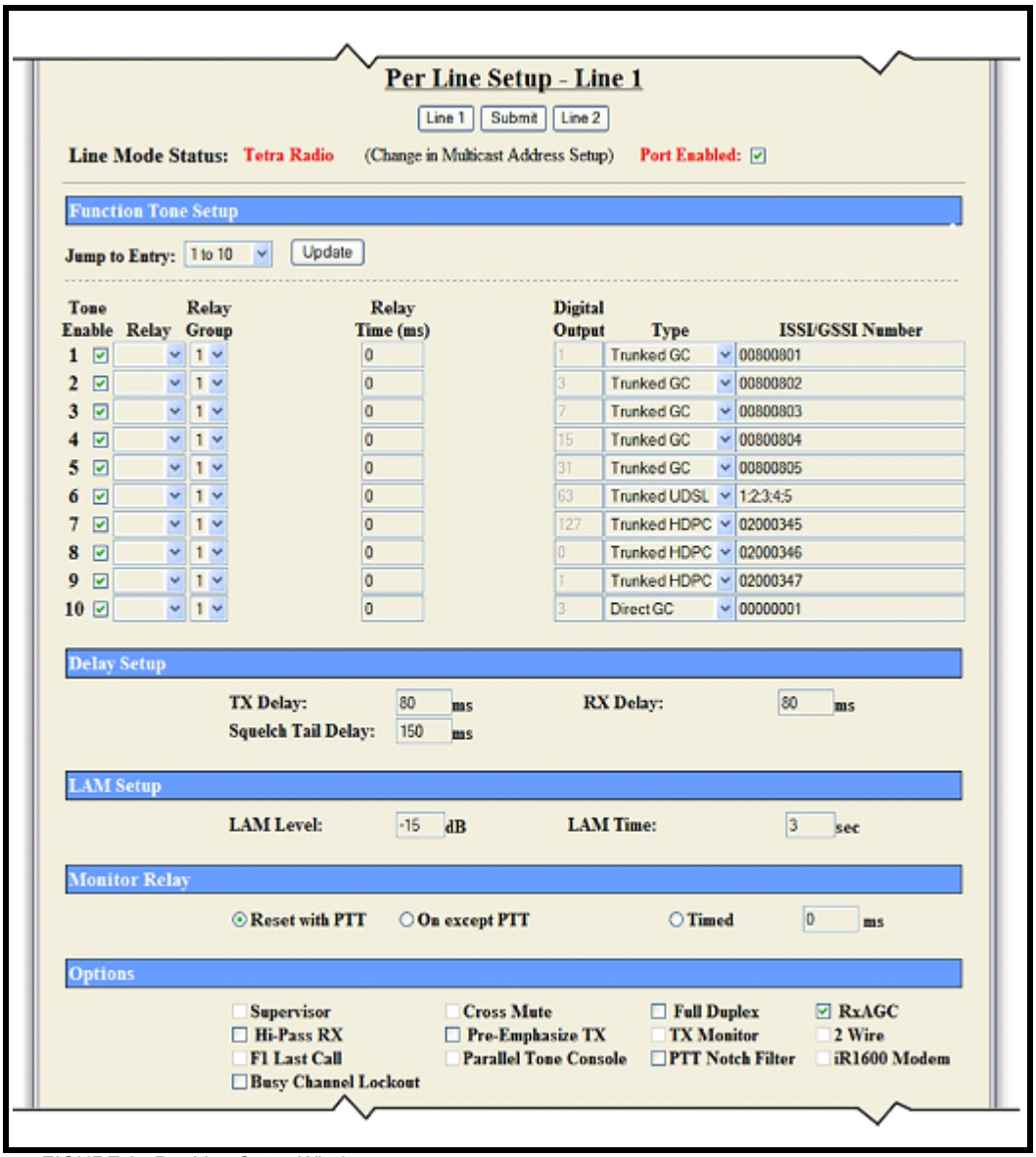

FIGURE 2. Per Line Setup Window

3.2.2.1 Type Drop Down Menu

The (ISSI/GSSI) drop down menu contains the following options:

Trunked GC – A Trunked Group uses TMS (Trunked Mode of Operation); this is a half-duplex point to multi-point call between the caller and pre-defined group of users.

Direct GC – A Direct Group Call uses DMS (Direct Mode of Operation); this point-to-multi-point call si made between radio terminals, without infrastructure access required.

Trunked UDSL – A Trunked User Defined Scan List uses TMO mode, the IP-223 scans selected talk groups, enabling a console operator to monitor and answer calls on multiple talk groups. The USDSL must be pre-defined within the radio terminal and the IP-223.

NOTE:

- If a function tone number in the UDSL is not assigned to a trunked GC, then the scan list is invalid and the IP-223 does not change to that function.
- If the function tone is correctly configured and in a UDSL, but the group number assigned to the function tone's trunked GC is invalid, the IP-223 changes to that function tone, but the invalid group number is not scanned.

A UDSL defaults to the first talk group in the list (TG 801 in our example). If listening out on the Trunked UDSL channel (tone 6), a console operator can receive calls on all talk groups in that list. Having received a call, the console operator can reply, and continue a radio conversation, while the call remains active.

Call activity time is set within the TETRA network. Once the call drops, the IP-223 defaults back to the first group in the list (TG801). When the console operator presses the PTT, with the UDSL selected, a group call is create on this talk group (TG801).

Trunked HDPC – Trunked Half-Duplex Private Call is a trunked call to a single terminal, rather than a group, allowing a console operator to make point-to-point private radio calls.

3.2.2.2 ISSI/GSSI Number Field

The ISSI (Individual Short Subscriber Identifier) / GSSI (Group Short Subscriber Identifier) Number field is used to specify the ISSI/GSSI number for the call types available via the IP-223.

For Trunked UDSL place groups in the ISSI/GSSI Number field by tone allocation number, separated by semi-colons. In the example shown in Figure 2, the function tone 6 is configured for the Trunked UDSL in the format 1;2;3;4;5.

3.2.3 IP-223 Per Line Serial Set Up

To **enable the line for PowerTrunk**, do the following:

1. From the IP-223's webpage, select **Per Line Setup**.
2. Select the **appropriate line**, 1 or 2 button.
3. In the Options field, select **Full Duplex** to hear Go Ahead tones.
4. From the Serial Port Mode drop down menu, select **PowerTrunk**.
5. Click **Submit**.
   The configuration is temporarily saved.
6. Click **Save to EEPROM**.
   The EEPROM window appears.
7. Click the **Save Parameters**.
   The configuration is sent and permanently saved to the IP-223.

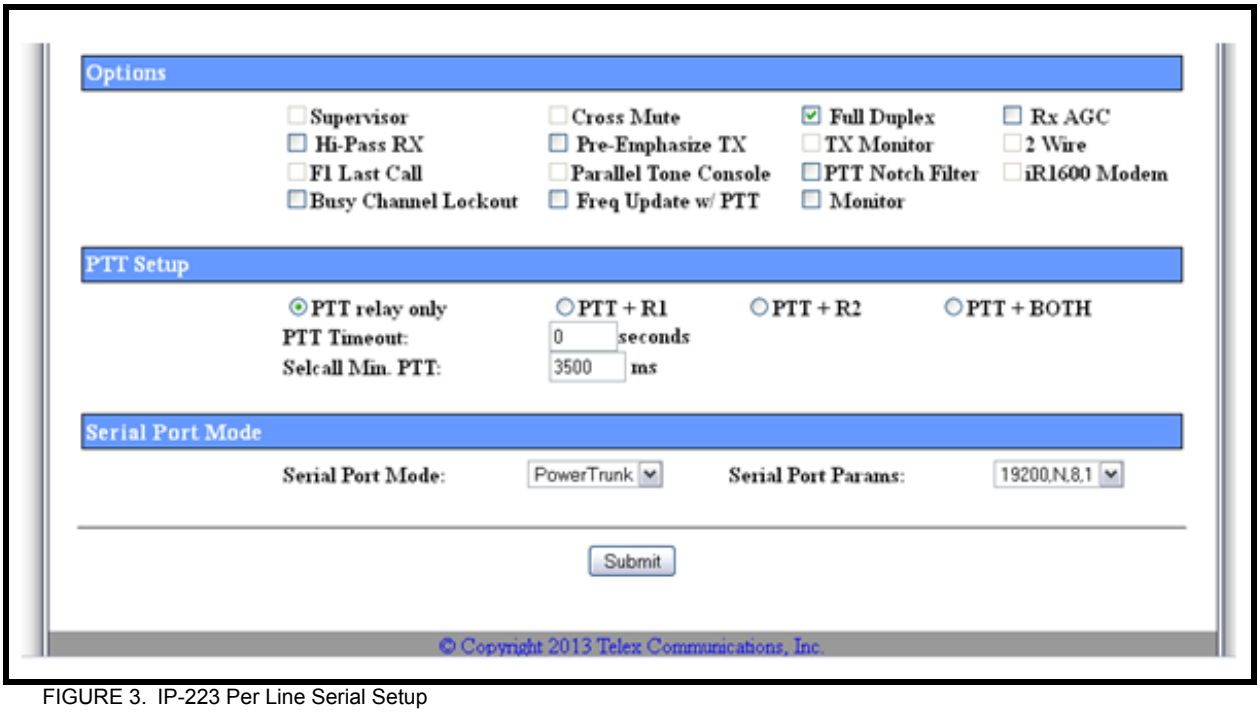

FIGURE 3. IP-223 Per Line Serial Setup

4.0 Radio Information

4.1 Radio Terminal Configurations

PowerTrunk MDT-400 terminal settings are discussed below.

The PEI (Peripheral Equipment Interface) port is used to configure the radio to allow direct control of the radio from the IP Gateways.

4.1.1 Allow Direct Control

To configure the radio to allow IP Gateway direct control, do the following:

1. Click the PEI menu.
   The PEI settings appear.
2. In the AT Commands configuration tab,
   a. Service Profile settings fields, configure all fields the match Figure 4.
   b. Serial Interface settings fields, configure all fields to match Figure 4.

REFERENCE: For more information, see the PowerTrunk Manager manual and PowerTrunk help files.

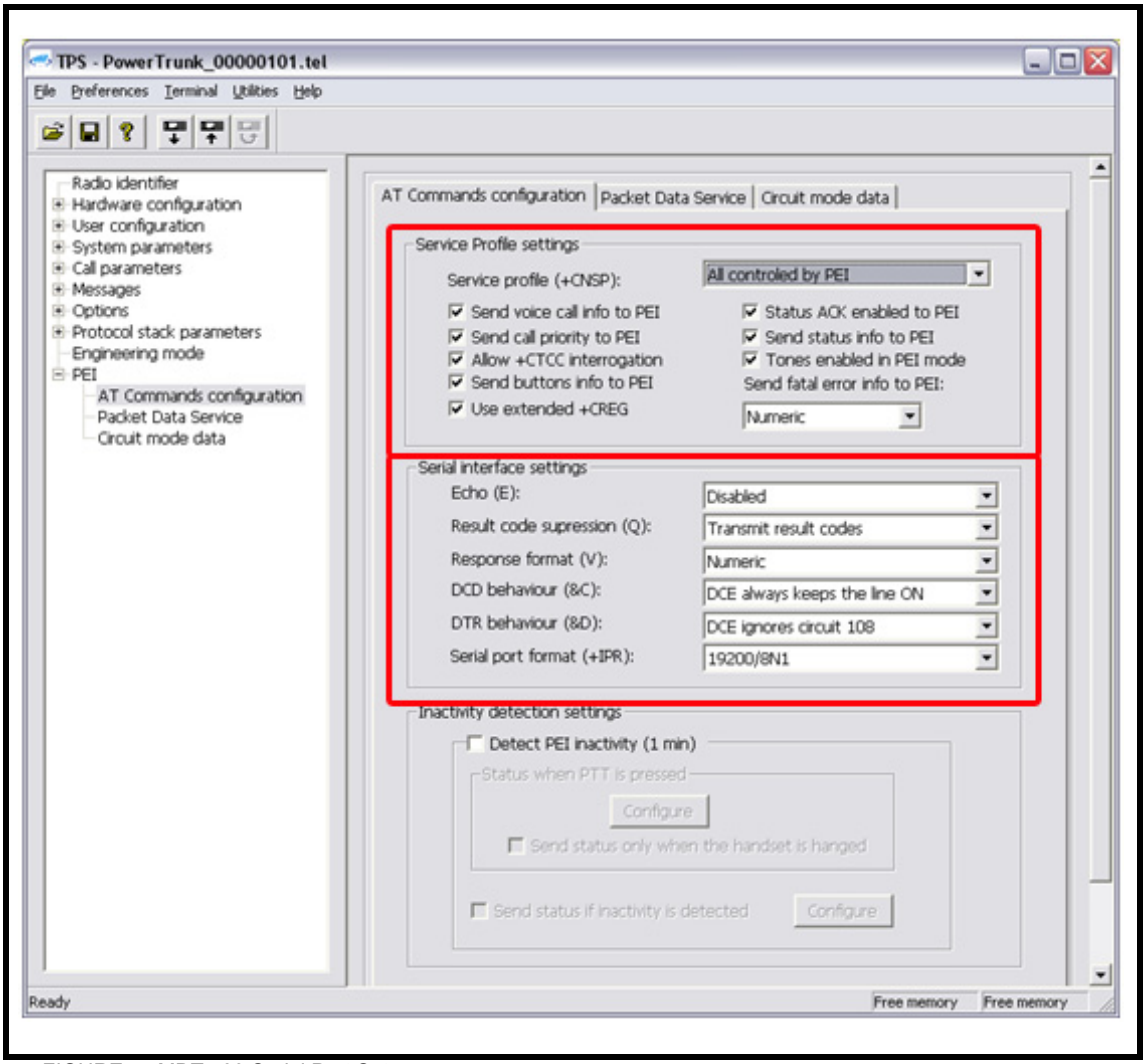

FIGURE 4. MDT-400 Serial Port Setup

4.1.2 Route Voice and I/O Control to External Radio Port

To **configure the radio to route voice and I/O control to the external port**, do the following:

1. Click the **Options** menu.
   The Options settings appear.
2. In the **Programmable I/O Lines configuration** tab:

   a. Configure all fields to **match Figure 5**.

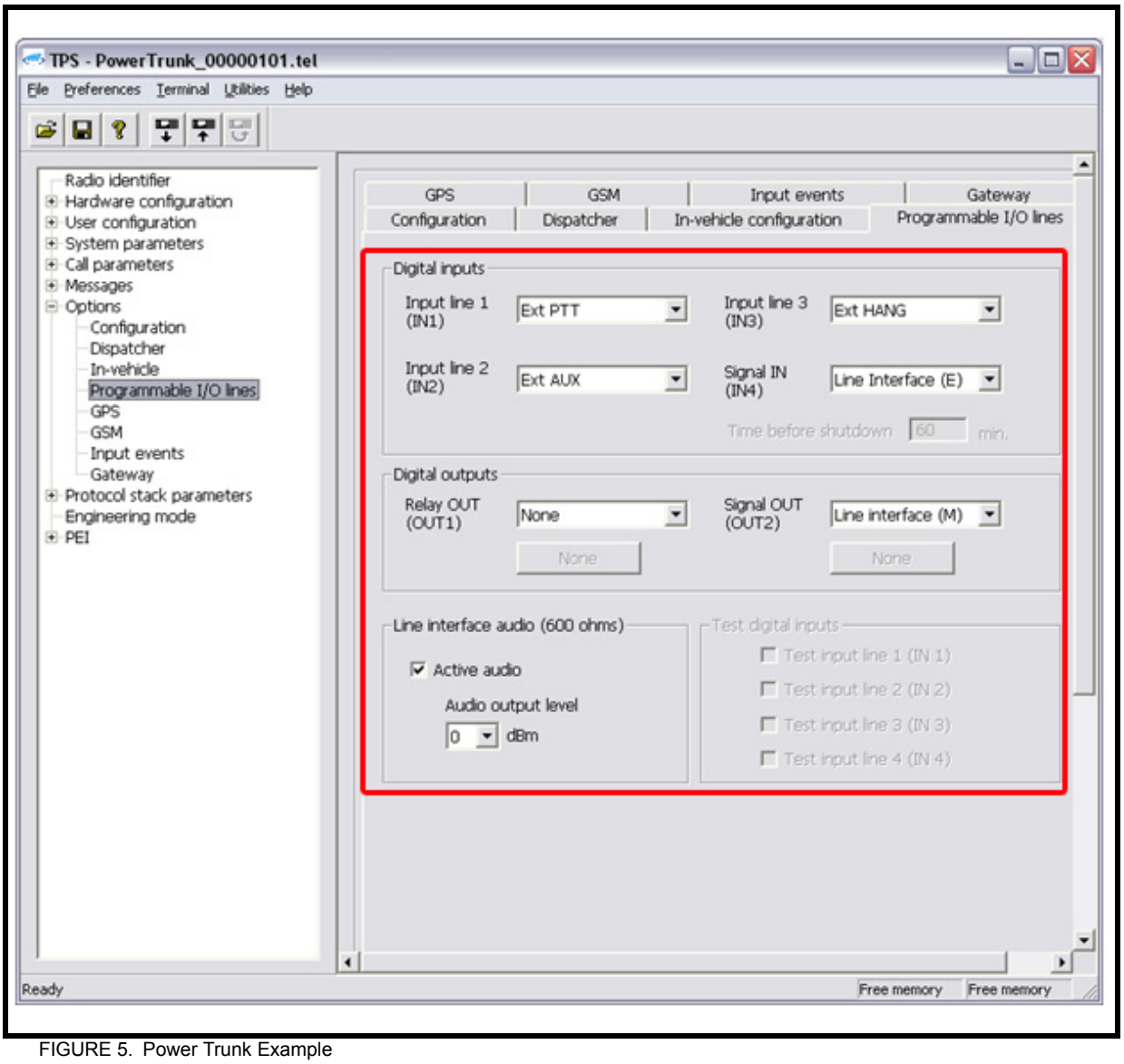

FIGURE 5. Power Trunk Example

4.1.3 TMO Group Parameters

To **define the TMO talk group parameters**, do the following:

> Configure the **talk group fields for TMO** per your custom configuration.

4.1.4 DMO Group Parameters

To **define the DMO talk group parameters**, do the following:

> Configure the **talk group fields for DMO** per your custom configuration.

NOTE: See Figure 6, note NO GROUP enable should not be selected.

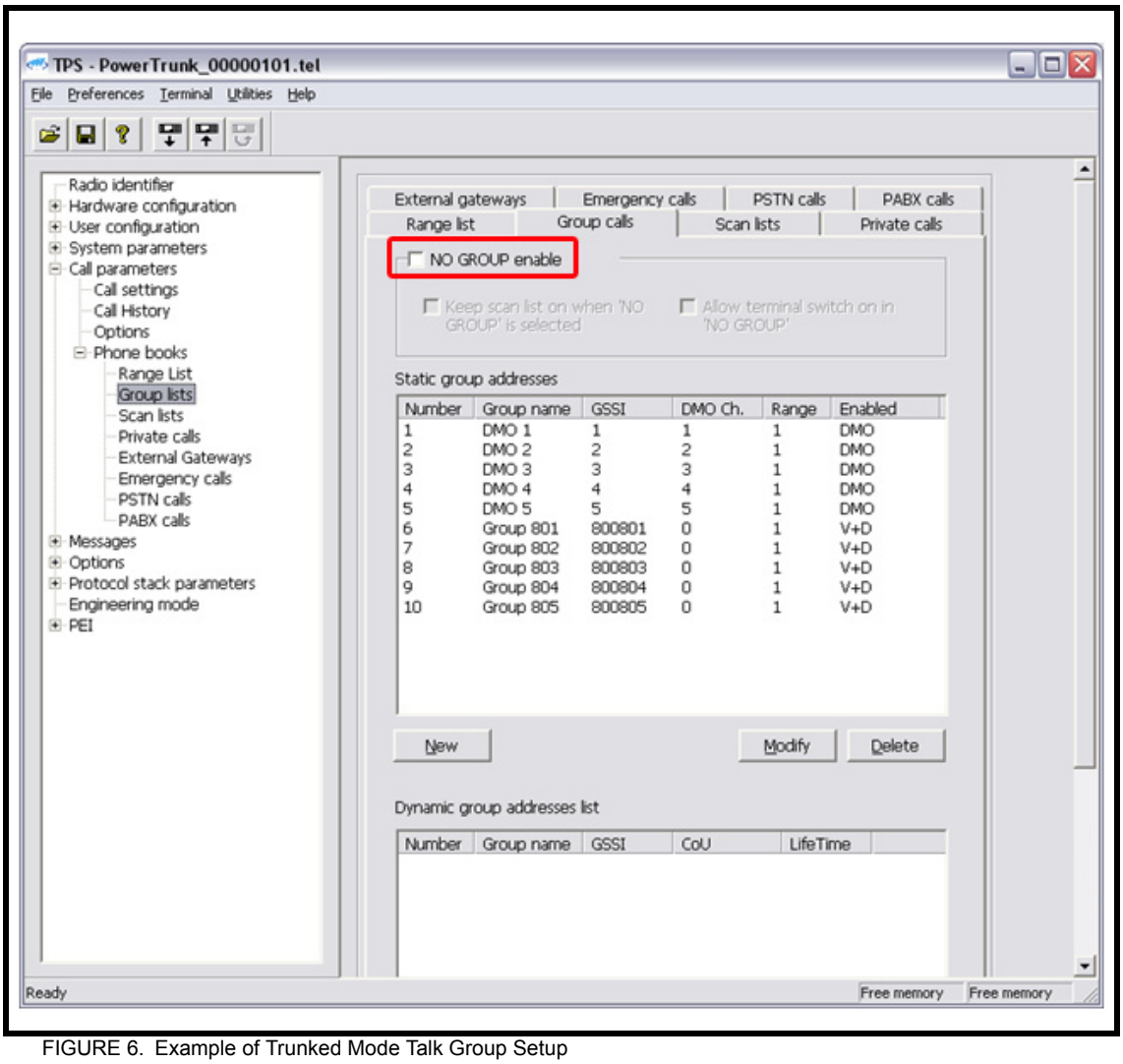

FIGURE 6. Example of Trunked Mode Talk Group Setup

NOTE: Talk group configurations shown in Figure 6 are provided as a guide and to aid later discussions. Guidance given here does not replace the authoritative documents and all terminal configuration should be made in accordance with the relevant PowerTrunk Radio Manager manuals. Terminals requiring infrastructure access should be configured as directed by the local TETRA network manager.

4.1.5 Configure Scan

To configure the radio for proper Scan functions, do the following:

1. Click the **Call parameters** menu.
   The Call parameters settings appears.
2. Click the **Phone books menu**.
   The Phone books settings appear.
3. In the Scan list configuration tab:

   a. Configure all field to match Figure 7.

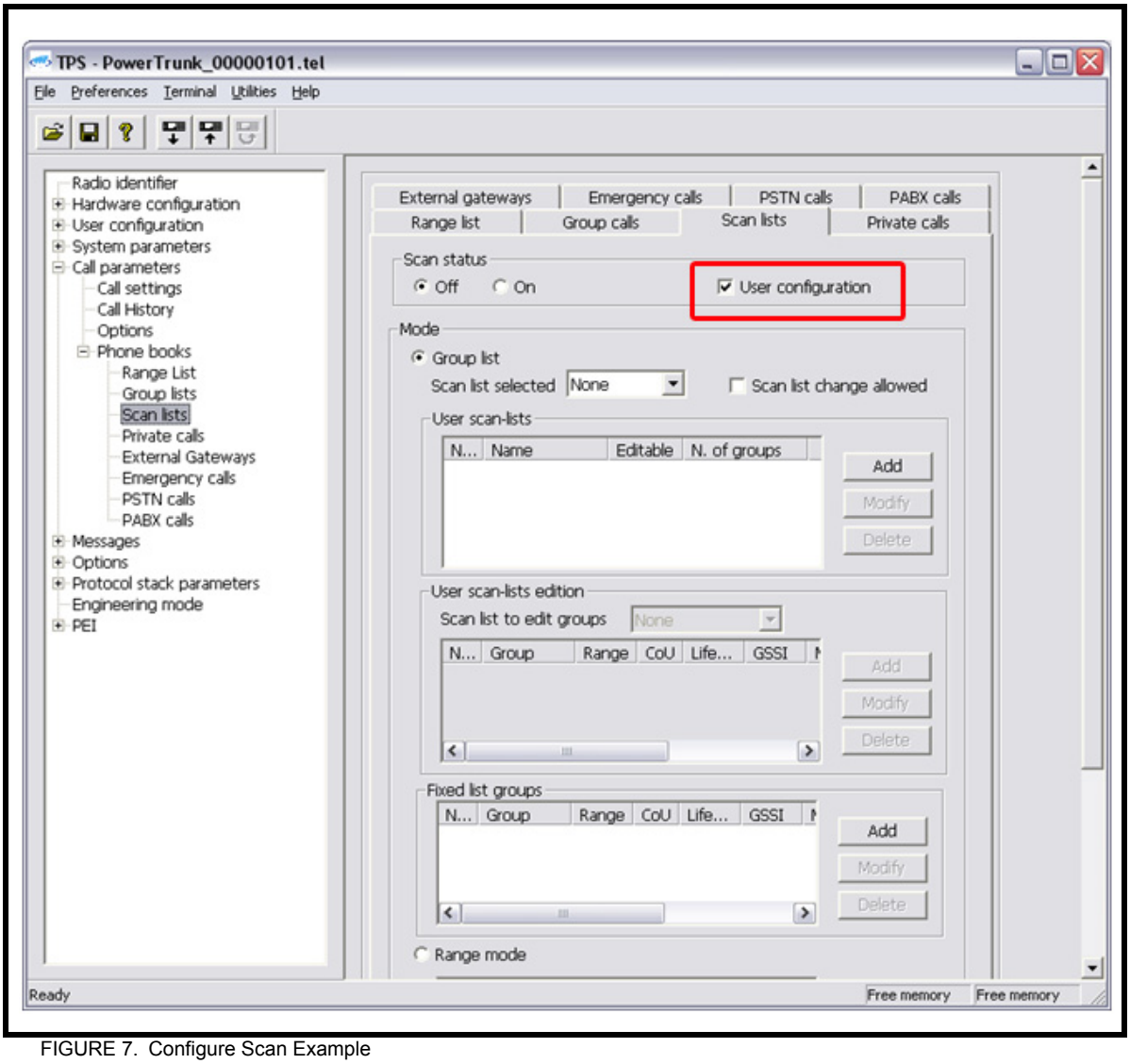

FIGURE 7. Configure Scan Example

5.0 Connecting the IP-223 and MDT-400

IP-223 and MDT radio cable assembly connection instructions follow.

5.1 Cable Connections Overview

The IP-223's DB-25 is connected to the MDTs remote control 26-pin auxiliary connector, routing audio and serial control from the IP-223 to the MDT.

The DB-25 can be connected to either Radio 1 or Radio 2 ports.

NOTE: If radio 2 is employed, a serial splitter cable must also be used for serial data connectivity, See "Cable Assembly Requirements" on page 6.

NOTE: DC power connections are not shown here.

5.2 IP-223 Front Panel Display

The IP-223 Front Panel display shows good serial connectivity with the MDT.

At boot up the IP-223 creates a serial link with the MDT terminal. If correctly configured and cabled, the IP-223 displays PT-TEL at the completion of this initial communication.

The IP-223 top row displays radio 1 information and the bottom row displays radio 2 information.

After the first IP-223 transmission, PT-TEL is cleared from the display and the indication reappears only when the IP-223 is rebooted.

6.0 Dispatch Console Options

The IP-223 works directly with all Telex IP-based consoles (IP-2002, IP-1616, C-6200, and C-Soft). All these consoles make the Telex TETRA air interface solution available to console operators. Radio functions offered by Telex IP-based consoles: group calls, HDPCs, and the UDSL, that have already been discussed.

7.0 Hardware Console Configuration

Console configuration is demonstrated in the following instructions using a Telex IP-2002 Radio Dispatch Console. The configuration recommendations also apply to the IP-1616 and C-6200 Radio Dispatch consoles; however, specific configuration windows vary depending on model.

NOTE: Console configuration is shown using the TSM application. Alternatively, the web browser configuration windows can be used to view the configuration and update all Telex IP-based consoles.

REFERENCE:

- For more information, see the Telex System Manager Technical Manual (P/N LIT000259000). This document is available for download at http://www.telex.com/us/dispatch/downloads/d.
- The Telex System Manager software is available for download at http://www.telex.com/us/dispatch/downloads/d.

7.1 Multicast Configuration

Multicast is used to configure the console to communicate with the IP-223. A standard Radio/TETRA configuration on line 1 is shown in Figure X.

To **configure the Multicast on the console**, do the following:

1. While in TSM, select the **Multicast** tab.
   The Multicast page appears.
2. Configure an **appropriate line** with the same Base IP Address as the IP-223 line connected to the TETRA terminal.
3. Configure the **line** with the same Multicast Addresses as the IP-223.
4. Configure the **line** with the same Multicast Port numbers, as the IP-223.

7.2 Per Line Function Tone Set Up

To configure the TETRA radio per line settings, do the following:

1. While in TSM, select the Per Line Setup tab.
   The Per Line page appears.
2. In the Channel (1 or 2) group box for the line, select the Generic radio button.
3. Click Configure.
   The Per Line page appears.
4. Click the Function Tone tab.
   The Function Tone page appears.
5. Select the Enable check box.
6. In the Alphanumeric field, enter a label for the function tones to correspond with those defined within the IP-223 (see Figure 2).

NOTE:

- Like the IP-223, the IP-2002 tone list can contain up to 100 separate function tone allocations, allowing various talk groups, HDPCs and UDSLs to be selected.

- The IP-1616 and C-6200 operate using 16 function tones and restricted to access only the first 16 tone allocations in the IP-223.

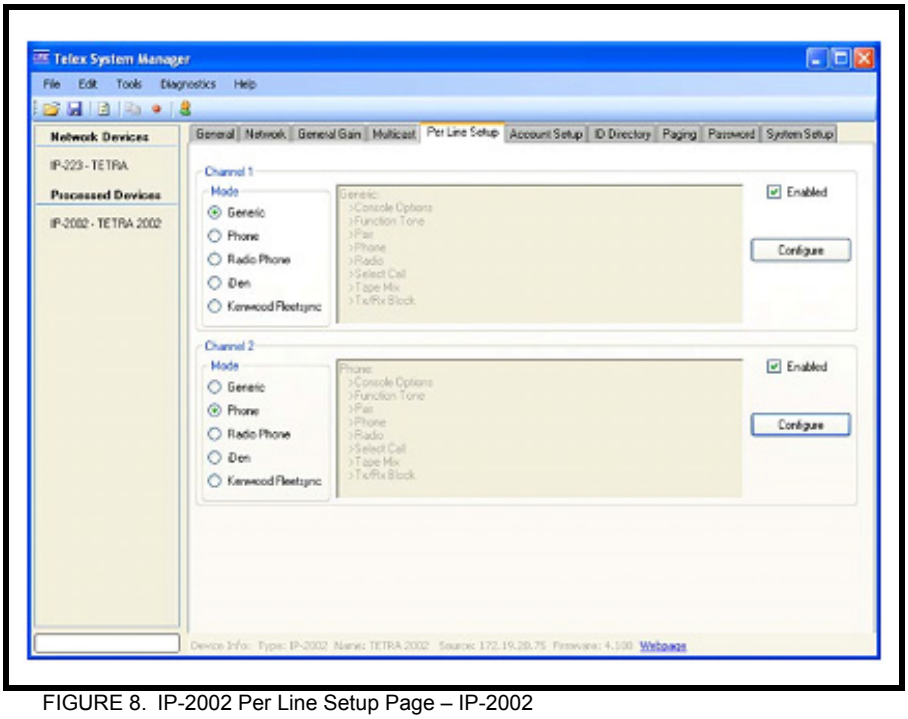

FIGURE 8. IP-2002 Per Line Setup Page – IP-2002

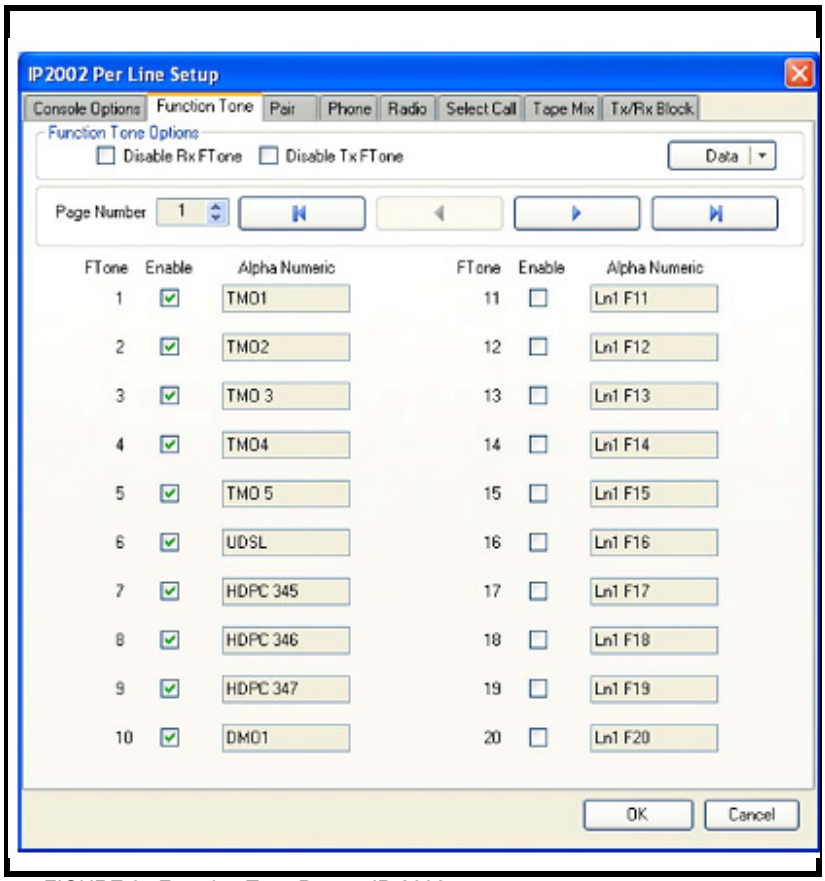

FIGURE 9. Function Tone Page – IP-2002

7.3 Making Calls

7.3.1 Trunked Group Calls, Direct Group Calls, or HDPC Group Calls

To **make a group call or an HDPC**, do the following:

1. From the console, press the **TETRA radio line's Select** button.
2. From the Call List (function tone list), select the **required function tone**.
3. Press a **PTT** button and wait for go-ahead tone.

NOTE:

- Go-ahead tones are generated by the connected terminal to indicate the call is set up and clear to send audio.
- Call activity time is a function of the TETRA knitwear. Group calls and HDPCs clear according to TETRA network parameters.

REFERENCE: Consult the terminal programming guide and TETRA network manager for a appropriate alarm activation.

8.0 C-Soft Console Configuration

8.1 Configure Per Line Parameters

The C-Soft Per Line Parameters window is used to configure C-Soft to IP-223 communication. Figure X illustrates the standard Radio/TETRA configuration for line 1.

To **configure C-Soft Per Line Parameters**, do the following:

NOTE: See "Multicast Configuration" on page 16

1. While in C-Soft Designer, select **Edit Setup Per Line Parameters**.
   The Per Line Parameters window appears.
2. Configure an **appropriate line** with the same Base IP Address as the IP-223 line connected to the TETRA terminal.
3. Configure the **line** with the same Multicast Addresses as the IP-223.
4. Configure the **line** with the same Multicast Port numbers as the IP-223

5. Click **Close**.

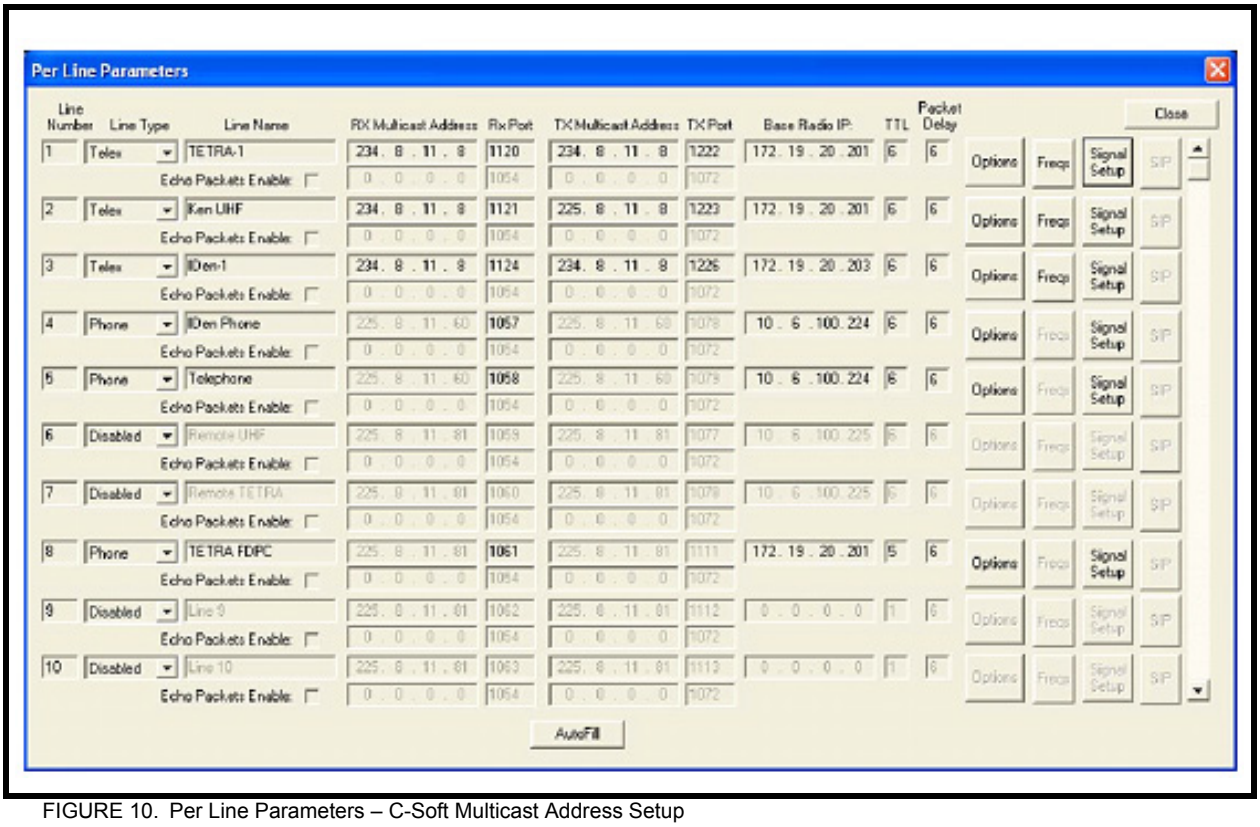

FIGURE 10. Per Line Parameters – C-Soft Multicast Address Setup

8.2 Configure Frequencies

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

1. Click the **Freqs** button for the TETRA radio line.
   The Frequency Parameters window appears.
2. Select **Enable** check boxes for each function tone.
3. Enter **labels** in the Frequency Names field to be associated with the IP-223's function tone allocation.
   The console operator is able to select the various call types defined within the IP-223 Per Line Setup.

NOTE: For more information, see "Configure Per Line Parameters" on page 18.

4. Click **Close**.

NOTE: The C-Soft frequency list has a maximum of 1000 entries, but only the first 100 in the IP-223 function tones/calls can be addressed.

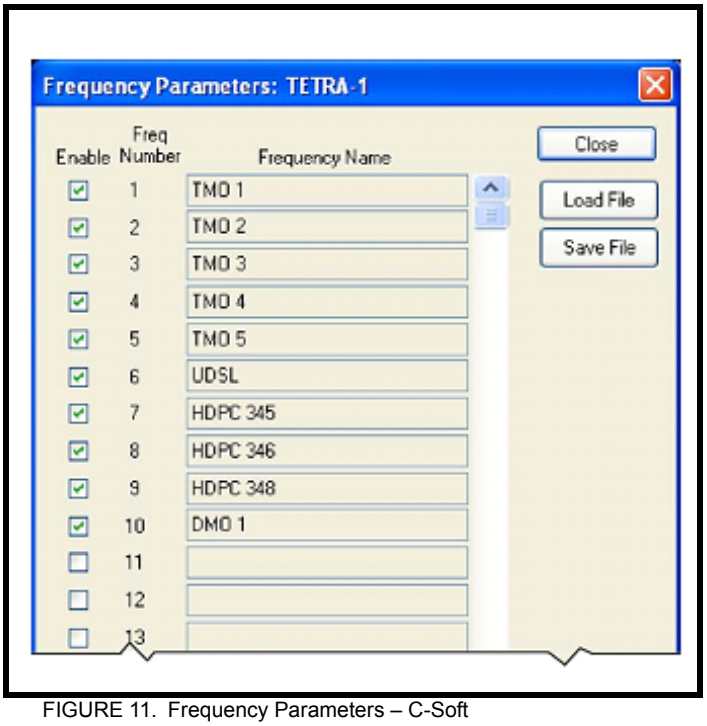

FIGURE 11. Frequency Parameters – C-Soft

8.3 General Signal Setup

To **configure the Signalling Parameters**, do the following:

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 5-6 Tone/DTMF ANI Setup tab appears.

3. Click the **5-6 Tone/DTMF ANI Setup** tab.
   The 5-6 tone/DTMF ANI Setup page appears.

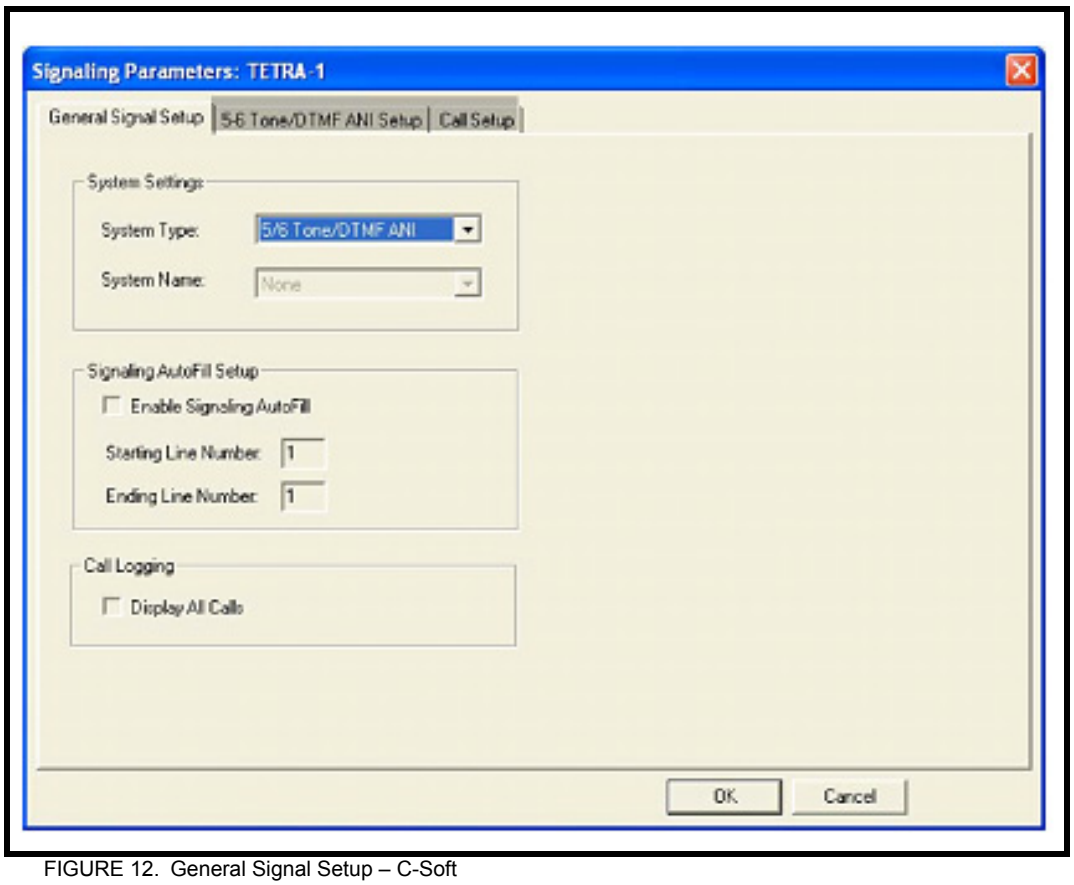

FIGURE 12. General Signal Setup – C-Soft

4. In the Unit ID field, enter the **8-digit unit ID of the TETRA terminal** connected to the associated IP-223.
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 drop down menu, select **Disabled**.
14. In the Initial Delay field, enter **0ms** (required).
15. In the End Delay field, enter **100ms**.

16. Click **OK**.

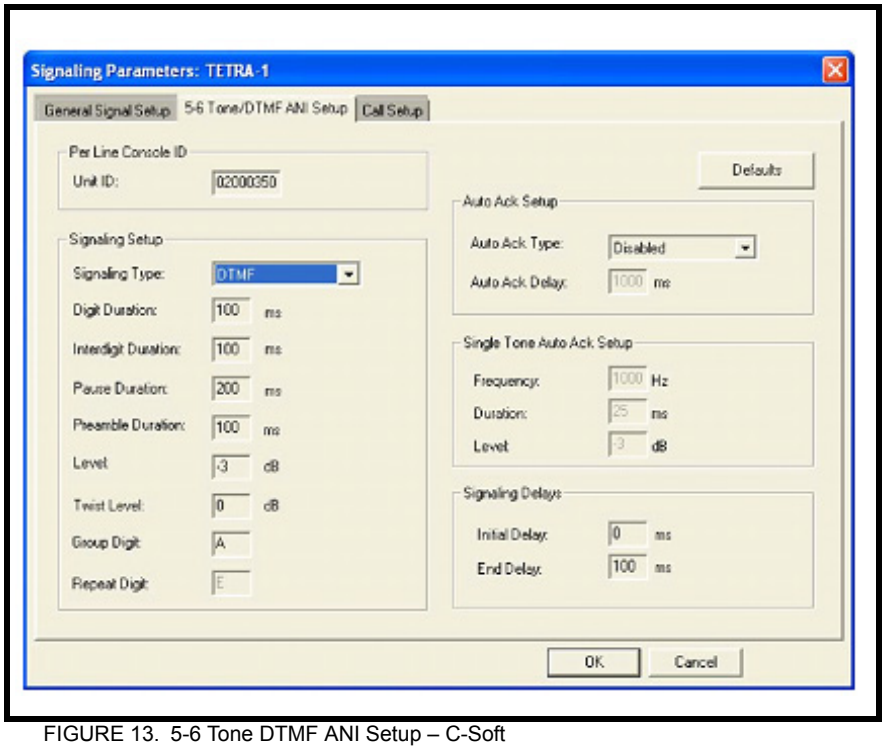

FIGURE 13. 5-6 Tone DTMF ANI Setup – C-Soft

8.4 HDPC Call Setup

The Call Setup Page, shown in Figure 14, is used to define a call setup button, creating an HDPC when associated to the TETRA Radio line. The button appears in the Call History, Manual Call List and Call List windows when the appropriate line is selected. When this button is activated, the K loads the contents of the User ID or Call List window and the D creates an HDPC.

To **set a single call setup button that can create an HDPC**, do the following:

1. From the Signaling Parameters page, click the **Call Setup** tab.
2. In the Call 1 field, enter **KD**.
3. In the Call 1 Label field, enter **HDPC**.

4. Click **OK**.

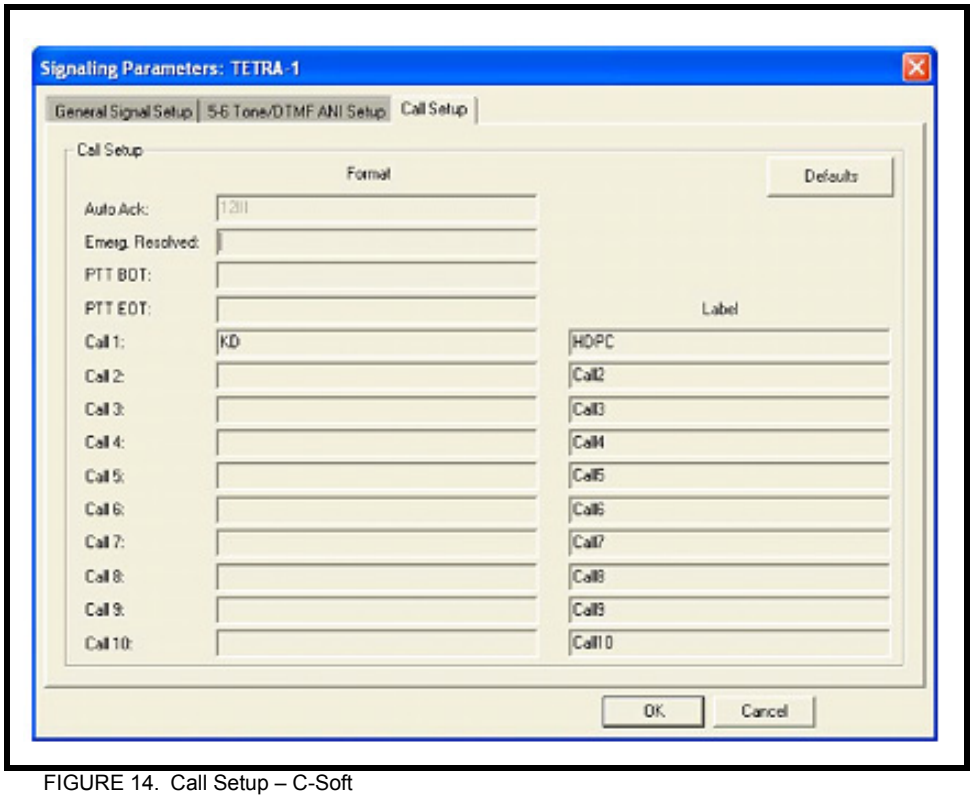

FIGURE 14. Call Setup – C-Soft

8.4.1 ID List

The C-Soft User ID List is used to translate IDs and aliases for ANI display and call history logging, in addition to forming the consoles call history logging, in addition to forming the consoles call directory.

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

1. From the menu bar, select **Edit|Edit User ID List** from the menu bar. *The User ID List window appears.*
2. In the Name field, enter an alias for the **User ID**.
3. In the User ID, enter the **ID number.**
4. In the Type drop down menu, select **Generic**.
5. Click **Close**.

NOTE:

- The list can contain up to 5000 entries.

- Shortened dialing can be used here, if specified within the attached TETRA radio, see Figure 15.

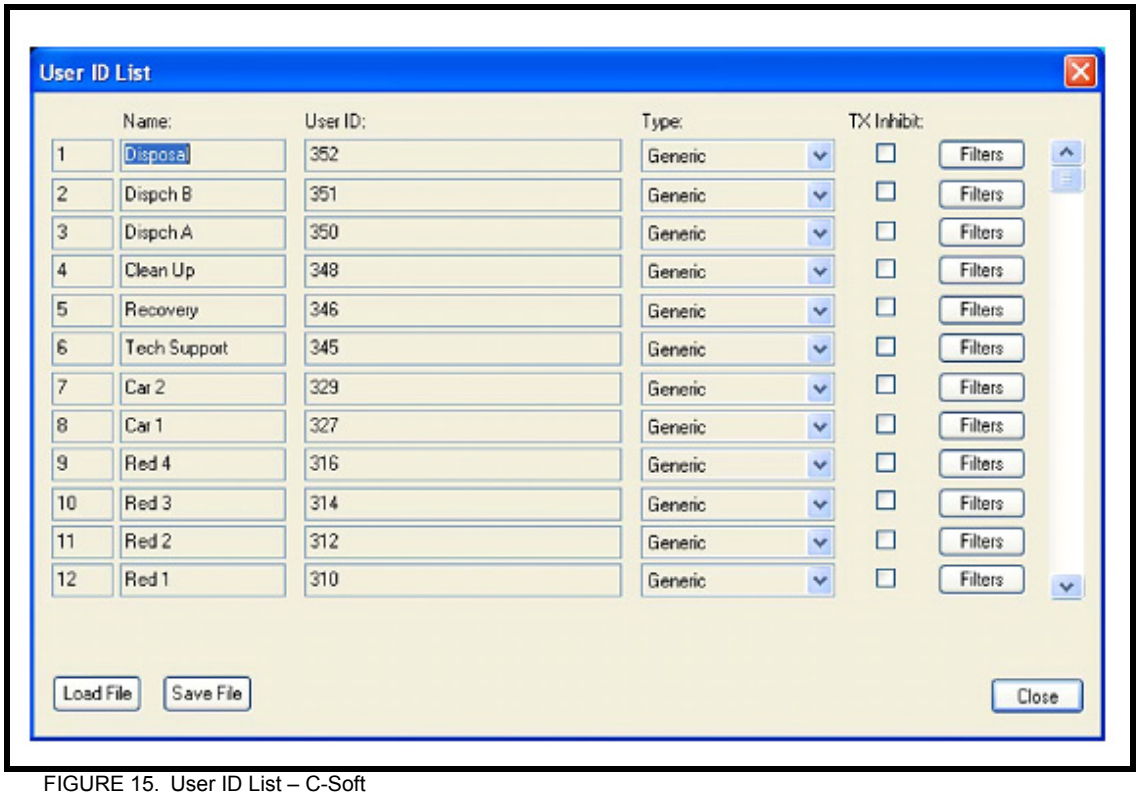

FIGURE 15. User ID List – C-Soft

8.5 Console Design Overview

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

The console example, shown in Figure 16, contains Per Line interface elements: select, mute, call history, frequency change, individual PTT and volume control.

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

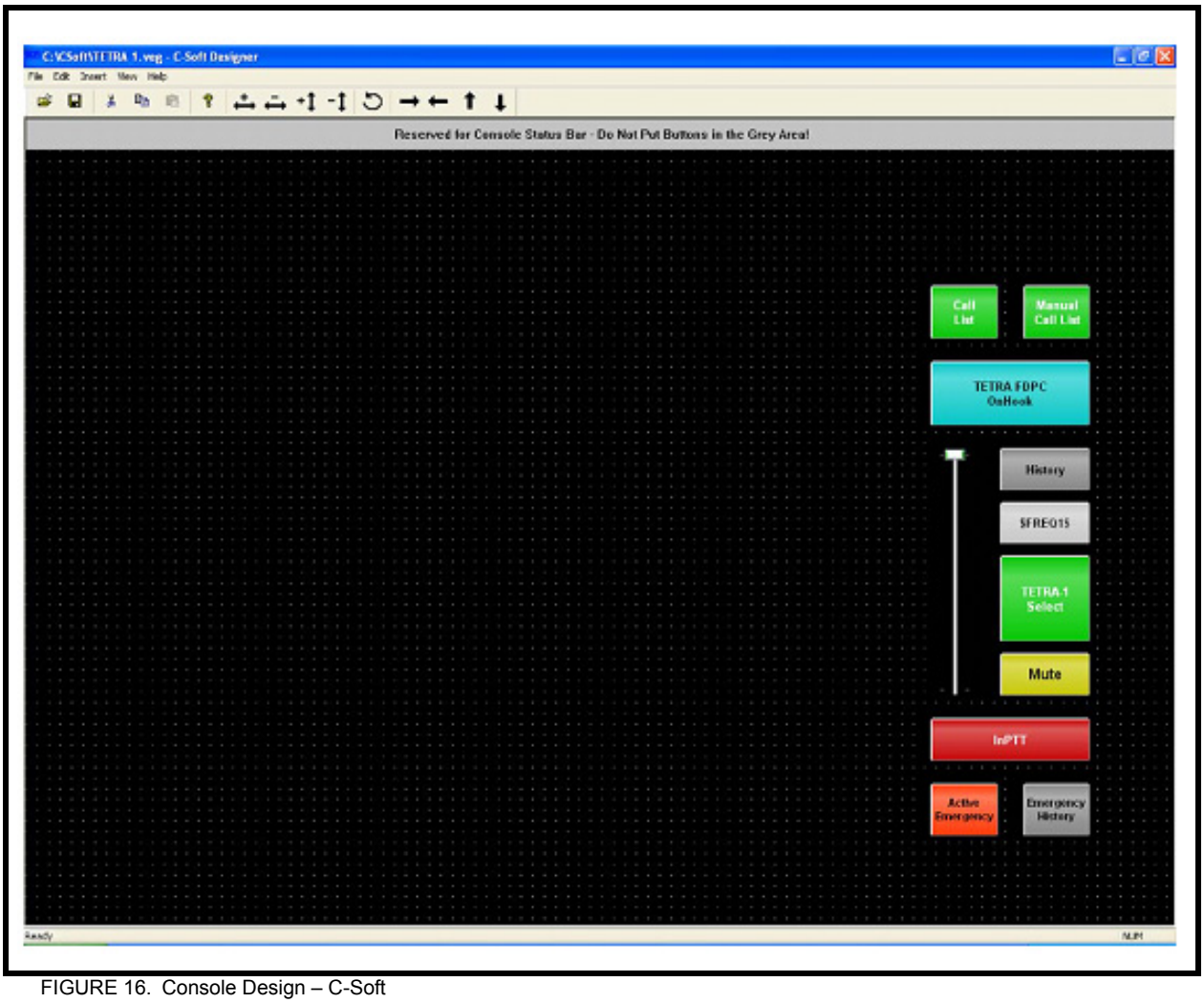

FIGURE 16. Console Design – C-Soft

8.6 Making Calls Overview

If scanning talk groups, the console operator can select the appropriate UDSL, using the frequency change pup-up button.

The console operator can replay to group calls, as they are received, using the PTT. No other frequency/channel/group selection is needed. Incoming calls are accompanied by ANI display (alias or ID of calling terminal) within the select button.

If call history windows are employed then calls are logged with an indication of: date, time, channel/frequency, calling ID, caller ID, and a status message (if present).

8.6.0.1 Make a Trunked Group Call, Direct Group Call, or HDPC Group Call

To **make a group call or HDPC**, do the following:

1. From the C-Soft console, click the **($freq1$)** button, (where $freq1$ is the default C-Soft button name or the user-defined name for the button).
   The frequency change pop-up window appears.
2. From the pop-up window, click the **required function tone**.
3. Select the **TETRA Radio line's Select** button.
   The line is Selected.
4. Click **PTT** to initiates a call.
   The call is in progress.

Figure 17 illustrates an example dispatch console. The Manual Call List and Call List are shown for completeness.

NOTE: These windows would generally be closed when not in use, and would not normally be present on the same screen simultaneously.

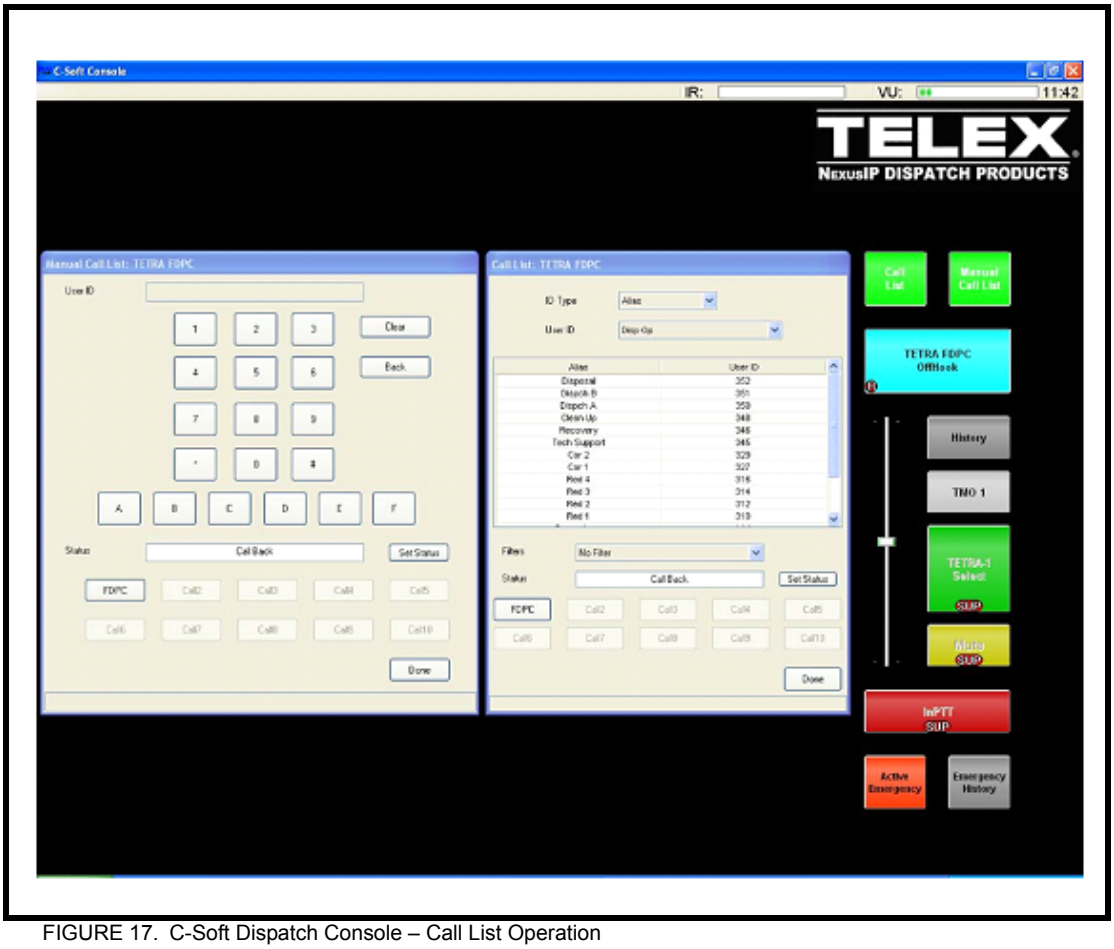

FIGURE 17. C-Soft Dispatch Console – Call List Operation

8.6.1 Manual Call List

The Manual Call List or the Call List can be used to make an HDPC.

To **make an HDPC from the Manual Call List or Call List**, do the following:

1. From the C-Soft console, click the **Manual Call List** button.
   The Manual Call List window appears.
   OR
   From the C-Soft console, click the **Call List** button.
   The Call List window appears.
2. Using the console's keyboard, enter a **number**.
3. Select the **TETRA Radio line**.
   The HDPC button, created earlier, appears in the window.
4. Click the **HDPC** button.
5. Listen for DTMF tones going out; once the tones are finished, click **PTT** to initiate the call.
   An HDPC is created.

NOTE: The Status field can be ignored because a status cannot be sent on a TETRA line.

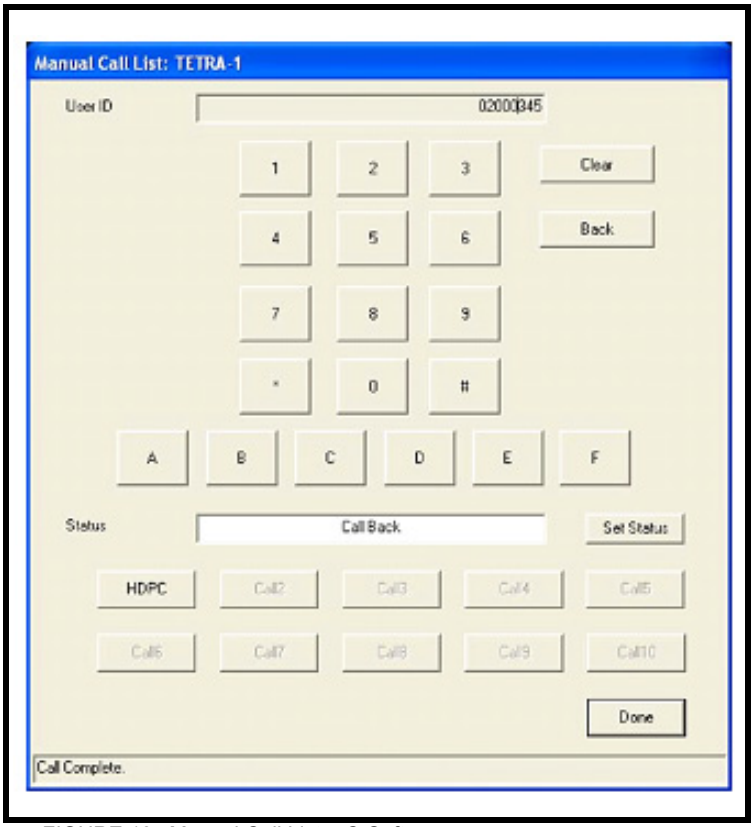

FIGURE 18. Manual Call List – C-Soft

9.0 Limitations of this Document

This application note is presented to advise an implementation strategy for Telex Dispatch solutions into TETRA networks. It does not supercede or replace the current Telex technical or user manuals, and should be used in conjunction with those manuals. Consult the relevant PowerTrunk terminal interface device.

See advice from the local TETRA network manager, regarding the functions and services available to your PowerTrunk terminal interface device.

Notes:

Revision History		
Document Title: TETRA Dispatch Solutions user PowerTrunk Terminal Interface		
Document Number: AN-DISPATCH-051		
Revision	**Change Description**	**Date**
A	Initial Release	04-04-2014

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

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