TELEX
RADIO DISPATCH PRODUCTS

Application Guide

Kenwood Radio Series
TK-x80, -x90, -x150, and -x180
to IP-224 Remote Adapter Panel

VOIProven

TELEX
Radio Dispatch

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Claims

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Warning

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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

This application note is intended to assist technical staff with the creation of an IP-224 interface to the Kenwood TK-x80, TK-x90, TK-x150, and TK-x180 series radios.

2.0 Hardware Requirements

- IP-224 Ethernet Adapter Panel (P/N F.01U.306.547)
- IP-224 to Kenwood TK-X150/X180, 5X10 and NXDN Radios Cable (P/N F.01U.165.540)
- IP-224 to Kenwood TK-X90 Cable (P/N F.01U.165.541)
- Kenwood TK-x80, TK-x90, TK-x150, or TK-x180 series radios

3.0 Software Requirements

- C-Soft version 6.500 or later
- IP-224 version 2.300 or later
- Telex System Manager (TSM) 2.300 or later
- Windows 7 (32-bit or 64-bit)
- Windows 8.1

4.0 Supported Features

TK-x80, -x150, and -x180 Supported Features			
Feature	**Analog Support**	**Feature**	**Analog Support**
Channel/Talkgroup	Yes	Emergency Acknowledgement	No
Zone Change	No	Encryption On/Off	Yes
		GPS Read	No
Group Call	Yes	GPS Trigger On/Off	No
Private Call	Yes	Monitor On/Off	Yes
		Radio Call Alert	No
ANI Decode	Yes	Radio Check	No
Emergency Decode	Yes	Radio Enable/Disable	Yes
Status Message Decode	Yes	Radio Select Call	Yes
Text Message Decode	No	Radio Remote Monitor	No
		Radio Send Text Message	No
Query Encryption	Yes	Radio Status (Send Status Message)	Yes
Query Monitor	Yes	Radio Status Request	Yes
Query Scan	Yes	Scan Add/Delete	Yes
Query Talk Around	Yes	Scan On/Off	Yes
		Talk Around On/Off	Yes

TK-x90 Supported Features			
Feature	**Analog Support**	**Feature**	**Analog Support**
Channel/Talkgroup	Yes	Emergency Acknowledgement	No
Zone Change	No	Encryption On/Off	Yes
		GPS Read	No
Group Call	No	GPS Trigger On/Off	No
Private Call	No	Monitor On/Off	Yes
		Radio Call Alert	No
ANI Decode	No	Radio Check	No
Emergency Decode	No	Radio Enable/Disable	No
Status Message Decode	No	Radio Select Call	No
Text Message Decode	No	Radio Remote Monitor	No
		Radio Send Text Message	No
Query Encryption	No	Radio Status (Send Status Message)	No
Query Monitor	No	Radio Status Request	No
Query Scan	No	Scan Add/Delete	Yes
Query Talk Around	No	Scan On/Off	Yes
		Talk Around On/Off	Yes

5.0 Cable Diagram

5.1 TK-x80 Model Cable Assembly

IP-224 to TK-x80 audio and serial cable connections. This cable is manufactured from a Kenwood KCT-19 accessory cable.

Signal	IP-224 DB-37	KCT-19 Accessory Connector
Ground	29	6
PTT Common	5	6
PTT	24	8
COR	15	11
RX+	20	12
TX+	1	5
TXD	17	14
RXD	36	15

5.2 TK-x90 Model Cable Assembly

IP-224 to TK-x90 audio and serial cable connections.

Signal	IP-224 DB-37	TK-x90 Radio DB-25
Ground	29	7
PTT Common	5	7
PTT	24	2 Aux Input (Programmable)
COR	15	20 AOI (Programmable)
RX+	20	17
TX+	1	13
TXD	17	10
RXD	36	9

5.3 TK-x150/-x180 Model Cable Assembly

IP-224 to TK-x150/-x180 audio and serial cable connections.

Signal	IP-224 DB-37	TK-XXXX Radio DB-25[a]
Ground	29	7
PTT Common	5	7
PTT	24	12 Aux Input 4 (Programmable)
COR	15	20 Aux Output 1 (Programmable)
RX+	20	17
TX+	1	6
TXD	17	2
RXD	36	3

a. There are differences between the TK-x150 and TK-x180 radio's DB-25 connectors:

- If COR is used, then pin 20 (TK-x150 an output only) is programmed for that function and the cable routes that signal to the IP-224.
- On the TK-x180 the same pin is a general purpose I/O and has an additional 470 Ohm series resistance added. Therefore, the IP-224 internal pull-up voltage must be removed. The Auto Configuration feature will adjust hardware settings accordingly.

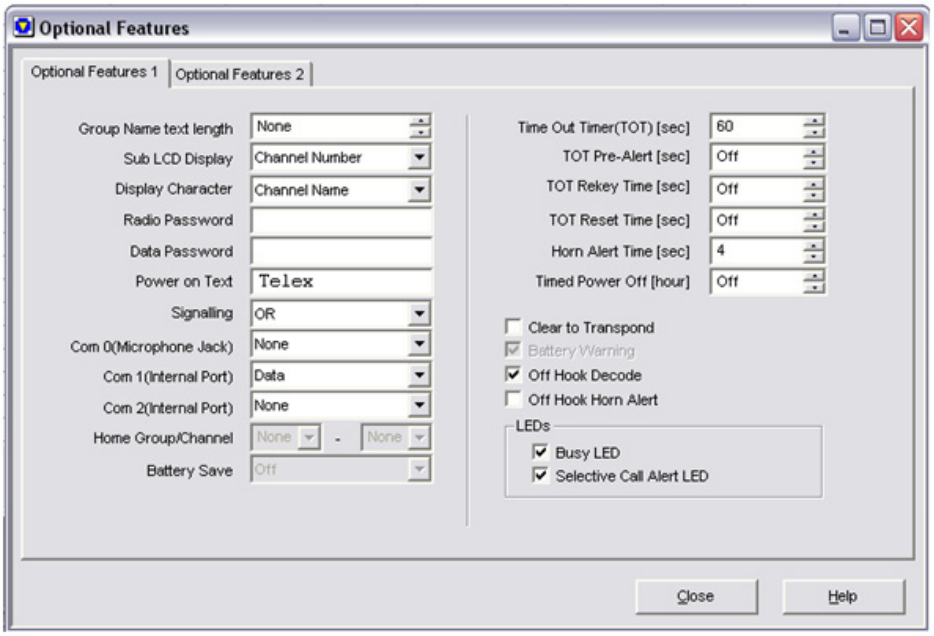
6.0 Radio Setup

6.1 TK-x80 Series Radio Configuration

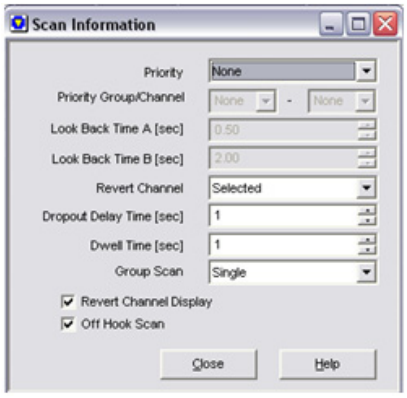
6.1.1 TK-x80 Series Radio Programming

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

1. From the **Com 1(Internal Port)** drop down menu, select **Data**.



2. Configure the **Scan Information window** to set up the scan functionality.



6.1.2 TK-x80 Series Radio Hardware Modifications

To **modify the radio settings**, do the following:

1. Move **R94 to R24 position**

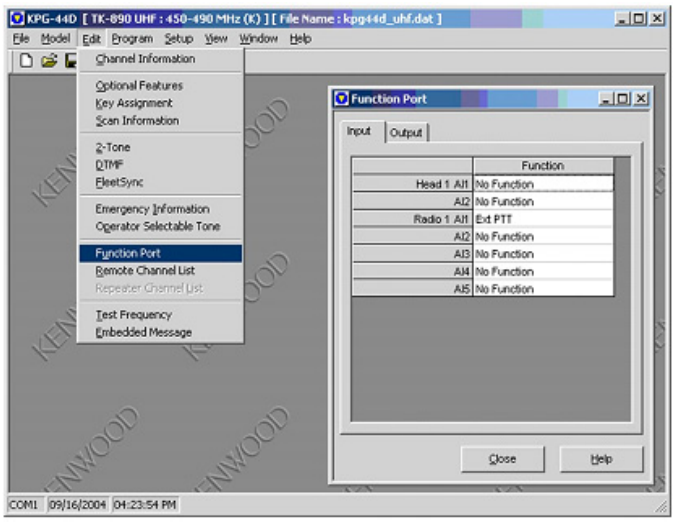
NOTE: For more information, see the Kenwood TK-80 series manual, section 1.3.

6.2 TK-x90 Series Radio Configuration

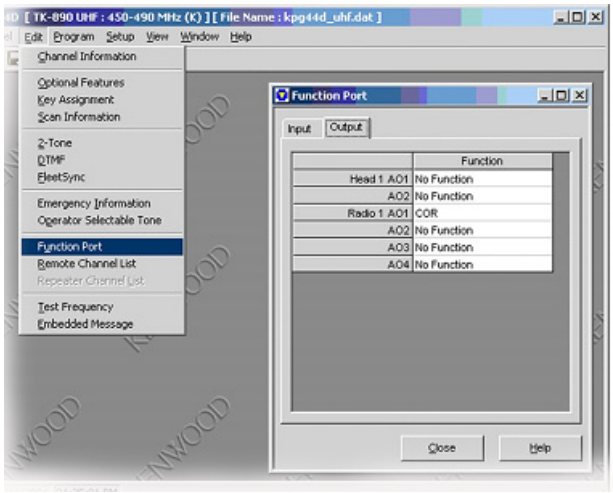
6.2.1 TK-x90 Series Radio Programming

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

1. From the edit menu, select **Function Port**.
   The Function Port window appears.
2. Verify the **Input tab** is open.
3. In the Radio 1 AI1 field, enter **Ext PTT**.



4. Click the **Output tab**.
5. In the Radio 1 AO1 field, enter **COR**.



6.2.2 TK-x90 Series Radio Hardware Modifications

The radio ships with pin 13 in DATA. The internal configuration for pin 13 must be modified.

To **modify the radio settings for pin 13**, do the following:

1. Set **pin 13 by relocating R641 to R640 for mic signal input**.

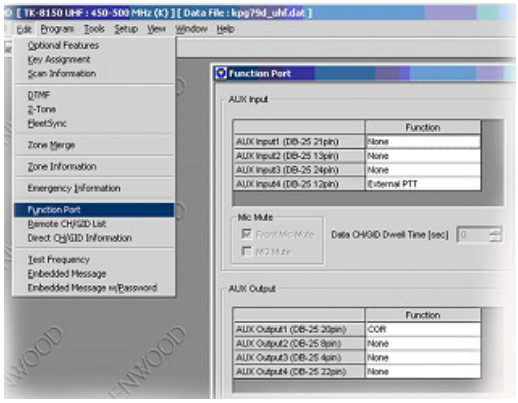
NOTE: For more information, see the manufacturer's technical manual Accessory Terminal Function section (R640 R641 Function).

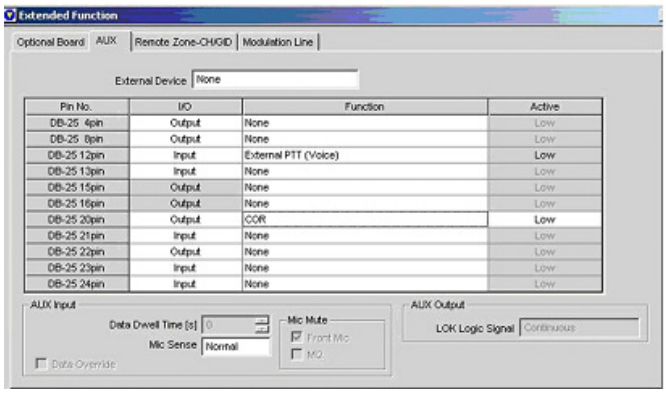
6.3 TK-x150/-x180 Series Radio Configuration

6.3.1 TK-x150/-x180 Series Radio Programming

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

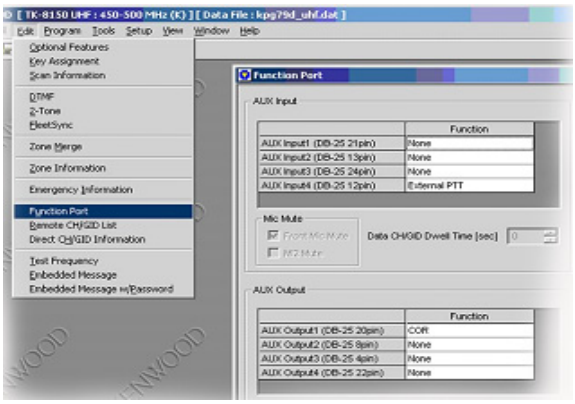
1. From the edit menu, select **Port Function**.
   The Function Port window appears.
2. Using the screen shot below, program the **Function Port**.





NOTE: For the TK-x180, the AUX programming window is different. The same interface cable is used for both the TK-x150 and the TK-x180 radios.

3. From the **Com 1** drop down menu, select **Data**



7.0 IP-224 Setup

These configuration instructions use **TSM** (Telex System Manager) to configure the IP-224; however the IP-224 can also be configured using web browser configuration windows. The TSM application and manual can be downloaded at http://www.telex.com/us/dispatch/downloads or is included on the product CD received with the IP-224

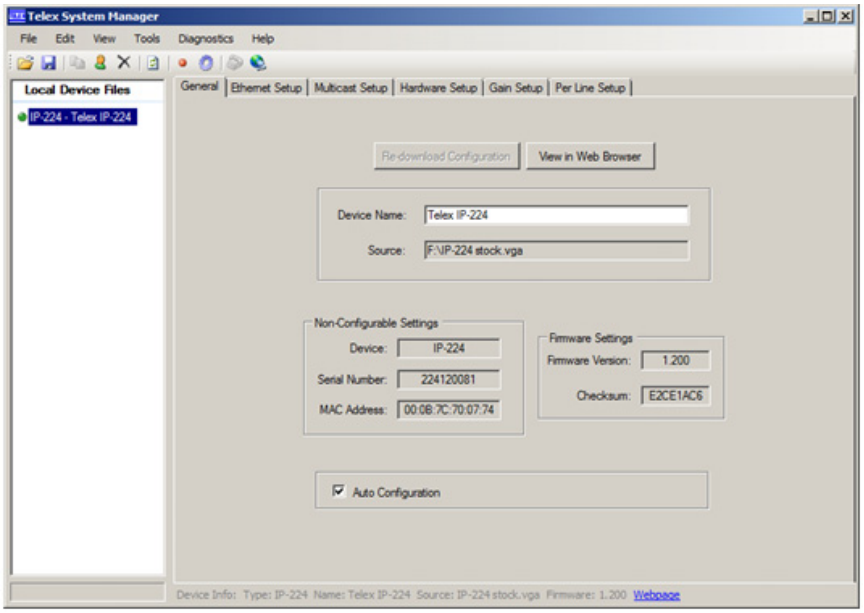
With the IP-224 attached to the network and powered up, login and read the settings from the desired unit using TSM.

7.1 Setting for Auto Configuration

The **General** page is used to view basic information about the IP-224 and turn on or off the Auto Configuration feature in the unit.

To **configure the Auto Configuration**, do the following:

1. From TSM, click the **General tab**.
   The General page appears.
2. Select the **Auto Configuration check box**.

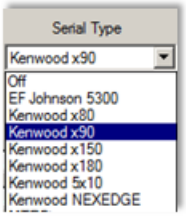


7.2 Multicast Configuration

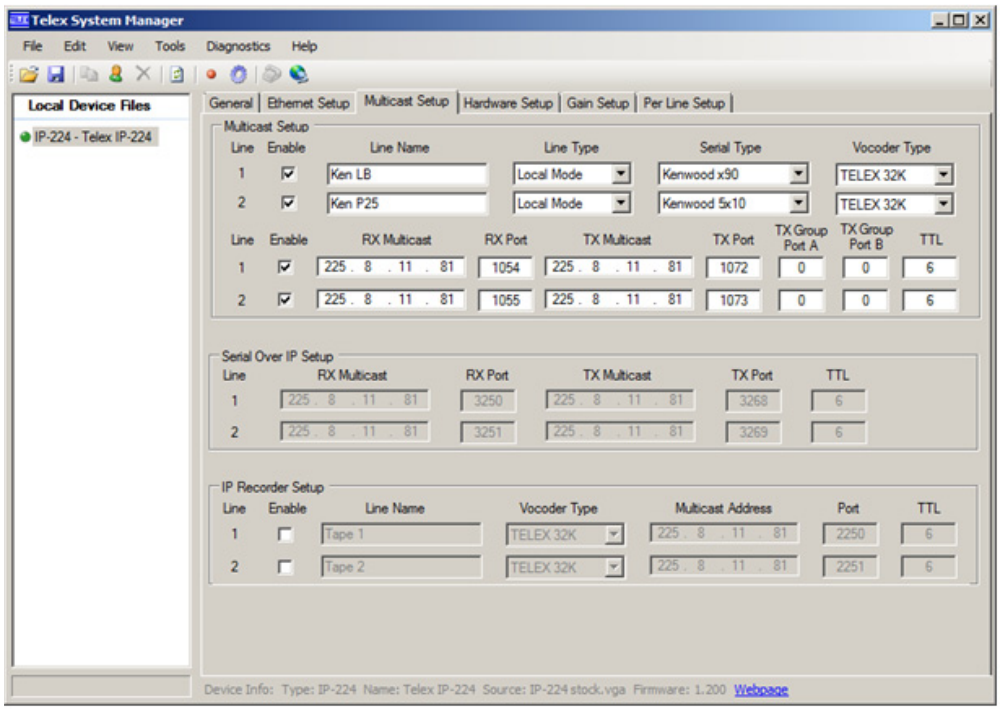
The **Multicast** page is used to configure the Line Type, Serial Type, Multicast Addresses, and Multicast Port numbers.

To **configure Multicast settings**, do the following:

1. From TSM, click the **Multicast Setup tab**.
   The Multicast page appears.
2. Select the **Enable check box** for the lines you are configuring.
3. In the Line Name field, enter a **name (up to 9 characters)** for the line you are configuring.
4. From the Line Type drop down menu, select **Local Mode**.
5. From the Serial Type drop down menu, select the **appropriate Kenwood radio series** you are configuring.



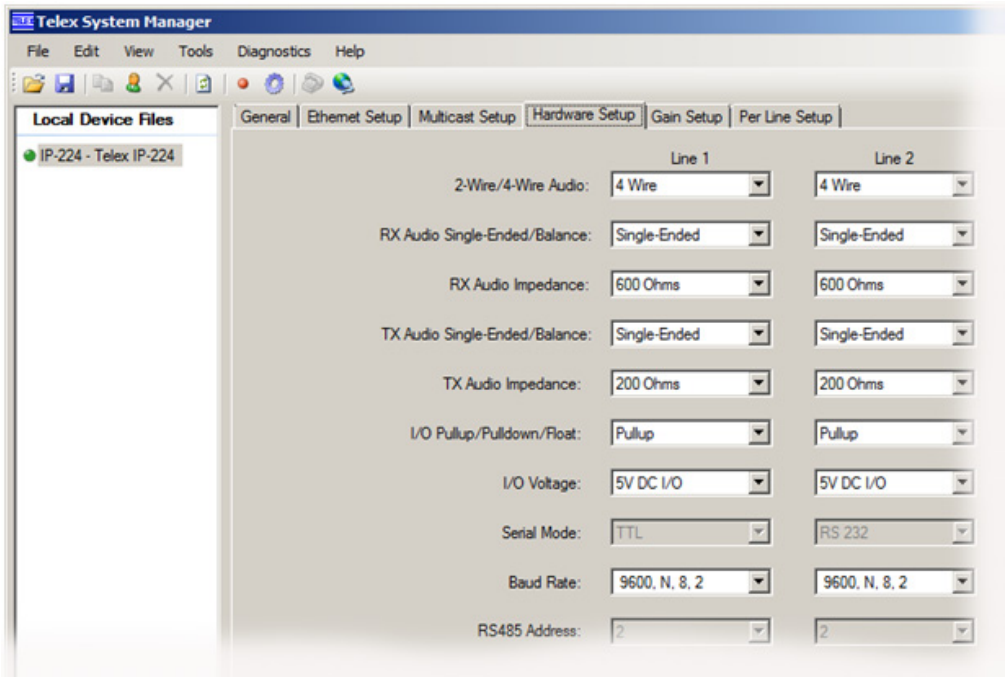
6. Configure the **correct Multicast Addresses and Multicast Port numbers** to match your system layout.



7.3 Hardware Configuration

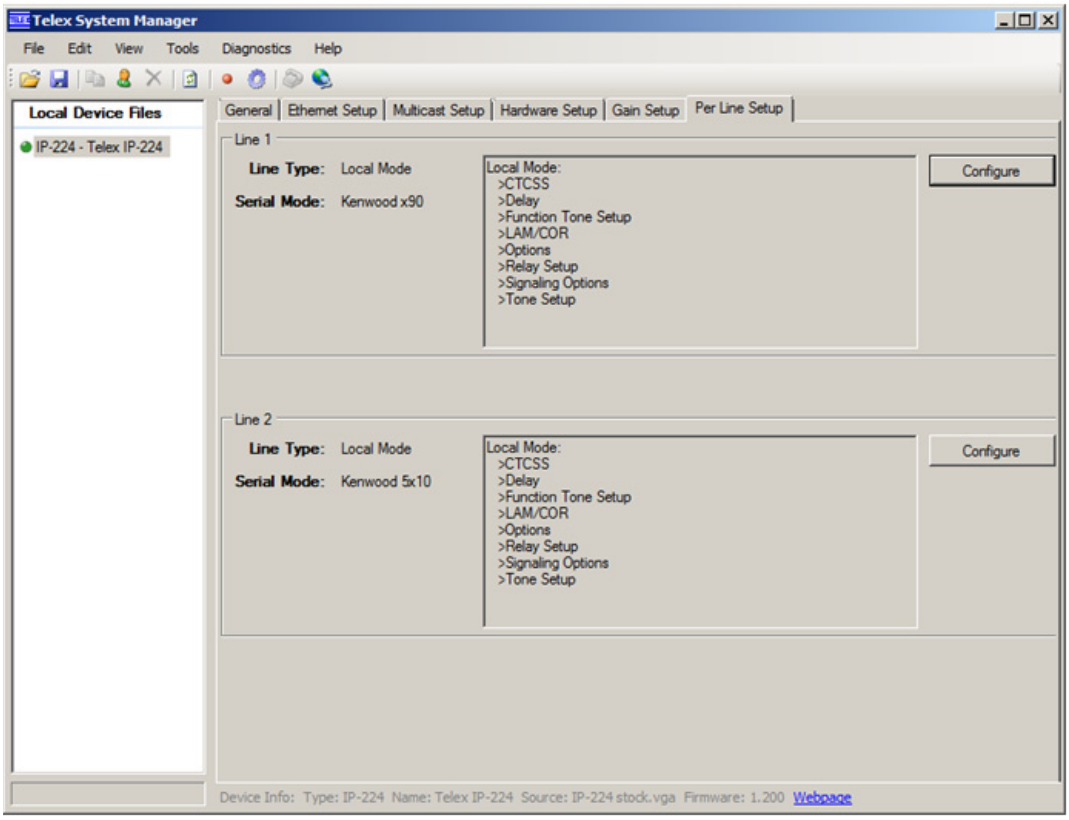
The **Hardware Setup** page is used to configure the Line I/O connector. Because the Auto Configuration is enabled on the General page, all I/O settings have been configured as needed to control the Kenwood radio selected by the Serial Type drop down menu on the Multicast Setup page.

NOTE: No additional steps are required on this page.



7.4 Per Line Configuration

The **Per Line Setup** page is used to view Line Type and Serial Mode. The Configure buttons allow entry to the individual line's configuration page.



7.4.1 Per Line Function Tone Configuration

The **Function Tone** page is used to enable function tones and configure what System/Zone and Channel information should be serially sent to the radio.

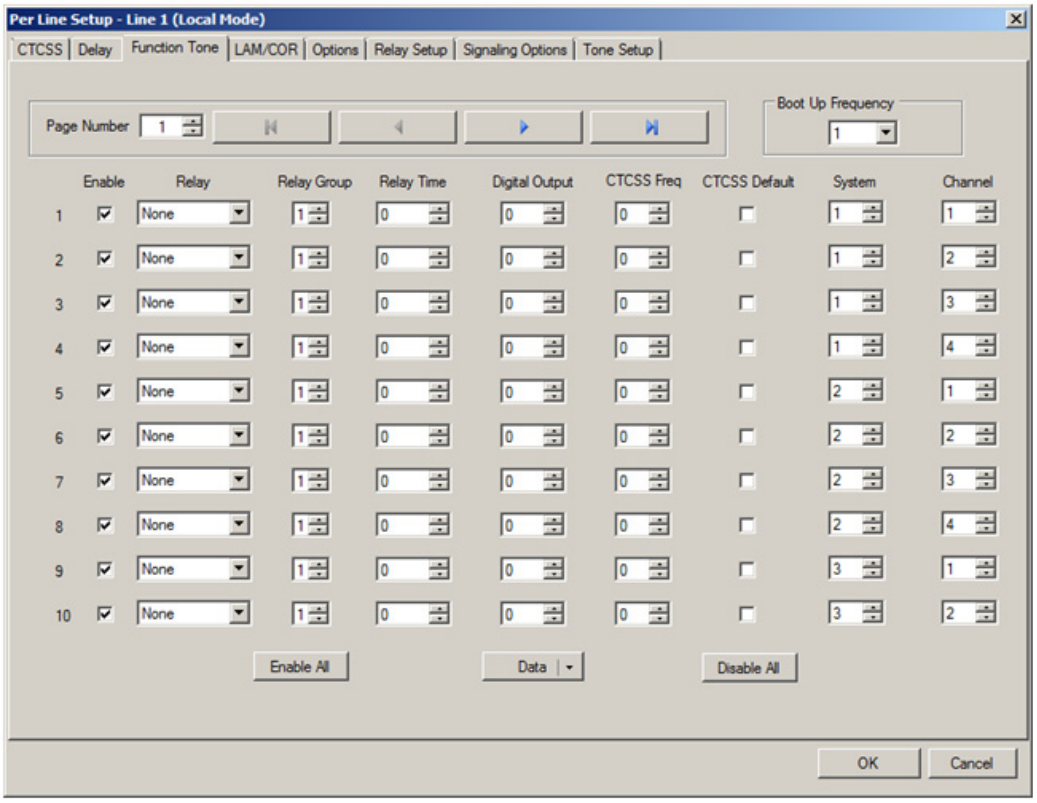
To **configure the Per Line Function Tone**, do the following:

1. From TSM, click the **Function Tone tab**.
   The Function Tone page appears.
2. Select the **Enable check box** for all channels to be accessed by the IP-224.

NOTE: Each page supports *10 channels*. There are 100 pages to support 1000 channels.

3. Program the **System and Channel information**.
   This information should correspond with the radio programming.

NOTE: The example shown indicates function tones 1 through 4 are mapped to system 1 channels 1–4, function tones 5 through 8 are mapped to system 2 channels 1–4 and function tones 9–10 to system 3 channels 1–2, respectively.



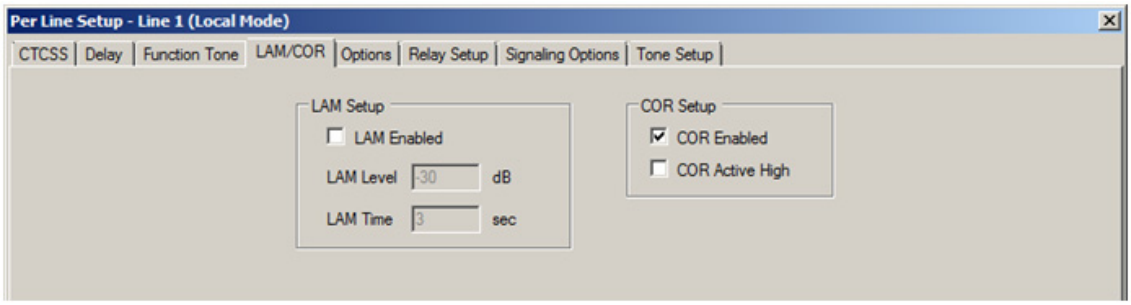
7.4.2 LAM/COR Configuration

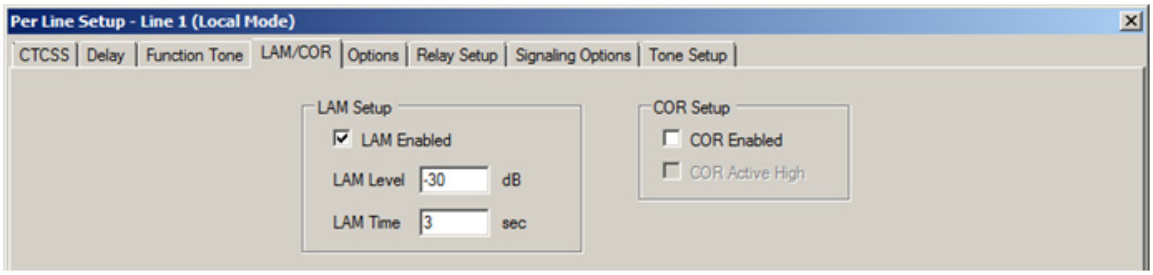
The **LAM/COR** page is used to configure the COR and LAM (VOX) operation. COR is the preferred method for generating RX packets, but when the radio is configured for a trunking format and go-ahead tones need to be heard at dispatch, LAM is the only alternative.

To **configure COR or LAM settings**, do the following:

1. Select the **LAM/COR tab**.
   The LAM/COR page appears.
2. Select the **COR Enabled check box**.
   OR
   Select the **LAM Enabled check box**.

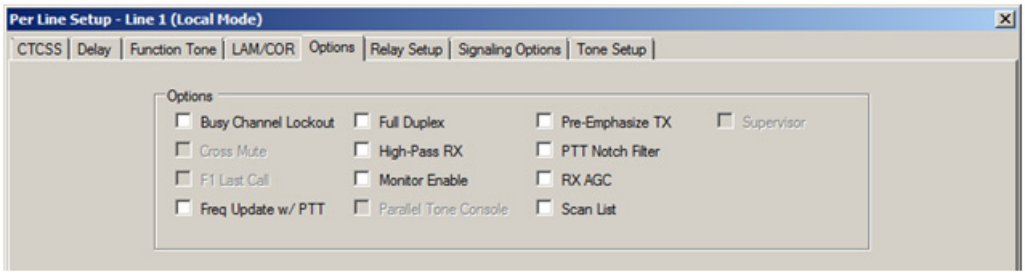
NOTE: Selecting both options creates an AND function, both COR and LAM would need to be achieved before RX packets would be sent to IP Consoles.





7.4.3 Options Configuration

The **Options** page is used to configure the various options supported by the radio type.



Freq Update w/PTT Check Box

If selected, the **Freq Update w/PTT** check box forces a channel change with each PTT.

NOTE: Otherwise, channel changes occur only when the incoming channel is different than the previous channel.

Full Duplex Check Box

If selected, the **Full Duplex** check box allows full-duplex (simultaneous TX and RX transmission) audio.

NOTE: COR settings can affect Full-Duplex operation. Trunked radio systems with go-ahead beeps typically require COR to be turned off.

Hi-Pass RX Check Box

If selected, the **Hi-Pass RX** check box enables a 300 Hz Hi-Pass filter for the RX audio.

Monitor Enable Check Box

If selected, the **Monitor Enable** check box allows serial monitor commands to be sent to the radio.

Pre-Emphasize TX Check Box

If selected, the **Pre-emphasize TX** check box enables a 6dB octave pre-emphasis filter for the TX audio.

PTT Notch Filter Check Box

If selected, the **PTT Notch Filter** check box enables a PTT notch filter to filter the PTT frequency from the RX audio.

Scan List

If selected, the **Scan List** check box indicates C-Soft's scan list is synchronized with the radio's scan list.

NOTE: All models can be used in scan mode, but the TK-x90 does not pass the active channel number back to the console.

7.5 Gain Configuration

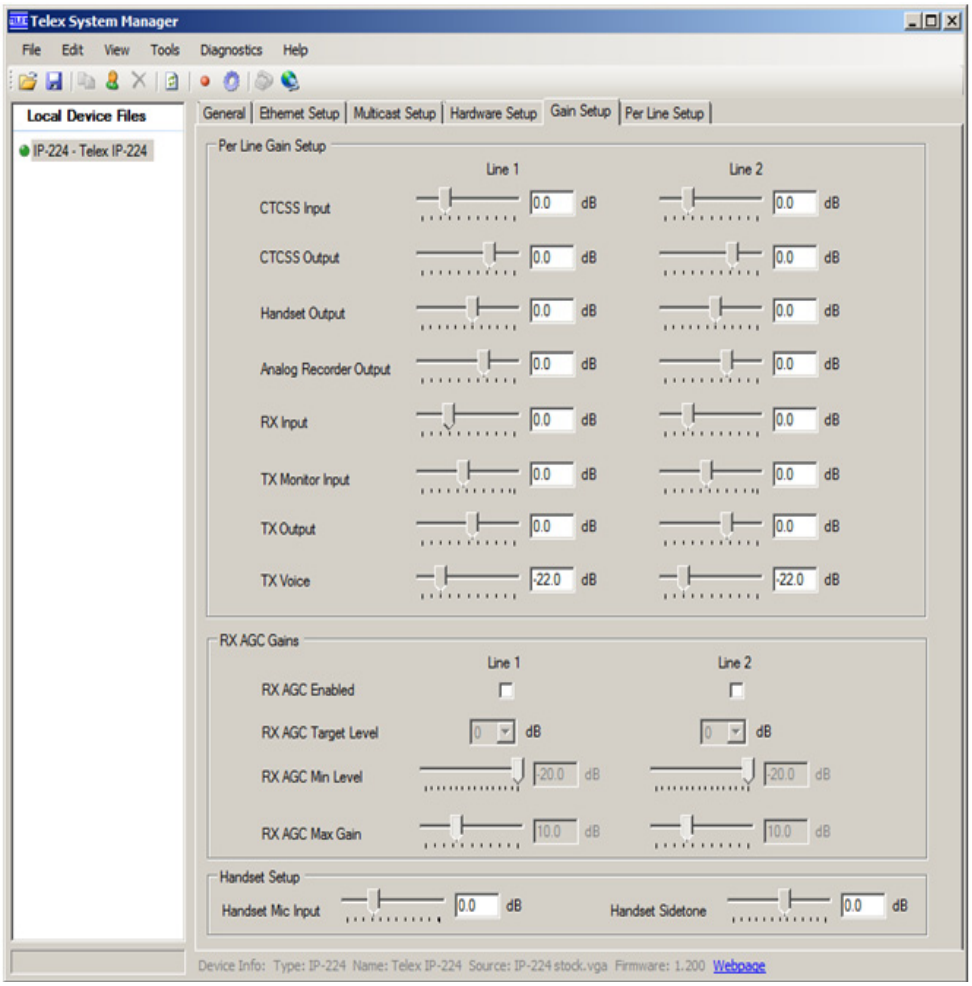
The **Gain Setup** page is used to configure the input and output audio levels for line 1 and line 2 I/O ports.

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

1. Open **TSM**.
2. Click the **Gain Setup tab**.
   The Per Line Gain Setup page appears.
3. Configure the **RX Input Gain slider to 0dB** for the line(s) to configure.
4. Configure the **TX Output Gain slider to -25dB** for the line(s) to configure.

NOTE: Fine tuning of these gain stages may be required once the system is deployed.

5. Record **updated configuration** to the IP-224.



Notes:

Suggestions or comments:
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