TELEX Application Note

Motorola MOTOTRBO Mobile Radios to IP-223 Series Adapter Panels

VOIProven TELEX Radio Dispatch

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Motorola MOTOTRBO Mobile Radios to IP-223 Series Adapter Panels

1.0 General

This application guide is intended to illustrate integration of a MOTOTRBO mobile radio into a Telex dispatch system, using an IP-223 remote adapter panel.

The MOTOTRBO interface provides the console operator with up to 15 channels and front panel control.

The application note covers MOTOTRBO radio and IP-223 hardware connections, IP-223 software settings, and MOTOTRBO radio configuration and console configuration for channel change control.

NOTE: The following instructions use a Motorola**[1] model XPR 4550 and an IP-223. Reference to MOTOTRBO or XPR includes models: XPR 4300, XPR 4350, XPR 4500 and the XPR 4550 (firmware version R01)

2.0 Interconnect Cable Assembly

A cable assembly is required to connect the XPR to the IP-223. Connect the cable via the IP-223's relevant DB-25 port (no serial control is required). The XPR connection, the 26 pin **MAP** (Mobile Accessory Port), is located on the back of the unit.

The pin out connectivity is shown in Table 1.

TABLE 1. Interface Cable Assembly

XPR MAP	IP-223 DB-25	Function
11	25	TX Audio
12	7	Audio Ground
14	24	RX Audio
16	2	PTT Relay Common
17	14	PTT Relay Normally Open
18	18	IP-223 Relay 2 Normally Closed
20	8	Digital IO 0
21	9	Digital IO 2
22	21	Digital IO 1

1.See "Copyright Notice" on page 15.

TABLE 1. Interface Cable Assembly

XPR MAP	IP-223 DB-25	Function
24	22	Digital IO 3
	19	Relay 2 Common Short to Pin 20
	20	COR, Short to Pin 19

3.0 XPR Configuration

The XPR accessory GPIO pins must be configured in MOTOTRBO's programming software in order for the IP-223 control. See Figure 1.

To **set the GPIO physical pins**, do the following:

1. Open the **MOTOTRBO customer programming software** for the radio to configure.
2. From the left navigation pane, select **Accessories**.
   The Accessories window appears.
3. From the RX Audio Type drop down menu, select **Flat Unsquelch**.
   With no squelch on the receive path, channel noise is passed directly to the IP-223.
4. Use the GPIO Physical Pin configurations in Table 2 to set the:
   - Feature drop down menu.
   - Active Level drop down menu.
   - Debounce check boxes.
5. The **LAM** (Line Activity Monitor) must be set to prevent noise from reaching the console. See "IP-223 Options Setup" on page 11.

NOTE: Pin 26 is not used in our implementation.

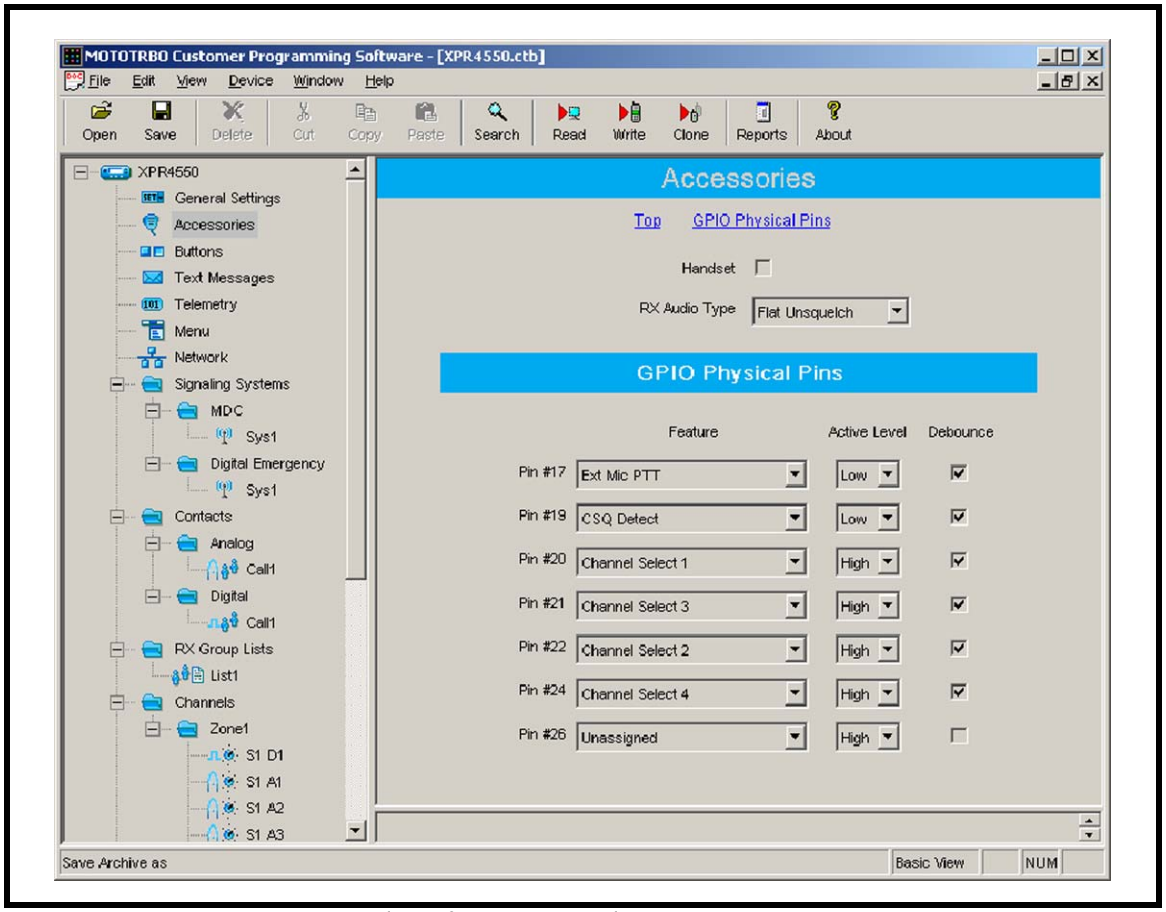

FIGURE 1. MOTOTRBO Programming Software—Accessories Setup

The following table duplicates the configuration shown in Figure 1 and is provided for reference.

TABLE 2. GPIO Physical Pin Configuration

Pin Number	Feature Drop Down Menu	Active Level Drop Down Menu	Debounce Check Box
17	Ext Mic PTT	Low	Select
19	CSQ Detect	Low	Select
20	Channel Select 1	High	Select
21	Channel Select 3	High	Select
22	Channel Select 2	High	Select
24	Channel Select 4	High	Select
26	Unassigned	High	Clear

4.0 IP-223 Jumper Setup

The IP-223 requires jumper settings, software configuration and audio alignment. Tasks specific to the MOTOTRBO configuration are discussed.

REFERENCE: For more information, see the IP-223 Technical Manual (P/N 803641).

4.1 IP-223 Jumper Settings

Use Table 3 to set the line 1 and line 2 jumpers for XPR radio control.

TABLE 3. IP-223 Jumper Settings

Line 1	Jumper Setting	Line 2
J33, J34	B = 4-Wire	J5, J6
J16, J21	A = Single Ended	J19, J20
J14	Hanging on center pin = 10K Ohm	J24
J3, J9, J11	A = Single Ended	J25, J28, J29
J13	B = High	J27
J17, J22	B = 600 Ohms	J10, J15

5.0 Audio Level Alignment

To **align the audio level**, do the following:

1. From Telex System Manager confirm the IP-223's LAM, COR, and AGC check boxes are unchecked for the relevant line. See "IP-223 Options Setup" on page 11.

REFERENCE: Steps 2, 3, and 4 require configuration information contained in the Level Adjustments section of the IP-223 Technical Manual (P/N 803641).

2. Measure the **TX signal between pin 25 and pin 7** on the IP-223's DB-25 pin connector.
   OR
   Measure the **TX signal** using the TX+ and GND test points located on the front of the IP-223.
3. Inject a **signal** between pin 24 and pin 7 on the IP-223's DB-25.
4. Measure the **signal** between the RX and GND text points located on the front of the IP-223.
5. From Telex System Manager, select the **IP-223** from the navigation pane.
   The console's configuration windows appear.
6. Click the **Per Line Setup** tab.
   The Per Line Setup window appears.
7. Click **Configure** for the channel to configure.
   The Per Line Notebook appears.
8. Click the **Options** tab.
   The Options page appears.
9. Select the **COR active** check box.
10. Clear the **COR Active High** check box.
11. Confirm that **receive audio** is present between pin 14 and pin 7 on the XPR MAP.

NOTE: A level from 0dB to -10dB should be sufficient for incoming voice traffic.

12. Connect the **IP-223** to the radio.
13. Test and adjust **levels** for clear undistorted audio.
14. Select the **LAM** check box.
15. Set the **LAM level** field. (example: -30dB).
16. Set the **LAM Timeout** field. (example: two (2) seconds)

NOTE: If during operation receive audio levels appear to vary, the RxACG check box can be selected. See "IP-223 Options Setup" on page 11.

6.0 IP-223 Software Configuration

The IP-223, in our example, is comfigured in the Telex System Manager application. Alternatively, the web browser configuration windows can be used.

REFERENCE: For more information, see the Telex System Manager Technical Manual (P/N LIT0000259000).

6.1 IP-223 Basic Settings

To **configure basic IP-223 settings**, do the following:

1. Open **Telex System Manger**.
2. In the Processed Devices pane, select the **IP-223** to configure.
3. Click the following page tabs and **configure settings** appropriate to your system
   - Network
   - General Gain
   - Multicast

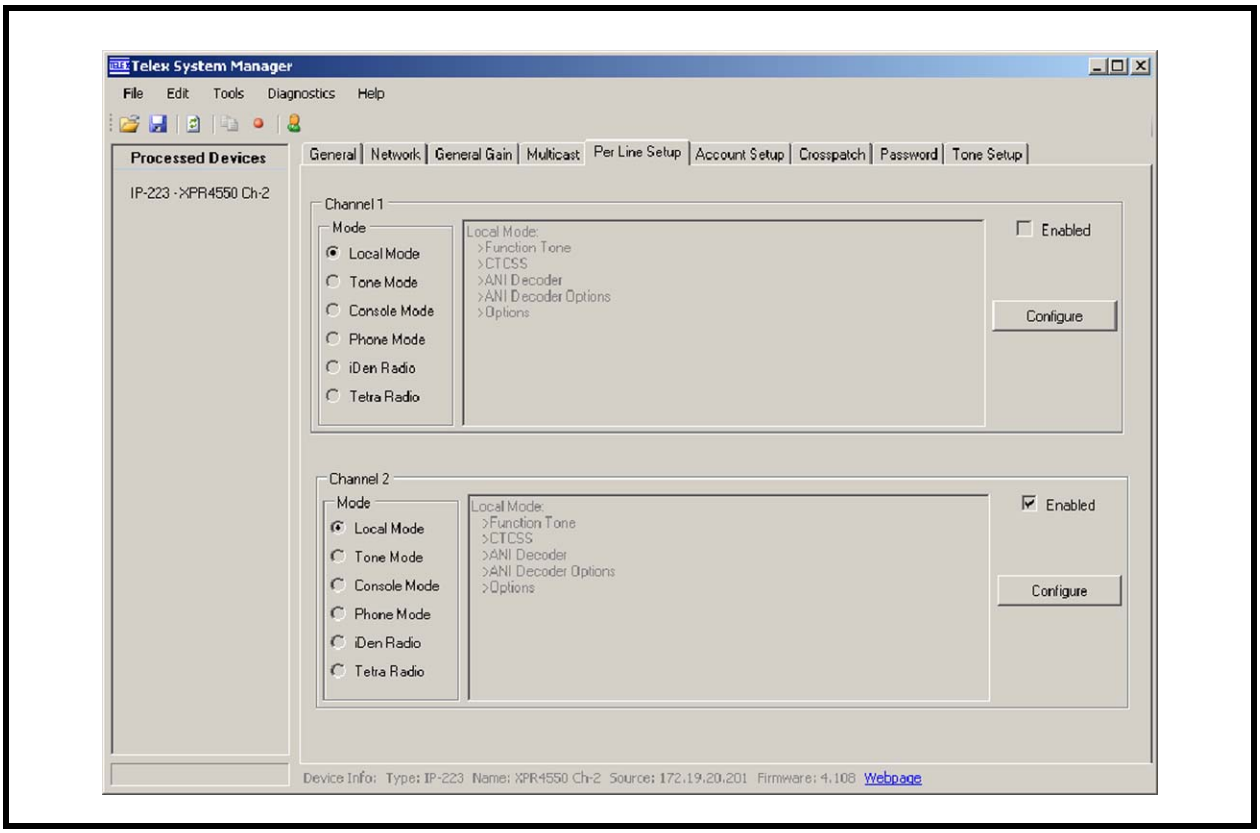

FIGURE 2. IP-223 Per Line Setup Page

6.2 IP-223 Per Line Setup Notebook

The **Per Line Setup** notebook is used to enable function tones associated with each available radio channel. Set the output for radio channel change using either BCD control or activate analog relay R02.

To **configure the Per Line Setup** do the following:

1. Click the **Per Line Setup** tab.
   The Per Line Setup page appears.
2. Select the **Local Mode** check box for the Channel you are configuring (example: Channel 2).
3. Select the **Enabled** check box for the Channel you are configuring.
   The selected Channel is enabled for local mode.

6.3 Function Tone Page

The **Function Tone** page is used to enable and configure tones to be associated with each available radio channel.

Access more function tones using the arrow buttons at the top of the Function Tone page or the Page Number spin box.

Fifteen channels are selectable from the console, using **BCD** (Binary Coded Digital) digital output 1–15. Digital output 16 places control of the radio channels with the radio front panel.

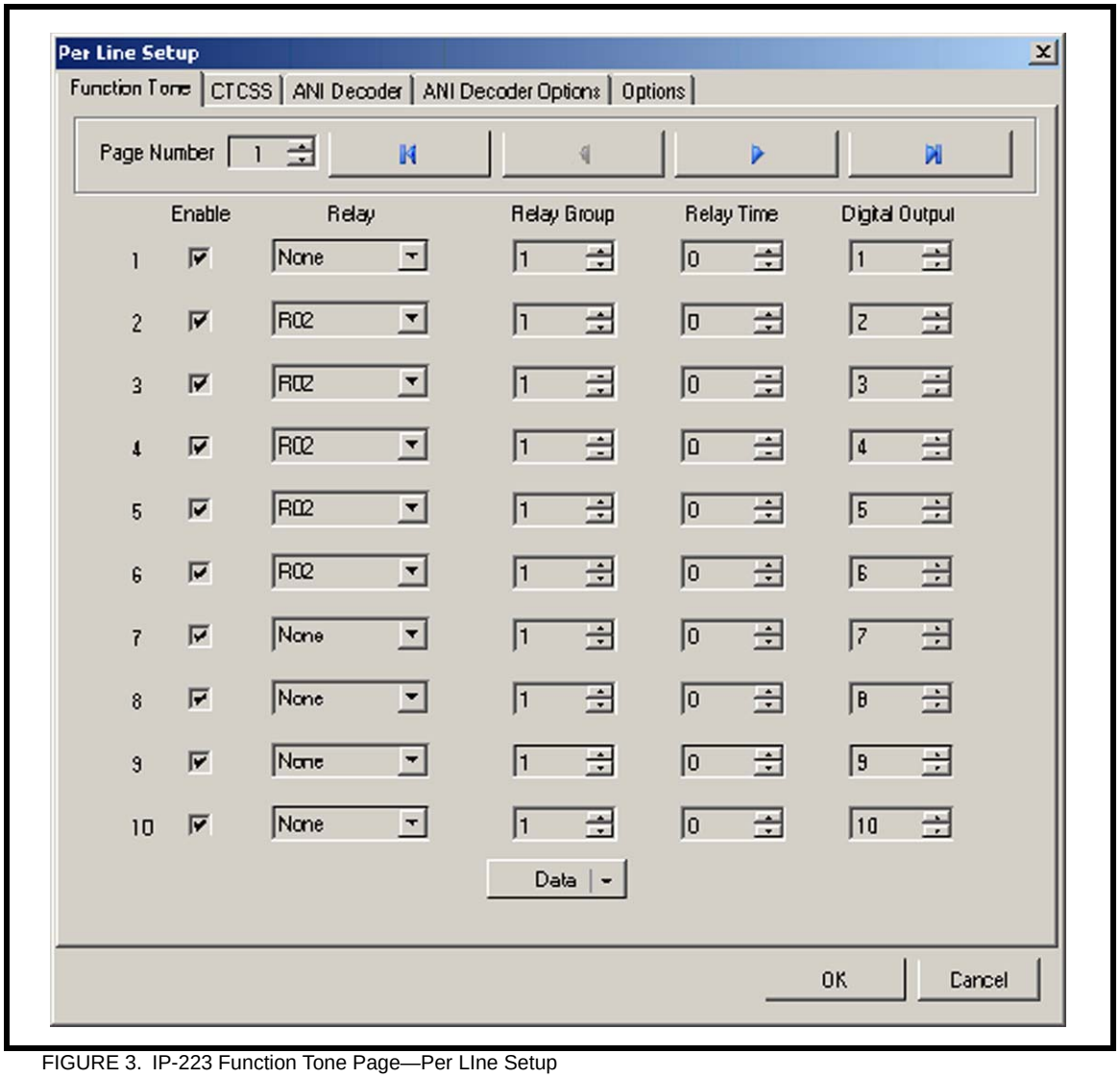

FIGURE 3. IP-223 Function Tone Page—Per LIne Setup

Enable Check Box

The **Enable** check box is used to activate the corresponding tone.

Relay Drop Down Menu

The **Relay** drop down menu identifies which relay(s) closes upon receipt of the function tone.

Available selections for this field are:

None Enables digital function tones to send BCD. Selects the digital radio channel as configured within the XPR settings.

R02 Enables analog function tones on relay 2.

Relay Group Spin Box

The **Relay Group** spin box identifies if a relay is grouped into separate functions. This allows more than one (1) relay to be activated at any particular time by being in separate groups.

Relay Time Spin Box

The **Relay Time** spin box identifies the selected relay(s) activated when the function tone is received, or the selected relay(s) is activated for a specified period of time when the function tone is received.

To **configure the IP-223's function tones,** do the following:

1. From the Per line Setup notebook, click the **Function Tone** tab.
   The Function tone page appears.
2. Select the **Enable** check box to enable a function tone.
3. From the Relay drop down menu, select the **relay (None or R02)** to use.
4. From the Relay Group spin box, set the **relay group number**.
5. From the Relay Time spin box, set the **relay time**.
6. From the Digital Output spin box, set a **digital output value** (example: corresponds to the channel number).

From the example shown in Figure 3:

- Function tone 1 is enabled to send BCD 1. This selects radio channel 1, which is a digital channel within the setting of our XPR mobile.
- Function tone 2 selects radio channel 2, which is an analog channel.
- Function tones 2–6 are associated with analog radio channels.
- Function tones 1, 7, 8, 9, and 10 are digital radio channels.

6.3.1 IP-223 Options Setup

The **Options Setup** page is used to configure required COR and LAM settings.

When a digital radio channel is selected, the IP-223 COR pin is permanently grounded via relay R02 normally closed relay contact.

When an analog radio channel is selected, the COR logic from the XPR MAP (pin 19) is applied to the IP-223 COR (pin 20) using the R02 normally open relay contact.

To **activate the IP-223 COR and LAM**, do the following:

1. From the Per Line Setup notebook, click the **Options** tab.
   The Options page appears.
2. Select the **LAM Enabled** check box.
3. Select the **COR Enabled** check box.
4. Select the **Tape Output** radio button.
5. Select the **PTT Relay Only** radio button.
6. Set the LAM Level to **-30dB.**
7. Set the TX Delay to **0ms**.
8. Set the Squelch Tail Delay to **100ms.**

9. Set the RX Delay to **80ms**.
10. Select the **Reset with PTT** radio button.
11. Select the **High Pass RX** check box.
12. Set the Mode drop down field to **Normal**.
13. Set the Parameters drop down field to **19200.N.8.1**.

NOTE: If during operation the receive audio levels vary, select the RxACG (Automatic Gain Control) check box to activate.

7.0 Console Setup

The IP-223 handles the MDC1200 decode and presentation of ANI to the console if the option is enabled, so no special setup is required with respect to ANI; however, in order to change radio channels, function tones within the console must be enabled and associated with the relevant tones set in the IP-223. MDC1200 decode is an optional purchase. Contact your sales representative for more information.

NOTE: Our example uses Telex's IP-2002 Hardware Console.

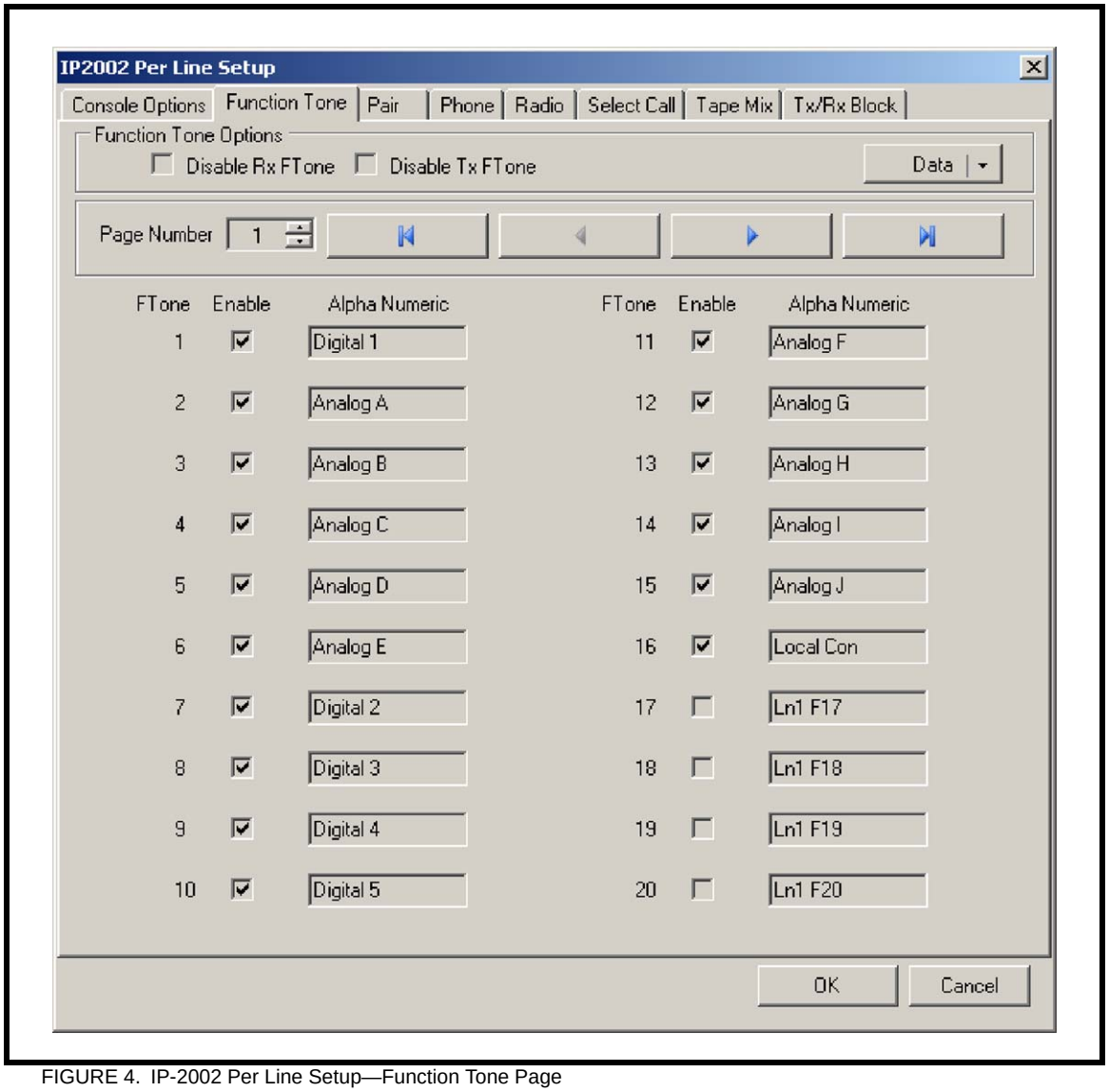

FIGURE 4. IP-2002 Per Line Setup—Function Tone Page

7.1 Console Function Tone Configuration

To **configure the console's function tones**, do the following:

NOTE: Radio channel allocation, is dependant on the radio network and the XPR interface used. The following example function tone organization and naming scheme reflect this dependency.

1. From TSM, select the **console** (IP-2002) from the navigation pane.
   The console's configuration windows appear.
2. Click the **Per Line Setup** tab.
3. Click **Configure** for the channel to configure.
   The Per Line Notebook appears.
4. Click the **Function Tone** tab.
   The Function Tone page appears.
5. Select the **Enable** check box for the tone to configure.
6. Enter an **Alpha Numeric identifier** in the Alpha Numeric field.

The consoles's alpha numeric identifiers correspond with the Function Tone settings on the IP-223, see "IP-223 Options Setup" on page 11. Our example, reference shown below, uses the following alpha numeric identifiers for the console's FTones:

FTone 1	*Digital 1*	FTone 2	*Analog A*
FTone 3	*Analog B*	FTone 4	*Analog C*
FTone 5	*Analog D*	FTone 6	*Analog E*
FTone 7	*Digital 2*	FTone 8	*Digital 3*
FTone 9	*Digital 4*	FTone 10	*Digital 5*
FTone 11	*Analog F*	FTone 12	*Analog G*
FTone 13	*Analog H*	FTone 14	*Analog I*
FTone 15	*Analog J*	FTone 16	*Local Con*

NOTE:

- A direct association between function tones in the IP2002 and the IP-223 is established by configuring per the examples shown in this application note. See Figure 3 and Figure 4.
- Tones assigned for digital radio channels in the IP2002 have no relay assigned in the IP-223. Tones assigned to analog radio channels have R02 assigned in the IP-223.
- Function tone 16 is assigned as *Local Con* because BCD command 16 is translated as binary output 10000. Only the four (4) least significant digits are sent to the radio as BCD channel change commands, so the XPR receives binary input 0000. This signifies no control, and channel change functionality is routed to the radio front panel.
- Selecting a function tone 1 to 15 from the console regains control and routes the XPR to the correct channel.

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