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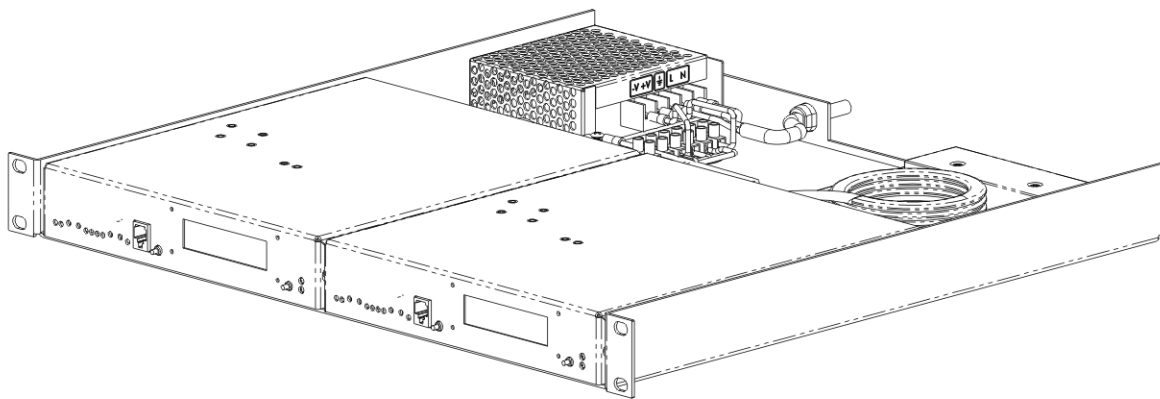
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TELEX[®]

RADIO DISPATCH PRODUCTS

Rebanding Control Panel Installation Manual



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FACTORY SERVICE CENTER

Factory Service Center
Telex Communications, Inc.
Radio Dispatch Products
8601 East Cornhusker Highway
Lincoln, Nebraska, 68507

PHONE NUMBERS

Sales:

Phone(800) 752-7560

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

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

Customer Service Repair:(800) 553-5992

Technical SupPort:

Phone(800) 898-6723

E-mail TelexDispatchtechsupPort@us.bosch.com

Webwww.telex.com

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General

This manual is intended to explain the operation and alignment of the Telex Rebanding Control Panel¹. The system consists of two (2) IP-223 Remote Adapter Panels, AC to DC 12V power supply, audio combining blocks and wiring, which are mounted to a 19" x 1U rack mount shelf.

The panel is designed to decode industry-standard **PTT** (Push-To-Talk)) and FTones (frequency selection tones) generated by a tone remote console through a 4-wire audio connection and then regenerate the industry-standard PTT and FTones for transmission to base or repeater stations operating on original and rebanded frequency assignments, respectively.

Receive audio from both repeaters are combined and sent back to the tone remote console through the 4-wire connection; also the receive audio from one repeater is retransmitted on the other repeater using the line-to-line crosspatch feature of the IP-223.

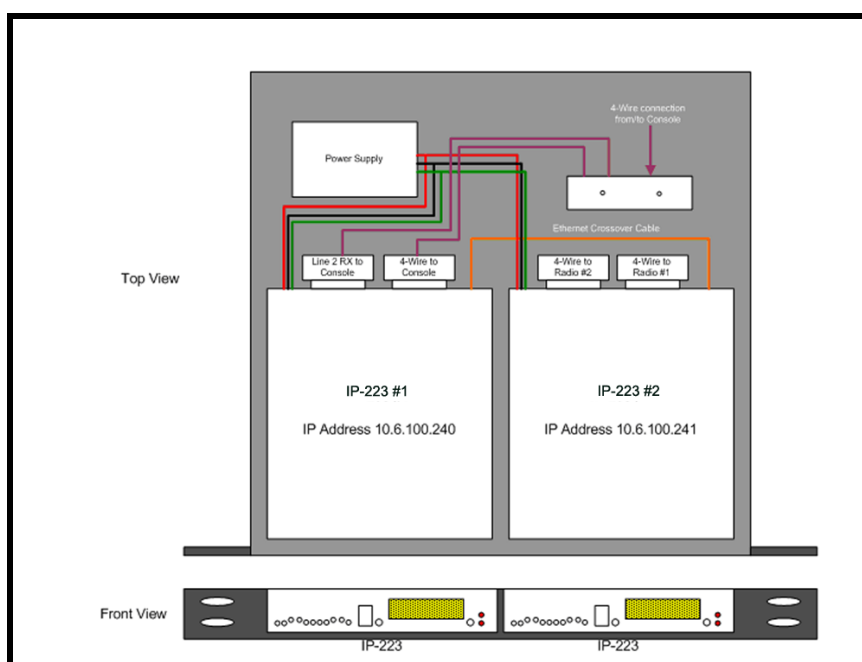


FIGURE 1. System Layout View—Control Panel

1. For additional information on the configuration and operation of the Telex Rebanding Control Panel, refer to the IP-223 Technical Manual, available at www.telex.com/Downloads/.

Scope

This installation manual covers the installation and audio alignment required to configure the Rebanding Control Panel. Refer to the IP-223 Technical Manual for system configuration details. A current version of the manual is available for download at www.telex.com/Downloads/.

Theory of Operation

Reference Figure 2, analog consoles and both Line 1 and Line 2 ports of IP-223 #1 are connected to an RJ-12 combiner block mounted to the panel shelf. Impedance and line bridging are accomplished by internal jumper settings within the IP-223.

Line 1 port of IP-223 #1 is set to Console mode and Line 2 is set to Local mode. When console generated tones are decoded by IP-223 #1 port 1, an Ethernet stream is sent to IP-223 #2 operating in Tone mode. The IP-223 #1 outbound Ethernet stream has the same TX port number as the TX ports for both lines in IP-223 #2 and PTT and function tones are generated for both repeaters.

IP-223 #2 receives RX audio from both repeaters and using different RX ports will generate unique RX Ethernet streams to IP-223 #1. IP-223 #1 has both Line 1 and Line 2 TX outputs connected in parallel and supplies combined radio RX audio back to the console.

During repeater operation, line-to-line crosspatch in IP-223 #2 is turned on such that repeater 1 rekeys repeater 2 and vice versa. The crosspatch feature is turned on/off based on a pair of function tones decoded from the console. Crosspatch on/off directly follows repeater on/off.

The decoded repeater on/off function tones are also regenerated to the repeaters attached to IP-223 #2. The received repeater audio is then combined with the last PTT frequency decoded from the console (revert back) and used to rekey the second repeater in the crosspatch. Thus, the Rebanding Control Panel may also be used to provide a back-to-back solution for multichannel repeater stations. Two such stations will be identically controlled by the Rebanding Control Panel.

While the Rebanding Control Panel is likely to find its greatest application in the rebanding of standalone conventional mutual aid channels, it is also applicable to the rebanding of any conventional channel for which there is a requirement for parallel operation of old and new frequency assignments. Additionally, there will be networked solutions for which the Rebanding Control Panel may be applicable such as simulcast, voted, and voted-steered configurations.

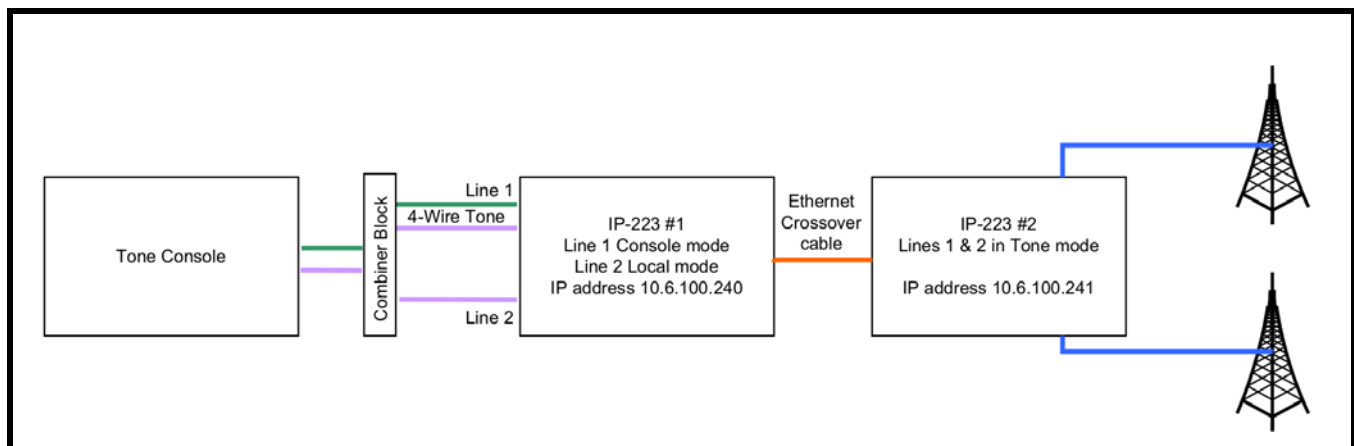


FIGURE 2. Rebanding Control Panel Block Diagram

Installation

Connections To/From Console

Connection into the Rebanding Control Panel from the console 4-wire demarcation point is provided by a 6-position RJ-12 (6x6) combiner block. Connect console 4-wire audio into any unused modular jack. See Figure 3 for pin out information.

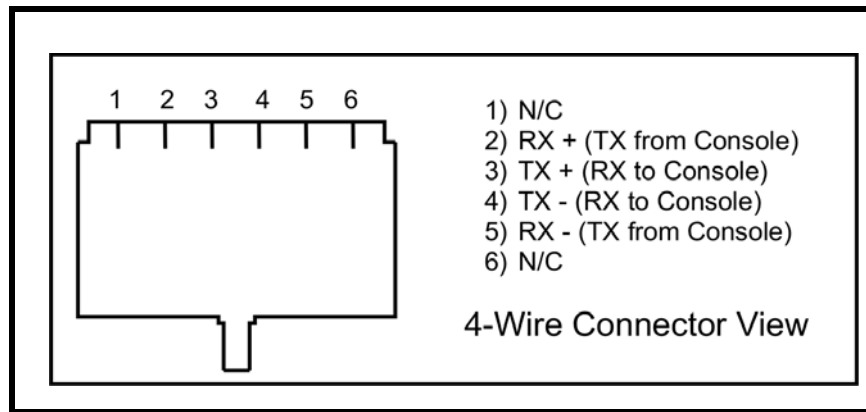


FIGURE 3. Console 4-wire Pin Out

Connections To/From Repeaters

Connections to and from the repeaters into IP-223 #2 are made with DB-25 to RJ-12 (6x6) adapters. The adaptor is preconfigured at the factory to support 4-wire audio using **VOX** (Voice Coding) or **COR** (Carrier Operated Relay) signaling if supported by the repeater and programmed to be on IP-223 #2. Connect the repeater into the adapter, see Figure 4 for pin out.

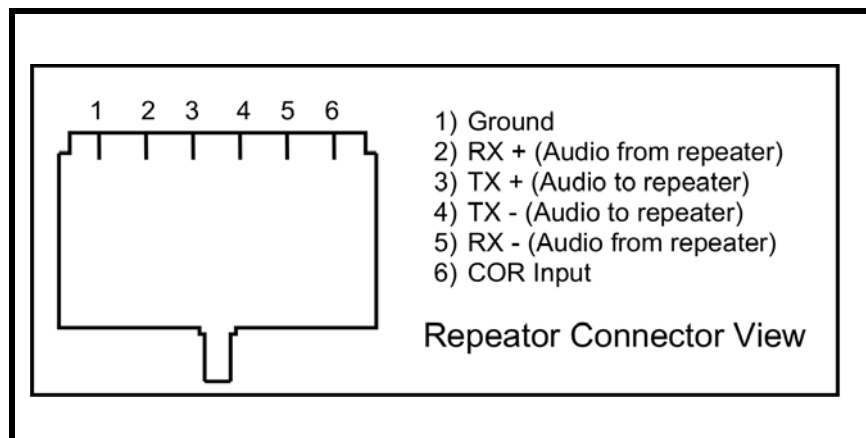


FIGURE 4. Repeater 6-wire Pin Out

Connections to 120VAC Power and Ground

120 VAC power is supplied to an onboard 12 VDC power supply with an 8-foot, 3-prong power cord. The power supply is internally fuse protected and all devices are bonded to rack/earth ground.

System Alignment

The system is configured and aligned by Telex at time of shipping. However, additional field adjustments may be required to align the system for proper operation.

To **accomplish the system alignment**, complete the following steps:

- Step 1** See “Adjust Tone from Console, IP-223 #1” on page 10.
- Step 2** See “Adjust Tone Control to Repeater, IP-223 #2 Line 1 and Line 2 TX” on page 11.
- Step 3** See “Receive Audio Adjustment from Repeater, IP-223 #2 Line 1 and Line 2 RX” on page 11.
- Step 4** See “Receive Audio Adjustment to Console, IP-223 #1 Line 1 and Line 2 RX” on page 11.

NOTE: Additional information on features and operation of the IP-223 can be found on the enclosed CD or at our website www.telex.com/Downloads/.

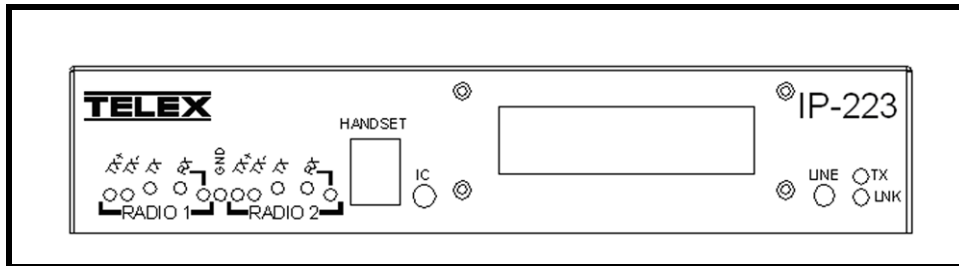


FIGURE 5. Front View IP-223

Adjust Tone from Console, IP-223 #1(Step 1)

The console TX input level is the first level that must be set. All of the tone decoding is based on this level.

To **adjust the tone from console, IP-223 #1**, do the following

1. Connect an **oscilloscope** OR **RMS voltmeter** OR **dBm meter** to GND (TP12).
2. From the front panel of IP-223 #1, **measure the RX level** at RADIO 1 RX (TP13).
3. To generate a PTT hold tone (typically -20dBm at 2175 HZ), press and hold down the **Tone Console's PTT button**.
4. Adjust potentiometer Line 1 RX (R175) until
-20dBm at 2175Hz between the test point and GND
OR
0.076 rms between the test point and GND.

To **verify the level**, do the following:

- > Press and hold the **LINE** button and press the **IC** button three (3) times.
The IP-223 #1 display tool is active. With AGC OFF, the reading should be: -35dBm or with AGC ON: The targeted level for the AGC circuitry, 0dBm appears on the display.

NOTE: When enabled, the **AGC** (Automatic Gain Control) compression potentiometers for Line 1 (RV5) control the aggressiveness of the AGC circuitry. The AGC can be used to enhance the gain capabilities of the RX circuitry. Line 1 (RV5) should be **set fully clockwise** and only adjusted **OFF full clockwise 10-15 degrees maximum**, if required.

Adjust Tone Control to Repeater, IP-223 #2 Line 1 and Line 2 TX (Step 2)

The panel is factory adjusted to generate an -20dBm or 0.076rms 2175Hz on IP-223 #2 Radio 1 and Radio 2 TX pairs based on the first alignment step.

To **adjust the tone control to repeater, IP-223 #2 Line 1 and Line 2 TX**, do the following:

1. Connect an **oscilloscope** or RMS **voltmeter** or **dBm meter** to TX test points RADIO 1 TX (**TP2** and **TP6**) located on the front panel of *IP-223 #2*.
OR
TX test points RADIO 2 TX (**TP8** and **TP9**) located on the front panel of *IP-223 #2*.
2. Generate and sustain a **PTT hold tone** for next step.
3. Adjust **Line 1 TX potentiometer (R47)** for -20dBm or 0.076 rms. 2175Hz
OR
Line 2 TX potentiometer (R61) for -20dBm or 0.076 rms. 2175Hz.
The final adjustment should allow for undistorted audio to be transmitted to the full range of transmission levels at the desired deviation.

Receive Audio Adjustment from Repeater, IP-223 #2 Line 1 and Line 2 RX (Step 3)

To **adjust the receive audio from the Repeater, IP-223 #2 Line 1 and Line 2 RX**, do the following:

1. Connect an **oscilloscope** or RMS **voltmeter** or **dBm meter** to TP12 (GND).
2. On the front panel of IP-223 #2, measure the TX level at **RADIO 1 RX (TP13)**
OR
RADIO 2 RX (TP1)
3. Using a communications service monitor, **inject the proper signal** into the repeater to generate a standard level of deviation signal (typically 3.5 or 5K) back to IP-223 #2.
4. Adjust potentiometer for **Line 1 RX (R175)** until -10dBm or 0.23 rms is measured between the test point and GND.
OR
Line 2 RX (R110) until -10dBm or 0.23 rms is measured between the test point and GND.
5. Access IP-223 #2's RX alignment display tool: press and hold the **LINE** button and then press the **IC** button 3 times.
A reading with AGC OFF: -10dBm.

NOTE: When enabled, the AGC compression potentiometers RV5/RV1 (L1/L2) control the aggressiveness of the AGC circuitry. The AGC can be used to enhance the gain capabilities of the RX circuitry. Line 1 (RV5/RV1) should be set **fully clockwise** and only adjusted **OFF full clockwise 10–15 degrees maximum**, if required.

Receive Audio Adjustment to Console, IP-223 #1 Line 1 and Line 2 RX (Step 4)

RADIO 1 TX test points (TP2 and TP6) and RADIO 2 TX test points (TP8 and TP9), located on the front panel of the IP-223 #1, provide a point to measure the actual value being placed into the radio or balanced TX line. The top panel accessible adjustment Line 1 TX potentiometer (R47) and Line 2 TX potentiometer (R61) are used to adjust these levels.

To **adjust the receive audio to the console, IP-223 #1 Line 1 and Line 2 RX**, do the following:

1. Turn ON the **TX alignment tone**.
2. Adjust the **TX output** to -5dBm or 0.44 rms.
The final adjustment should allow for undistorted audio to be transmitted for the full range of transmission levels at the desired deviation.

IP-223 Programming Configurations

IP Address Setup

IP-223 #1 IP Address	IP-223 #2 IP Address
10.6.100.240	10.6.100.241

IP-223 #1 Jumper Settings

Line 1	Signal	Line 2
J33, J34	2- or 4-Wire, B = 4-Wire	J5, J6
J16, J21	RX Input, B = Balanced	J19, J20
J14	RX Input Impedance, A = 600 ohms	J24
J3, J9, J11	TX Output, B = Balanced	J25, J28, J29
J13	TX Output Level, B = High	J27
J8	Digital I/O Pull-up Voltage, B = +12	J30
(J17), J22	TX Output Impedances: (A) and B = 1.2K ohms	(J10), J15

IP-223 #1 Web Browser Configuration

Consult the IP-223 Technical Manual, located at www.Telex.com/Downloads/ for further configuration details.

Basic Ethernet Setup (IP-223 #1)

The **Basic Ethernet Setup** window, shown in Figure 6, contains static Network Address Configuration fields for IP-223 #1.

The screenshot shows the 'Basic Ethernet Setup' window for IP-223 #1. The window has a header bar with the Telex logo and navigation icons. The main content area is titled 'Basic Ethernet Setup' and contains the following fields:

- Unit IP Address:** 10.6.100.240
- Subnet Mask:** 255.255.0.0
- Gateway Address:** 10.6.100.1
- DNS Number 1:** 0.0.0.0
- DNS Number 2:** 0.0.0.0
- DNS Number 3:** 0.0.0.0
- Unit Name:** Reband #1
- Packet Delay before Playback:** 6
- QOS: Precedence Bits:** 0
- QOS: D, T, and R Bits:** 0
- Local Computer IP Addresses:** A list of 10 IP addresses, all set to 0.0.0.0.

The 'Submit' button is located at the bottom right of the form.

FIGURE 6. Network Address Configuration IP-223 #1—Basic Ethernet Setup

Multicast Port Number Setup (IP-223 #1)

The **Multicast Port Number Setup** window, see Figure 7, contains Channel (Line) Type field, Channel (Line) Name, Network Address and Port fields to configure Lines 1 and 2 for IP-223 #1.

IP-223 #1

TELEX
RADIO DISPATCH PRODUCTS
IP-223
Name: Reband #1
MAC: 00-0B-7C-31-8F-21
SN: 23247905 FW: 4.001

Basic Ethernet Setup General Gain Setup Multicast Address Setup Per Line Setup Save to EEPROM

[Additional Feature](#) [Clone Console](#) [Crosspatch Setup](#) [CRP PIN Table](#) [PIN Change](#) [Tone Frequency & Durations](#)

Multicast Port Number Setup

Channel Number:	Enable via Ethernet:	Channel Type:	Channel Name:	Multicast Address:	RX Port:	Multicast Address:	TX Port:	TX Group Port:	Channel Hops:
1	☒	Console Mode	Channel 1	225.8.11.81	1054	225.8.11.81	1072	0	6
2	☒	Local Mode	Channel 2	225.8.11.81	1055	225.8.11.81	1073	0	6
Tape 1	☐	Tape Channel 1	Tape 1	225.8.11.81	2250				6
Tape 2	☐	Tape Channel 2	Tape 2	225.8.11.81	2251				6
Phone	☐	Ring Signal	Ring	225.8.11.81	2052				6

Submit

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Multicast Address Configuration

FIGURE 7. Multicast Configuration IP-223 #1—Multicast Port Number Setup

Per Line Setup—Console Mode (IP-223 #1)

The **Per Line Setup—Console Mode** window, shown in Figure 8, is used to enable Line 1 F-Tones, set the LAM level and other options required for IP-223 #1 installation.

NOTE: No configuration changes are required for Line 2 IP-223 #1 in Local Mode. All function tones that are to be decoded must be enabled. The Parallel Console checkbox must be selected. In some cases of excessive incoming line loss, RxAGC may need to be selected.

IP-223 #1

Console Mode

TELEX
RADIO DISPATCH PRODUCTS
IP-223
Name: Reband #1
MAC: 00-0B-7C-31-8F-21
SN: 23247905 FW: 4.005

Basic Ethernet Setup General Gain Setup Multicast Address Setup Per Line Setup Save to EEPROM

Account Setup Additional Feature Close Console CRP Setup CRP PIN Table Pass Change Tone Freq & Durations

Per Line Setup - Line 1
Line 1 Submit Line 2

Line Mode Status: Console Mode (Change in Multicast Address Setup) Port Enabled: ☒

ANI Setup

☐ Fleetsync ☐ FS 1400 baud ☐ MDC ☐ MDC 1400 baud

Tone Type: None
Digit Duration: 25 ms
Pause Duration: 100 ms
Group Digit: A
ANI Decoder #: 1 2 3 4
ANI Call Type: None
ANI Call Format:

COR Setup

☐ LAM Enabled ☐ COR Enabled ☐ COR Active High

CTCSS Setup

☐ Always On ☐ On with PTT ☒ Tape Output

Delay Setup

TX Delay: 0 ms RX Delay: 0 ms
Squelch Tail Delay: 0 ms

Function Tone Setup

Jump to Entry: 1 to 10 Update

	Tone Enable	Relay	Relay Group	Relay Time (ms)	Digital Output	CTCSS Freq	CTCSS Default	System	Chan
1	☒	P01	1	0	0	0	☐	1	1
2	☒	P01	1	0	0	0	☐	1	2
3	☒	P02	1	0	0	0	☐	1	3
4	☒	BOTH	1	0	0	0	☐	1	4
5	☒	P01	1	0	0	0	☐	1	5
6	☒	P01	1	0	0	0	☐	1	6
7	☒	P02	1	0	0	0	☐	1	7
8	☒	BOTH	1	0	0	0	☐	1	8
9	☒	P01	1	0	0	0	☐	1	9
10	☒	P01	1	0	0	0	☐	1	10

LAM Setup

LAM Level: -30 dB LAM Time: 3 sec

Monitor Relay

☒ Reset with PTT ☐ On except PTT ☐ Tuned 0 ms

Options

☐ Supervisor ☐ Cross Mute ☐ Full Duplex ☒ RxAGC
☐ Hi-Pass RX ☐ Pre-Emphasize TX ☐ TX Monitor ☐ 2 Wire
☐ F1 Last Call ☒ Parallel Console ☒ PTT Notch Filter ☐ IR1600 Modem

PTT Setup

☒ PTT relay only ☐ PTT + R1 ☐ PTT + R2 ☐ PTT + BOTH
PTT Timeout: 0 seconds

Serial Port Mode

Serial Port Mode: Normal Serial Port Params: 19200,N,8,1

Submit

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Tone Enable

LAM Setup

Options

Parallel Console

RxAGC

FIGURE 8. Per Line Setup IP-223 #1—Console Mode, Line 1

IP-223 #2 Web Browser Configuration

IP-223 #2 Jumper Settings

Line 1	Signal	Line 2
J33, J34	2- or 4-Wire B = 4-Wire	J5, J6
J16, J21	RX Input, B = Balanced	J19, J20
J14	RX Input Impedance, A= 600 ohms	J24
J3, J9, J11	TX Output, B = Balanced	J25, J28, J29
J13	TX Output Level, B = High	J27
J8	Digital I/O Pull-up Voltage, B = +12	J30
J17, J22	TX Output Impedances, B = 600 ohms	J10, J15

Basic Ethernet Setup (IP-223 #2)

The **Basic Ethernet Setup** window, shown in Figure 9, is used to configure the static Network Address fields for IP-223 #2.

IP-223 #2

TELEX
RADIO DISPATCH PRODUCTS
IP-223
Name: Reband #2
MAC: 00-0B-7C-31-8F-21
SN: 23247905 FW: 4.001

Basic Ethernet Setup General Gain Setup Multicast Address Setup Per Line Setup Save to EEPROM

[Additional Feature](#) [Clone Console](#) [Crosspatch Setup](#) [CRP PIN Table](#) [PIN Change](#) [Tone Frequency & Durations](#)

Basic Ethernet Setup

Use DHCP Server: ☐
(If using DHCP, some parameters below will not be required)

IP Address

Unit IP Address:

Subnet Mask:

Gateway Address:

DNS Number 1:
DNS Number 2:
DNS Number 3:
Unit Name:

Packet Delay before Playback:
QOS: Precedence Bits:
QOS: D, T, and R Bits:

Local Computer IP Addresses

1	0.0.0.0
2	0.0.0.0
3	0.0.0.0
4	0.0.0.0
5	0.0.0.0
6	0.0.0.0
7	0.0.0.0
8	0.0.0.0
9	0.0.0.0
10	0.0.0.0

FIGURE 9. Network Address Setup IP-223 #2—Basic Ethernet Setup

Multicast Port Number Setup (IP-223 #2)

The **Multicast Port Number Setup** window, shown in Figure 10, is used to configure the Channel (Line) Type field, Channel (Line) Names, Network Address and Port fields for Lines 1 and 2 on IP-223 #2.

IP-223 #2

TELEX
RADIO DISPATCH PRODUCTS
IP-223

Name: Reband #2
MAC: 00-0B-7C-31-8F-21
SN: 23247905 FW: 4.001

Basic Ethernet Setup General Gain Setup Multicast Address Setup Per Line Setup Save to EEPROM

Additional Feature Clone Console Crosspatch Setup CRP PIN Table PIN Change Tone Frequency & Durations

Multicast Port Number Setup

Channel Number	Enable via Ethernet	Channel Type	Channel Name	Multicast Address	RX Port	Multicast Address	TX Port	TX Group Port	Channel Hops
1	☒	Tone Mode	Channel 1	225.8.11.81	1054	225.8.11.81	1072	0	6
2	☒	Tone Mode	Channel 2	225.8.11.81	1055	225.8.11.81	1072	0	6
Tape 1	☐	Tape Channel 1	Tape 1	225.8.11.81	2250				6
Tape 2	☐	Tape Channel 2	Tape 2	225.8.11.81	2251				6
Phone	☐	Ring Signal	Ring	225.8.11.81	2052				6

Submit

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FIGURE 10. Multicast Address Configuration IP-223 #2—Multicast Port Number Setup

Crosspatch Setup

The **Crosspatch Setup** window, shown in Figure 11, is used to configure FTones to control line-to-line crosspatch.

To control the line-to-line crosspatch at IP-223 #2, do the following:

1. Select an **FTone** from the Start Patch FTone drop down menu, to configure the start crosspatch FTone.
2. Select an **FTone** from the Stop Patch FTone drop down menu, to configure the stop crosspatch FTone.

IP-223 #2

TELEX
RADIO DISPATCH PRODUCTS
IP-223

Name: Reband #2
MAC: 00-0B-7C-31-8F-21
SN: 23247905 FW: 4.001

Basic Ethernet Setup General Gain Setup Multicast Address Setup Per Line Setup Save to EEPROM

Additional Feature Clone Console Crosspatch Setup CRP PIN Table PIN Change Tone Frequency & Durations

Crosspatch Setup

Submit

Local Setup:

Line-Line: ☐ Enable

Start Patch FTone: F6 Stop Patch FTone: F5

Remote Setup:

RCP: ☐ Enable

Dialing Digits: 4 Interdigit Time: 2000 ms Beep Dly: 0 ms

Patch Timeout: 0 sec Global: 0 sec Drop All:

RCP Tables:

FIGURE 11. FTone Crosspatch Control IP-223 #2—Crosspatch Setup

Per Line Setup—Tone Mode (IP-223 #2)

The **Per Line Setup—Tone Mode** window shown in Figure 12, is used to enable Line 1 FTones, LAM, or COR, and to set the LAM level and LAM time for IP-223 #1 installation.

NOTE: All function tone that are to be decoded must be enabled.

NOTE: In some installations, the Repeater supports COR signaling. If COR signaling is used instead of LAM (VOX detection), the **COR Enabled** check box must be selected.

System Drawings

System Drawings

The following drawings for the Rebanding Control Panel are included for your convenience.

- Shipping Drawing
- System Component Layout
- System Electrical Connections

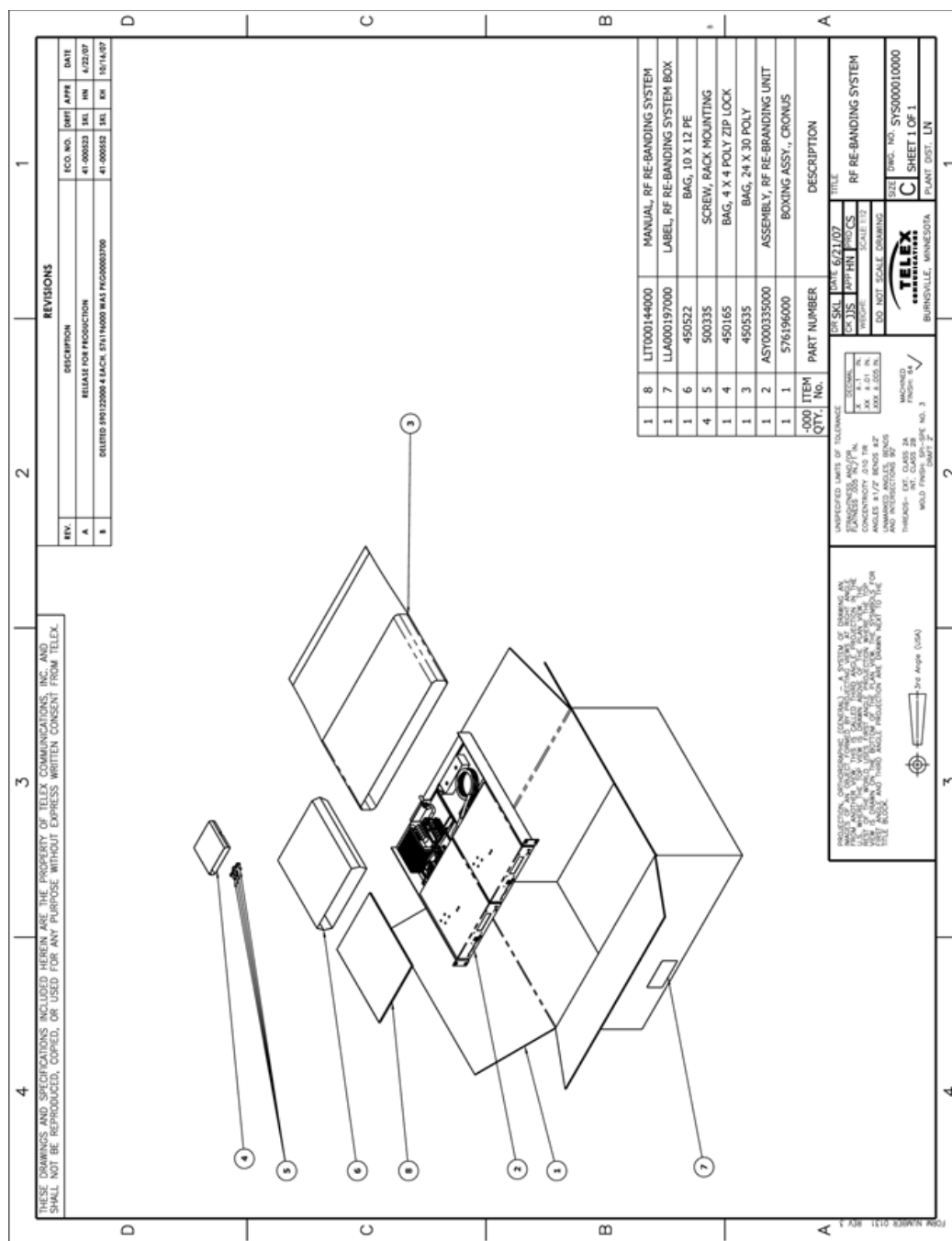


FIGURE 13. Shipping Drawing

System Component Layout

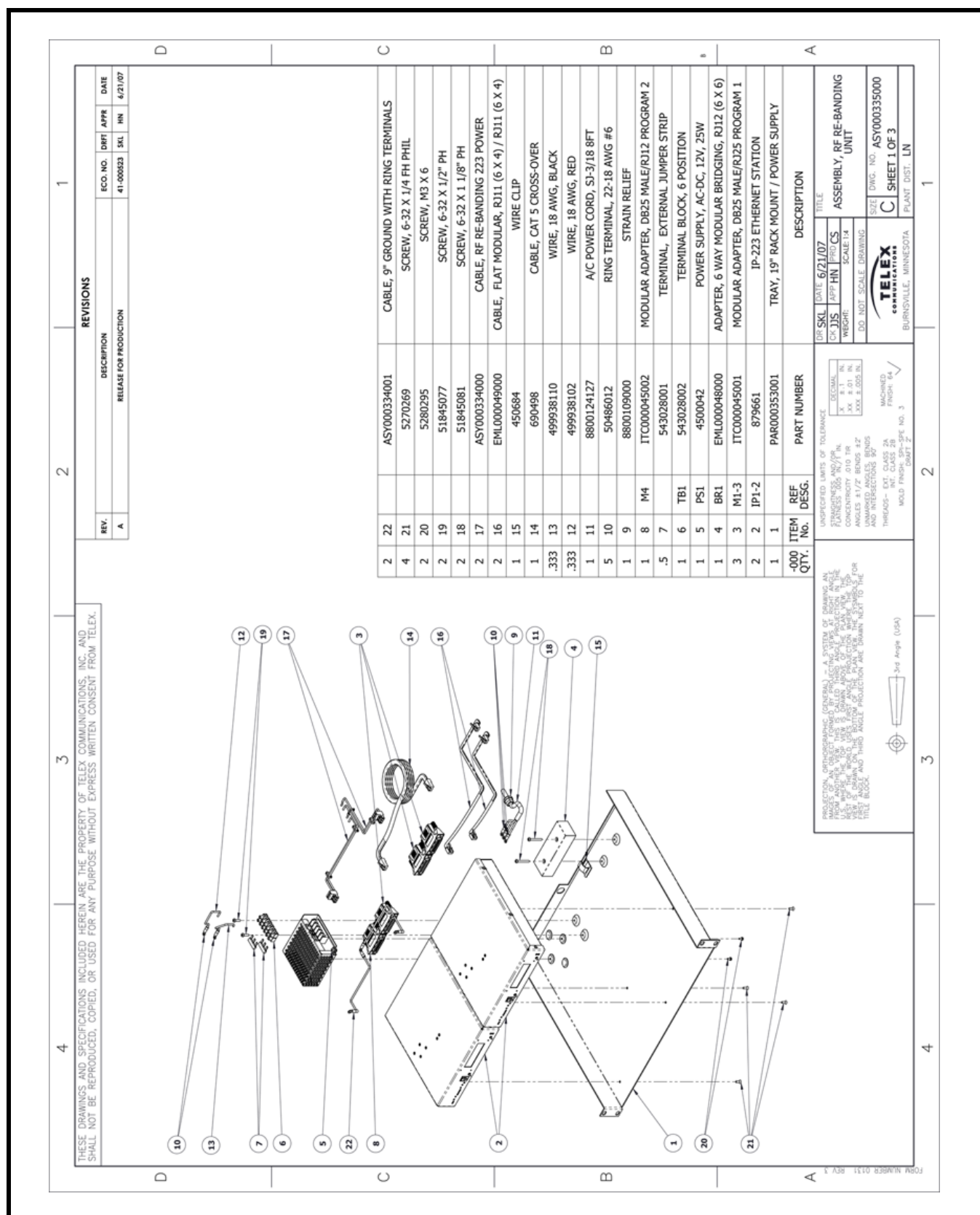


FIGURE 14. System Component Layout

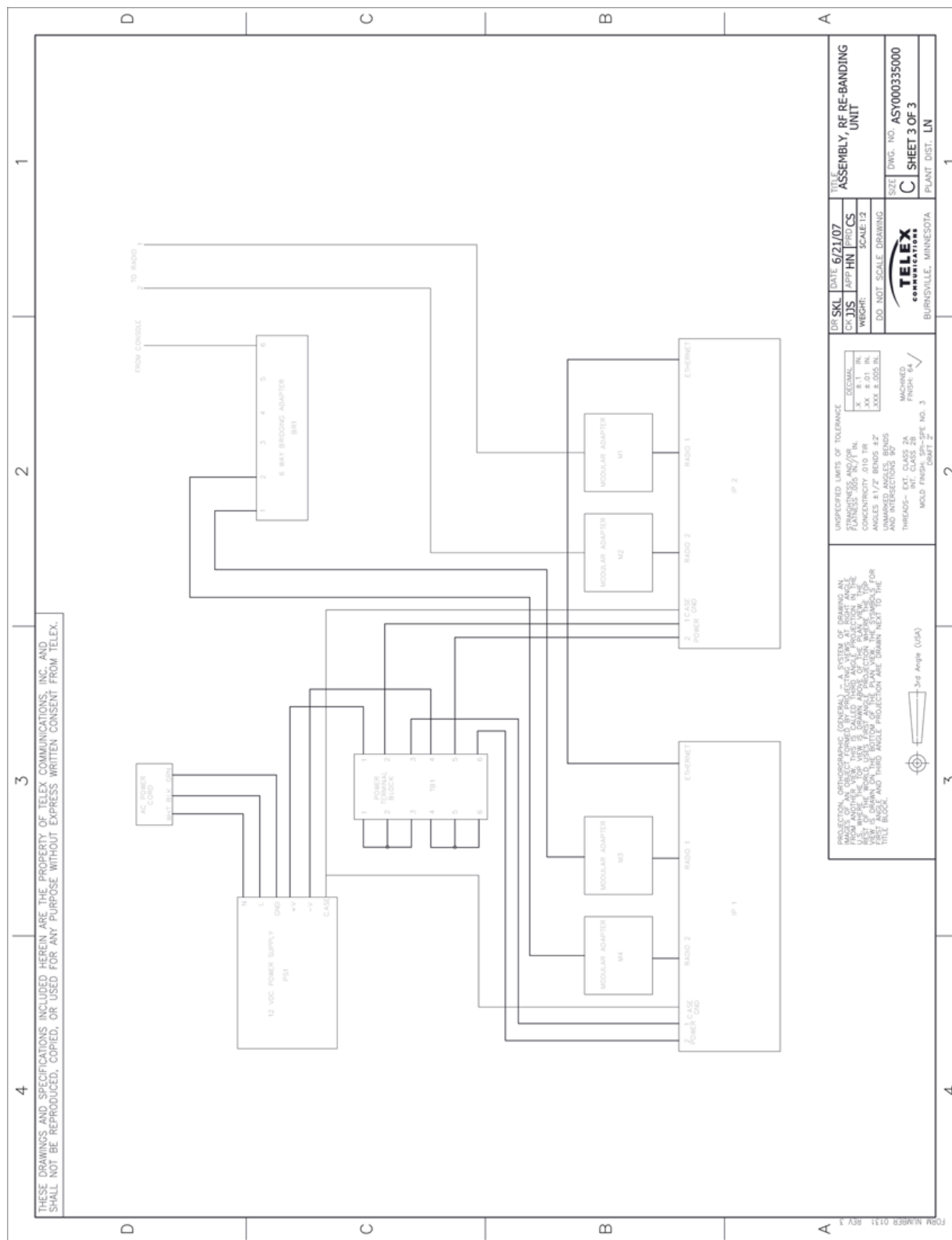


FIGURE 15. System Electrical Connections

NOTES

