PTX-PRO

13 GHz Transmitter

MRC

VISLINK GROUP

User and Technical Manual

Manual Part No. 400590-1 Rev. B June 2009

Notices

About This Manual

Part number **400590-1**

Revision **B June 2009**

PTX-PRO 13 GHz Transmitter (PTX-PRO)

Copyright

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Printed in U.S.A.

Proprietary Material

Quality Certification

Microwave Radio Communications is certified to ISO 9001:2000.

Changes or modifications not expressly approved by MRC could void the user's authority to operate the equipment.

General Safety Information

The following safety requirements, as well as local site requirements and regulations, must be observed by personnel operating and maintaining the equipment covered by this manual to ensure awareness of potential hazards.

WARNING - RF Power Hazard

High levels of RF power are present in the unit. Exposure to RF or microwave power can cause burns and may be harmful to health.

Remove power from the unit before disconnecting any RF cables and before inspecting damaged cables and/or antennas.

Avoid standing in front of high gain antennas (such as a dish antenna) and never look into the open end of a waveguide or cable where RF power may be present.

RF Exposure - Safe Working Distances

MRC provides this warning for safety purposes with the intent to inform the user of the potential hazard of RF exposure. The following guidelines for safe operation were derived from OET bulletin 65, August 1997, as recommended by the Federal Communications Commission (FCC).

The PTX-PRO 13 GHz Transmitter is a mobile transmitter system designed to provide services to broadcast ENG users under CFR 74 subpart F and 74.601 TV pickup stations. This unit, operated without an antenna, will not create RF energy exceeding 1.0 mW/cm^2, the FCC limit for exposure. Once connected to an antenna, the potential for harmful exposure will be greatly enhanced.

In this situation, a certain distance from the radiator is to be maintained. Calculations need to be performed to understand what that safe margin for exposure is. This is known as the Maximum Permissible Exposure (MPE) limit.

Note	Hazardous RF radiation limits and recommended distances may vary by country. Ensure that all applicable state and federal regulations are observed when using this transmitter.

Calculations provided are for common antennas often utilized in the ENG environment. The following formula used is that suggested by OET 65.

Calculating MPE

EIRP = P * (10 ^ (G / 10)) = (antilog of G/10) * P

P = RF power delivered to the antenna in mW
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna in centimeters
S = MPE in mW/cm^2 (milliwatts per square centimeters)

Conversions
dBi to numeric gain = Antilog (dBi/10)
Feet to centimeters = Feet * 30.48
Centimeters to Feet = cm * .0328
4 π = 12.57

User Input
RF power delivered to the antenna = Watts
Antenna gain (referenced to isotropic antenna) = dBi
Distance from the center of radiation = Feet

Calculation steps:

1. [P] RF power input. Convert watts to milliwatts = Watts * 1000
2. [G] Antenna gain dBi. Convert to numeric gain = Antilog (dBi/10)
3. [EIRP] Multiply P * G
4. [R] Convert centimeters to feet = Centimeters * .0328
5. Square R
6. Multiply $R^2 * 4\pi$
7. [S] Divide ($R^2 * 4\pi$) into EIRP

S = Power Density in milliwatts per square centimeters.
Note: At frequencies above 1500 MHz, S must not be greater than 1

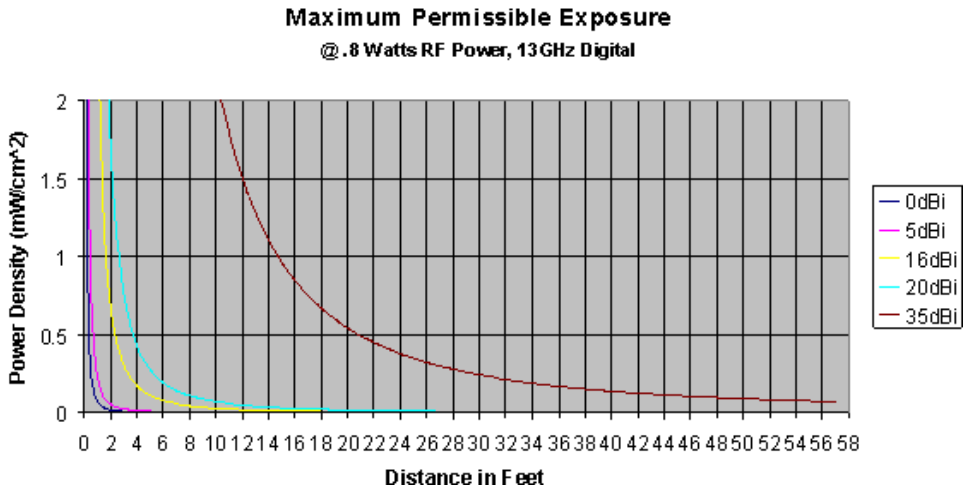
Reference

FCC OET Bulletin 65, August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

The example shown in Figure 1 is a typical graph for an MRC PTX-PRO 13 GHz Transmitter and shows the permissible exposure distance for various antennas. Graphs and data will vary, based on the actual transmitter, output power, frequency, and antenna utilized. The plot provides the permissible output of the transmitter for digital modulation

MRC, in accordance with the requirements set forth by the FCC, provides this information as a guide to the user. It is assumed that the users of this equipment are licensed and qualified to operate the equipment per the guidelines and recommendations contained within the product user guides and in accordance with any FCC rules that may apply.

Figure 1: Digital Modulation



The following table reflects the graphic representations above.

Table 1:

Antenna Gain (dBi)	Minimum Distance from Antenna (cm)	Minimum Distance from Antenna (inch)
0	8	3.15
5	45	17.71
16	51	20.07
20	80	31.49
35	449	176.73

Conventions

Pay special attention to information marked in one of the following ways:

WARNING	Follow WARNINGS closely to prevent personal injury or death.

CAUTION	*Follow CAUTIONS to prevent damage to the equipment.*

Note	Notes provide additional information to assist you in using and maintaining the equipment.

Symbols Used

The following symbols may be used on the equipment or may be contained in this manual:

Symbol	Meaning
	WARNING: General Warning. Risk of Danger
	WARNING: Risk of Electric Shock
	CAUTION: Electrostatic Discharge. Possible Damage to Equipment
 -OR-	Fuse - Identifies fuses or their location.
	Frame or Chassis Ground - Identifies the frame or chassis terminal.
	Earth Ground - Identifies the earth ground terminal
	Protective Earth Ground - Identifies any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal on a protective earth electrode.
	Waste Electrical and Electronic Equipment (WEEE) - The product must not be disposed of with other waste at the end of its life cycle. It is the user's responsibility to dispose of the waste equipment by handing it over to a designated collection point for recycling.

Contents

1 *Introduction*

1.1 For Whom It's Written

This manual is intended for use by qualified operators, installers, and service personnel. Users of this manual should already be familiar with the basic concepts of radio, video, and audio.

1.2 Related Documents

- Van Portable Systems User and Technical Manual (part no. 400522-1)
- Glossary of Terms and Abbreviations (Part No. 400576-1)

1.3 Ordering Documentation

Any of the above manuals may be ordered by contacting MRC Customer Service:

Business Hours: **Monday - Friday**
8:00 AM - 7:00 PM Eastern Time (US)
(0800 - 1900 hrs US ET)
Telephone: 800.490.5700 (Press 3)
+1.978.671.5700 (Press 3)
E-mail: customerservice@mrcbroadcast.com

When contacting Customer Service, please have the following information available:

- Model number and serial number of the unit. This is located on a label on the bottom of each unit.
- Approximate purchase date.
- Firmware version, which appears on the PTX-PRO alphanumeric display at startup.

- OR -

- Firmware version(s) displayed on the **Main** page of the **MRC Radio Configurator** (Configurator), when the Configurator software is connected to the PTX-PRO.

1.4 Calling for Service

MRC Technical Support is available 24 hours a day, 7 days a week. During regular business hours you can reach our expert staff directly.

Business Hours: **Monday - Friday**
8:00 AM - 5:00PM Eastern Time (US)
(0800 - 1700 hrs US ET)
Telephone: 888.777.9221 (US and Canada)
+1.978.671.5929
E-mail: technicalsupport@mrcbroadcast.com

After regular business hours and on weekends and holidays, you can also reach our expert staff as follows:

Telephone: 888.777.9221 (US and Canada)
+1.978.671.5929

Your call will be automatically forwarded to the on-call Technical Support specialist.

When contacting Technical Support, please have the following information available:

- Model number and serial number of the unit. This is located on a label on the bottom of each unit.
- Approximate purchase date.
- Firmware version, which appears on the PTX-PRO alphanumeric display at startup.

  - OR -

- Firmware version(s) displayed on the **Main** page of the **MRC Radio Configurator** (Configurator), when the Configurator software is connected to the PTX-PRO.

1.5 Tell Us What You Think!

We'd appreciate any comments or suggestions you have about this manual. The more feedback we get, the better the manuals get!

If you're viewing this manual electronically, it's easy - just click on the link below to send us an E-mail.

Feedback

Or, you can E-mail our Technical Support team at:

technicalsupport@mrcbroadcast.com

Be sure to tell us what product you're writing about, and which document.

2 Product Description

2.1 Chapter Overview

This chapter provides an overall description of the PTX-PRO 13 GHz Transmitter (PTX-PRO) components, options, and capabilities.

Here are the topics covered:

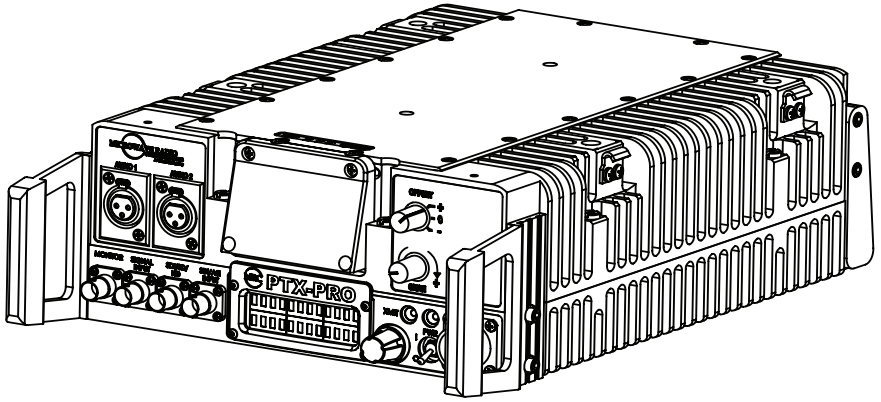
2.2 Description

The PTX-PRO, as shown in Figure 2-1, is used for digital video microwave communications and is designed to be a highly reliable, flexible, and compact portable microwave transmitter for either tripod or mobile applications.

The PTX-PRO is ideal for portable Electronic News Gathering (ENG), Digital Video Broadcasting (DVB), mobile communication, wireless airborne networks, and Outside Broadcast (OB) systems.

The PTX-PRO architecture allows you the maximum flexibility in configuration, siting, and operation. The PTX-PRO is a versatile portable transmitter designed to accept a 70 MHz IF input signal or composite video signal, audio signals, SD/HD SDI signals, or ASI/SDI signals from external sources and to provide 13 GHz microwave signal outputs for communications purposes.

Figure 2-1: PTX-PRO Transmitter - Typical



The PTX-PRO accepts either external 70 MHz, external IF, composite video (CV), HD or SD SDI, or SDI/ASI input signals and up-converts these signals to the 13 GHz RF band.

The RF frequency synthesizer circuit included in the IF/RF module, in conjunction with the command and control power supply module, provides the means to channelize RF video and audio signals in the 13 GHz RF band, as applicable to the configuration of the PTX-PRO.

Standard U.S. FCC band plans, as well as customer-created channel plans, may be customized using the Configurator software.

The PTX-PRO includes MPEG/CODFM modules and serves as a stand-alone digital video microwave transmission system.

2.2.1 Options

All configurations are available with either NTSC or PAL system modulation.

PTX-PRO options consist of the following:

Standard and High Definition Video All PTX-PRO configurations are available with Standard Definition (SD) or SD and optional High Definition (HD) video technologies.

Antenna Options The PTX-PRO is fully compatible with the MRC family of transmit antennas, including the following:

- MRC MegaHorn Compact Horn
- MRC 2, 3, and 4 ft. Parabolic Antennas.

Contact your Sales Representative to explore the antenna choices available.

2.2.2 Power Options

The architecture of the PTX-PRO allows a number of options for the external power source. The PTX-PRO configurations operate on the following external AC or DC power sources:

- 90 to 264 VAC, 50/60 Hz
- +11.0 to +36.0 VDC

A built-in universal AC and DC power supply provides full flexibility in choosing power sources. For additional information, refer to the “Installation” Chapter on page 6-1 .

Fuse ratings for the AC and DC power sources are shown in Table 2-1.

Table 2-1: Fuse Ratings

Operating Voltage	Fuse Rating
90 to 264 VAC, 50/60 Hz	2.0A, 250V AGC, Slow Blow
+11.0 to +36.0 VDC	15.0A, 250V, Slow Blow

CAUTION *Avoid possible equipment damage. If you are using a DC power source for your PTX-PRO, do not exceed 36 volts DC input power.*

Refer to the “Installation” Chapter on page 6-1 for additional information.

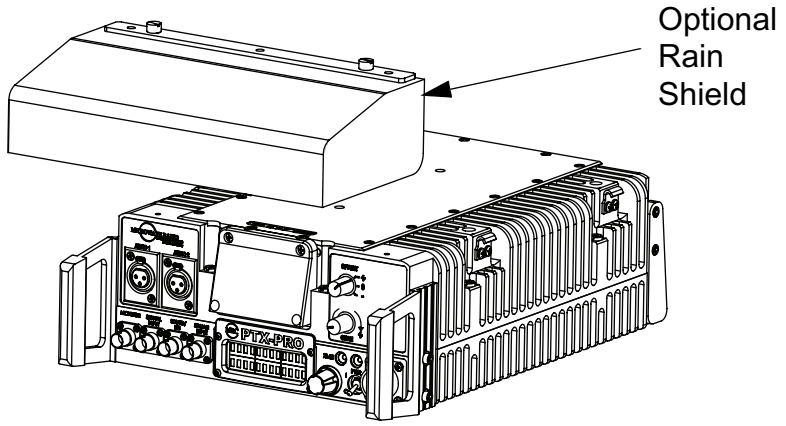
2.2.3 Mounting and Deployment Options

For more details on installation of the PTX-PRO in various applications, see the “Installation” Chapter on page 6-1.

Portable Deployment In portable applications, the PTX-PRO is typically mounted on an MRC Quick Release Mount for easy attachment to an MRC tripod. The Quick Release Mount connects to a Dovetail Adapter Plate machined into the MRC tripod mount. Other mounting options are available.

An optional Rain Shield, as shown in Figure 2-2, is available.

Figure 2-2: PTX-PRO with Optional Rain Shield



2.2.4 System Integration

System Operation Once the PTX-PRO is connected and powered up, system settings can be selected or modified from the front panel of the PTX-PRO.

System Configurations The PTX-PRO offers two levels of system configurations designed to match the needs of different personnel.

For the field operator, the PTX-PRO has up to nine Presets that can be selected from the front panel. Each Preset controls key parameters such as modulation, frequency, and audio and video settings. Additional settings that may be controlled from the front panel include channel and offset.

For the advanced operator and technical staff, the Configurator software allows complete control of parameters in the PTX-PRO. The Configurator software runs on a Microsoft Windows-based PC and connects to the PTX-PRO via an RS-232 serial interface cable.

Interfacing a PC to the PTX-PRO provides complete control of PTX-PRO Presets. You can read the current settings, program new settings, or return the units to their factory default settings. The Configurator software automatically detects the hardware and licensed options installed in PTX-PRO and assigns the appropriate configurations to the correct hardware.

3 Routine Operation

3.1 Chapter Overview

This chapter provides basic information that will enable you to operate your PTX-PRO 13 GHz Transmitter (PTX-PRO).

Here are the topics covered:

For a summary of settings that can be made with the PTX-PRO front panel control switches and which settings are made using the Configurator software, see Section 3.7 on page 3-14.

Information on settings made with the MRC Radio Configurator (Configurator) software can be found in the “Advanced Operation” Chapter on page 5-1.

3.2 Overview of Controls, Indicators and Connectors

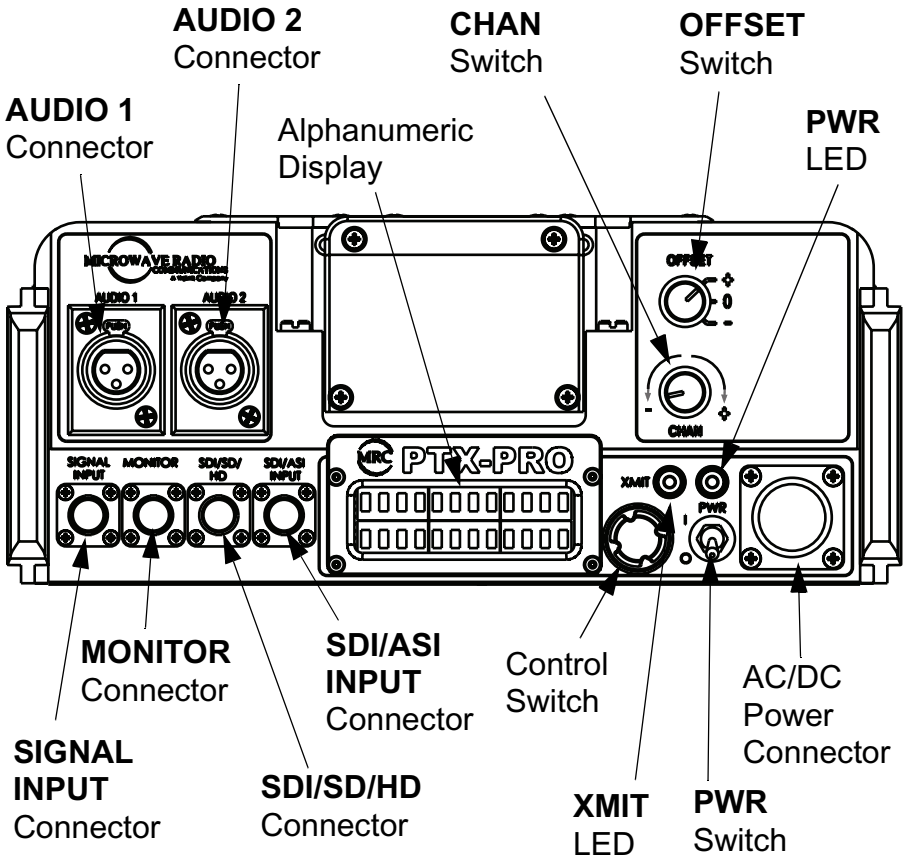
This section describes the controls, indicators, and connectors used on the PTX-PRO.

Controls, indicators, and connectors contained on the various configurations of the PTX-PRO are identified and described below. Topics covered are as follows:

3.2.1 Front Panel Controls, Indicators, and Connectors

Each of these controls, indicators, and connectors are described in more detail in the following paragraphs. Controls, indicators, and connectors contained on the PTX-PRO front panel are shown in Figure 3-1.

Figure 3-1: PTX-PRO Front Panel Controls, Indicators, and Connectors



AUDIO 1 and AUDIO 2 XLR Connectors Each front panel XLR **AUDIO** connector receives one channel of balanced audio input.

Alphanumeric Display The PTX-PRO front panel contains a two-line by 12-character alphanumeric display. The display works in conjunction with the control switch to allow you to monitor system status and to control system settings.

OFFSET Switch The front panel three-position **OFFSET** switch provides selection of **+** (plus), **0** (center), or **-** (minus) channel offset.

Note that **OFFSET -** (minus) cannot be selected for Channel 1 and **OFFSET +** (plus) cannot be selected for Channel 22.

CHAN Switch The front panel **CHAN** selector switch is used to select the operating channel required. The **CHAN** selector switch allows selection of 22 channels in the 13 GHz band.

Rotating the switch clockwise incrementally increases the channel number and rotating the switch counterclockwise decreases the channel number. The selected channel is displayed on the Main screen of the alphanumeric display.

SIGNAL INPUT BNC Connector The front panel **SIGNAL INPUT** 75 ohm BNC female connector provides the input connection for 70 MHz IF or composite video to the unit.

MONITOR BNC Connector The front panel **MONITOR** 75 ohm BNC female connector provides a 70 MHz output for external signal monitoring.

PWR LED The front panel **PWR** (power) LED is a multi-color status LED. **PWR** LED indications are as follows:

WARNING

A **Major Alarm** may also indicate a potential safety hazard.
Shut down the PTX-PRO and disconnect power.

LED Color	Meaning
-----	**Power is not on in the unit.**
Green	**Power is on and no errors are detected.**
Amber	**Minor Alarm - Power is on but some part of the system reports an abnormal condition that might impair performance.**
Red	**Major Alarm - Power is on but there is a failure or error that prevents normal operation.**

SDI/HD/SD BNC Connector The front panel **SDI/HD/SD** 75 ohm BNC female connector provides the HD/SD/SDI data stream input to the unit.

SDI/ASI INPUT BNC Connector The front panel **SDI/ASI INPUT** 75 ohm BNC female connector provides SDI or ASI inputs to the unit.

Control Switch Routine PTX-PRO operating settings are controlled by the front panel control switch. Turning the control switch right (cw) displays monitor options, turning the control switch left (ccw) displays command setting options, and pressing the control switch in makes selections as described below:

	**Turn the control switch to the right (cw) to view Monitor options.** **Monitor options are dependent upon the Preset operating mode selected and provide current status of the PTX-PRO. Status includes, but is not limited to, the following:** • Frequency Setting • Output Attenuation Level • Frequency Band • Operating Mode • System Errors.
	**Turn the control switch to the left (ccw) to view Command options.** **The Command options allow control of the PTX-PRO, including:** • Change Preset • Change Video Mode to SD or HD • Change SD or HD Video Mode Settings • Change Color Bar Settings • Setting Output Attenuation

Pressing the control switch causes an action to occur.

Command Options

- If the displayed setting is **Chng Preset**, **Chng VI Mode**, **Chng SD/HD VI**, **Chng Clr Bar**, or **Set TX VVA**, pressing the control switch causes the displayed setting to blink.
  Turning the control switch cw or ccw then displays the other options for that setting.
  When the desired option is displayed, pressing the control switch selects that option.

Transmit

- Pressing the control switch for one second changes the transmitter to the transmit mode from the standby mode.
- Pressing the control switch for one second changes the transmitter from the transmit mode to the standby mode.

XMIT LED When the PTX-PRO front panel control switch is pressed for one second, the transmitter changes from the standby mode to the transmit mode or from the transmit mode to the standby mode. When the transmitter is in the transmit mode, the front panel **XMIT** LED illuminates blue. When the transmitter is in the standby mode, the **XMIT** LED is off.

PWR Switch The front panel **PWR** (power) switch controls application of AC or DC power to the PTX-PRO.

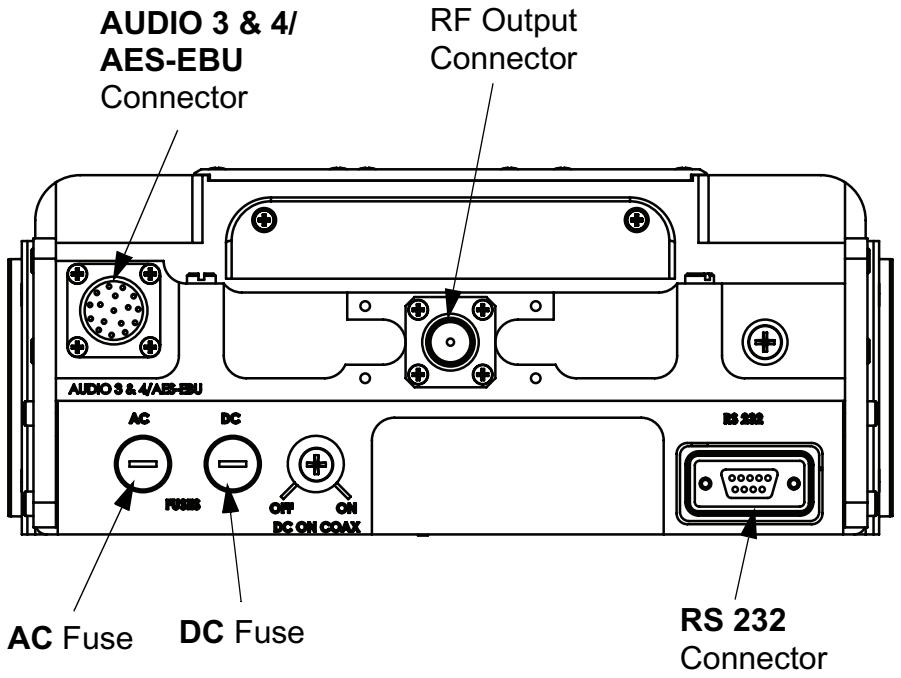
AC/DC Power Connector The front panel AC/DC power connector mounted on the front panel of the unit allows the PTX-PRO to operate on external AC or DC power sources.

3.2.2 Rear Panel Connectors and Fuses

Controls, fuses, and connectors contained on the PTX-PRO rear panel are shown in Figure 3-2.

AUDIO 3 & 4/AES-EBU Connector The rear panel 10-pin female connector receives balanced audio inputs for audio channels 3 and 4.

Figure 3-2: PTX-PRO Rear Panel Controls, Indicators, and Connectors



RF Output Type "N" Connector The rear panel 50 ohm, type "N", female connector provides the RF output to the transmitting antenna. The universal type "N" connector allows the PTX-PRO to easily be used for emergency restoration of a Studio-Transmitter Link (STL) or Inter-City Relay (ICR) link.

AC Fuse The rear panel **AC** fuse provides AC input power protection for units used with AC power sources.

DC Fuse The rear panel **DC** fuse provides DC input power protection for units used with DC power sources.

RS 232 DB-9 Connector The **RS 232** DB-9 connector provides connections for factory test or to a Microsoft Windows-based PC when using the Configurator software. The connector also provides connections for Wayside data.

3.3 Preparing for Operation

Each installation or deployment will have its own specific tasks according to the application and the installed hardware.

3.3.1 Portable Deployment - Typical

For portable applications where the PTX-PRO will be moved from place to place and set up each time, the system will typically be mounted on an MRC Quick Release Mount for easy attachment to an MRC tripod. Other mounts are also available.

For additional information, refer to the "Installation" Chapter on page 6-1.

3.3.2 Powering the PTX-PRO Transmitter

The procedures required to power up and power down the PTX-PRO are contained in the following steps.

Power Up

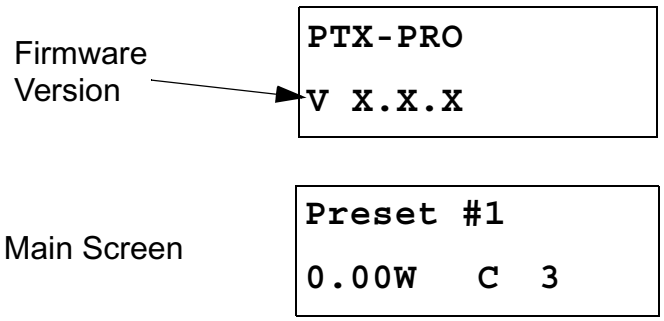
1. Verify the power cable is properly connected to the PTX-PRO front panel power connector.
2. Verify all front and rear panel cables and connectors have been properly connected.

   If you are unsure of the connections, refer to the "Installation" Chapter on page 6-1.

   Connect the power cable to the power source.

   If you are unsure of the power requirements or the connections, refer to the "Installation" Chapter on page 6-1.
3. Verify the power source is turned on.
4. Set the front panel **PWR** switch to on (**I**).
5. The normal power-up sequence is as follows:
   - The **PWR** LED above the **PWR** switch should illuminate and should quickly change colors from red, to green, to amber, to green, and should remain green.
   - The alphanumeric display should light up and quickly display a self-test screen, then the version of the firmware, and finally the Main screen.
   - Some typical screens are shown in Figure 3-3. Exact screens displayed will vary.
   - The PTX-PRO will typically power up using the last settings in use when power was turned off.
   - If the PTX-PRO does not power up normally, refer to the "Troubleshooting" Chapter on page 4-1.

Figure 3-3: Typical PTX-PRO Power Up Screen



Power Down

1. Set the **PWR** switch to off (**0**).
2. Set the power source power to off.

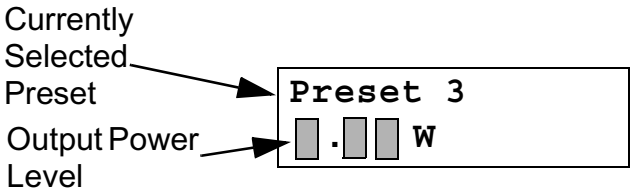
3.4 Using the Display Screens

As you use the PTX-PRO, you will interact extensively with the screens displayed on the alphanumeric display. Following are some points to make this easier.

Main Screen The Main screen is your starting point for navigating through the Monitor and Control screens. The Main screen provides the current values of the Preset selected and the selected Preset output power level.

When the PTX-PRO completes its power-up sequence, the Main screen will be displayed. A typical Main screen is shown in Figure 3-4.

Figure 3-4: Main Screen - Typical



Accessing the Main Screen You can access the Main screen at any time by scrolling to the end of the screens you are viewing (either Monitor or Control). Your next click of the control switch will bring up the Main screen.

Accessing the Monitor Screen You can access the Monitor screen at any time by turning the control switch clockwise (cw).

Accessing the Control Screen You can access the Control screen at any time by turning the control switch counter-clockwise (ccw).

Default to Main Screen If you do not turn or press the control switch within a period of approximately 7 seconds, the display will default to the Main screen.

If you turn the control switch within those 7 seconds, you will continue scrolling within that set of screens (Monitor or Control).

3.5 PTX-PRO Monitoring Operations

The PTX-PRO Presets are set to five possible modes of operation. These operating modes are established using the Configurator software. Operating mode options displayed on the Monitor screens are indicated below in **bold** fonts. Operating mode options available via the Configurator software are as follows:

- MPEG/COFDM IF Out (**COFDM** mode)
- COFDM Only - ASI In (**ASI/SDI In** mode)
- External 70MHz IF In (**Ext IF Input** mode)
- LMS-T (Terrestrial) (**LMS-T** mode)

Once the PTX-PRO is set up and powered up, you will be able to check its configuration and monitor its operation. When configuration settings are established for the individual Presets using the Configurator software, the individual Preset operating modes should be recorded for quick reference.

The following sections describe how to use the Monitor screens. Here are the tasks described:

3.5.1 Using the Monitor Screens in COFDM Mode

When the PTX-PRO is operating in the **COFDM** mode, 70 MHz COFDM IF output from the internal COFDM/MPEG board is supplied to the RF output and **MONITOR** connectors. See Figure 3-5 on page 3-8 for the COFDM Monitor Menu Map.

3.5.2 Using the Monitor Screens in ASI/SDI Input Mode

When the PTX-PRO is operating in the **ASI In** mode, the internal MPEG encoder is bypassed and an externally supplied ASI stream is routed to the **MONITOR** and RF output connectors. See Figure 3-6 on page 3-9 for the ASI In Menu Map.

3.5.3 Using the Monitor Screens in Ext IF Input Mode

When the PTX-PRO is operating in the **Ext. IF In** mode, the 70 MHz IF input signal to the **SIGNAL INPUT** connector is routed through the transmitter. See Figure 3-7 on page 3-10 for the Ext. IF Monitor Map.

3.5.4 Using the Monitor Screens in LMS-T Mode

When the PTX-PRO is operating in the **LMS-T** mode, this mode utilizes a single carrier modulator and supplies a configurable LMV-S signal to the transmitter RF output and **MONITOR** connectors.

This mode is operational for QPSK and 16 QAM modulation formats. See Figure 3-8 on page 3-11 for the LMS-T Monitor Menu Map.

Figure 3-5: COFDM Monitor Menu Map - Typical

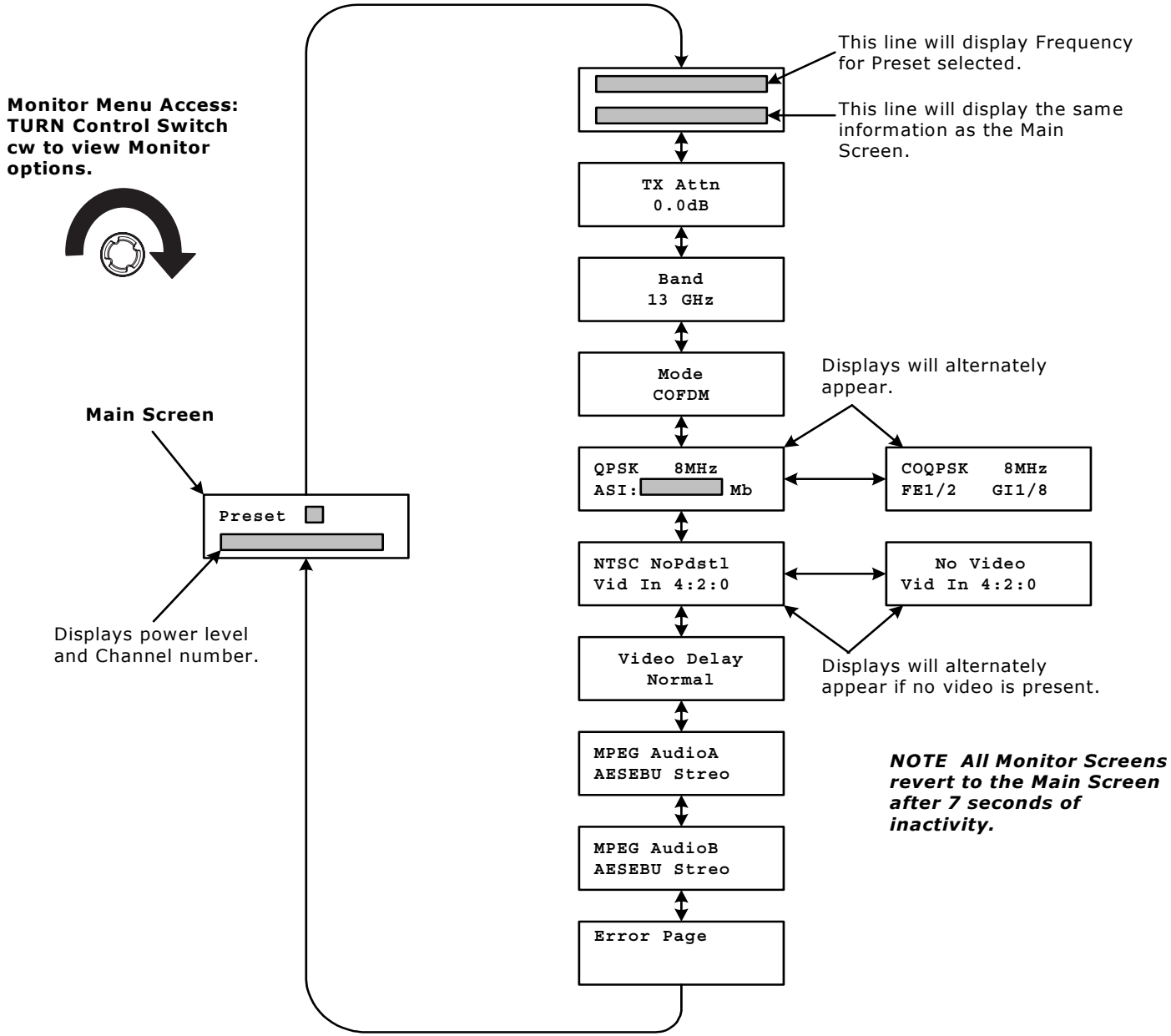


Figure 3-6: ASI/SDI Input Monitor Map - Typical

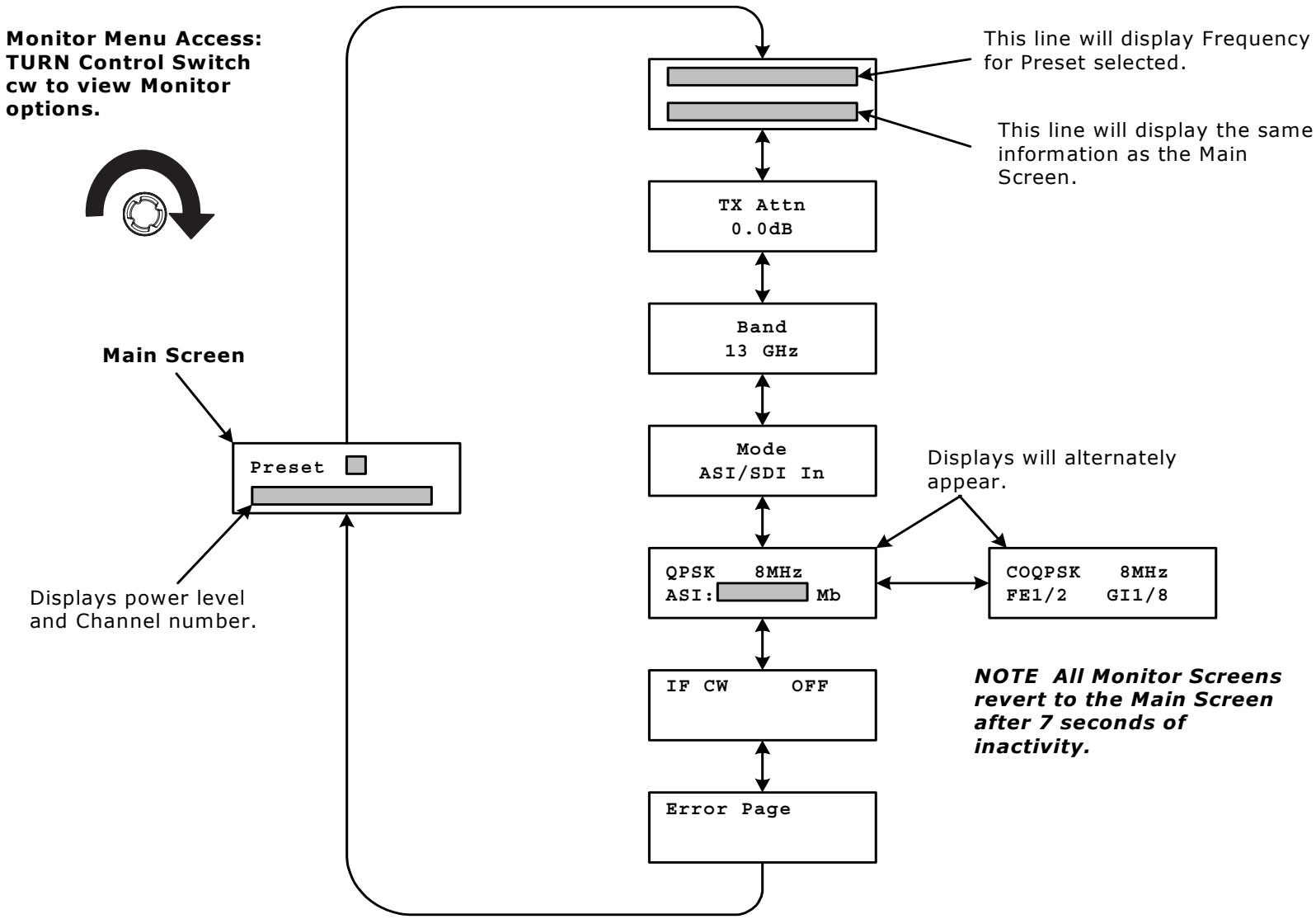


Figure 3-7: Ext IF Input Monitor Map - Typical

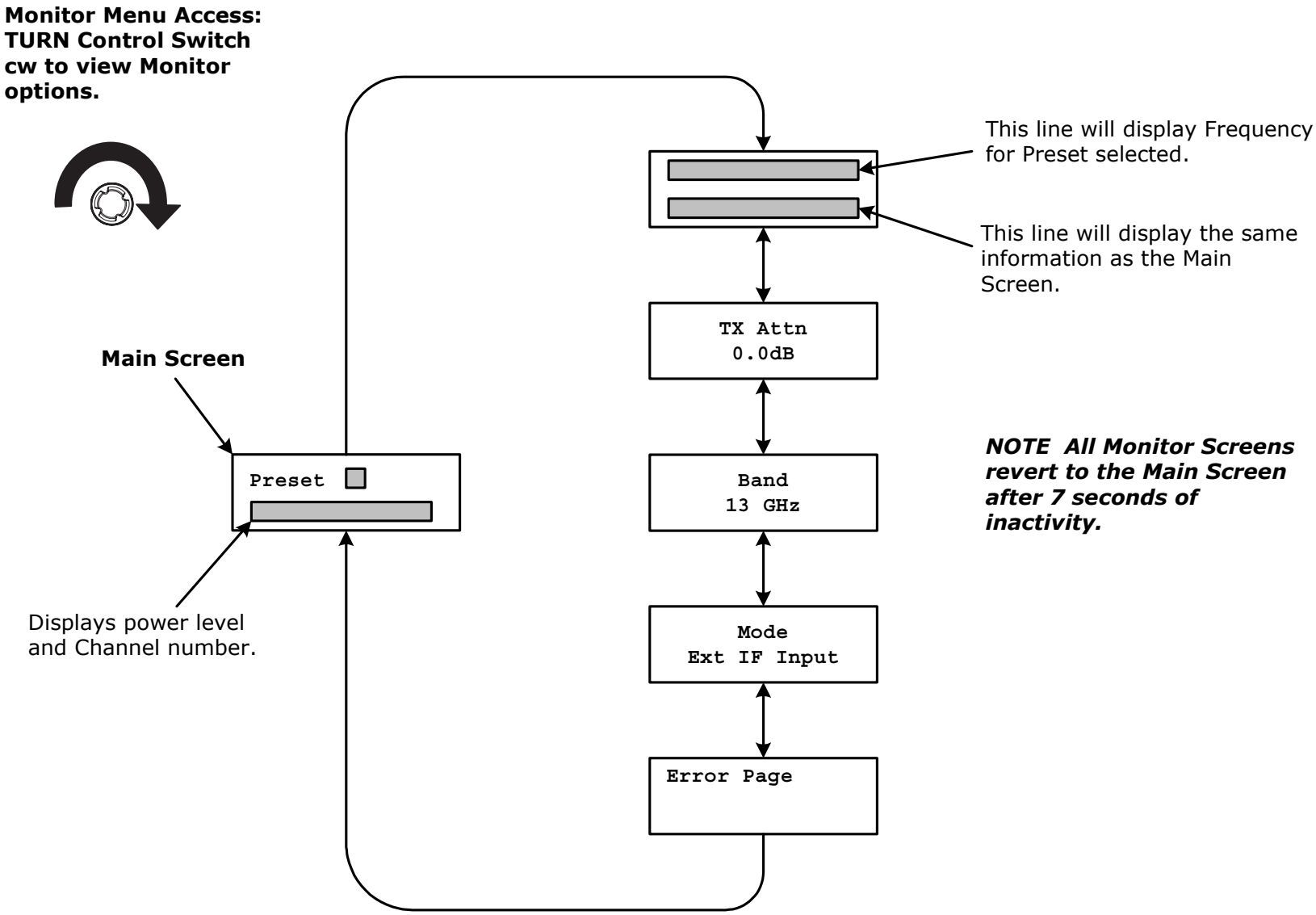
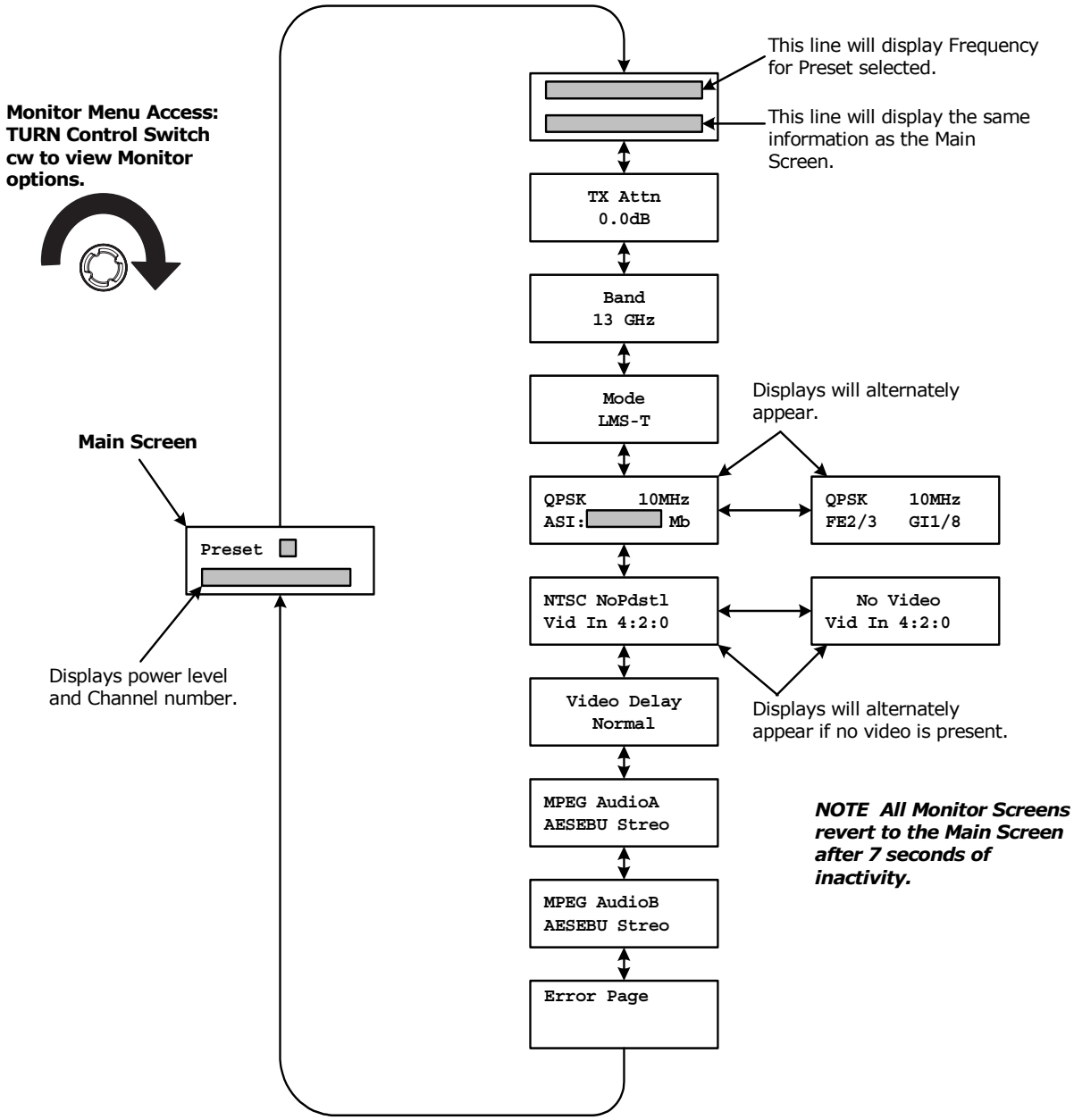


Figure 3-8: LMS-T Monitor Menu Map

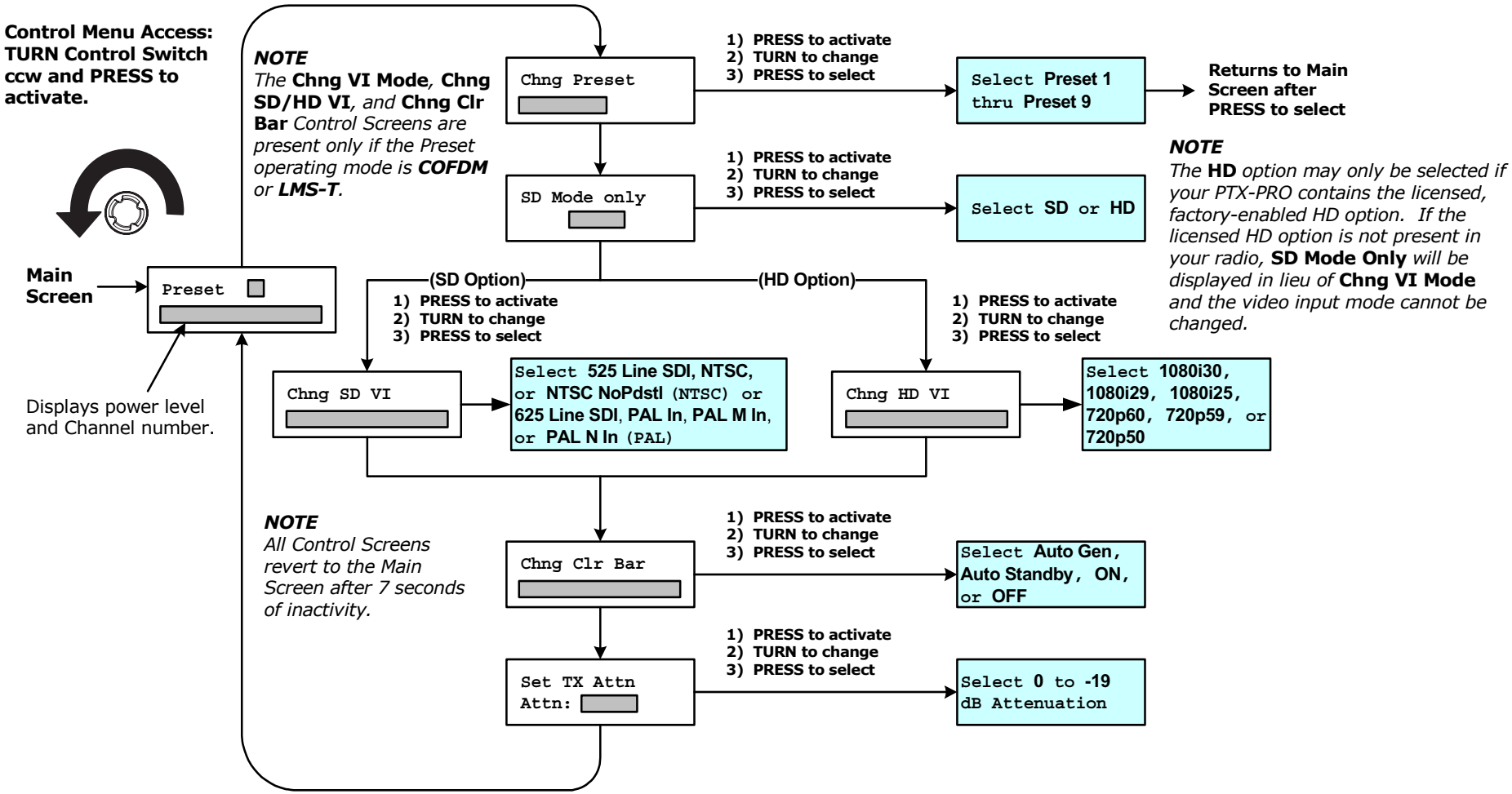


3.6 PTX-PRO Control Operations

This section describes how to configure your PTX-PRO using the front panel control switch. Turning the front panel control switch counterclockwise (ccw) controls transmitter functions including changing Presets, changing the video input (VI) mode, changing SD or HD video inputs, changing color bar settings, and setting RF attenuation levels.

See ”Front Panel vs. Configurator Settings” on page 3-14 for a summary of settings that can be changed using the front panel control switch and which are made using the Configurator software. See Figure 3-9 on page 3-13 for the Control Menu Map.

Figure 3-9: Control Menu Map



3.7 Front Panel vs. Configurator Settings

The design of the PTX-PRO and the Configurator software makes commonly available settings accessible from the PTX-PRO front panel switches and alphanumeric display and more advanced settings accessible through the Configurator software.

A summary of settings that can be controlled by each method is shown in Table 3-1.

Table 3-1: Front Panel vs. Configuration Setting

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
Presets			
Preset in use	1, 2,... 9	✔	✔
Preset text	Any 12 alphanumeric characters		✔
Operation Mode (Special license required for LMS-T)	• COFDM		✔
	• ASI In		✔
	• Ext. IF In		✔
	• LMS-T		✔
Color Bars	• ON	✔	✔
	• OFF	✔	✔
	• Auto	✔	✔
	• Standby	✔	✔

Table 3-1: Front Panel vs. Configuration Setting (Continued)

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
IF/CW Tone	• ON		✔
	• OFF		✔
Variable Voltage Attenuation (TX VVA) (Back Off)	• Variable (0 to -19 dB in 1 dB steps)	✔	✔
Channels			
Channel & Offset in use	• 1 thru 22	✔	
	• +, 0, -	✔	
Channel & Offset Frequencies	13 GHz band		✔
MPEG			
Service Name	• Any eight alphanumeric characters		✔
Network Name	• Any eight alphanumeric characters		✔
Video Input Mode	• SD	✔	✔
	• HD (Special license required)	✔	✔

Table 3-1: Front Panel vs. Configuration Setting (Continued)

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
SD Video Input Mode (NTSC Operation)	• SDI 525 In		✔
	• NTSC In		✔
	• NTSC No Pedestal		✔
SD Video Input Mode (PAL Operation)	• SDI 625		✔
	• PAL In		✔
	• PAL M In		✔
	• PAL N In		✔
HD Video Input Mode	• 720p @ 50 Hz	✔	✔
	• 720p @ 59.94 Hz	✔	✔
	• 720p @ 60 Hz	✔	✔
	• 1080i @ 25 Hz	✔	✔
	• 1080i @ 29.97 Hz	✔	✔
	• 1080i @ 30 Hz	✔	✔
Video Delay	• Standard		✔
	• Low		✔
Chroma Format	• 4:2:0		✔
	• 4:2:2 (Special license required)		✔

Table 3-1: Front Panel vs. Configuration Setting (Continued)

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
Wayside State	• OFF		✔
	• IRD Compatible		✔
	• STRATA Compatible		✔
Wayside Baud Rate	• 1200		✔
	• 2400		✔
	• 4800		✔
	• 9600		✔
	• 19200		✔
	• 38400		✔
BISS Encryption	• OFF		✔
	• BISS-1		✔
	• BISS-E		✔
Audio A Type	• OFF		✔
	• MPEG		✔
Audio A Mode	• Stereo		✔
	• Dual Mono		✔
Audio A Input	• Test Tone		✔
	• Analog		✔
	• SDI EMB		✔
	• AES EBU		✔

Table 3-1: Front Panel vs. Configuration Setting (Continued)

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
Audio B Type	• OFF		✔
	• MPEG		✔
Audio B Mode	• Stereo		✔
	• Dual Mono		✔
Audio B Input	• Test Tone		✔
	• Analog		✔
	• SDI EMB		✔
	• AES EBU		✔
PID Information	• PCR (32 - 8190)		✔
	• DAT (32 - 8190)		✔
	• VID (32 - 8190)		✔
	• AUD-A (32 - 8190)		✔
	• AUD B (32 - 8190)		✔
COFDM (Special licenses required)			
Modulation	• QSPK		✔
	• 16 QAM		✔
	• 64 QAM		✔
Bandwidth	• 6 MHz		✔
	• 7 MHz		✔
	• 8 MHz		✔

Table 3-1: Front Panel vs. Configuration Setting (Continued)

Parameter	Available Settings	Set Using Control Switches	Set Using Configurator
FEC	• 1/2		✔
	• 2/3		✔
	• 3/4		✔
	• 5/6		✔
	• 7/8		✔
Guard Interval	• 1/32		✔
	• 1/16		✔
	• 1/8		✔
	• 1/4		✔
LMS-T (Special license required)			
Modulation	• QPSK		✔
	• 16 QAM		✔
Bandwidth	• 10 MHz • 20 MHz		✔
FEC	• 2/3		✔
Guard Interval	• 1/16		✔
	• 1/8		✔

4 Troubleshooting

4.1 Chapter Overview

This chapter describes how to troubleshoot your PTX-PRO 13 GHz Transmitter (PTX-PRO).

Here are the topics covered:

CAUTION *To avoid possible equipment damage, turn off DC on coax before connecting any test equipment to the PTX-PRO RF output connector.*

4.2 Power LED

Above the PTX-PRO front panel **PWR** switch is a multi-color **PWR** LED that provides unit status indications. The **PWR** LED status indications are listed in Table 4-1.

WARNING

A **Major Alarm** may also indicate a potential safety hazard.

Shut down the PTX-PRO and disconnect power.

Table 4-1: Power LED Indications

LED Color	Meaning	Suggested Action
-----	Power is not on in the unit.	Turn on power, as required.
Green	Power is on and no errors are detected.	None.
Amber	**Minor Alarm** - Power is on but some part of the system reports an abnormal condition that requires attention. Condition might impair performance.	Check Monitor Screens for error messages or Error Codes. Troubleshoot using tables in this chapter.
Red	**Major Alarm** - Power is on but there is a serious failure or error that will prevent normal operation. The internal processors are not running.	***Turn off unit and disconnect power.*** Call MRC Technical Support.

4.3 Display Messages

One of the ways the PTX-PRO will alert you to problems is by error messages on the PTX-PRO front panel displays. These are displayed on the Monitor screens.

See Table 4-2 for descriptions of the messages and what to do when they appear.

Table 4-2: Display Messages

Message	Meaning	Suggested Operator Action	Suggested Technical Staff Action
Not On Chnl	Channel frequencies defined in the Channel Plan for that band are not being recognized.	• Change the channel. • Contact technical staff.	• Use Configurator software to check settings. Check the Channel Plan to be sure it is correct. Verify Channel Plan matches the transmitter settings. • If message persists even when operating on a frequency that matches the channel plan, unit may have suffered internal failure. Call MRC Technical Support.
No Video	The PTX-PRO is unable to lock onto video signal.	• Check for correct operation mode. • Check cable connections to **SIGNAL INPUT** and **SDI/ASI INPUT** connectors. • Contact technical staff.	• Use Configurator software to check settings. • If message persists, unit may have suffered internal failure. Call MRC Technical Support.

4.4 Error Codes

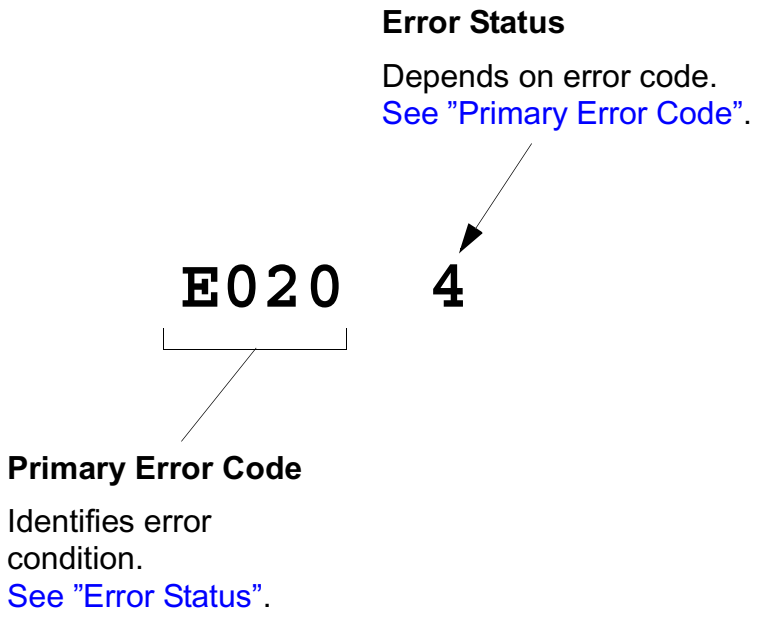
The PTX-PRO has a library of diagnostic error codes to help you pinpoint any problems.

These error codes:

- Are displayed on the front panel display, on the Error Code Screen.
- Cause the **PWR** status LED to glow amber, alerting you to investigate the problem.

The Error Codes are formatted into 2 groups of characters, as shown in Figure 4-1.

Figure 4-1: Error Code Format



4.4.1 Error Status

The significance of the Error Status digit depends on what Primary Error Code is being reported. See Table 4-3.

Table 4-3: Error Status Digit

Status Digit	Meaning
Status Error (Error Codes E020, E021, E080, and E0E0 thru E0E4)	
8	There is an error.
Parameter Error (Error Codes E030 thru E034, E03A thru E03E, and E042 thru E049)	
4	Value is too low.
8	Value is too high.

4.4.2 Primary Error Code

The first group of characters is the Primary Error Code. In most cases this portion of the Error Code will uniquely identify the problem.

See Table 4-4 on page 4-4 for descriptions of the error codes and what to do when they appear.

Table 4-4: Primary Error Codes

Error Code	Meaning	Suggested Operator Action	Suggested Technical Staff Action
Status Errors *(Some part of System is reporting an abnormal condition.)*			
E000	Error Summary	• Provides error summary. • Contact technical staff.	Call MRC Technical Support.
E001	Message ID	• Displayed when a specific status message times out. • Contact technical staff.	Call MRC Technical Support.
E020	TX IF Fault	• Verify condition of all cable connections. • Contact technical staff.	Call MRC Technical Support.
E021	TX RF Fault	• Verify condition of all cable connections. • Contact technical staff.	Call MRC Technical Support.
E080	Communication Failure with the COFDM/MPEG Module	• Verify condition of cable connections. Contact technical staff.	If problem persists, possible hardware failure. Call MRC Technical Support.
Parameter Errors *(Some internal parameter is outside of allowable limits.)*			
E030	TX 2.048 Volt Reference Error	• Check for Error Codes related to power - E03A thru E03E. • Verify cable connectors are fully mated and verify cable and connectors are undamaged. • Make sure power cable is connected properly. • Contact technical staff.	If errors persist with correct power connected, unit has suffered internal failure. Call MRC Technical Support.
E031	TX 5.5 Volt Reference Error		
E032	TX 7 Volt Line Error		
E033	TX 11 Volt Line Error		

Table 4-4: Primary Error Codes (Continued)

Error Code	Meaning	Suggested Operator Action	Suggested Technical Staff Action
E034	TX Temperature Error	• Check PTX-PRO to be sure it is not too close to sources of heat. Relocate PTX-PRO, if possible. • Verify PTX-PRO has room around it for air circulation. Move objects preventing air flow. • Contact technical staff.	If errors persist with proper location and airflow and correct power is connected, unit has suffered internal failure. Call MRC Technical Support.
E038	50 Ohm Coax Current Error	• Contact technical staff.	Call MRC Technical Support.
E039	50 Ohm Coax Voltage Error		
E03A	50 Ohm Coax Power Error		
E03B	TX Circular Connector Current Error	• Verify all power cables are properly connected and are not damaged. • Verify correct input power is being applied to the PTX-PRO. • Contact technical staff.	If errors persist with correct power connected, unit has suffered internal failure. Call MRC Technical Support.
E03C	TX Circular Connector Voltage Error		
E03D	TX Circular Connector Power Error		
E03E	TX DC Bus Error	• Contact technical staff.	Call MRC Technical Support.
E03F	TX Fan Fault	• Contact technical staff.	Call MRC Technical Support.

4.5 Operational Problems

Information provided on the following pages will assist you in troubleshooting problems that arise in the operation of your PTX-PRO.

For video problems, See Table 4-5; for general system problems, See Table 4-6 on page 4-7.

Table 4-5: Video Problems

Problem	Possible Cause	Suggested Operator Action	Suggested Technical Staff Action
Video Problems			
No video.	Problem with video source or cabling	• Check video source and cabling. • Contact technical staff.	• Check video source and cabling. • Call MRC Technical Support.
	Transmitter and Receiver compatibility problems	• Verify Transmitter and Receiver are both operating in the same digital mode. • Verify Transmitter and Receiver are both operating on the same frequency. If frequency offsets are used, verify offsets are identical between Transmitter and Receiver. • Contact technical staff.	• Call MRC Technical Support
	Video source configuration problem	• Verify PTX-PRO front panel settings match video source inputs. • Contact technical staff.	• Verify video inputs match Configurator software settings. • Call MRC Technical Support.

Table 4-6: General System Problems

Problem	Possible Cause	Suggested Operator Action	Suggested Technical Staff Action
General System Problems			
PWR LED on PTX-PRO is off when **PWR** switch is set to on (**I**).	Missing input power.	• Make sure power cable is connected properly. • Verify power source is turned on. • Contact technical staff.	• Check input power voltage. • Check both **AC** and **DC** power fuses. • Call MRC Technical Support.
PWR LED on PTX-PRO is amber.	PTX-PRO is indicating a **Minor Alarm**.	• Check all Monitor Screens on PTX-PRO display. Troubleshoot per Section 4.3 on page 4-2. • Check Error Code Screen on PTX-PRO display. Troubleshoot per Section 4.4 on page 4-3.	• Error messages: Troubleshoot per Section 4.3 on page 4-2. • Error Codes: Troubleshoot per Section 4.4 on page 4-3. • Call MRC Technical Support.
PWR LED on PTX-PRO is red.	PTX-PRO is indicating a **Major Alarm**.	**TURN OFF POWER and call for service.**	Call MRC Technical Support.

4.6 Configurator Troubleshooting

This section provides information so you can troubleshoot and correct problems that may arise when using the Configurator.

4.6.1 Configurator Error Messages

The Configurator has an extensive set of self-diagnostics that will alert you when an operation cannot be completed.

When there is a problem, a message will appear in the Configurator message area describing the problem. If the Configurator encounters a major error, a pop-up window may be displayed. Close the error message window by clicking **OK**.

Table 4-7 on page 4-8 provides the most common MRC Radio Configurator error messages and what to do if they occur.

Table 4-7: Configurator Error Messages

Error Message	Possible Cause	Suggested Action
Connection failed on [COM port name]	PTX-PRO system power is off.	Turn PTX-PRO system power on.
	RS-232 cable is disconnected.	Connect cable. Ensure connectors are fully seated on both ends.
	RS-232 cable is defective.	Replace cable.
	Installed PTX-PRO hardware is defective.	Contact MRC Technical Support.
Querying [Setting] failed...	Problem with RS-232 communication.	Try again. If error still appears, turn off PTX-PRO system power, close the Configurator, then turn on PTX-PRO power and re-start Configurator.
	RS-232 cable is disconnected.	Connect cable. Be sure connectors on both ends are fully seated.
	RS-232 cable is defective.	Replace cable.
	Installed PTX-PRO hardware is defective.	Contact MRC Technical Support.

Table 4-7: Configurator Error Messages (Continued)

Error Message	Possible Cause	Suggested Action
Configuration File Corrupt OR Unable to Open Configuration File	Unable to read data stored in file chosen.	Select a different configuration file.
	File damaged.	Re-create configuration and save it with a different file name.
	Problem with PC or its disk drive.	Contact your PC service provider.

4.6.2 Configurator Operational Problems

Table 4-8 provides the most common operational problems with the Configurator and what to do if they occur.

Table 4-8: Configurator Operational Problems

Problem	Possible Cause	Suggested Action
PC/Software Problems		
Configurator won't install on PC.	Previous version of MRC Radio Configurator already installed.	Uninstall previous version using the "Add/ Remove Programs" function in Microsoft Windows Control Panel.
	PC does not meet System Requirements.	See "PC Requirements" on page 6-17 .
	CD damaged.	Contact MRC Technical Support.
	Problem with PC or its disk drive.	Contact your PC service provider.

Problem	Possible Cause	Suggested Action
Configurator crashes when trying to run. AND / OR Get “Runtime Error” message.	Program files damaged.	Use the “Add/Remove Programs” function in Microsoft Windows Control Panel to uninstall the Configurator, then reinstall it.
	Problem with PC or its disk drive.	Contact your PC service provider.

5 Advanced Operation

5.1 Chapter Overview

This chapter describes how to use the MRC Radio Configurator (Configurator) software to configure settings in the PTX-PRO 13 GHz Transmitter (PTX-PRO). This information is provided and intended for use by the technical staff.

A summary of settings that can be made using the front panel control switches and those that can be made using the Configurator software is provided in “Front Panel vs. Configurator Settings” on page 3-14.

Here are the topics covered:

5.2 Before You Begin

Before you begin, you should review the following topics.

5.2.1 PTX-PRO

The procedures described in this chapter assume you already know how to operate your PTX-PRO. If this is not the case, please review the following Chapters in this manual:

“Introduction” Chapter on page 1-1
“Product Description” Chapter on page 2-1
“Routine Operation” Chapter on page 3-1

5.2.2 Configurator Software

This chapter also assumes the Configurator software is installed and operating on your PC and that you are familiar with its tabs, buttons, pages, etc.

5.2.3 Settings

Before beginning to create or program a configuration or channel plan into your PTX-PRO, you must define what settings are required.

5.2.4 System Rules

CAUTION *Do not make any configuration changes to your PTX-PRO while the PTX-PRO is connected to a radio system that is actively transmitting.*

Attempts to program configuration changes into a PTX-PRO when the radio system is actively transmitting will interrupt broadcast operations.

When configuring your PTX-PRO on-line (connected to a PC), the following system rules must be followed.

- When the PTX-PRO is properly connected to your PC and the system is powered up, the Configurator software will automatically detect your PTX-PRO, your hardware configuration, and the licensed options contained in your PTX-PRO.
- The PTX-PRO must be powered up prior to initializing the Configurator software.
- The configuration settings can be saved to the PTX-PRO or can be saved to a file and can be recalled at a later date.
- Configuration settings may be loaded into the Configurator from your PTX-PRO, may be modified, and may be loaded into your PTX-PRO and/or saved to a file in the on-line mode.
- The PTX-PRO must not be placed in the transmit mode when utilizing the Configurator software.
- Channel plans may be created in the on-line mode or in the offline mode. Channel plans created in the offline mode can be saved to a file on your PC and can be recalled at a later date.
- Channel plans may be loaded into the Configurator from your PTX-PRO, may be modified, and may be loaded into your PTX-PRO and/or saved to a file in the on-line mode.
- PTX-PRO configurations and channel plans may be created or modified from a file on your PC in the on-line mode.
- When selecting options in the on-line mode, if the option is a licensed option that is not contained in your radio, the option may not be displayed, e.g., if you do not have the LMS-T licensed option in your radio, the LMS-T tab will not be present on the Configurator.
- In certain instances, licensed options may be displayed on a Configurator page, but if your radio does not contain the licensed option, the option will be inactive, you cannot select the option, and you cannot load the option into your radio.

The procedures required to create or update configurations and/or channel plans are provided in the following sections.

5.2.5 Configurations

New configurations can created from scratch, updated from existing files on your PC, or may be loaded in from a PTX-PRO and modified. Once a configuration is created or modified and saved, you can load the configuration into your PTX-PRO. The steps required to load configuration changes are provided in the applicable procedures.

Once a configuration is created or modified, it should be saved to a file on your PC. The steps required to save configuration settings are provided in the applicable procedures provided in this Chapter.

5.2.6 Channel Plans

New channel plans can be created from scratch, updated from existing files on your PC, or may be loaded in from a PTX-PRO and modified. Once a channel plan is created or modified and saved, you can load the channel plan into your PTX-PRO. The steps required to load channel plan changes are provided in the applicable procedures provided in this Chapter.

Once a channel plan is created or modified, it should be saved to a file on your PC. The steps required to save channel plan settings are provided in the applicable procedures.

5.3 Create or Update a Configuration

There are various ways to create or modify a configuration on-line with the PTX-PRO connected to a PC via an RS-232 link.

- Create a configuration on-line.
- Load in an existing configuration from a file and modify it on-line.
- Load in a configuration from the PTX-PRO and modify it.
- Load and modify individual configuration pages.
- Once a configuration is created and saved to a file on your PC, the configuration file can be loaded into the PTX-PRO.

Each of these methods is explained in detailed steps in the following sections.

5.3.1 Using the Configurator Software

The MRC Radio Configurator software has an easy-to-use Graphical User Interface (GUI) to access Preset configuration settings and channel plan settings. The Configurator software is accessed through the **MRC Radio Configurator** icon displayed on your PC desktop.

The settings are grouped into pages according to function. The pages are accessed using tabs. Pages also contain option buttons, pull-down menus, text boxes, radio buttons, and check boxes to select or activate different functions and options.

Procedures contained in this Chapter utilize easy-to-use flowcharts to navigate through the various procedures. The procedures allow use of the Configurator in the on-line mode with the Configurator software connected to the PTX-PRO via an RS-232 interface.

5.3.2 Determine Licensed Options

Prior to preparing or modifying any PTX-PRO configuration settings in the offline mode, you must determine what licensed options are contained in your PTX-PRO.

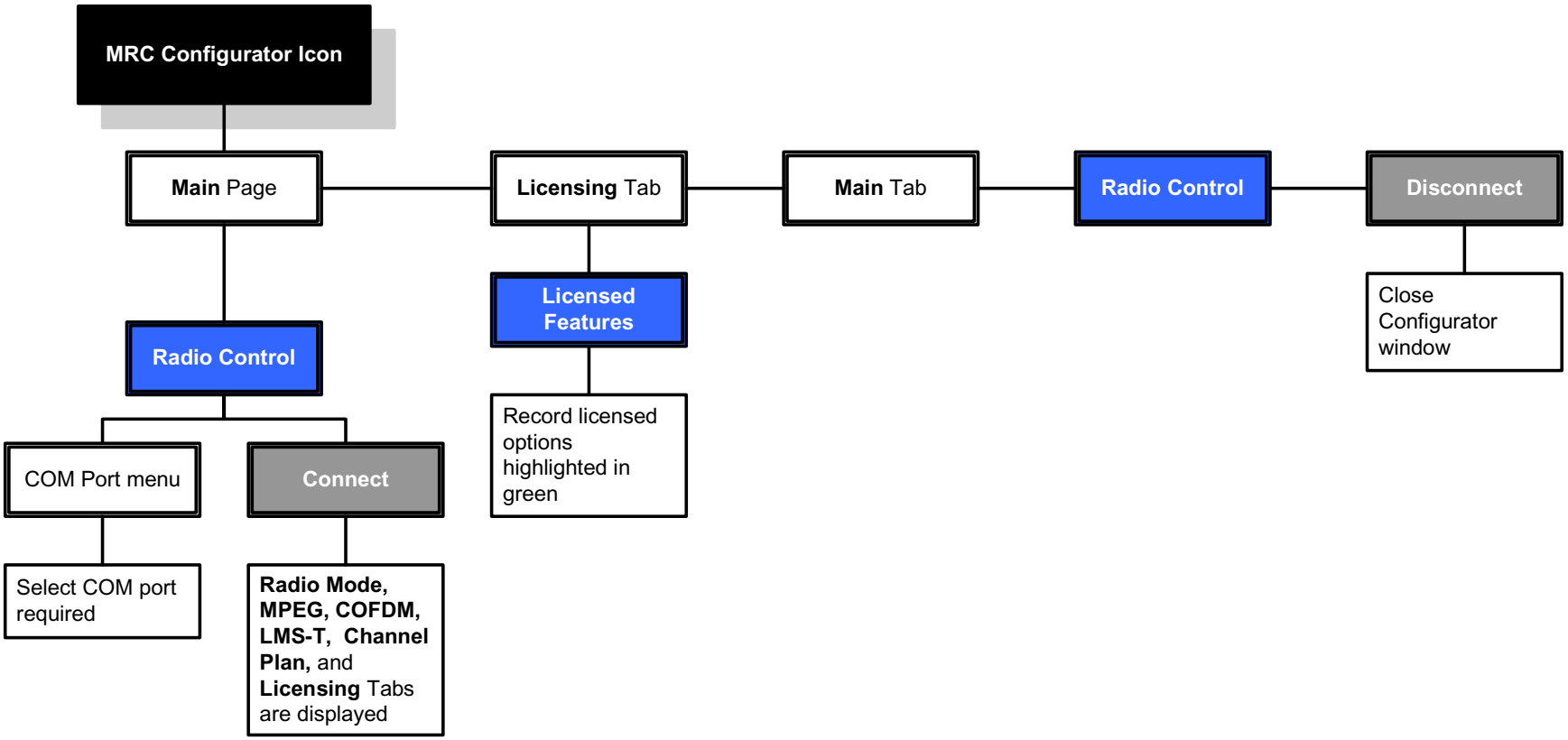
If you have not previously recorded your PTX-PRO licensed options, you must perform this procedure.

In order to determine the licensed options contained in your PTX-PRO, you must connect your PTX-PRO to the Configurator software via an RS-232 link to your PC. When your PTX-PRO is powered up and is connected to the Configurator in the on-line mode, the Configurator software automatically detects the licensed options contained in your PTX-PRO.

After determining what licensed options are contained in your PTX-PRO, you must record the options. You can then disconnect from the Configurator software and can prepare configuration settings in the offline mode without having your PTX-PRO connected to your PC and the Configurator software.

The flowchart required to determine the licensed options contained in your PTX-PRO is contained in Figure 5-1 on page 5-4.

Figure 5-1: Determine Licensed Options



5.3.3 Create New Configuration On-Line

The flowchart required to create new Preset configuration settings and channel plans in the on-line mode is contained in Figure 5-2 thru Figure 5-6.

Figure 5-2: Create New Configuration On-Line - Sheet 1 of 5

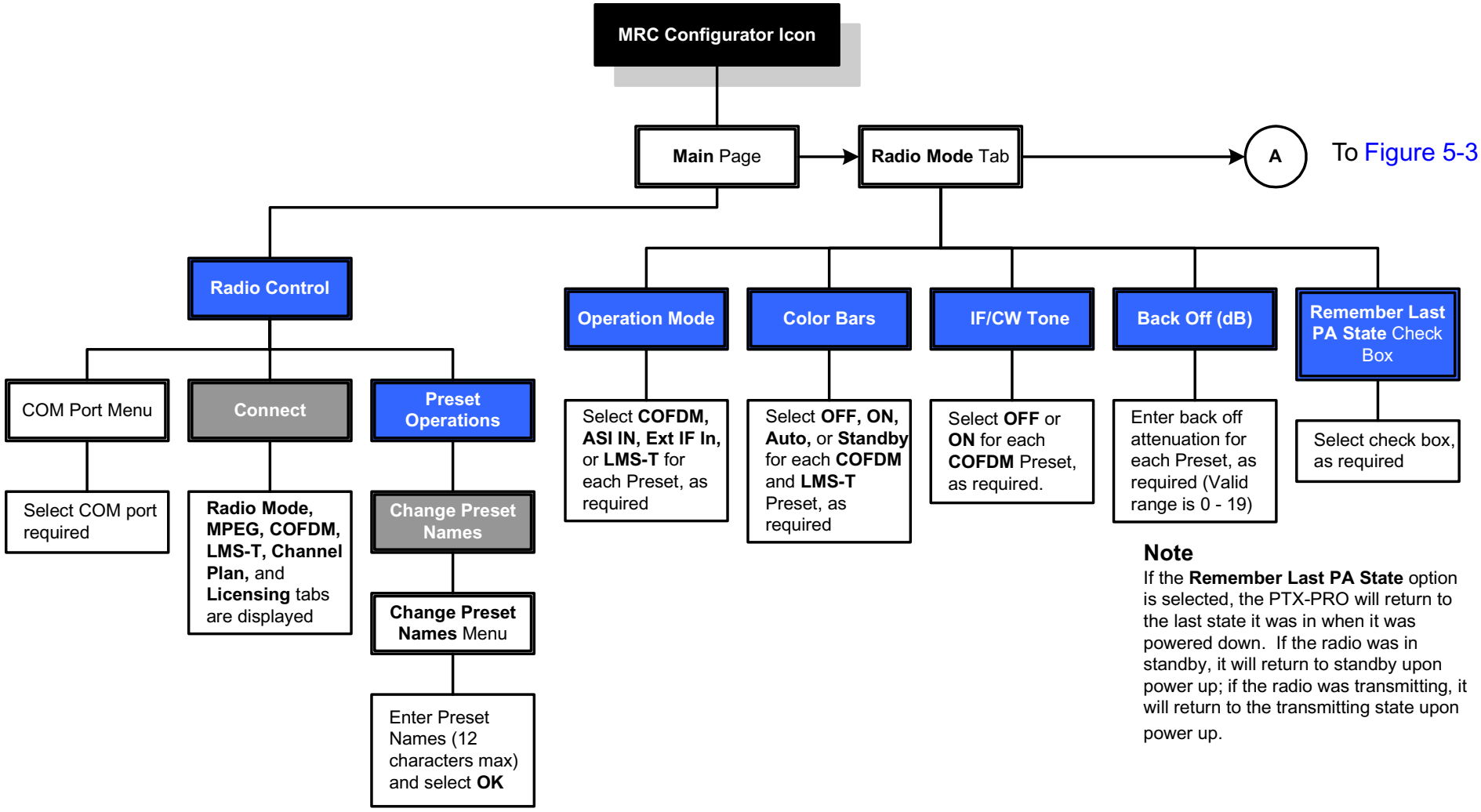


Figure 5-3: Create New Configuration On-Line - Sheet 2 of 5

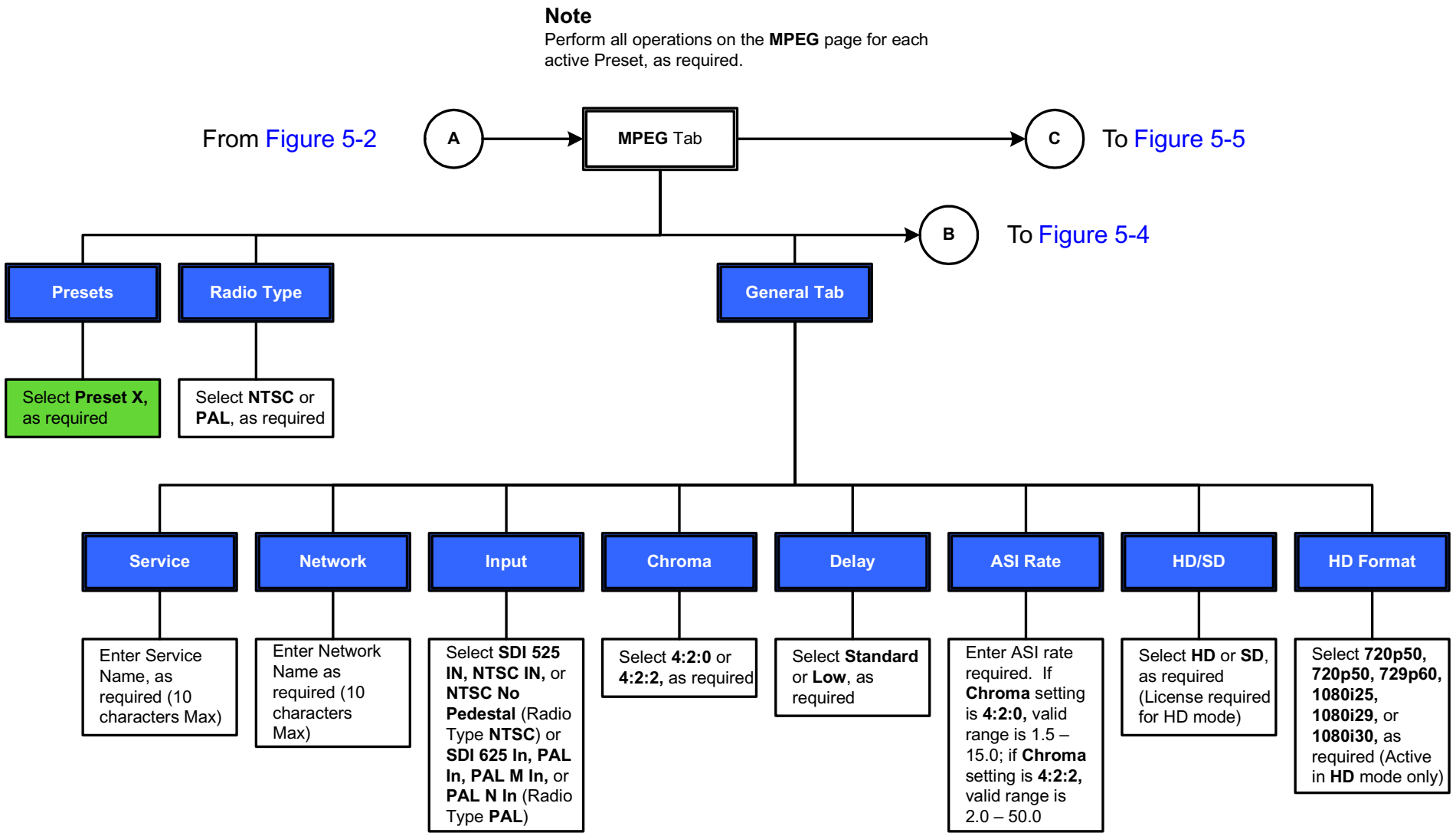


Figure 5-4: Create New Configuration On-Line - Sheet 3 of 5

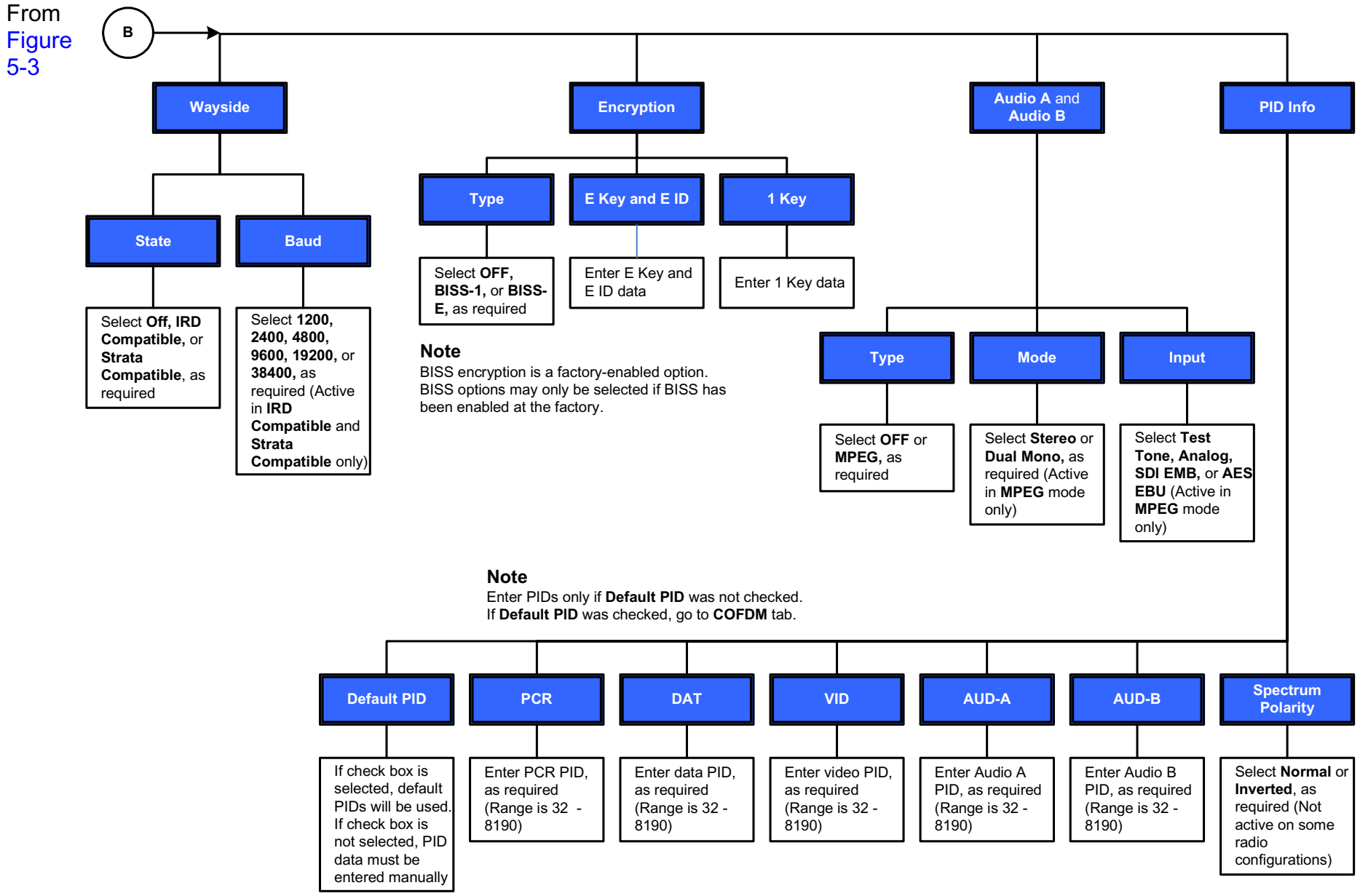


Figure 5-5: Create New Configuration On-Line - Sheet 4 of 5

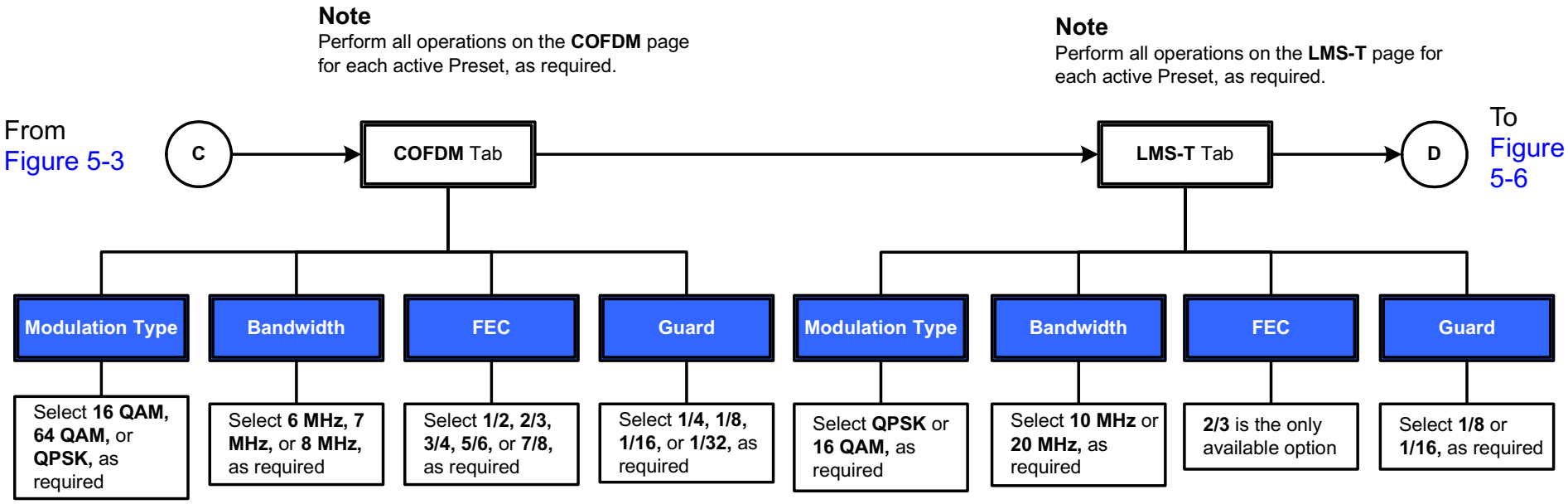
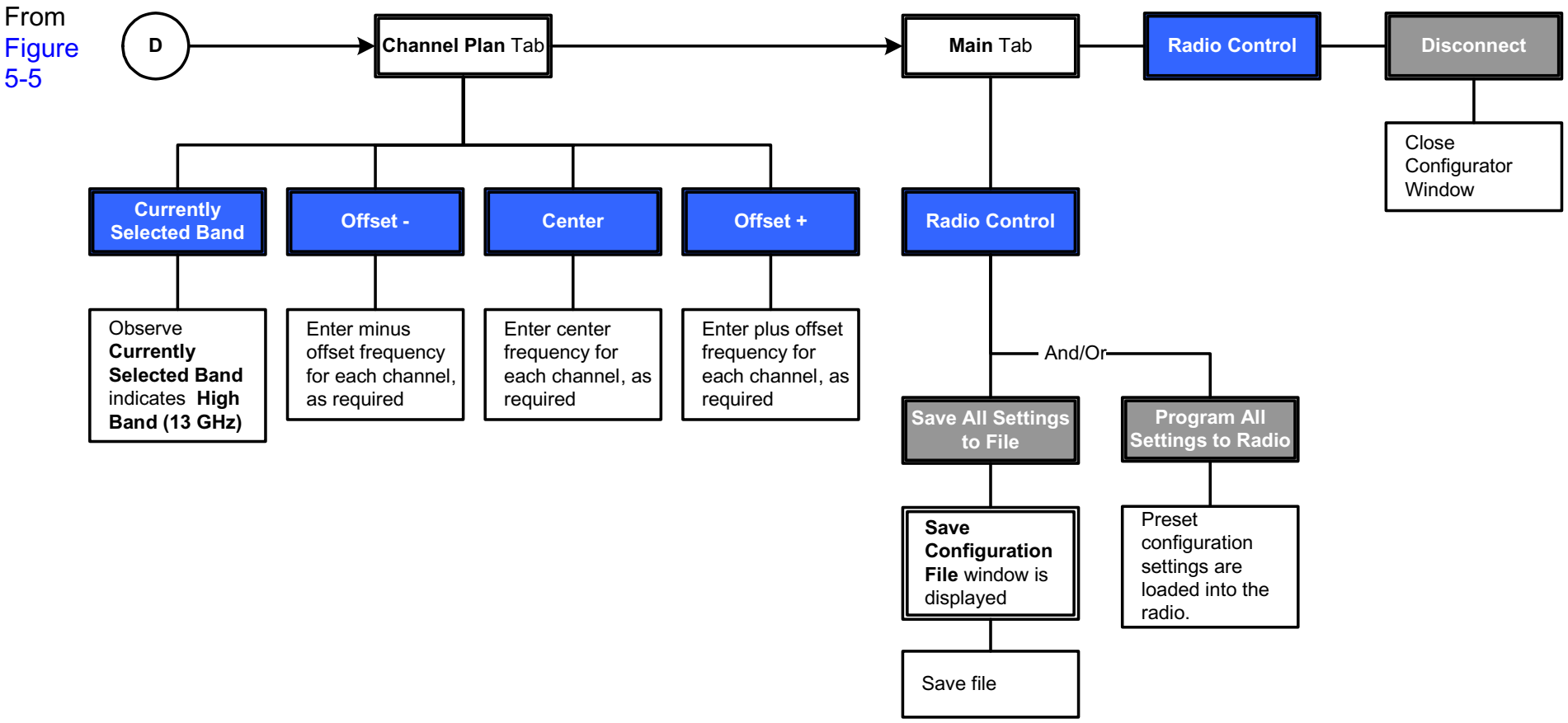


Figure 5-6: Create New Configuration On-Line - Sheet 5 of 5



5.3.4 Load and Modify Configuration Settings On- Line

The flowchart required to load Preset configuration settings and channel plans from the radio and to modify the settings in the on-line mode is contained in Figure 5-7 thru Figure 5-11.

Figure 5-7: Load and Modify Configuration Settings On-Line - Sheet 1 of 5

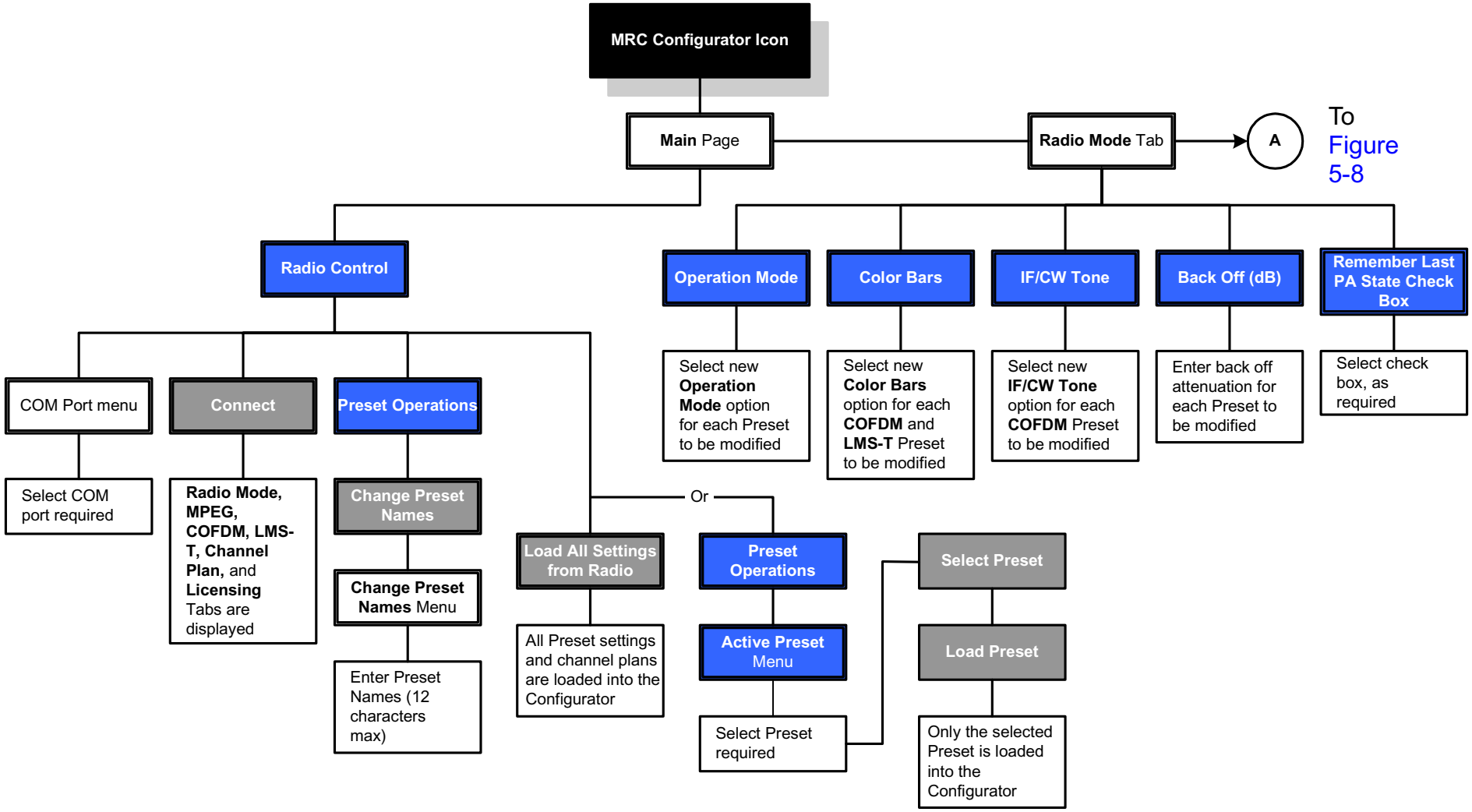


Figure 5-8: Load and Modify Configuration Settings On-Line - Sheet 2 of 5

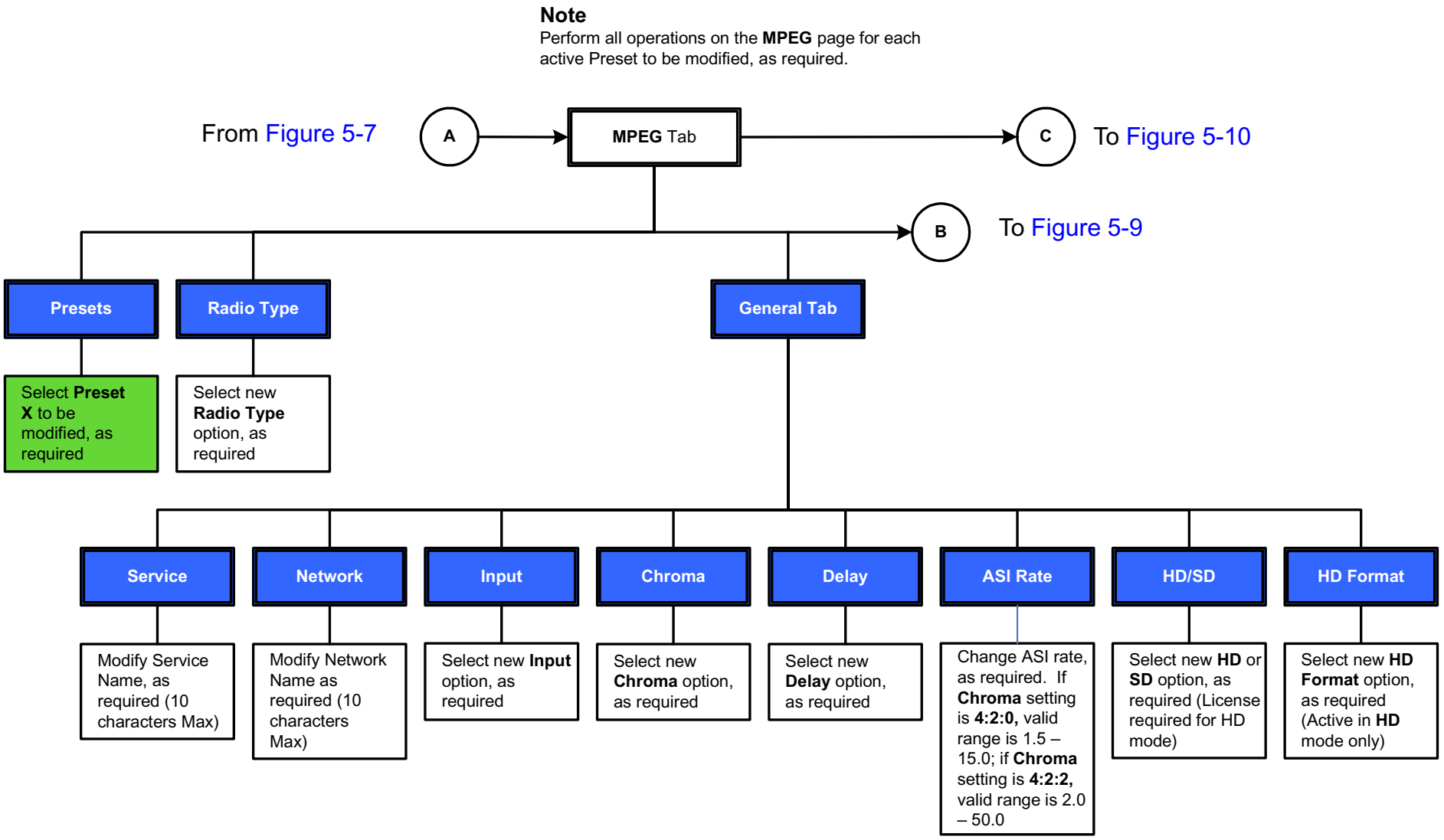


Figure 5-9: Load and Modify Configuration Settings On-Line - Sheet 3 of 5

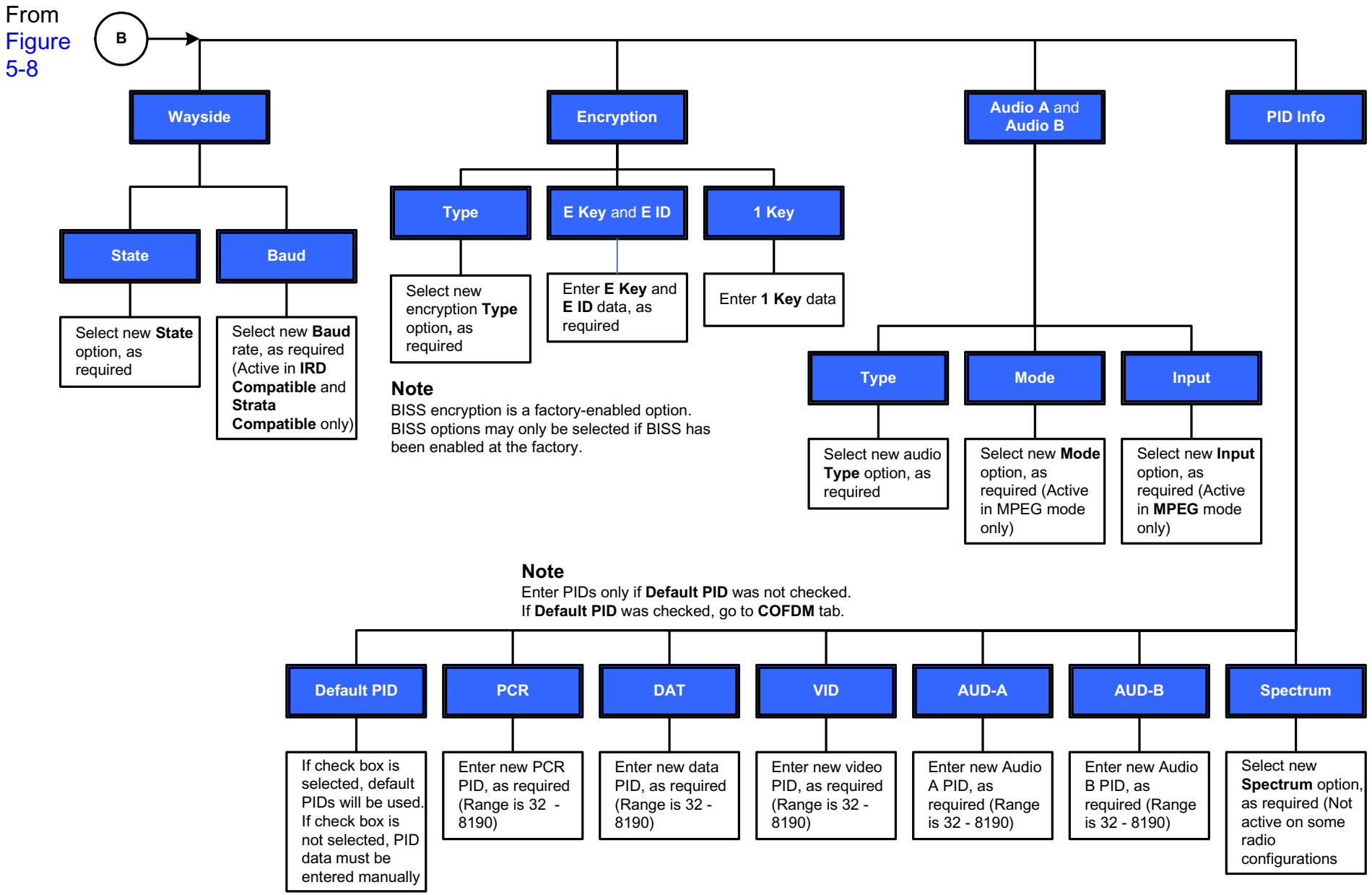


Figure 5-10: Load and Modify Configuration Settings On-Line - Sheet 4 of 5

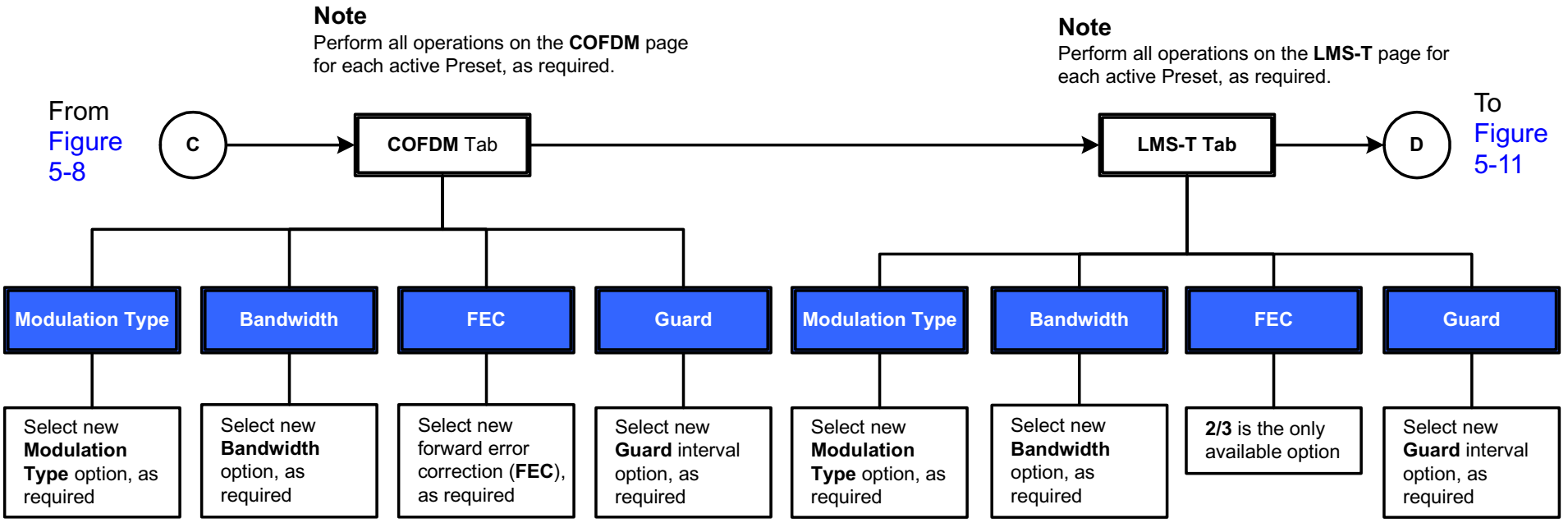
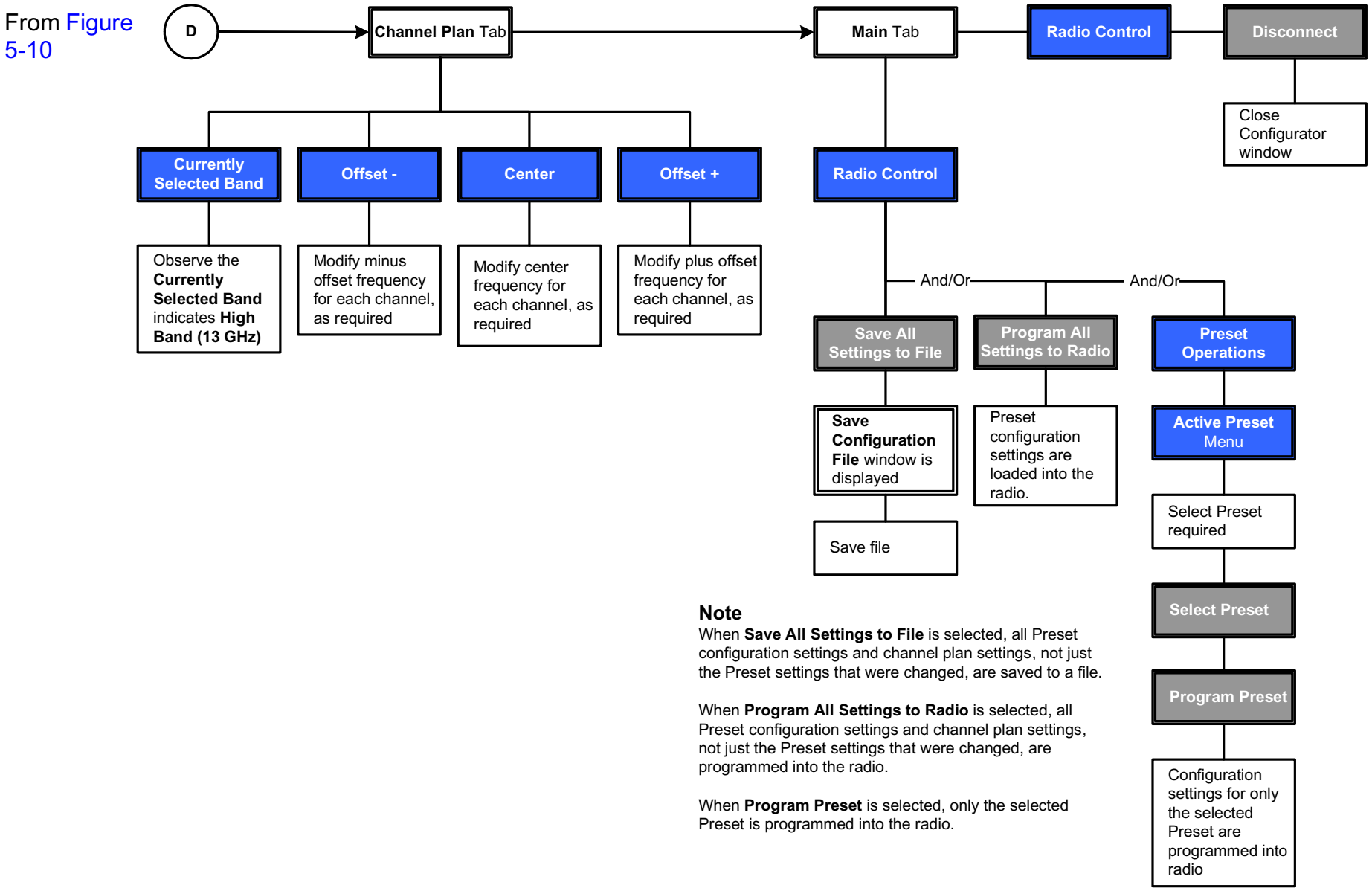


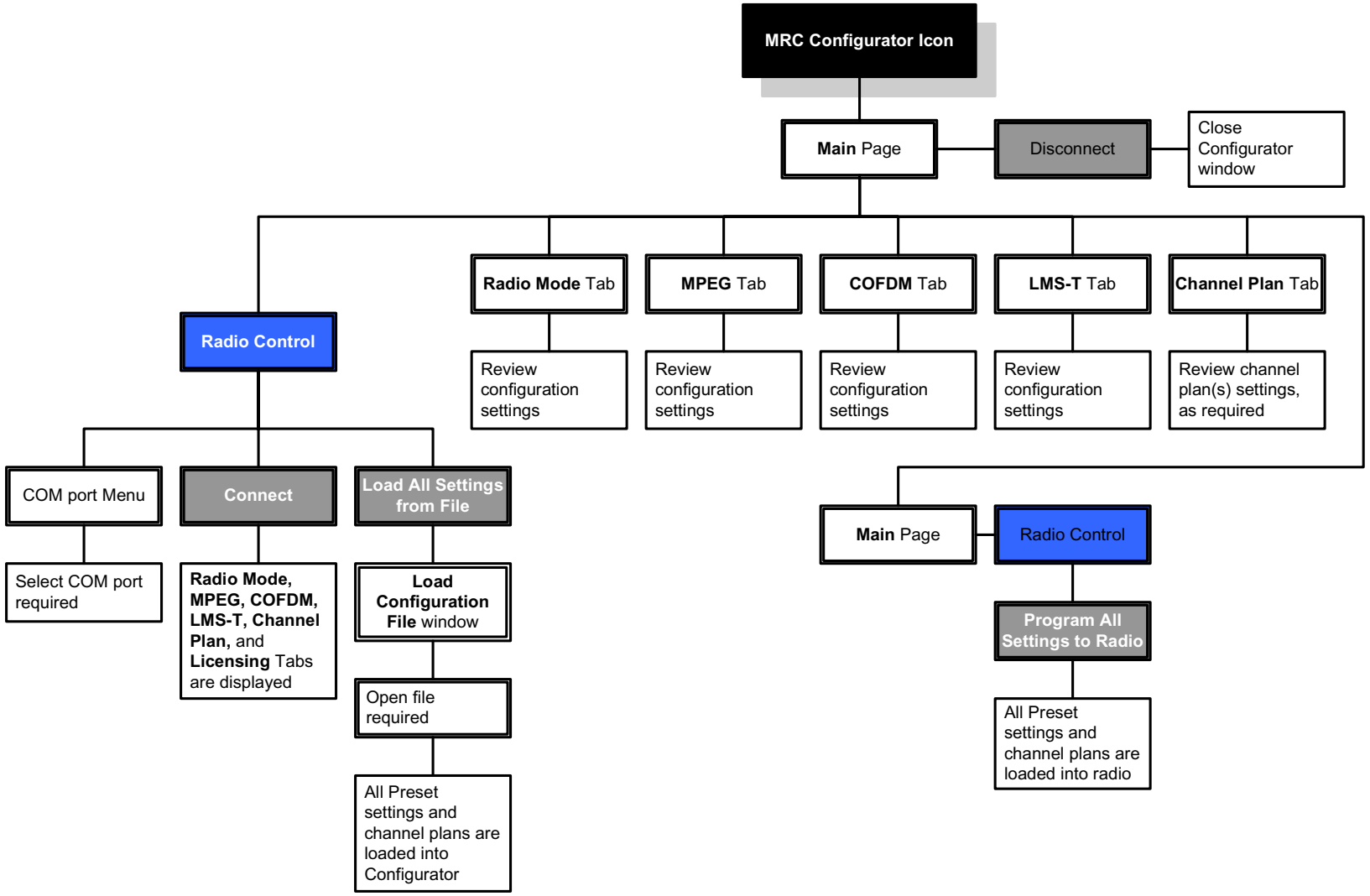
Figure 5-11: Load and Modify Configuration Settings On-Line - Sheet 5 of 5



5.3.5 Load Configuration File into Radio On-Line

The flowchart required to load a configuration and channel plan from a file on your PC into your PTX-PRO is contained in Figure 5-12.

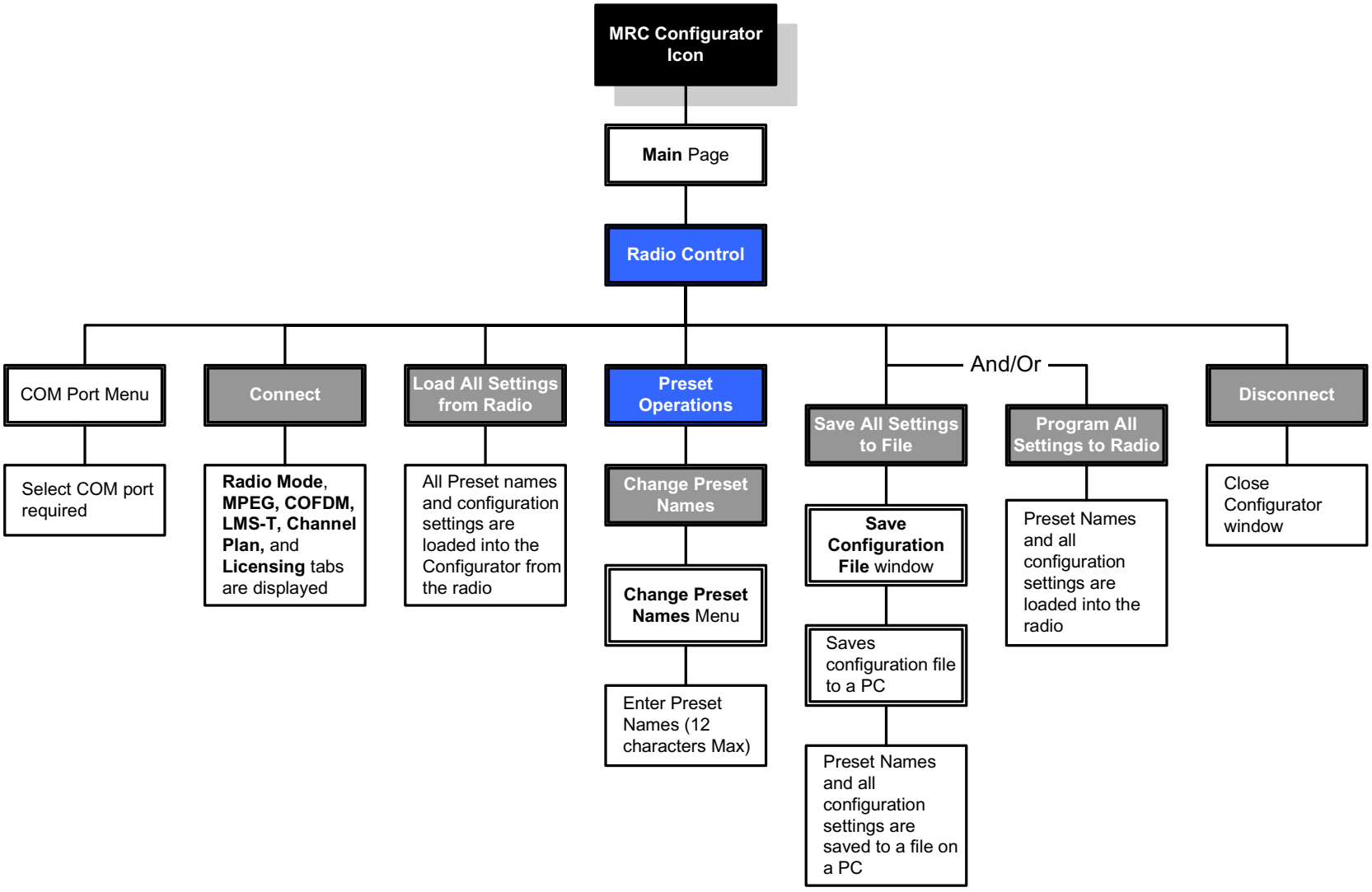
Figure 5-12: Load Configuration file into Radio On-Line



5.3.6 Change Preset Names in On-Line Mode

The flowchart required to change Preset names in the on-line mode is contained in Figure 5-13.

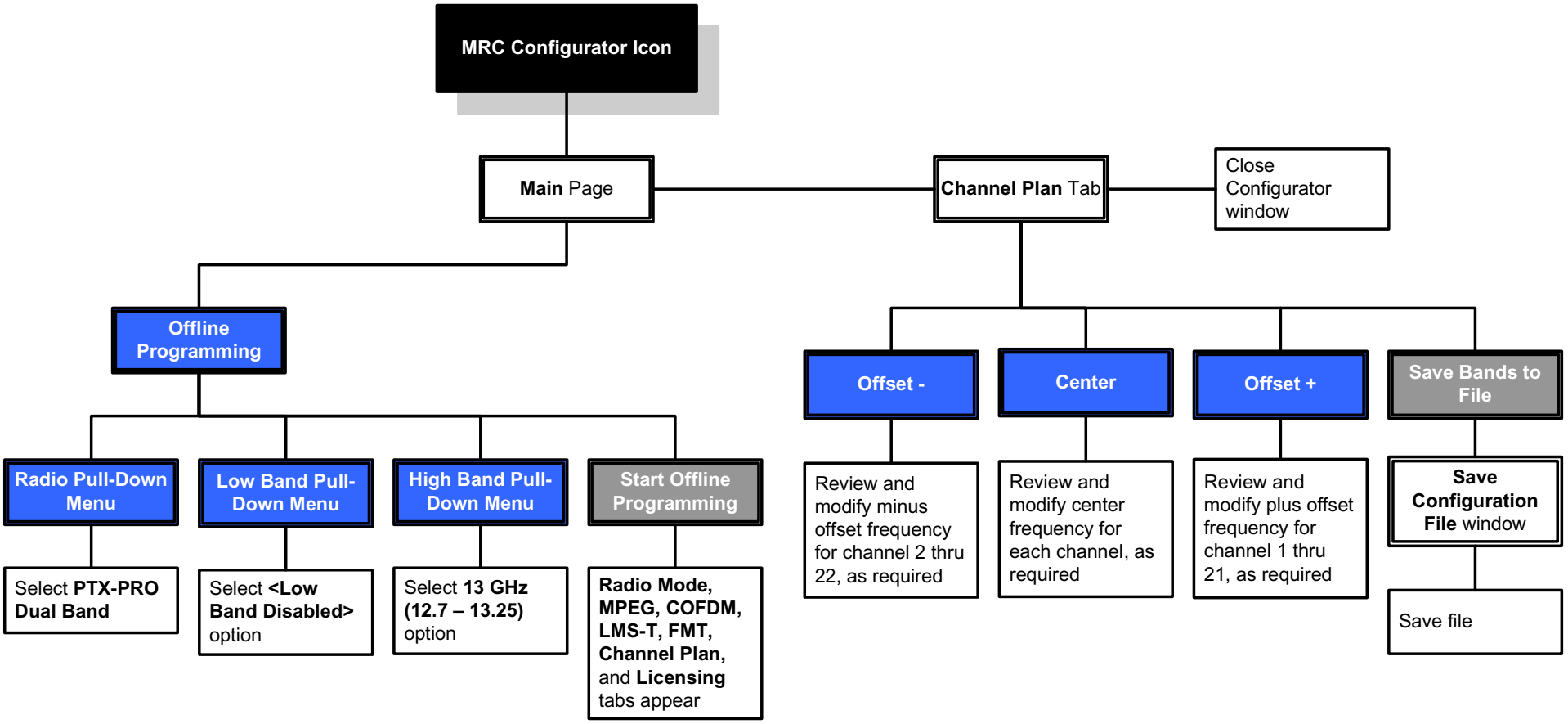
Figure 5-13: Change Preset Names in On-Line Mode



5.3.7 Create Channel Plan Offline

The flowchart required to create new channel plans in the offline mode is contained in Figure 5-14.

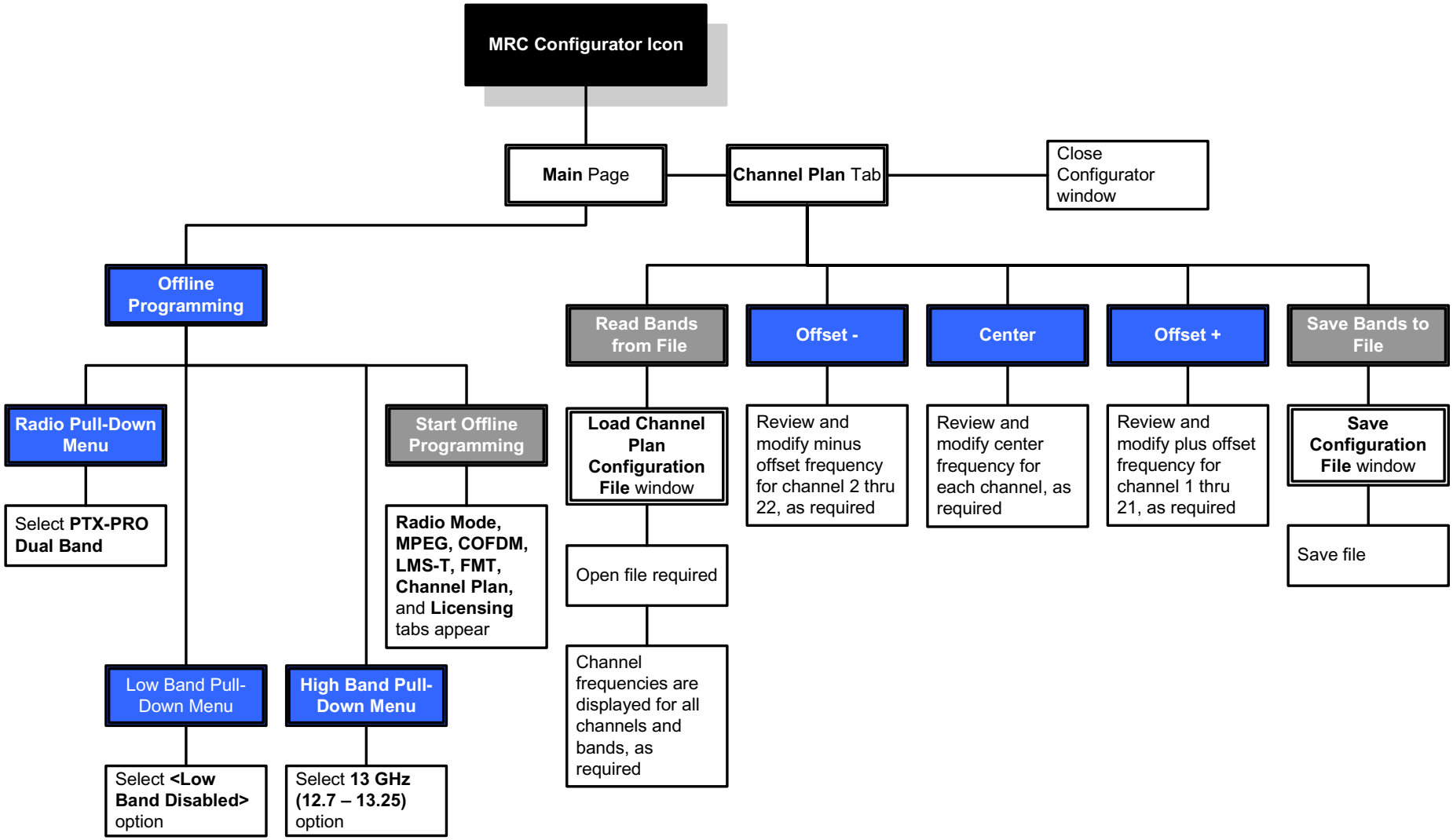
Figure 5-14: Create Channel Plan Offline



5.3.8 Modify Channel Plan in Offline Mode

The flowchart required to modify a channel plan contained in a file on your PC is contained in Figure 5-15.

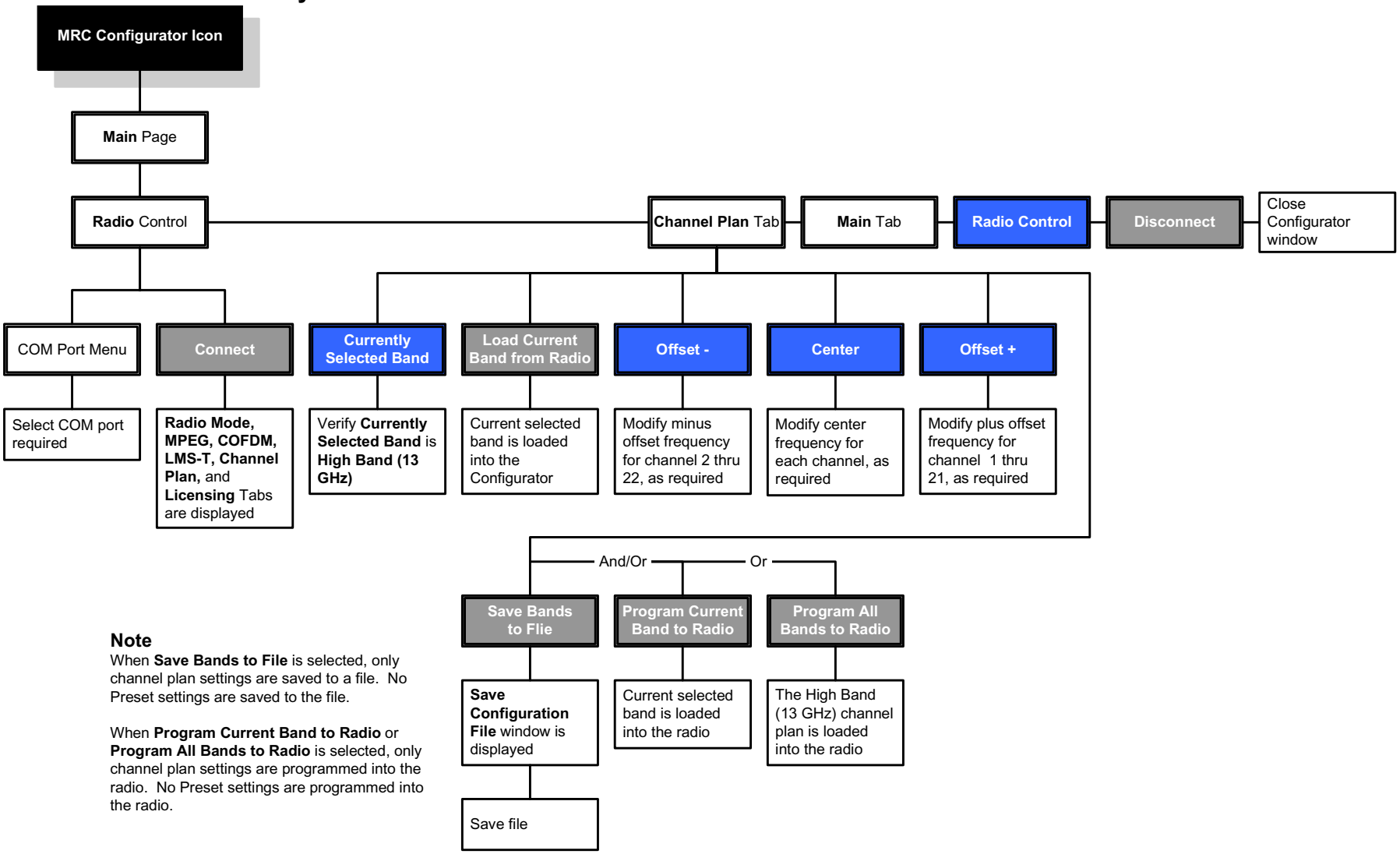
Figure 5-15: Modify Channel Plan in Offline Mode



5.3.9 Load and Modify a Channel Plan On-Line

The flowchart required to load a channel plan in your radio and to modify the plan in the on-line mode is contained in Figure 5-16.

Figure 5-16: Load and Modify a Channel Plan On-Line



Note

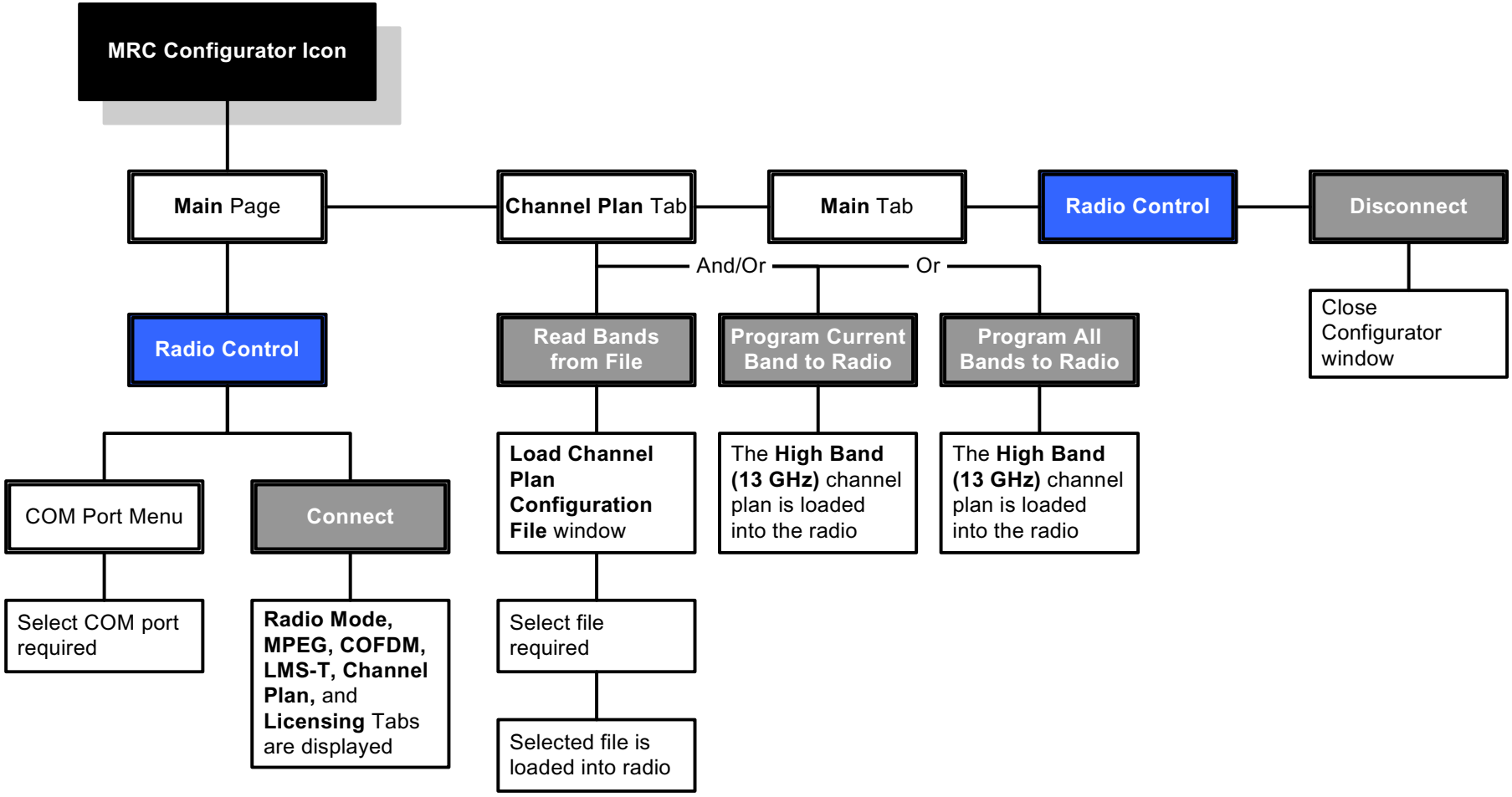
When **Save Bands to File** is selected, only channel plan settings are saved to a file. No Preset settings are saved to the file.

When **Program Current Band to Radio** or **Program All Bands to Radio** is selected, only channel plan settings are programmed into the radio. No Preset settings are programmed into the radio.

5.3.10 Load Channel Plan File into Radio On-Line

The flowchart required to load a channel plan from a file on your PC into your PTX-PRO in the on-line mode is contained in Figure 5-17.

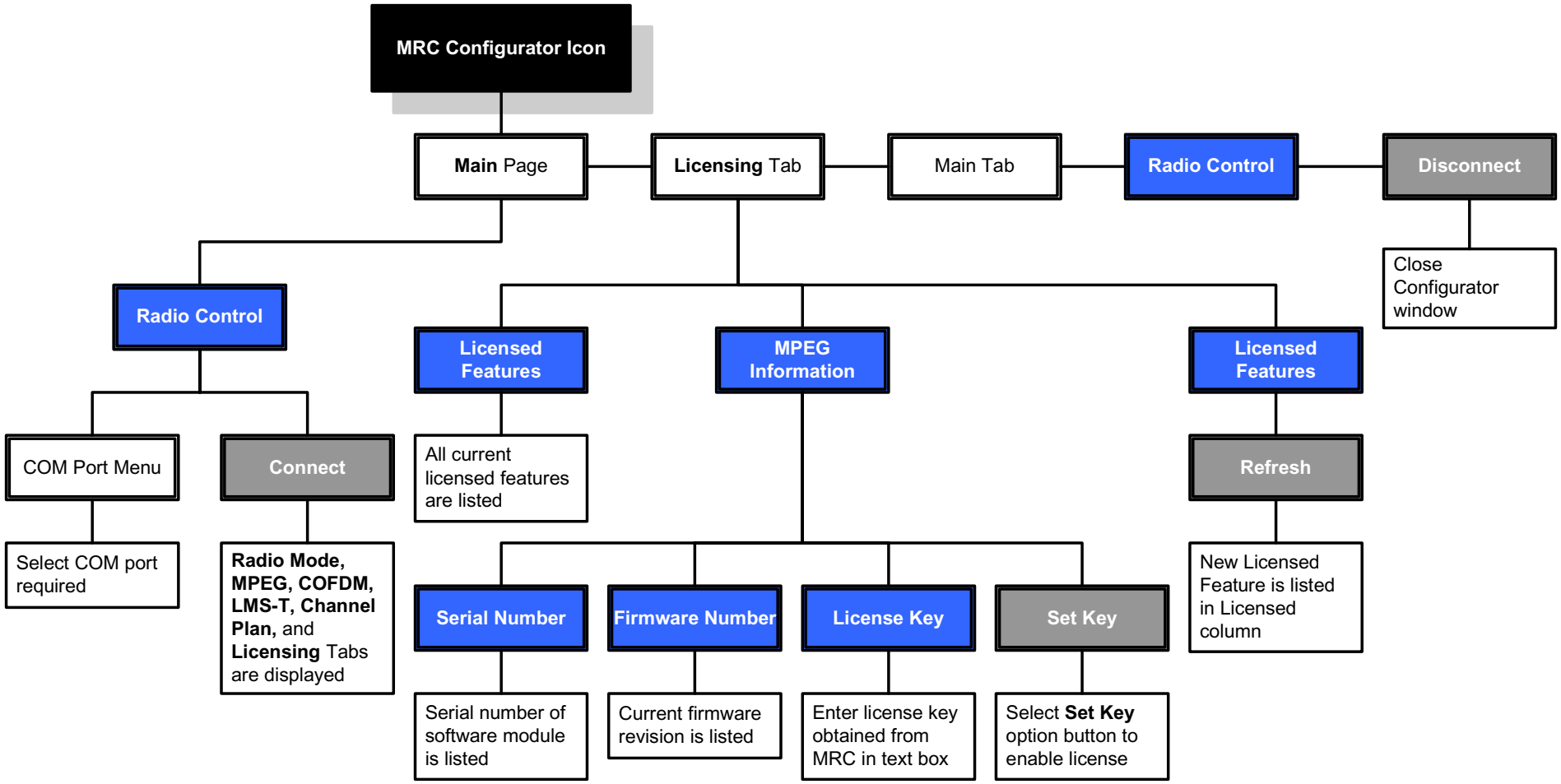
Figure 5-17: Load Channel Plan into Radio in On-Line Mode



5.3.11 Add Licensed Option

The flowchart required to add new licensed options to your PTX-PRO is contained in Figure 5-18. The license required to add a new licensed feature must be obtained from MRC prior to performing this procedure.

Figure 5-18: Add Licensed Option



6 Installation

6.1 Chapter Overview

This chapter describes how to unpack and install your PTX-PRO 13 GHz Transmitter (PTX-PRO). The topics covered in this chapter are as follows:

6.2 Unpacking

Each PTX-PRO is shipped assembled, wired, and factory tested. Each unit is packaged in appropriate shipping containers.

Here are some tips to help you with unpacking your new equipment:

- Unpack the equipment carefully to avoid accidental damage.
- Be sure to locate all parts and accessories.
- Verify that the items shipped agree with those listed on the packing list.
- DO NOT discard the container or packing material until you have inspected the equipment and are sure there is no shipping damage. The container and packing must be available in the event that a damage claim needs to be filed with the shipping carrier.

6.3 Initial Inspection

After the equipment is unpacked, we recommend you inspect it using the following checklist:

- Check for any dents or scratches.
- Check that the equipment is clean and dry.
- Check that no cables or connectors are broken, damaged, or loose.
- Check that no switches or LED indicators are broken, damaged, or loose.

6.4 Damage in Shipment

Should any damage be discovered after unpacking the unit, use the following procedure:

- Immediately file a claim with the shipping carrier.
- Forward a copy of the damage report to MRC Customer Service.
- Contact MRC Customer Service to determine the disposition of the equipment.

6.5 Mounting and Cabling

CAUTION *Be sure the power being supplied matches the power required by the equipment.*

CAUTION *Power supply cords and cables must be protected. Do not run cords where they can be walked upon. Protect cables against pinching and chafing. Pay special attention to locations where the cables enter or exit an enclosure or make a sharp bend.*

CAUTION *Ensure that the electrical supply is protected by over-current protection devices, as required by the applicable electrical codes.*

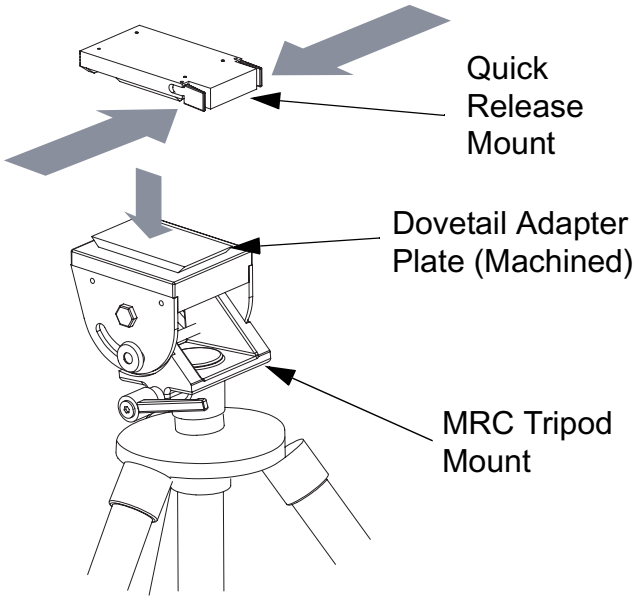
Each installation or deployment will have its own specific tasks according to the application and the installed hardware. The following section describes mounting and cabling the PTX-PRO.

6.5.1 Portable Deployment

For portable applications, the PTX-PRO will typically be moved from place to place and set up each time. The power, antenna, and audio/video connections are usually removed at the end of each deployment.

Mounting - MRC Tripod The PTX-PRO will typically be attached to a Quick Release Mount for easy mounting on an MRC tripod. The Quick Release Mount is attached to the bottom of the PTX-PRO using four 1/2-inch long, #6-32, flat head screws. The Quick Release Mount typically remains attached to the PTX-PRO. The Quick Release Mount and PTX-PRO are then attached to the Dovetail Adapter Plate machined into the MRC tripod mount. See Figure 6-1.

Figure 6-1: Quick Release Mount on MRC Tripod

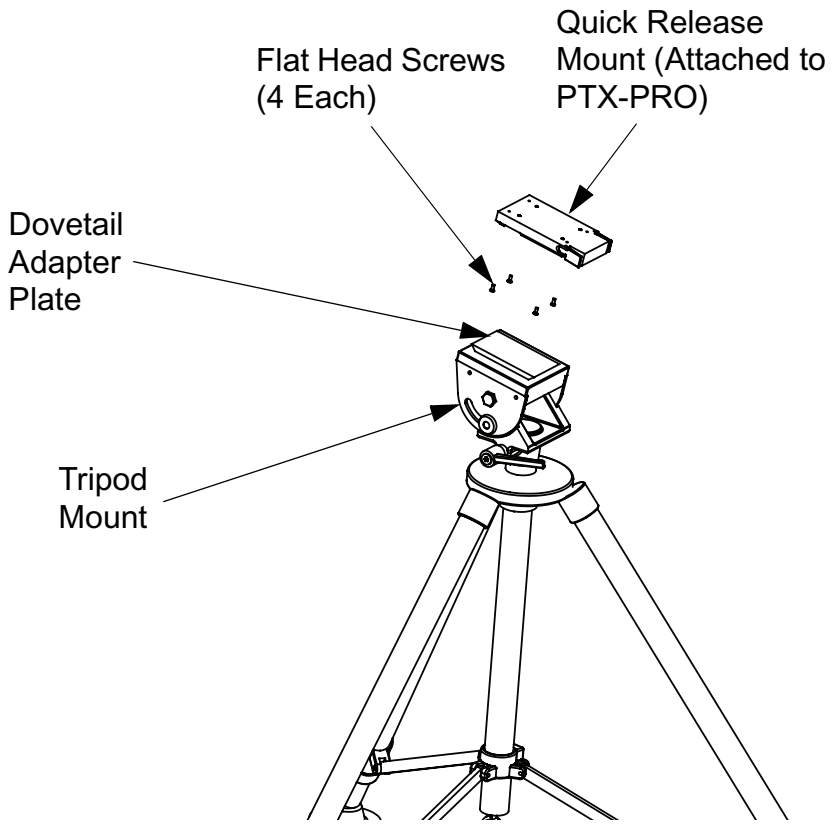


Note	The versatility of the Quick Release Mount and a mating Dovetail Adapter Plate allow the Dovetail Adapter Plate to be attached to the bottom of the PTX-PRO and the Quick Release Mount to be attached to a non-MRC tripod, or vice versa. The method you use to attach the PTX-PRO to a non-MRC tripod is your choice. Optional mounting procedures and illustrations to mount your PTX-PRO on non-MRC tripods are provided in the following paragraphs.

Mounting - Non-MRC Tripod (Option 1) To mount a PTX-PRO on a non-MRC tripod, one option is to attach the Quick Release Mount to the bottom of the PTX-PRO using four 1/2-inch long, #6-32, flat head screws.

The Dovetail Adapter Plate is then attached to the non-MRC tripod and the Quick Release Mount and PTX-PRO assembly is attached to the Dovetail Adapter Plate on the tripod mount. See Figure 6-2.

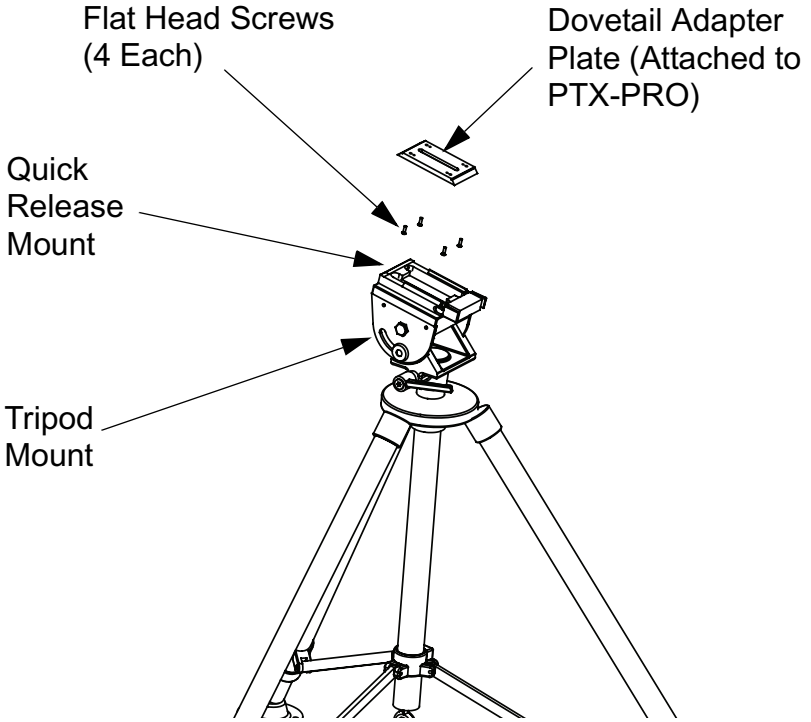
Figure 6-2: Dovetail Adapter Plate on Non-MRC Tripod



Mounting - Non-MRC Tripod (Option 2) To mount a PTX-PRO on a non-MRC tripod, another option is to attach the Dovetail Adapter Plate to the bottom of the PTX-PRO using four 1/2-inch long, #6-32, flat head screws.

The Quick Release Mount is then attached to the non-MRC tripod and the Dovetail Adapter Plate and PTX-PRO assembly is attached to the Quick Release Mount on the tripod mount. See Figure 6-3 on page 6-4.

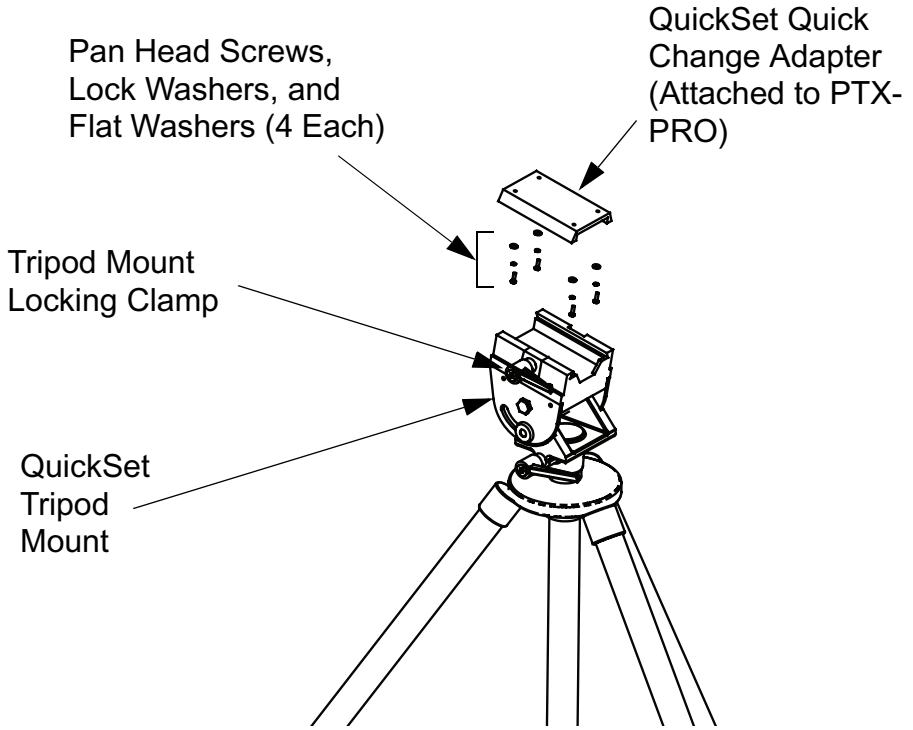
Figure 6-3: Quick Release Mount on Non-MRC Tripod



Mounting - Non-MRC Tripod (Option 3) A third option is available to mount a PTX-PRO to a non-MRC tripod that contains a QuickSet tripod mount. This option requires the use of a QuickSet Quick Change Adapter. The Quick Change Adapter is attached to the bottom of the PTX-PRO using four 1/2-inch long, #6-32, pan head screws, lock washers, and flat washers.

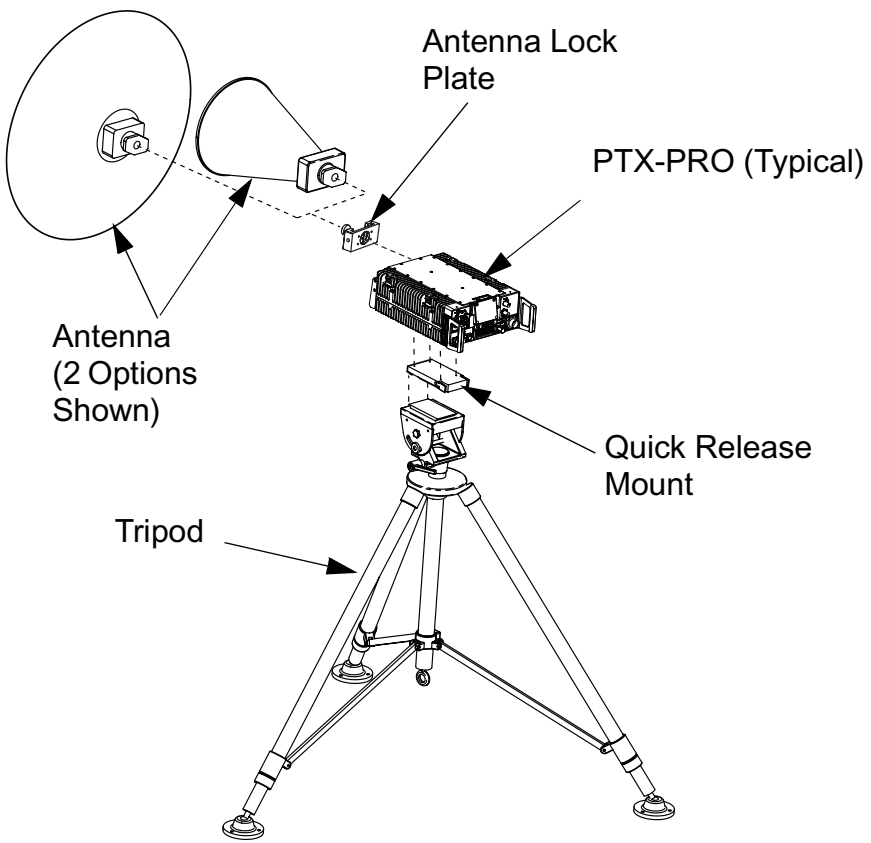
The Quick Change Adapter and PTX-PRO assembly is then attached to the QuickSet tripod mount and is secured with the tripod mount locking clamp. See Figure 6-4.

Figure 6-4: Quick Change Adapter on QuickSet Tripod Mount - Typical



Final Mounting When the PTX-PRO is mounted on the tripod, the antenna is typically attached to the Antenna Lock Plate mounted on the PTX-PRO. See Figure 6-5 on page 6-5.

Figure 6-5: Complete Tripod Installation - Typical



6.6 Power Connections

6.6.1 Power Requirements

The PTX-PRO has the following power requirements, depending upon the power option utilized.

Supply Voltage:	+11.0 to +36 Volts DC
	90 to 264 VAC, 50/60 Hz
Power Consumption:	50 watts nominal

6.6.2 Power Supply and Distribution

AC or DC power is supplied externally, from an external power source.

> ***CAUTION*** *Avoid possible equipment damage. If you are using a DC power source for your PTX-PRO, do not exceed 36 volts DC input power.*

Power is distributed to the PTX-PRO through the front panel **PWR** connector on the PTX-PRO.

> ***CAUTION*** *To avoid possible equipment damage, turn off DC Power on the coax before connecting any test equipment.*

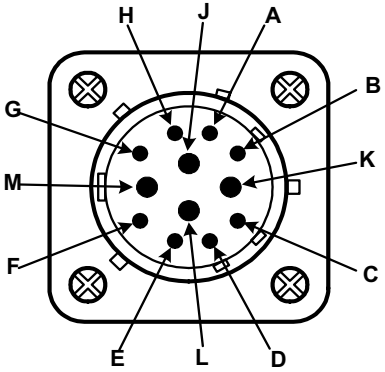
Panel Power Connections The PTX-PRO power connector is located on the front panel. The mating connector that plugs into this panel connector is described below.

Manufacturer:	ITT Cannon
Part Number	KPTR06F14-12SX
Description:	12-Pin, Female, Plug

Manufacturer:	Amphenol
Part Number	PT06E14-12SX
Description:	12-Pin, Female, Plug

Pin designations on the front panel **PWR** connector are shown in Table 6-1.

Table 6-1: Front Panel AC/DC Power Connector Pin-Outs

Connector Information	Pin-Out	Signal Description
12-Pin, Male, Panel-Mount 	A	90 to 264 VAC
	B	N/C
	C	Neutral
	D	N/C
	E	N/C
	F	N/C
	G	N/C
	H	N/C
	J	DC (+)
	K	DC (-)
	L	AC Ground / DC (-)
	M	DC (+)

6.6.3 Power Cable Assemblies

The PTX-PRO contains a universal AC/DC power supply and can operate on either external AC or DC power sources. Power cable assemblies are available from MRC for the PTX-PRO based on the power to be used.

AC Power Cable Assemblies Prefabricated AC Power Cable Assemblies are available from MRC to connect the PTX-PRO **PWR** connector to either 120 VAC or 240 VAC (nominal).

The AC Power Cable Assemblies are 6.0 ft. (1.8 m) long. The 120 VAC Power Cable Assembly comes complete with power connectors on both ends. See Figure 6-6 on page 6-7 for the wiring diagram of the 120 VAC Power Cable Assembly.

The 240 VAC Power Cable Assembly comes with a power connector on one end only. The user must provide the input power connector for the 240 VAC version of the Power Cable Assembly. See Figure 6-7 on page 6-7 for the wiring diagram of the 240 VAC Power Cable Assembly.

DC Power Cable Assembly A prefabricated DC Power Cable Assembly is available from MRC to connect the PTX-PRO **PWR** connector to a DC power source.

The DC Power Cable Assembly is 10 ft. (3 m) long. The DC Power Cable Assembly comes with a power connector on one end only. See Figure 6-8 on page 6-7 for the wiring diagram of the DC Power Cable Assembly.

Power Cable Fabrication If it is necessary to fabricate your own AC or DC power cable assembly, 20 AWG stranded wire is recommended for lengths up to 10 feet (3 m). Use one wire per connector contact. The mating connector for the PTX-PRO **PWR** connector is described in "Panel Power Connections" on page 6-5. Consult the factory if you need longer cabling.

Figure 6-6: 120 AC Power Cable Assembly

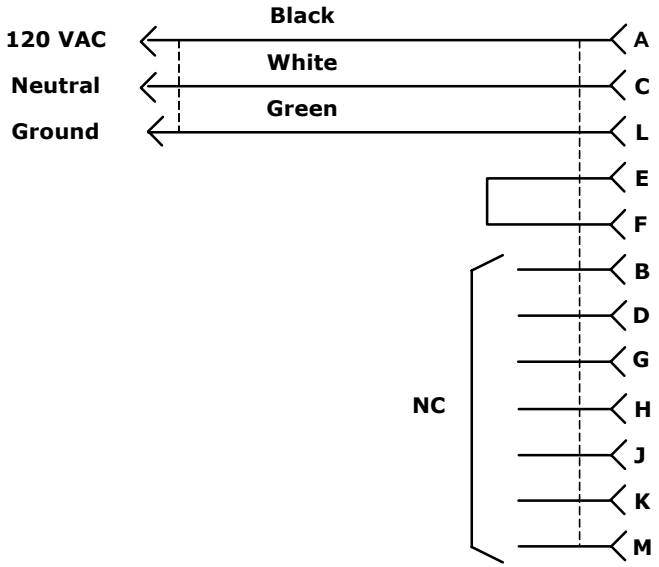


Figure 6-7: 240 VAC Power Cable Assembly

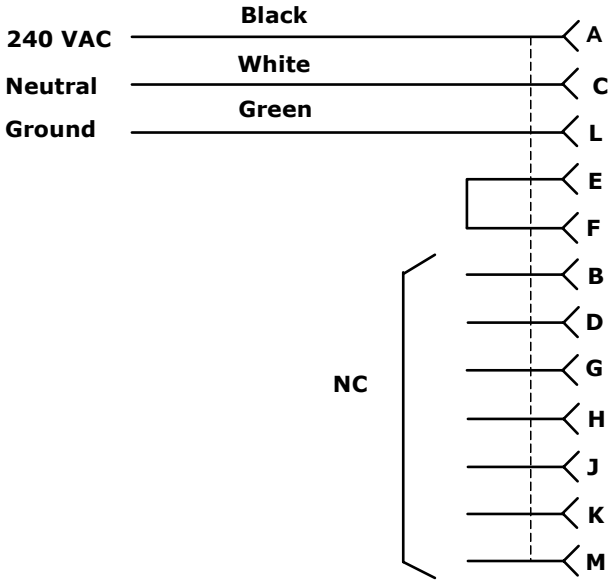
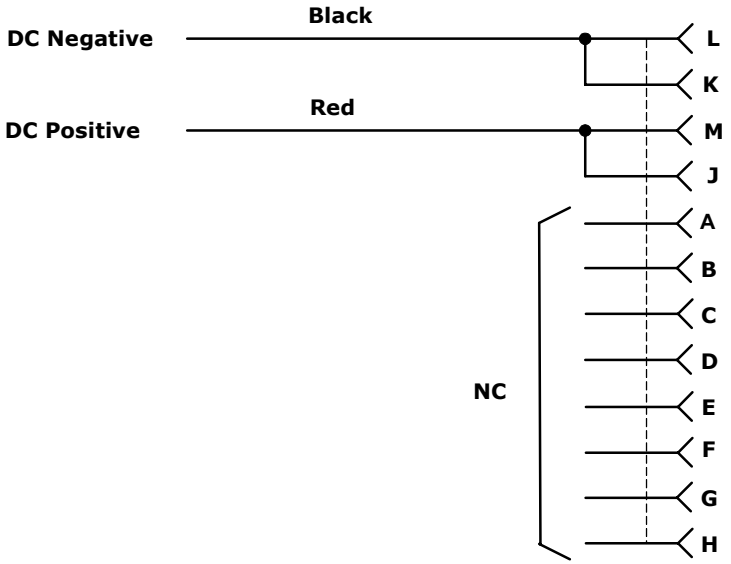


Figure 6-8: DC Power Cable Assembly



6.6.4 Additional Powering Notes

CAUTION	*Be sure the power being supplied matches the power required by the equipment.*

CAUTION	*Power supply cords and cables must be protected. Do not run cords where they can be walked upon. Protect cables against pinching and chafing. Pay special attention to locations where the cables enter or exit an enclosure or make a sharp bend.*

CAUTION *Ensure that the electrical supply is protected by over-current protection devices, as required by the applicable electrical codes.*

Check the electrical supply to be sure it can provide all the power needed at the site without overloading. Power ratings for equipment can be found on a rating plate, usually on the rear panel. If necessary, consult a licensed electrician.

6.7 Grounding

CAUTION *Be sure the equipment grounding follows applicable electrical codes.*

CAUTION *Never modify a grounded power plug to connect to an ungrounded receptacle.*

The equipment must be connected to the common ground on the installation. This common ground is often the vehicle or aircraft ground. The ground wire should be as short as possible, and should follow the straightest path possible.

6.8 Audio Connections

All PTX-PRO audio inputs are applied to either the front or rear panel audio connectors.

6.8.1 Front Panel Audio Connections

Front panel **AUDIO 1** and **AUDIO 2** XLR connectors are used for both Audio A inputs. Connector pin-outs are shown in Figure 6-9. Pin-out connections are shown in Table 6-2.

Figure 6-9: XLR Connector Pin-Outs

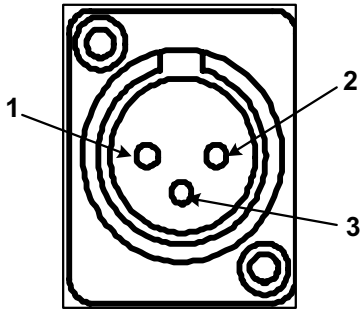


Table 6-2: XLR Connector Pin-Outs

Panel Connector Pin	Function
AUDIO 1	
1	Ground
2	Live (+)
3	Return (-)
AUDIO 2	
1	Ground
2	Live (+)
3	Return (-)

A prefabricated cable assembly (See Figure 6-10 on page 6-10) is available that splits the audio connections into two separate cables with XLR connectors. The two connectors are labelled **Audio 1** and **Audio 2**. One cable assembly is included with each PTX-PRO ordered.

Should you need additional cables, contact MRC Customer Service.

6.8.2 Rear Panel Audio Connections

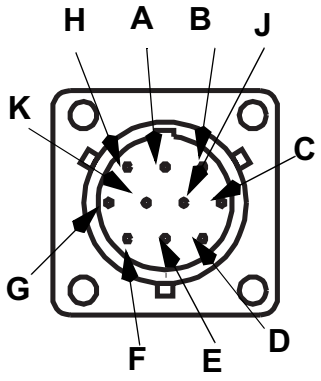
The rear panel **AUDIO 3 & 4** 10-pin female connector receives balanced audio inputs for audio channels 3 and 4. This connector is used for both Audio B inputs.

The mating connector that plugs into this panel connector is described below.

Manufacturer:	Amphenol (or ITT Cannon)
Part Number	MS3116F12-10S (KPT06F12-10S)
Description:	10-Pin, Female, Plug

Rear panel **AUDIO 3 & 4** connector pin-outs are shown in Table 6-3.

Table 6-3: Rear Panel Audio Connector Pin-Outs

Connector Information	Pin-Out	Signal Description
10-Pin, Male, Panel-Mount 	A	DIGITAL 1 CH1 +
	B	DIGITAL 1/2 GND
	C	DIGITAL 1 CH1 -
	D	DIGITAL 2 CH2 +
	E	DIGITAL 2 CH2 -
	F	ANALOG 3 RIGHT CH2 -
	G	ANALOG 3/4 COM
	H	ANALOG 3 RIGHT CH2 +
	J	ANALOG 4 LEFT CH2 -
	K	ANALOG 4 LEFT CH2 +

The PTX-PRO provides a maximum of four audio circuits. Each audio circuit is a 3-wire balanced circuit capable of carrying one tone or voice signal. An audio circuit can carry one analog balanced channel or two digital AES/EBU channels.

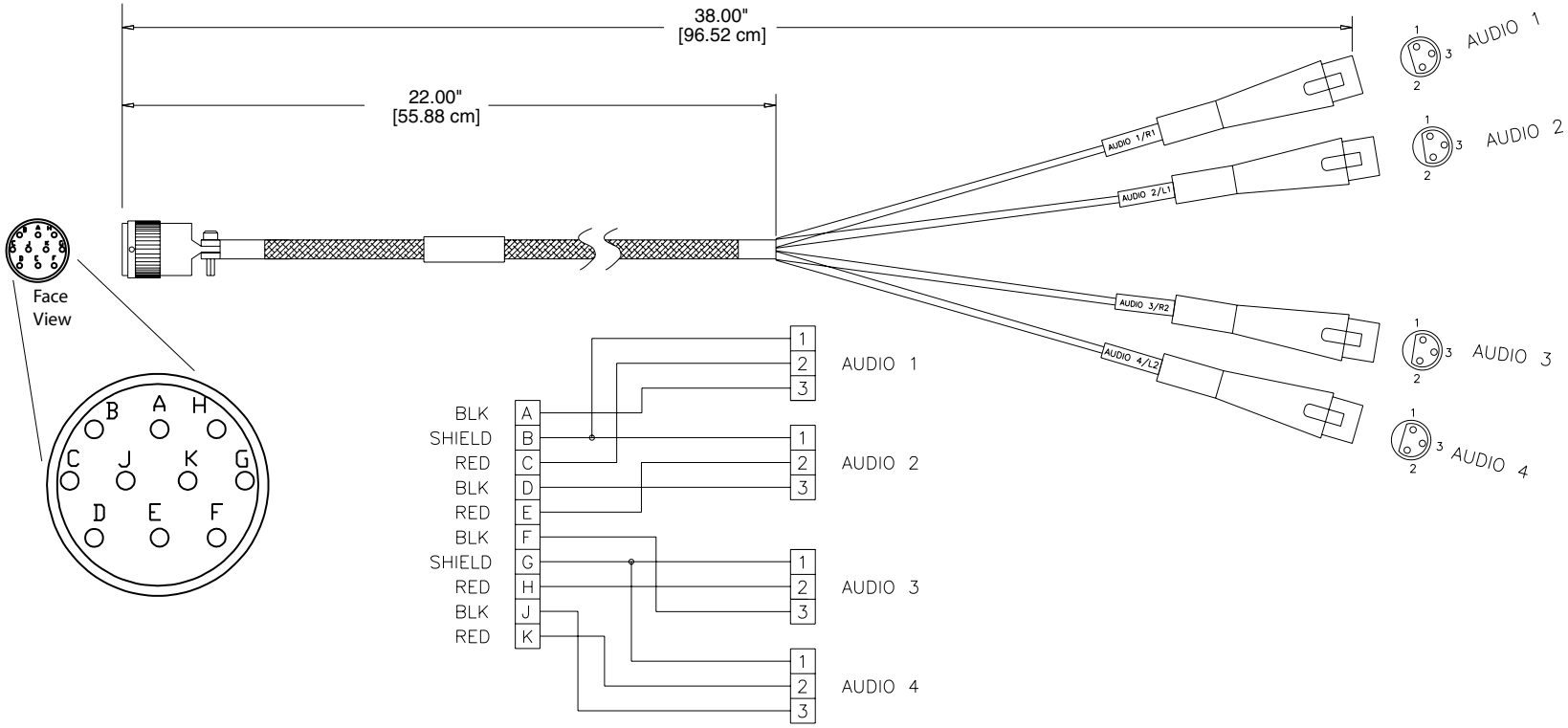
6.8.3 MPEG Audio Input

MPEG audio circuits must be configured in pairs:

- **Audio A** - Channels 1 and 2
- **Audio B** - Channels 3 and 4

Audio channels are configured using the Configurator software.

Figure 6-10: Audio XLR Cable Assembly



6.8.4 AES/EBU Audio Input

The PTX-PRO will only provide digital audio when operating in digital mode.

In digital mode, the PTX-PRO receives a digital signal and routes the data to the MPEG encoder and then to the COFDM modulator. The PTX-PRO audio switching circuitry connects the output of the MPEG encoder to the **AUDIO** connector.

When configured for digital audio output (AES/EBU), the MPEG encoder provides two paired channels of digital data (+ and -), or four individual channels. All four circuits are balanced inputs, with each pair (+ and -) sharing one ground.

In digital mode, the audio channels are referred to as **Audio A** and **Audio B**.

6.8.5 Video Connections

The PTX-PRO provides several video input and output options.

Video connections are made to the BNC **SIGNAL INPUT** or **SDI/ ASI INPUT** connectors located on the front panel of the PTX-

PRO. Video input selections are made by selecting Presets created using the Configurator software.

Video input options for the PTX-PRO are shown in Table 6-4.

Table 6-4: Video Input and Output Signal Options

Operation Mode	Signal Input	Signal Output	Notes
MPEG/ COFDM IF Out	NTSC/PAL (525/625)	COFDM - RF	Up-converted Channeled RF signal
	SDI (525/625)	COFDM - RF	
	ASI	COFDM - RF	
Ext IF In	70 MHz	RF	

6.9 Signal Connections

Details of the PTX-PRO signal connections are shown in Table 6-5.

Table 6-5: Signal Connections

Unit	Function	Connector	Notes
PTX-PRO	**MONITOR** Connector	75 Ohm BNC Female	70 MHz signal output monitoring connection.
	SIGNAL INPUT Connector	75 Ohm BNC Female	Input may be NTSC 70 MHz IF or composite video.
	SDI/SD/ HD Connector	75 Ohm BNC Female	HD/SD SDI external data stream input.
	SDI/ASI INPUT Connector	75 Ohm BNC Female	SDI/ASI external data stream input.
	RF Output Connector	50 Ohm Type N Female	13 GHz RF output .

6.10 Data Connections

The PTX-PRO contains an **RS 232** data connector located on the rear panel. The male DB-9 connector is used for the following purposes:

- Radio programming using a PC
- Wayside data communication.

The PTX-PRO can be connected to a PC via a standard null modem cable or it can be interfaced to a LAN for applications such as remote monitoring and control.

6.10.1 PTX-PRO Programming

The RS-232 data connection is used when programming the PTX-PRO using the Configurator software running on a Microsoft Windows-based PC.

The PTX-PRO is configured to be a DTE device. If you need to access the radio programming connections, a null modem cable is used to connect the PTX-PRO to your PC. One cable is supplied with each PTX-PRO ordered. Additional cables can be purchased from MRC or from any computer or electronics store.

Programming connections are shown in Table 6-6.

Table 6-6: RS-232 Panel Connector

Pin	Function	Comments
1	N/C	
2	Receive Data	Used for communication between PTX-PRO and external computer.
3	Transmit Data	
4	N/C	
5	GND	
6	N/C	
7	Transmit Data	Wayside data
8	Receive Data (Wayside)	Used to carry Wayside Data from an external device.
9	N/C	

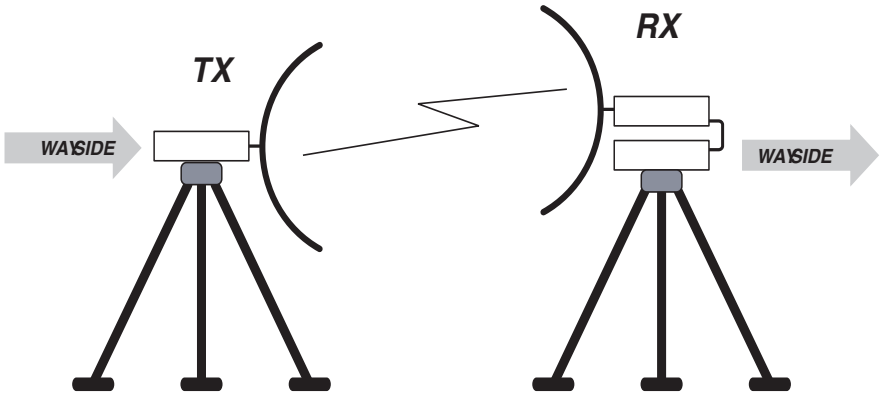
6.10.2 Wayside Data

Overview The Wayside channel is a simplex data channel transmitting data from the PTX-PRO to a receiver system. See Figure 6-11. Data inputs to the PTX-PRO are provided via connections to the serial port through a Multipurpose Data Cable provided by MRC.

Compatibility MRC has verified that the Wayside channel is compatible with the following receivers:

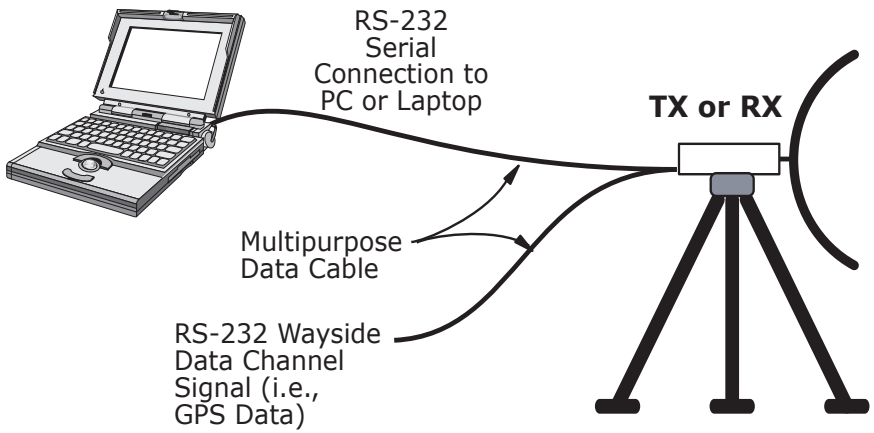
- STRATA Receiver Unit (RXU) with MPEG decoding
- STRATA Receiver Control Unit (RCU) with MPEG decoding.
- Tandberg Alteia IRD (Integrated Receiver Decoder)

Figure 6-11: Wayside Simplex Data Channel



Wayside Connections to the Serial Port Connecting the Wayside channel to the serial port requires use of a Serial/ Wayside Multipurpose Data Cable as shown in Figure 6-12 on page 6-13 and Figure 6-17 on page 6-16.

Figure 6-12: Wayside and Serial Interface Connections



The cable connects to the **RS 232** connector on the PTX-PRO and has connections for both the Wayside channel and the PC or laptop required for use with the MRC Radio Configurator (Configurator) software.

Wayside Data connections are shown in Table 6-6 on page 6-12 and in Figure 6-17 on page 6-16.

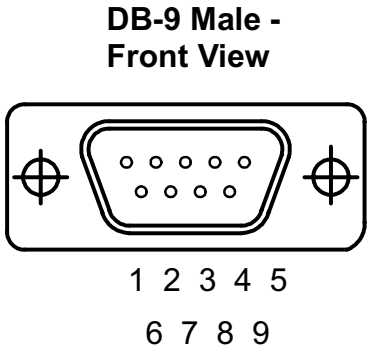
Wayside Transmitter and Receiver Connections Data connections on the transmit end of the Wayside channel for the **RS 232** serial port connector on the PTX-PRO are shown in Figure 6-17 on page 6-16.

Data connections on the Receive end of the Wayside channel for the **RS 232** serial port connector on the PTX-PRO are shown in Figure 6-17 on page 6-16. Both serial and Wayside connections are shown.

6.10.3 Panel Data Connectors

The pinout of the **RS 232** serial port DB-9 connector is shown in Figure 6-13 and Table 6-6 on page 6-12.

Figure 6-13: RS-232 Panel Connector



6.10.4 Multipurpose Data Cable

In order to access both radio and Wayside data, you need to use a Multipurpose Data Cable. The cable and wiring diagram are shown in Figure 6-17 on page 6-16. If necessary, the Multipurpose Data Cable may be ordered from MRC.

The Multipurpose Data Cable contains two DB-9 female connectors and one DB-9 male connector. The Multipurpose Data Cable contains band markers indicating connections to **HOST**, **WAYSIDE**, and **RS-232** connectors. The Multipurpose Data Cable DB-9 female **RS-232** connector is connected to the PTX-PRO **RS 232** connector.

The **HOST** DB-9 male connector is configured as a Data Terminal Equipment (DTE) device connector for connection to a PC or laptop PC. When connected to a DTE device, a null modem cable must be connected between the DTE device and the Multipurpose Data Cable DB-9 **HOST** male connector. If connected to a Data Communications Equipment (DCE) device, a null modem cable cannot be used, but a straight pin-to-pin extension cable will be required.

The **WAYSIDE** DB-9 female connector is configured as a DCE device connector for connection to a modem, GPS, etc. When

connected to a DCE device, a null modem cable must be connected between the DCE device and the Multipurpose Data Cable DB-9 female **WAYSIDE** connector. If connected to a DTE device, a null modem cable cannot be used, but a straight pin-to-pin extension cable will be required.

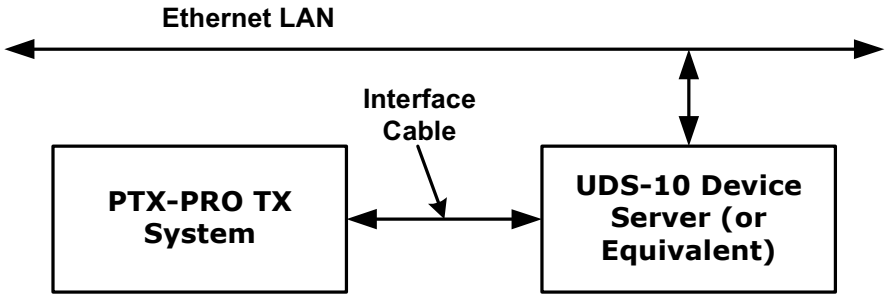
Null modem cables may be obtained from MRC or any computer or electronics store.

6.10.5 Networking

The **RS 232** connector on the PTX-PRO can also be connected to a network if desired. This allows both monitoring and programming the PTX-PRO from a remote location.

To connect the PTX-PRO to a network, you will need the items described below. See Figure 6-14.

Figure 6-14: Network Interconnection



- **Device Server**

  There are several types on the market. Also called Serial-to-Ethernet converters, they take serial RS-232 data and convert it to the format needed for an Ethernet network.

  One type MRC has used with success is the Lantronix UDS-10. It accepts data via a DB-25 connector, and connects to the network via an RJ-45 connector. See Figure 6-15.

- **Interface Cable**

  This cable is needed to connect to the PTX-PRO data connector (DB-9) on one end and connect to the device server on the other (a DB-25 connector in the case of the UDS-10).

  This is a custom cable which you will have to fabricate. See Figure 6-16 on page 6-15 for the connections on the PTX-PRO end.

Figure 6-15: Lantronix UDS-10 Device Server

Figure 6-16: Network Interface Cable

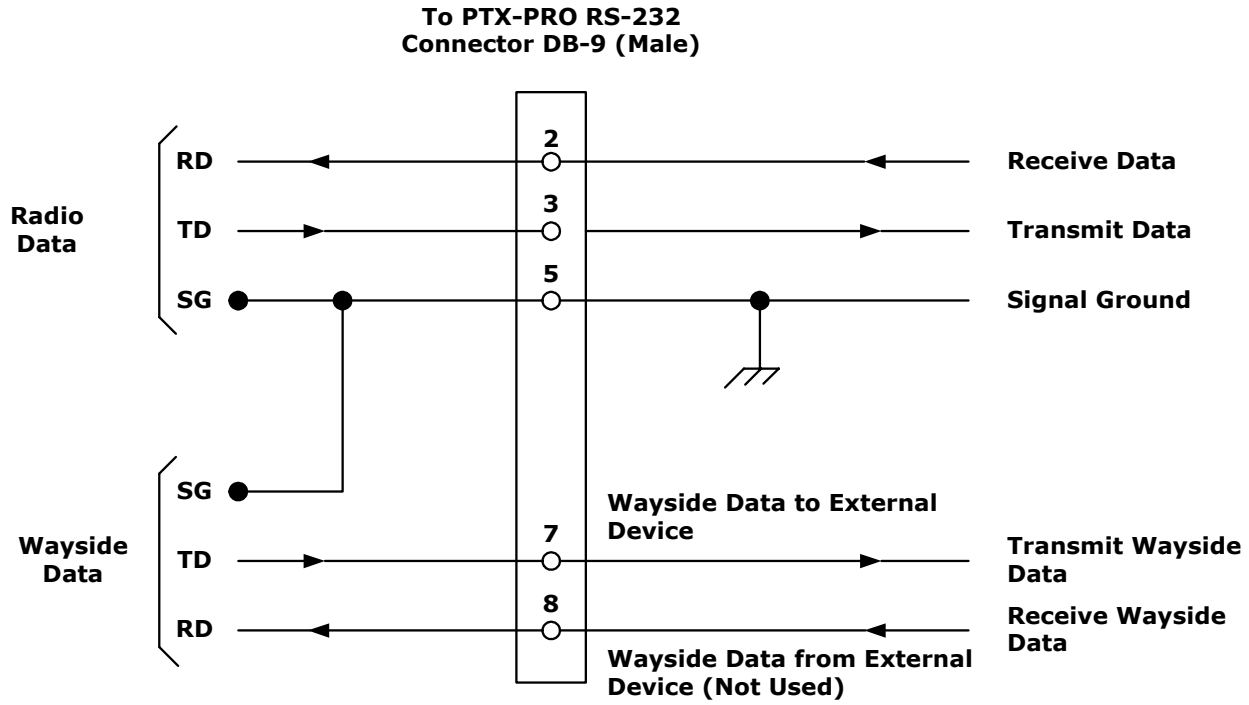
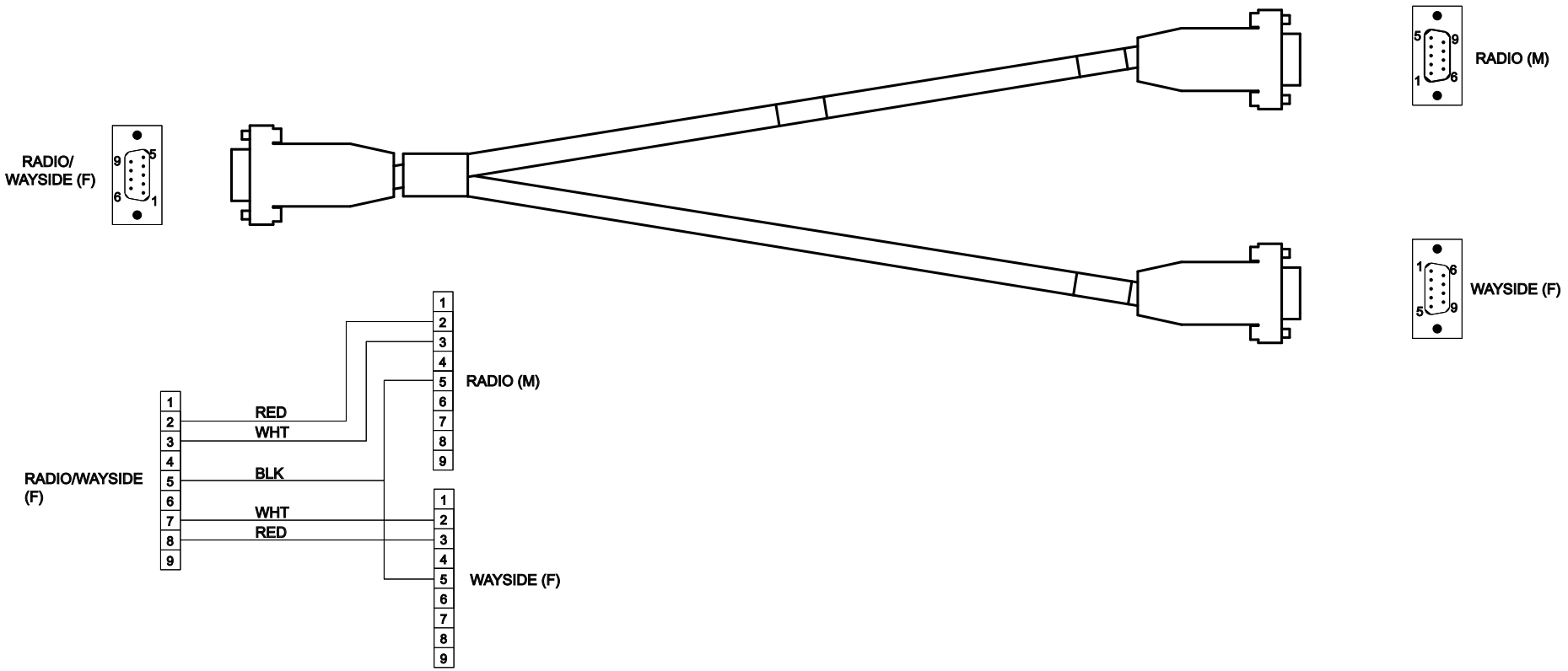


Figure 6-17: Multipurpose Radio and Wayside Data Cable



6.11 Powering Up

When the wiring and mounting are completed, it is time to power up the PTX-PRO. As good practice, you should make a final check before power is applied.

6.11.1 Checks before power-up

Here are your final pre-power-up checks:

- Double check to be sure all the cables are connected to the correct connectors.
- Make sure the connections are all fully mated and locked.

CAUTION *Be sure the power being supplied matches the power required by the equipment.*

6.11.2 Initial power-up

Now you are ready to apply power:

1. Verify the power cable is properly connected to the front panel power connector.

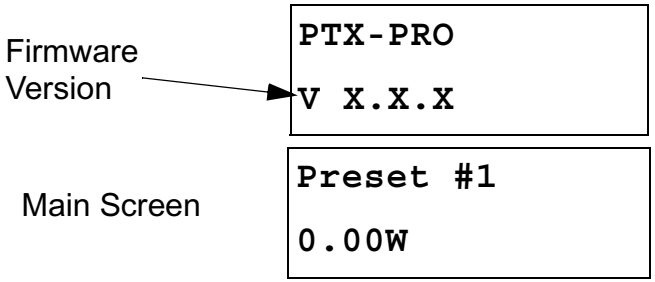
2. Verify all front and rear panel cables and connectors have been properly connected. Connect the power cable to AC or DC power of the correct voltage and polarity. Verify the power source is turned on.
3. Set the **PWR** switch to **I** (on).
4. The normal power-up sequence is as follows:

- The **PWR** LED above the **PWR** switch should illuminate and should quickly change colors from red, to green, to amber, to green, and should remain green.
- The alphanumeric display should light up and quickly display a self-test screen, then the version of the firmware, and finally the Main Screen.

  Some typical screens are shown in Figure 6-18. Exact screens displayed will vary.
- The PTX-PRO will typically power up using the last settings in use when power was turned off.

  If the PTX-PRO does not power up normally, refer to the "Troubleshooting" Chapter on page 4-1.

Figure 6-18: Typical PTX-PRO Power Up Screen



5. If everything appears to be normal, test the performance of your PTX-PRO by setting up a link and transmitting and receiving video and audio.

If you have any problems, refer to the "Troubleshooting" Chapter on page 4-1 to determine the cause.

6.12 Configurator Software Installation

The steps required to install the MRC Radio Configurator software on your PC is contained in the following steps.

6.12.1 PC Requirements

The MRC Radio Configurator software (Configurator) is designed to run on Microsoft Windows -based PCs that meet the requirements shown in Table 6-7.

Table 6-7: PC Requirements

	Minimum	Maximum
Processor Speed	400 MHz	1 GHz
RAM	96 MB	256 MB
Screen Resolution	800x600	1024x768

- Microsoft Windows XP Operating System with SP2
- 500 MB of free hard disk space
- CD-ROM drive
- Internet Explorer 4.01 SP1 or later
- One RS-232 I/O port configured as COM 1 thru COM 9.

6.12.2 Installing Configurator Software

Before using the MRC Radio Configurator, it must be installed on your PC. To install the Configurator, perform the following steps.

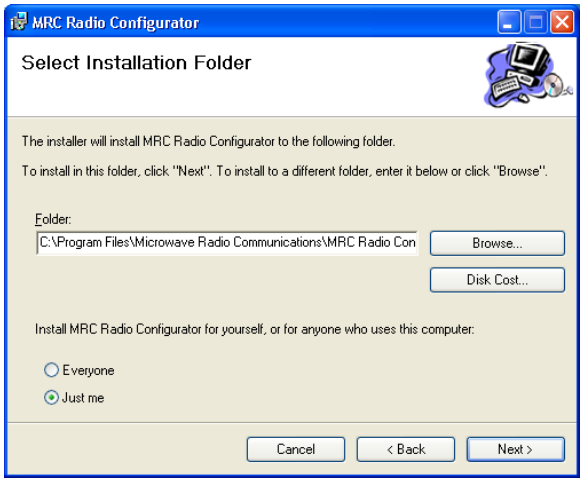
Note	If any version of the MRC Radio Configurator is already installed, you **must** uninstall it before attempting to install a new version. Use the “Add/Remove Programs” feature in the Microsoft Windows Control Panel to do this.

1. Locate the CD that was provided with your PTX-PRO.
2. Insert the CD into your computer CD drive.
3. Using the **My Computer** icon on your PC (or any other method), navigate to that CD drive and display the CD directory on your screen.
4. Open the CD, select the MRC Radio Configurator, and observe the **Setup Wizard** is displayed. See Figure 6-19.

Figure 6-19: Setup Wizard

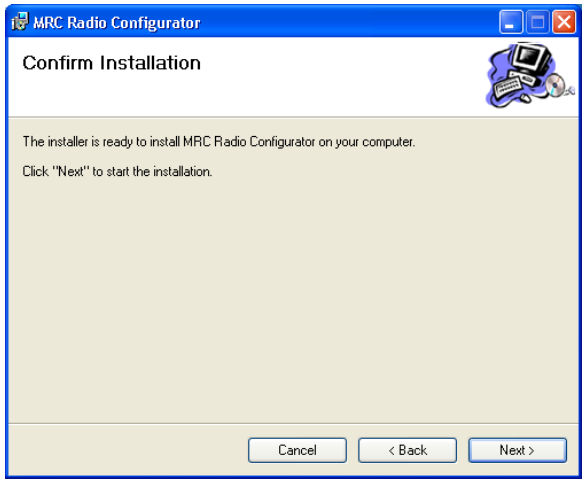
5. Select the **Next** option button and observe the **Select Installation Folder** window is displayed. See Figure 6-20.

Figure 6-20: Select Installation Folder Window



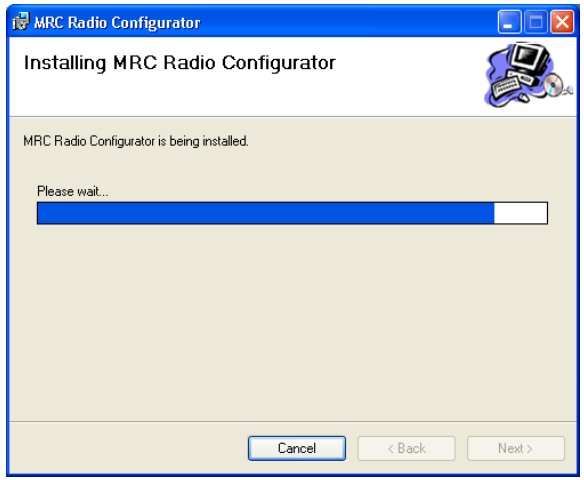
6. Select the folder in which you wish to save the Configurator software using the **Browse** option button or accept the default folder, select the **Next** option button, and observe the **Confirm Installation** window is displayed. See Figure 6-21 on page 6-19.

Figure 6-21: Confirm Installation Window



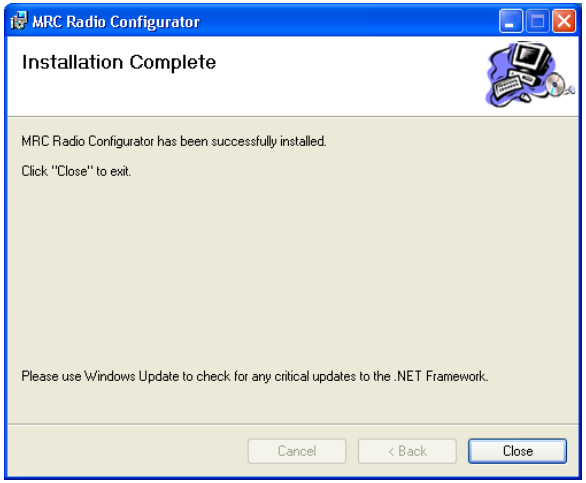
7. Select the **Next** option button and observe the **Installing MRC Radio Configurator** window is displayed. See Figure 6-22.

Figure 6-22: Installing MRC Radio Configurator Window



8. When the software installation is complete, observe the **Installation Complete** window is displayed. See Figure 6-23.

Figure 6-23: Installation Complete Window



9. Select the **Close** option button and observe the **MRC Radio Configurator** icon is displayed on your desktop. See Figure 6-24.

Figure 6-24: MRC Radio Configurator Icon - Typical

6.13 Product Modifications

The product you purchased has been carefully designed and tested, and is warranted to meet specifications when connected and operated as described in this manual.

Note	If you modify a product without authorization from MRC, you will void the warranty.

7 Replacement Parts

7.1 Chapter Overview

This chapter describes which replacement parts are available for the PTX-PRO 13 GHz Transmitter (PTX-PRO).

Since there are no supported field repairs on the PTX-PRO. The only parts available are external cables and mounting hardware.

7.2 External Cables

The external cables and connectors for the PTX-PRO are listed in Table 7-1. If you need something that is not listed, ask your Sales Representative or consult the factory.

Table 7-1: PTX-PRO Cables and Connectors

Description	Comments
AC Power Cable (120 VAC)	Connects AC power to the PTX-PRO. Connectors on both ends.
AC Power Cable (240 VAC)	Connects AC power to the PTX-PRO. Connectors on one end only.
DC Power Cable (+11.0 to +36.0 VDC)	Connects DC power to the PTX-PRO. Connector on one end only.
Audio Input Cable	Provides input to PTX-PRO **AUDIO 1** and **2** connectors from two XLR connectors. See “Audio Connections” on page 6-8.

Table 7-1: PTX-PRO Cables and Connectors (Continued)

Description	Comments
Null Modem Cable	Connects PTX-PRO **RS-232** connector to PC RS-232 connector. For programming and monitoring data only. See ”Data Connections” on page 6-11.
Audio Input Connector	Connects to PTX-PRO **AUDIO 3 & 4** connector for Audio 3 and 4 inputs. See ”Data Connections” on page 6-11.
Multipurpose Data Cable	Connects to PTX-PRO **RS 232** connector to monitor Wayside and Radio data.
RF Coaxial Cable	Connects PTX-PRO RF output connector to antenna.
Power Input Connector	Connector only - Mates with PTX-PRO **PWR** connector.
Audio Input XLR Connector	Connector only - Mates with PTX-PRO **AUDIO 1** or **2** connectors.

7.3 Mounting Hardware

The mounting hardware for the PTX-PRO is listed in Table 7-2. If you need something that is not listed, ask your Sales Representative or consult the factory.

Table 7-2: PTX-PRO Mounting Hardware

Description	Comments
Antenna Lock Plate	Attaches an MRC antenna directly to PTX-PRO RF output connector.

Table 7-2: PTX-PRO Mounting Hardware (Continued)

Description	Comments
Quick Release	Provides quick release mounting capabilities of the PTX-PRO units on an MRC tripod

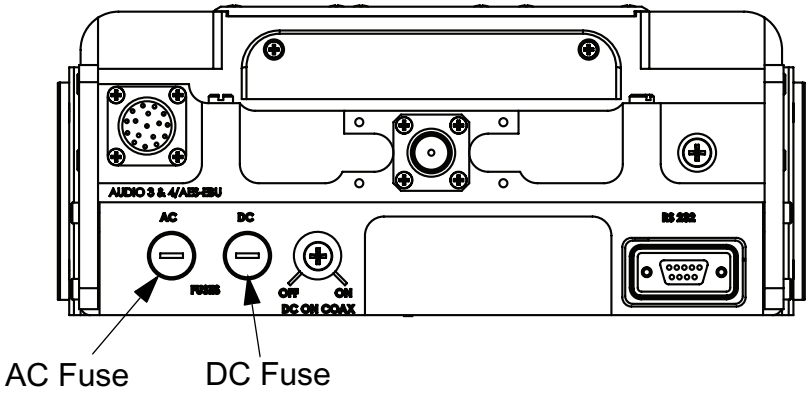
7.4 Power Fuses

The PTX-PRO configurations operate on the following external AC or DC power sources:

- 90 to 264 VAC, 50/60 Hz
- +11.0 to +36.0 VDC

Power fuses for the AC and DC configurations of the PTX-PRO are located on the rear panel of the unit. See Figure 7-1 .

Figure 7-1: AC and DC Power Fuse Locations



Fuse ratings for the AC and DC power sources are shown in Table 7-3.

Table 7-3: Fuse Ratings

Operating Voltage	Fuse Rating
90 to 264 VAC, 50/60 Hz	2.0A, 250V AGC, Slow Blow
+11.0 to +36.0 VDC	15.0A, 250V, Slow Blow

7.5 Supported Repairs

The PTX-PRO is designed to be compact, rugged, and reliable.

The PTX-PRO requires specialized test equipment to calibrate amplitude and frequency characteristics after repair. In addition, sealing the PTX-PRO enclosure after repair requires exacting techniques and special fixtures to ensure weather resistance of the units.

There are NO supported field repairs for the PTX-PRO .

Return the entire unit for factory repair.

If you attempt field repair, you risk damaging your equipment. If your equipment is under warranty, you may also affect your warranty coverage.

8 Theory of Operation

8.1 Chapter Overview

This chapter provides technical details about the design and functioning of the PTX-PRO 13 GHz Transmitter (PTX-PRO). This chapter is intended to complement information contained in the “Product Description” Chapter on page 2-1.

The descriptions in this chapter assume you are already familiar with the information contained in Chapter 2. We recommend that you review Chapter 2 before beginning to read this one.

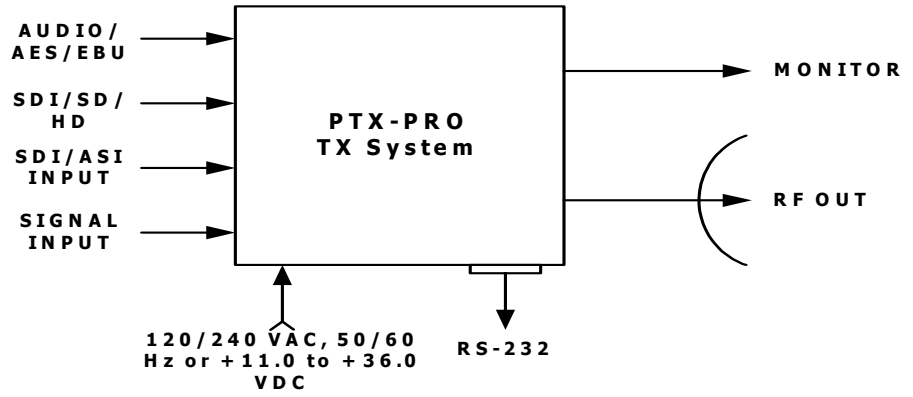
Here are the topics covered:

8.2 System Architecture

The PTX-PRO is designed around a flexible, modular architecture. The overall PTX-PRO system architecture for a PTX-PRO is shown in Figure 8-1.

The PTX-PRO is a versatile portable transmitter designed to accept an IF 70 MHz input signal or composite video signal, audio signals, or SD/HD SDI signals or ASI/SDI signals from external sources and to provide a 13 GHz microwave signal output.

Figure 8-1: PTX-PRO System Architecture



All configurations are available with either NTSC or PAL system modulation.

PTX-PRO key features are:

- RF output high/low power selection for 13 GHz operation
- System modulation scheme:
  Digital: COFDM or LMS-T
- COFDM Modulation:
  Selectable 6, 7, or 8 MHz bandwidth
  QPSK, 16 QAM, or 64 QAM
- COFDM Modulation with selectable Guard Interval technology (1/4, 1/8, 1/16/ or 1/32)
- Forward Error Correction (FEC) (1/2, 3/5, 5/6, or 7/8)
- MPEG encoding with SD and optional HD video solution technologies
- Front panel local control
- Wide choice of antennas.

All PTX-PRO configurations are available with Standard Definition (SD) or SD and optional High Definition (HD) video technologies.

The PTX-PRO can accept a wide variety of signal formats and includes an RF up-converter for use in transporting signals over a microwave link. The PTX-PRO also contains an MPEG/COFDM module.

The PTX-PRO contains a universal power supply and can operate on 90 to 264 VAC, 50/60 Hz or +11.0 to +36.0 VDC.

8.3 System Theory of Operation

The PTX-PRO is comprised of the following primary components:

- Command and control universal power supply module
- MPEG encoder/COFDM modulator module

See Figure 8-2 on page 8-3 for a block diagram of the 13 GHz PTX-PRO.

The PTX-PRO also contains the IF/RF module which accepts either a 70 MHz COFDM or external 70 MHz input signal and up-converts these signals to the 13 GHz RF band. The PTX-PRO can therefore serve as a standalone digital video microwave transmission system.

The RF frequency synthesizer circuit included in the IF/RF module, along with the command and control module, provide the means to channelize RF video and audio signals in the 13 GHz RF band. Standard U.S. FCC band plans, as well as custom channel plans, may be accommodated using the MRC Radio Configurator (Configurator), when the Configurator software is connected to the PTX-PRO.

8.3.1 Command and Control Power Supply

The PTX-PRO command and control power supply modules contain external and internal communications circuitry, as well as supplying necessary system voltages.

The PTX-PRO power supply accepts a wide range of DC input voltages (+11.0 to +36.0 VDC) or 90 to 264 VAC, 50/60 Hz. The supply converts the input voltage to the DC voltages required by the rest of the PTX-PRO circuits and distributes the appropriate output voltages to the various circuits.

The on-board microprocessor manages the system configuration and operation of all modules to which it is connected, e.g., MPEG/COFDM, IF/RF modules, etc.

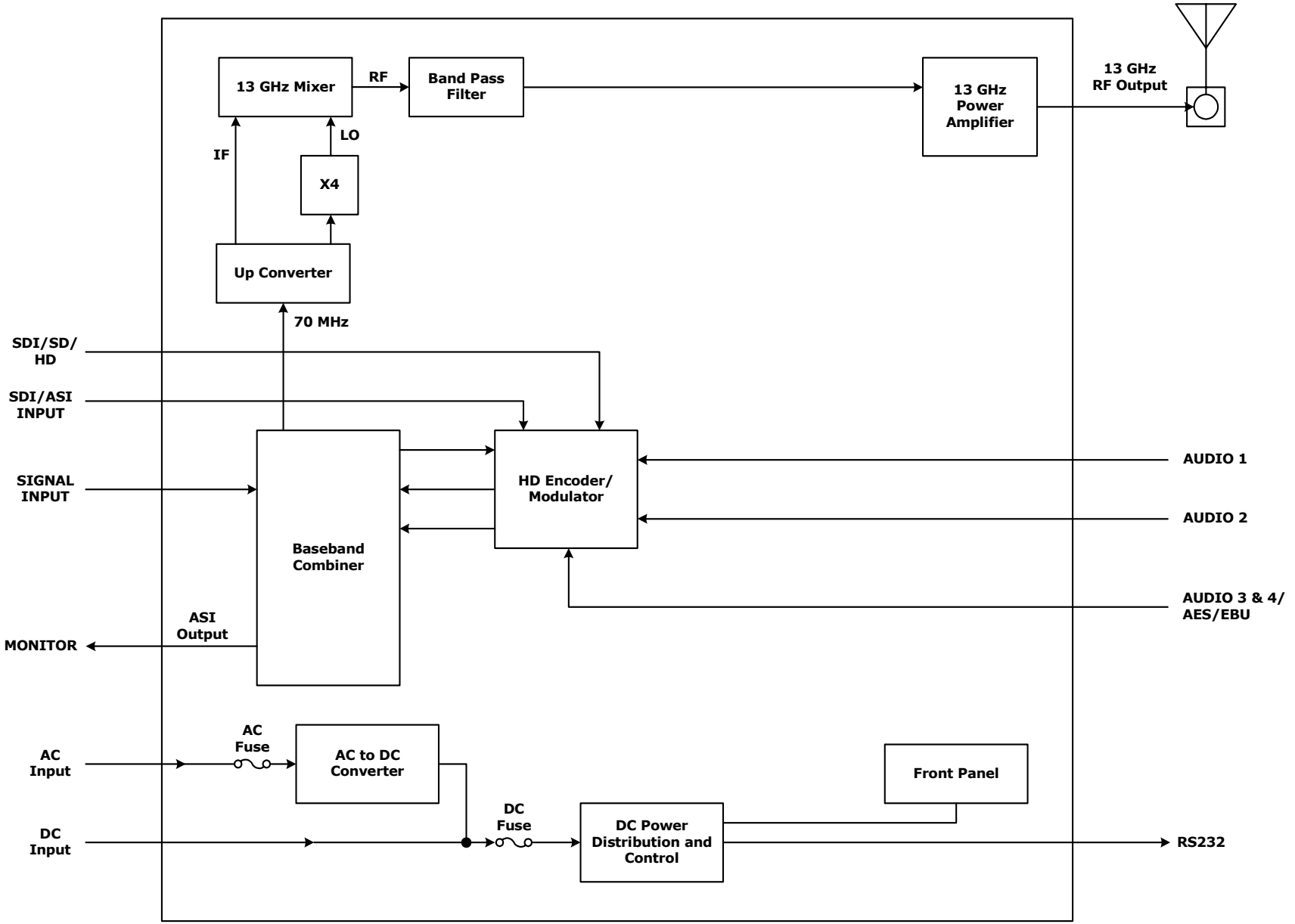
This ensures that the PTX-PRO can permit switching modes of operation, change system Presets, etc. Therefore, system control may be accomplished using front panel control or remote control.

8.3.2 MPEG/COFDM Encoder/Modulator Module

The MPEG/COFDM module is the heart of the PTX-PRO digital mode circuitry. This circuit may be configured to accept a wide range of digital or analog video and audio signal inputs and provide COFDM IF (70 MHz) video signal outputs.

The various signal inputs and outputs are connected through the PTX-PRO combiner circuit where they are switched under software control.

Figure 8-2: Standalone 13 GHz PTX-PRO Block Diagram



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