JANTEQ CORPORATION

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User Manual

BHDTX-S-TWINTX-HP-AB

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User Manual

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CAUTION

DO NOT REMOVE ANY COVERS

REFER SERVICING TO QUALIFIED TECHNICIANS ONLY

DISCONNECT ALL POWER BEFORE SERVICING

READ AND PERFORM ALL INSTRUCTIONS CAREFULLY. FAILURE TO FOLLOW SUGGESTED INSTRUCTIONS AND GUIDELINES MAY VOID ALL WARRANTIES.

PROPRIETRY NOTICE AND LIABILITY DISCLAIMER

FCC RF Exposure Compliance

FCC RF exposure compliance must be addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of §1.1307(b)(3). The applicable exposure limits, to demonstrate compliance, are specified in FCC Part 1.1310. Additionally, the installer of the antenna to be used with this transmitter may be required to perform an MPE evaluation and an Environmental Assessment (EA) of the location at the time of licensing per CFR 47 Part 1.1307. Fixed mounted antenna(s) that are co-located with other antenna(s) must satisfy the co-location requirements of Part 1.1307 for satisfying RF exposure compliance.

Document Revisions

Author	Description	Date	Revision
JP/TC	Initial release	08/10/2011	A

Table of Contents

1.0 Overview

This chapter provides a general description of the BHDTX-S-TWINTX-HP-AB digital microwave transmitter, including:

- Introduction to the BHDTX-S-TWINTX-HP-AB
- Illustration of the BHDTX-S-TWINTX-HP-AB components
- Key features of the transmitter
- Initial programming of the transmitter

1.1 Introduction to the BHDTX-S-TWINTX-HP-AB Transmitter

The BHDTX-S-TWINTX-HP-AB is a high-power digital transmitter using COFDM modulation and MPEG-4 encoding. In addition to the normal DVB-T bandwidths of 6, 7, and 8 MHz, the radio is available with the narrow band options of 1.25, 2.5, and 5 MHz. The new line of transmitters can cover multiple bands in one radio and can be ordered in either the L, S, or C models.

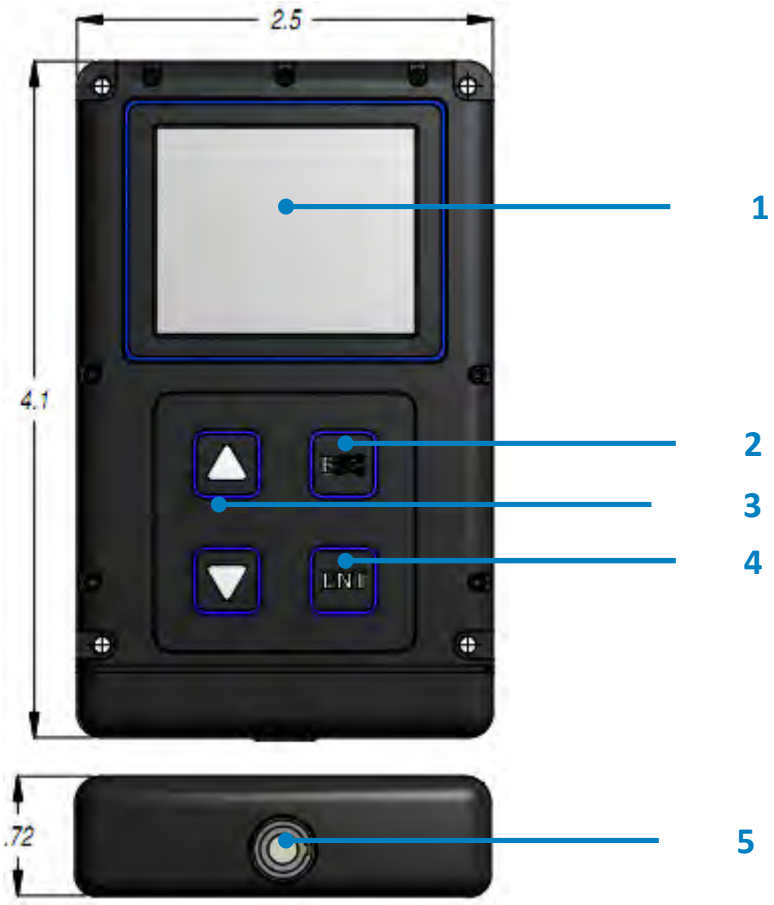
The attractive ruggedized base unit is packed with features. The remote control unit has a 2" high resolution color display provides crisp full frame rate pictures for video confidence and the display of the base unit's interactive menus. Local menu navigation is through the remote control unit's front panel. Four tactile buttons offer user or administrative-level access.

All Janteq radios use a main profile H.264 codec capable of IBP**.** This has been further enhanced by adding a striping technique to create an ultra-low delay option. As a result, the user has a wide range of transmission options:

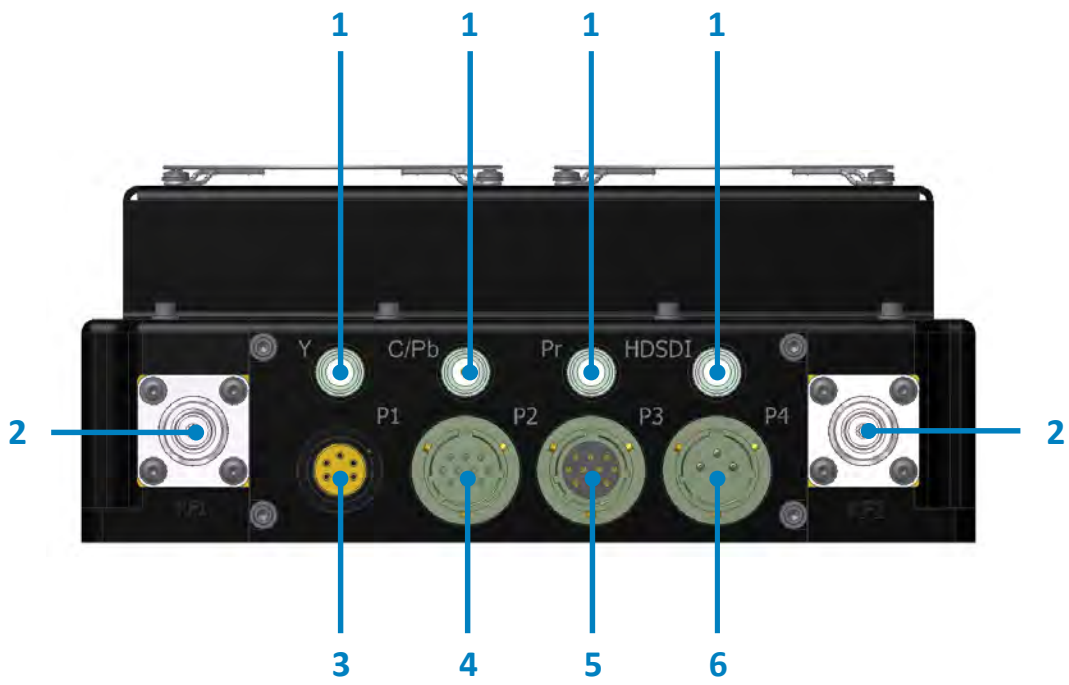
- Low delay (≤ 50 mS) offers reasonable quality for reasonable bandwidth. (Optional)
- Normal delay (≈130 mS) offers good quality for reasonable bandwidth.

The base unit features optional full IP connectivity that can provide streaming video at variable bitrates, along with user data, telemetry, and interfaces to the remote control unit.

1.2 BHDTX-S-TWINTX-HP-AB Components



BHDTX-S-TWINTX-HP-AB Remote Control Unit
1 Color screen. **View video and display the transmitter's menus.**
2 Escape (ESC) button. **Press to escape out of a current menu function shown on the screen.**
3 Up and down arrow buttons. **Press to navigate through menu options shown on the screen.**
4 Enter (ENT) button. **Press to select a menu option selected on the screen.**
5 Connector for connection to the base unit.



BHDTX-S-TWINTX-HP-AB Base Unit
1 Video Input Ports: **Y** (Composite, S-Video, Component), **C/PB** (S-Video/Component), **PR** (Component), **HDSDI** (SD/HD Serial)
2 RF Output Connectors: **RF1, RF2**
3 Remote Control Unit Connector: **P1**
4 Serial I/O Connector: **P2**
5 Audio Input Connector: **P3**
6 Power Connector: **P4**

1.3 Key Features

The BHDTX-S-TWINTX-HP-AB transmitter offers the following key features:

- Available in L, S, or C bands
- DVB-T bandwidths of 5, 6, 7, and 8 MHz normal, with 1.25 and 2.5 MHz optional
- Bandwidth efficient H.264 IBP encoding, with MPEG-2 optional
- Main profile encoder with IBP and ultra-low latency modes optional
- User friendly controls with 2" full frame high resolution LCD for video monitoring and spectacular menu graphics
- Flexible interface for Composite, Y/C (S-Video), Y/PB/PR (Component), SD/HD SDI
- Accommodates wide range of video formats to 1080P/30, menu selectable
- High power RF output
- Stylish machined aluminum housing with excellent RFI/EMI suppression
- Low latency, ≤ 4 frames end to end with ultra-low latency available ≈ 50mS optional
- Internal audio/video test sources
- Accommodates a wide range of audio inputs from -60dBm to +18dBm with Mic/Line, Tone, and Embedded SDI, balanced or unbalanced with mic phantom power
- Audio limiter for improved audio dynamic range

1.4 Programming the Transmitter Prior to Use

Before using the transmitter, an administrator must program it for use. Preset configuration and monitoring are enabled through the Windows-based Transmitter Programmer application. Refer to the chapter *Transmitter Programmer Application* on page 32 for more information.

2.0 Basic Operation

This chapter explains how to perform basic operations and use the basic menu functions on the BHDTX-S-TWINTX-HP-AB, including:

- Connecting and powering the transmitter
- Description of the transmitter's home page
- Accessing the user menus
- Description of the user menus

2.1 Connecting and Powering the Transmitter

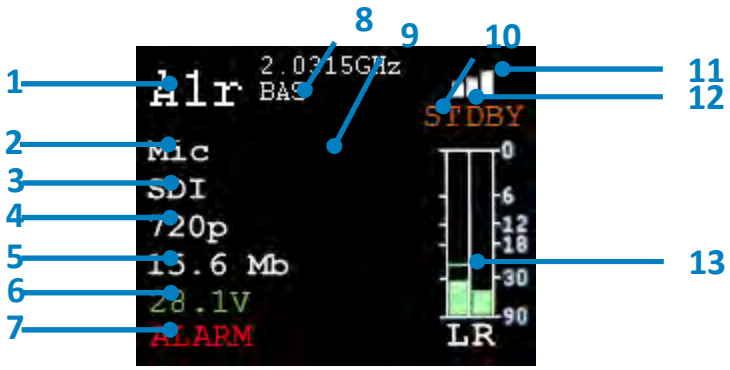
To operate the transmitter, you must first make the following connections:

- Connect the power cable provided to a suitable supply.
- Connect suitable audio and video signals to the transmitter.
- Connect the desired microwave antennas to the RF outputs.
- Connect the remote control cable to the remote control unit.

Refer to chapter *Cable Connections* on page 28 for more information on connections and voltage requirements. When powered, the transmitter begins to initialize and will automatically reset to the last used preset.

The video screen on the remote control unit will light up. Wait for the transmitter to finish initializing. The home page opens, showing the overall setup of the transmitter.

2.2 Home Page

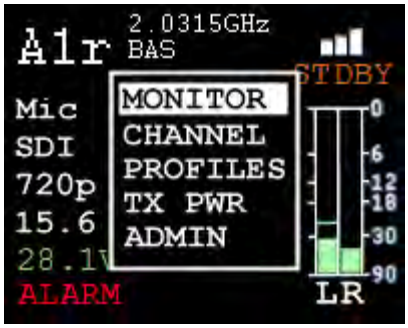


Home Page Indicators with Explanation of Examples	
1 Channel. **Channel** A1r **in the** BAS **channel plan.** **2** Audio Input. **Audio input is selected for** Mic**.** **3** Video Input. **Type of video is set to** SDI**.** **4** Video Format. **Video format is set to** 720p**.** **5** OFDM Payload. **OFDM payload is** 15.6 Mb**.** **6** Input Voltage. **Input voltage is at** 28.1 V**. Input voltage text will appear GREEN when input voltage is above 20V and RED when it drops below this level.** **7 ALARM appears when there is a warning (check the transmitter's alarm page for more information when an alarm appears).**	**8** Frequency and Band. **Frequency is** 2.245 GHz**, and the band is** S-Band**.** **9** Profile Name. **No profile is being used. If a profile is being used, the name appears.** **10** PA1. **PA1 is OFF (antenna icon appears when ON).** **11** PA2. **PA2 is OFF (antenna icon appears when ON).** **12** Power Level. **The RF out power shows one green bar (≥1.0 W). Two green bars indicate medium (2.5W). Three green bars indicate higher power (≥5.0 W).** STDBY appears when the unit is in standby mode (RF output is disabled). **NOTE:** Antenna icons disappear when unit is in standby**.** **13** Input Audio Level. **The two audio channels are shown in dBfs (dB full scale, +18 dBm) on a bar graph. The bars turn yellow above -18 dBfs and red above -6 dBfs.**

2.3 Accessing the User Menus

The user menus provide an interface for the user to control non-administrator functions. To access the user menus:

1 **With the transmitter powered on, press and hold the** ENT **button until the popup menu appears:**



2 **Press the up and down arrow buttons on the transmitter to highlight the menu you want to work with.**

3 **With the appropriate menu highlighted, press the** ENT **button to access the selected menu.**

4 **To work with any menu, simply use the up and down arrow buttons to select different submenus and menu options. Press the** ENT **button to select the highlighted submenu or menu option. Press the** ESC **button if you want to cancel and return to the previous screen.**

2.4 User Menu Descriptions

The available user menus include:

- MONITOR
- CHANNEL
- PROFILES
- TX PWR
- ADMIN

2.4.1 MONITOR

The **MONITOR** menu displays the video monitor, which shows the video as it is offered to the encoder. Loss of video would result in a blue field or color bars with the transmitter's service name overlaid. You can take the following actions with the video monitor open:

- Press the up arrow button to crop the video to fill the screen.
- Press the down arrow button to return the video to its original aspect ratio.
- Press the **ESC** button to return to the main screen.

2.4.2 CHANNEL

The **CHANNEL** menu allows you to select the channel number in a given channel plan for the selected Band. You can take the following actions with this feature open:

- Select Channel from the menu and press Enter. The channel number on the Home Page will start flashing.
- Use the Up/Down arrows to find the desired channel number and press Enter to select.

2.4.3 PROFILES

The **PROFILES** menu allows you to select one of thirty two profiles that have been preconfigured on the transmitter and are held in memory. **PROFILES** contain all the parameters, from type of input format to transmitter bandwidth that you will need, along with the Channel number, to define the radio. You can take the following actions with this feature open:

- Press the up and down arrow buttons to highlight a preconfigured profile, and then press the **ENT** button to select that profile. Pressing **ENT** again will give you the choice of **Recall, Store** or **Name**.
- Selecting **Recall** and pressing enter will load that profile onto the selected **Channel**. Use **ESC** to return to the Home screen.
- Selecting **Store** and pressing **ENT** will load any new profile that you may have created into that profile position. **CAUTION**, this action will permanently erase the original profile memory held in that position.
- Selecting **Name** and pressing **ENT** twice will allow you to set a name associated with that profile. Use the Up Down arrows and ENT to select an eight character alpha numeric name.
- Pressing ESC before ENT will allow you to back out of the selection leaving the field unchanged.

2.4.4 TX POWER

The **TX POWER** menu allows you to select high (5.0 W), medium (2.5 W) or low (1.0 W) RF output power on the transmitter.

2.4.5 ADMIN

The **ADMIN** menu allows you to access all of the administrator menus that are discussed in the next chapter. If the transmitter is in user mode many of the parameters in the menu will be grayed-out allowing you to read but not change the parameter. If this is the case, you will require a three digit PIN, which you must enter to gain access to the full administrator menu.

3.0 Administrative Setup

This chapter explains how to perform administrator operations by using the administrator menu functions on the BHDTX-S-TWINTX-HP-AB, including:

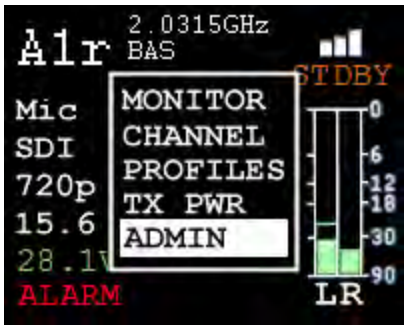
- Accessing the administrator menus
- Working with profiles
- Description of the administrator menus

3.1 Accessing the Administrator Menus

You can configure the transmitter by using the administrator menus. To work with all these menus you must have administrator access with the three-digit PIN. This is the PIN set through the Transmitter Programmer application. **324** is the factory PIN default.

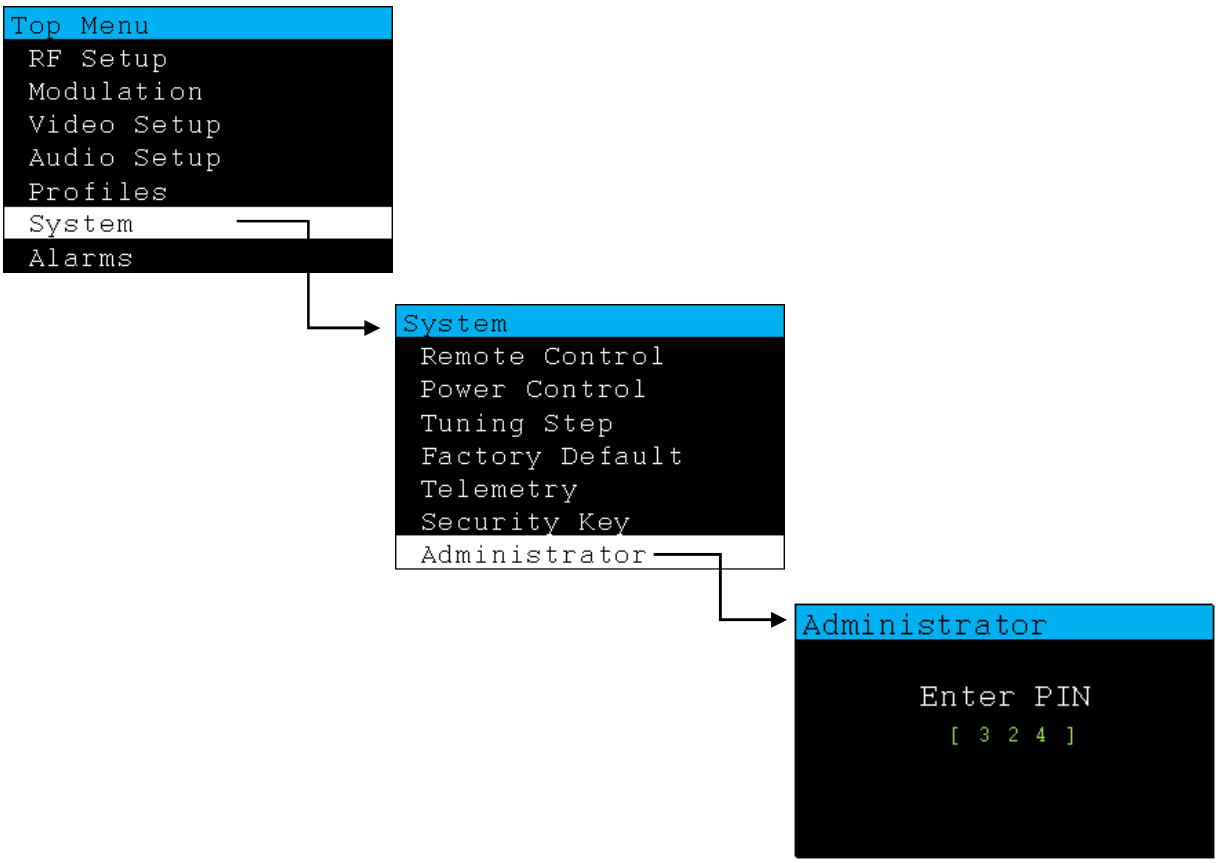
To access **ALL** the administrator menus:

1 **With the transmitter powered on, press and hold the** ENT **button until the popup menu appears:**

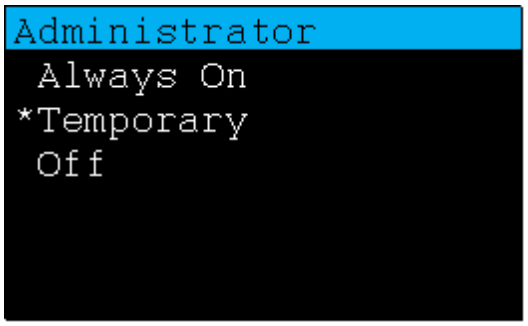


2 **Press the up and down arrow buttons on the transmitter to highlight the** ADMIN **menu.**

3 **With the** ADMIN **menu highlighted, press the** ENT **button. From the drop down menu select Systems and from the subsequent menu select Administrator. The transmitter prompts you to enter a PIN:**



4 Enter the three-digit PIN. To enter each of the three digits in the PIN, use the up and down arrow buttons to highlight each number, and then press the ENT **button to select the number. Repeat this for each number. When you enter the correct PIN, there will then be three options available *Always On, Temporary, and Off*:**



Always On - Administrator-level access is on, even when the unit is power cycled

Temporary - Administrator-level access is on until the next power cycled

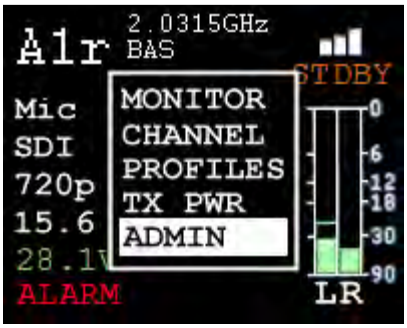
Off - Turn Administrator-level access off

5 **To work with any menu, simply use the up and down arrow buttons to select different submenus and menu options. Press the** ENT **button to select the highlighted submenu or menu option. Press the** ESC **button if you want to cancel and return to the previous screen.**

3.2 Working with Profiles

Due to the large number of parameters that can be changed in the transmitter, 32 profiles can be stored to aid in the setup of the unit. Profiles can be chosen with various bandwidths, modulation format and guard intervals to accommodate the link path. Once the channel has been selected a profile can be attached that best suits the path. If you are an end user, many of these parameters within the profile can be further changed to suit the mission and if you have the required PIN you will have access to all the features.

3.3 ADMIN Menu Descriptions

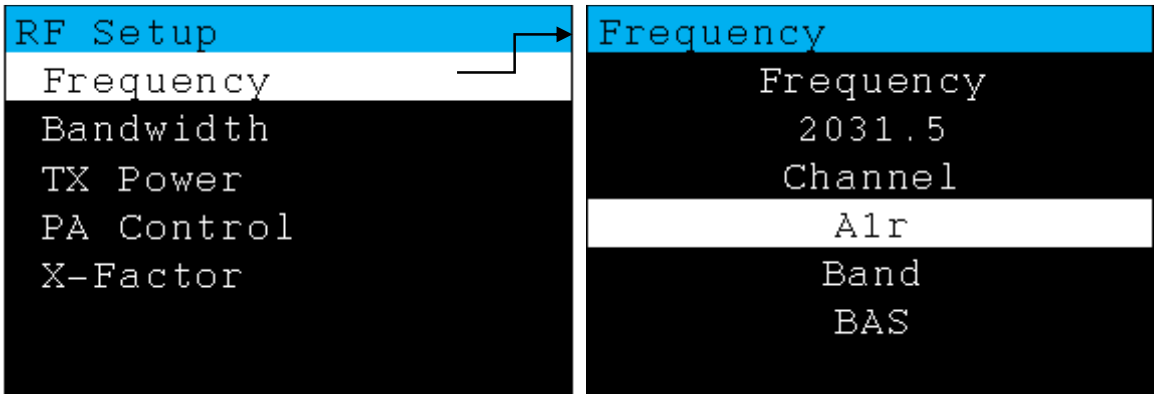


This section explains each of the ADMIN menus and includes tables to describe each of the submenus and menu options. The **R/W** column for each row specifies whether the corresponding option is readable (to view information), writable (to set a preference), or both.

- RF Setup
- Modulation
- Video Setup
- Audio Setup
- Profiles
- System
- Alarms
- SW Version

3.3.1 RF Setup

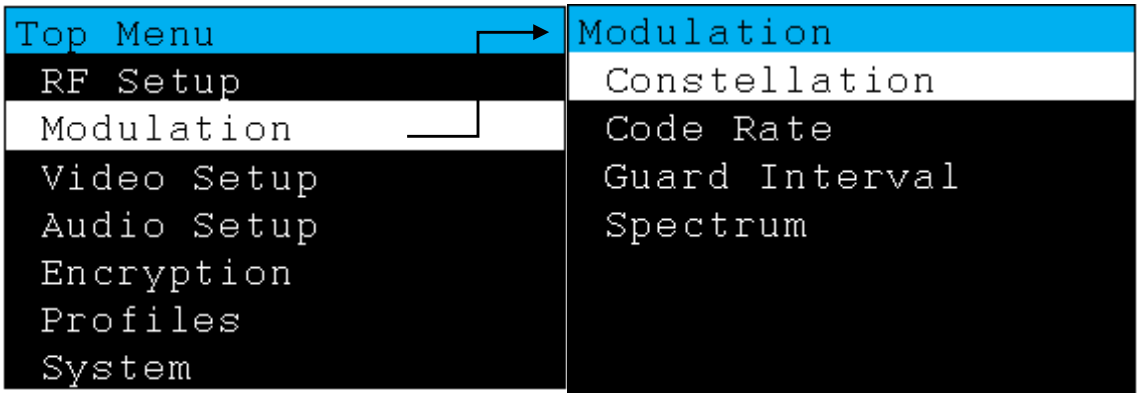
The **RF Setup** menu allows you to set up the RF parameters.



The following table shows the **RF Setup** submenus and options:

Submenu	R/W	Description
Frequency	**R/W**	**Allows you to select the following submenu options:** Frequency: **Allows you to take the transmitter "off channel." You can select the frequency within the limits specified in the band but channel plan # will not show unless it complies.** Channel: **Select a channel number that corresponds to the Channel plan for that band.** Band: **Select the band, which will update the selection of channels available. There can be a maximum of four bands defined, as specified by the channel plan for the particular model.**
Bandwidth	**R/W**	**Select a bandwidth. Choices include 5, 6, 7, or 8 MHz, with 1.25 and 2.5 optional**
TX Power	**R/W**	**Sets the transmitter output power to set values for low, medium, or high or to a relative value (0-51), 51 being the highest output when Auto has been turned off in the Systems/ Power control menu.**
PA Control		**This gives you the choice of either RFs on or either RF off.**
X-Factor		**Specify a percentage ranging 0-100%.**

3.3.2 Modulation



The **Modulation** menu allows you to set the DVB-T modulation parameters.

The following table shows the **Modulation** submenus and options:

Submenu	R/W	Description
Constellation	**R/W**	**Sets the DVB-T constellation. Options include QPSK, 16 QAM, or 64 QAM.**
Code Rate	**R/W**	**Sets the DVB-T inner code (Viterbi) rate. Options include 1/3, 2/3, 3/4, 5/6, and 7/8.**
Guard Interval	**R/W**	**Sets the DVB-T guard interval. Options include 1/32, 1/16, 1/8, and 1/4.**
Spectrum	**R/W**	**Sets the spectrum inversion to allow for heterodyning receivers.** **Normal – carrier 0 is lowest in output frequency.** Inverted – carrier 0 is highest in output frequency

3.3.3 Video Setup

The **Video Setup** menu allows you to manipulate various video input settings and configure the video encoder.

The following table shows the **Video Setup** submenus and options:

<table>
<tr><th>Submenu</th><th>R/W</th><th>Description</th></tr>
<tr><td>Input</td><td>R/W</td><td>Sets the input source for video into the encoder. You can select the following options:
HD/SD SDI: SD/HD SDI from the BNC connector.
Composite: Composite SD video from the BNC connector. Selecting composite when in HD mode results in a popup warning.
Y Pr Pb: Component video (SD or HD).
Test Modes: Disconnects input from the connectors and uses internal test bars instead.
Ext ASI (BNC): Disables the encoder and takes a DVB-ASI transport stream from the BNC connector. Then uses that as the modulation source, after performing the necessary PCR re-stamping and rate adaptation.</td></tr>
<tr><td>Format</td><td>R/W</td><td>Sets the video mode for the encoder. When you select this submenu, the transmitter displays the following additional submenus:
Format: Sets the video standard the transmitter should expect at the input connector, configures the test bar generator (if applicable), and configures the encoder. The selection you make for this submenu locks the allowed options that you can select for the Frame Rate submenu (discussed below).
Frame Rate: Where applicable, enables changes in the frame rate. This submenu is interlocked with the Format submenu (discussed above) so that you can select only valid frame rates for the selected format.

The following table shows the valid format/frame rates:
<table>
<tr><th>Hz</th><th>NTSC</th><th>PAL</th><th>720p</th><th>1080i</th><th>1080p</th></tr>
<tr><td>23.98</td><td></td><td></td><td></td><td></td><td>YES</td></tr>
<tr><td>24</td><td></td><td></td><td></td><td></td><td>YES</td></tr>
<tr><td>25</td><td></td><td>YES</td><td></td><td>YES</td><td>YES</td></tr>
<tr><td>29.97</td><td>YES</td><td></td><td></td><td>YES</td><td>YES</td></tr>
<tr><td>30</td><td></td><td></td><td></td><td>YES</td><td>YES</td></tr>
<tr><td>50</td><td></td><td></td><td>YES</td><td></td><td></td></tr>
<tr><td>59.94</td><td></td><td></td><td>YES</td><td></td><td></td></tr>
<tr><td>60</td><td></td><td></td><td>YES</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Test Modes</td><td></td><td>Sets the test pattern for the internal test bar generator. You can select the following options:
Test Off: Turns off the test pattern generator.
SMPTE Bars: SMPTE 75% bars, with pong.
Zone Plate: Zone plate, with pong over SMPTE bars.
Full Zone Plate: Zone plate over full screen.
Lip Sync: Black field with 1 frame white field once per second, coinciding with 1 kHz tone burst on white field.</td></tr>
</table>

Submenu	R/W	Description
Video Loss		**Sets the behavior of the transmitter when no video or an invalid video is present at the input and the encoder is enabled. You can select the following options:** **No Change: No video present: Leaves the encoder running with no video input.** **Bars: After a timeout, switch to internally generated bars (format determined by the selected** Test Modes **submenu option).** **Blue: After a timeout, switches to internally generated blue screen.** **Black: After a timeout, switches to internally generated black screen.**
Enc1 Options	**R/W**	**Sets the video options for the first video encoder. When you select this submenu, the transmitter displays the following additional submenus:** Reduced Frame Rate**: Reduces the encoded frame rate to the option you select, allowing you to increase image quality and/or reduced the required bandwidth. Options include normal, 15, 10, 8, 4, 2, and 1 fps.** I/P GOP**: Configures the encoder GOP structure. The options available for this submenu depend on the delay mode:** – Normal Delay **options include IP, IBP, and IBBP.** – Low Delay **option is IP.** GOP Size**: Sets the GOP size to the option you select. Options include 5, 10, 30, 50, and 100.** Profile: **Sets the h.264 encoding profile. Options include baseline, main, and high.** Codec: **Sets the codec to use for video encoding. Options include:** – H.264: **Can be used for both RF and network streaming.** – Motion JPEG: **Can be used only for network streaming. If this option is selected, the encoder 1 video stream will not be transmitted over RF.** MJPEG Min Quality: **Sets the minimum quality to use when** Motion JPEG **is used for codec. Setting a lower value reduces the required bandwidth, while setting a higher value increases the required bandwidth. Options include 0, 25, 50, 75, and 100.** MJPEG Max Quality: **Set the maximum quality to use when** Motion JPEG **is used for codec. Setting a lower value reduces the required bandwidth, while setting a higher value increases the required bandwidth. Options include 0, 25, 50, 75, and 100.**
Enc2 Options	**R/W**	**Sets the video options for the second video encoder. Note that these options are disabled if the delay mode is set to** Low Delay**. When you select this submenu, the transmitter displays the following additional submenus:** Reduced Frame Rate: **Reduces the encoded frame rate to increase image quality and/or reduced the required bandwidth.**

Submenu	R/W	Description
		Options include normal, 15, 10, 8, 4, 2, and 1 fps. Video Scaling: **Scales the video to reduce the required bandwidth. The maximum image size is NTSC, which means that if the video source is HD, then the 2nd encoder will scale the image to NTSC or smaller. Options include QCIF, CIF, and NTSC.** Bitrate: **Enables the second encoder, and sets the maximum video bitrate. To disable the second encoder, set the bitrate to** Off**. Options include 2000, 1000, 500, 400, 300, 200, 100, and 50 kbps.** I/P GOP: **Sets the GOP format. Options include IP, IBP, and IBBP.** GOP Size: **Sets the GOP size. Options include 5, 10, 30, 50, and 100.** Codec: **Sets the codec to use for video encoding. Options include:** – H.264: **Can be used for both RF and network streaming.** – Motion JPEG: **Can be used only for network streaming. If this option is selected, the encoder 2 video stream will not be transmitted over RF.** MJPEG Min Quality: **Sets the minimum quality to use when** Motion JPEG **is used for codec. Setting a lower value reduces the required bandwidth, while setting a higher value increases the required bandwidth. Options include 0, 25, 50, 75, and 100.** MJPEG Max Quality: **Set the maximum quality to use when** Motion JPEG **is used for codec. Setting a lower value reduces the required bandwidth, while setting a higher value increases the required bandwidth. Options include 0, 25, 50, 75, and 100.**
Encoder Options	**R/W**	**Sets the global encoder options. When you select this submenu, the transmitter displays the following additional submenus:** Delay: **Sets the delay mode. Options include:** – Normal Delay: **Puts the encoder in normal delay mode.** – Low Delay: **Puts the encoder in low delay mode (latency depends on encoder capabilities and video format).** Streaming Options: **Specifies which video and audio encoder streams to transmit via RTP on the Ethernet port. Options include:** – Video Select: **Sets encoder 1 or encoder 2 as the streaming source. Options include encoder 1 and encoder 2.** – Audio Select: **Sets the 1st or 2nd audio pair or turns off audio streaming. Options include none, audio 0, and audio 1.** Frame Counter: **When set to** On**, this option will overlay a frame counter on the video. Options are off and on.** Encoder Mode: **Sets the overall encoder mode, whether the unit is used as an encoder to ASI or as an encoder to RF. Options include:**

Submenu	R/W	Description
		– Encode To RF: **Enables modulator and sends encoded video out as DVB-T microwave.** – Encode To ASI: **Disables modulator and sends encoded video out as DVB-ASI on the ASI output connector.** PID Edit: **Allows you to manually adjust the PIDs within the transport stream, if used as an encoder. Has no effect if external ASI input is selected. No checks are made to ensure that PIDs do not clash (nothing stops you from having two PIDs with the same value). PIDs that can be changed include:** – Vid0 PID: **0x0020-0x1ffe** – Vid1 PID: **0x0020-0x1ffe** – Aud0 PID: **0x0020-0x1ffe** – Aud1 PID: **0x0020-0x1ffe** – PMT PID: **0x0020-0x1ffe** – PCR PID: **0x0020-0x0ffe** Service: **Specifies the service ID, service name, and service provider for insertion into the SDT table. The service name is also used when test patterns are displayed. Specify up to 16 characters for service name and service provider.** SDI Glitch Detect: **When SDI input is selected, the video encoder is reset when the device detects the SDI input has been connected. If a particular SDI device is causing the transmitter to intermittently reset its video encoder, the reset detection can be disabled. Options include off and on.**

3.3.4 Audio Setup

The **Audio Setup** menu allows you to configure the audio for the transmitter.

Some transmitters have encoders that accommodate more than one audio pair.

The following table shows the **Audio Setup** submenus and options:

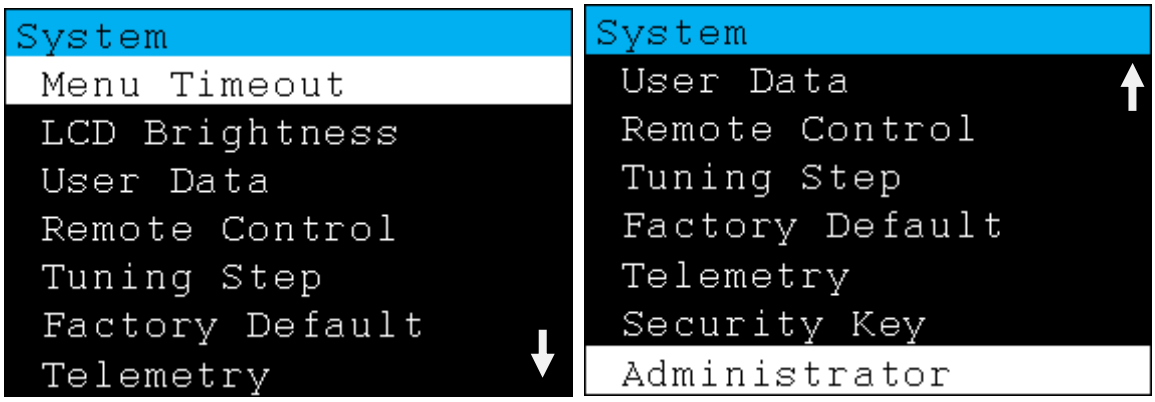
Submenu	R/W	Description
Audio 1 Left	**R/W**	**Configures the left audio channel of the analogue audio pair. When you select this submenu, the transmitter displays the following additional submenus:** Source: **Selects the audio to be used by the encoder. It is ignored when the transmitter is in external ASI input. Options include:** – Off: **Disables the audio input for the analogue audio pair.** – Mic: **Sets the analog input to microphone level.** – Line: **Sets the analog input to line level.** – Embedded SDI: **De-embeds all four audio pairs from the input SDI. It also sets the** Audio 1 left & Right **to the Audio 1 embedded source.** – Tone: **Sets 1 kHz - 20 dBfs tone for left/right on all four channels.** – Beep: **Sets 1k Hz - 20 dBfs beep (once per second) on all four channels.** – Tone & Beep: **Sets 1 kHz - 20 dBfs tone on left and beep on right.** Level: **Enables analog audio gain to be adjusted. Digital gains (embedded SDI and test tones) cannot be adjusted. Microphone and line level inputs can be adjusted from 0 to -69 dB reference level (corresponding to 0 to 69 dB gain).** Phantom: **Enables and disables 5 V phantom power on channel one or on both of the audio pairs. Options include off, single (Unbalanced), and double (Balanced Mic).** Limiter: **Enables an audio limiter to be placed in/out of circuit. Options include off and on. (Limiter works -8 to 0dBfs)** Bal/Unbal: **Allows the microphone audio to be balanced (differential) or unbalanced (single ended). This setting affects both the left and right channel. Options include unbalanced and balanced.**
Audio 1 Right	**R/W**	**Configures the right audio channel of the analogue audio pair. When you select this submenu, the transmitter displays the following additional submenus:** Source: **Selects the audio to be used by the encoder. It is ignored when the transmitter is in external ASI input. Options include:** – Off: **Disables the audio input for the analogue audio pair. This option disables the** Audio 1 Left **source as well.** – Mic: **Sets the analog input to microphone level.** – Line: **Sets the analog input to line level.** – Embedded SDI: **De-embeds all of the first audio pair from the input SDI. It also sets the** Audio 1 left & Right **to the Audio 1 embedded source.**

Submenu	R/W	Description
		– Tone: **Sets 1 kHz - 20 dBfs tone for left/right.** – Beep: **Sets 1k Hz - 20 dBfs beep (once per second).** – Tone & Beep: **Sets 1 kHz - 20 dBfs tone on left and beep on right.** Level: **Enables analog audio gain to be adjusted. Digital gains (embedded SDI and test tones) cannot be adjusted. Microphone and line level inputs can be adjusted from 0 to -69 dB reference level (corresponding to 0 to 69 dB gain).** Phantom: **Enables and disables 5 V phantom power on channel one or on both of the audio pairs. Options include off, single (Unbalanced), and double (Balanced Mic).** Limiter: **Enables an audio limiter to be placed in/out of circuit. Options include off and on. (Limiter works -8 to 0dBfs)**
Audio 2 L/R (For Transmitters with two Audio pairs)	**R/W**	**Configures the second audio pair. When you select this submenu, the transmitter displays the following additional submenu:** Source: **Selects the audio to be used by the encoder. It is ignored when the transmitter is in external ASI input. Options include:** – Off: **Disables the audio input for the second audio pair.** – Embedded SDI: **De-embeds the second audio pair from the input SDI.** – Tone: **Sets 1 kHz - 20 dBfs tone for left/right.** – Beep: **Sets 1k Hz - 20 dBfs beep (once per second).** – Tone & Beep: **Sets 1 kHz - 20 dBfs tone on left and beep on right.**
Audio Coding	**R/W** **R/W** **R/W**	**Sets the audio coding for both audio pairs. When you select this submenu, the transmitter displays the following additional submenus:** Audio Coding: **Sets how the audio is encoded. Options include MPEG Layer II, AAC-LC, and linear audio.** Bit Rate: **Sets the audio encoder bitrate for MPEG Layer II and AAC-LC. Options include 64, 128, 160, 192, 224, 256, 320, and 384 kbps.** Sample Rate: **Sets the sample rate for the audio encoding. Options include 32 and 48 kbps.**

3.3.5 Profiles

The **Profiles** menu allows you to manage up to 32 profiles on the transmitter. Profiles are discussed more in the section *Working with Profiles* on page 15.

3.3.6 System



The **System** menu sets global system options for the transmitter.

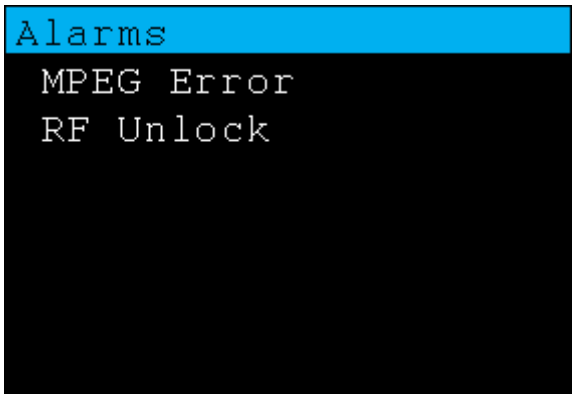
The following table shows the **System** submenus and options:

Submenu	R/W	Description
Menu Time out	**R/W**	**Sets the amount of time after which the menu times out if no key presses are detected. After the menu times out, you can press and hold the** ENT **button for three seconds to activate the menu. Options include none, 10, 20, and 30 seconds.**
LCD Brightness	**R/W**	**Sets the LCD brightness. Options include:** Off Mode: **Turns the display off after a timeout until a key is pressed.** Day Mode: **Sets the LCD to maximum brightness.** Night Mode: **Dims the display after a timeout until a key is pressed.**
User Data	**R/W**	**Manages settings related to the RS485 user data side channel, available on connector P1. When you select this submenu, the transmitter displays the following additional submenus:** Format: **Sets the user data format within the transport stream. Options include:** – Standard: **Standard user data format.** – DOJ: **DOJ-specified user data format.** Baud Rate: **Sets the baud rate. Options include User Data off or a range from 1,200 to 921,600 bits per second.** Rx Sense: **Allows the sense of the RS485 balanced wires to be inverted (if cabling is incorrect). Options include normal and inverted.** Parity: **Sets the parity. Options include none, even, and odd.** Data Bits: **Sets the number of data bits. Options include 5, 6, 7, and 8 bits.**

Submenu	R/W	Description
Remote Control	**R/W**	**Manages settings for the remote control interface available on the power input connector. When you select this submenu, the transmitter displays the following additional submenus:** Interface: **Sets the interface. Options include RS-232 and RS-485.** Baud Rate: **Sets the baud rate. Options include a range from 1200 to 115200 bits per second.**
Power Control	**R/W**	**Configures the PA to be in closed loop (auto on) or open loop (off) power control mode. This option affects the display in the transmitter power control. Options include:** TXPwr Auto Off: **Turns off the closed loop, and runs the PA in open loop mode. The power control page displays a number from 0 – 51, with 51 being maximum power.** TXPwr Auto On: **Turns on the closed loop. The power control page displays the calibrated power levels as stored in the head.**
Tuning Step	**R/W**	**Sets the tuning step size when tuning off channel. This does not affect the channels in the channel plan. Options include 100, 125, and 250 KHz.**
Factory Default	**R/W**	**Restores all of the current settings on the transmitter back to factory defaults. Options include:** No - resume ops: **Do** not **continue the process of changing current settings.** Yes – defaults: **Continue the process to clear all settings and set them to factory defaults, which will start the initializing process.**
Telemetry	**R/W**	**Enables and disables telemetry insertion into the transport stream (parameters such as battery voltage, temperature, RF power, video input status, etc.). Options include:** Enable: **Insert telemetry.** Disable: **Disable telemetry.**
Security Key	**R**	**Displays the digital serial number and the license type for the transmitter.**

Submenu	R/W	Description
Administrator	R/W	**Sets your administrator mode preference. The menu system has two modes of operation, user or administrator. Each menu item has a read-only or read-write tag associated with it, which is defined in the Transmitter Programmer application. If a menu item is read-only, then in user mode, the menu mode can be viewed but not modified. In administrator mode, all menu items can be modified.** **If administrator mode is currently off, you will have to enter a 3-digit PIN, which is defined in the Transmitter Programmer application. 324 is the Factory PIN default.** **Once administrator mode is activated, the options include:** Always on: **Administrator mode is always enabled.** Temporary: **Administrator mode is enabled until the next power cycle.** Off: **Administrator mode is disabled, and you must return to this page to enable administrator mode again.**

3.3.7 Alarms



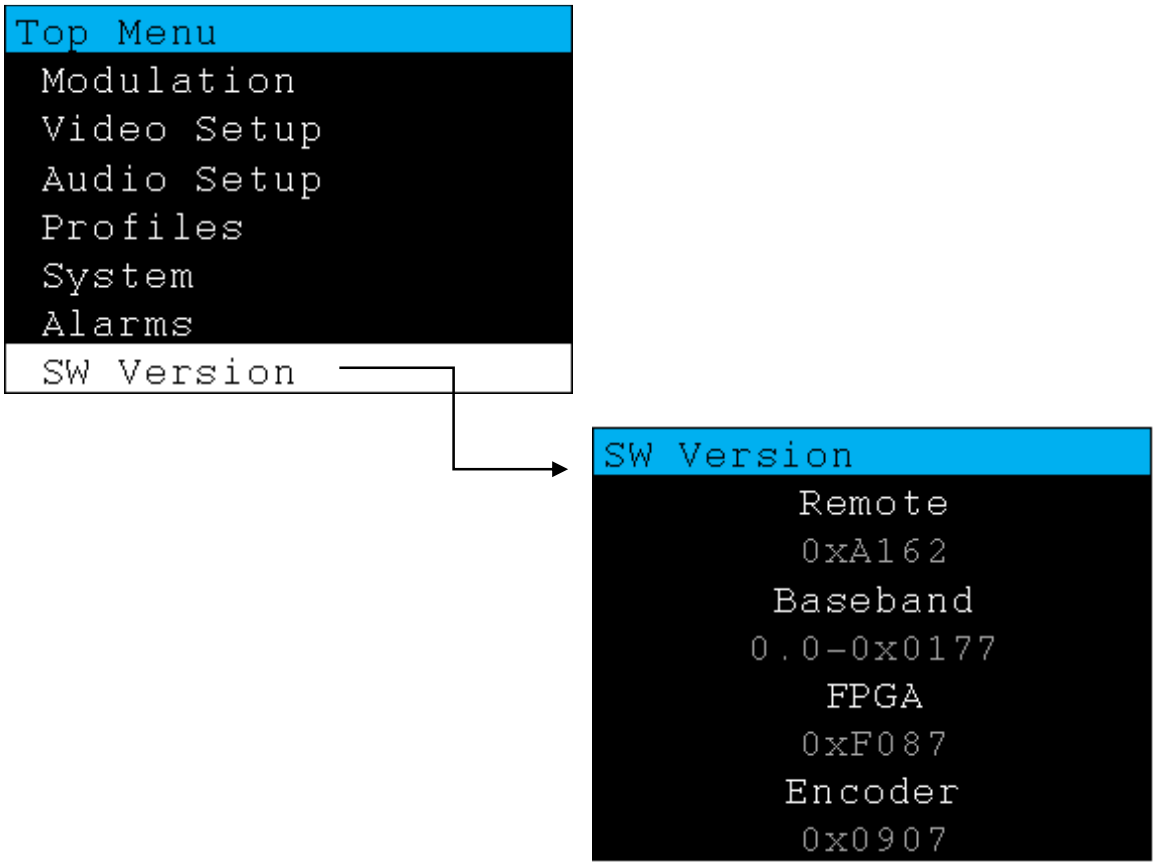
The **Alarms** menu shows you any active alarms.

The following table shows the possible alarms:

Submenu	R/W	Description
ENC Error	R	**An error was detected with the encoder (typically if the encoder is not detected or if there is a comms fault to the encoder).**
Low Battery	R	**The input voltage is below 20 V.**
FPGA Fault	R	**Baseband FPGA fault, which is typically a comms error (FPGA not configured).**
ADV Fault	R	**There is a comms fault to the component or composite video input chip.**
RF Fault	R	**An invalid frequency has been selected, or there is a hardware fault of the RF.**

Submenu	R/W	Description
Over Temp	**R**	**The unit is too hot.**
RF Unlock	**R**	**The RF head reported a PLL that is unlocked, possibly because an invalid frequency has been entered.**
ASI Overrun	**R**	**The external ASI is too fast for the modulator.**

3.3.8 SW Version



The **SW Version** menu displays the current software version for the boards within the base unit and the remote control unit, including baseband, FPGA, Encoder, and Remote Control.

4.0 Connections

This chapter explains the different wire connections for the transmitter, including:

- Antenna connections
- Cable Connections

4.1 Antenna Connections

Antennas are connected to the RF1 and RF2 connectors. The RF1 and RF2 connectors are N-Type Female. Always use 50Ω antennas with VSWR of at least 2:1 or better. Although the unit can withstand open and short, permanent damage can occur if unit is left on without a proper 50Ω load/antenna.

4.2 Cable Connections

The BHDTX-S-TWINTX-HP-AB transmitter base unit uses a 50-way connector to interface to the front panel. The RF outputs to a pair of N-type Female connector. All video input connections are 75Ω BNC. Power, Serial, Remote, and Audio interfaces use Amphenol Circular connectors.

4.2.1 RF Outputs

The BHDTX-S-TWINTX-HP-AB transmitter base unit comes standard with dual RF outputs. Although the RF output can withstand an open and a short, it is highly recommended to always operate the transmitter with a proper 50Ω load (such as 50Ω antennas) at each of the output.

Connection	Connector Type	Function
RF1	N-type (F)	RF1 Output
RF2	N-type (F)	RF2 Output

4.2.2 Power Input and Remote Control Interface

A four-pin Amphenol circular connector (P4) provides DC power. The voltage input range is +20 to +30 VDC and is protected against reverse polarity. A six-pin Amphenol circular connector (P1) provides interface to the remote control unit of the transmitter base unit. The Remote Control Interface cable is included with the transmitter.

Connection	Connector Type	Pin	Function
POWER (P4)	Amphenol PT02E-12-4P (M)	A	+20 to +30 VDC
		B	+20 to +30 VDC
		C	GROUND
		D	GROUND
REMOTE (P1)	Amphenol 71-570122-06S (F)	A	REMOTE DC
		B	CAN_L
		C	CAN_H
		D	GROUND
		E	ASI_P
		F	ASI_N

4.2.3 Serial Interface

A 10-pin Amphenol Circular is provided for serial interfacing to the base unit. This port can be an alternative to the remote control port and is used as a general serial software interface for upgrading and GUI connection.

Connection	Connector Type	Pin	Function
SERIAL (P2)	Amphenol 71-570123-10P (M)	A	USB +5V
		B	USB Data-
		C	USB Data+
		D	GROUND
		E	USERDATA IN-
		F	USERDATA IN+
		G	GROUND
		H	RS232 TX/RS485-
		J	RS232 RX/RS485+
		K	GROUND

4.2.4 Audio Inputs

A 10-pin Amphenol Circular is provided for the audio input. Each balanced input is modulated onto their respective channel (CH1→RF1, CH2→RF2).

Connection	Connector Type	Pin	Function
AUDIO (P3)	Amphenol 71-570123-10S (F)	A	N/C
		B	N/C
		C	AUDIO CH1-
		D	AUDIO CH1+
		E	GROUND
		F	AUDIO CH2-
		G	AUDIO CH2+
		H	GROUND
		J	N/C
		K	GROUND

4.2.5 Video

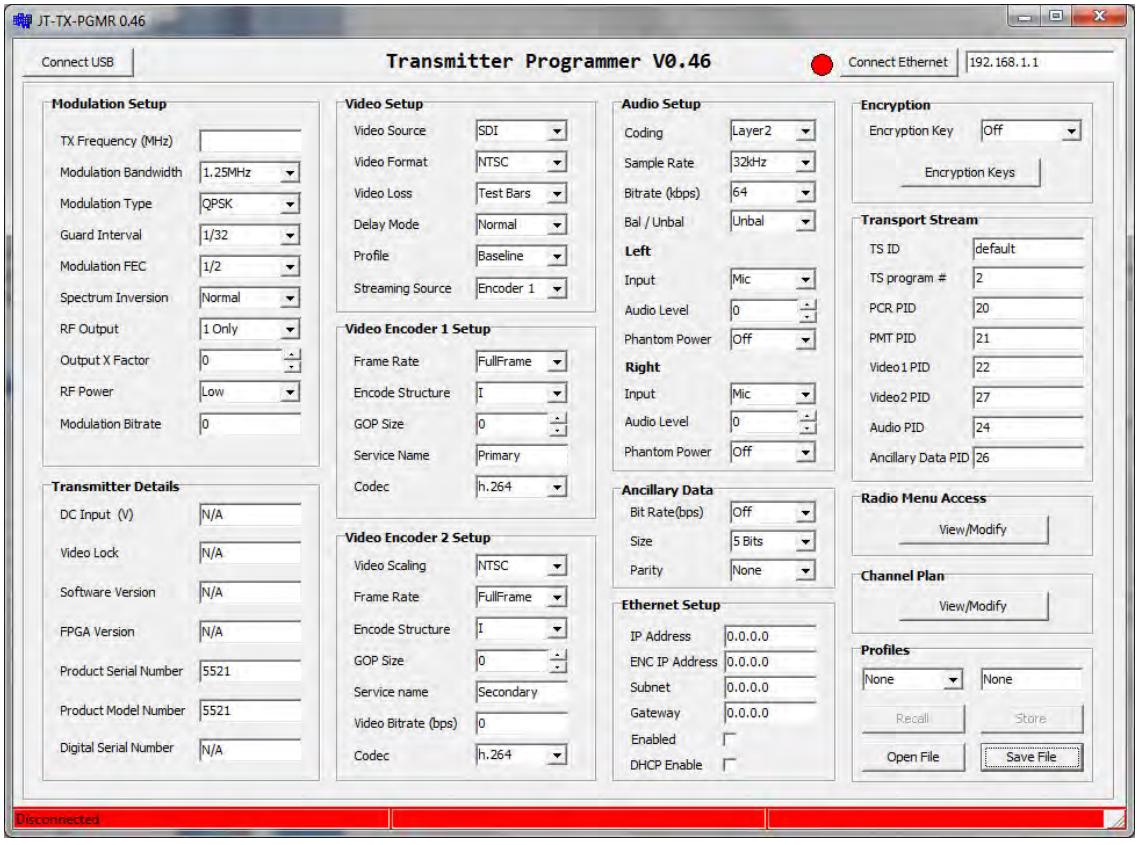
Video is brought in on four 75Ω BNC connectors. Depending on the format, one, two, or three connections may be required for the video input. The input format is selectable through the Remote Control unit.

Connection	Connector Type	contact	Function
Y	75Ω BNC	Center Pin	Composite Input Component/S-Video Luma
		Outer Shield	GROUND
C/PB	75Ω BNC	Center Pin	S-Video Chroma Component (Blue-Chroma)
		Outer Shield	GROUND
PR	75Ω BNC	Center Pin	Component (Red-Chroma)
		Outer Shield	GROUND
HDSDI	75Ω BNC	Center Pin	SD/HD Serial Digital Interface Input
		Outer Shield	GROUND

5.0 Transmitter Programmer Application

The Janteq Transmitter Programmer is a Windows-based application that allows you to configure and monitor preset parameters for use on transmitters. This application enables you to interface with the BHDTX-S-TWINTX-HP-AB transmitter locally using a USB cable or remotely using an Ethernet connection. The Transmitter Programmer application is common to all Janteq's new line of transmitters.

The following screenshot shows the Transmitter Programmer application:



5.1 System Requirements

Although the application has been developed for Windows XP and Windows Vista, it may also work with other operating systems. However, support is provided only for Windows XP and Windows Vista.

5.2 Installation

The application is provided on a CD. Use the following steps to install the application:

1 **Insert the CD into the computer that you will use to program the transmitter. The setup utility starts automatically.**

2 **When the setup window opens, follow the on-screen instructions to install the application.**

3 **After the application is installed, you can access** Tx Programmer **on the Windows** Start **menu.**

5.3 Connecting the Transmitter and Saving Configurations

Before you can use the application with the transmitter, you must first connect the transmitter so that the application can communicate with it. Use the following steps to connect the transmitter to the application:

1 **Physically connect the transmitter to your computer:**

USB connection to Base Unit. Using the optional USB/DB-9 serial cable (contact factory or email **sales@janteq.com** for optional serial USB/DB-9 cable), connect the base unit to the computer that is running the application. Windows automatically loads the necessary driver.

USB connection via Remote Control Unit. Using an optional USB Mini-B cable (available separately), connect the USB Mini-B cable from the computer that is running the application to the remote control unit while the remote control unit is connected to the base unit. Windows automatically loads the necessary driver.

2 **Apply appropriate power to the base unit.**

3 **Click on** *Connect USB* button located at the top-left corner of the application window.

NOTE: *Connect Ethernet located at the top-right corner* ***will not work****. Contact factory or email* ***sales@janteq.com*** *if Ethernet connectivity is desired.*

5.4 Online Help

Online help is installed with the application. For information on using the application, you can access the online help the following ways:

- For help on entering information for a specific field, right-click the field and then click **Help** on the popup menu. You can also press **[F1]** on your keyboard. The help opens with the specific topic that describes the corresponding field.

- For general information on the application (in addition to the specific field help discussed above), click the button with the help icon (question mark) at the top right of the application window. The help opens with an overview topic.

With the online help open, you can navigate to different topics through the table of contents on the left. You can also use the search feature to find topics by keywords or phrases.

Appendix A: Acronyms

This appendix lists and describes the various acronyms used in the document.

Name	Meaning
ASI	Asynchronous Serial Interface
AV	Audio/Video
AVC	Advanced Video Codec
COFDM	Coded Orthogonal Frequency Division Multiplexing
DVB-T	Digital Video Broadcast-Terrestrial
FEC	Forward Error Correction
FM	Frequency Modulation
FPS	Frames per Second
GOP	Group of Pictures
HD	High Definition
HDMI	High Definition Multimedia Interface
HD-SDI	High Definition Serial Digital Interface
IEC	International Electrotechnical Commission
IO	Input/Output
ISO	International Organization for Standardization
LAN	Local Area Network
LNA	Low Noise Amplifier
MER	Modulation Error Ratio
MPEG	Moving Picture Experts Group
OFDM	Orthogonal Frequency Division Multiplexing
OSD	On Screen Display

Name	Meaning
PA	Power Amplifier
PID	Packet Identifier
PPM	Parts Per Million
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
RS232	Serial Communication Port – RS232 Standard
SD	Standard Definition
SDI	Serial Digital Interface
SD-SDI	Standard Definition Serial Data Interface
SI	Service Information
SMPTE	Society of Motion Picture and Television Engineers
TS	Transport Stream
TX	Transmitter
USB	Universal Serial Bus
VSWR	Voltage Standing Wave Ratio

Appendix B: Technical Specifications

This appendix provides a reference for the BHDTX-S-TWINTX-HP-AB transmitter's technical specifications.

RF Section	
Frequency Range	2000 to 2700MHz
RF Power Levels	RF1: 1W, 2.5W, 5.0W (selectable) RF2: 1W, 2.5W, 5.0W (selectable)
Frequency Stability	± 2.5 ppm
Tuning step size	100/125/250 kHz
TX Standby	No RF Output (<-60 dB Reduction)

Modulation Mode	
COFDM	DVB-T 2K: 5 MHz, 6 MHz, 7 MHz, 8 MHz
Optional Narrow Band	1.25 and 2.5 MHz
Constellation	QPSK, 16 QAM, 64 QAM
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard Interval	1/32, 1/16, 1/8, 1/4
Spectrum Inversion	Programmable

Video Section	
Video Input Formats	NTSC, PAL,525i,480P, 720P,1080i (4:2:0), 1080p
Video Frame Rates	23.98, 24, 25, 29.97, 30, 50, 59.97, 60 Hz
Video Input Signals	Composite, Component (Y/PB/PR), S-Video (Y/C), SD/HD SDI
Test Mode	SMPTE Color Bars, Zone plate
DVB-ASI Input	SMPTE 299

Video Section	
Composite Input	75Ω, 1Vp-p, NTSC / PAL
HD/SD - SDI input	SMPTE 292 / 259M Level C (1.5Gb/s – 270Mb/s)

Encoder	
Compression Type	H.264/MPEG-4 AVC (MPEG-2 OPTIONAL)
Compression Standard	ISO/IEC14496-10
Profile	Base, Main, and High
System Latency, End-to-End Delay	<130mS

Audio Section	
Audio Channels	1 Stereo Pair
Menu Selectable Combinations	MIC/LINE Inputs: Selectable Soft Limit for Levels Greater +10 dBm Audio Range:-60 dBm to 18 dBm Max Input Level
Audio Gain Control: Ch 1&2	0 dB – 69 dB Gain, Continually Variable by 1 dB
Audio Coding	MPEG 1 Layer 2 Audio, ISO/IEC 13818-3
Linear PCM	MPEG-1 Layer 1
Audio Bit Rate	128 kb/s to 384 kb/s per Channel
Audio Sample Rate	32 & 48 kHz
Analog Audio Inputs	MIC / Line, Gain Selectable -60 to +18 dBm
Frequency Response	40 Hz – 20 KHz: ± 3dB
Audio THD	0.5% @ 1 KHz, +8 dBm
Signal-Noise	> 60 dB
Input Impedance	5K ohms Unbalanced, Mic. 600 ohms Bal' for Line
Mic Bias	5 Volts
Tone Generator	Internal 400 Hz L, 1 kHz R Channel Tone Generator

User Data Channel	
User Data Channel	Transparent Data Pipe, up to 1 Mb/s, RS-485 Input

Remote Control Unit	
Display	Hi Res. 2-Inch Color TFT
Backlight	Adjustable Time Out: None, 10, 20, or 30 Seconds
Indication	Presets, RF Output Level, Input Voltage, Audio Level, Full Color Video Display
Alarms	Voltage and Temperature
Profiles	32 User Defined
Menu Selector	Tactile Up/Down, ESC/ENT Buttons
Menu	Interactive User/Administrator Menu Tree Allowing Control of Presets, Frequency, RF Output Power, Modulation, Video Source, Audio Source, Audio Gains, Audio Modes, Video Format, and COFDM

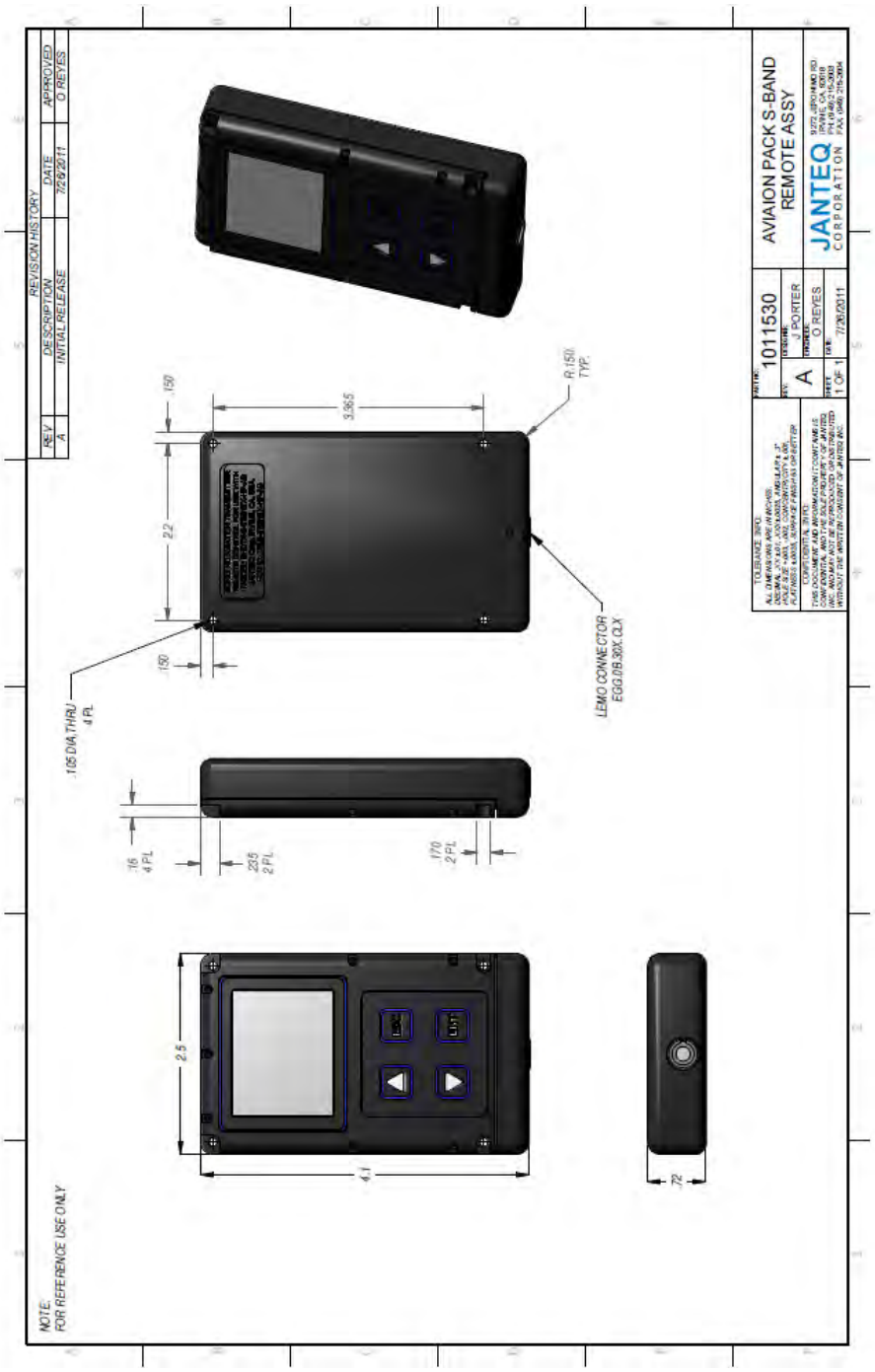
Power Requirements	
Input Voltage Range	+20 TO +30 VDC – Under/Over Voltage and Reverse Polarity Protected
Power Consumption	120VA (WATTS)

Physical	
Dimensions	
Base Unit	H 10.3” (262mm) x W 8.0” (203mm) x D 3.5” (89mm)
Remote Control Unit	H 4.1” (104 mm) x W 2.5” (64 mm) x D .72” (18 mm)
Weight	
Base Unit	10.45 lbs. (4740 g)
Remote Control Unit	0.35 lbs. (159 g)

Environmental	
Temperature	Operating: -10 to +50˚ C (Ambient) Storage: -30 to +85˚ C
Relative Humidity	0.5 to 95.0% Non-Condensing

Appendix C: Dimensions / Wiring Diagram

The illustration on the next three pages shows the dimensions of the BHDTX-S-TWINTX-HP-AB HD video transmitter base unit, remote control unit, and the wiring diagram of the base unit's connectors.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4 PL
LEMO CONNECTOR
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.235
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.170
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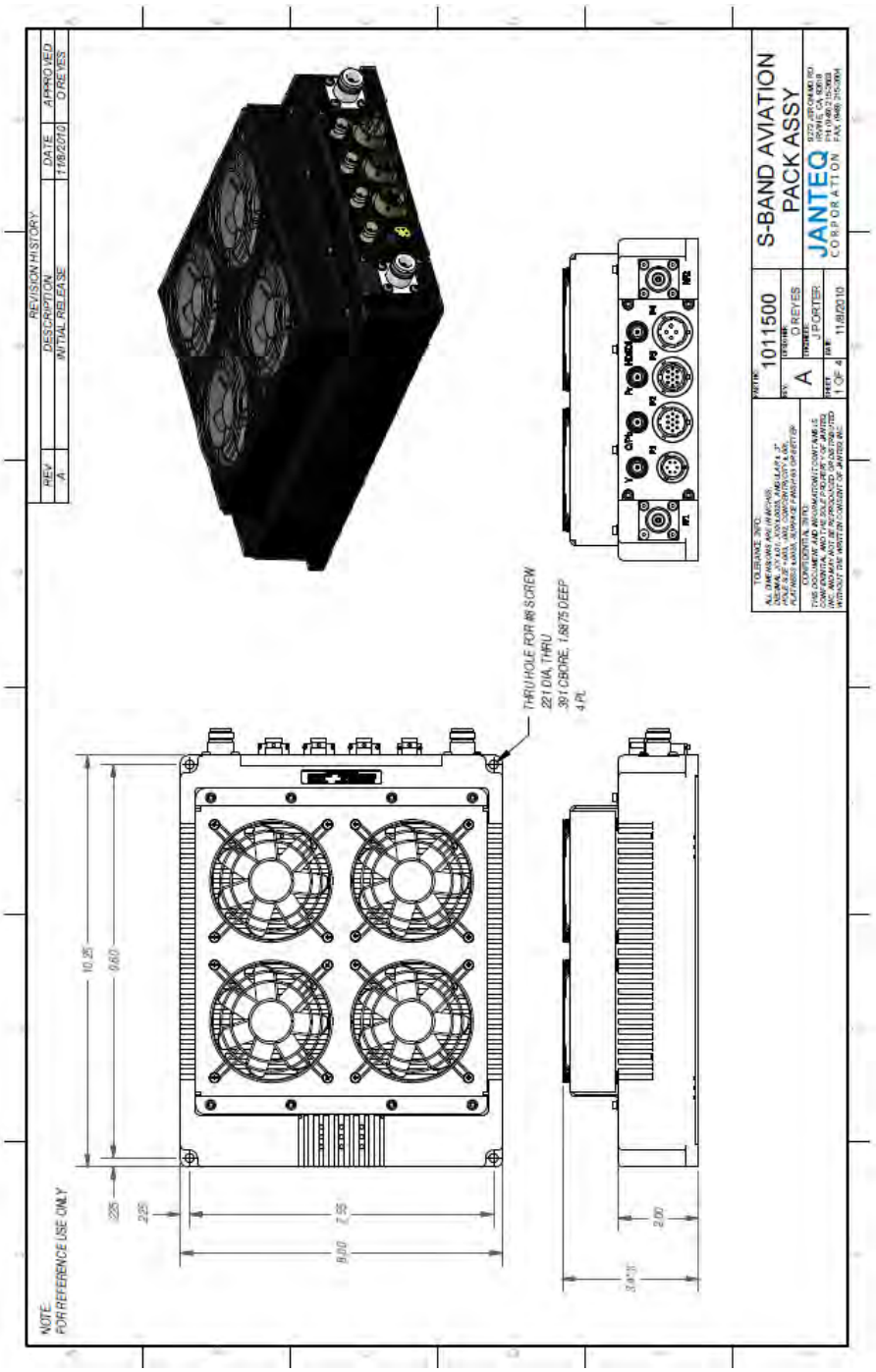
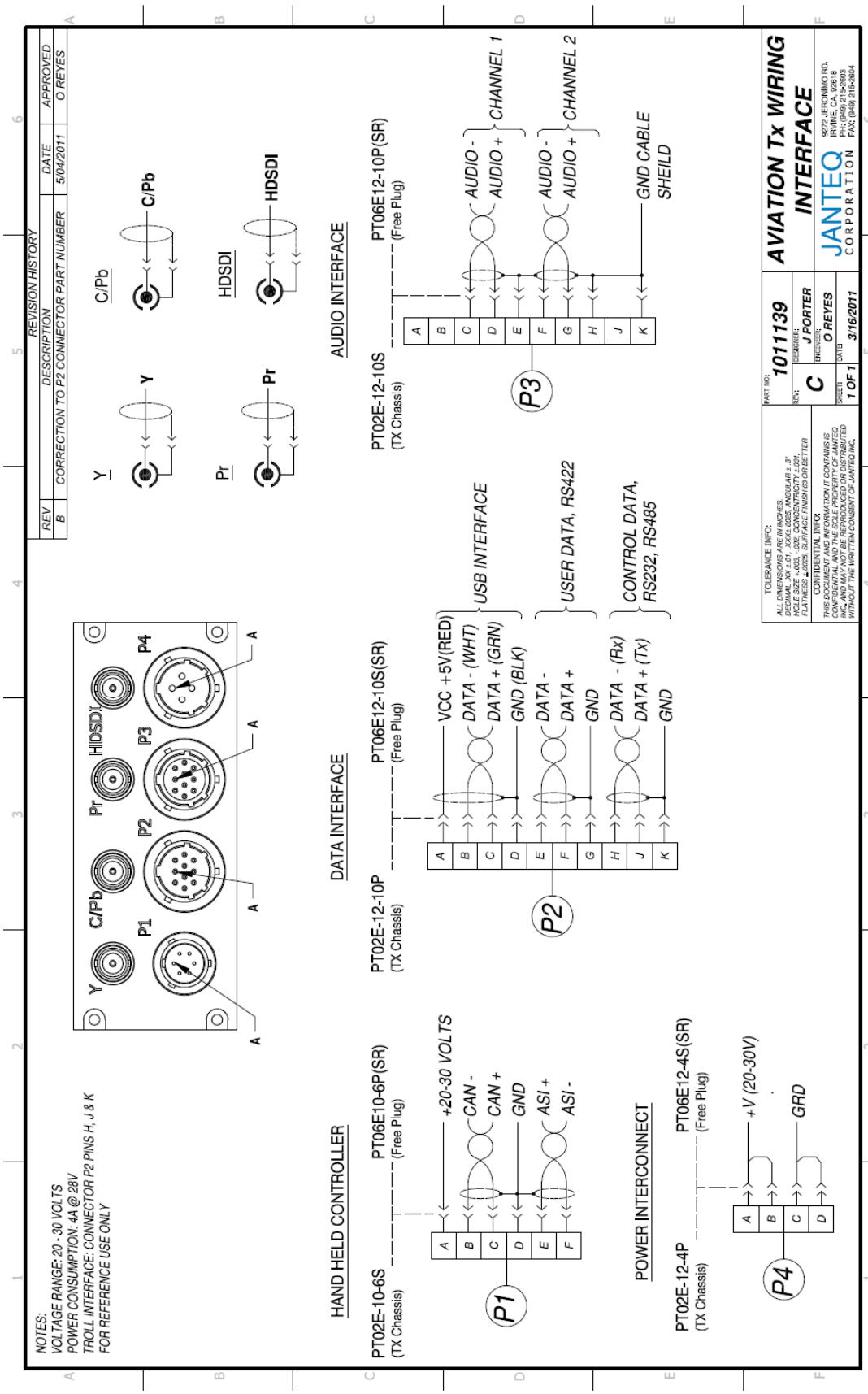
NOTE
FOR REFERENCE USE ONLY


S-BAND AVIATION
PACK ASSY
JANTEQ
CORPORATION
1011500
THRU HOLE FOR #8 SCREW
.221 DIA. THRU
.391 CBORE, 1.875 DEEP
4 PL
10.25
9.60
.225
2.25
7.75
9.40
2.00
NOTE:
FOR REFERENCE USE ONLY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CORRECTION TO P2 CONNECTOR PART NUMBER
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NOTES:
VOLTAGE RANGE: 20 - 30 VOLTS
POWER CONSUMPTION: 4A @ 28V
TROLL INTERFACE: CONNECTOR P2 PINS H, J & K
FOR REFERENCE USE ONLY
Y
C/Pb
Pr
HDSDI
P1
P2
P3
P4
HAND HELD CONTROLLER
PT02E-10-6S
(TX Chassis)
PT06E10-6P(SR)
(Free Plug)
+20-30 VOLTS
CAN -
CAN +
GND
ASI +
ASI -
DATA INTERFACE
PT02E-12-10P
(TX Chassis)
PT06E12-10S(SR)
(Free Plug)
VCC +5V(RED)
DATA - (WHT)
DATA + (GRN)
GND (BLK)
USB INTERFACE
DATA -
DATA +
GND
USER DATA, RS422
DATA - (Rx)
DATA + (Tx)
GND
CONTROL DATA,
RS232, RS485
POWER INTERCONNECT
PT02E-12-4P
(TX Chassis)
PT06E12-4S(SR)
(Free Plug)
+V (20-30V)
GRD
AUDIO INTERFACE
PT02E-12-10S
(TX Chassis)
PT06E12-10P(SR)
(Free Plug)
AUDIO -
AUDIO +
CHANNEL 1
CHANNEL 2
GND CABLE
SHEILD
TOLERANCE INFO:
ALL DIMENSIONS ARE IN INCHES
DECIMAL .XX ± .01, .XXX ± .005, ANGULAR ± .3°
HOLE SIZE +.003, -.002, CONCENTRICITY ± .001,
FLATNESS ≤ .0025, SURFACE FINISH 63 OR BETTER
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ENGINEER:
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INTERFACE
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CORPORATION
9272 JERONIMO RD.
IRVINE, CA. 926 18
PH: (949) 215-2603
FAX: (949) 215-2604