Axis Series – TX User and Programming Guide

ATXT1   AXTX1M – Mini   AXTX1MB – Mini-B

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Contents

1. System Descriptions

The subject equipment of this User Guide is identified as follows:

Equipment Title	Part Number
Full Size Camera Back Transmitter	AXTX1
Miniature Transmitter	AXTX1M
Miniature B Transmitter	AXTX1MB

Figure 1-1 – AXTX1: Camera Back Transmitter

Figure 1-2a – AXTX1M - Mini Transmitter

Figure 1-3b – AXTX1MB: Mini-B Transmitter

1.1 What are the Axis Series Transmitters?

The new Axis series transmitter comes in three different packages designed to suit the needs of many different types of applications. These transmitters both offer excellent coverage, low delay performance and multiple format/frame rate capabilities that enable users to acquire stunning images via a wireless connection, at extended non line of sight ranges. By using 2nd generation MPEG4 H.264 compression technology, users can now deploy 2 or 3 cameras within the same bandwidth previously required by a single MPEG2 system. All modes of DVB-T modulation are also supported.

The increased compression and efficiency of the MPEG4 H.264 encoder offers users additional range with the added benefit of small size, low latency and low power consumption. In particular, high quality HD transmissions are now possible using 40% lower band width requirements than those of conventional MPEG2 systems need, allowing for HD transmission in a single 8MHz DVB-T channel and also being able to use very robust error correction and modulation settings.   Built with a solid aluminum housing, the ability to transmit images in a non-line of sight environment at ranges well over a ½ mile and its low delay capabilities makes this transmitter a very formidable workhorse to suit almost all your RF needs.

The AXTX1 camera back transmitter is a rugged, digital video transmitter, ideal for Sports, ENG News and other Broadcast applications and the AXTX1M-Mini and AXTX1MB-Mini B are smaller packaged version geared towards Digital Cinema and Video Assist applications.

The AXTX1 camera back transmitter can have either Anton Bauer or Sony "V" Mount battery plates installed to facilitate easy mounting to most camera types. The AXTX1M-Mini has a Sony "mini" battery mount, as well as a threaded mounting hole on the bottom of the unit to attach to a wide range of camera brackets for easy mounting of the AXTX1-Mini to many different style cameras. While the Axis series transmitters can be operated with almost any receiver that supports DVB-T signals, we recommend using it with the Wave Central AXRX1 receiver. The AXRX1 receiver is available in many different configurations with options for 2-way, 4-way, 6-way and 8-way diversity.

1.2 Features and Benefits

It can be very useful to understand how the features of the unit yield tangible benefits to you. This table summarizes these features and, more importantly, the benefits.

Features and Benefits Table

Feature	Benefit to you
Digital COFDM Modulation.	Excellent performance - Resistant to multipath interference, delivers high quality video and audio, even in non-line of sight operation.
Low Delay H.264 SD & HD encoding.	Robust transmission and minimal latency, switches easily with wired cameras.
Compliant DVB-T 6/7/8MHz.	True multi-mode operation - Simple integration with your current equipment.
ASI input and output.	Allows for different types of applications: RF Transmitter or Portable H.264 Encoder.
High Efficiency 100mW RF Amp (Cool Operation)	Excellent range in non-line of sight environments like stadiums and arenas.
Compact and Power Efficient Transmitters Low power consumption, 10W	Two models allow for the type of transmitter just where you need it. Sized right to ensure the success of your operation.
HD-SDI/SDI with embedded audio input HDMI input with embedded audio input video input	Easy connections connect to your current cameras. Added flexibility of using HD consumer level HDMI cameras.
Choice of different licensed and un-licensed frequency bands. (1.4, 2, 5.8, 6.4, 6.8, 7GHz Available)	Choose the frequency that best suits your operations. Select license free bands for some operations. Avoid cluttered parts of the licensed radio spectrum.
Sixteen Presets Available	You can establish 16 different parameters to include: Preset frequencies, COFDM constellations, video and audio settings, into any of sixteen presets. Configure the transmitter once and then users can select from the front panel.
Display Screen and PC GUI	Software Driven - Simple and fast to deploy and operate – Saves you time and minimizes operator error.
AXTX1M1 Camera Back Transmitter	Suitable for Sports, ENG News and other Broadcast applications

AXTX1M Mini about the size of an iPhone	Digital Cinema and Video Assist applications
AXTX1MB Mini-B	Digital Cinema and Video Assist applications

1.3 Applications

The Broadcast Transmitter has been designed to operate in multiple roles in many environments. Here are some examples:

1.1 Professional Camera Back Applications – Sports and News

We can supply either Anton Bauer or Sony "V" mounting plates that enable the camera back transmitter to be directly connected to professional cameras.

The Sony "V" mount, for example enables the transmitter to be mounted directly onto cameras such as the SONY PDW Series Cameras and Thomson 8000 Series. The transmitter mounts between the camera and the battery. The camera is powered from the battery, through the AXTX1 transmitter, powering both units. The AXTX1 is also available with Anton Bauer connectors to directly mount onto Panasonic and Ikegami ENG type cameras.

1.2 Helicopter Integration for Sports, News and Traffic Coverage

A variety of installation options can be made much simpler and easier to operate, by using either of the AXTX1 transmitters. By having ASI in/out connectors, the AXTX1 allows for specific "Heli-Tele" configurations and options.

1. ASI out: Can be used to encode an HDSDI signal from a gimbal mounted camera to ASI, which is then fed to an RF amplifier and directly coupled to an antenna. (Minimal RF loss)

2. ASI in: Can be used in an aerial "re-trans" system. Signals sent up to a helicopter from ground vehicles and then sent to remote receive sites, miles away.

3. The small lightweight AXTX1-Mini is perfectly suited for these types of applications.

1.2.1 System Integration into Vehicles or Aircraft

Users should be aware of the following issues when integrating the equipment into vehicles.

1. For the additional range required in vehicle applications, the use of amplifiers should be considered. Interconnection between the transmitter and any power amplifier should be kept as short as possible, but where this is not possible, special attention should be taken to use only low loss cables.

2. Long cable runs from the RF output to the antenna should be avoided, for maximum RF output.

3. The antenna should be mounted vertically ideally, and exposed to free space.

4. The equipment should be supplied with a clean supply in the range 7V to 18V and capable of 1.10A maximum at 12VDC. Care should be taken to avoid direct supply from the vehicle 12V which can be very noisy. Power conversion will be required for 24V vehicles.

5. The video input can be connected across long video cable lengths so remotely mounted cameras should pose no problem.

6. Insure for proper ventilation of equipment, especially RF transmitter and Amplifiers.

1.3 Variants and Options

1.3.1 Variants – AXTX1 Camera Back Transmitter, with Camera Paint

There are several major variants of the AXTX1 Camera Back Transmitter:

Operating Frequency Band	Model/Part Number
AXTX1 CBT 1.990-2.492GHz 100mW	AXTX1 - 2G
AXTX1 CBT 5.730-5.840GHz 100mW	AXTX1 - 5G
AXTX1 CBT 6.436-7.120GHz 100mW	AXTX1 - 7G

1.3.2 Variants – AXTX1M – Mini TX

There are also three variants of the AXTX1M – Mini TX Transmitter:

Equipment Title	Part Number
AXTX1 Mini TX 1.990-2.492GHz 100mW	AXTX1M - 2G
AXTX1 Mini TX 5.730-5.840GHz 100mW	AXTX1M - 5G
AXTX1 Mini TX 6.436-7.120GHz 100mW	AXTX1M - 7G

1.3.3 Variants – AXTX1MB – Mini-B TX

Equipment Title	Part Number
AXTX1 Mini-B TX 1.990-2.492GHz 100mW	AXTX1MB - 2G
AXTX1 Mini-B TX 5.730-5.840GHz 100mW	AXTX1MB - 5G
AXTX1 Mini-B TX 6.436-7.120GHz 100mW	AXTX1MB - 7G

1.3.4 Accessory Options

Equipment Title	Part Number
V-Mount Battery Plates (AXTX1 only)	TX-VBAT
AB Battery Plates (AXTX1 only)	TX-ABBAT

1.3.5 Licensing Options

Encryption: AES 128 is available upon request

1.4 Main Connectors

Here are the unit's main connectors:

1.4.1   AXTX1 Broadcast Transmitter – Front View

Figure 1-4 AXTX1 Front View Connectors

Serial	Item
1	SMA Connector for 450MHz Camera Control Antenna.
2	N Connector for AXTX1 Main RF Antenna.
3	Tally Connector.

4	XLR Connectors (x2) Analog Audio In.
5	LEMO 4 pin female connector for CCU, camera paint system (RS-232)
6	Hirose 6 pin female connector for CCU, camera paint system (RS-422)
7	BNC Connector for HD/SDI Video Input.

1.4.2 AXTX1 Broadcast Transmitter - Bottom View
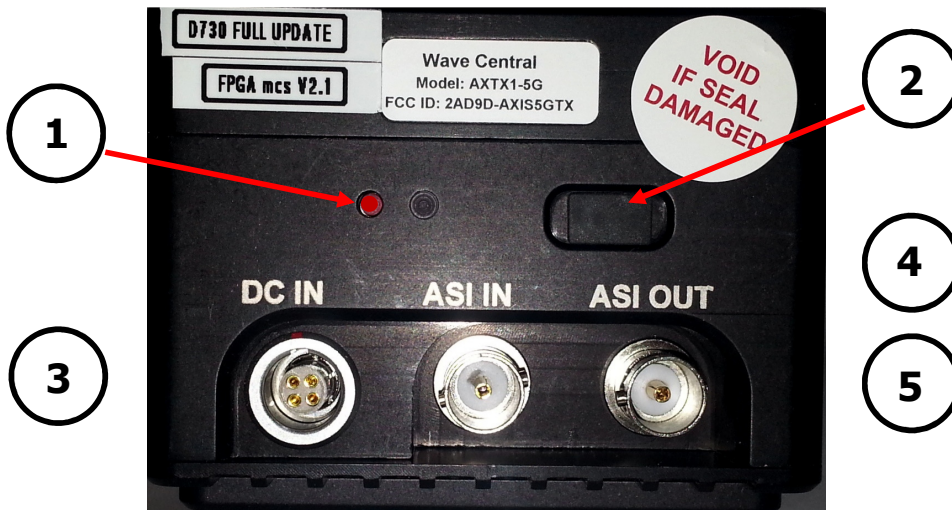
Figure 1-5 AXTX1 Bottom Connectors

Serial	Item
1	Unit's Internal Fan On/Off Button. (For limited fan off operation)
2	USB Programming Connector to Program TX Unit.
3	LEMO 4Pin Connector for External DC Power for Main Unit.
4	BNC ASI Video Input.
5	BNC ASI Video Output.

1.4.3   AXTX1 Broadcast Transmitter - Top View
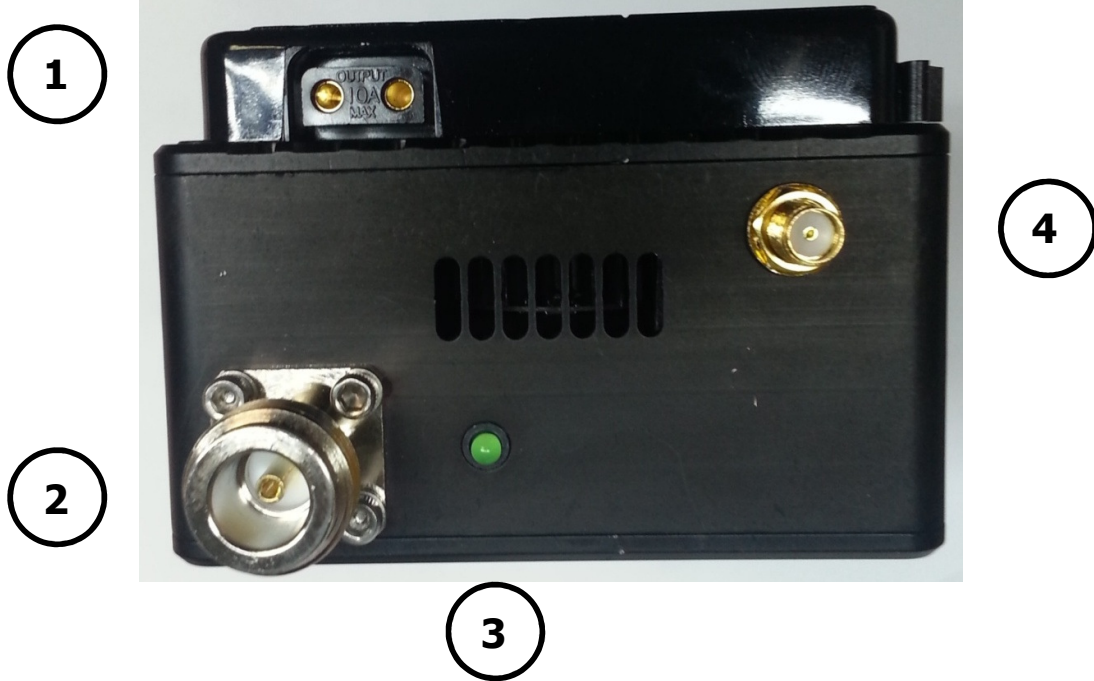
Figure 1-4 AXTX1 Top Connectors

Serial	Item
1	DC Power NOT USED
2	Type N Connector female, RF Output
3	RF output Indicator
4	SMA female connector for Paint System Antenna

1.4.4   AXTX1 Broadcast Transmitter – Left Side View
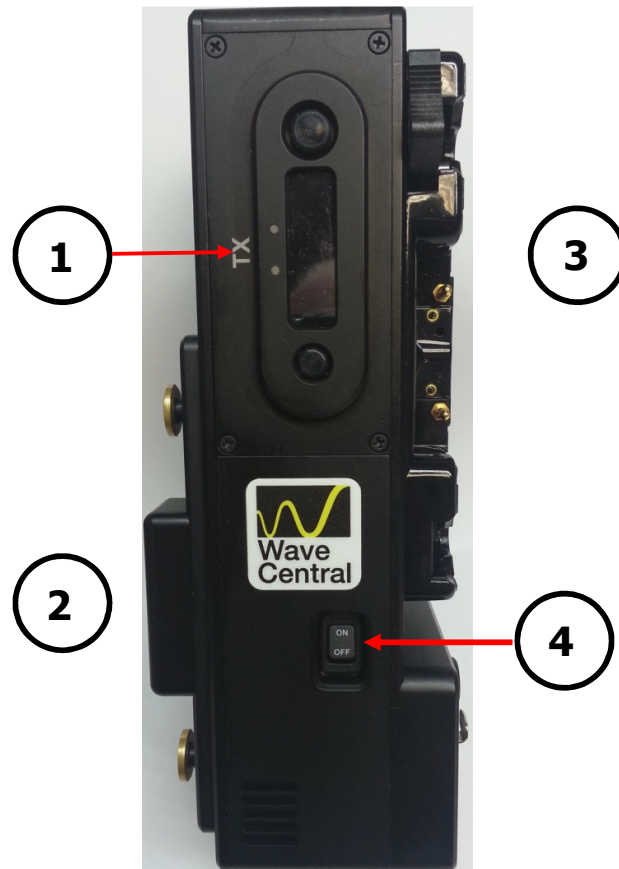
Figure 1-5 AXTX1 Left Side View

Serial	Item
1	Transmitter Control Panel and Display
2	Camera Mount Plate
3	Camera/Transmitter Battery Mount Plate
4	Transmitter/Paint Main DC Power Switch

1.4.5   AXTX1 Broadcast Transmitter – Right Side View
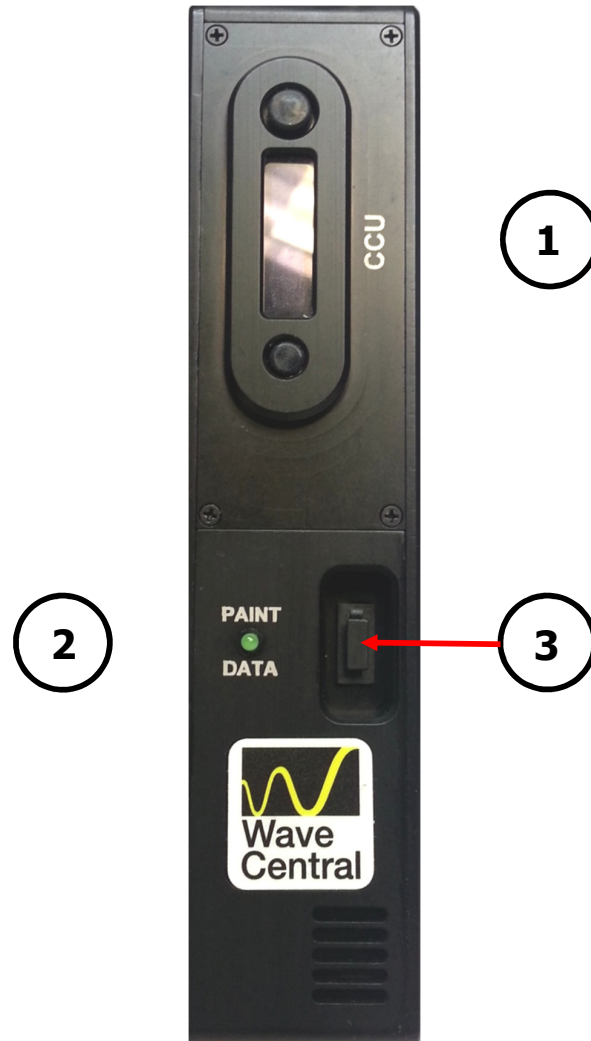
Figure 1-6 AXTX1 Right Side View

Serial	Item
1	Camera Control Unit (CCU) Panel and Display for Paint
2	Indicator, Paint Data connection with base station
3	HDMI Type A input with embedded audio input and video input

1.5 Applicable Unit Software

Each Transmitter has **two** software elements:

- **Firmware** that runs the device, via board level FPGA's. (Field Programmable Gate Array)
- And **Control Application** that is run from a Windows based PC, external of the transmitter.

1.5.1 Internal Software

Although much of the transmitter is built up of hardware components, many of the sophisticated features are implemented via **firmware** programmed into the FPGA's.

When you perform a firmware upgrade, a complete firmware installation package is provided which contains all the required upgrade codes.

1.5.2 Control Application

For customized operation and unit configurations, connecting to a PC and running the transmitter **Control Application** will give the user much more global command control of the unit's settings and parameters.

Here is a screen shot of what the Transmitter Control Application looks like:
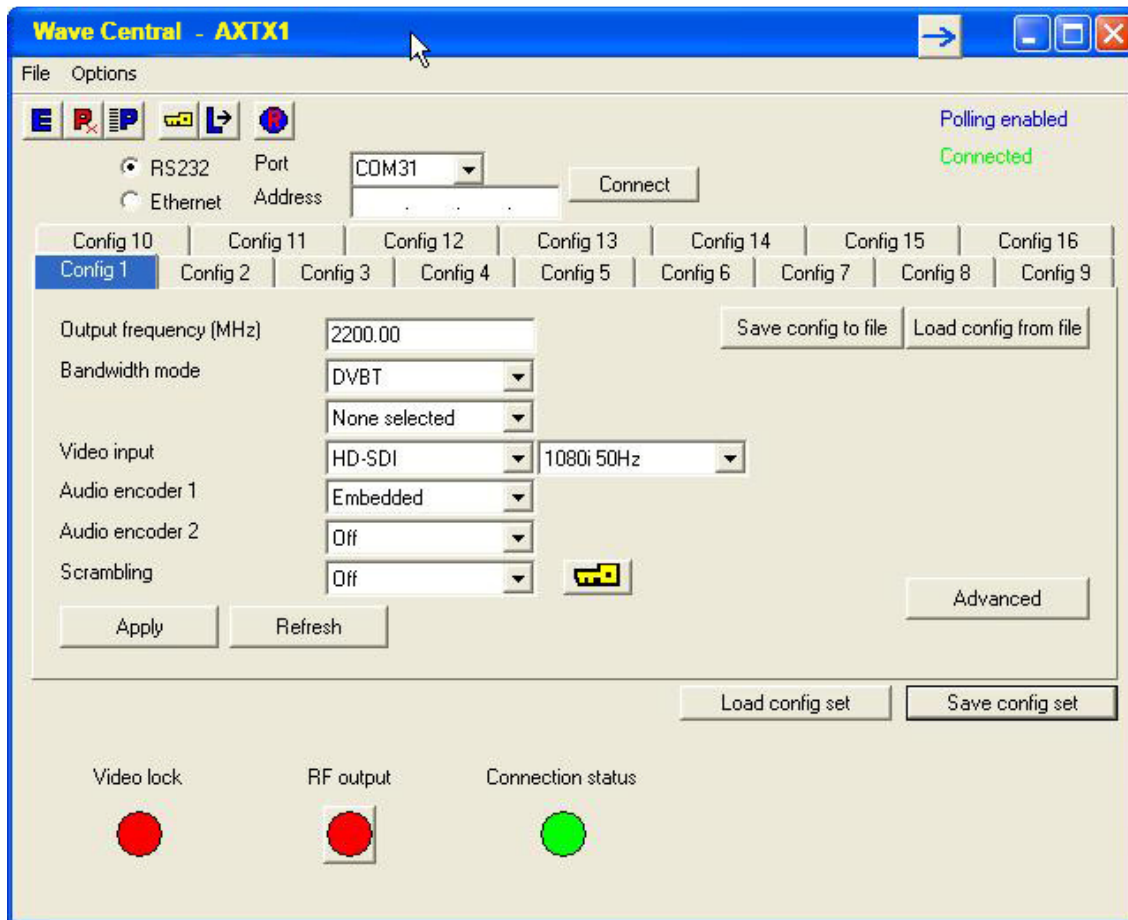
Figure 1-6 Transmitter Control Application

2 . Placards and Markings

Which model do I have? What is its Serial Number?

The information covering placards, labels, markings, etc., showing the part number, legend and location of each placard, label, or marking required for safety or maintenance significant information.

2.1 General

You'll need to be able to quickly identify equipment types and serial numbers you have and at what frequencies your systems are designed to work. You may need to find the Serial Number during a support call for example.

The simplest way is to check the placards and markings on the units and this section shows you how to decode them. The AXTX1 is shown as an example.

2.2 Exterior Placards and Marking System (AXTX1)

The system information that includes placards, labels, and markings required for servicing instructions, inspections, cautions, warnings, etc.

The outside of each Broadcast Transmitter unit is marked with several placards:

- Serial Number Placard
- Product Placard
- Warranty Void Placard

2.2.1   Serial Number Placard

Figure 2-1 Serial Number Placard AXTX1

2.2.2   Product Operating Range and Warranty Void Placard
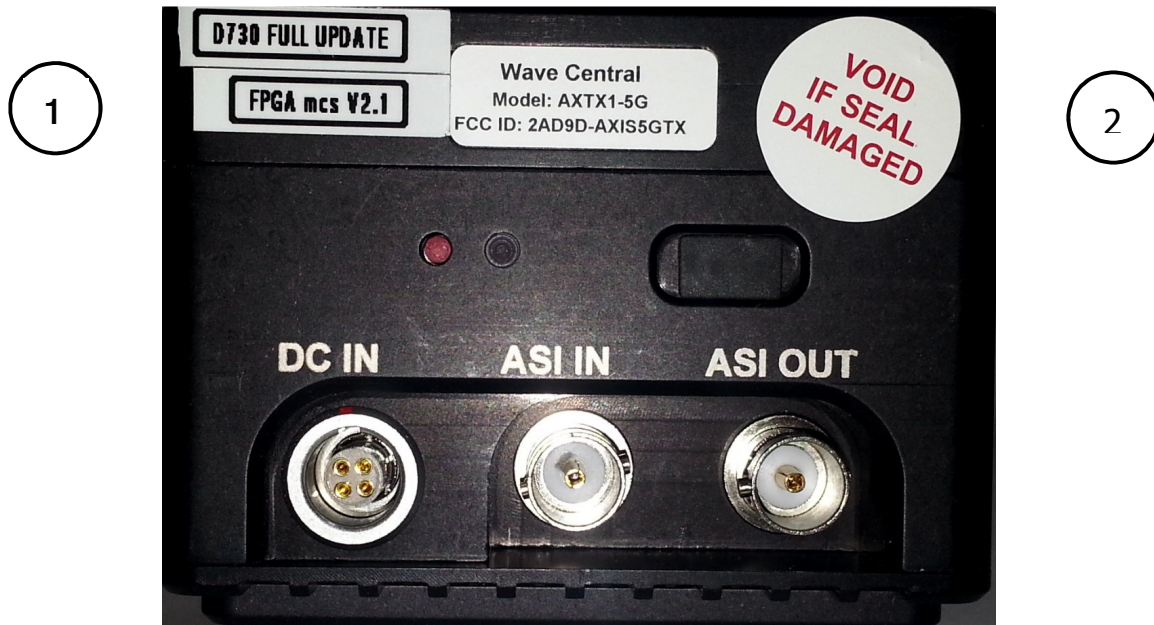
Figure 2-2 AXTX1 Product and Warranty Void Placard

Serial	Item
1	Product code and frequency range, 5.5GHz to 6.0GHz in this example.
2	Warranty Void, if seal is damaged.

2.3 Interior Placards and Marking System

The system information covering placards, labels, and markings required for general interior and emergency information, instructions, cautions, warnings, etc.

There are no interior placards and markings that will concern the operator of this unit.

2.4 Exterior Color Schemes and Marking System

This system information includes specifications and requirements covering exterior color and related markings.

2.4.1   Enclosure Color

The main enclosure is anodized in black.

2.4.2   Panel Markings

The markings on the Axis Series are in white.

3 . Cautions and Warnings

3.1 Cautions and Warnings

Serial	Area	Note
1	Enclosures	Do not remove any factory installed screws or fastenings. Damage to the units may result and void any warranties. Only authorised, trained personnel should open the product. There are no functions that required the user to gain access to the interior of the product. There are no user serviceable parts inside.
2	Maintenance	Other than cleaning, no scheduled maintenance is required to ensure proper function of the unit.
3	Environment	The equipment should not be used in hazardous or corrosive atmospheres. Users are reminded of the necessity of complying with restrictions regarding the use of radio devices in fuel depots, chemical plants and locations where explosives are stored and/or used.
4	Power Supply	Ensure that the power supply arrangements are adequate to meet the stated requirements of each product. Observe all electrical safety precautions.
5	Electro Static Discharge (ESD) Precautions	ESD guidelines must be followed for this electrostatic sensitive device.
6	Lightning Strike	There is a risk of lightning strike to antennas. The equipment should not be assembled in an area at the time of lightning activity. Antennas should be adequately protected from lightning strikes.
7	Working at Height	Observe caution when locating the device at height, for example on a mast. Ensure the unit is well secured to prevent it falling and injuring personnel.
8	Risk of Eye Injury	Care should be taken to avoid eye contact with the antennas.
9	Cables	Connecting cables should not be positioned where they are likely to become damaged or were they may present a trip hazard.
10	Thermal Control System	Any powered device will always produce heat as a by-product of its operation. If you operate this device in an enclosed space you must ensure it has adequate airflow to keep it cool. Also, if worn close to the body, care must be taken to protect the operator from excessive temperatures.

Serial	Area	Note
11	RF Emission System	When using this device please ensure a distance of 20cm is maintained between your device and your body while the device is transmitting.
12	Aircraft Safety	Use of this equipment on board aircraft is strictly forbidden. Use of radio transmitter equipment in an aircraft can endanger navigation and other systems.

3.2 Specific Absorption Rates (SAR) FCC Exemption

This device is excluded from SAR testing since the separation distance is more than 20cm per KDB 447498

4 . Panels, Displays, Controls, Indicators and Alarms

4.1 General

You'll need to be able to find all the interface connections and controls on the unit. You'll also need to be able to identify and interpret any alarms or indicators. This section will help you identify all these features.

Each Axis-Series Broadcast Transmitter has several panels which contain all the interface connections for the units and the controls and indicators. There is an operational control panel on one panel of the unit.

The next section describes the transmitter control panel for the all Axis Series Broadcast Transmitters.

4.2 Panel System – AXTX1

The AXTX1 has **two** significant display panels:

- Transmitter Control Panel
- CCU, Camera Control Unit, Paint for AXTX1 only.

4.3 Alarm System – AXTX1 Series

The right LED indicator is an alarm indicator.

4.4 Indicator System – AXTX1 Series

User information is displayed on the display screen or on the Control application. Two LED's are located above the TX indicator panel screen. The GREEN LED indicates, control panel is communicating with the main board. The right LED indicator illuminates RED for an *alarm*, as indicated below.

Figure 2-3 AXTX1-Series TX Control Panel

4.5 Control Panel System – AXTX1 Series Transmitters

Cancel/Back   Joystick/Confirm

Figure 2-3a AXTX1-Series TX Control Panel

The control panel located on the right panel has **two** push buttons. Here's what they do:

4.5.1 Joystick/Confirm Button (2)

Button	Does this...
Joystick/Confirm Button	Move the joystick for UP, DOWN, LEFT and RIGHT. Press the joystick for ENTER.

4.5.2 Cancel/Back Button (3)

Button	Does this...
Cancel/Back Button	Press to cancel action or go back one level.

5 . Connectivity

What are all the connectivity options?

5.1 General

You'll need a means of interconnecting equipment in the communication system for the purpose of transporting energy and /or communication signals. This section will help you identify all these wires, waveguides, glass-fibers, connecting elements, etc.

The Broadcast Transmitter provides connectivity for

- Power
- Signal (such as video, audio and data)
- Control (using your PC)

The next section describes the connectivity options for the AXTX1 Broadcast Transmitter…

5.2 Power – AXTX1

Connecting systems designed mainly for transporting electric power to the communication system equipment. This includes connecting elements, wires, fuses, over-voltage protection and breakers.

5.2.1   DC Power

The AXTX1 does not have any batteries on board. The unit accepts **6-17VDC** through the **power interface** on the bottom panel (reverse polarity protected). This is a LEMO 4-pin female connector, marked **DC IN**.

5.2.2   AC Power

You can purchase an optional AC Adapter to power the AXTX1.

5.3 Signal – AXTX1

Describes connecting systems designed mainly for transporting the communication signals. This could be video, audio, data (RS232 or RS485) and IP.

5.3.1   Video

The unit accepts **video** signals through the **Video interface** on the front panel. This is a BNC female connectors marked HD/SDI.

This cable has another BNC plug where you can connect your video source.

Alternatively the **HDMI interface** on the right hand side panel can be used. This is a HDMI Type A female recessed connector, adjacent to the Paint Data LED indicator.

5.3.1.1 ASI In and ASI Out

There are two BNC connectors mounted on the bottom, marked ASI IN and ASI OUT

5.3.2   Audio

The unit accepts **audio** signals through the two **XLR female** connectors on the front panel. These two connectors are marked Audio 1 and Audio 2.

Alternatively embedded digital audio can be extracted from HD/SDI or HDMI sources.

5.3.3   Data

The unit accepts Camera data signals through the **DATA and PAINT** interface on the front panel. The DATA is a LEMO 4-pin female connector; RS-232. The PAINT is a Hirose 6 female connector; RS-422

Your supplied Data cable assembly fits in here.

A specific cable must be for the camera that will be control. Supported cameras are Sony, Grass Valley LDX, Ikegami, Panasonic and Hitachi.

5.3.4   IP

The AXTX1 does not carry IP signals.

5.4 Control – AXTX1

Describes connecting systems designed mainly for controlling and configuring the radio units.

The AXTX1 uses Serial Control Data (over USB) to communicate with a Personal Computer for programming.

The unit accepts **Control** signals through the USB **connector** on the bottom panel.

Your supplied Control cable assembly fits in here.

This cable has a USB 4-pin plug where you can connect your Personal Computer.

5.4.1   IP Control

The AXTX1 does not use IP control.

5.4.2   Paint

This unit accepts paint/data from the camera remote paint system via the built-in wireless receiver system through the **Data and PAINT** interface connectors on the front panel.

This is a LEMO 4 pin female for RS-232 data connector

This is a Hirose 6 pin female for RS-422 data connector

6 . Setting up your Transmitter

6.1 General

These guidelines will help you install and set up your system. As a general rule we connect in order:

- Antennas
- Signals
- Power

6.2 Connecting Antennas

Each AXTX1 unit requires **one** antenna. The antenna **must** be fitted before the unit is placed into RF mode.

6.2.1   Assembling the Antenna System

AXTX1 units normally use simple Omni-antennas and do not require any rigging. Naturally, it is possible to use a variety of antenna types for specialist applications.

6.2.2   Attaching the Antenna

You'll need an AXTX1 and one antenna. An **ANT2-200250**, 2dBI flexi N-Type mount antenna 2.00 to 2.50GHz would be a typical example for an S-Band variant.

1. Connect the antenna to the N-Type N connector on the top panel of the transmitter unit.

2. Do not over tighten the antenna – hand tight only!

CAUTION: Antennas should be connected **directly** to the unit. If you have to use cables between the antennas and the AXTX1 (in a mobile application for example), keep them short and use very high quality cable.

Note: There are many types of antenna that can be fitted to the AXTX1 unit. Your antennas may look different from those in this guide.

6.2.3   Antenna Polarization

COFDM links are very robust and are tolerant to changes in antenna position, however, it is important to try and keep the antennas in the same plane if possible.

The antennas used with the COFDM links are normally **linearly** polarized.

6.3 Down Converter System

There are no down converters used with transmitters.

6.4 Up converter System

The Up converter board is inside the enclosure of the transmitter and has no user serviceable parts. There are no operational controls on the board.

6.5 Connecting Signals – AXTX1

6.5.1   Connecting Video Signals

For a composite or SDI input you'll need a Video source, AXTX1 and a CA0006 Video cable assembly.

1. Connect one BNC 2-way plug to the HD/SDI connector of the AXTX1.

2. Connect the other BNC 2-way plug to the video source.

3. Switch on the Video source.

4. Ensure the radio in configured to accept HD or SDI video.

For a HDMI input you'll need a Video source, AXTX1 and a HDMI cable suitable for the video source with a Type A plug at the other end.

1. Connect one HDMI Type A plug to the HDMI In connector of the right side of the AXTX1.

2. Connect the other HDMI plug to the video source.

3. Switch on the Video source.

4. Ensure the radio is configured to accept HDMI video.

6.5.2   Connecting Audio Signals

1. Connect the analog audio source to the XLR audio 1 and/or audio 2 inputs.

2. Ensure the radio is configured to send **Analog** audio (Audio is set to **embedded source** by default).

For **embedded audio** input you'll need a digital Video input setup as above and a Video source which embeds audio.

1. Connect Video signals as described above.

2. Configure the video source to provide embedded audio.

3. Ensure the radio is configured to send Embedded audio.

6.5.3   Connecting Camera DATA and PAINT signals

Depending upon camera being used, either the LEMO 4-pin (RS-232) labelled DATA or the Hirose 6-pin (RS-422) labelled PAINT would be used.

1. Connect the DB-9 cable from the RCP-TX-IDU

2. Connect the D-Type 9-way plug to the camera control unit to the corresponding DATA or PAINT connectors depending upon camera being used.

3. Switch on the Camera CCU data source.

6.6 Connecting Power – AXTX1

The AXTX1 requires 12VDC. The unit can be powered from DC by using suitable batteries or a vehicle power source.

Take care that the vehicle supply is within limits for this unit. Aircraft for example, normally use 28VDC supplies.

CAUTION: When using a 12VDC supply ensure the **polarity** is correct. The **red** banana plug should be connected to the **positive** terminal. The **Black** banana plug should be connected to **negative** terminal.

6.6.1   Connecting DC Power

You'll need a 12VDC power source.

1. Connect the LEMO 4-pin plug to the **DC IN** connector of the bottom of the AXTX1.

2. The other of the LEMO cable has a male XRL 4 pin plug that attaches to 12VDC power supply capable of at least 2 Amps

6.6.2 Connecting AC Power

You'll require a 12VDC Power Supply (optional) Adapter for 120VAC input and an AXTX1.

1. Connect the LEMO 4-pin female connector to the **DC IN** connector on the AXTX1. The other of the LEMO cable has a male XRL 4 pin plug that attaches to the optional 120VAC Adapter.

2. Connect the IEC AC 3-way female plug to the IEC AC 3-pin male socket on the AC Adapter.

3. Connect the IEC AC plug to your local AC supply and switch on.

4. On the display screen, you'll see the text illuminate.

6.7 A Look at the Display – AXTX1

The AXTX1 is equipped with a display screen on the right panel. You can control what is displayed on this screen using the Control Panel buttons described earlier.

Figure 6-1 AXTX1 Display Screen and Control Buttons

6.8 A Look at the TX Control System – AXTX1

Cancel/Back   **Joystick/Confirm**

Figure 6-2 AXTX1-Series TX Control Panel

The control panel located on the right panel has **two** push buttons. Here's what they do:

6.8.1   Joystick/Confirm Button (2)

Button	Does this...
Joystick/Confirm Button	Move the joystick for UP, DOWN, LEFT and RIGHT. Press the joystick for ENTER.

6.8.2   Cancel/Back Button (3)

Button	Does this...
Cancel/Back Button	Press to cancel action or go back one level.

6.9 A Look at the Menu Structure – AXTX1

6.9.1   Display Screen, Menu Structure

Unit Status

	Vid Lock	No	ASI	Program Num	0
	Vid Rate	8.522Mbps		ASI In	Off
	ASI Lock	No		ASI Out	On
	Chaining	Off		Man Mux rate	Default
	S/W Ver	1.4c1		Man Vid rate	Default
	Serial	e03a095e			
	FPGA Ver	00023140	Scram	Scram	Off
	FPGA Temp	39;		ABS Key	///////////
	Reply	Error		AES Key 1	///////////

Cont' (column header above ASI)

Unit Control

				AES Key 2	///////////
RF	Freq	2200.00MHz			
	RF Out	Off	Data	Mode	Off
	B/W	8MHz DVB-T		Baud	1200
	TX Mode	Off		Pkt Len	Default
	RF Power	100mW		Metadata	Off
	RF Atten	0.00dB			
DVB-T	FEC	3/4	Service	Name	H.264 Unit 1
	Const	QPSK		Network	Solo
	Guard	1/32		PMT PID	Default
	Spec Pol	Norm		PCR PID	Default
	Offset	None		VID PID	Default
				Aud1 PID	Default
				Aud2 PID	Default
				Data PID	Default
				Meta PID	Default
	Spec Pol	Norm	Config	Config1	
Video In	Input	SDI NTSC		Defaults	No
	HD Format	1080i59			
	Pattern	Auto Bars			
	OSD Text	Service Name	**Local Settings**		
	Heartbeat	Off		Serial	90F0E712
				S/W Ver	1.4
Video Enc	Mode	Low Delay Int		Name	SOLH264TX
	Horz Res	Full		Menu Level	Full
	Vert Res	Full		SOLO4 FP	On
	F/Rate	Full		Status Disp	On
	GOP	Default		LEDs	On
	OTS Delay	0ms		Voltage Disp	Off
	Encoder	MPEG4 H.264		Low Batt Disp	Off
				Low Batt	7.00V
Audio 1	Aud 1 Mode	L2 Stereo		Brightness	128
	Aud 1 Source	Embedded		Disp Mode	Auto Dim
	Aud 1 Bitrate	256kbps		Boot Logo	On
	Aud Level	0dB		Terminal Mode	No
	Mic Bias	Off		Time	Not Set
	Grp DID 1	(0xFF/oxE7)		Date	Not Set
	PTS Delay	0ms			
Audio 2	Aud 2 Mode	off			
	Aud 2 Source	Analog			
	Aud 2 Bitrate	384kbps			
	Aud Level	0dB			
	Mic Bias	Off			
	Grp DID 1	(0xFF/oxE7)			
	PTS Delay	0ms			

6.9.2   Display Screen, Menu Functions

Menu	Sub-Menu	Function
Unit Status	N/A	Encoder/modulator board status.
Unit Control	RF	RF output related settings and preset range modes.
	DVB-T	Modulation options relevant to DVB-T mode.
	Video In	Video input interface settings.
	Video Enc	Video encoder options.
	Audio 1	Audio encoder 1 settings. Options not starting with "Aud 1" are shared for both encoders.
	Audio 2	Audio encoder 1 settings. Options not starting with "Aud 2" are shared for both encoders.
	ASI	ASI IO and advanced chaining setup.
	Scram	Scrambling options and keys.
	Data	Data channel settings.
	Service	Service names and manual PID setup.
	Config	Config number and restore default option.
Local Settings	N/A	Display screen settings and status.

7 . Basic Operation

7.1 General

This chapter covers normal day to day operations of a fully configured AXTX1 system.

Once installed and configured the AXTX1 is easy to operate. These guidelines will help you perform basic operations on your Broadcast Transmitter.

Note: If you are working with a new system or you need to change any of the configurations, look at the **Advanced Operation** and **Control System** chapters later in this guide.

7.2 Starting and Stopping – AXTX1

AXTX1 units don't have power switches – you simply apply power to them and they will start up.

7.2.1   Powering Up – AXTX1

You'll need a fully configured **AXTX1.**

1. Switch on the AXTX1 using the procedure 7-6 above.

2. On the display screen, you'll see the text illuminate.

7.2.2   Powering Up – AXTX1

You'll need a fully configured **AXTX1.**

1. Supply power to the AXTX1 using the procedure 7-7 above.

2. Power is now immediately available to the camera.

3. Switch the toggle switch to ON to power the transmitter.

4. On the display screen, you'll see the text illuminate.

7.2.3   Shutting Down – AXTX1

It can be important to shut down a system gracefully. This ensures that all processes are terminated correctly and not data or settings are lost.

1. Ensure the unit is **not** in sleep mode.

2. Switch to On/Off switch to OFF

3. On the display screen, you'll see the text go out.

4. Disconnect the power cable from the AXTX1.

5. The system is shut down safely.

7.3 Working with the Control Panel – AXTX1

The broadcast transmitter has a control panel to enable you to change **modes**, **configurations** and to control the **RF** setting.

7.3.1   Selecting the Root Menu

1. **Power** on the AXTX1

2. Let the unit **initialize**

3. You'll see the frequency and the **Root** menu on the display screen:

Figure 7-1 Selecting the Root Menu

7.3.2   Selecting a Configuration

You'll need a powered AXTX1 set at the root menu as in 8-3-1 above.

1. Push up/down on the **Joystick** button to select a new configuration number
2. Your new **configuration** appears highlighted.
3. **Push** the **Joystick / Confirm** button to select the new configuration
4. The highlight disappears and your **new configuration** number is displayed.

Note: Changing a configuration turns off the RF output to prevent accidental transmission and potential interference. The RF output must manually be re-enabled once the user is confident that the correct configuration has been selected.
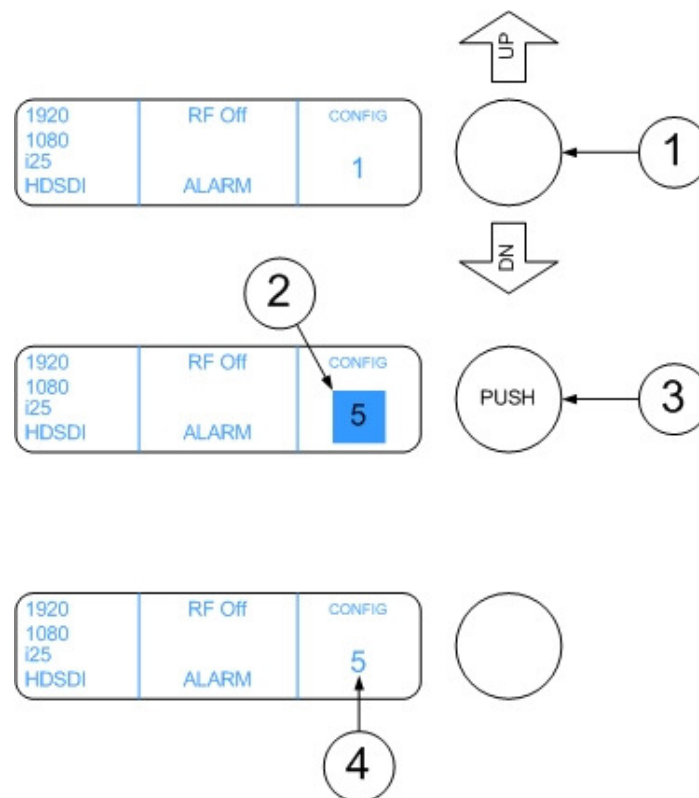

Figure 7-2 Selecting a Configuration

7.3.3   Selecting RF on or off

You'll need a powered AXTX1 set at the root menu as in 8-3-1 above.

1. Push the **Joystick / Confirm** button for **two** seconds.
2. The RF caption will toggle to **on**.

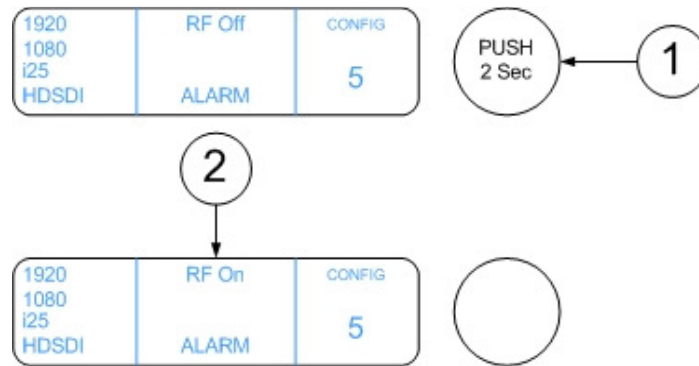3. Push the **Joystick / Confirm** button for two seconds to turn the RF off

Figure 7-3 Selecting RF on or off

7.3.4 Using the Unit Status Menu

You'll need a powered AXTX1 set at the root menu as in 8-3-1 above.

1. Push **Cancel / Back** button
2. You'll see the **frequency** and the **Unit Status:** menu on the display screen
3. Push the **Joystick/Confirm** button to **enter** the Unit Status menu
4. You'll see **Vid Lock**, which is the first item in the Unit Status menu
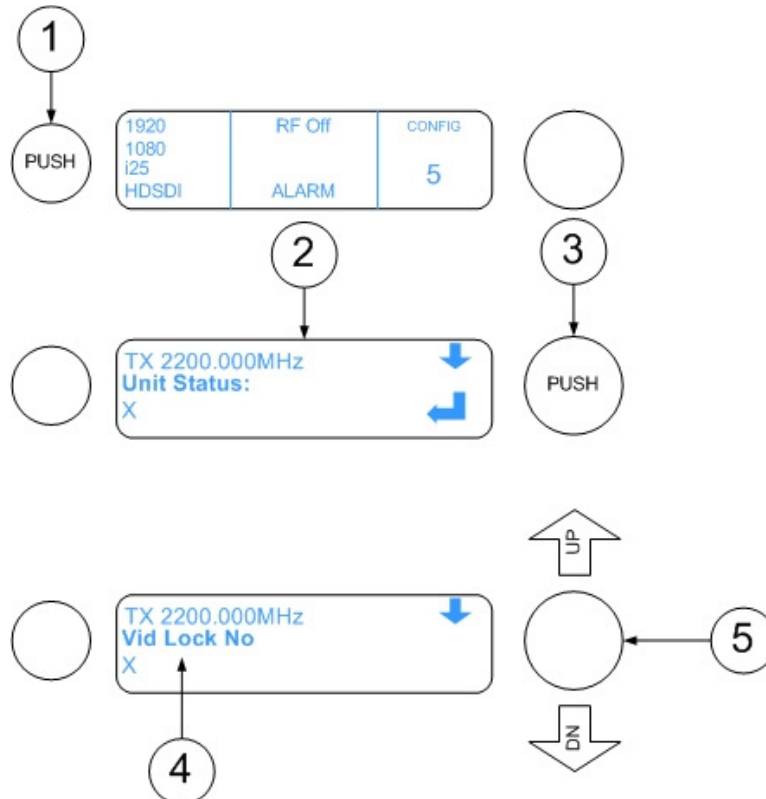5. Use the Joystick/Confirm button **up/down arrows** to scroll through the menu items.

Figure 7-4 Using the Unit Status Menu

Unit Status indicators are:

Menu	Sub-Menu	Typical Value	Notes
Unit Status	Vid Lock	No or Yes	

31

	Vid Rate	8.522Mbps	
	ASI Lock	No or Yes	
	S/W Ver	1.4	
	Serial	e03a095e	
	Battery	12.0V	May show Reply Error on Units where battery monitoring are not available.
	FPGA Ver	00023140	
	FPGA Temp	50C	Expect running internal temperature of 50-75°C depending on environment.

Note: Don't worry if you accidentally press the **Joystick/Confirm** button when you are moving about the Unit Status menu. It really just shows you the current settings and will not allow you to change them.

7.3.5 Using the Unit Control Menu

You'll need a powered AXTX1 set at the root menu as in 8-3-1 above.

1. Push **Cancel / Back** button
2. You'll see the **frequency** and the **Unit Status:** menu on the display screen
3. Use the **Joystick/Confirm** button down arrow to scroll down to **Unit Control**
4. Push the **Joystick/Confirm** button to **enter** the Unit Control menu
5. You'll see **RF**, which is the first item in the Unit Control menu
6. Use the **Joystick/Confirm** button to move up and down the Unit Control menu
7. When you find a Config you want to change, **press** the **Joystick/Confirm** button to select that Config for editing.
8. Use the **Joystick/Confirm** button to move up and down the possible settings
9. Press the **Joystick/Confirm** button to **save** the new setting
10. Press the **Joystick/Confirm** button again to **confirm** the new setting
11. When done, press the **Cancel/Back** button to return to the top menu

Here are *some* of the settings you can configure from the menu just for the **RF sub menu**. For a **full list**, take a look at the menu at **7-9-1**.

Menu	Sub-Menu	Sub-Sub-Menu	Typical Value
Unit Control	RF	Freq	2031.50MHz
		RF Out	On
		B/W	8MHz
		TX Mode	Off

		RF Power	100mW
		RF Atten	0.00dB

7.3.6   Using the Local Settings Menu

You'll need a powered AXTX1 set at the root menu as in 8-3-1 above.

1. Push **Cancel / Back** button
2. You'll see the **frequency** and the **Unit Status:** menu on the display screen
3. Use the **Joystick/Confirm** button down arrow to scroll down to **Local Settings**
4. Push the **Joystick/Confirm** button to **enter** the Local Settings menu
5. You'll see **Serial**, which is the first item in the Local Settings menu
6. Use the **Joystick/Confirm** button to move up and down the Local Settings menu
7. When you find a Config you want to change, **press** the **Joystick/Confirm** button to select that Config for editing.
8. Use the **Joystick/Confirm** button to move up and down the possible settings
9. Press the **Joystick/Confirm** button to **save** the new setting
10. Press the **Joystick/Confirm** button again to **confirm** the new setting
11. When done, press the **Cancel/Back** button to return to the top menu

For a full list of the settings you can configure from the Local Settings menu, take a look at the menu at **7-9-1**.

7.3.7   Using the Control Panel Button Lock Feature

You'll need a powered AXTX1.

1. Hold **Joystick/Confirm** button then press **Cancel / Back** button for about 8 sec
2. The Control Panel buttons will lock
3. A key appears on the Display screen to show that the panel is locked
4. Press and hold again to unlock the Control Panel
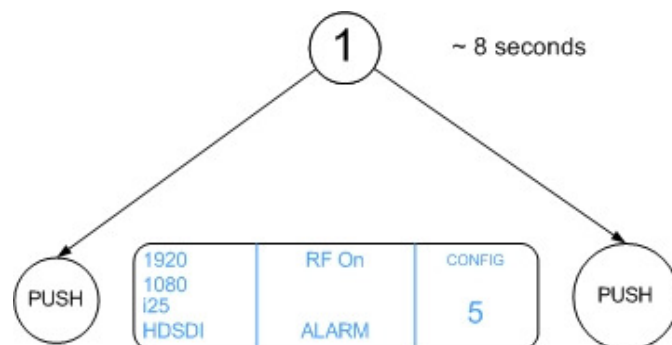
Note: You must press the **Joystick/Confirm** button just before the **Cancel / Back** button to avoid menu interaction.

Note: You can lock or unlock the Control Panel from anywhere in the menu structure.

8 . Advanced Operation

8.1 General

These guidelines will help you perform advanced operations on your radio.

8.2 Encryption

Your material is a valuable asset to your organization and naturally you don't want others intercepting your radio signal. To do this, all that they need is a radio receiver that operates in the same mode and on the same frequency you are using to transmit.

8.2.1   Encryption System

If the AES scrambling option has been purchased for the Axis system in use, then it is possible to encrypt the link. Both Bcrypt128 and BCrypt256 are license-controlled features. You'll need to encrypt the traffic leaving the transmitter and set up the receiver for decrypt.

8.2.2   Switching on the Transmitter Encryption

Here's how you set up **Encryption** on the device:

1. Connect your radio to your PC and run the control application (see Ch10, Control System)

2. In the **Scrambling** combo box click the drop-down arrow and select an encryption type. (AES128 for example).

3. Click the **Encryption** button (yellow key icon).

4. The **Write encryption key** dialog box will open

5. In the **Key type** combo box click the drop-down arrow and select the key type you want to write. (Should match the key type you chose in step 1).

6. In the **AES128 key** text box, type the encryption key you want to use.
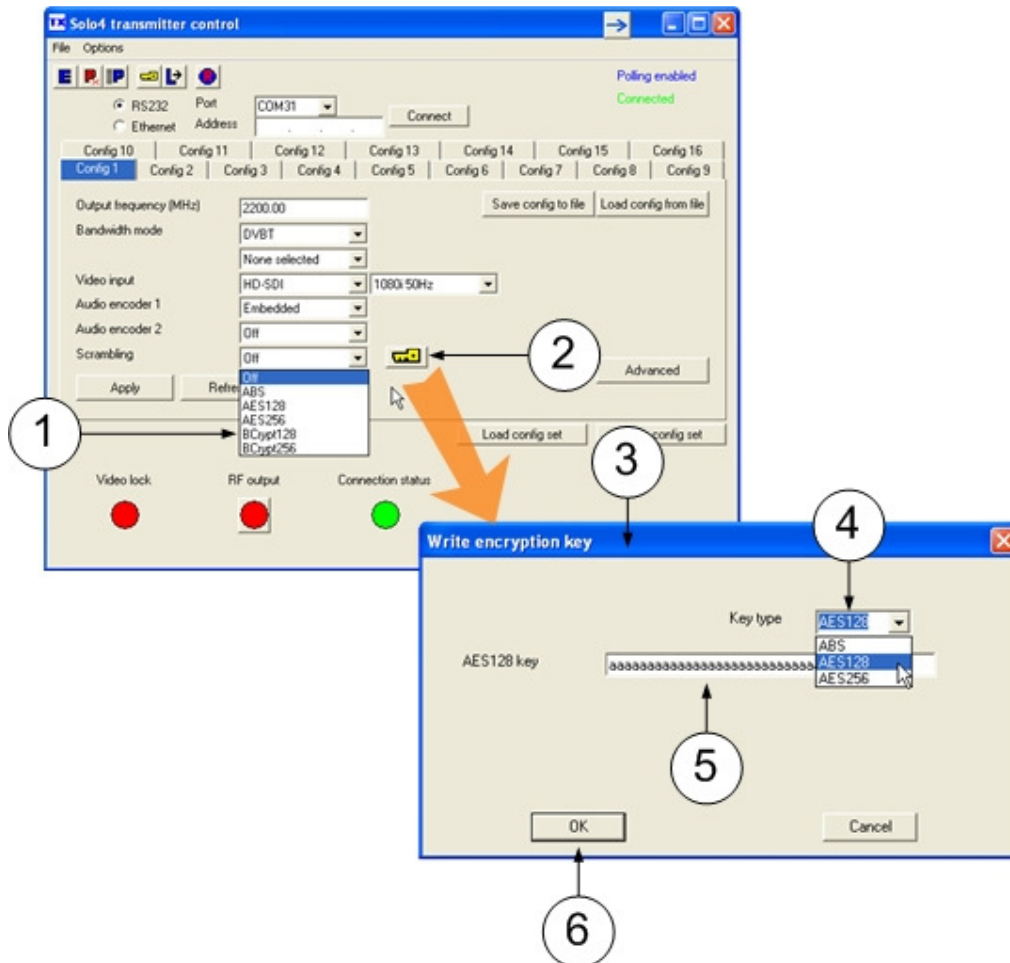
7. Click the **OK** button.

Figure 8-1 Switching on Transmitter Encryption

8.2.3   Number of Encryption Key Characters Required

In our example above we used AES128 encryption. This needed a key of 32 characters. If we had chosen AES256 it would need a 64 character key which we spread over two fields like this:
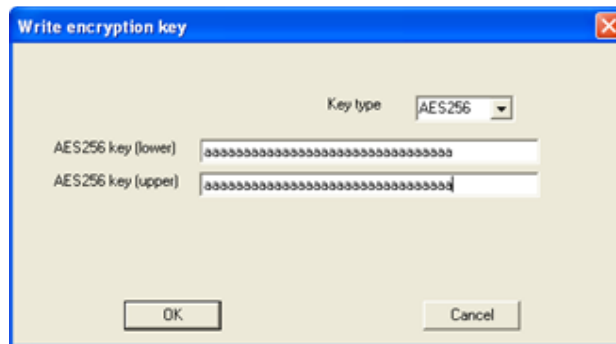

Figure 8-2 Write Encryption Key Dialog for AES256 key Type

Key Type	Number of Characters Needed
ABS	8
AES128	32
AES256	64 (32 in each field)

Note: AES128 uses the same key entered as AES256 (lower). Therefore, setting one will overwrite the other. In the same way, Bcrypt uses the same keys as AES. ABS is entirely separate.

9 . Control System

9.1   General

To get the most from your radio system you must customize the programming for your operations and area. Use the Transmitter Control Application to navigate to the system setting you want to customize.

CAUTION: Before you start programming your radio make sure the batteries are fresh and fully charged. If the radio loses power while you program it, its memory might be corrupted which will require you to reset defaults. All information programmed in the radio might be lost. It is recommended the use an AC adapter to power your radio.

The control system provides equipment that controls the communication system, to keep it functioning in proper and stable order. It enables you to change many of the settings of the radio like frequency or bandwidth.

The control system may be in the form of a **Control Application** that runs on your PC connected to the device using Serial communications. The AXTX1 uses this system.

Alternatively, it may be in the form of **Control Pages** that are viewed on your PC browser when connected to the device using IP communications.

9.2   Connecting your PC to your Radio

The AXTX1 has a **Control Application** which enables you to perform many configuration tasks quickly and easily. This section tells you how to connect your PC to the transmitter and then configure the unit using this Control Application.

9.2.1   Installing the Control Application

Install **Control Application** system onto your Personal Computer (PC). It comes as a simple exe file which you just place on your desktop or other convenient location on your PC.

It does not need to write anything to your registry.

Remember, the AXTX1 is very simple to operate using its control panel after it has been fully configured using the Control Application.

9.2.2   Serial Connection between Radio and PC

You'll need a fully powered AXTX1**, USB Cable** and a personal computer running the **Control Application**.

1. Connect the USB cable into the USB connector (bottom of AXTX1).

2. Connect to other end of the USB cable to your PC.

9.2.3   Starting the Control Application

1. Power up the radio.

2. Double-click the Solo4 transmitter control icon on the PC

3. The PC and Transmitter negotiate a serial connection (this may take several seconds)

4. The AXTX1 Transmitter Control window opens

9.2.4 Logging in to the Control Application

You <u>do not</u> require a login to access the AXTX1 with the Control Application.

9.2.5 A Look at the Main Window

Every Windows based application must have a main window as its entry point function. For the transmitter Control Application, this is the **AXTX1 transmitter control** window:
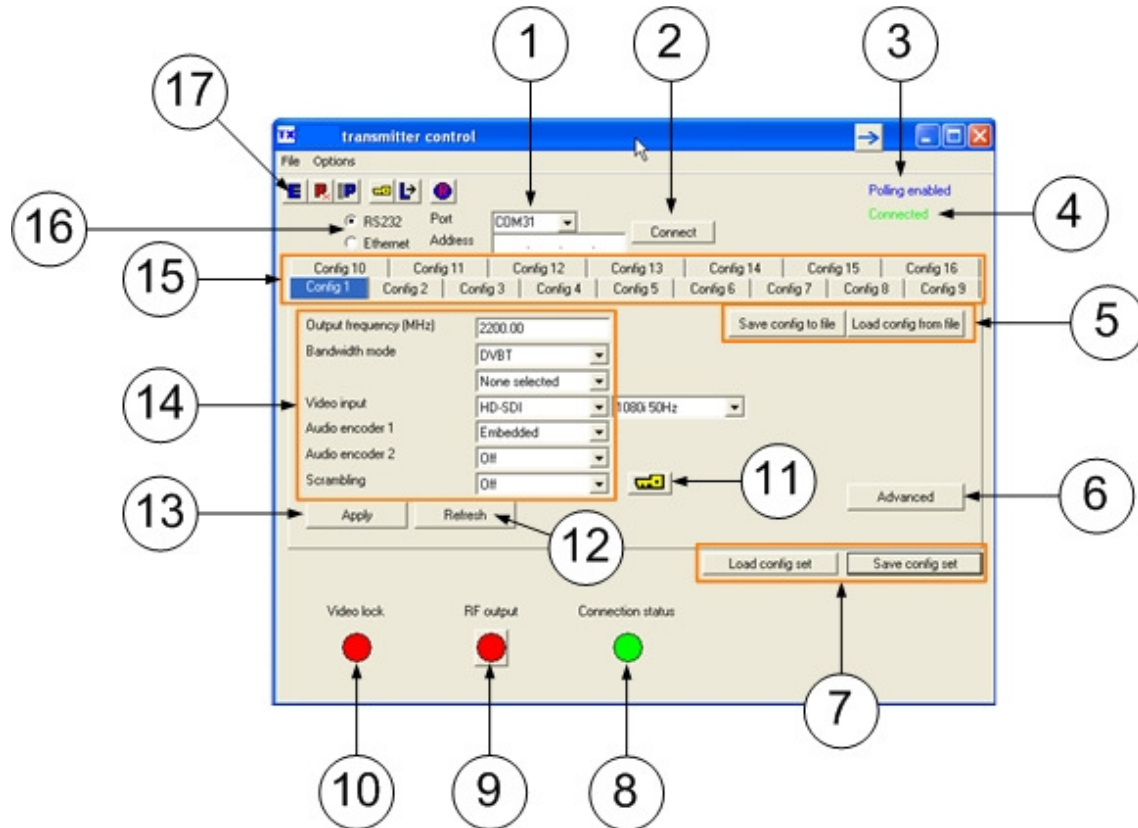

Figure 9-1 Transmitter Control, Main Window

Serial	Item
1	Serial Port drop-down
2	Connect Button
3	Polling Status
4	Connection Status
5	Configuration Buttons
6	Advanced Options

7	Configuration Set Buttons
8	Connection Status Indicator
9	RF Output Indicator
10	Video Lock Indicator
11	Encryption Button
12	Refresh Button
13	Apply Button
14	Basic Setup Pane
15	Presets (16 on this version)
16	RS232/IP radio Buttons
17	Toolbar

9.3   Configuring Basic Settings

When you start-up the Control Application for the first time you'll need to set up a couple of things to suit how you want to work with the software.

9.3.1   Serial Port Configuration

This combo box shows the COM port that the application has used to connect to the device. In this example, the application is using the personal computer's COM 31 port.

You can force the application to use a particular serial port by clicking the Drop-down arrow and selecting a different COM port from the list.

9.3.2   Using the Connect Button

Normally, the control application immediately negotiates a connection to the device. You can force a reconnect by pressing the **Connect** button.

9.3.3   Understanding Polling Status

Polling is when the application interrogates the radio device to gather data about its current state.

Normally, the polling is **disabled** which means you need to press the **Refresh** Button to update the window after each change.

9.3.4   Enabling Polling

You can **enable** polling like this:

1. From the Options menu select **Enable Polling** (CTRL+P)

9.3.5   Configuring Polling

You can **configure** polling like this:

From the **Options** menu select **Polling Options**

2. On the **Polling List** tab put checkmarks against items you want to poll

3. Click the **OK** button

4. Click the **Miscellaneous** tab

5. In the **Polling Interval** Text box type a polling interval in milliseconds

6. Click the **OK** button

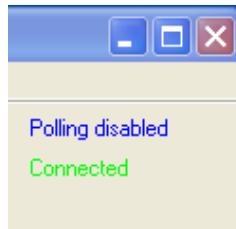### 9.3.6 Understanding Connection Status

This will show the green **Connected** caption when the application is connected to the unit. You'll see the red **Not Connected** caption if the application and unit are disconnected.
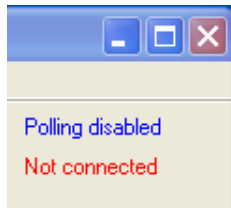
Not Connected

Check the cable connection between the PC and the device.

Check the communications port is set up correctly

Connected

This is what you want to see. It means your Control Application is communicating successfully with the device.

9.3.7 Using the Configuration Buttons

The **Configuration Buttons** are used for saving or loading a **single configuration** using a text file.

When you have put some effort into setting up a **configuration tab** just the way you want it (like Config 1 for example) you'll want to save it.

Naturally, the moment you click the **Apply** button the configuration is saved into the **device** but what if one of your colleagues changes this at some later date?

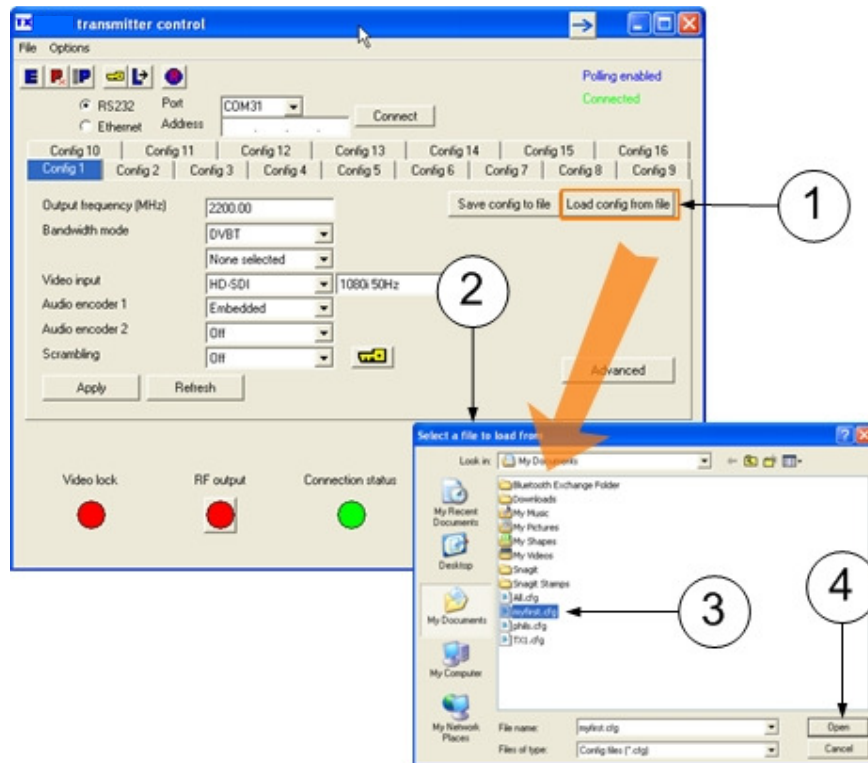### 9.3.8 Saving a Configuration

1. Set up the **Basic Setup Pane** just the way you want it.

2. Keep the selected configuration **highlighted**.

3. Click the **Save Config to file** button.
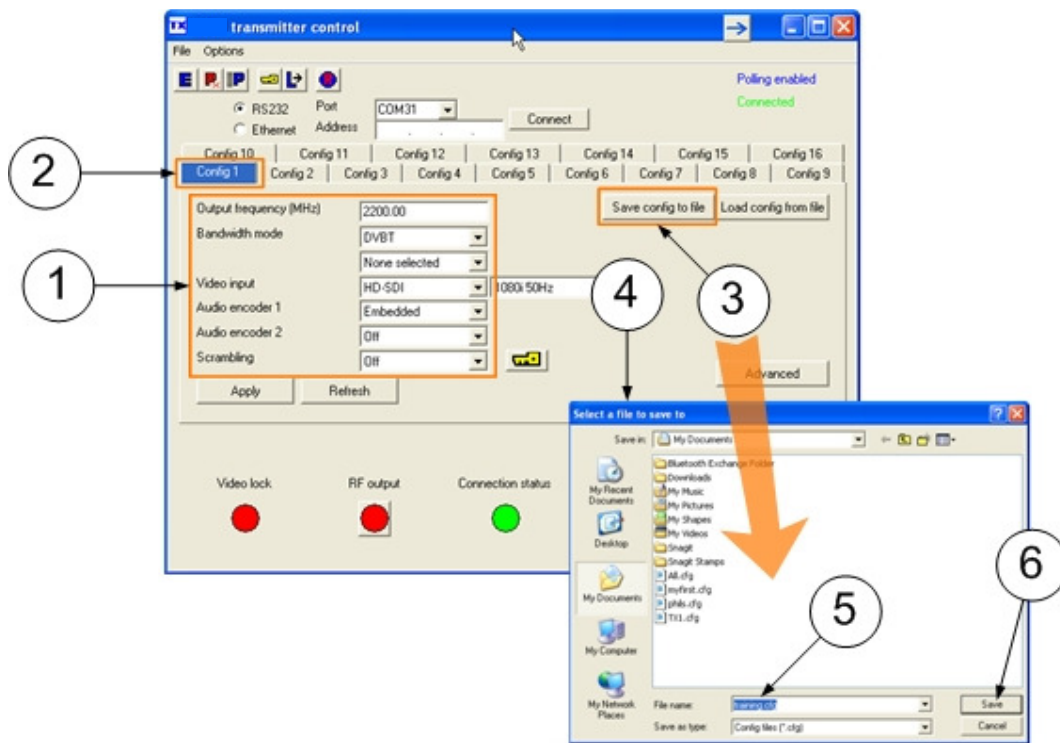
4. The **Select a file to save to** dialog box will open.

5. Type a name for the config in the **File name:** text box. (Keep the .cfg extension).

6. Click the **Save** button.

9.3.9   Loading a Configuration

1. Click the **Load Config from file** button

2. The **Select a file to load from** dialog box will open

3. **Select** the Config file you want to load.

4. Click the **Open** button.

5. Wait for several seconds, and your Config will load.

9.3.10   Opening the Advanced Options Window

1. Click the **Advanced** button.

Note: I'll tell you all about the advanced options in a later section.

9.3.11   Using the Configuration Set Buttons

Used for saving or loading **all sixteen configurations** from a text file.

When you have put some effort into setting up **all** your configuration tabs (Config 1 to Config 16) you'll want to save them in one quick action. Here's how you do that:

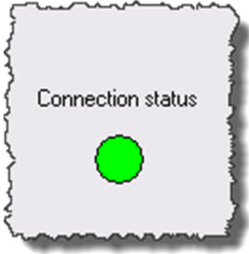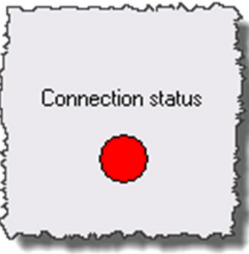## 9.3.12   Saving a Configuration Set

1. Set up all the Config tabs just the way you want them.

2. Click the **Save Config Set** button.

3. The **Select a file to save to** dialog box will open.

4. Type a name for the Config in the **File name:** text box. (Keep the .cfg extension).

5. Click the **Save** button.

6. The Please wait while the Configs are read and saved… message box opens

7. Then the **Config Set saved** alert box opens

8. Click the **OK** button

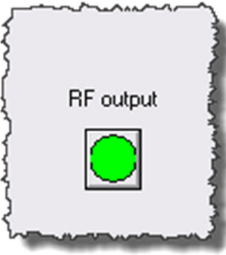## 9.3.13   Loading a Configuration Set

1. Click the **Load Config Set** button.

2. The **Open** dialog box will open.

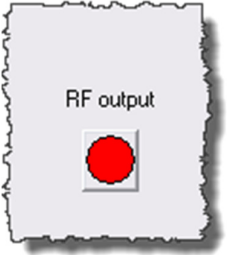3. **Select** the Config file you want to load.

4. Click the **Open** button.
5. The **Please wait while the configs are read and sent...** message box opens.
6. The **Config Set loaded** alert box opens.
7. Click the **OK** button.

9.3.14   Understanding the Connection Status Indicator

Connection Status Indicator shows...	Means...
Steady Green Aspect	Control application and device are successfully connected.
Steady Red Aspect	Control application and device are **not** connected.

9.3.15   Understanding the RF Output Indicator

RF Output Indicator shows...	Means...
Steady Green Aspect	The unit is **emitting** RF energy.

Steady Red Aspect	The unit is **not** emitting RF energy.

9.3.16 Understanding the Video Lock Indicator

Video Lock Indicator shows…	Means…
Steady Green Aspect	The unit has a **locked video** signal.
Steady Red Aspect	The unit has no video lock.

9.3.17 Using the Apply Button

Apply	Each time you change any parameter on the Control Application it is **very important** to click the **Apply** button and wait for a moment for the changes to be sent to the device. Many times people change a parameter and then wonder why the device has not changed behaviour. **Always** click the **Apply** button.

9.3.18 Using the Refresh Button

Refresh	If the **Polling is enabled** then the Control Application **will check** with the device every few seconds so it can update the Transmitter Control Window with the latest configuration changes. Sometimes, you may choose to leave **polling off**. To update the Window in this case you'll need to click the **Refresh Button** to see the latest changes.

9.3.19 Basic Setup Pane - Quick Setup

There are several **basic setup** fields that enable you to do a quick setup of the unit without getting into fine details. (We'll meet those later).

There are the **six** basic things to setup:

Basic Setting	What you can do...
Output frequency (MHz)	Type in the **frequency** that you want this device to use in megahertz (MHz).
	If you type in a frequency which is **out of range**, the unit will automatically round to the highest or lowest frequency which actually is available.
	The transmitter frequency can be set in step sizes of 125kHz.
Bandwidth mode	In this combo box the drop-down arrow enables you to choose between **DVB-T** modes.
	Note: To select 6MHz or 7MHz DVB-T modes the user must first click the **Advanced** button to enter the Advanced setting page.
Video Input	You can select the type of camera you want to connect to the transmitter.
	Note: If you select an HD Video Input a second drop-down box will open to the right where you should select the resolution and scan frequency.
Audio Encoder 1 and 2	In this combo box the drop-down arrow enables you to select the audio source.
	By default, audio encoder 1 is set to **Embedded** and audio encoder 2 is **Off**. You can select:
	Off, **Embedded** or **Analogue**
	The audio settings are optimised based on the bit rate of the selected transmit mode.
Scrambling	If the encryption option has been purchased it is possible to encrypt the link.
	In this combo box the drop-down arrow enables you to choose between various **encryption modes**. (See Note-(1)).

Note-(1): **Some** encryption modes are **licensed** features. If you are not licensed for these modes you'll be able to select them from the drop-down list but when you click the **Apply** button the combo box will drop back to **off** automatically.

9.3.20 Understanding Presets

There are **sixteen** presets available to you. You can set up just one of them if you want but it can be very useful to have all sixteen populated. Try having different frequencies and range settings available.

Then, when you just have the simple two button panel available to you on the device, you'll have maximum flexibility with settings.

9.3.21   Understanding the Toolbar
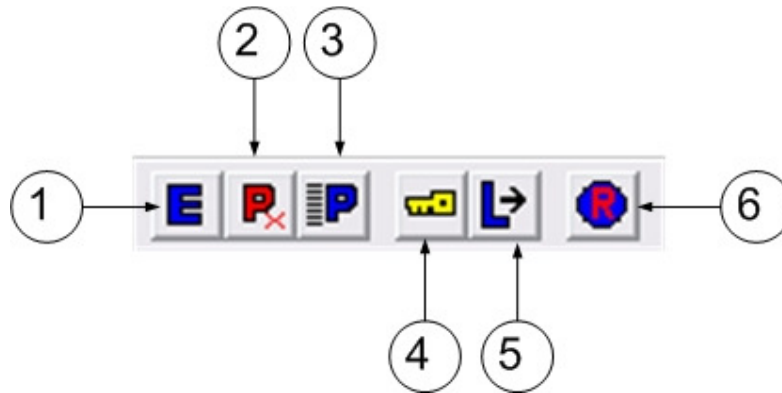
Serial	Toolbar Button	Toolbar Button
1	Engineering	Opens the **Engineering options** window. There are no operational controls here. The page is only used for engineering setups and is described in Part-C, Installation Guide.
2	Enable Polling	Makes the control application automatically refresh the data presented to you every few seconds. This button **toggles** between polling being **on** or **off**.
3	Edit Polling Options	Opens the **Polling options** window where you can set **what** will be polled (On the **polling list** tab) and **how often** it will be polled (On the **Miscellaneous** tab).
4	Write Encryption Key	Pressing the Encryption button opens the **Write encryption key** window which enables you to input a key that you want to use for this device.
5	Write Licence Code	Opens the **licence code file** window which enables you to insert a new licence into your device. The licence enables activation of extra features.
6	Restore Defaults	Clicking this button sets all of the fields back to a **factory default** condition.

9.4 Configuring the Radio

Many of the configuration tasks are best achieved by using the **Advanced Window**. This is the **Secondary** window of the Control Application. This is where you can perform all the advanced setup.

9.4.1   Opening the Advanced Options Window

To see the **Advanced Options** window:

1. Click the Advanced button on the AXTX1 Transmitter Control Window

2. The Advanced options window opens

3. Select the tab you want to work with

4. Change the parameters to give you the performance you require

5. Click the Apply button.

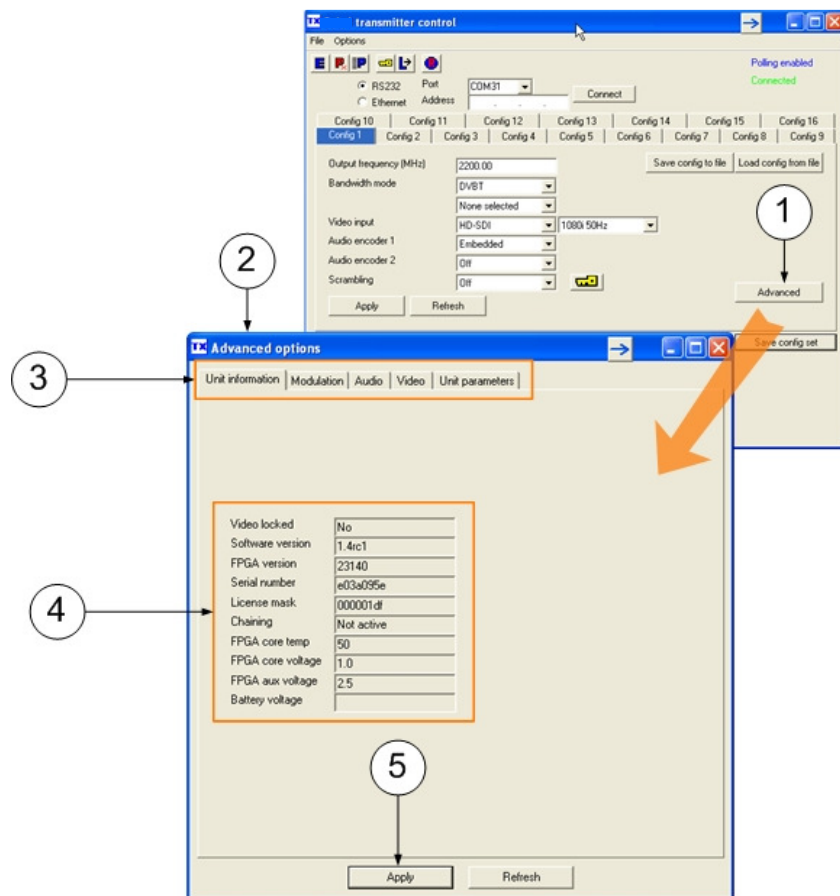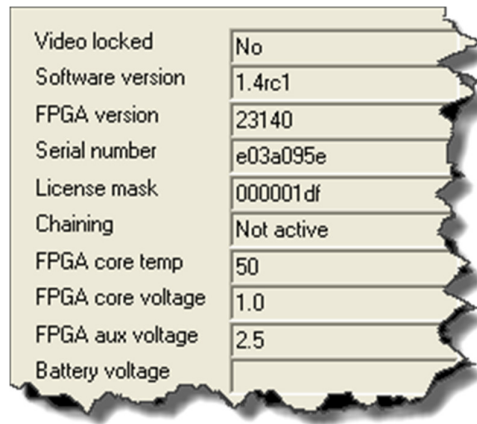**Figure 9-2 Advanced Options Window**

9.5 Understanding the Unit Information Tab

To work with the **Unit Information** tab:

1. Click the **Advanced** button on the **AXTX1 Transmitter Control** Window

2. The **Advanced options** window opens

3. Select the **Information tab**

The **unit information** fields are all greyed out. There is nothing for the operator to enter here; they are simply status results being sent back from the unit for your information.

Unit Parameter	Sample Entries	Notes
Video locked	No or Yes	Tells you if the unit has successfully locked to the incoming bit stream.
Software version	1.4c1	The version of software currently running on the device.
FPGA version	23140	The version of the Field Programmable Gate Array used in the unit.
Serial number	e03a095e	The Electronic Serial Number of the unit. The licence file is specially configured to **only** work with a device that has a matching **Electronic Serial Number**. This means the licence can only be used with the actual hardware device for which it is intended.
Licence mask	000001df	A hexadecimal mask which represents the licence codes.
Chaining	Not active	The current chaining status.
FPGA core temp	50	The temperature of the FPGA in degrees Celsius.
FPGA core voltage	1.0	The core voltage in the main processing chip on the board.
FPGA aux voltage	2.5	The auxiliary voltage in the main processing chip on the board. This is the intermediate voltage between the I/O voltage and the Core Voltage.
Battery Voltage	12	The main battery voltage (if present, only available on AXTX1).

9.6 Configuring the Modulation Tab

To work with the **Modulation** tab:

1. Click the **Advanced** button on the **AXTX1 Transmitter Control** Window

2. The **Advanced options** window opens

3. Select the **Modulation tab**

The modulation tab can best be divided into **three** sections:

- ■ Radio Settings
- ■ DVB-T Settings
- ■ Power Settings

9.6.1   Radio Settings (1)

Unit Parameter	Options	Notes
Output frequency (MHz)	L, S C and X Bands	The **frequency** in Megahertz (MHz) that you want to use for this preset. If you try to input a frequency that is **out of range**, the radio will tune the lowest available frequency automatically.
Modulation bandwidth	6, 7 & 8MHz	DVB-T bandwidths (normally broadcast)

Modulation output	Off or On	Switches the RF modulation on & off (same as the RF button on the unit)

> **Note**: When you use the **Basic Setup** parameters on the **Transmitter Control window**, what you're actually doing is pre-setting these parameters above.

9.6.2 Radio Settings Table

The RF effect of preset transmit modes differ depending on a couple of other settings.

With a SD video input source selected, modes have the following effect.

Mode	Radio Setting...	Data rate	Sensitivity
Short range	DVB-T, FEC3/4, Guard 1/32, 16QAM	18.2Mbps	
Medium range	DVB-T, FEC1/2, Guard 1/32, 16QAM	12.1Mbps	
Long range	DVB-T, FEC3/4, Guard 1/32, QPSK	9.1Mbps	
Ultra long range	DVB-T, FEC1/2, Guard 1/32, QPSK	6.0Mbps	
Extra-long range 1	2.5MHz, FEC2/3, Guard 1/16, 16QAM	4.8Mbps	-94dBm

9.6.3 DVB-T Settings (2)

On the **AXTX1 Transmitter Control** window in the **Bandwidth mode** combo box, it is possible to select **DVBT** mode. This uses a wider Bandwidth of 6, 7 or 8MHz.

When selected, this next set of **DVBT parameters** now become important. (They are ignored when we are working in narrowband or Ultra narrowband).

DVB-T stands for **Digital video broadcasting, terrestrial**. It's the same standard that's used if your digital TV at home gets its signal from a conventional antenna.

Unit Parameter	Options	Notes
DBVT FEC rate	1/2, 2/3, 3/4, 5/6 and 7/8	Default is 1/2. The forward error correction (FEC) rate which is being applied to the DVBT mode in use. Think 'data bits/all bits' 1/2 means 1 bit out of 2 bits is data and therefore 1 bit is used for error correction. Little user data means less picture quality, but

		more error correction means a more robust signal and therefore more range.
		7/8 means 7 bits out of 8 bits are data and therefore 1 bit is used for error correction.
		More user data means better picture quality, but less error correction means less robust signal and therefore less range.
DVBT guard interval	1/32, 1/16, 1/8 and 1/4	Default is 1/32. The guard interval which is being applied to the DVBT mode in use. The guard interval is a deliberate extension of the RF symbol period to give immunity to reflections. 1/32, short extension, deals with fast reflections, more data, less range. 1/4, long extension, deals with slower reflections, less data, more range.
DVBT modulation	QPSK, 16QAM and 64QAM	The COFDM constellation in use. QPSK-less user data, more robust, more range. 16QAM-more user data, less robust, less range. (link performance reduced by 5db) 64QAM-max user data, least robust, least range.
DVBT spectrum inversion	Normal or Inverted	Default is Normal. You would only use inverted if you were using a non-compliant down converter that inverted the COFDM spectrum.
DVBT 4KHz offset	None, +4KHz or -4KHz.	A legacy feature to overcome extremely narrow band interference. Enables the whole DVBT frequency to be shifted a very small amount to counter this problem.
Network Name	Unit1 is the default value. Can be anything.	This name simply differentiates one digital service from another.

9.6.4   Power Settings (3)

These settings enable you to configure some **preset radio settings** and control the **power output**. This can be useful for a quick radio setup and also for attenuating a radio quickly for use with a power amplifier for example.

Unit Parameter	Options	Notes
Preset transmit mode	None Selected, Short range, Medium range, Long range, Ultra long range,	This simply populates the **Radio Settings** section of the **advanced options** window with preset values (See Note-(1))

	Extra-long range 1	
	Extra-long range 2	
Output power	Low or High Presets: 10, 50, 100mW	How much RF power you want the transmitter to emit.
Output attenuation high (dB)	0 is default	If you have selected **High** Output power above then the attenuation here will apply.
Output attenuation low (dB)	32.00 is default	If you have selected **Low** Output power above then the attenuation here will apply.
Output attenuation preset (dB)	0.00	If you have selected **a preset (10, 50, 100, 200 or 500)** output power above then the attenuation here will apply.

9.7 Configuring the Audio Parameters

To work with the **Audio** tab:

1. Click the Advanced button on the AXTX1 Transmitter Control Window

2. The Advanced options window opens

3. Select the Audio tab
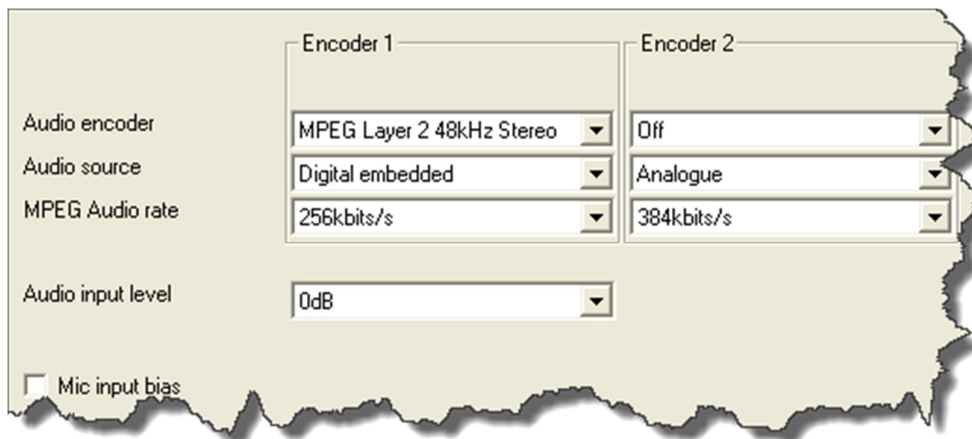
9.7.1   Audio Settings

Sometimes, you'll only want to use video on your link. In this case, you'll want to switch audio off completely.

This set of controls enables you to make decisions about the audio you plan to send over the radio link.

Note: When you click **Restore Defaults**, Encoder 1 is set back to **Embedded** and Encoder 2 is set back to **off**. This is the default condition.

Note: There are two encoders which work identically.

Unit Parameter	Options	Notes
Audio encoder	Off	You can select one of many modes to suit

	MPEG L1 48kHz stereo	operational and bandwidth requirements.
	MPEG L1 48kHz mono	As you select each of these audio modes and apply them, take a look at the Video bitrates parameter and watch it change.
	MPEG L2 48kHz stereo	
	MPEG L2 48kHz mono	The higher the audio quality used the less the video bandwidth available.
Audio source	Digital Embedded Analogue	You can select analog or digital for the audio input of the device. If you are an analog video input only analog audio will be available.
MPEG Audio rate (MPEG L1)	64, 96, 128, 160, 192, 224, 256, 288, 320, 352, 384, 416 and 448kbits/s	This is the MPEG audio encoding bit-rate. Generally the higher the number the better the quality.
MPEG Audio rate (MPEG L2)	48, 56, 64, 80, 96, 112, 128, 160, 192, 224, 256, 320 and 384kbits/s	This is the MPEG audio encoding bit-rate. Generally the higher the number the better the quality. **Note**: Bit-rates 224, 256, 320 and 384kbit/s are only available in stereo mode.
Audio input level	0db, 12db, 24db, 36db, 48db, 60dB, 72dB, 84dB, 96dB, 108dB and 120dB	Used to set the audio gain applied to the audio input signal. 0db is no gain which is the default setting. If you have low level audio sources you may want to apply more gain.

9.8 Configuring the Video Parameters

To work with the **Video** tab:

1. Click the Advanced button on the AXTX1 Transmitter Control Window

2. The Advanced options window opens

3. Select the Video tab
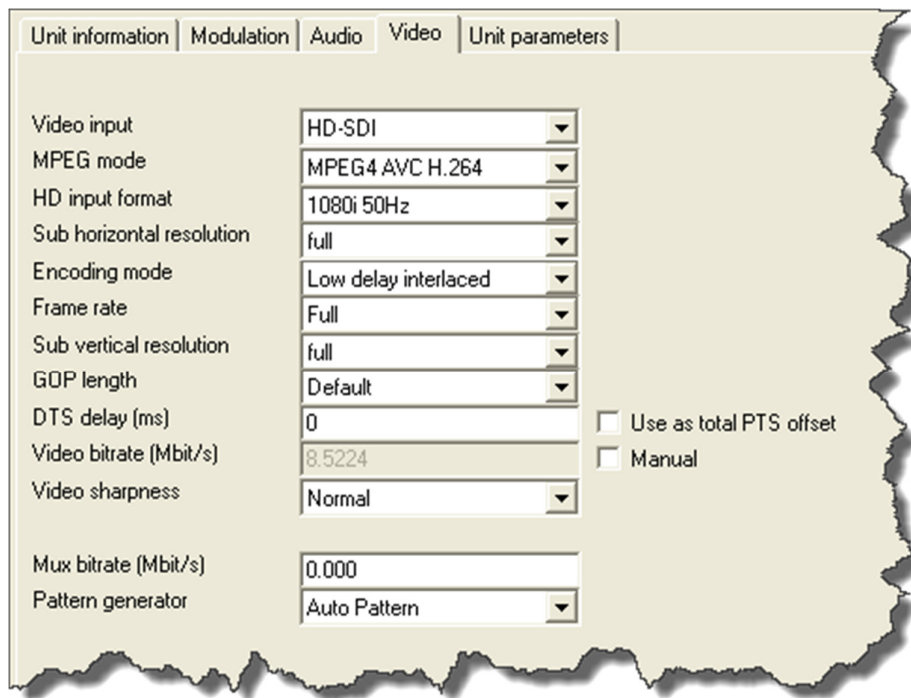
9.8.1   Video Settings

Unit Parameter	Options	Notes
Video input	Off Comp PAL Comp NTSC Comp NTSC no pedestal Comp PAL S-Video Comp NTSC S-Video Comp NTSC S-Video no pedestal SDI PAL SDI NTSC HDMI PAL HDMI NTSC HD-SDI HD-HDMI	You can select the video to be off or any available setting to suit the camera source you have.
MPEG mode	MPEG4 AVC H.264 or MPEG4 ASP	Select between MPEG4 modes.
HD input format	720p 50Hz	HD Cameras are able to produce a variety of different output formats.

	720p 59.94Hz	Simply match the output of you camera to a setting from this list to ensure the transmitter passes your video signal accurately.
	720p 60Hz	
	1080i 50Hz	
	1080i 59.94Hz	
	1080i 60Hz	
	1080p 23.976Hz	
	1080p 24Hz	
	1080p 25Hz	
	1080p 29.97Hz	
	1080p 30Hz	
	1080psf 23.976Hz	
	1080psf 24Hz	
	1080psf 25Hz	
	1080psf 29.97Hz	
	1080psf 30Hz	
Sub horizontal resolution	Full, 3/4, 2/3, 1/2, 1/4	This is the fraction of the horizontal resolution for whatever format you have selected. Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1920 is the horizontal resolution. If you choose Full then you'll see all 1920 pixels, if you choose 1/2 you'll see a down-sampled picture which requires much less bit-rate to encoder.
Encoding mode	Low delay interlaced Standard delay interlaced Low delay progressive Standard delay progressive	Default is low delay interlaced.
Frame rate	Full, 1/2, 1/4, 1/8, 1/24	If full frame rate is giving poor quality, you can step this down until you get an acceptable picture.
		Note: Using a sub-frame rate will force the Encoding mode to Standard delay progressive.
Sub vertical resolution	Full, 1/2, 1/4	This is the fraction of the vertical resolution for whatever format you have selected. Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1080 is the vertical resolution.

		If you choose Full then you'll see all 1080 lines, if you choose 1/2 you'll see a down-sampled picture which requires much less bit-rate to encoder.
		Note: Using a sub-vertical resolution will force the Encoding mode to progressive.
GOP Length	Default Intra only 2 to 64 frames	GOP means Group of Pictures. The default results in a GOP length equivalent to 1 second. (See Part-B Concept Guide, for an explanation of GOP structures). Shorter GOP, less delay, lower quality video, more error resilience. Longer GOP, more delay, higher quality video, less error resilience.
		Note: This option only affects Standard delay Encoding modes.
DTS Delay (ms)	0	Decoding Time Stamp (DTS) is used to apply an additional video decoding delay for 3rd party decoders which might require it. Audio is also delayed by the same amount to ensure synchronisation.
Manual Video Bit Rate (Mbit/s)	No Checkmark Checkmark	Normally left in automatic. You can put a checkmark in here and then the Video bit rate box will become active. Now you can manually set the video bit rate you want to use.
Video sharpness	Normal, Sharp, or De-blocking filter disabled	You can increase the sharpness of the video but you will reduce the bandwidth. De-blocking filter disabled applies to the H.264 encoder only. This option is aimed at reducing processor power needed when using a PC based software decoder. Though video quality will be reduced as a consequence.
Mux bit rate (Mbit/s)	0.000	When set to 0 the mux bit rate is defined automatically based on modulation settings. When set manually with RF output turned off. This overrides the automatic calculation. In this case it can be used to adjust the stream rate on the ASI/chaining outputs.
Pattern generator	Auto Pattern Auto Black Screen Moving Pattern Static Pattern	A series of pattern formats you can select which are displayed if video is absent, or force on for testing purposes.

	A/V Sync Disabled	
Use as Total PTS Offset	No Checkmark Checkmark	For very advanced use only. This overrides automatic PTS delay calculations with the value entered in the DTS delay option.

9.9 Configuring the Unit Parameters

To work with the **Video** tab:

1. Click the Advanced button on the AXTX1 Transmitter Control Window

2. The Advanced options window opens

3. Select the Unit parameters tab

9.9.1   Unit Parameter Settings

Unit Parameter	Options	Notes
Unit name	H.264 Unit 1	The default is H.264 Unit 1. This is an identifier for the service. This may have to match the name at the receiver for the service to be decoded depending on receiver settings.

Sleep mode	No or Yes	Default is No. The unit can be forced into a sleep mode where main functions are disabled and the power consumption is significantly reduced. Select yes to put the unit into sleep mode. Select no to bring the unit back to normal operation.
Data	Off Mode 1 8b No Parity Mode 1 8b Even Parity Mode 1 8b Odd Parity Mode 2 8b No Parity Mode 2 8b Even Parity Mode 2 8b Odd Parity Mode 2 7b No Parity Mode 2 7b Even Parity Mode 2 7b Odd Parity	Selects if RS232 data is passed over the link. You can choose to leave data turned off or select from one of the available modes. 8b (8-bit data) or 7b (7-bit data) must match the data source, as must the parity.
Data baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	This is the speed of serial data running through the unit. This must match the data source you are planning to use.
Data packet length	Default 1 to 176 Bytes	In normal operation this should be left as default. If low end-to-end data latency is required the data packet length can be reduced. However this will reduce the bit rate available for video encoding.
Scrambling	Off, ABS, AES128, AES256, BCrypt128, BCrypt256	Default is off. You can select an encryption mode here. Then you set a key.
Heartbeat enable	Off or On	Default is Off. *Heartbeat On places a small flashing block onto the video output.* This can be used to ensure the unit and link is still operational where you have a typically static video scene.
Metadata	Off or On	The transmitter can be made to send metadata (like the FPGA temperature) over the radio link. Switch this on to see this data at the receiver On-Screen Display (OSD).
On Screen Display	Service name Video source	This can be used to select overlay text which is added to the pattern generator.

	Off	
PMT PID	Default or 0x0001 to 0x1FFE	Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID). A demultiplexer extracts elementary streams from the transport stream in part by looking for packets identified by the same PID. In most applications, Time-division multiplexing will be used to decide how often a particular PID appears in the transport stream. Program Map Tables (PMTs) contain information about programs. For each program, there is one PMT.
PCR PID	Default or 0x0001 to 0x1FFE	To enable a decoder to present synchronized content, such as audio tracks matching the associated video, at least once each 100 ms a *Program Clock Reference*, or PCR is transmitted in the adaptation field of an MPEG-2 transport stream packet.
Video PID	Default or 0x0001 to 0x1FFE	Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID).
Audio 1 PID	Default or 0x0001 to 0x1FFE	Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID).
Audio 2 PID	Default or 0x0001 to 0x1FFE	Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID).
Data PID	Default or 0x0001 to 0x1FFE	Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID).

10 Care and Maintenance

10.1 General

- Do not subject the radio to physical abuse, excessive shock or vibration
- Do not drop, jar or throw the radio
- Do not carry the radio by the antenna
- Avoid exposure to excessive moisture or liquids
- Do not submerse the radio unless it is designed to be submersible
- Do not expose the radio to corrosives, solvents, cleaners or mineral spirits
- Avoid exposure to excessive cold and heat
- Avoid prolonged exposure to direct sunlight
- Do not place or leave radios on surfaces that are unstable
- Always turn the radio off before installing optional accessories
- Only use accessories intended for the specific make and model of your radio, especially batteries, chargers and power adapters

10.2 Daily Care and Charging

- Use approved batteries, chargers and adapters designed specifically for your make and model radio
- Do not attempt to charge a wet radio or battery pack
- Do not charge the radio or battery pack near anything flammable
- Stabilize the battery pack to room temperature (72 degrees F) before charging
- Do not charge radios and/or battery packs on wet or unstable surfaces
- Do not leave radios and/or batteries in chargers for excessive periods

10.3 Cleaning

- Turn off the radio and remove batteries (if applicable) before maintenance
- Use a clean, soft, damp cloth to clean the radio. A microfiber cloth is recommended
- Do not use alcohol or cleaning solutions to clean the radio
- Do not immerse the radio in water to clean it
- If the radio becomes wet, immediately dry it with a microfiber or other lint-free cloth.

10.4 Storage

- Turn off the radio and remove batteries before storage
- Store radios and battery packs in a cool, dry area at room temperature (72 degrees F).
- Do not store radios and/or batteries in active chargers

10.5 Repairs

Do not attempt any repair. The radio contains no user serviceable parts. Contact the Customer Service Centre or take it to a qualified repair technician.

11 Appendix A-Glossary

11.1 General

The glossary contains some abbreviations and terms you'll need to know.

11.2 Glossary

A	Means...
AC	**Alternating Current.** Current that is continually changing in magnitude and periodically in direction from a zero reference level.
AES	In cryptography, the **Advanced Encryption Standard** (**AES**) is an encryption standard adopted by the U.S. government. The standard comprises three block ciphers, AES-128, AES-192 and AES-256, adopted from a larger collection originally published as **Rijndael.** Each AES cipher has a 128-bit block size, with key sizes of 128, 192 and 256 bits, respectively.
Amplification	The process of increasing the strength (current, voltage or power) of a signal.
Amplitude	The level of an audio or other signal in voltage or current. The magnitude of variation in a changing quantity from its zero value.
Amplitude Modulation	Modulation in which the amplitude of the carrier wave is varied above and below its normal value in accordance with the intelligence of the signal being transmitted. Also called AM.
Analogue	**Analogue transmission** is a transmission method of conveying voice, data, image, signal or video information using a continuous signal which varies in amplitude, phase, or some other property in proportion to that of a variable.
Antenna	An **antenna** (or **aerial**) is a transducer designed to radiate or receiver electromagnetic energy (generally RF).
Antenna Bandwidth	The frequency range over which a given antenna will accept signals.
Antenna Gain	The effectiveness of a directional antenna as compared to a standard non-directional antenna. It is usually expressed as the ratio in decibels of standard antenna input power to directional antenna input power that will produce the same field strength in the desired direction. For a receiving antenna, the ratio of signal power values produced at the receiver input terminals is used. The more directional an antenna is the higher is its gain.
Attenuation	Power loss resulting from conductor resistance and dielectric loss within the insulating material used to separate the conductors.

A	Means...
ASI	**Asynchronous Serial Interface**. A streaming data interface which often carries an MPEG Transport Stream. An ASI signal can carry one or multiple SD, HD or audio programs that are already compressed, not like an uncompressed SD-SDI (270Mbs) or HD-SDI (1.45Gbs). An ASI signal can carry varying amounts of data but is always padded to run at a fixed line rate of 270 Mb/s.

B	Means...
BNC	**Bayonet Neill-Concelman –** A very common type of RF connector used for terminating coaxial cable.
Bandwidth	The width of a band of frequencies used for a particular purpose.

C	Means...
COFDM	**Coded Orthogonal Frequency Division Multiplexing** is a frequency-division multiplexing (FDM) scheme utilized as a digital multi-carrier modulation method. A large number of closely-spaced orthogonal sub-carriers are used to carry data.

D	Means...
Digital	A **digital signal** is a discontinuous signal that changes from one state to another in discrete steps.
Decibel	The standard unit used to express transmission gain or loss and relative power levels. Also written as dB
Decoder	Processor in a video receiver that converts digital video data to analogue signals for replay on analogue monitors; or in certain cases a software decoder, a program that decodes digital data for replay on the PC (decompression etc.).
Demodulate	To recover the information originally impressed on the radio wave.

E	Means...
Electromagnetic field	The field of force that an electrical current produces around the conductor through which it flows.
Electromagnetic Waves	A wave propagating as a periodic disturbance of the electric and magnetic fields and having frequency in the electromagnetic spectrum; the means by which energy is transmitted from one place to another.
Encoder	A processor in a video transmitter which converts analog video

	from a camera to digital data.

F	**Means…**
FEC	**Forward Error Correction** is a system of error control for data transmission, whereby the sender adds redundant data to its messages, also known as an **error-correction code**. This allows the receiver to detect and correct errors (within some bound) without the need to ask the sender for additional data. The advantage of forward error correction is that a back-channel is not required, or that retransmission of data can often be avoided, at the cost of higher bandwidth requirements on average. FEC is therefore applied in situations where retransmissions are relatively costly or impossible.
Firmware	Software which is installed directly on a device is intended specifically for that device and is used to control it.
FOV	**Field of View -** The field of view (also field of vision) is the angular extent of the observable world that is seen at any given moment.
Fading	A periodic decrease in received signal strength
Frequency	The rate at which a process repeats itself. In radio communications, frequency is expressed in cycles per second. Signals also have a property called wavelength, which is inversely proportional to the frequency.
Frequency Modulation	The process of varying the frequency of a carrier wave, usually with an audio frequency, in order to convey intelligence. Also called **FM**.

G	**Means…**
GHz	**Gigahertz** - One gigahertz is equal to 1,000 megahertz (MHz) or 1,000,000,000 Hz.
Gain	The increase in signal strength that is produced by an amplifier.

H	**Means…**
Hertz	One cycle per second.

I	**Means…**
IP Address	**Internet Protocol Address** – A unique numeric ID for a device within a network.

IR	**Infra-Red** - Infrared (IR) radiation is electromagnetic radiation whose wavelength is longer than that of visible light.
Impedance	The total opposition offered by a circuit or component to the flow of alternating current.

L	Means…
LOS and NLOS	**Line-of-sight** propagation refers to electro-magnetic radiation including light emissions travelling in a straight line. The rays or waves are diffracted, refracted, reflected, or absorbed by atmosphere and obstructions with material and generally cannot travel over the horizon or behind obstacles. NLOS is Non Line-of-sight.
Load	A device that consumes electrical power.
Lux	The **lux** (symbol: **lx**) is the SI unit of IL luminance and luminous remittance. It is used in photometry as a measure of the *apparent* intensity of light hitting or passing through a surface.

M	Means…
MHz	**Megahertz** is equal to 1,000,000 Hz
mW	**Milliwatt** - The milliwatt (symbol: mW) is equal to one thousandth (10^{-3}) of a watt.

N	Means…
nm	A **nanometer**; symbol **nm**, is a unit of length in the metric system, equal to one billionth of a meter (i.e., 10^{-9} m or one millionth of a millimetre).
Noise	Random pulses of electromagnetic energy generated by lightening or electrical equipment.

O	Means…
Omni directional antenna	An antenna whose radiation pattern shows equal radiation in all horizontal directions.
Oscillation	A periodic, repetitive motion or set of values (voltage, current, velocity).

P	Means…
PIR	**Passive Infra-Red** sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view.

PTZ	**Pan, Tilt and Zoom** – PTZ is a common way of referring to controllable cameras.
Propagation	A phenomenon by which any wave moves from one point to another; the travel of electromagnetic waves through space or along a transmission line.

R	**Means...**
RX	**Receiver**, an electronic device that changes a radio signal from a transmitter into useful information.
Radiate	To transmit RF energy.
Radio Frequency	Any frequency of electrical energy capable of propagation into space (usually above 20kHz). Also called RF.

S	**Means...**
SNR	**Signal to Noise Ratio** is an electrical engineering measurement defined as the ratio of a signal power to the noise power corrupting the signal. Signal-to-noise ratio compares the level of a desired signal (such as music) to the level of background noise. The higher the ratio, the less obtrusive the background noise is.
Signal	In electronics, a signal is an electric current or electromagnetic field used to convey data from one place to another. The simplest form of signal is a direct current (DC) that is switched on and off; this is the principle by which the early telegraph worked. More complex signals consist of an alternating-current (AC) or electromagnetic carrier that contains one or more data streams.

T	**Means...**
TX	A **transmitter** is an electronic device which, usually with the aid of an antenna, propagates an electromagnetic signal such as radio, television, or other telecommunications.
TNC	The **TNC (threaded Neill-Concelman) connector** is a threaded version of the BNC connector. The connector has a 50 Ω impedance and operates best in the 0–11 GHz frequency spectrum.

U	**Means...**
USB	Universal Serial Bus

V	**Means...**

VHF	**Very High Frequency** – 30 MHz to 300 MHz
V	Volt
Viterbi	The process of decoding forward error correction in the decoder.

W	Means...
Watt	The **watt** (symbol: **W**) is a derived unit of power in the International System of Units (SI). It measures rate of energy conversion. One watt is equivalent to 1 joule (J) of energy per second.
Waveform	Signal shape
Waveguide	A specially form hollow metal tube, usually rectangular in shape in cross section, used to connect a High Power amplifier to the antenna.

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