

Resource Identifier: 100322

Revision 1.0

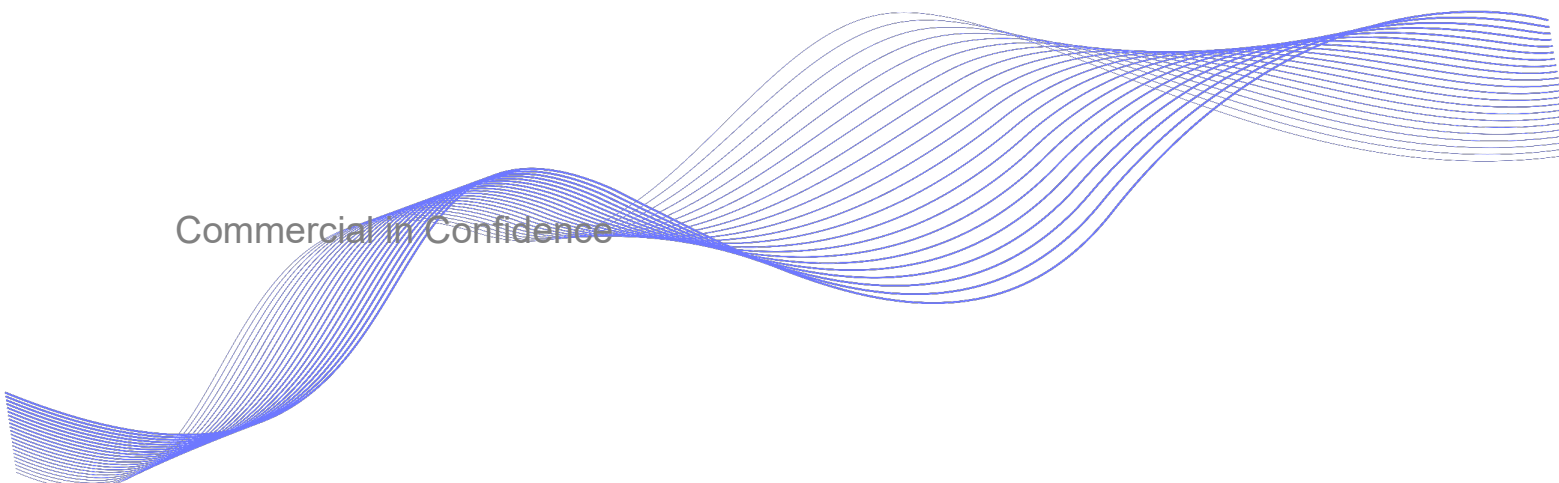


For the  
moments  
that matter

# Sapphire-BTX Setup Guide



Commercial in Confidence



## 0. Preface

### 0.1 About this Document

This document contains relevant information required to identify, install and control the equipment or system.

Since the available functions can be licensed and depend on the specific implementation, not all the functions and or applications contained in this document may be relevant or applicable to the system you will be working with.

The actual presentation may differ from those in this document due to hardware or software changes.

### 0.2 Intended Audience

This document is for anyone interested in how the system can be used, but it is of most benefit to:

- Operators who oversee the daily operation of the equipment
- Installers who are responsible for the pre-installation, on-site installation, and configuration of the system in the end-user environment
- Maintainers who are responsible for maintaining the equipment or system

### 0.3 Notice about this Publication

While every attempt is made to maintain the accuracy of the information in this product manual, it is subject to change without notice.

Performance specifications are included for guidance. All particulars are given in good faith, actual performance may vary.

### 0.4 Text Conventions

This document uses these conventions to identify text that has a special meaning:

| Description   | Example   |
|---|---|
| Text in capitals represents a key press on a keyboard.<br>The + sign means hold down the first key and press the second key.              | ESC, F1, SHIFT<br>CTRL+C                              |
| <Text> Serves as a placeholder for variable text that is replaced as appropriate, the text may be written in italics.                     | Use the filename<br><system_name>.sys for...          |
| Text in italics can represent a link to a place in the existing document (often these are hyperlinks) or a reference to another document. | Refer to <i>Section 0.4, Text Conventions</i> .       |
| Text in bold emphasises a term of significance.   | We call this a <b>protocol</b> and its function is... |
| Successive software menu selections are shown using arrows to indicate sub-menus. This is often shown in bold.                            | Select <b>Presets&gt;Streamers</b> then edit...       |

## 0.5 Symbols

These symbols are used to highlight important information.

**WARNING:** A notice of when a situation may result in personal injury or loss of life, or destruction of equipment.

**CAUTION:** A notice of when a situation may result in loss of data or damage to equipment or systems.

**Note:** A notice to draw attention to something or to supply additional information.

## 0.6 Copyright

This document contains information that is proprietary to Domo Tactical Communications (DTC) Limited trading as Domo Broadcast Systems (DBS). Any copying or reproduction in any form whatsoever is prohibited without the written permission of DTC.

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## 0.7 Related Documents

All DTC documents can be downloaded from WatchDox, see *Section 8.1*.

| Document            | Source   |
|---------------------|--|
| MASH Serial Guide   | Describes the serial control protocol  |
| MASH REST API Guide | Describes the REST API control over IP   |
| MASH Schemas Guide  | Explains the contents of schemas from the unit.<br>Schemas are used to generate all the status/config/command web pages, options, help text etc. |

## 0.8 Document History

This is a controlled document, written and produced by the DTC Technical Publications team. Changes are recorded in the table below.

| Revision | Date       | Author | Summary of Changes |
|----------|------------|--------|--------------------|
| 1.0      | 28/09/2022 | IR     | First draft        |

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# 1. Product Overview

## 1.1 Description

The Sapphire Broadcast Transmitter (Sapphire-BTX) integrates a true 4K HEVC encoder with a COFDM modulator creating a single, compact package, suitable for camera-back mounting.

The Sapphire-BTX is equipped with a single video input capable of 3G HD-SDI, 6G and 12G, thus allowing video formats to UHD.

Back-to-back V-Lock or Anton Bauer battery plates facilitate pass-through power whilst an additional external power connector is provided at the base. Analogue stereo audio inputs are supported as well as camera control and Tally interfaces. An ASI transport stream interface is provided to facilitate easy connection to other modulation systems.

Sapphire-BTX is equipped with a high-quality, low-latency H.265 (H.264 is also available) encoder capable of UHD and HD formats in 10bit 4:2:2 with automatic HDR support.

Up to 8 stereo pairs of audio in either MPEG-1 layer 1, or PCM format (4 stereo pairs in AAC-LC) can be extracted and encoded by The Sapphire-BTX whilst analogue audio inputs with power are included for direct microphone connection.

Camera control and transmitter settings are accessible through a single colour panel on the side or using the web browser interface.

Bi-directional camera control is a hardware option in the Sapphire-BTX.

## 1.2 Basic Specifications

|                          |                           |
|--------------------------|---------------------------|
| <b>DC Input</b>          | 9-36VDC                   |
| <b>Power consumption</b> | 25W typical @ 4K encoding |
| <b>Temperature range</b> | -10 to +50°C              |
| <b>Dimensions</b>        | 155mm x 95mm x 33mm       |
| <b>Weight</b>            | 500g                      |

**Note:** Detailed technical specifications are given in the product datasheet. Please contact DBS for latest specifications.

## 1.3 Approval Notices

### 1.3.1 EMC/Safety and CE Marking

The equipment has been designed to meet and has been tested against harmonized EMC and safety standards. The CE Declaration of Conformity as well as the technical file are available on request.

## 2. Product Package

### 2.1 Overview

Carefully open the packaging and verify that all the parts have been included, as ordered. Retain the packing materials for storage.

**Note:** If you do not have all the parts or are not happy with the condition of your delivered product, please contact DTC. See *Section 8.2*.

### 2.2 Parts List

These items will be in the package.

| Part Number  | Description   |
|--------------|---|
| Primary unit | Sapphire Camera Back Transmitter (see variants below) |
| CAB0035      | BTX power cable                                       |
| CAB008       | Stereo audio input cable                              |

### 2.3 Variants

This part number will identify the product; it is also on the label.

| Part Number   | Description  |
|---------------|--|
| BTX-200270-AB | Sapphire Camera Back TX 1980-2700MHz, AB battery mount     |
| BTX-200270-V  | Sapphire Camera Back TX 1980-2700MHz, V-lock battery mount |
| BTX-310360-AB | Sapphire Camera Back TX 3100-3600MHz, AB battery mount     |
| BTX-310360-V  | Sapphire Camera Back TX 3100-3600MHz, V-lock mount battery |
| BTX-440500-AB | Sapphire Camera Back TX 4400-5000MHz, AB battery mount     |
| BTX-440500-V  | Sapphire Camera Back TX 4400-5000MHz, V-lock mount battery |
| BTX-550600-AB | Sapphire Camera Back TX 5500-6000MHz, AB battery mount     |
| BTX-550600-V  | Sapphire Camera Back TX 5500-6000MHz, V-lock mount battery |

## 2.4 Camera Control Options

The Sapphire-BTX can include a camera control module. These are the camera control options which can also be ordered as an upgrade.

| Part Number          | Description                           |
|----------------------|---------------------------------------|
| VS-CCCAM-ARRI-UP-SAP | Hitachi camera control and cable      |
| VS-CCCAM-GV-UP-SAP   | Grass Valley camera control and cable |
| VS-CCCAM-H-UP-SAP    | Hitachi camera control and cable      |
| VS-CCCAM-I-UP-SAP    | Ikegami camera control and cable      |
| VS-CCCAM-P-UP-SAP    | Panasonic camera control and cable    |
| VS-CCCAM-S-UP-SAP    | Sony camera control and cable         |

## 2.5 Licensing

Some product functions are enabled by licenses. The license for your product can be viewed in the control software, see *Section 5.10*.

| Description       | Included/Optional |
|-------------------|-------------------|
| Encode            | Included          |
| H.265 HEVC        | Included          |
| H.264 AVC         | Included          |
| MPEG-2            | Included          |
| UHD               | Optional          |
| Ultra Low Latency | Included          |
| 10-bit            | Included          |
| 4:2:2             | Included          |
| PxF               | Optional          |
| DES               | Optional          |
| BISS              | Optional          |
| Recording         | Optional          |
| IP Streaming      | Optional          |
| MPEG-1 ULL        | Included          |
| 4KDCI             | Optional          |



## 3. Connections, Controls, and Indicators

### 3.1 Introduction

This chapter will help identify all the connections and interfaces of the product needed to install, control, and monitor the device.

### 3.2 Bottom Panel



**Note:** See *Section 3.6* for pinout.

| No. | Item                  | Connection   |
|-----|-----------------------|--|
| 1   | RJ45 jack             | Gigabit Ethernet connection for web user interface control and IP streaming.   |
| 2   | Hirose 6-way (male)   | 9-36VDC input. Connect supplied CAB0035 BTX power cable to a nominal 12V supply.   |
| 3   | Hirose 6-way (female) | CAB008 can connect here to provide a stereo analogue audio input.  |
| 4   | BNC socket (75Ω)      | SDI video input.<br>Supports 12G-SDI, 6G-SDI, or 3G-SDI video formats.   |
| 5   | Video input LED       | Dual colour LED: <ul style="list-style-type: none"> <li>• <b>Red</b> – no video lock</li> <li>• <b>Green</b> – video lock</li> </ul> |
| 6   | BNC socket (75Ω)      | ASI video output.  |

### 3.3 Top Panel



| No. | Item            | Connection  |
|-----|-----------------|---|
| 1   | N-type (female) | RF out antenna connector.   |
| 2   | LED             | The LED will flash when camera control data is received.  |
| 3   | SMA (female)    | Camera control telemetry antenna connector.<br><b>Note:</b> RF In will be non-functional for units without the camera control option. |

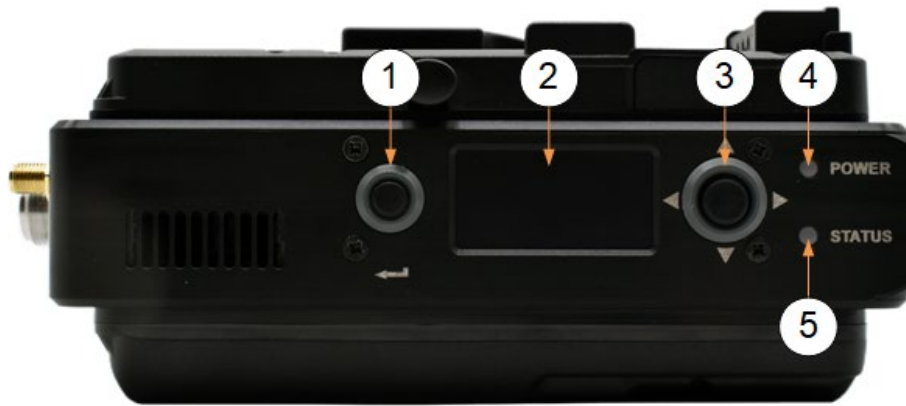
### 3.4 Data Panel



**Note:** See *Section 3.6* for pinout.

| No. | Item                  | Connection   |
|-----|-----------------------|--|
| 1   | On/off switch         | Controls power to the BTX only.  |
| 2   | Hirose 10-way (male)  | This is the remote-control data input/output to the camera.<br><b>Note:</b> Camera control will be non-functional for units without the camera control option. |
| 3   | Hirose 4-way (female) | Tally light connection.<br><b>Note:</b> Tally will be non-functional for units without the camera control option.  |
| 4   | Hirose 6-way (male)   | Auxiliary data connector. Typically used to transmit GPS data from an external device.   |

### 3.5 LED Display Panel



| No. | Item           | Connection   |
|-----|----------------|--|
| 1   | Button control | Menu cancel/back button  |
| 2   | LED display    | Display screen for status and control of the most used parameters.<br>See <i>Chapter 4</i> for a description of operation.   |
| 3   | Button control | Menu navigation/select/edit button.  |
| 4   | Power LED      | Power LED will illuminate when power is applied.   |
| 5   | Status LED     | Tri-colour LED: <ul style="list-style-type: none"> <li>• <b>Red</b> – no video lock, RF off</li> <li>• <b>Amber</b> – no video lock, RF on</li> <li>• <b>Off</b> – video lock, RF off</li> <li>• <b>Green</b> – video lock, RF on</li> </ul> |

## 3.6 Pinout

### 3.6.1 9-36V DC

Mating part: Hirose HR10-7P-6S(73)

| Pin | Function |
|-----|----------|
| 1   | VIN      |
| 2   | VIN      |
| 3   | VIN      |
| 4   | GND      |
| 5   | GND      |
| 6   | GND      |

### 3.6.2 AUDIO

Mating part: Hirose HR10A-7P-6P(73)

| Pin | Function    |
|-----|-------------|
| 1   | AUDIO IN L+ |
| 2   | AUDIO IN L- |
| 3   | GND         |
| 4   | AUDIO IN R+ |
| 5   | AUDIO IN R- |
| 6   | GND         |

### 3.6.3 CAMERA CONTROL

Mating part: Hirose HR10A-10P-10S(73)

| Pin | Function             |
|-----|----------------------|
| 1   | CAM CTRL TX+ (RS422) |
| 2   | CAM CTRL TX- (RS422) |
| 3   | CAM CTRL RX+ (RS422) |
| 4   | CAM CTRL RX- (RS422) |
| 5   | GND                  |
| 6   | CAM CTRL TX (RS232)  |
| 7   | CAM CTRL RX (RS232)  |
| 8   | NC                   |
| 9   | NC                   |
| 10  | GND                  |

### 3.6.4 TALLY

Mating part: Hirose HR10A-7P-4P(73)

| Pin | Function |
|-----|----------|
| 1   | GND      |
| 2   | VOUT     |
| 3   | RED      |
| 4   | GREEN    |

### 3.6.5 AUX

Mating part: Hirose HR10-7P-6S(73)

| Pin | Function |
|-----|----------|
| 1   | RS232 TX |
| 2   | RS232 RX |
| 3   | GND      |
| 4   | USB D+   |
| 5   | USB D-   |
| 6   | 5V       |

## 4. LED Display Control

### 4.1 Power

The Sapphire-BTX can be powered by two sources:

- Via a battery – AB or V mount depending on the device battery plate
- Via 9-36VDC input to the 6-way Hirose (male) power connector

The power switch should be used to control power to the device (see *Section 3.4*). When the power is switched on, the power LED will be illuminated (see *Section 3.5*) and the unit will boot up.

### 4.2 Introduction

Some product features are licensed and may not be available for selection. See *Section 2.5* for license options.

The Sapphire-BTX has an LED display and control buttons which can be used to monitor and configure the BTX without the need to connect to a PC device.

When the unit has fully booted, the LED display will show the status screen.



The display will go to sleep and display a blank screen after approximately 30s of inactivity.

## 4.3 Control Buttons

The LED display is controlled using the buttons situated either side of the display. Either button can be used to wake up the screen if it is in sleep mode (display off).



### Left Button

The left button is the cancel/back button. Press this button to return to the previous menu or cancel changes to a setting.

### Right Button

The right button is the navigate/select/edit button.

- To navigate the display, push the button up or down through the menu.

**Note:** A good tip is to use a fingernail to control navigation.

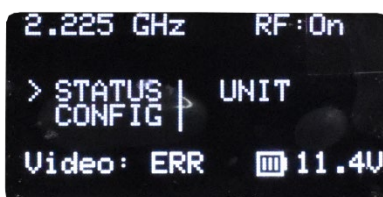
- Press the button to select a chosen menu or parameter.
- To edit, use the up/down and left/right buttons to change the setting as applicable. Press to enter the changed value.

## 4.4 LED Display Menus

### 4.4.1 Control Menu

When the unit has booted, it will enter the status menu. To return to the control menu, press the cancel button.

The control menu shows the top-level categories.





### 4.4.2 Status Menu

The Status menu provides information only of the current settings. It also allows you to monitor key indicators.

Navigate through the pages by pressing up/down on the right button.



### 4.4.3 Config Menu

The Config menu will allow you to navigate the transmitter configuration parameters.

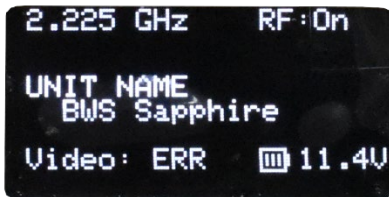
Navigate through the pages by pressing up/down on the right button. Each Config page will have sub-menus which will allow you to select and edit parameters.



### 4.4.4 Unit Menu

The Unit menu will allow you to navigate settings which are specific to the device such as unit name, IP, and fan settings. The unit menu will allow you to restore the device to factory default settings, if necessary.

Navigate through the pages by pressing up/down on the right button.



## 5. Web Browser Control

### 5.1 Power

The Sapphire-BTX can be powered by two sources:

- Via a battery – AB or V mount depending on the device battery plate
- Via 9-36VDC input to the 6-way Hirose (male) power connector

The power switch should be used to control power to the device (see *Section 3.4*). When the power is switched on, the power LED will be illuminated (see *Section 3.5*) and the unit will boot up.

### 5.2 Introduction

Some product features are licensed and may not be available for selection. See *Section 2.5* for license options.

The Sapphire-BTX has a comprehensive web user interface (WUI) for detailed monitoring and control. The WUI is accessed via a web browser using the IP address of the BTX, so an Ethernet connection to a PC device is required.

Our devices are shipped to you with the IP DHCP setting enabled. This means that if the Sapphire-BTX is connected to a network which is administered by a DHCP server, the IP address will be automatically assigned. If the device is connected to a network which does **not** have a DHCP server, contact your Network Administrator for an IP address you can use.

Re-configuration of the IP settings can be achieved via the web interface (see *Section 5.7*), or via the LED display control (see *Section 5.3.2*).

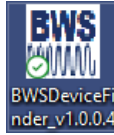
**Note:** If you are using a standalone PC or laptop, you will need to set the IP address of the PC to match the IP address range of the device. Refer to *Section 7.1* to find out how to do this.

## 5.3 IP Address Identification

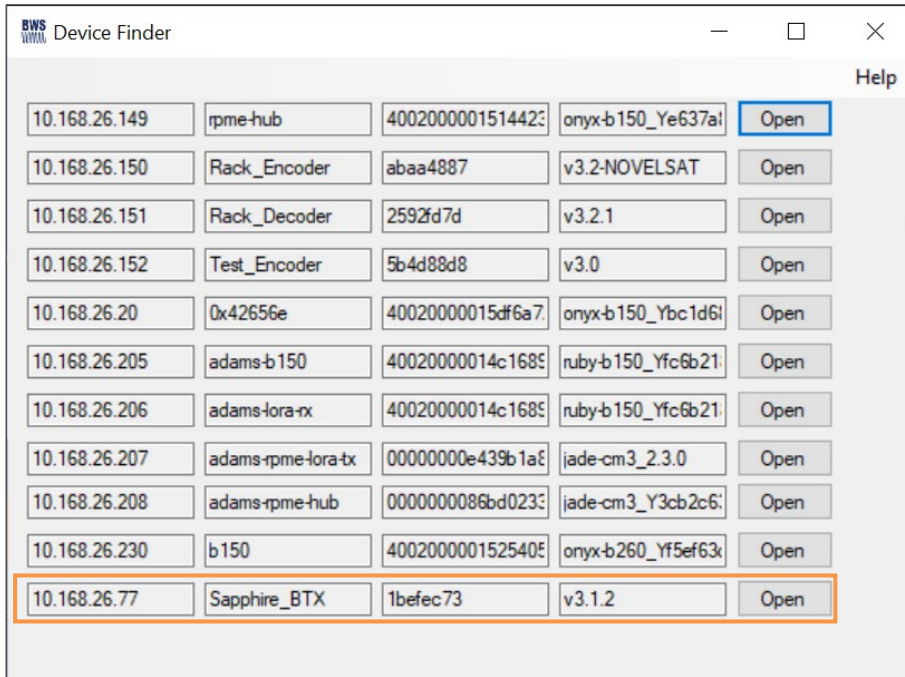
### 5.3.1 Device Finder

DBS' **Device Finder** application can be used to identify DBS product IP addresses on a network.

Device Finder comes as a simple executable file which can be downloaded from DTC's WatchDox facility, see *Section 8.1*. This can be saved to the PC desktop.



Double-click the Device Finder executable to open the application. All DBS devices attached to the network will be detected. Click **Open** to initialise communications with your PC's default web browser.



### 5.3.2 LED Display

The IP address of the BTX can be found and edited, if required from the LED display. This can be useful if the device is not connected via a DHCP server, or the IP address does not match the subnet of the PC and the IP address settings need to be changed.

**Note:** See *Chapter 4* for details of LED display control.

The IP address can be discovered in the Unit page by scrolling down to the IP settings.

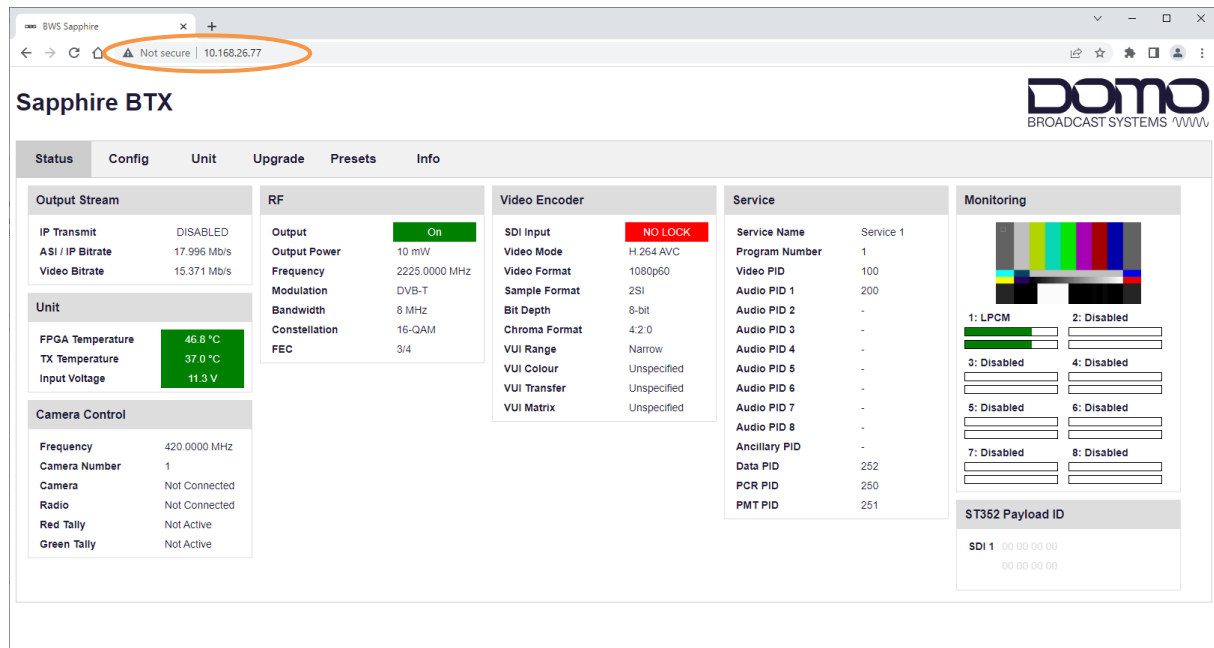
Change the **DHCP Mode** setting to **Off** if you want to enter the IP settings manually.



## 5.4 Open the Web Interface

Once the IP address has been confirmed, open a web browser on a PC device and enter the IP address of the BTX in the address bar. Alternatively, if running Device Finder, click **Open** on the line of the device address.

The web interface will open to the Status page.




The screenshot shows a web browser window with the address bar containing "10.168.26.77". The page title is "Sapphire BTX" and the Domo logo is in the top right. The interface is divided into several sections:

- Status:** IP Transmit (DISABLED), ASI / IP Bitrate (17.996 Mb/s), Video Bitrate (15.371 Mb/s).
- Unit:** FPGA Temperature (46.8 °C), TX Temperature (37.0 °C), Input Voltage (11.3 V).
- Camera Control:** Frequency (420.0000 MHz), Camera Number (1), Camera (Not Connected), Radio (Not Connected), Red Tally (Not Active), Green Tally (Not Active).
- RF:** Output (On), Output Power (10 mW), Frequency (2225.0000 MHz), Modulation (DVB-T), Bandwidth (8 MHz), Constellation (16-QAM), FEC (3/4).
- Video Encoder:** SDI Input (NO LOCK), Video Mode (H.264 AVC), Video Format (1080p60), Sample Format (2SI), Bit Depth (8-bit), Chroma Format (4:2:0), VUI Range (Narrow), VUI Colour (Unspecified), VUI Transfer (Unspecified), VUI Matrix (Unspecified).
- Service:** Service Name (Service 1), Program Number (1), Video PID (100), Audio PID 1 (200), Audio PID 2 (-), Audio PID 3 (-), Audio PID 4 (-), Audio PID 5 (-), Audio PID 6 (-), Audio PID 7 (-), Audio PID 8 (-), Ancillary PID (-), Data PID (252), PCR PID (250), PMT PID (251).
- Monitoring:** A color bar and signal level indicators for LPCM and other audio channels.
- ST352 Payload ID:** SDI 1 (00 00 00 00).

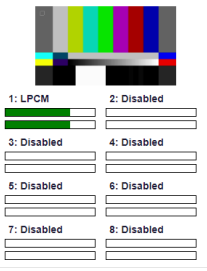
## 5.5 Status Page

The Status page provides monitoring of configuration and performance parameters. Input voltage and temperatures are colour-coded to help identify excessive measurements.



### Sapphire BTX

Status Config Unit Upgrade Presets Info

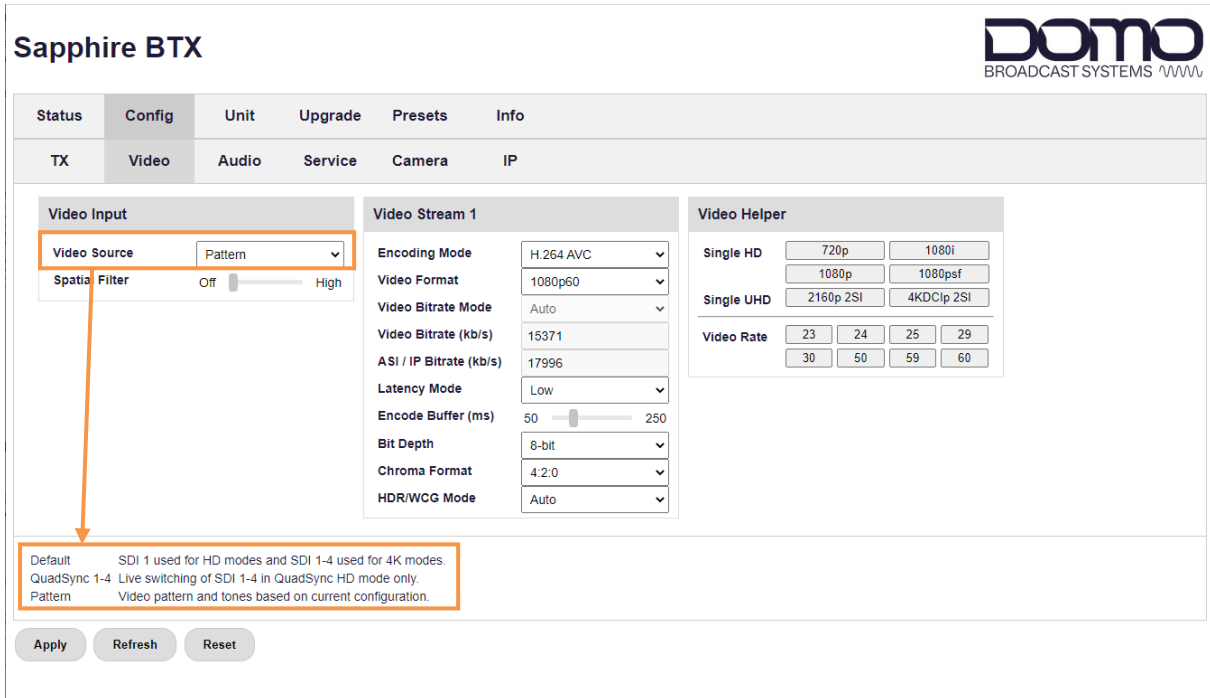
| Output Stream  | RF  | Video Encoder  | Service   | Monitoring   |
|--|---|--|---|--|
| <b>IP Transmit</b> DISABLED<br><b>ASI / IP Bitrate</b> 17.996 Mb/s<br><b>Video Bitrate</b> 15.371 Mb/s | <b>Output</b> On<br><b>Output Power</b> 10 mW<br><b>Frequency</b> 2225.0000 MHz<br><b>Modulation</b> DVB-T<br><b>Bandwidth</b> 8 MHz<br><b>Constellation</b> 16-QAM<br><b>FEC</b> 3/4 | <b>SDI Input</b> NO LOCK<br><b>Video Mode</b> H.264 AVC<br><b>Video Format</b> 1080p60<br><b>Sample Format</b> 2SI<br><b>Bit Depth</b> 8-bit<br><b>Chroma Format</b> 4:2:0<br><b>VUI Range</b> Narrow<br><b>VUI Colour</b> Unspecified<br><b>VUI Transfer</b> Unspecified<br><b>VUI Matrix</b> Unspecified | <b>Service Name</b> Service 1<br><b>Program Number</b> 1<br><b>Video PID</b> 100<br><b>Audio PID 1</b> 200<br><b>Audio PID 2</b> -<br><b>Audio PID 3</b> -<br><b>Audio PID 4</b> -<br><b>Audio PID 5</b> -<br><b>Audio PID 6</b> -<br><b>Audio PID 7</b> -<br><b>Audio PID 8</b> -<br><b>Ancillary PID</b> -<br><b>Data PID</b> 252<br><b>PCR PID</b> 250<br><b>PMT PID</b> 251 |  <p>1: LPCM      2: Disabled<br/>3: Disabled    4: Disabled<br/>5: Disabled    6: Disabled<br/>7: Disabled    8: Disabled</p> <b>ST352 Payload ID</b><br>SDI 1 00 00 00 00<br>00 00 00 00 |

## 5.6 Config Pages

### 5.6.1 Video Page/Overview

The Config pages will open to the **Video** page. The video page allows you to make changes to the video input settings.

If you click on a parameter, a useful help guide will be displayed at the bottom of the page.



**Sapphire BTX**

DOMO BROADCAST SYSTEMS WWW

Status Config Unit Upgrade Presets Info

TX Video Audio Service Camera IP

**Video Input**

Video Source Pattern

Spatial Filter Off High

**Video Stream 1**

Encoding Mode H.264 AVC

Video Format 1080p60

Video Bitrate Mode Auto

Video Bitrate (kb/s) 15371

ASI / IP Bitrate (kb/s) 17996

Latency Mode Low

Encode Buffer (ms) 50 250

Bit Depth 8-bit

Chroma Format 4:2:0

HDR/WCG Mode Auto

**Video Helper**

Single HD 720p 1080i

1080p 1080psf

Single UHD 2160p 2SI 4KDCIip 2SI

Video Rate 23 24 25 29

30 50 59 60

Default SDI 1 used for HD modes and SDI 1-4 used for 4K modes.  
 QuadSync 1-4 Live switching of SDI 1-4 in QuadSync HD mode only.  
 Pattern Video pattern and tones based on current configuration.


Apply Refresh Reset

- **Apply** – click Apply to save changes to settings and make them active.
- **Refresh** – if you make changes but do not click Save, click the Refresh button to return the current settings.
- **Reset** – the reset button will restart the software codec. During the reset, there will be a short pause in operation.

### 5.6.2 TX Page

The TX page allows you to make changes to the transmitter RF and modulation settings.

## Sapphire BTX



|        |        |       |         |         |      |
|--------|--------|-------|---------|---------|------|
| Status | Config | Unit  | Upgrade | Presets | Info |
| TX     | Video  | Audio | Service | Camera  | IP   |

| RF               |           | DVB-T          |        |
|------------------|-----------|----------------|--------|
| Output           | On        | Bandwidth      | 8 MHz  |
| Output Power     | 10 mW     | Constellation  | 16-QAM |
| Attenuation (dB) | 0.00      | FEC            | 3/4    |
| Frequency (MHz)  | 2225.0000 | Guard Interval | 1/32   |
|                  |           | Polarity       | Normal |


Apply Refresh Reset

### 5.6.3 Audio Page

The audio page allows you to make changes to the audio settings.

**Note:** Only enable audio channels that are required. Extra audio data will reduce the video bitrate and hence the video quality.

## Sapphire BTX



|        |        |       |         |         |      |
|--------|--------|-------|---------|---------|------|
| Status | Config | Unit  | Upgrade | Presets | Info |
| TX     | Video  | Audio | Service | Camera  | IP   |

### Analogue Input 1

Reference Level: +18dBu  
Gain Left (dB): 0.0  
Gain Right (dB): 0.0  
Phantom Power: Off

### Audio Helper

Standard: None, 2 Ch, 4 Ch, 6 Ch, 8 Ch, 10 Ch, 12 Ch, 14 Ch, 16 Ch

### Audio Stream 1

Source: Analogue 1  
Encoding Mode: LPCM (16-bit)  
Audio Bitrate (kb/s): 1920

### Audio Stream 2

Source: SDI 1 (G1P2)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 3

Source: SDI 1 (G2P1)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 4

Source: SDI 1 (G2P2)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 5

Source: SDI 1 (G3P1)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 6

Source: SDI 1 (G3P2)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 7

Source: SDI 1 (G4P1)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -

### Audio Stream 8

Source: SDI 1 (G4P2)  
Encoding Mode: Off  
Audio Bitrate (kb/s): -


Apply Refresh Reset



### 5.6.4 Service Page

The Service page allows you to make changes to the transport stream service settings. Scrambling is a licensed feature and may not apply.

## Sapphire BTX



|        |        |       |         |         |      |
|--------|--------|-------|---------|---------|------|
| Status | Config | Unit  | Upgrade | Presets | Info |
| TX     | Video  | Audio | Service | Camera  | IP   |

### Service 1

|                |           |
|----------------|-----------|
| Program Number | 1         |
| Service Name   | Service 1 |
| Video PID      | 100       |
| Audio PID 1    | 200       |
| Audio PID 2    | 201       |
| Audio PID 3    | 202       |
| Audio PID 4    | 203       |
| Audio PID 5    | 204       |
| Audio PID 6    | 205       |
| Audio PID 7    | 206       |
| Audio PID 8    | 207       |
| Ancillary PID  | 254       |
| Data PID       | 252       |
| PCR PID        | 250       |
| PMT PID        | 251       |

### Remux

|      |     |
|------|-----|
| Mode | Off |
|------|-----|

### Scrambling

|           |                  |
|-----------|------------------|
| DES Mode  | Off              |
| DES Key   | 0000000000000000 |
| BISS Mode | Off              |
| BISS Key  | 000000000000     |

### Ancillary

|              |     |
|--------------|-----|
| Extract Mode | Off |
|--------------|-----|

### Data


|           |             |
|-----------|-------------|
| Mode      | Internal CC |
| Baud Rate | 115200      |

Apply Refresh Reset

### 5.6.5 Camera Page

If the BTX has a camera control module fitted, the Camera page will allow you to make changes to the camera communications settings.

## Sapphire BTX



|        |        |       |         |         |      |
|--------|--------|-------|---------|---------|------|
| Status | Config | Unit  | Upgrade | Presets | Info |
| TX     | Video  | Audio | Service | Camera  | IP   |


### Camera Control

|                 |            |
|-----------------|------------|
| Frequency (MHz) | 420.000000 |
| Camera Number   | 1          |
| Camera Type     | Hitachi    |

Apply Refresh Reset

### 5.6.6 IP Page

The IP page allows you to make changes to the IP steaming settings.

**Sapphire BTX**


Status

Config

Unit

Upgrade

Presets

Info

TX

Video

Audio

Service

Camera

IP

**Stream Output**

|                 |   |
|-----------------|---|
| IP Mode         | Transmit <span style="float: right;">▼</span> |
| IP Interface    | Port 1 <span style="float: right;">▼</span>   |
| Stream Protocol | UDP <span style="float: right;">▼</span>      |
| Stream Address  | 239.16.33.210                                 |
| UDP Port Number | 10000   |
| TTL             | 64  |
| TP per IP       | 7 <span style="float: right;">▼</span>        |

**Stream Diagnostics**

|                   |             |
|-------------------|-------------|
| Estimated Bitrate | 18.379 Mb/s |
| IP Packet Size    | 1344 bytes  |

Off IP stream disabled.  
 Transmit IP stream output enabled.

Apply
Refresh
Reset

When **unicast** streaming, enter the IP address of the destination device in the Stream Address box.


When **multicast** streaming, enter a Stream Address in the multicast streaming range of 224.0.0.0 to 239.255.255.255. See table below.

| Start Address | End Address     | Description   |
|---------------|-----------------|---|
| 224.0.0.0     | 224.0.0.255     | Reserved for special well-known multicast addresses |
| 224.0.1.0     | 238.255.255.255 | Globally scoped (Internet-wide) multicast addresses |
| 239.0.0.0     | 239.255.255.255 | Administratively scoped (local) multicast addresses |

**Table 5-1: Multicast Address Uses**

## 5.7 Unit Page

The Unit page allows you to change the IP address settings for the unit. It also provides settings for fan speed, unit name and password, if required.

**Sapphire BTX**


Status
Config
Unit
Upgrade
Presets
Info

**Ethernet Port 1**

|                 |                        |
|-----------------|------------------------|
| DHCP Mode       | Off                    |
| IP Address      | 192.168.100.21         |
| Gateway Address | 192.168.0.1            |
| Subnet Mask     | 255.255.255.0          |
| MAC Address     | 74:1A:E0:80:06:12      |
| Link State Up   | RX: 57952<br>TX: 98771 |

**Global**

|                  |              |
|------------------|--------------|
| Fan Mode         | Full         |
| Idle Fan Speed   | High         |
| Record Fan Speed | Off          |
| Unit Name        | BWS Sapphire |
| Web Password     | Set          |

Off Manual IP address/gateway/subnet settings.  
On DHCP used to obtain IP address/gateway/subnet settings. DHCP service must be present.

Apply
Refresh
Restore Defaults
Reboot

- **Apply** – this button will save changes to settings and make them active.
- **Refresh** – if you make changes but do not click Apply, click the Refresh button to return the current settings.
- **Restore Defaults** – this button will return the unit to the factory settings. That is the condition that the device was originally delivered in.
- **Reboot** – this will perform a full unit reboot. During the reboot, there will be a pause in operation.

## 5.8 Upgrade Page

The Upgrade page provides the recommended method to upgrade software and licenses.

Click **Choose file** to browse to the location of the upgrade file and **Upload** to start the process. Software upgrades can take up to 10mins and power must not be interrupted during the process.

License upgrades require the device to be rebooted to enable the license.

Sapphire BTX

Status Config Unit Upgrade Presets Info

Codec Firmware

Choose file No file chosen Upload

Codec License

Choose file No file chosen Upload

## 5.9 Presets Page

The Presets page allows the user to save the current BTX settings to a file (Create), and to Import pre-saved files.

The Manage options allow you to load imported files to the BTX or download saved files to a PC.

Sapphire BTX

Status Config Unit Upgrade Presets Info

Manage

Choose File

Delete Download Load

Create

Preset Name

Preset Type Unit Save

Import


Choose file No file chosen Upload

Refresh Restore Defaults

## 5.10 Info Page

The information page provides details that may be useful during a service call, including software and hardware versions, and currently loaded licenses.

### Sapphire BTX



Status Config Unit Upgrade Presets **Info**

| Codec             |   | Licensable |                   | Support  |  |
|-------------------|---|------------|-------------------|--|--|
| Software Version  | v3.2  | Codec      | Encode            | +44 (0)1489 884550   |  |
| Hardware Version  | 00002953                                    |            | H.265 HEVC        | <a href="mailto:uk.technical.support@domotactical.com">uk.technical.support@domotactical.com</a> |  |
| Serial Number     | 1befec73                                    |            | H.264 AVC         | <a href="http://www.dombroadcast.com">www.dombroadcast.com</a>                                   |  |
| License Mask      | 0006ffff                                    |            | MPEG-2            | <a href="http://dte.watchdox.com">dte.watchdox.com</a>   |  |
| UHD               |   |            | Ultra Low Latency | <b>Documentation</b>   |  |
| 10-bit            |   |            | 4:2:2             | <a href="#">User Manual</a>  |  |
| PsF               |   |            | DES               |  |  |
| DES               |   |            | BISS              |  |  |
| Recording         |   |            | IP Streaming      |  |  |
| SRT               |   |            | MPEG-1 ULL        |  |  |
| Software Version  | v1.4.2                                      | Encode     | 4KDCI             |  |  |
| Source Repository | <a href="https://github.com">github.com</a> |            |                   |  |  |

[Diagnostic Download](#)

## 6. Basic Setup Guide

### 6.1 Introduction

This chapter explains how to make basic RF and video settings.

Only the settings for the BTX are explained. The receiving device must be configured accordingly to achieve a successful radio link.

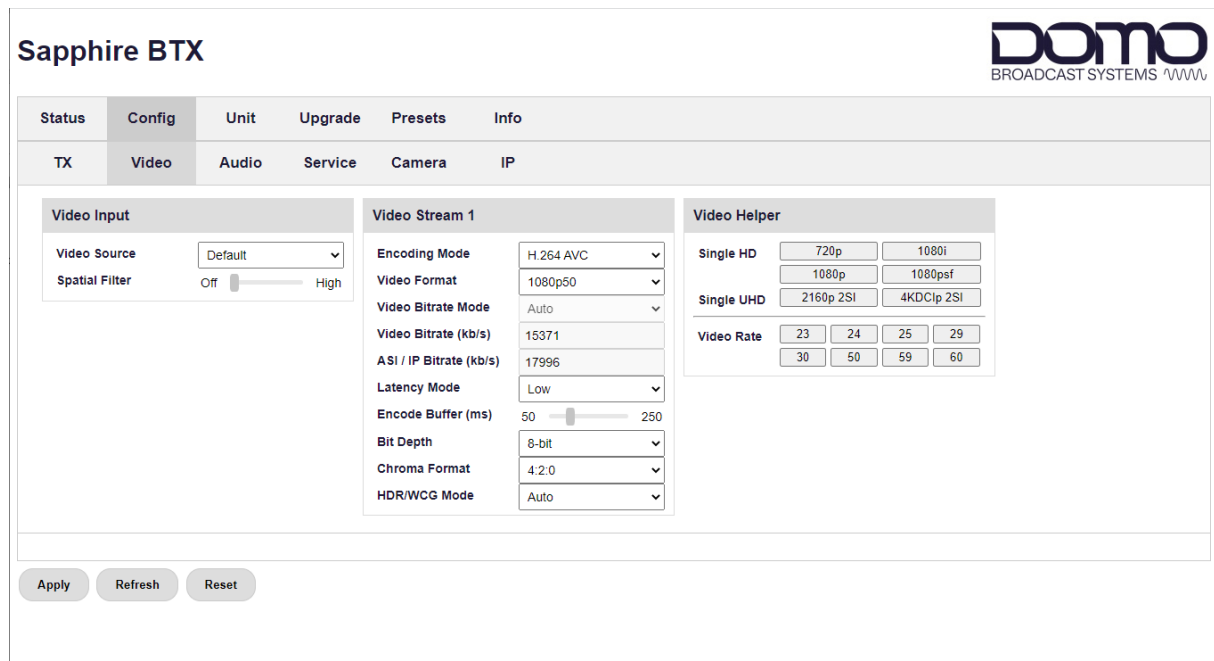
All settings are described using the web user interface, but video and RF settings can also be configured from the LED display control via the **Config** menu, see *Chapter 4*.

### 6.2 Video Setup

Ensure the BTX has a camera video source connected to the video input BNC.

Open the web interface and go to the **Config>Video** page. Set the Video Source to Default and, using the **Video Helper** tool, select the video input resolution and video rate.

Click **Apply** to make the settings active.



**Sapphire BTX**

DOMO BROADCAST SYSTEMS

Status Config Unit Upgrade Presets Info

TX Video Audio Service Camera IP

**Video Input**

Video Source: Default

Spatial Filter: Off

**Video Stream 1**

Encoding Mode: H.264 AVC

Video Format: 1080p50

Video Bitrate Mode: Auto

Video Bitrate (kb/s): 15371

ASI / IP Bitrate (kb/s): 17996

Latency Mode: Low

Encode Buffer (ms): 50

Bit Depth: 8-bit

Chroma Format: 4:2:0

HDR/WCG Mode: Auto

**Video Helper**

Single HD: 720p, 1080i, 1080p, 1080psf

Single UHD: 2160p 2SI, 4KDCIp 2SI

Video Rate: 23, 24, 25, 29, 30, 50, 59, 60

Apply Refresh Reset

Video lock can be verified in the **Status** page and/or by verifying the video input LED on the bottom panel has turned green, see *Section 3.2*.

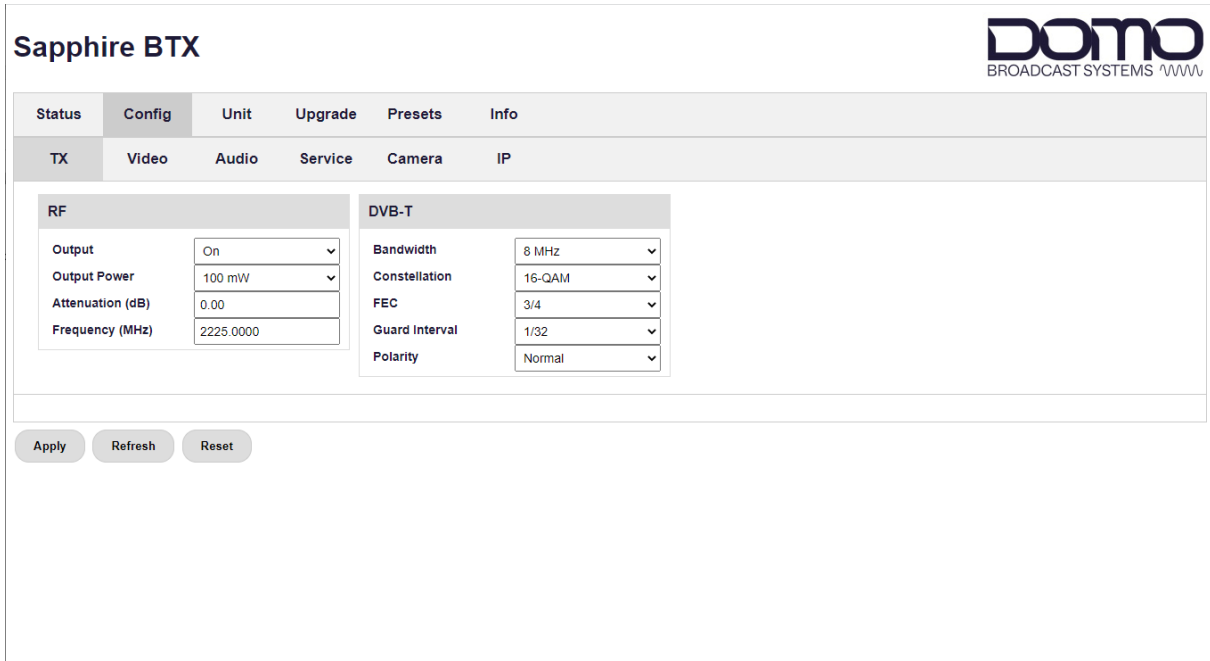
## 6.3 RF Setup

Ensure an RF antenna has been fitted to the N-type connector on the top panel. The antenna must be compatible with the transmit frequency of the BTX.

Open the web interface and go to the **Config>TX** page. Set the **Frequency** of operation and **Output Power**, as required for the deployment. The screenshot below is at full RF output power for the device with no Attenuation applied.

**Note:** Attenuation can be applied to lower the RF output power. Refer to *Section 7.2* for a dBm to Watts conversion table and example calculation.

Click **Apply** to make the settings active.



The screenshot shows the 'Sapphire BTX' web interface. At the top right is the 'DOMO BROADCAST SYSTEMS' logo. Below the title is a navigation menu with tabs: Status, Config (selected), Unit, Upgrade, Presets, and Info. Under the 'Config' tab, there are sub-tabs: TX (selected), Video, Audio, Service, Camera, and IP. The main content area is divided into two columns: 'RF' and 'DVB-T'. The 'RF' column has four settings: Output (On), Output Power (100 mW), Attenuation (dB) (0.00), and Frequency (MHz) (2225.0000). The 'DVB-T' column has five settings: Bandwidth (8 MHz), Constellation (16-QAM), FEC (3/4), Guard Interval (1/32), and Polarity (Normal). At the bottom of the interface are three buttons: Apply, Refresh, and Reset.

Ensure the RF and DVB-T modulation settings are matched in the receiver to achieve an RF lock.

## 7. Appendix A – Reference Material

### 7.1 How to Configure a PC IP Address

The following guide will tell you how to configure a PC or laptop IP address so that it matches the IP address range of the unit you are connected to. This is important because if they don't match, you will not be able to communicate with your device.

The IP address range given in this example is a good one to use if you are unsure.

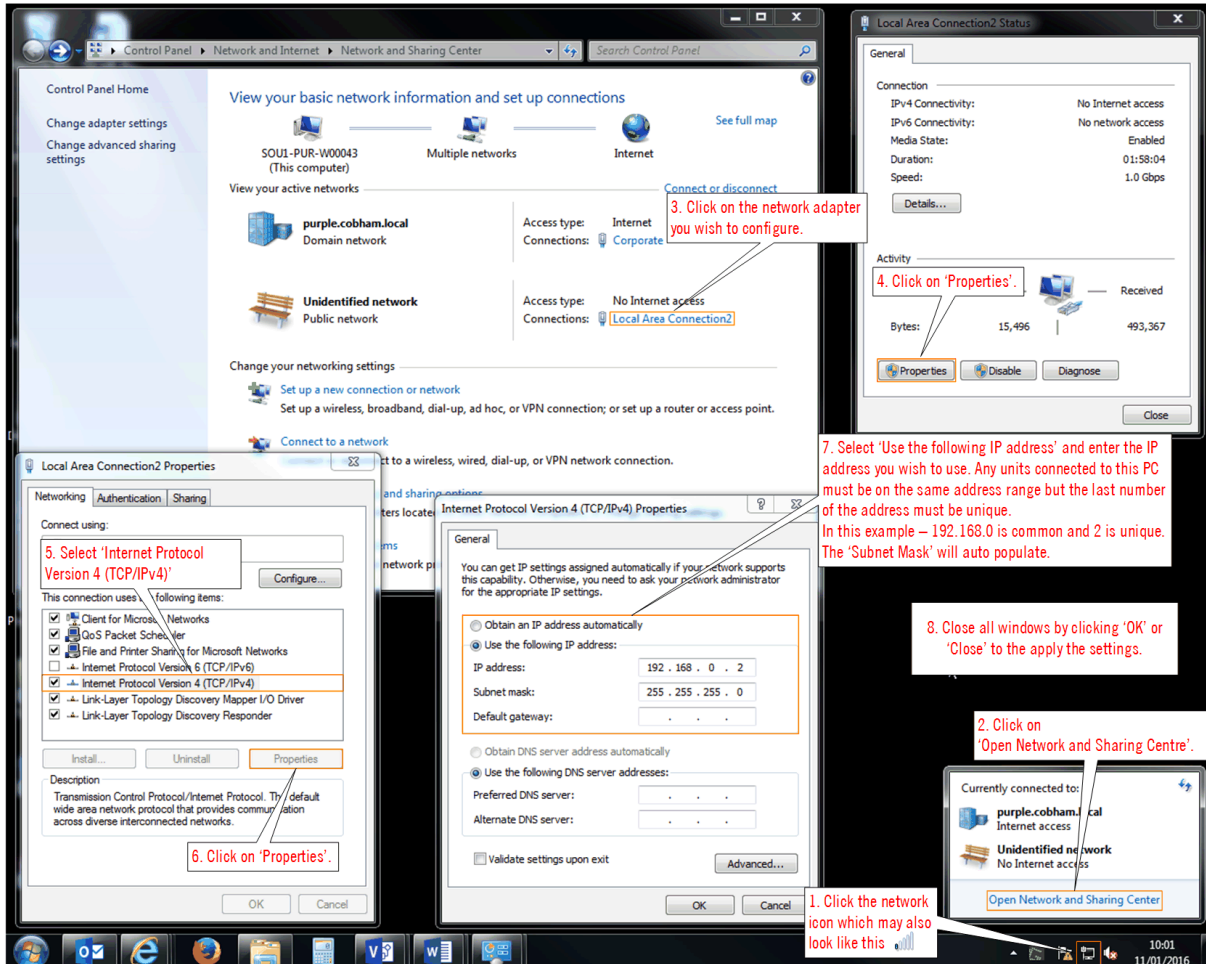


Figure 7-1 How to configure a PC IP address



## 7.2 dBm to Watts Conversion

It will be useful to know the equivalent dBm to watts power conversion when adding attenuation to the RF output. BTXs have a maximum RF output of 100mW (20dBm).

When calculating, do the sum in dBm then convert to Watts:

i.e., 20dBm-3dBm = 17dBm (50mW)

| <b>dBm</b> | <b>Watts</b> |
|------------|--------------|
| 0          | 1.0mW        |
| 1          | 1.3mW        |
| 2          | 1.6mW        |
| 3          | 2.0mW        |
| 4          | 2.5mW        |
| 5          | 3.2mW        |
| 6          | 4mW          |
| 7          | 5mW          |
| 8          | 6mW          |
| 9          | 8mW          |
| 10         | 10mW         |
| 11         | 13mW         |
| 12         | 16mW         |
| 13         | 20mW         |
| 14         | 25mW         |
| 15         | 32mW         |
| 16         | 40mW         |
| 17         | 50mW         |
| 18         | 63mW         |
| 19         | 79mW         |
| 20         | 100mW        |

## 8. Appendix B – After Sales Support

### 8.1 Documentation and Software

It is DTC's practise to make the majority of our latest user guides and software available to customers online, by using our WatchDox facility. To access this site, please contact your Account Manager or send a request to [uk.technical.support@domotactical.com](mailto:uk.technical.support@domotactical.com).

You will be sent a link where you can log in and create your own password followed by a confirmation email. Once you have done this, you can then log in to your account.

### 8.2 Contact Technical Support

The Technical Support team can be accessed by one of the following:

- **Phone US:** 1 800 665 4648. Monday to Friday 08:30-17:30 (ET)
- **Phone UK:** +44 1489 884 550. Monday to Friday 0900-1730 (UK time)
- **Email US:** [dtc.support@domotactical.com](mailto:dtc.support@domotactical.com) (no restricted content)
- **Email ROW:** [uk.technical.support@domotactical.com](mailto:uk.technical.support@domotactical.com) (no restricted content)

### 8.3 Using the DTC RMA Service

#### 8.3.1 Contact DTC

If there is a problem and our technical support team have been unable to resolve the issue, email [dtc.rma@domotactical.com](mailto:dtc.rma@domotactical.com) (US) or [solent.customerhub@domotactical.com](mailto:solent.customerhub@domotactical.com) (UK/ROW) to request a Return Material Authorisation (RMA) form.

**Note:** Alternatively, use the online form at <https://www.domotactical.com/support/>.

#### 8.3.2 Complete and Return the RMA Form

Complete the RMA form with the following information and return to the customer hub:

- Name
- Address
- Unit serial number
- Date of purchase or the original invoice number
- Date of failure
- A detailed description of the problems you have encountered
- A list of the hardware/software configuration if applicable

When the hub receives the completed form, an RMA number and shipping instructions will be sent.

#### 8.3.3 Pack the Device

**Note:** Before packing, remove all personal non-DTC kit or media from the device.

Use the original shipping container and packing materials, if possible.

If the original packing materials are not available, wrap the equipment with soft material (e.g., PU/PE form) then put the wrapped equipment into a hard cardboard shipping box.

### 8.3.4 Put the RMA Number on the Box

Clearly mark the outside of the shipping box with the RMA number. If an RMA number is not present on the shipping box, receiving will be unable to identify it and it might be returned.

### 8.3.5 Send the Box to DTC

Send the box using your normal shipping process.

## 9. Appendix C – Safety and Maintenance

**Note:** The following guidelines may or may not be applicable to your product. However, we would ask that you read them to assess their relevance.

### 9.1 Cautions and Warnings

| Area                    | Note   |
|-------------------------|--|
| Aircraft safety         | Use of this equipment on board aircraft is strictly forbidden without the required testing and qualification for aircraft type.<br><br>Use of radio transmitter equipment in an aircraft can endanger navigation and other systems without appropriate testing, or carry-on certification by a competent certified body. |
| Cables                  | Connecting cables should not be positioned where they are likely to become damaged or where they may present a trip hazard.  |
| Electrostatic discharge | ESD guidelines must be followed for this electrostatic sensitive device.   |
| Enclosures              | Do not remove any factory installed screws or fastenings as this may void any warranties.<br><br>There are no functions that require the user to gain access to the interior of the product. There are no user serviceable parts inside.   |
| 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.   |
| 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.   |
| Power supply            | Ensure that the power supply arrangements are adequate to meet the stated requirements of each product. Observe all electrical safety precautions.   |
| Risk of eye injury      | Care should be taken to avoid eye contact with the antennas.   |
| RF emissions            | When using this device please ensure 20cm is maintained between your device and your body while the device is transmitting.  |
| Thermal control system  | If you operate this device in an enclosed space, you must ensure it has adequate airflow to keep it cool.<br><br>If worn close to the body, care must be taken to protect the operator from excessive temperatures.  |
| 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.   |

### 9.2 Repairs and Alterations

Attempted repairs, alterations, improper installations or connections may invalidate the warranty.

Please contact Technical Support if you suspect a faulty or defective component. See *Section 8.2*.

## 9.3 Caring for your Equipment

- Do not subject the unit to physical abuse, excessive shock or vibration
- Do not drop, jar or throw the unit
- Do not carry the unit by the antenna
- Avoid exposure to excessive moisture or liquids
- Do not submerge the unit unless it is designed to be submersible
- Do not expose the unit 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 units on surfaces that are unstable
- Only use accessories intended for the specific make and model of your unit, especially batteries, chargers and power adapters.

## 9.4 Charging

- Use approved batteries, chargers and adapters designed specifically for your make and model unit
- Do not attempt to charge a wet unit or battery pack
- Do not charge the unit or battery pack near anything flammable
- Stabilize the battery pack to room temperature (22°C) before charging
- Do not charge units and/or battery packs on wet or unstable surfaces
- Do not leave units and/or batteries in chargers for excessive periods

## 9.5 Working with Lithium Batteries

- Charge only with the approved charging cable
- Batteries are to be used only for the specified purpose. Incorrect use will invalidate the warranty and may make the battery become dangerous.
- Charge in a clean, dry environment ideally at 10°C (0 to 45°C is permissible).
- Do not store or operate in direct sunlight for extended periods. Battery can be damaged by over-heating, for example if placed on the rear parcel shelf of a motor vehicle.
- Store in a cool dry environment. Storage at elevated temperatures can cause permanent loss of capacity.
- For short term storage (less than six months), store in a fully charged state.
- For extended periods of storage (more than one year), charge before storage and recharge every six to nine months.
- Always fully recharge the battery after any storage period greater than one month before use.
- Do not store the battery with the charge depleted as this can cause failure of the battery and invalidate warranty.
- Do not short circuit
- Do not immerse in water
- Do not incinerate. Cells are likely to explode if placed in a fire.

- Dispose of batteries in accordance with the regulations in place for the country of use. Batteries are normally considered separate waste and should not be allowed to enter the normal waste stream. Either return to the seller or deliver to an approved re-cycling facility.

## 9.6 Cleaning

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

## 9.7 Storage

- Turn off the unit and remove batteries before storage
- Store units and battery packs in a cool, dry area at room temperature (22°C)
- Do not store units and/or batteries in active chargers