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SOLH264TX Broadcast Transmitter User Guide

Wireless Broadcast Solutions, HD/SD Products, SOLO ENG H.264 SD/HD COFDM Transmitter

Commercial in Confidence

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0. Preface

0.1 About this Document

This document contains relevant details required for the Operation and Administration of the equipment or system.

Since the available functions are licenced 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.

Actual screen presentation may differ from those in this document due to software changes or your browser configuration.

0.2 Who Should Read this Publication

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

- **Operators** who are in charge of 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 Assumed Knowledge

Throughout this book it is assumed that the reader has a thorough knowledge of:

- Basic Personal Computer Operations.
- Basic Radio Frequency (RF) Principles.

0.4 Notice about Specifications

While DTC makes every attempt to maintain the accuracy of the information contained in its product manuals, the information is subject to change without notice. Performance specifications included in this manual are design-centre specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

0.5 Notice about this Guide

The product described in this manual is subject to continuous development and improvement. All particulars of the product and its use (including the information and particulars in this guide) are given by DTC in good faith. However, it is acknowledged there may be errors or omissions in this guide.

0.6 Typographic Conventions

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

Typographic Convention	Example
TEXT in small capitals represents a specific key press on the console keyboard or hardware panel .	ESC, F1, SHIFT
The + sign means “hold down the first key while pressing the second key”.	Press CTRL+C to abort
<Text> Serves as a placeholder for variable text that you will replace as appropriate to its context.	Use the filename <systemname>.sys for...
Text in bold emphasises a new word or term of significance.	We call this a protocol and its function is...
[-a] Text in these brackets indicates an optional component that can be left out.	Ls [-a]
NN This indicates a value entered on a numeric keypad .	45 on the numeric keypad
Successive menu selections are shown using arrows to indicate a sub-menu. In this example this would mean: Select the Insert menu, then select picture , then select from file .	Insert>picture>from file

0.7 Symbols

This document uses these symbols to highlight important information:

WARNING: A written notice given to a reader when a situation might result in personal injury or loss of life.

CAUTION: A written notice given when a situation might result in damage to or destruction of equipment or systems.

Note: A written notice given to draw the reader’s attention to something or to supply additional information.

0.8 Trademarks

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0.9 Related Documents

You may also need to read:

Document	Source
Solo Concept Guide	DTC
IP Concept Guide	DTC

0.10 Document History

This document was written and produced by the DTC Technical Publications Team.

This is a change controlled document. Each main page of this document displays a revision number and date at the bottom left corner of the page. The revision is also indicated in the table below.

Changes to any page will raise the revision status of the whole document.

Revision	Date	Authors	Summary of Changes
1.0	16/01/2014	RC	First release
2.0	17/01/2014	RC	
3.0	28/04/2016	IR	DTC rebrand
4.0	17/05/2016	IR	Power switch cautions.

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1. Systems Description

The subject equipment of this User Guide is:

Equipment Title	Part Number
Broadcast Transmitter	SOLH264TX –
Broadcast Camera Back Transmitter	SOLH264ENGTX-AB SOLH264ENGTX-PAG SOLH264ENGTX-V



Figure 1-1 – SOLH264TX Broadcast Transmitter

1.1 What is the SOLH264TX Broadcast Transmitter?

The SOLO H.264 Transmitter from DTC is a rugged, Standard or High Definition digital video transmitter, ideal for motorsport, airborne, sports, news links and law enforcement surveillance applications.

The H.264 Transmitter can operate in a variety of transmission bandwidths allowing the user to trade off image quality against range to suit all types of applications. Excellent range, performance and spectral efficiency are offered when operating in the optional narrow bandwidth mode, which combined with the ultra-efficient H.264 encoding, enables true broadcast quality pictures to be transmitted in only 2.5MHz bandwidth. This enables users to maximise usage of limited RF spectrum as two or three cameras can occupy the 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, HD transmission is possible using 40% lower bit-rates than conventional MPEG2 systems, enabling true HD transmission in a

single 8MHz DVB-T channel whilst using robust modulation settings. Able to transmit images in a non-line of sight environment up to 1km depending on mode and frequency, the transmitter can achieve even further range with an optional clip-on booster PA.

Greater security of the transmission can be ensured using the optional internal AES128/256.

The SOLO H.264 transmitter features mounting holes for bespoke applications and can be easily connected to any camera type. A range of camera brackets are available to facilitate easy mounting of the SOLO H.264 transmitter to satisfy many different camera styles.

For excellent range and coverage, the SOLO H.264 transmitter can be operated with the DTC Pro-RXB receiver. The Pro-RXB receiver is available with 2-way, 4-way, 6-way and 8-way diversity.

1.2 What are the Key Features of the SOLH264TX Broadcast Transmitter?

- Low delay H.264 SD & HD encoding
- HD-SDI/SDI with embedded audio input
- Composite video input
- HDMI input with embedded audio input
- ASI input and output
- DVB-T 6/7/8MHz and optional narrowband modulation
- Low power consumption 10W
- Ultra lightweight 400g

1.3 What are the Features and Benefits of the SOLH264TX Broadcast Transmitter?

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

Features and Benefits Table

Key Features	Key Benefits
Digital COFDM Modulation	Excellent performance - Resistant to multipath interference, delivers high quality video and audio, even when mobile or in built up areas like urban environments.
Low Delay H.264 SD & HD encoding.	High reliability - Use a radio system just like it was a line.
Compliant DVB-T 6/7/8MHz and optional proprietary narrowband modulation.	True multi-mode operation - Perfect integration with your current equipment, or spectrally efficient transmission modes.
ASI input and output.	Low cost of ownership - Easy connection within your current broadcast environment.

Key Features	Key Benefits
100mW RF Up-Converter.	Excellent range in non-line of sight environments like cities, stadiums and airports.
Compact and Power Efficient Transmitters. Low power consumption, 10W.	Put the transmitter just where you need it. Get those difficult links that ensure the success of your operation. Never lose a link for lack of power.
HD-SDI/SDI with embedded audio input HDMI input with embedded audio input Composite Video input	Low cost of ownership - Easy connection to your current cameras. Flexibility of using HD consumer level HDMI cameras.
1 Watt clip-on Power amplifier available (option)	Easy to use power amplifier means you can simply extend range for vehicle or aircraft operations.
Integral Encryption at AES128 or AES256 (Optional).	Secure - Preserve your security of transmission with powerful, simple to operate encryption.
Choice of L, S, C or X band solutions	Improved operational efficiency - Efficient use of limited radio spectrum. Choose the frequency that suits your operations. Select licence free bands for some operations. Avoid cluttered parts of the radio spectrum.
Sixteen Presets Available	Better use of assets and resources - You can preset frequencies, COFDM constellations, video and audio settings etc. into any of sixteen presets. Configure the whole operation in the calm of the base then the operations staff just have to quickly select the preset with the FCON panel.
Simple Field Controller control panel	Easy to use - Operations staff can make quick changes to reconfigure the transmitter. These changes are automatically made in the receiver to keep things simple.
On Screen display and PC GUI	Software Driven - Simple and fast to deploy and operate – saves you time and cost.
Variety of Receivers and Transmitters	Mix and match components to get just the set up you want to deliver coverage of many types of operations.
High reliability and availability	Reduced maintenance requirement, reduced spares holding, resulting in significant cost benefits over the life of the system.
Low Mass, ultra lightweight 370g	Suitable for light to heavy rotary and fixed wing platforms.

Table 1-1 – What are the Features and Benefits

1.4 About Applications

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

Professional Camera Back Applications – Sports and News

DTC can supply a range of brackets that enable the Broadcast transmitter to be connected to professional cameras.

The HDTXBRAC-V bracket for example enables the transmitter to be mounted at right angles on cameras such as the Thomson 8000 Series, or SONY HD C Series Cameras. The bracket sits in line on the VLock (IDX style) connector, between the camera and the battery. The camera is powered as normal from the battery, and battery power is fed to the transmitter using the cable. The HDTXBRAC-AB bracket is also available with Anton Bauer connectors.

Helicopter Integration for News and Traffic Coverage

DTC equipment has been integrated in a variety of helicopter types. The DTC system integration team can provide advice and integration guidance when installing on helicopters.

A variety of antennas are available to assist with Aircraft and Helicopter up-linking and down-linking.

1. Antenna: A variety of rigid, flexi and semi-flexi antennas are available from DTC for camera mount use.
2. The antenna should be mounted vertically ideally, and exposed to free space.
3. The equipment should not be exposed for any long periods to any form of liquids.

Integration in Vehicles

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

1. Ventilation: The equipment does not require forced air cooling, but ideally should be mounted to a metal surface for cooling effect.
2. For the additional range required in vehicle applications, the use of amplifiers should be considered. DTC offers a range of power amplifiers. 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. An appropriate cable might be RG213C/U. It is essential to minimise the distance between the amplifier and the antenna.
3. Long cable runs from the RF output to the antenna should be avoided, for maximum range.
4. The antenna should be mounted vertically ideally, and exposed to free space.
5. The equipment should be supplied with a clean supply in the range 6V to 17V and capable of 1.10A maximum at 12V. 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.
6. The video input can be connected across long video cable lengths so remotely mounted cameras should pose no problem.
7. The SOLH264TX transmitter equipment should not be exposed for any long periods to any form of liquids.

Note: The SOLO product range has been specifically designed for professional broadcast, government security and law enforcement users, the equipment will tune across frequencies that are only available to licenced government users. Non-government users should employ the equipment restricted to the licence exempt bands only typically 1.389 to 1.399GHz, 2.400 to 2.483GHz and 5.725 to 5.875GHz, or in bands specified by the appropriate authorities.

1.5 Getting an Overview of the SOLH264TX

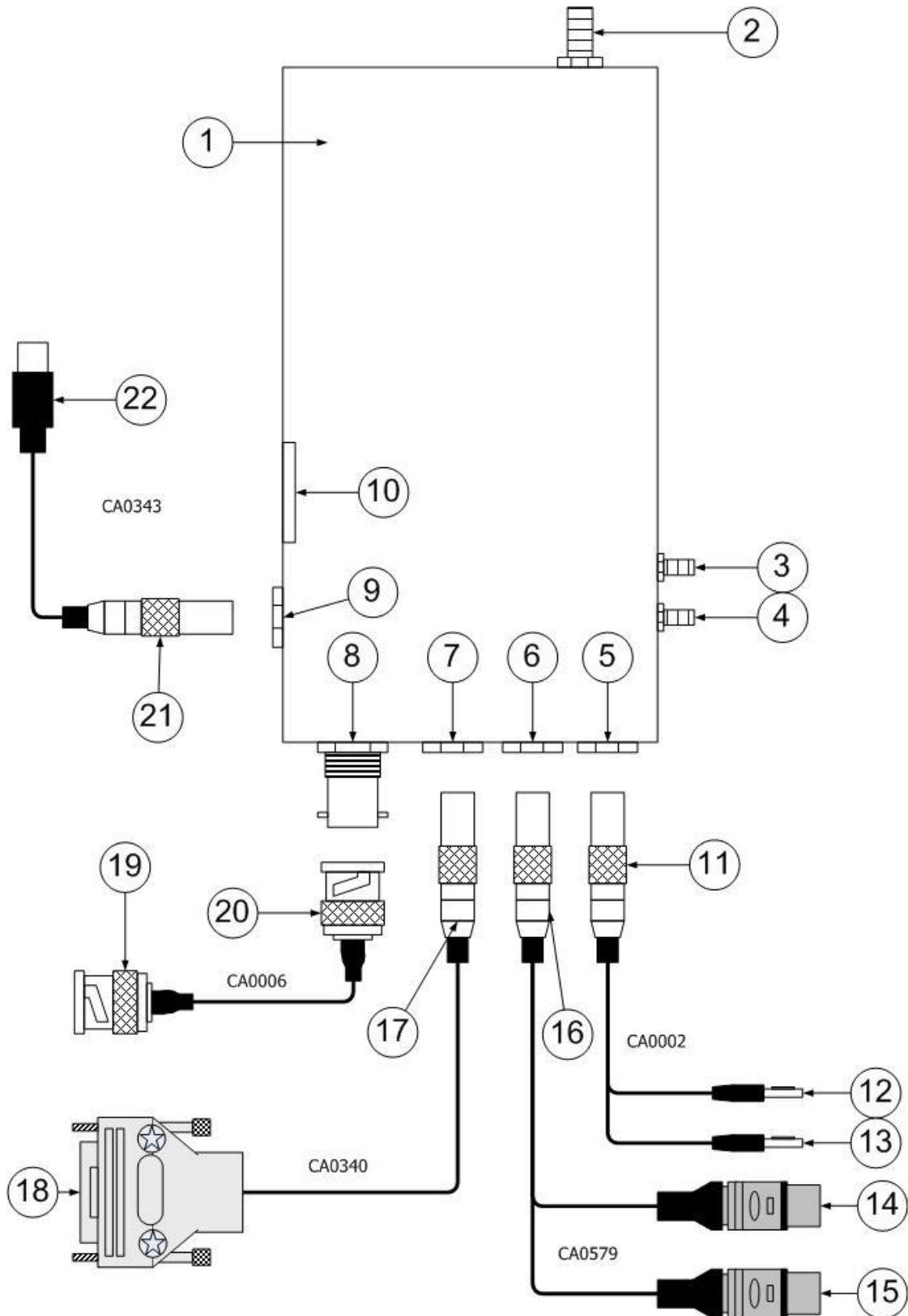


Figure 1-2 Main System Diagram, SOLH264TX

No	Item	Function
1	SOLH264TX Broadcast Transmitter unit.	Main Unit.
2	SMA 2-way receptacle (sockets).	Antennas connect here. Do not over tighten – hand tight only.
3	SMB 2-way receptacle, (sockets).	For ASI output.
4	SMB 2-way receptacle, (sockets).	For ASI input.
5	Lemo OB 4-way receptacle, (sockets).	For Power In.
6	Lemo OB 5-way receptacle, (sockets).	For audio In.
7	Lemo OB 4-way receptacle, (sockets).	For Data In.
8	BNC 2-way receptacle, (sockets).	For Video In.
9	Lemo OB 6-way receptacle, (sockets).	For RS232 Communications.
10	HDMI Type-A 19-way receptacle, (sockets).	For HD Video input.
11	Lemo OB 4-way plug, (pins).	For Power In.
12	Banana 1-way plug (pin).	Red for positive 12VDC.
13	Banana 1-way plug (pin).	Black for negative 12VDC.
14	XLR 3-way plug (sockets).	For left audio in.
15	XLR 3-way plug (sockets).	For right audio in.
16	Lemo OB 5-way plug, (pins).	For audio in.
17	Lemo OB 4-way plug, (pins).	For data in.
18	D-Type 9-way (sockets).	For data input.
19	BNC 2-way plug, (pins).	For video input from camera.
20	BNC 2-way plug, (pins).	For video input.
21	Lemo OB 6-way plug, (pins).	For RS232 Comm. From PC.
22	USB 4-way plug (pins).	For RS232 comm. To PC.

Table 1-2 – Main System Diagram Key, SOLH264TX

1.6 Getting an Overview of the SOLH264ENGTX Broadcast Camera Back Transmitter

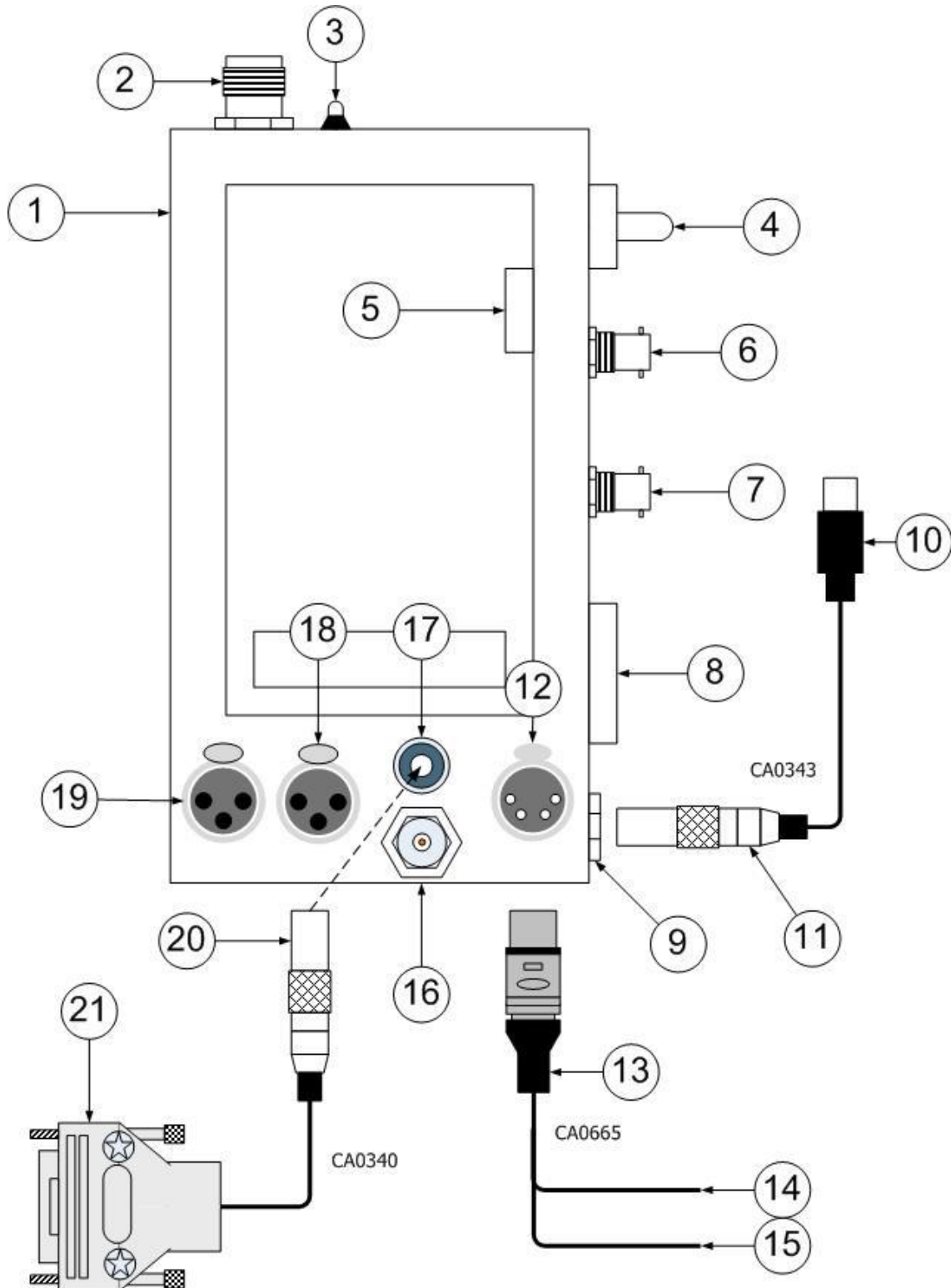


Figure 1-3 Main System Diagram, SOLH264ENGTX

No	Item	Function
1	SOLH264ENGTX Broadcast Camera Back Transmitter unit.	Main Unit.
2	N-Type 2-way receptacle (sockets).	Antennas connect here. Do not over tighten – hand tight only.
3	RF LED. (Green).	When illuminated, RF is being emitted.
4	Transmitter Power Switch	Switches the unit on or off.
		CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. Do not use force.
5	D-Tap.	Enables you to tap up to 50W of power from the battery for auxiliary use.
6	BNC 2-way receptacle, (sockets).	For ASI output.
7	BNC 2-way receptacle, (sockets).	For ASI input.
8	HDMI Type-A 19-way receptacle, (sockets).	For HD Video input.
9	Lemo OB 6-way receptacle, (sockets).	For RS232 Communications.
10	USB 4-way plug (pins).	For RS232 comm. To PC.
11	Lemo OB 6-way plug, (pins).	For RS232 Comm. From PC.
12	XLR 4-way plug (pins).	For power input.
13	XLR 4-way plug (sockets).	For power input.
14	Bare end	For Power.
15	Bare end	For Power.
16	BNC 2-way receptacle, (sockets).	For video input.
17	Lemo OB 4-way receptacle, (sockets).	For data in.
18	XLR 3-way receptacle, (sockets).	For audio right input.
19	XLR 3-way receptacle, (sockets).	For audio left input.
20	Lemo OB 4-way plug, (pins),	For data in.
21	D-Type 9-way (sockets).	For data input.

Table 1-3 – Main System Diagram Key, SOLH264ENGTX

2. Getting Started

2.1 Identifying your Device

There are two types of broadcast transmitter described in this User Guide.



This is a **Broadcast Transmitter**.

Its type designation is: **SOLH264TX-**

Size (mm): 130 (L) x 80 (W) x 30 (D).

Weight: base unit 370g.

Operating Temperature: -10 deg C to +50 deg C.

Power Consumption:

SD encoding – 9.6W.

HD encoding – 13W

Worst case with 100mW RF

DC Input 6 to 17VDC Reverse polarity protected.



This is a **Broadcast Camera Back Transmitter**.

Its type designation is:

SOLH264ENGTX-AB for the Anton Bauer mount battery plate.

SOLH264ENGTX-PAG for the PAG mount battery plate.

SOLH264ENGTX-V for the V mount battery plate.

Size (mm): 200 (L) x 110mm (W) x 71 (D).

Weight: 900g.

Operating Temperature: -10 deg C to +50 deg C.

Power Consumption: 10W.

DC Input 6 to 17VDC Reverse polarity protected.

Figure 2-1 – SOLO Broadcast Transmitters

2.2 Unpacking your SOLH264TX Broadcast Transmitter.

Carefully open the packaging and remove the device. Verify that all the components have been included in the package as shown in the packing list. Inspect the unit for shipping damage.

Retain the packing list and all the packing materials for storage.

The codes on the picture mean:

- CA – Cable Assembly
- SA – Sub Assembly
- AP – Assembly Part.

The codes are useful to you if you need to order a new cable sometime.

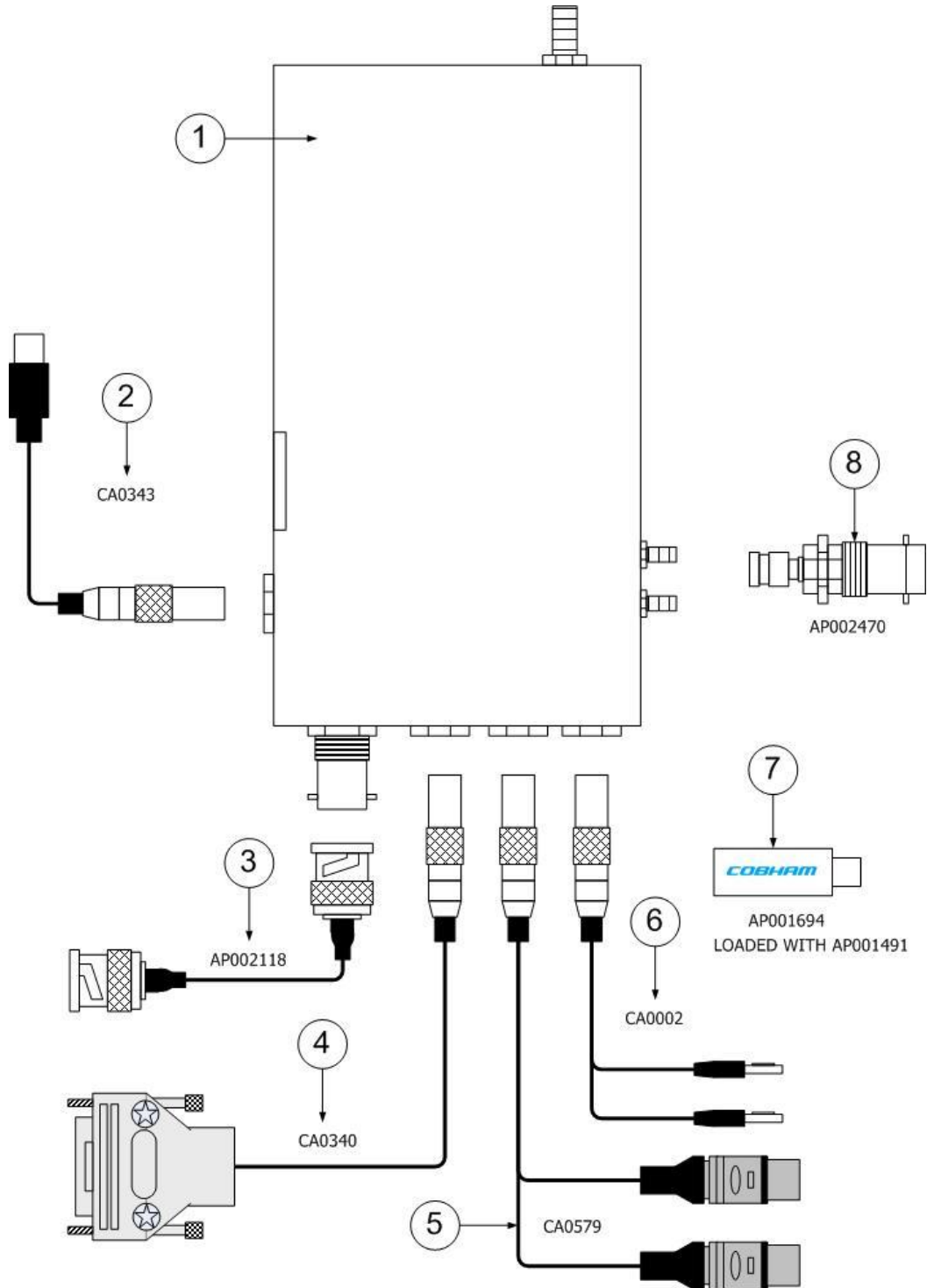


Figure 2-2 – SOLH264TX Packing Diagram

No	Item	Notes
1	Broadcast Transmitter	SOLH264TX-100150 with a frequency range of 1.00 GHz to 1.50 GHz for example.
2	Field Controller USB Cable.	CA0343 USB-A 4-way plug (pins) to Lemo OB 6-way plug (pins).
3	BNC Video Cable	AP002118 BNC 2-way plug (pins) to BNC 2-way plug (pins).
4	Broadcast Tx External RS232 Data Cable, 3 metres.	CA0340 ODU 4-way plug (pins) to D-Type 9-way (sockets).
5	HDTX External XLR Audio Cable Assembly 3M	CA0579 Lemo OB 5-way plug (pins) to XLR 3-way plug (sockets) and XLR 3-way plug (sockets).
6	SOLO 12VDC Power lead Lemo-wire 3 metres	CA0002 Lemo OB 4-way plug (pins) to Banana 1-way plug (pin) red to Banana 1-way plug (pin) black
7	Field Controller Support Software Loaded onto AP001694 1Gb USB	Field Controller Support Software (AP001491) Loaded onto AP001694 1Gb USB
8	SMB (female) to BNC (female) adaptor	AP002470

Table 2-1 – Parts in the SOLH264TX Package

2.3 Unpacking your SOLH264ENGTX Broadcast Transmitter.

Carefully open the packaging and remove the device. Verify that all the components have been included in the package as shown in the packing list. Inspect the unit for shipping damage.

Retain the packing list and all the packing materials for storage.

The codes on the picture mean:

- CA – Cable Assembly
- SA – Sub Assembly
- AP – Assembly Part.

The codes are useful to you if you need to order a new cable sometime.

The diagram illustrates the connection points for the SOLH264ENGTX transmitter. It features a central transmitter unit with several ports. On the left side, there are four circular ports: two with three pins, one with a central pin, and one with four pins. A callout labeled '6' points to a component labeled 'AP001694 LOADED WITH AP001491'. On the right side, there are two BNC connectors and two SMA connectors. A cable labeled '2' and 'CA0343' is connected to the top SMA connector. Below the transmitter, a cable labeled '4' and 'CA0340' is connected to a component labeled '4'. To the right, a cable labeled '3' and 'CA0665' is connected to a component labeled '3'. At the bottom right, a cable labeled '5' and 'AP002118' is connected to a component labeled '5'. A callout labeled '1' points to the top of the transmitter unit.

Figure 2-3 – SOLH264ENGTX Packing Diagram

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No	Item	Notes
1	Broadcast Transmitter	SOLH264ENGTX-V-100150 with a frequency range of 1.00 GHz to 1.50 GHz for example.
2	Field Controller USB Cable.	CA0343 USB-A 4-way plug (pins) to Lemo 0B 6-way plug (pins).
3	Pro-RXB/ENGTX DC Power XLR - Bare Wires Cable Assembly	CA0665 Power XLR 4-way plug (sockets) to Bare wire and Bare wire.
4	Broadcast Tx External RS232 Data Cable, 3 metres.	CA0340 ODU 4-way plug (pins) to D-Type 9-way (sockets).
5	BNC Video Cable	AP002118 BNC 2-way plug (pins) to BNC 2-way plug (pins).
6	Field Controller Support Software Loaded onto AP001694 1Gb USB	Field Controller Support Software (AP001491) Loaded onto AP001694 1Gb USB

Table 2-2 – Parts in the SOLH264ENGTX Package

Troubleshooting

☹️ I don't have all the parts you described!

😊 Call your DTC contact right away and we'll get this solved for you. See *Getting Technical Support*.

DTC – Solent Fusion 2 1100 Parkway, Solent Business Park Whiteley, Hampshire PO15 7AB, England	+44 (0)1489 566 750
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2.4 About the Labels on your Device

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

This topic contains 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.

Step 1: Identify the Enclosure External Barcode Serial Number Label

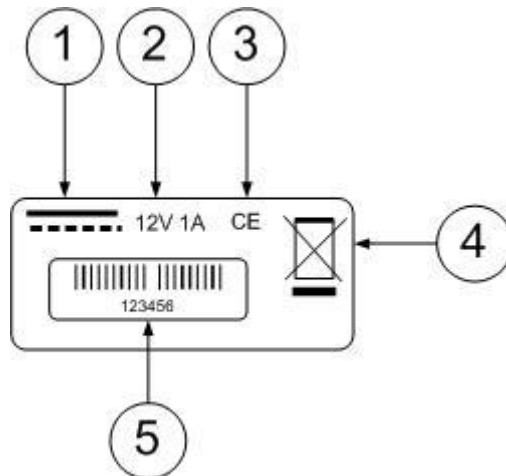


Figure 2-4 – Enclosure External Barcode Serial Number Label

No	Item
1	Indicates DC power required.
2	Power requirements. 12VDC, 1 Amp in this case.
3	The CE marking (also known as CE mark) is a mandatory conformity mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements.
4	Disposal mark.
5	Barcode with six digit serial number. We'll nearly always ask you for this number during a support call.

Table 2-3 – SOLH264TX Label Key

Step 2: Identify the Product Label

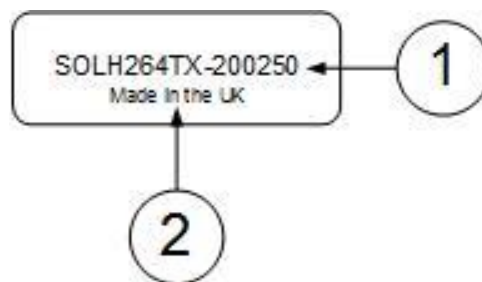


Figure 2-5 – Product Label

No	Item
1	Product code and frequency range, 2GHz to 2.5GHz in this example.
2	Country of manufacture.

Table 2-4 – Product Label Key

2.5 Planning the Hardware Installation

During the design and layout of the system, you should give careful consideration of the location of this and all other associated modules. Some of the items to consider include:

- Space - Leave at least 100mm clearance from panels to allow for cable bending.
- Proximity to other devices (for example, source equipment).
- Length of cable runs.
- Environmental conditions (temperature, humidity, etc.)
- Access for service repair.
- Compliance with local regulations.

2.6 Identifying the Variants of SOLH264TX

Step 1: Identify the Variants

Equipment Title	Part Number
Solo H.264 SD TX 340-470MHz 100mW	SOLH264TX-034047
Solo H.264 SD TX 1.0-1.5GHz 100mW	SOLH264TX-100150
Solo H.264 SD TX 1.5-2.0GHz 100mW	SOLH264TX-150200
Solo H.264 SD TX 1.98-2.7GHz 100mW	SOLH264TX-198270
Solo H.264 SD TX 2.5-3.0GHz 100mW	SOLH264TX-250300
Solo H.264 SD TX 3.0-3.7GHz 100mW	SOLH264TX-300370
Solo H.264 SD TX 3.5-4.0GHz 100mW	SOLH264TX-350400
Solo H.264 SD TX 4.0-4.5GHz 100mW	SOLH264TX-400450
Solo H.264 SD TX 4.4-5.0GHz 100mW	SOLH264TX-440500
Solo H.264 SD TX 5.0-5.5GHz 100mW	SOLH264TX-500550
Solo H.264 SD TX 5.5-6.0GHz 100mW	SOLH264TX-550600
Solo H.264 SD TX 6.4-7.5GHz 100mW	SOLH264TX-640750

Equipment Title	Part Number
Solo H.264 SD TX 8.1-8.6GHz 100mW	SOLH264TX-810860

Table 2-5 – SOLH264TX Variants

2.7 Identifying the Variants of SOLH264ENGTX

Step 1: Identify the 100mW Variants

Equipment Title	Part Number
Solo H.264 ENG SD TX 100mW 340-470MHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-034047
Solo H.264 ENG SD TX 100mW 1.00-1.50GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-100150
Solo H.264 ENG SD TX 100mW 1.50-2.00GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-150200
Solo H.264 ENG SD TX 100mW 1.98-2.70GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-198270
Solo H.264 ENG SD TX 100mW 2.50-3.00GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-250300
Solo H.264 ENG SD TX 100mW 3.00-3.70GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-300370
Solo H.264 ENG SD TX 100mW 3.50-4.00GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-350400
Solo H.264 ENG SD TX 100mW 4.00-4.50GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-400450
Solo H.264 ENG SD TX 100mW 4.40-5.00GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-440500
Solo H.264 ENG SD TX 100mW 5.00-5.50GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-500550
Solo H.264 ENG SD TX 100mW 5.50-6.00GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-550600
Solo H.264 ENG SD TX 100mW 6.40-7.50GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-640750
Solo H.264 ENG SD TX 100mW 8.10-8.60GHz with AB-Mount Battery Plate	SOLH264ENGTX-AB-810860

Table 2-6 – SOLH264ENGTX 100mW Variants

Note: These same 13 items are available with a PAG Mount Battery Plate (SOLH264ENGTX-PAG-<FREQ>) and also with a V-Mount Battery Plate (SOLH264ENGTX-V-<FREQ>).

Step 1: Identify the 500mW Variants

Equipment Title	Part Number
Solo H.264 ENG SD TX 500mW 2.00-2.50GHz with AB-Mount Battery Plate	SOLH264ENGTX500mW-AB-200250
Solo H.264 ENG SD TX 500mW 2.00-2.50GHz with PAG-Mount Battery Plate	SOLH264ENGTX500mW-PAG-200250
Solo H.264 ENG SD TX 500mW 2.00-2.50GHz with V-Mount Battery Plate	SOLH264ENGTX500mW-V-200250

Table 2-7 – SOLH264ENGTX 500mW Variants

2.8 Identifying the Options of SOLH264TX

The SOLH264TX has **two** types of options:

- Accessory Options
- Licensing Options

Step 1: Identify the Accessory Options

Equipment Title	Part Number
ASI In/Out BNCs (SOLH264ENGTX only)	TX-ASIUP
HD Encoder Upgrade	TX-HDUP
RF Band Swap	TX-RFUP-xxxxxx
V-Mount Camera Bracket	HDTXBRAC-V
Anton Bauer Camera Bracket	HDTXBRAC-AB

Table 2-8 – SOLH264TX Accessory Options

Step 2: Identify the Licensing Options

Equipment Title	Part Number
2.5MHz/1.25MHz/625kHz Narrowband Modulation	TX-NBUP
HD Encoder Upgrade	TX-HDUP
AES 128 Internal Encryption	AES128TX
AES 256 Internal Encryption	AES256TX

Table 2-9 – SOLH264TX Licensing Options

2.9 About the Software with your Transmitter

The transmitter has **two** software elements:

- **Firmware** that runs inside the device on the main board.
- **Control Application** that you run on your Windows PC.

About the Firmware

Although much of the unit is built up of hardware components, many of the sophisticated features are implemented in firmware running on a Field Programmable Gate Array (FPGA) inside the device.

When you need to perform an internal software upgrade we provide an installer pack which contains all the code you'll need to do this easily.

About the Control Application

The software tools provide users a convenient access to the most common features and functions of the device. All software tools are implemented as a Serial Control Application.

Here's what the Transmitter Control Application looks like:

Screenshot: Transmitter Control Application

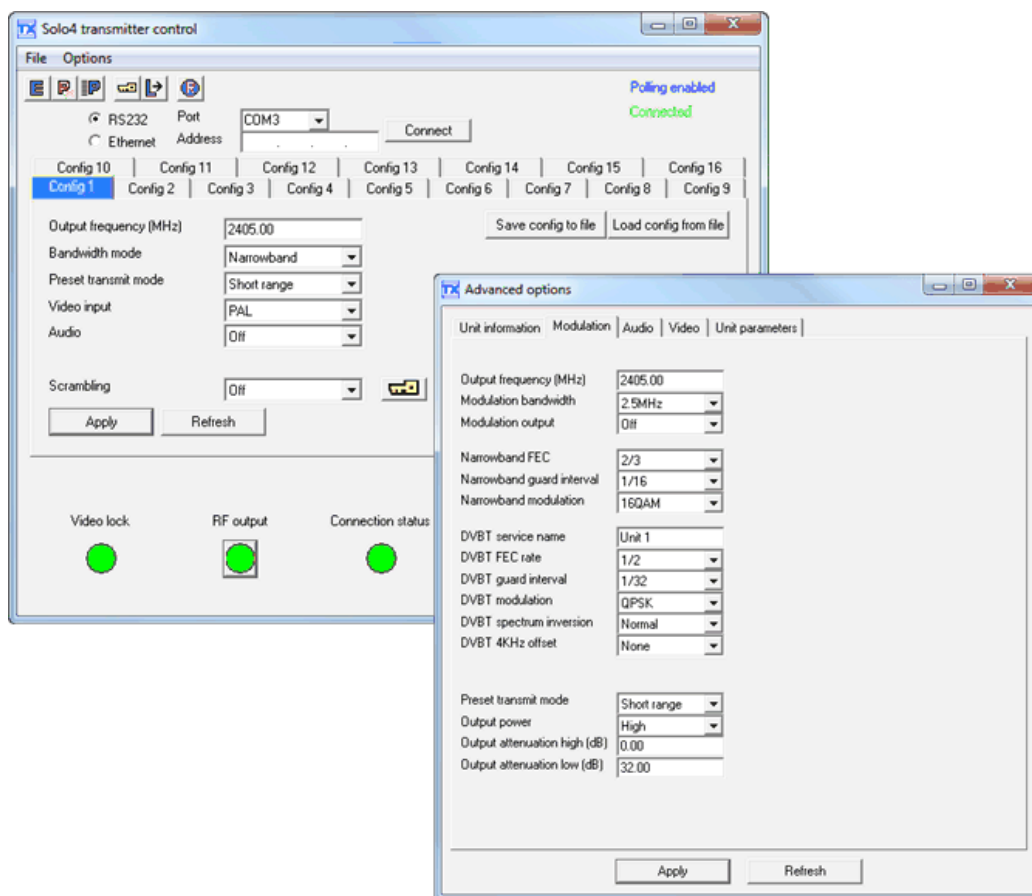


Figure 2-6 – Transmitter Control Application

3. Controls, Connections and Indicators

3.1 About Controls, Connections and Indicators

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

Each 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 panels for the SOLH264TX Broadcast Transmitter followed by the panels for the SOLSOLH264ENGTX Broadcast Camera Back Transmitter.

3.2 Exploring the Top Panel - SOLH264TX

Diagram: Top Panel



Figure 3-1 SOLH264TX Top Panel

No	Item	Used for...
1	SMA 2-way receptacle (sockets).	Antennas connect here. Do not over tighten – hand tight only.

Table 3-1 – SOLH264TX Top Panel Key

3.3 Exploring the Bottom Panel - SOLH264TX

Diagram: Bottom Panel



Figure 3-2 SOLH264TX Bottom Panel

No	Item	Used for...
1	BNC 2-way receptacle, (sockets) marked Video/SDI.	Video Input.
2	Lemo OB 4-way receptacle (sockets) marked Data.	Data Input.
3	Lemo OB 5-way receptacle (sockets) marked Audio.	Audio Input.
4	Lemo OB 4-way receptacle (sockets) marked +12V.	Power In.

Table 3-2 – SOLH264TX Bottom Panel Key

3.4 Exploring the Left Hand Side Panel - SOLH264TX

Diagram: Left Hand Side Panel

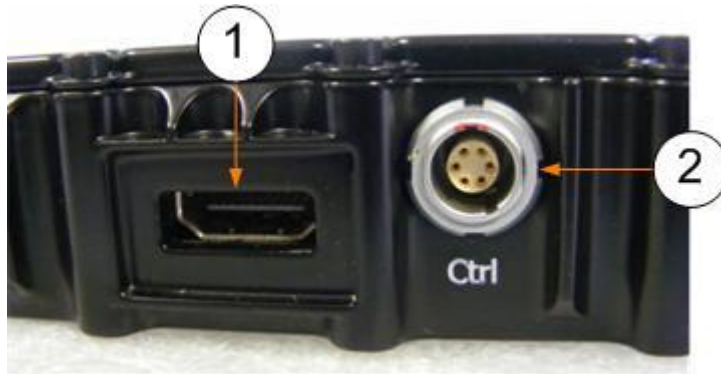


Figure 3-3 SOLH264TX Left Hand Side Panel

No	Item	Used for...
1	HDMI Type-A 19-way receptacle (sockets).	HD Video Input.
2	Lemo OB 6-way receptacle (sockets) marked Ctrl.	For RS232 communications.

Table 3-3 – SOLH264TX Left Hand Side Panel Key

3.5 Exploring the Right Hand Side Panel - SOLH264TX

Diagram: Right Hand Side Panel

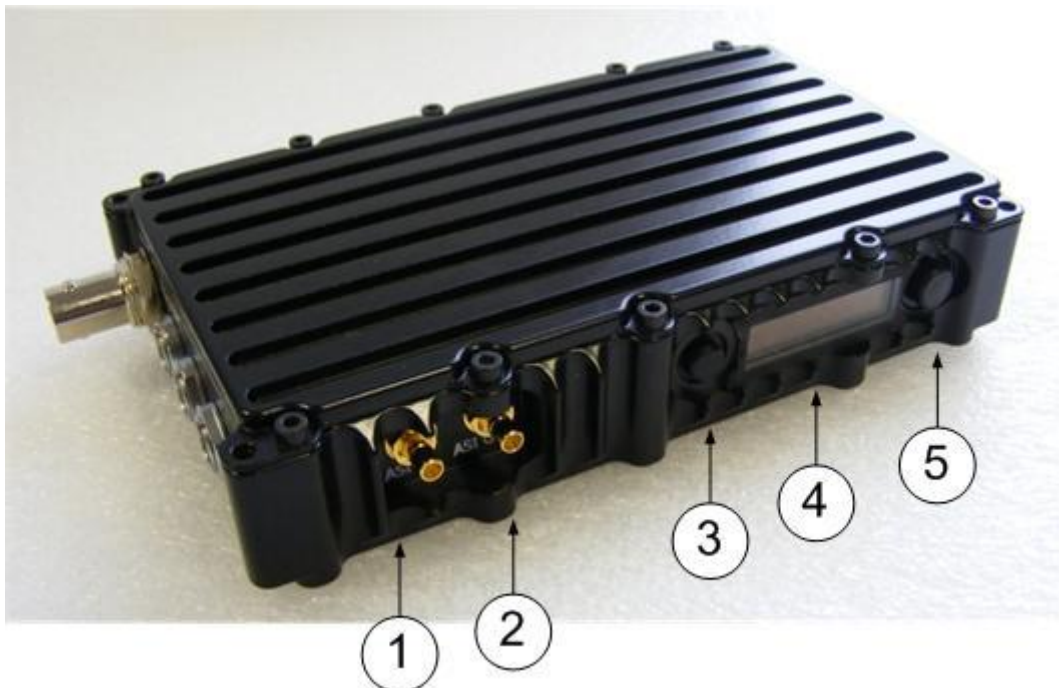


Figure 3-4 SOLH264TX Right Hand Side Panel

No	Item	Used for...
1	SMB 2-way receptacle, (sockets) marked ASI In.	For ASI Input.
2	SMB 2-way receptacle, (sockets) marked ASI Out.	For ASI Output.
3	Cancel / Back Button.	User Interface.
4	Display Screen.	User Interface.
5	Joystick / Confirm.	User Interface.

Table 3-4 – SOLH264TX Right Hand Side Panel Key

3.6 Exploring the Control Panel - SOLH264TX

Before you Begin

You'll need:

- A powered SOLH264TX.

Step1: Cancel/Back Button

No	Name	Notes
1	Cancel/Back Button	Press to cancel action or go back one level.

Step2: Joystick/Confirm Button

No	Name	Notes
1	Joystick/Confirm Button	Move the joystick for UP, DOWN, LEFT and RIGHT. Press the joystick for ENTER.

3.7 Exploring the Top Panel – SOLH264ENGTX

Diagram: Top Panel

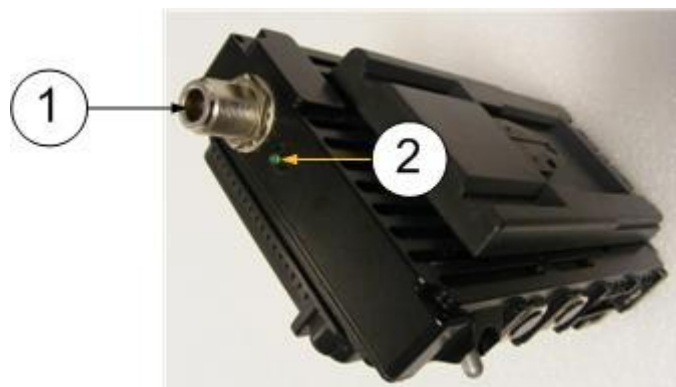


Figure 3-5 SOLH264ENGTX Top Panel

No	Item	Used for...
1	N-Type 2-way receptacle (sockets).	Antennas connect here. Do not over tighten – hand tight only.
2	RF LED (Green).	Illuminates when RF is selected ON.

Table 3-5 – SOLH264ENGTX Top Panel Key

3.8 Exploring the Back Panel – SOLH264ENGTX

Diagram: Back Panel

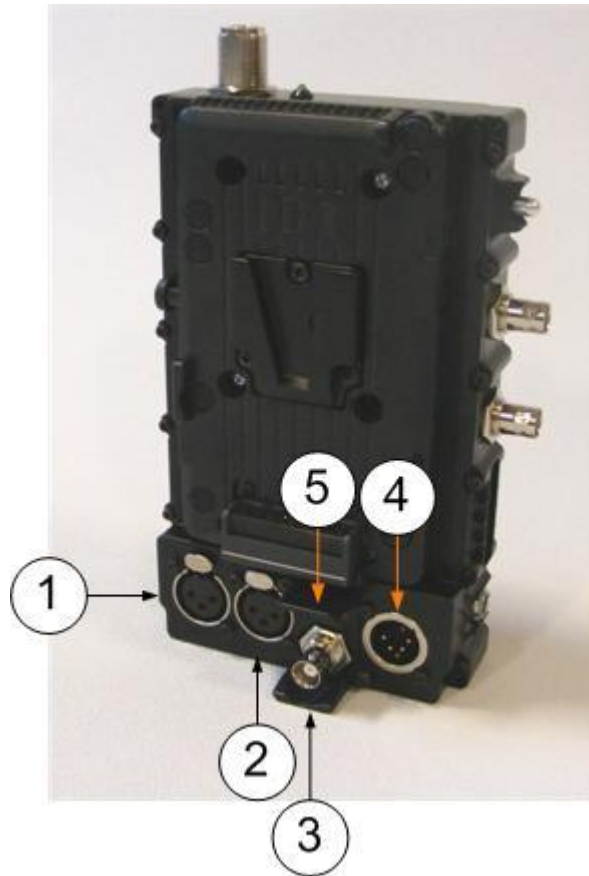


Figure 3-6 SOLH264ENGTX Back Panel

No	Item	Used for...
1	XLR 3-way receptacle, (sockets).	For left audio input.
2	XLR 3-way receptacle, (sockets).	For right audio input.
3	BNC 2-way receptacle, (sockets).	For Video Input.
4	XLR 4-way receptacle, (pins).	For DC power in.

Table 3-6 – SOLH264ENGTX Back Panel Key

3.9 Exploring the Right Hand Side Panel – SOLH264ENGTX

Diagram: Right Hand Side Panel

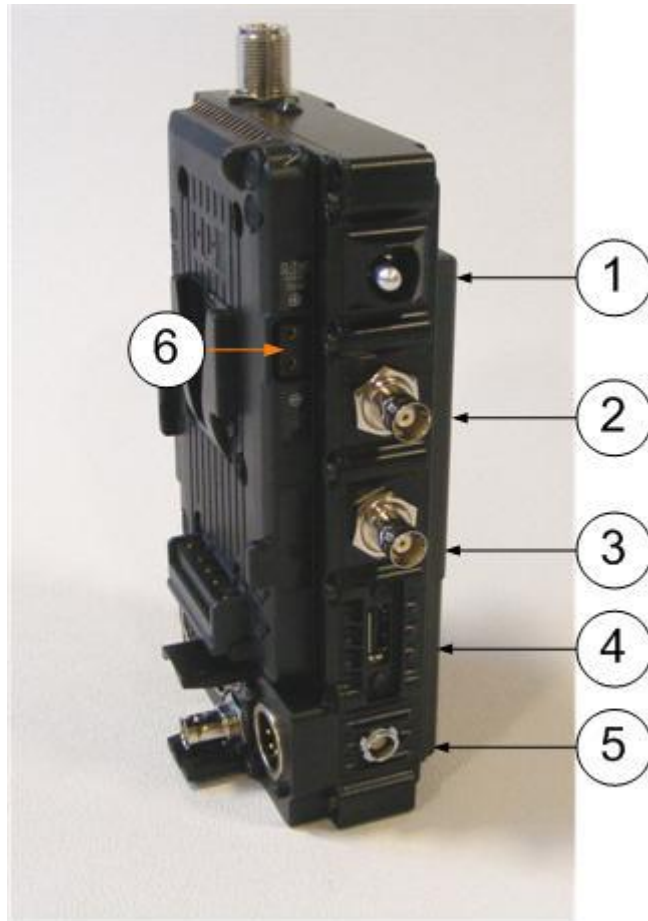


Figure 3-7 SOLH264ENGTX Right Hand Side Panel

No	Item	Used for...
1	Toggle Switch.	To supply power to the transmitter.
		CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. Do not use force.
2	BNC 2-way receptacle (sockets).	For ASI Output.
3	BNC 2-way receptacle (sockets).	For ASI Input.
4	HDMI Type-A 19-way receptacle, (sockets).	For HD Video input.
5	Lemo OB 6-way receptacle, (sockets).	For RS232 Communications.

No	Item	Used for...
6	D-Tap.	Enables you to tap up to 50W of power from the battery for auxiliary use.

Table 3-7 – SOLH264ENGTX Right Hand Side Panel Key

3.10 Exploring the Left Hand Side Panel – SOLH264ENGTX

Diagram: Left Hand Side Panel

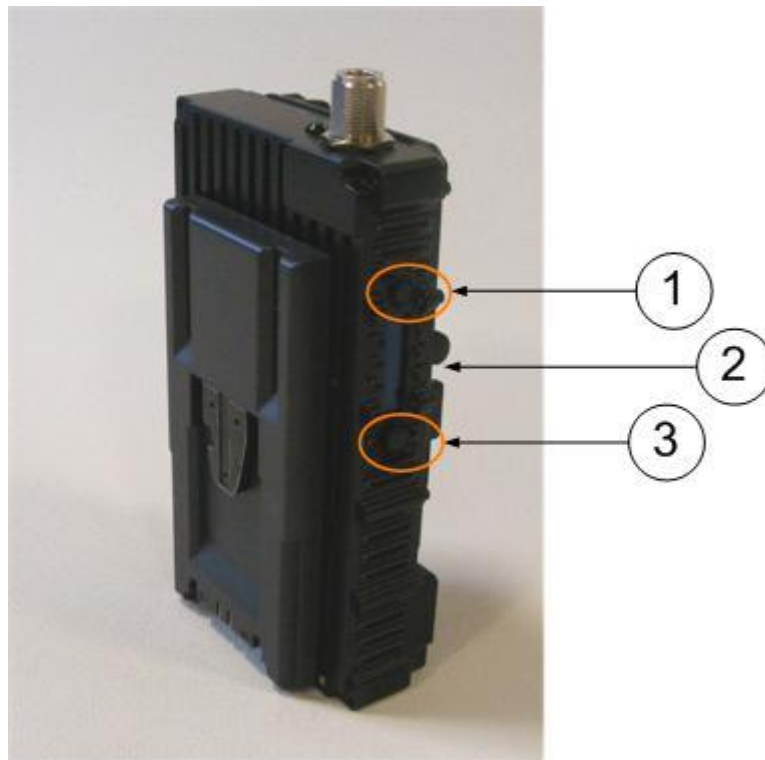


Figure 3-8 SOLH264ENGTX Left Hand Side Panel

No	Item	Used for...
1	Cancel / Back Button	
2	Display Screen	
3	Joystick / Confirm	

Table 3-8 – SOLH264ENGTX Left Hand Side Panel Key

3.11 Exploring the Indicator System – SOLH264ENGTX

There is one LED indicator (green) located on the top panel of the transmitter. When illuminated, it means the RF is ON.

3.12 Exploring the Control Panel - SOLH264ENGTX

Before you Begin

You'll need:

- A powered SOLH264ENGTX.

Step1: Cancel/Back Button

No	Name	Notes
1	Cancel/Back Button	Press to cancel action or go back one level.

Step2: Joystick/Confirm Button

No	Name	Notes
1	Joystick/Confirm Button	Move the joystick for UP, DOWN, LEFT and RIGHT. Press the joystick for ENTER.

4. Setting up your SOLH264TX

4.1 Connecting the Antenna

This topic describes connecting systems designed mainly for transporting the RF signals. Of all the variables affecting single-channel radio communications, the one factor that an operator has the most control over is the antenna. With the right antenna, an operator can change a marginal net into a reliable net.

There is an antenna interface located on the top panel of the SOLH264TX. An antenna **must** be fitted before you place the unit in RF mode.

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

Before you Begin

You'll need:

- An antenna that matches the frequency range of your SOLH264TX.

SOLH264ENGTX Variant: This variant uses an N-Type connector for its antenna.

Step 1: Attach the Antennas

1. Connect the antenna to the SMA receptacle on the top panel of the SOLH264TX.
2. Do not over tighten the antenna – hand tight only!

Step 2: Set Antenna Polarization

1. 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.
2. The antennas used with the COFDM links are normally **linearly** polarized.

Next Steps

Connect DC Power.

4.2 Connecting DC Power - SOLH264TX

The SOLH264TX requires 12VDC. This can be supplied from a vehicle, an AC Adaptor or a battery pack.

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.

Before you Begin

You'll need:

- A 12VDC Power Source
- SOLH264TX
- CA0002 Power Cable Assembly.

Step 1: Connect the DC Power

1. Connect the Lemo OB 4-way plug to the Lemo OB 4-way 12V receptacle (sockets) on the SOLH264TX.
2. Connect the Red Banana plug to the positive terminal of the DC source.
3. Connect the Black Banana plug to the negative terminal of the DC source.
4. On the display screen, you'll see the text illuminate.

Next Steps

Connect Video Signals.

4.3 Connecting AC Power - SOLH264TX

Before you Begin

You'll need:

- A 12V AC Adapter (Optional)
- SOLH264TX.

Step 1: Connect the AC Power

1. Connect the **Lemo OB 4-way plug** (pins) from the AC adaptor to the **Lemo OB 4-way receptacle** (sockets) on the SOLH264TX which is located on the bottom panel.
2. Now connect the **IEC mains 3-way plug** (sockets) to the **IEC mains 3-way receptacle** on the AC adaptor.
3. Connect IEC mains plug to your **local AC supply** and switch on.

Next Steps

Connect Video Signals.

4.4 Connecting DC Power - SOLH264ENGTX

The SOLH264ENGTX requires 12VDC. The unit can be powered from DC by using camera batteries or an external power source.

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

Before you Begin

You'll need:

- A suitable camera battery.
- SOLH264ENGTX

Step 1: Connect the DC Power from the Camera

1. Connect the SOLH264ENGTX to your camera back plane.
2. Connect the camera battery to the back panel of the SOLH264ENGTX.
3. The camera now has power available.
4. Use the toggle switch on the right hand panel to switch **On** the transmitter.

CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. **Do not use force.**

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

Next Steps

Connect Video Signals.

4.5 Connecting AC Power - SOLH264ENGTX

Before you Begin

You'll need:

- An AC Adapter (Optional)
- SOLH264ENGTX
- CA0665 Cable.

Step 1: Connect the AC Power

CAUTION: First, connect the CA0665 cable to your AC Adapter unit taking care to observe polarity and voltage requirements.

1. Connect the **XLR 4-way plug** (sockets) from the AC adaptor to the **XLR 4-way receptacle** (pins) on the SOLH264ENGTX which is located on the bottom panel.
2. Now connect the **IEC mains 3-way plug** (sockets) to the **IEC mains 3-way receptacle** on the AC adaptor.
3. Connect IEC mains plug to your **local AC supply** and switch on.
4. Use the toggle switch on the right hand panel to switch **On** the transmitter.

CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. **Do not use force.**

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

Next Steps

Connect Video Signals.

4.6 Connecting Composite or SDI Video Signals

Before you Begin

You'll need:

- SOLH264TX
- AP002118 Video Cable Assembly
- A Composite or SDI Video Source.

Step 1: Connect Video Signal

1. Connect one BNC 2-way plug to the VIDEO/SDI receptacle of the SOLH264TX.
2. Connect the other BNC 2-way plug to the video source.
3. Switch on the Video source.

4. Ensure the radio is configured to accept composite or SDI video.

4.7 Connecting HDMI Video Signals

Before you Begin

You'll need:

- SOLH264TX
- An HDMI Video Cable Assembly
- A HDMI Video Source.

Step 1: Connect Video Signal

1. Connect one HDMI Type A plug to the HDMI In receptacle of the SOLH264TX.
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.

4.8 Connecting Audio Signals

Before you Begin

You'll need:

- SOLH264TX
- CA0579 Audio Cable Assembly
- An Audio Source.

Step 1: Connect Audio Signal

1. Connect the Lemo OB 5-way plug to the Audio receptacle of the SOLH264TX.
2. Connect the XLR 2-way plugs to the audio source.
3. Switch on the audio source.
4. Ensure the radio is configured to send **Analogue** audio (Audio is set to **Embedded source** by default).

SOLH264ENGTX Variant: This variant uses XLR connectors for audio input.

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.

4.9 Connecting Data Signals

Before you Begin

You'll need:

- SOLH264TX
- CA0340 Data Cable Assembly
- A Data Source.

Step 1: Connect Data Signal

1. Connect the Lemo OB 4-way plug to the Data receptacle of the SOLH264TX.
2. Connect the D-Type 9-way plug to the data source.
3. Switch on the data source.
4. Ensure the radio is configured to send data (data is off by default).

4.10 Exploring the Control Panel

The control panel has **two** buttons. Here's what they do:

Before you Begin

You'll need:

- A fully powered SOLH264TX or SOLH264ENGTX

Step 1: Interpret the Cancel / Back Button

No	Name	Notes
1	Cancel/Back Button	Press to cancel action or go back one level.

Step 2: Interpret the Joystick / Confirm Button

No	Name	Notes
1	Joystick/Confirm Button	Move the joystick for UP, DOWN, LEFT and RIGHT. Press the joystick for ENTER.

4.11 Exploring the Display

The SOLH264TX and SOLH264ENGTX are equipped with a display screen. You can control what is displayed on this screen using the Control Panel buttons described earlier.

Before you Begin

You'll need:

- A fully powered SOLH264TX or SOLH264ENGTX

Step 1: Observe the Display



Figure 4-1 SOLH264TX Display

4.12 Exploring the Menu

Before you Begin

You'll need:

- A fully powered SOLH264TX or SOLH264ENGTX

Step 1: Observe the Display Menu Structure

Unit Status			Cont'		
	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 //
					AES Key 2 //
Unit Control					
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
NB/UMVL	FEC	2/3			Aud2 PID Default
	Const	16-QAM			Data PID Default
	Guard	1/16			Meta PID Default
Video In	Spec Pol	Norm		Config	Config1
	Input	SDI NTSC			Defaults No
	HD Format	1080i59			
	Pattern	Auto Bars			
	OSD Text	Service Name			
	Heartbeat	Off			
			Local Settings		
Video Enc	Mode	Low Delay Int		Serial	90F0E712
	Horz Res	Full		S/W Ver	1.4
	Vert Res	Full		Name	SOLH264TX
	F/Rate	Full		Menu Level	Full
	GOP	Default		SOLO4 FP	On
	OTS Delay	0ms		Status Disp	On
	Encoder	MPEG4 H.264		LEDs	On
				Voltage Disp	Off
Audio 1	Aud 1 Mode	L2 Stereo		Low Batt Disp	Off
	Aud 1 Source	Embedded		Low Batt	7.00V
	Aud 1 Bitrate	256kbps		Brightness	128
	Aud Level	0dB		Disp Mode	Auto Dim
	Mic Bias	Off		Boot Logo	On
	Grp DID 1	(0xFF/0xE7)		Terminal Mode	No
	PTS Delay	0ms		Time	Not Set
				Date	Not Set
Audio 2	Aud 2 Mode	off			
	Aud 2 Source	Analog			
	Aud 2 Bitrate	384kbps			
	Aud Level	0dB			
	Mic Bias	Off			
	Grp DID 1	(0xFF/0xE7)			

Figure 4-2 Display Menu Structure

Step 2: Observe the Display 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.
	NB/UMVL	Modulation options relevant to Narrowband 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.

Table 4-1 – SOLH264TX Display Menu Functions

5. Basic Operation

5.1 Starting and Stopping the SOLH264TX

SOLH264TX units don't have power switches – you simply apply power to them and they will start up.

Before you Begin

You'll need:

- A SOLH264TX
- A source of power.

Step 1: Powering Up - SOLH264TX

1. Power-on the SOLH264TX using one of the procedures in *Setting up your SOLH264TX*.
2. On the display screen, you'll see the text illuminate.

Step 2: Shutting Down - SOLH264TX

It is important to shut down the system carefully. This ensures that all processes are terminated correctly and no data or settings are lost.

1. Ensure the unit is **not** in sleep mode.
2. Disconnect the power cable from the SOLH264TX.
3. On the display screen, you'll see the text go out.
4. The system is shut down safely.

Next Steps

Work with the Control Panel.

5.2 Starting and Stopping the SOLH264ENGTX

Before you Begin

You'll need:

- A SOLH264ENGTX
- A source of power.

Step 1: Powering Up - SOLH264ENGTX

1. Supply power to the SOLH264ENGTX using the procedure *Setting up your SOLH264TX*.
2. Power is now immediately available to the camera.
3. Use the toggle switch on the right hand panel to switch **On** the transmitter.

CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. **Do not use force.**

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

Step 2: Shutting Down - SOLH264ENGTX

It is important to shut down the system carefully. This ensures that all processes are terminated correctly and no data or settings are lost.

1. Ensure the unit is **not** in sleep mode.
2. Use the toggle switch on the right hand panel to switch **Off** the transmitter.

CAUTION: This is a lock switch, pull the switch body to toggle between Off/On. **Do not use force.**

3. On the display screen, you'll see the text go out.
4. The system is shut down safely.
5. Disconnect the power cable or battery from the SOLH264ENGTX.

Next Steps

Work with the Control Panel.

5.3 Working with the Control Panel

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

Before you Begin

You'll need:

- A SOLH264TX

Step 1: Select the Root Menu

1. **Power** on the SOLH264TX
2. Let the unit **initialize**
3. You'll see the frequency and the **Root** menu on the display screen:



Figure 5-1 Selecting the Root Menu

Step 2: Select a Configuration

1. Ensure you are at the root menu.
2. Push up/down on the **Joystick** button to select a new configuration number
3. Your new **configuration** appears highlighted.
4. **Push** the **Joystick / Confirm** button to select the new configuration
5. 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.

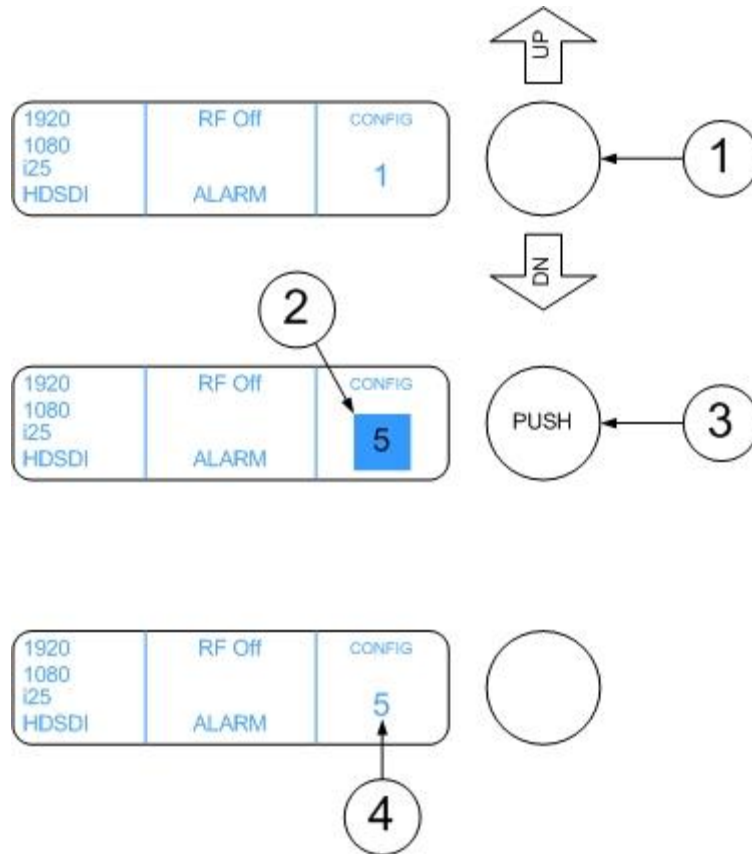


Figure 5-2 Selecting a Configuration

Step 3: Select RF On or Off

1. Ensure you are at the root menu.
2. Push the **Joystick / Confirm** button for **two** seconds.
3. The RF caption will toggle to **on**.
4. Push the **Joystick / Confirm** button for two seconds to turn the RF off.

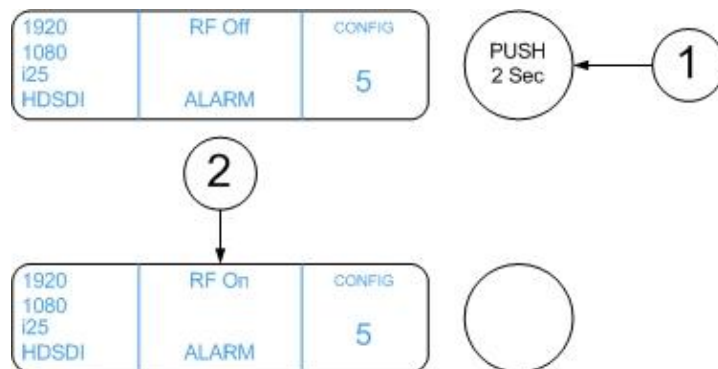


Figure 5-3 Selecting RF On or Off

Step 4: Use the Unit Status Menu

1. Ensure you are at the root menu.
2. Push **Cancel / Back** button

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

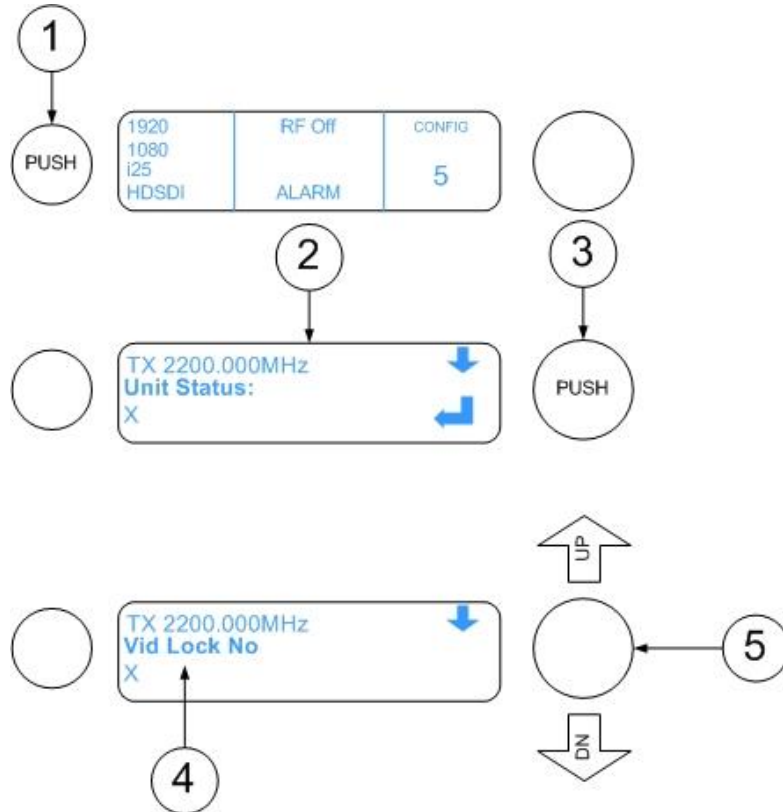


Figure 5-4 Using the Unit Status Menu

Step 5: Interpret the Unit Status Indicators

Menu	Sub-Menu	Typical Value	Notes
Unit Status	Vid Lock	No or Yes	
	Vid Rate	8.522Mbps	
	ASI Lock	No or Yes	
	Chaining	Off or On	Overflow will be shown if the chained in service exceeds available bit-rate.
	S/W Ver	1.4	
	Serial	e03a095e	
	Battery	12.0V	May show Reply Error on Units where battery monitoring are not available.

Menu	Sub-Menu	Typical Value	Notes
	FPGA Ver	00023140	
	FPGA Temp	50C	Expect running internal temperature of 50-75°C depending on environment.

Table 5-1 – Interpret the Unit Status Indicators

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.

Step 6: Use the Unit Control Menu

1. Ensure you are at the root menu.
2. Push **Cancel / Back** button
3. You'll see the **frequency** and the **Unit Status:** menu on the display screen
4. Use the **Joystick/Confirm** button down arrow to scroll down to **Unit Control**
5. Push the **Joystick/Confirm** button to **enter** the Unit Control menu
6. You'll see **RF**, which is the first item in the Unit Control menu
7. Use the **Joystick/Confirm** button to move up and down the Unit Control menu
8. When you find a Config you want to change, **press** the **Joystick/Confirm** button to select that Config for editing.
9. Use the **Joystick/Confirm** button to move up and down the possible settings
10. Press the **Joystick/Confirm** button to **save** the new setting
11. Press the **Joystick/Confirm** button again to **confirm** the new setting
12. 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**.

A full list is at *Exploring the Menu - SOLH264TX* earlier in this User Guide.

Menu	Sub-Menu	Typical Value	Notes
Unit Control	RF	Freq	2200.00MHz
		RF Out	On
		B/W	8MHz
		TX Mode	Off
		RF Power	100mW
		RF Atten	0.00dB

Table 5-2 – Interpret part of the Unit Control Menu

Step 7: Use the Local Settings Menu

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

A full list of the settings you can configure from the Local Settings menu is at *Exploring the Menu - SOLH264TX* earlier in this User Guide.

Step 8: Using the Control Panel Button Lock Feature

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

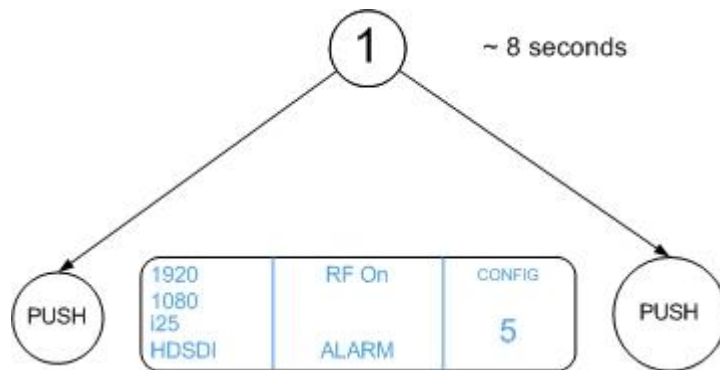


Figure 5-5 Using the Unit Status Menu

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.

Note: The lock or unlock setting is retained even after a power cycle.

6. Advanced Operation

6.1 About Encryption

Your material is a valuable asset to your organisation 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.

6.2 Setting up Encryption

If the AES scrambling option has been purchased for the SOLO system in use, then it is possible to encrypt the link. Both AES128 and AES256 are licence-controlled features. You'll need to encrypt the traffic leaving the transmitter and set up the receiver for decrypt.

Before you Begin

You'll need:

- A fully powered SOLH264TX.
- The correct licence loaded on the SOLH264TX for Encryption.
- A laptop with the Control Application connected to the SOLH264TX.
- Connect your radio to your PC and run the control application (see *Advanced Setup* later in this User Guide).

Step 1: Select the Encryption Mode

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

Step 2: Change the Encryption Key

The **encryption key** is a 128bit value for AES128 and a 256bit value for AES256, and is entered as 32 or 64 ASCII hexadecimal characters (0..9, A..F).

2. Click the **Encryption** button (yellow key icon).
3. The **Write encryption key** dialog box will open
4. 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).
5. In the **AES128 key** text box, type the encryption key you want to use.
6. Click the **OK** button.

Screenshot: Setting up Encryption

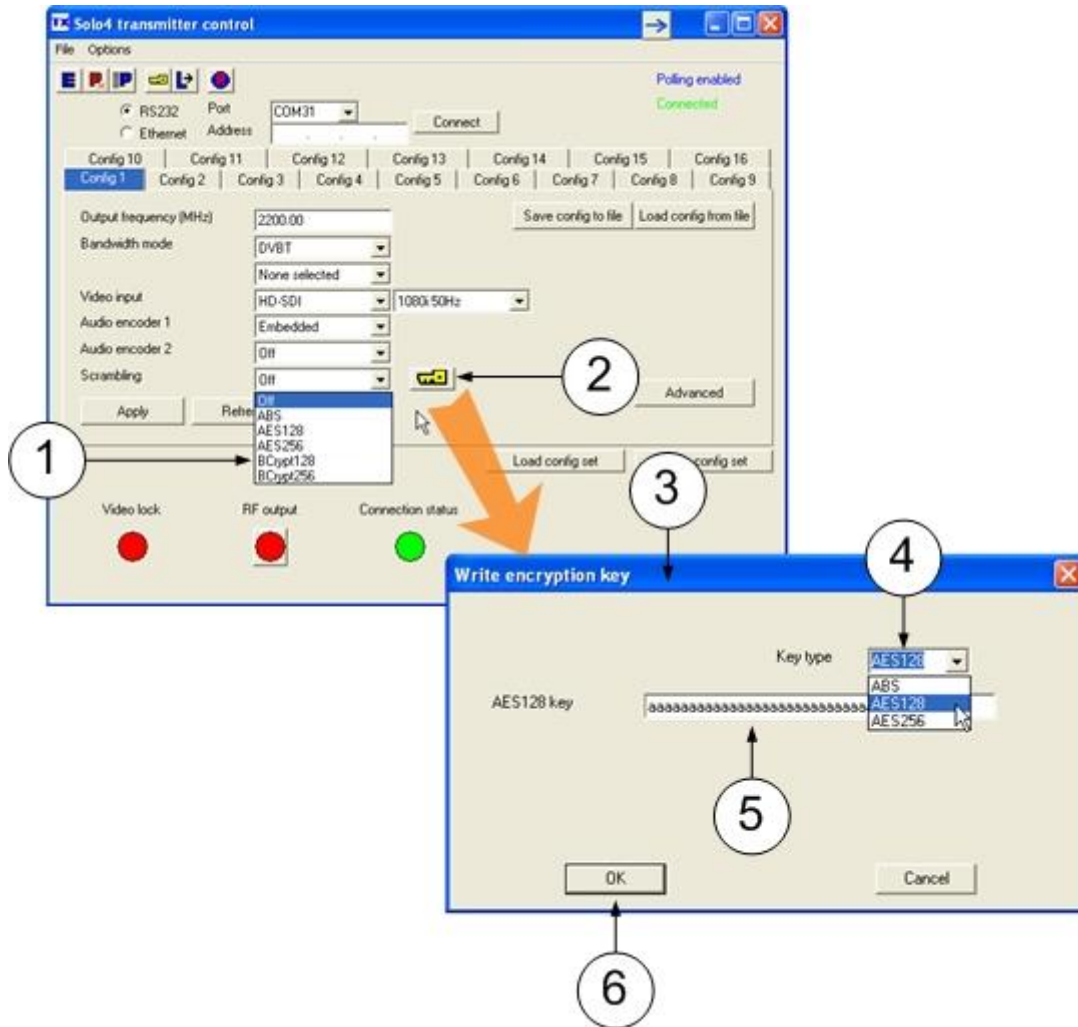


Figure 6-1 Setting up Encryption

Step 3: Check the Number of Encryption Key Characters Required

In our example earlier 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.

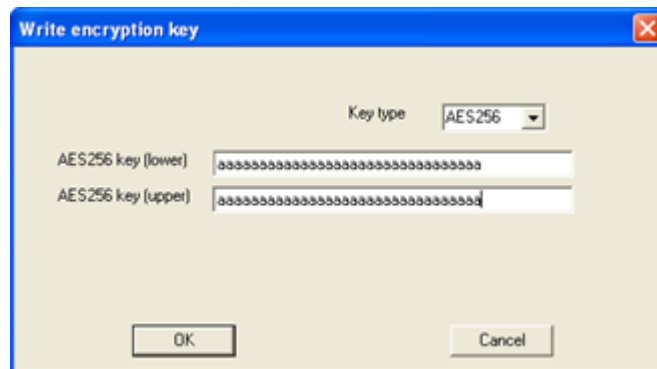


Figure 6-2 Write Encryption Key Dialog for AES256 KeyType

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

Table 6-1 – Number of Key Characters Required

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.

7. Advanced Setup

7.1 About Advanced Setup

To get the most from your radio system you must customise the programming for your operations and area.

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. Alternatively, you could use an AC adapter to power your radio.

The **Control Application** or **Control Pages** enable you to control the communication system, to keep it functioning in proper and stable order. It enables you to change many of the settings of the unit like frequency or bandwidth.

The control system is in the form of a **Control Application** that runs on your PC connected to the device using Serial communications.

7.2 Installing the Control Application on your PC

Before you Begin

You'll need:

- A PC running **Windows XP** or better.
- The PC to have a D-Type 9-way **RS232 port** (or a USB adapter to D-Type).
- A copy of the **Control Application**. (You can download the latest version of the Control Application from the DTC Website.

Step 1: Install the Control Application on your PC

1. The Control Application comes as a simple .exe file which you just place on your desktop or other convenient location on your PC.
2. It does not need to write anything to your registry.

Next Steps

Connect the SOLH264TX to your PC using a Serial Connection.

7.3 Connecting your PC to the SOLH264TX using a Serial Connection

Before you Begin

You'll need:

- A Personal Computer with the transmitter Control Application.
- A CA0343 Control Cable.
- A powered SOLH264TX unit.

Step 1: Install the Transmitter Control Application on your PC

Ensure you have installed the **Transmitter Control Application** onto your Personal Computer. You can download the latest version of this software from the DTC website.

Step 2: Connect to your Personal Computer using Serial (RS232)

1. Connect the **Lemo OB 6-way plug** (pins) on the CA0343 Control Cable to the **Lemo OB 6-way receptacle** (sockets) on the SOLH264TX.
2. Connect the **USB 4-way plug** (pins) on the CA0343 to your PC.

Diagram: SOLH264TX Serial Connection

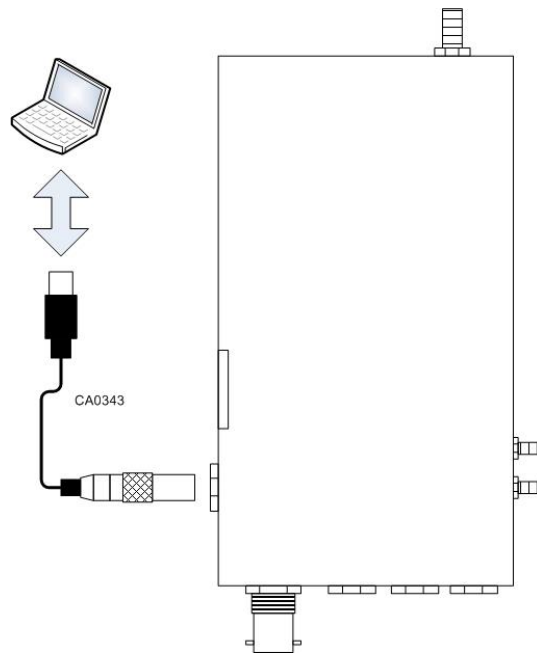


Figure 7-1 SOLH264TX Serial Connection

Step 3: Start the Transmitter Control Application

1. Double-click the **Transmitter Control Application** icon on the computer desktop.
2. The **Transmitter Control Application** opens and automatically attempts to connect to the SOLH264TX.
3. It uses the **RS232** Serial protocol.
4. It tries all available **Com ports**. My example has connected using my PC's COM3 port.
5. When successful you'll see the green **Connected** caption.
6. The **Connection Status** light will also show green and the fields will populate with data.

Screenshot: Start the Transmitter Control Application

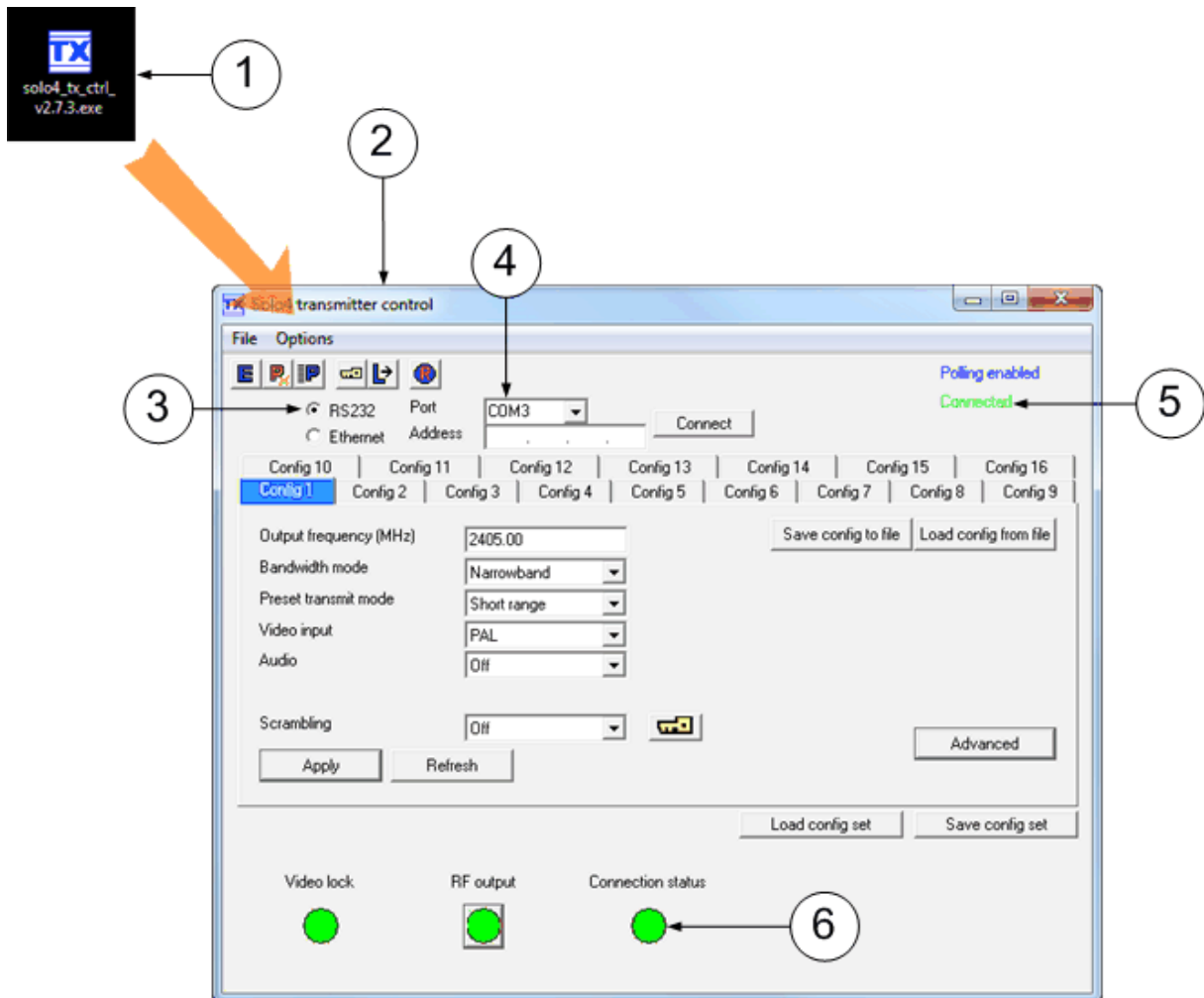


Figure 7-2 Start the Transmitter Control Application

Troubleshooting

- ☹️ I see an **Unable to Connect** message.
- 😊 Check the **cable** is the correct type, (CA0343 Control Cable).
- 😊 Ensure you are connecting with **RS232** on the **correct Port** like this:

Step 1: Check the Com Port

1. You'll see the **Unable to Connect** message box.
2. Click the **OK** button and the **Control Application** opens with no connection.
3. Check the option button is set for **RS232**.
4. Using the drop-down box, choose another **COM port** from those presented.
5. Click the **Connect** button.

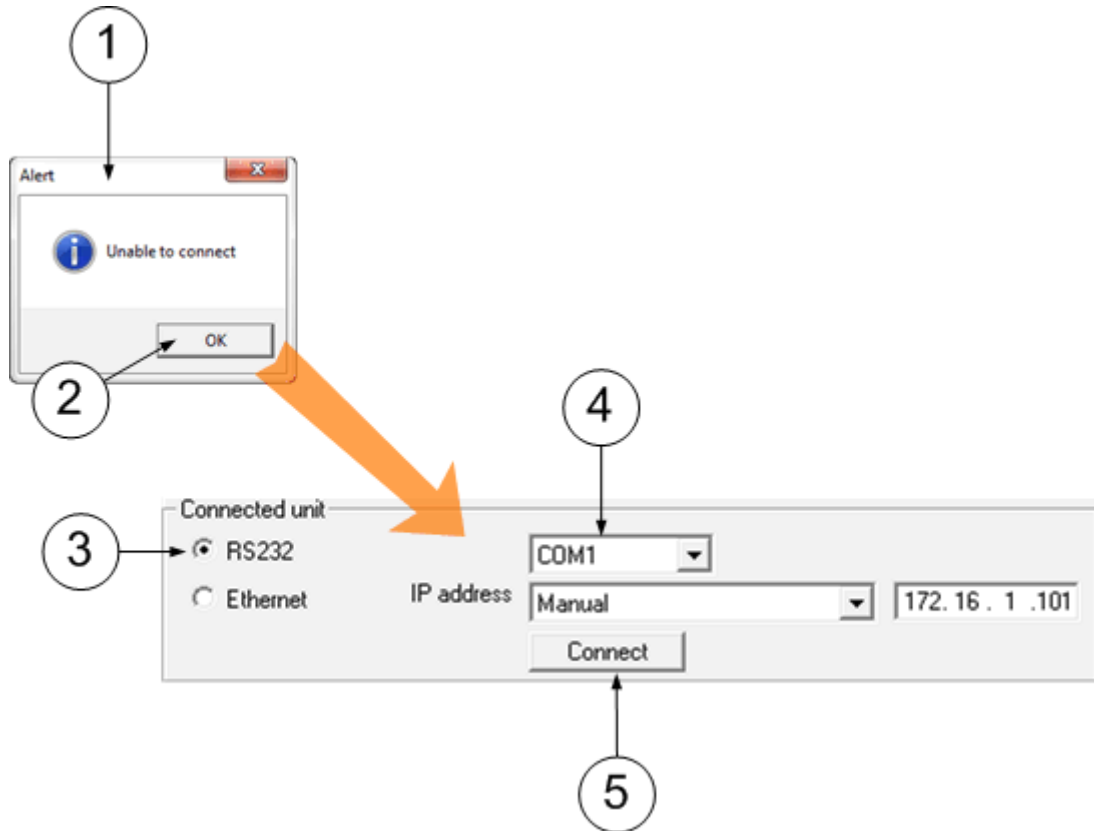


Figure 7-3 Unable to Connect

Next Steps

Explore the Main Window.

7.4 Exploring the Control Application Main Window

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Screenshot: Explore the Control Application Main Window

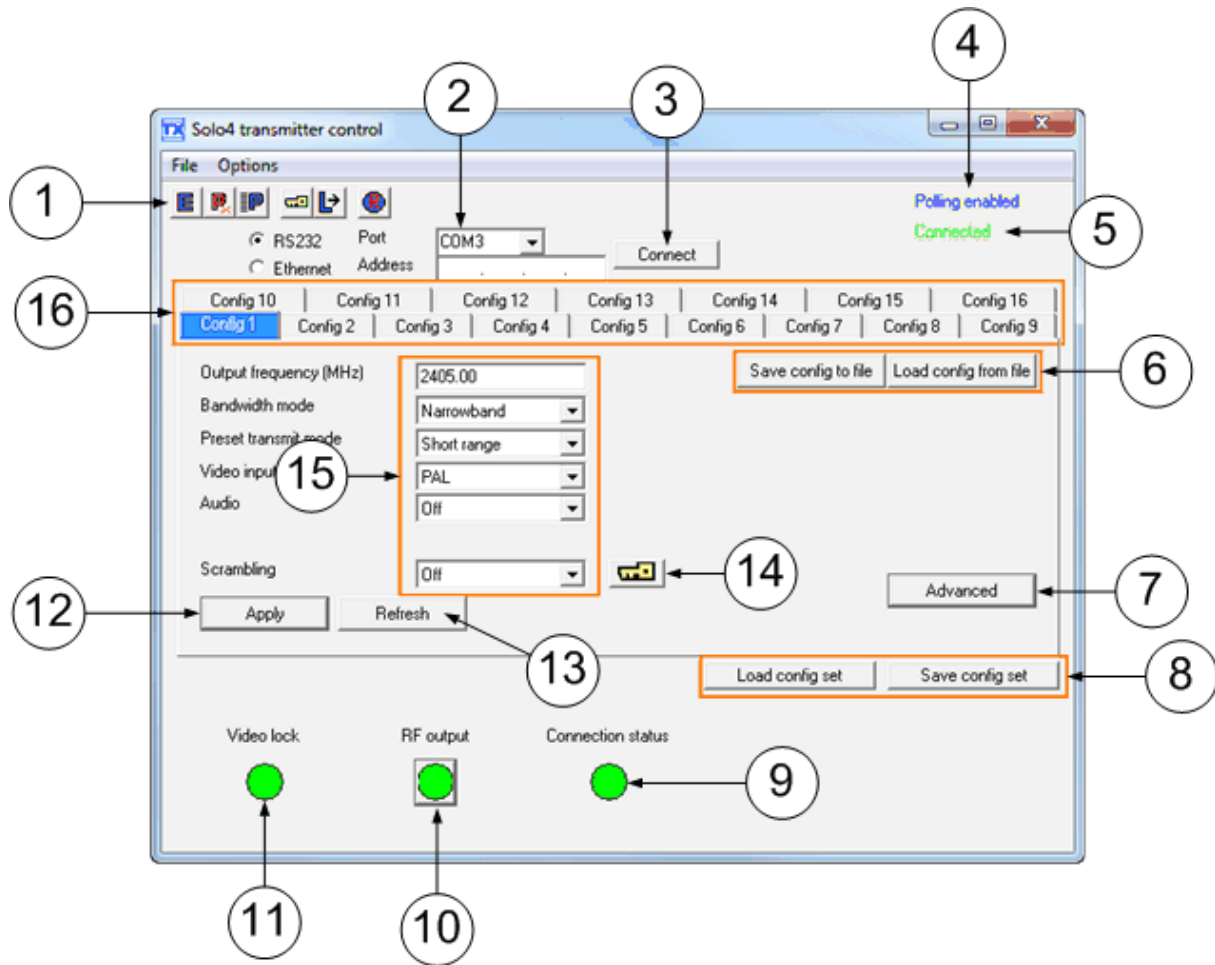


Figure 7-4 Explore the Control Application Main Window

No	Name	Notes
1	Toolbar	Access to frequently used tools.
2	Serial Port	This combo box shows the COM port that the application has been used to connect to the device. In this example, the application is using the personal computer's COM3 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.
3	Connect Button	Normally, the control application immediately negotiates a connection to the device. You can force a reconnect by pressing the Connect button.
4	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.

No	Name	Notes
5	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.
6	Configuration Buttons	The Configuration Buttons are used for saving or loading a single configuration using a text file.
7	Advanced Button	Opens the Advanced Options window. You'll use this to fine tune your set up.
8	Configuration Set Buttons	Used for saving or loading all 16 configurations using a text file.
9	Connection Status	Steady Green Aspect: Control application and device are successfully connected. Steady Red Aspect: Control application and device are not connected.
10	RF Output	Steady Green Aspect: The unit is emitting RF energy. Steady Red Aspect: The unit is not emitting RF energy. You can left click this button to toggle the RF Mode.
11	Video Lock	Steady Green Aspect: The unit has a locked video signal. Steady Red Aspect: The unit has no video lock.
12	Apply Button	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.
13	Refresh Button	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.
14	Encryption Button	Enables you to write an encryption key for the unit.
15	Basic Settings	The core settings you need to consider when setting up a link. These are repeated in the Advanced window along with many more settings.
16	Presets	There are 16 presets available to you. You can set up just one of them if you want but it can be very useful to have all eight populated. Try having different frequencies and range settings available. Then, when you just have the simple three-button panel available to you on the device, you'll have maximum flexibility with settings.

Table 7-1 – Control Application Main Window Key

7.5 Enabling Polling

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.

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Step 1: Enable Polling

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

Step 2: Configure Polling

2. From the **Options** menu select **Polling Options**
3. On the **Polling List** tab put checkmarks against items you want to poll
4. Click the **OK** button
5. Click the **Miscellaneous** tab
6. In the **Polling Interval** Text box type a polling interval in milliseconds
7. Click the **OK** button

7.6 Working with 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?

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Step 1: Saving a Configuration

1. Set up the **config tab** just the way you want it.
2. Keep it **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.

Step 2: 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.

7.7 Working with the Configuration Set Buttons

Used for saving or loading **all 16 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:

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Step 1: Saving a Configuration Set

1. Set up 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

Step 2: 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

7.8 Performing a 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 **five** basic things to setup:

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Step 1: Do the Quick 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 250kHz.
Bandwidth mode	In this combo box the drop-down arrow enables you to choose between DVB-T and DTC's Narrowband modes. Note: To select 6MHz or 7MHz DVB-T modes the user must first click the Advanced button to enter the Advanced setting page.
Default transmit mode	These modes set the radio part of the link to some pre-determined values. This will enable you to quickly set up the radio section before working on the payload part of the link.
Audio	In this combo box the drop-down arrow enables you to switch the audio on or off . The audio settings are optimised based on the bitrate 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-2).

Table 7-2 – Quick Setup

Note-1: Ultra Long Range mode is a **licenced** feature. If you are not licenced for this mode you'll be able to select it but the unit will simply drop into long range mode automatically.

Note-2: Some encryption modes are **licenced** features. If you are not licenced 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.

What actually happens here is when you choose a basic setting like **Narrowband** mode, the application automatically sets up a whole bunch of things in the advanced window for you.

7.9 Working with the Toolbar

Before you Begin

You'll need:

- To have connected your PC to the SOLH264TX using Serial.
- To have established a serial connection. (Green Connected caption and green Connection Status light are on).

Screenshot: The Toolbar

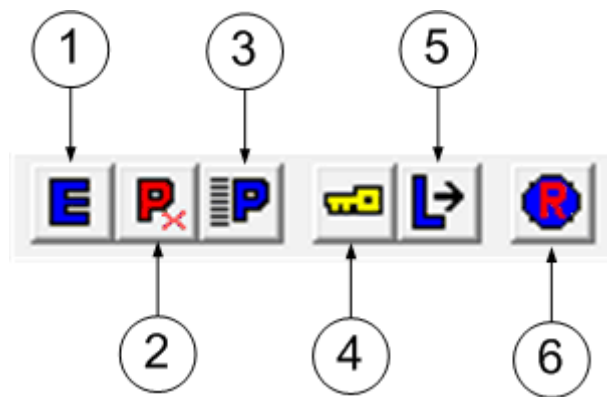


Figure 7-5 The Toolbar

Step 2: Interpret the Toolbar

No	Name	Notes
1	Engineering	Opens the Engineering options window. There are no operational controls here. The page is only used for engineering setups.
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.

Table 7-3 – Toolbar Key

7.10 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.

Step 1: Open the Advanced Options Window

To see the **Advanced Options** window:

1. Click the **Advanced** button on the SOLO4 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.

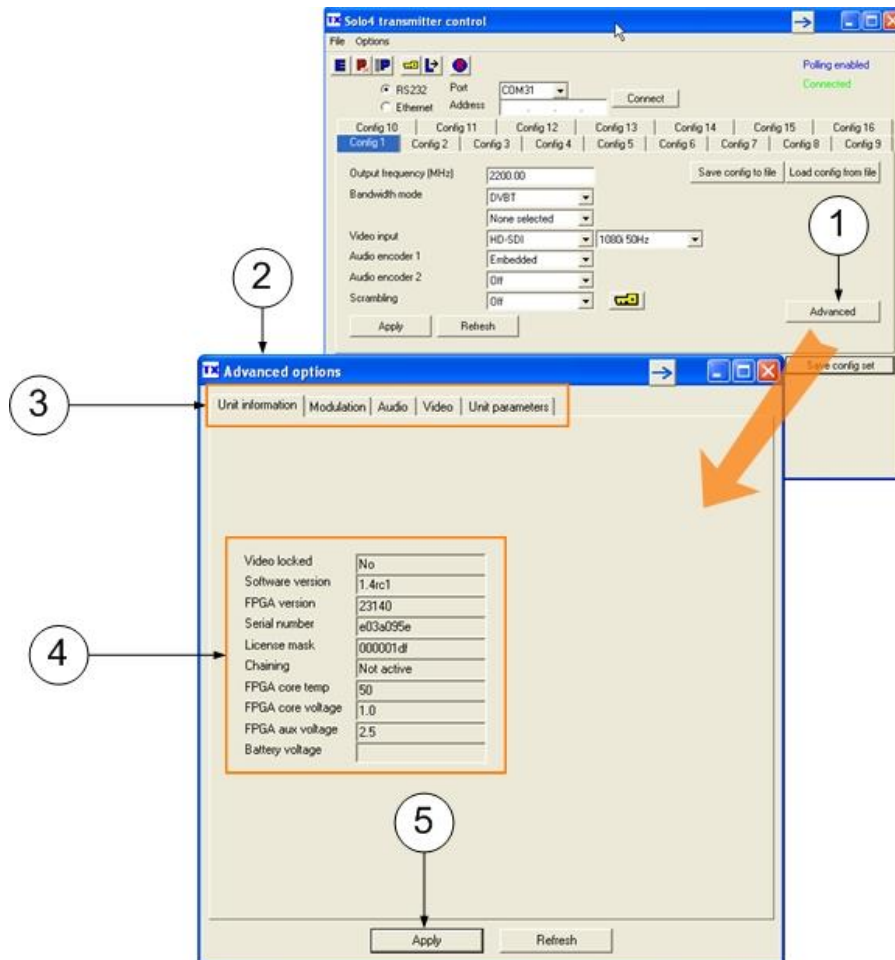


Figure 7-6 Advanced Options Window

7.11 Understanding the Unit Information Tab

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

1. Click the **Advanced** button on the SOLO4 Transmitter Control Window.

2. The **Advanced options window** opens.
3. Select the **Information** tab.

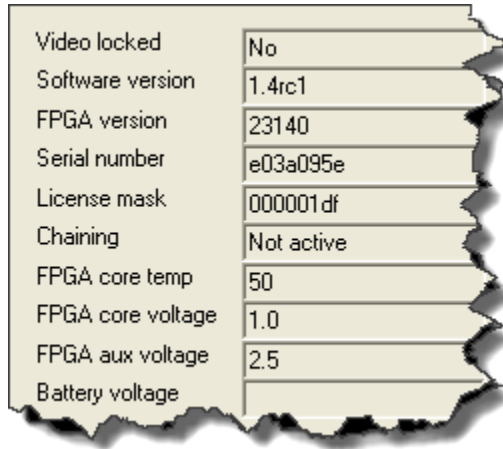


Figure 7-7 Information Tab

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.

This can be very useful should you have to make a support call to DTC.

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

		SOLH264(ENGTX).
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7.12 Configuring the Modulation Tab

To work with the **Modulation** tab:

1. Click the **Advanced** button on the SOLO4 Transmitter Control Window
2. The **Advanced options window** opens
3. Select the **Modulation** tab

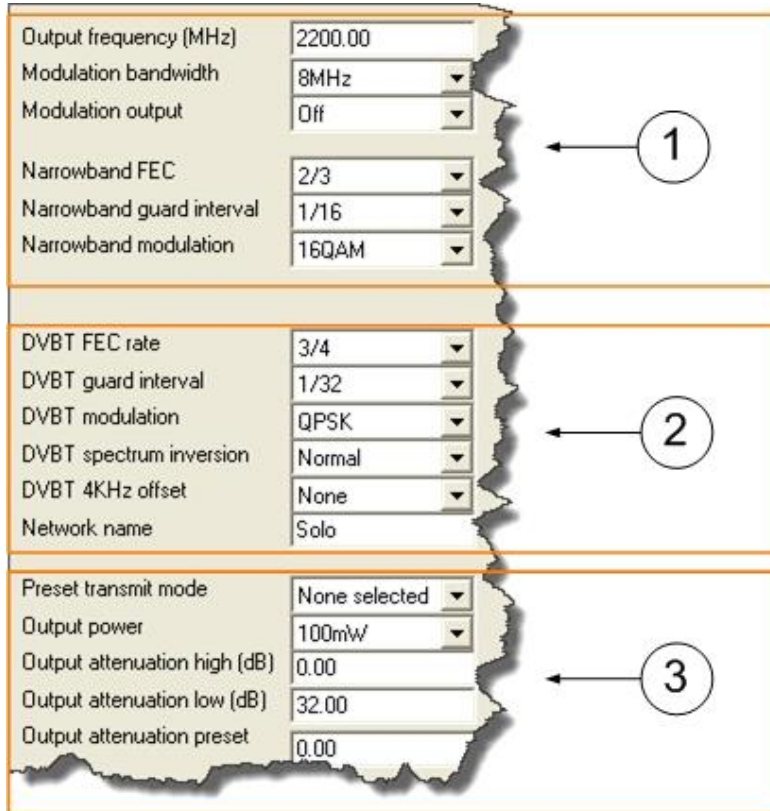


Figure 7-8 Modulation Tab

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

1. Radio Settings
2. DVB-T Settings
3. Power Settings

Step 1: Configure the 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 2.5MHz 1.25MHz 625kHz	DVB-T bandwidths (normally broadcast) DTC narrowband (this is a licensable feature, normally surveillance use) DTC Ultra-narrowband (this is a licensable feature, normally surveillance use) DTC Extra-Narrowband (this is a licensable feature, normally surveillance use)
Modulation output	Off or On	Switches the RF modulation on & off (same as the RF button on the unit)
Narrowband FEC	1/3 or 2/3	This field indicates the forward error correction (FEC) rate which is being applied. Think 'data bits/all bits' 1/3 means 1 bit out of 3 bits is data and therefore 2 bits are used for error correction. Little user data means less picture quality, but more error correction means a more robust signal and therefore more range. 2/3 means 2 bits out of 3 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.
Narrowband guard interval	1/16 or 1/8	The guard interval which is being applied to the narrowband mode in use. The guard interval is a deliberate extension of the RF symbol period to give immunity to reflections. 1/16, short extension, deals with fast reflections, more data, less range. 1/8, long extension, deals with slower reflections, less data, more range.
Narrowband modulation	QPSK, 16QAM, BPSK and 8PSK	The COFDM constellation in use. On a sliding scale: 16QAM-more user data, less robust, less range. QPSK 8PSK BPSK-less user data, more robust, more range.

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

Step 2: Interpret the 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	2.5MHz, FEC2/3, Guard 1/16, 16QAM	4.8Mbps	-94dBm
Medium range	2.5MHz, FEC2/3, Guard 1/16, QPSK	2.4Mbps	-99dBm
Long range	2.5MHz, FEC1/3, Guard 1/16, QPSK	1.2Mbps	-102dBm
Ultra long range	1.25MHz, FEC1/3, Guard 1/16, QPSK	0.6Mbps	-105dBm
Extra-long range 1	625kHz, FEC1/3, Guard 1/16, QPSK	0.3Mbps	-108dBm
Extra-long range 2	625kHz, FEC1/3, Guard 1/16, BPSK	0.15Mbps	-111dBm

In any other situation, 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
Extra-long range 2	2.5MHz, FEC2/3, Guard 1/16, QPSK	2.4Mbps	-99dBm

Note: All narrowband based range modes are a **licenced** feature. If you are not licenced for a mode you'll be able to select it but the unit will simply drop into off mode automatically.

Step 3: Configure the DVB-T Settings (2)

On the **SOLO4 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	<p>Default is 1/2.</p> <p>The forward error correction (FEC) rate which is being applied to the DVBT mode in use.</p> <p>Think 'data bits/all bits'</p> <p>1/2 means 1 bit out of 2 bits is data and therefore 1 bit is used for error correction.</p> <p>Little user data means less picture quality, but more error correction means a more robust signal and therefore more range.</p> <p>7/8 means 7 bits out of 8 bits are data and therefore 1 bit is used for error correction.</p> <p>More user data means better picture quality, but less error correction means less robust signal and therefore less range.</p>
DVBT guard interval	1/32, 1/16, 1/8 and 1/4	<p>Default is 1/32.</p> <p>The guard interval which is being applied to the DVBT mode in use.</p> <p>The guard interval is a deliberate extension of the RF symbol period to give immunity to reflections.</p> <p>1/32, short extension, deals with fast reflections, more data, less range.</p> <p>1/4, long extension, deals with slower reflections, less data, more range.</p>
DVBT modulation	QPSK, 16QAM and 64QAM	<p>The COFDM constellation in use.</p> <p>QPSK-less user data, more robust, more range.</p> <p>16QAM-more user data, less robust, less range. (link performance reduced by 5db)</p> <p>64QAM-max user data, least robust, least range.</p>
DVBT spectrum inversion	Normal or Inverted	<p>Default is Normal. You would only use inverted if you were using a non-compliant down converter that inverted the COFDM spectrum.</p>
DVBT 4KHz offset	None, +4KHz or -4KHz.	<p>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.</p>

Unit Parameter	Options	Notes
Network Name	Solo is the default value. Can be anything.	This name simply differentiates one digital service from another.

Step 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, Extra-long range 1, Extra-long range 2	This simply populates the Radio Settings section of the advanced options window with preset values (See Note-(1))
Output power	Low or High Presets: 10, 50, 100, 200 and 500mW	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.

Note-(1): All narrowband based range modes are licenced features. If you are not licenced for a mode you'll be able to select it but the unit will simply drop into Off mode automatically.

7.13 Configuring the Audio Parameters

To work with the **Audio** tab:

1. Click the **Advanced** button on the SOLO4 Transmitter Control Window
2. The **Advanced options window** opens
3. Select the **Audio** tab

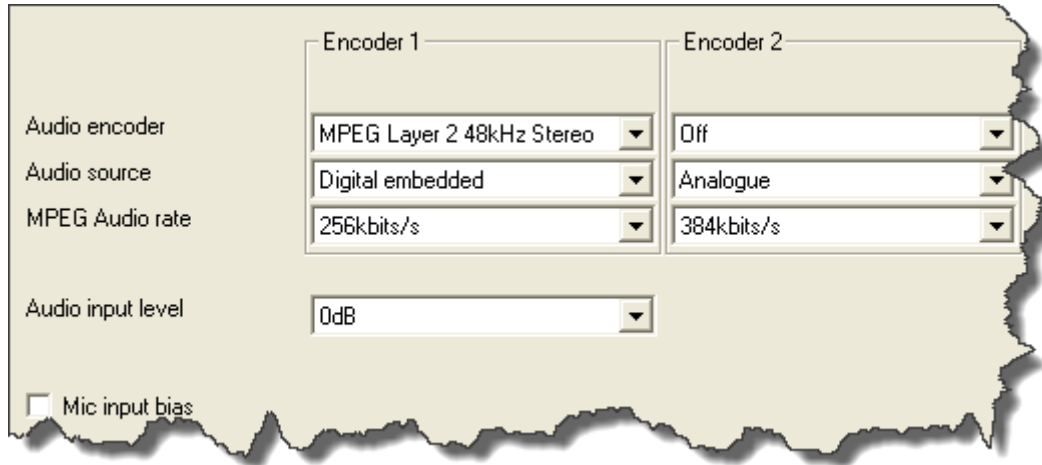


Figure 7-9 Audio Tab

Step 1: Configure the 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 MPEG L1 48kHz stereo MPEG L1 48kHz mono MPEG L2 48kHz stereo MPEG L2 48kHz mono	You can select one of many modes to suit operational and bandwidth requirements. As you select each of these audio modes and apply them, take a look at the Video bitrates parameter and watch it change. The higher the audio quality used the less the video bandwidth available.
Audio source	Digital Embedded Analogue	You can select analogue or digital for the audio input of the device. If you are an analogue video input only analogue 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.
Mic input bias	Checked or unchecked	Applies a small voltage to the audio inputs to supply phantom power for Electret microphones. This will be 5V on SOLH264TX units and 12V on SOLH264ENGTX units.

7.14 Configuring the Video Parameters

To work with the **Video** tab:

1. Click the **Advanced** button on the SOLO4 Transmitter Control Window
2. The **Advanced options window** opens
3. Select the **Video** tab

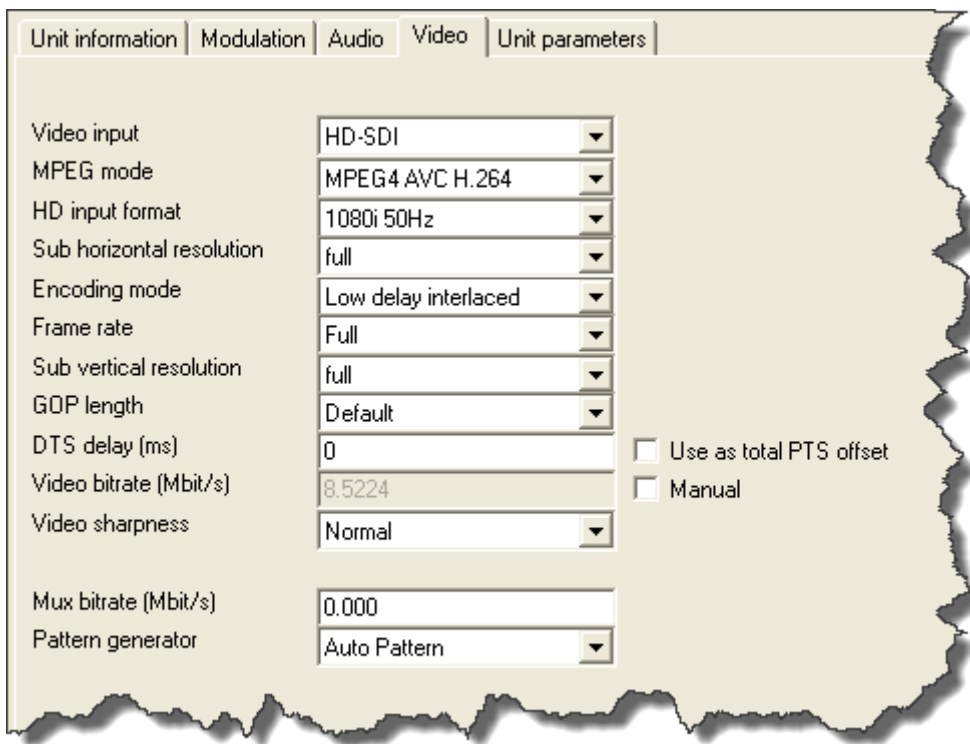


Figure 7-10 Video Tab

Step 1: Configure the Video Settings

Unit Parameter	Options	Notes
Video input	Off Comp PAL Comp NTSC Comp NTSC no ped Comp PAL S-Video Comp NTSC S-Video Comp NTSC S-Video no ped 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 720p 59.94Hz 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	HD Cameras are able to produce a variety of different output formats. Simply match the output of you camera to a setting from this list to ensure the transmitter passes your video signal accurately.

Unit Parameter	Options	Notes
Sub horizontal resolution	Full, 3/4, 2/3, 1/2, 1/4	<p>This is the fraction of the horizontal resolution for whatever format you have selected.</p> <p>Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1920 is the horizontal resolution.</p> <p>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.</p>
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	<p>If full frame rate is giving poor quality, you can step this down until you get an acceptable picture.</p> <p>Note: Using a sub-frame rate will force the Encoding mode to Standard delay progressive.</p>
Sub vertical resolution	Full, 1/2, 1/4	<p>This is the fraction of the vertical resolution for whatever format you have selected.</p> <p>Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1080 is the vertical resolution.</p> <p>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.</p> <p>Note: Using a sub-vertical resolution will force the Encoding mode to progressive.</p>
GOP Length	Default Intra only 2 to 64 frames	<p>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).</p> <p>Shorter GOP, less delay, lower quality video, more error resilience.</p> <p>Longer GOP, more delay, higher quality video, less error resilience.</p> <p>Note: This option only affects Standard delay Encoding modes.</p>
DTS Delay (ms)	0	Decoding Time Stamp (DTS) is used to apply an additional video decoding delay for 3 rd party decoders which might require it. Audio is also delayed by the same amount to ensure synchronisation.

Unit Parameter	Options	Notes
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/V Sync Disabled	A series of pattern formats you can select which are displayed if video is absent, or force on for testing purposes.
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.

7.15 Configuring the Unit Parameters

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

1. Click the **Advanced** button on the SOLO4 Transmitter Control Window
2. The **Advanced options window** opens
3. Select the **Unit parameters** tab

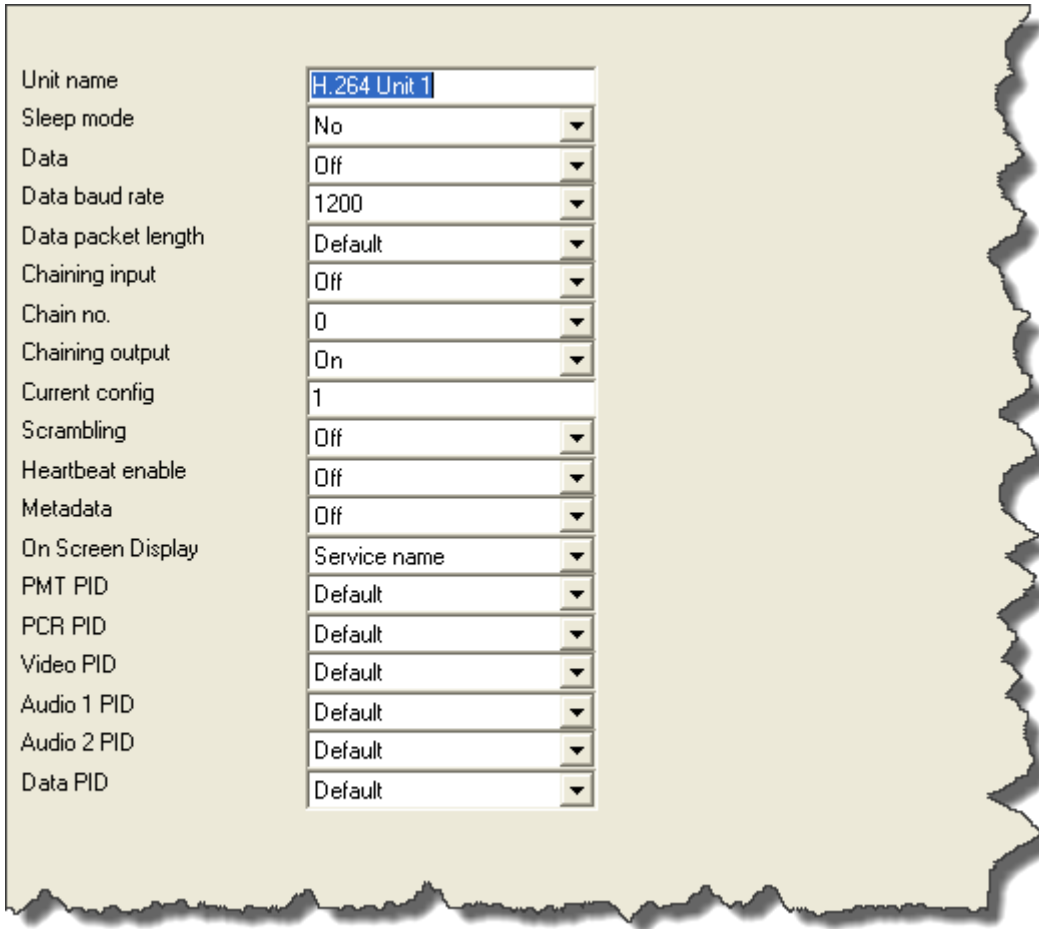


Figure 7-11 Unit Parameters Tab

Step 1: Configure the 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.

Unit Parameter	Options	Notes
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.
Chaining input	Off, On, or Relay	The default is off.
Chain no.	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	The default is 0. This only becomes important when using chaining mode.
Chaining output	Off or On	The default is on.
Current config	1 to 16	This is the Config you are currently working on. Only 1 to 16.
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).

Unit Parameter	Options	Notes
On Screen Display	Service name Video source Off	This can be used to select overlay text which is added to the pattern generator.
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 de-multiplexer 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 <i>Program Clock Reference</i> , 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).

8. Appendix A – Cautions and Warnings

8.1 Cautions and Warnings

Serial	Area	Note
1	Enclosures	<p>Do not remove any factory installed screws or fastenings. Damage to the units may result and void any warranties.</p> <p>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.</p>
2	Maintenance	<p>Other than cleaning, no scheduled maintenance is required to ensure proper function of the unit.</p>
3	Environment	<p>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.</p>
4	Power Supply	<p>Ensure that the power supply arrangements are adequate to meet the stated requirements of each product. Observe all electrical safety precautions.</p>
5	Electro Static Discharge (ESD) Precautions	<p>ESD guidelines must be followed for this electrostatic sensitive device.</p>
6	Lightning Strike	<p>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.</p>
7	Working at Height	<p>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.</p>
8	Risk of Eye Injury	<p>Care should be taken to avoid eye contact with the antennas.</p>
9	Cables	<p>Connecting cables should not be positioned where they are likely to become damaged or where they may present a trip hazard.</p>
10	Thermal Control System	<p>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.</p> <p>Also, if worn close to the body, care must be taken to protect the operator from excessive temperatures.</p>
11	RF Emission System	<p>When using this device please ensure a distance of 20cm is maintained between your device and your body while the device is transmitting.</p>

Serial	Area	Note
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.

Table 8-1 – Cautions and Warnings

8.2 EMC / Safety and Radio Approvals

The equipment has been designed to meet and has been tested against the following harmonized EMC and safety standards:

8.3 CE Marking

The CE mark is affixed to all Broadcast Transmitter products, and the CE Declaration of Conformity, as well as the technical file is available on request.

9. Appendix B - Care and Maintenance

9.1 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
- Always turn the unit off before installing optional accessories
- Only use accessories intended for the specific make and model of your unit, especially batteries, chargers and power adapters

9.2 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 (72 degrees F) 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

9.3 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 degrees Celsius. (0 to 45 degrees Celsius 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 (less than six months) storage, 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.

9.4 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.

9.5 Storage

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

9.6 Repairs

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

9.7 Getting Technical Support

Contact Client Services

Technical support enquiries should be sent to the Client Services team.

Post: DTC - Solent, Fusion 2, 1100 Parkway, Solent Business Park, Whiteley, Hampshire, PO15 7AB, England.

Phone: +44 1489 566 750 then press 1 for support. Office hours: 0900-1700 UK time excluding holidays.

Email: solent.support@domotactical.com (no restricted content).

For technical support we undertake to get a first response to you in less than one working day and a progress update at least every two weeks.

Documentation

It is DTC's practice to make the majority of our latest manuals and user guides available to customers online, by using our WatchDox facility. To access this site please contact your Account Manager or send a request to solent.support@domotactical.com.

You will then be sent a link where you can login and create your own password. You will then receive a confirmation email. Once you have done this you will then be able log into your account.

9.8 Using the DTC RMA Service

You have a problem and all troubleshooting steps have been unsuccessful. You need to contact DTC for Return Material Authorisation (RMA) Service.

Step 1: Email DTC

To return something to Solent please Email solent.rma@domotactical.com. We will then send you an RMA request form to complete and return. We'll then send you an RMA number and shipping instructions.

Step 2: Save your Personal Kit

Remove all personal kit or media from the device.

Step 3: Pack the Unit

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.

Step 4: Prepare an Information Sheet

Include a sheet with the following information.

Note: Please keep a copy of this sheet for your records.

- 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

Step 5: 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.

Step 6: Send the Box to DTC

Send the box using your normal shipping process.

10. Appendix C-Glossary

10.1 Glossary

0-9	Means...
16QAM	16-state Quadrature Amplitude Modulation.
64QAM	64-state Quadrature Amplitude Modulation.

A	Means...
AC	Alternating Current. Current that is continually changing in magnitude and periodically in direction from a zero reference level.
A/V	Audio/Video.
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.
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 (270Mbps) 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.
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	Analog 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 receive electromagnetic energy (generally RF).
Antenna Bandwidth	The frequency range over which a given antenna will accept signals.

A	Means...
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.

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...
D/C	Downconverter. A device which converts microwave frequencies to UHF frequencies for use in DTC receivers.
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.

E	Means...
Elementary Stream (ES)	<p>Elementary streams: These streams contain only one MPEG-2 video channel and no audio. Elementary streams are required if you intend to use Milestone or any player that cannot operate with Transport streams.</p> <p>You must be in RTSP mode to use Elementary streams.</p>
Encoder	<p>A processor in a video transmitter which converts analogue video from a camera to digital data.</p>

F	Means...
FEC	<p>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.</p>
Firmware	<p>Software which is installed directly on a device and is intended specifically for that device and is used to control it.</p>
FOV	<p>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.</p>
Fading	<p>A periodic decrease in received signal strength</p>
Frequency	<p>The rate at which a process repeats itself. In radio communications, frequency is expressed in cycles per second.</p> <p>Signals also have a property called wavelength, which is inversely proportional to the frequency.</p>
Frequency Modulation	<p>The process of varying the frequency of a carrier wave, usually with an audio frequency, in order to convey intelligence. Also called FM.</p>
FPGA	<p>Field-Programmable Gate Array - an integrated circuit designed to be configured by the customer or designer after manufacturing, hence "field-programmable".</p>

G	Means...
GUI	<p>Graphical User Interface.</p>
GHz	<p>Gigahertz - One gigahertz is equal to 1,000 megahertz (MHz) or 1,000,000,000 Hz.</p>
Gain	<p>The increase in signal strength that is produced by an amplifier.</p>

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 illuminance and luminous emittance. It is used in photometry as a measure of the <i>apparent</i> 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.
MPEG	Moving Pictures Experts Group.
Modulation	To change the output of a transmitter in amplitude, phase or frequency in accordance with the information to be transmitted. Data is superimposed on a carrier current or wave by means of a process called modulation. Signal modulation can be done in either of two main ways: analogue and digital. In recent years, digital modulation has been getting more common, while analogue modulation methods have been used less and less. There are still plenty of analogue signals around, however, and they will probably never become totally extinct.
Multicast	Multicasting is sending data from a sender to multiple receivers where each receiver signals that they <i>want</i> to receive the data.

N	Means...
nm	A nanometre (American spelling: nanometer ; symbol nm) is a unit of length in the metric system, equal to one billionth of a metre (i.e., 10^{-9} m or one millionth of a millimetre).
NMEA 0183	NMEA 0183 is a combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonar, anemometer, gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association.
NTSC	National Television Systems Committee.
Noise	Random pulses of electromagnetic energy generated by lightning 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...
PAL	Phase Alternate Line.
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.

Q	Means...
QPSK	Quadrature Phase Shift Keying.

R	Means...
RF	Radio Frequency.
RTSP	Real Time Streaming Protocol (RTSP) is a network control protocol designed for use in entertainment and communications systems to control streaming media servers. The protocol is used for establishing and controlling media sessions between end points. Clients of media servers issue VCR-like commands, such as play and pause, to facilitate real-time control of playback of media files from the server.

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.
Shannon Limit	The Shannon limit or Shannon capacity of a communications channel is the theoretical maximum information transfer rate of the channel, for a particular noise level.
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.
Streaming	Streaming is the transmission of digital audio or video or the listening and viewing of such data without first storing it.

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.
Transport Stream (TS)	Transport streams: These streams can contain several MPEG-2 content channels and associated audio. All the channels are multiplexed together, allowing the receiver to choose which to play back.

U	Means...
UDP	User Datagram Protocol (UDP) Sometimes called fire and forget because there is no dialog between the sender and receiver. If the receiver does not get a packet, the sender will never know. However, UDP is very efficient when there is little chance of errors (like in your LAN), or when TCP would provide "too late" delivery.

U	Means...
USB	Universal Serial Bus
UVMS	Universal Video Management System , a network video recorder storage solution from BAE Systems. Provides comprehensive archiving coupled with live and retrospective viewing.
Unicast	Unicast is simply sending packets from one source to one destination. For example, from one web server to one (or each) person viewing a page on a web browser.

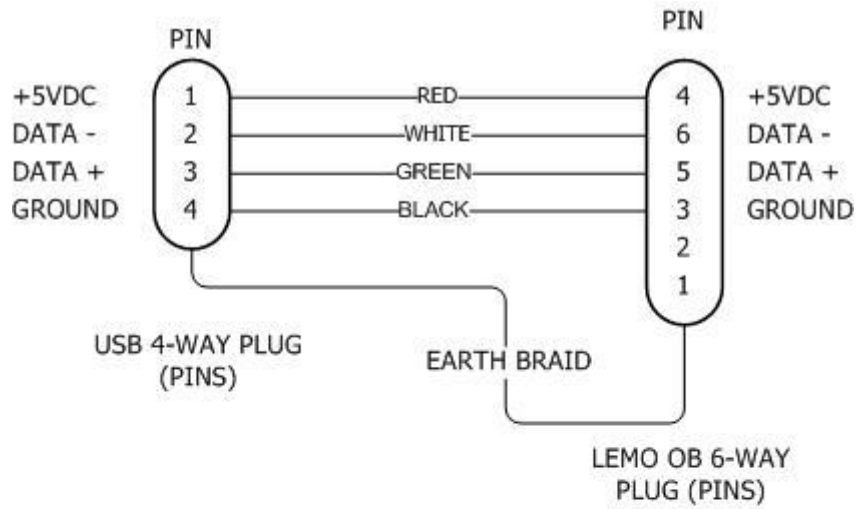
V	Means...
VHF	Very High Frequency – 30 MHz to 300 MHz
V	Volt.
Viterbi Decoder	A Viterbi decoder uses the Viterbi algorithm for decoding a bit stream that has been encoded using forward error correction based on a Convolutional code.

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 formed hollow metal tube, usually rectangular in shape in cross section, used to connect a High Power amplifier to the antenna.

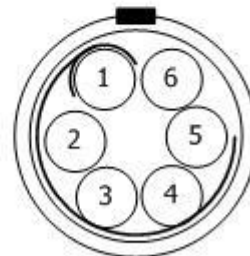
11. Appendix D – Reference Material

11.1 Cable Assemblies

Field Controller USB Cable (CA0343)

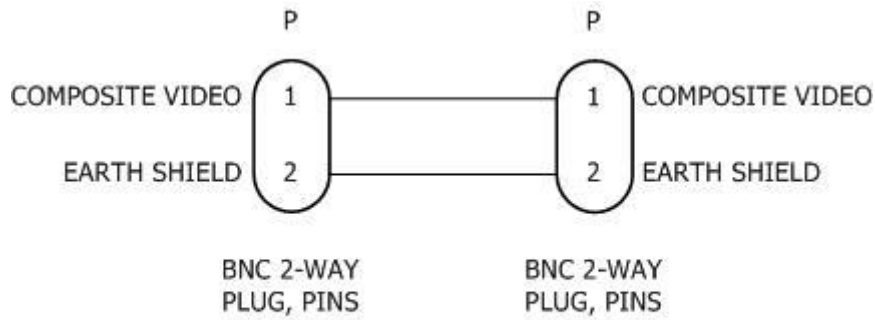


CA0343 FIELD CONTROLLER USB CABLE



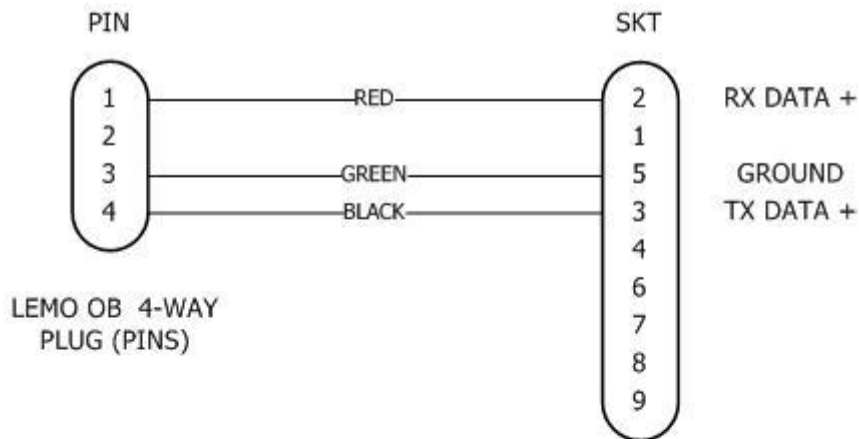
LEMO OB 6-WAY PLUG (PINS) TERMINATION VIEW

BNC Video Cable (AP002118)

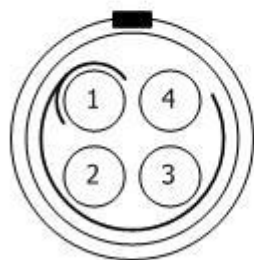


AP002118 VIDEO CABLE

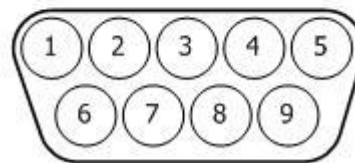
Broadcast TX External 4 Pin ODU Plug – Dsub9 (CA0340)



CA0340 BROADCAST TX EXTERNAL

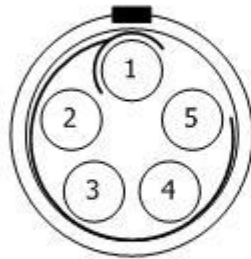
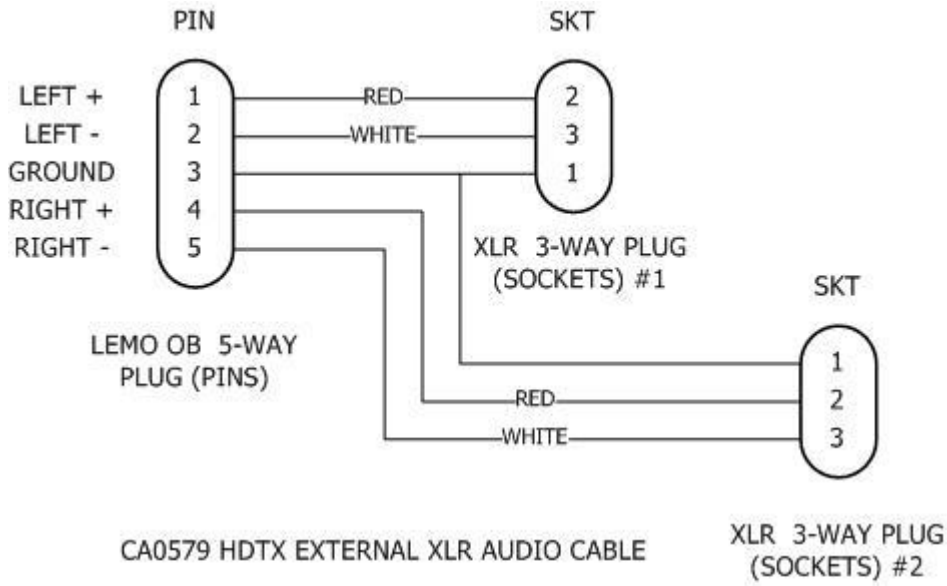


LEMO OB 4-WAY PLUG (PINS) TERMINATION VIEW



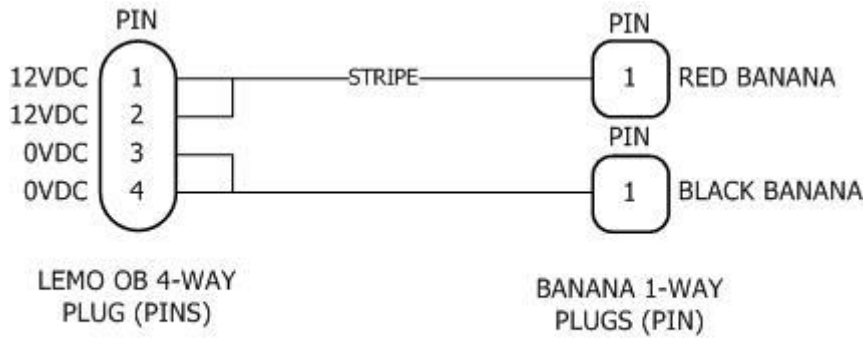
D-TYPE 9-WAY PLUG (SOCKETS) TERMINATION VIEW

HDTX External XLR Audio Cable Assembly (CA0579)

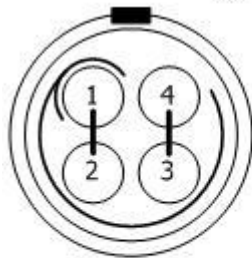


LEMO OB 5-WAY PLUG (PINS) TERMINATION VIEW

SOLO 12VDC Power Cable Assembly (CA0002)

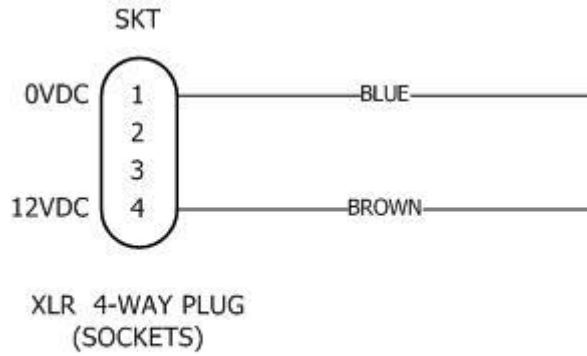


CA0002 12VDC POWER CABLE



LEMO OB 4-WAY PLUG (PINS) TERMINATION VIEW

Pro-RXB / ENGTX DC Cable Assembly (CA0665) – (SOLH264ENGTX Only)



CA0665 PRO-RX / ENGTX DC POWER CABLE

11.1 Remote Control Commands – List V1.1.2

A full list of the SOLH264TX & SOLH264ENGTX remote control commands is supplied in the following tables.

Type g Messages for Unit Level Commands

Function	R/W	Block	Command	Data	Type
Software function	r	g	ver	Software version number	Hex string
FPGA Version	r	g	fpg	FPGA Version number	Hex string
	Bytes 1-3 (xxxxx110) = FPGA S/W Version - e.g. v1.1.0 Byte 4 (xxxx1xxx) = FPGA Function - 1 = h.264 encoder with DVB-T modulation - 2 = h.264 encoder with NB modulation Byte 5 (xxx1xxxx) = H/W Functionality - 0 = D730 revision 1 - 1 = D730 revision 2				
Serial Number	r	g	ser	Hex based serial number	Hex string
Licence code	w	g	lic	Licence number for software facilities	Hex string
Licence mask	r	g	lma	Licensed features	Hex string
	Bit mask... 0x00000001 = HD h.264 encoder 0x00000002 = SD h.264 encoder 0x00000004 = DVB-T modulation 0x00000008 = AES Bcrypt1 128 0x00000010 = AES Bcrypt1 256 0x00000020 = License Exempt Band Only				
Unit address	r/w	g	add	Unit Address 0001 - 9998	int
Board Type	r	g	bty	Returns "D730" on a D730 unit	string
Unit Type	r	g	uty	Unit type as set using the 'u' command on power-up,	int
Restore Default Build	w	g	def	0 = No 1 = Yes	int

Function	R/W	Block	Command	Data	Type
Load Configuration Number	r/w	g	lod	Config number	int
Sleep Mode	r/w	g	sle	0 = No 1 = Yes	int
DVB-T Service Name	r/w	g	dna	Unit Name String	string
Network Name	r/w	g	net	Unit Name String	string
Video Heartbeat	r/w	g	blo	0 = Disabled 1 = Enabled	int
Transmitter Metadata	r/w	m	eta	0 = Disabled 1 = Enabled	int
OSD Mode (not currently available)	r/w	g	osd	0 = Off 1 = Video Source 2 = Service Name	int
FPGA Core Temperature	r/w	g	tmp	Temperature in degrees C	int

Type o Messages for Modulation Commands

Function	R/W	Block	Command	Data	Type
Modulation output	r/w	o	out	0=off 1=COFDM	int
Modulation Frequency	r/w	o	fre	Set Frequency in MHz, decimal point allowed.	double
COFDM Bandwidth	r/w	o	wid	0 = 6MHz 1 = 7MHz 2 = 8MHz	list
Spectrum Inversion	r/w	o	spe	0 = Normal 1 = Inverted	int
FEC Code Rate	r/w	o	dfe	0 = 1/2 1 = 2/3 2 = 3/4 3 = 5/6 4 = 7/8	int
Guard Interval	r/w	o	dgu	0 = 1/32	int

Function	R/W	Block	Command	Data	Type
				1 = 1/16 2 = 1/8 3 = 1/4	
Constellation Mode	r/w	o	dmo	0 = QPSK 1 = 16QAM 2 = 64QAM	int
4K Offset	r/w	o	4ko	0 = none 1 = +4KHz 2 = -4KHz	Int
Output level attenuation high	r/w	o	lev	See ATTENUATION NOTE below. Default = 1274 = 0.0dB	int
Output level attenuation low	r/w	o	llv	See ATTENUATION NOTE below. Default = 32 = 32.0dB	int
Output High Low switch	r/w	o	hls	0 = low level 1 = high level (default)	int

Attenuation Note: dB values (0-32dB in 0.25dB steps) are converted to a linear scale shown below:

Value To/From Transmitter = $1274 * 10^{(\text{Attenuation}/-20)}$

Actual Attenuation = $-20 * \log_{10}(\text{Value}/1274)$

Type z Messages for Scrambling Commands

Function	R/W	Block	Command	Data	Type
Scrambling	r/w	z	scr	0=off 1=ABS 8=AES128 Bcrypt 10=AES256 Bcrypt	int
AES Key lower 128	w	z	kez	Encryption key for AES lower 128	hex string (32 chars)
AES Key upper 128 (for AES 256 only)	w	z	kex	Encryption key for AES upper 128	hex string (32 chars)
ABS key	w	z	key	Encryption key for ABS	hex string (12 chars)
Video Input	r/w	v	inp	0 = Off 2 = Comp PAL 3 = Comp NTSC 4 = Comp NTSC No Pedestal 5 = Comp PAL S-vid 6 = Comp NTSC S-vid 7 = Comp NTSC S-Vid No Pedestal 8 = SDI PAL 9 = SDI NTSC 10 = HDMI PAL 11 = HDMI NTSC 12 = HD-SDI 13 = HD HDMI	int

Function	R/W	Block	Command	Data	Type
HD Input Format	r/w	v	hdf	0 = 720p 50Hz 1 = 720p 59.94Hz 2 = 720p 60Hz 3 = 1080i 25Hz 4 = 1080i 29.97Hz 5 = 1080i 30Hz 6 = 1080p 23.976Hz 7 = 1080p 24Hz 8 = 1080p 25Hz 9 = 1080p 29.97Hz 10 = 1080p 30Hz 11 = 1080psf 23.976Hz 12 = 1080psf 24Hz 13 = 1080psf 25Hz 14 = 1080psf 29.97Hz 15 = 1080psf 30Hz	int
SD Aspect Ratio	r/w	v	sdw	0 = 4:3 1 = 16:9	int
Video Locked	r	v	loc	0 = Video not locked 1 = Video locked	int

Type e Messages for Video Encoder Commands

Function	R/W	Block	Command	Data	Type
Video Encoder Mode	r/w	e	enc	1=MPEG4 ASP h.263 (not currently available) 2=MPEG4 AVC h.264	int
Sub Horizontal Resolution	r/w	e	hor	0 = full 1 = 3/4 2 = 2/3 3 = 1/2	int
Sub Vertical Resolution	r/w	e	ver	0= full 1=1/2	int

Function	R/W	Block	Command	Data	Type
Sub Frame Rate	r/w	e	frm	0 = full 1 = 1/2 2 = 1/4 3 = 1/8 4 = 1/24	int
Encoding Options	r/w	e	cmd	Interlaced... 0 = Low delay 1 = Standard delay Progressive... 2 = Low delay 3 = Standard delay	int
GOP Length	r/w	e	per	0 = Default 1 = Intra only 2-64 = Frames	int
Video Sharpness	r/w	e	sha	0 = Normal 1 = Sharp 2 = De-blocking filter disabled	int
Video PTS Offset	r/w	e	pts	0 = VBV+DTS 1 = DTS	int
Video DTS Delay	r/w	e	dts	Video DTS delay (ms) Default = 90ms	int
Manual Video Bitrate	r/w	e	vbr	Video bitrate override 0 = Automatic Non-zero sets video bitrate (kbps)	double
Video Bitrate	r	e	vid	Current video bitrate (Mbps)	double

Type a Messages for Audio Commands

Function	R/W	Block	Command	Data	Type
Audio Source	r/w	a	1in 2in	0 = Digital Embedded (audio pair 1 gets source channels 1-2) (audio pair 2 gets source channels 3-4) 1 = Analogue	int
Audio Encoder	r/w	a	1en 2en	0 = Off MPEG Layer 1... 1 = 48kHz Stereo 2 = 48kHz Mono MPEG Layer 2... 3 = 48kHz Stereo 4 = 48kHz Mono	int
MPEG Layer 1 Audio Bitrate	r/w	a	1br 2br	2 = 64kbps 3 = 96kbps 4 = 128kbps 5 = 160kbps 6 = 192kbps 7 = 224kbps 8 = 256kbps 9 = 288kbps 10 = 320kbps 11 = 352kbps 12 = 384kbps 13 = 416kbps 14 = 448kbps	int

Function	R/W	Block	Command	Data	Type
MPEG Layer 2 Audio Bitrate				2 = 48kbps 3 = 56kbps 4 = 64kbps 5 = 80kbps 6 = 96kbps 7 = 112kbps 8 = 128kbps 9 = 160kbps 10 = 192kbps 11 = 224kbps 12 = 256kbps 13 = 320kbps 14 = 384kbps	
Mono Select	r/w	a	1ms 2ms	0 = Left mono 1 = Right mono	Int
Audio PTS Offset	r/w	a	pts	Audio PTS offset (ms)	int
Balanced Audio Gain	r/w	a	bal	0 = 0dB 1 = 20dB 2 = 40dB 3 = 60dB	int
Analogue Input Level (D730 revision 1 or with Balanced Audio Gain > 0)	r/w	a	lev	0 = 0dB (line level) 1 = 12dB (mic level) 2 = 24dB (mic level) 3 = 36dB (mic level) 4 = 48dB (mic level) also enables ALC 5 = 60dB (mic level) also enables ALC	int

Function	R/W	Block	Command	Data	Type
Analogue Input Level (D730 revision 2 with Balanced Audio Gain = 0)				0 = 0dB 1 = 12dB 2 = 24dB 3 = 36dB 4 = 48dB 5 = 60dB 6 = 72dB 7 = 84dB 8 = 96dB 9 = 108dB + ALC 10 = 120dB + ALC	
Balanced Audio Mic Bias	r/w	a	bmb	0 = No Bias 1 = +5V Bias	int
SDI Embedded Audio Group	r/w	a	grp	Sets audio group DID for SD / HD SDI 0 = 0xFF / 0xE7 1 = 0xFD / 0xE6 2 = 0xFB / 0xE5 3 = 0xF9 / 0xE4	int
Available Digital Audio Sources	r	a	sta	Bit mask... 0x01 = SDI group 0 0x02 = SDI group 1 0x04 = SDI group 2 0x08 = SDI group 3 0x10 = HDMI	int
Audio Clock Options (Relevant to D730 revision 2 only)	r/w	a	clk	0 = Best quality analogue audio 1 = Allows analogue audio when video clock is out of specification, slightly reduces SNR.	int

Audio Note: Commands starting with a1** control audio channel 1, a2** control audio channel 2, and other a*** commands are global.

Type p Messages for SI Commands

Function	R/W	Block	Command	Data	Type
PMT PID	r/w	p	mpd	0=Default Other=Custom PID	int
PCR PID	r/w	p	cpd	0 = Default Other = Custom PID	int
Video PID	r/w	p	vid	0 = Default Other = Custom PID	int
Audio Channel 1 PID	r/w	p	au1	0 = Default Other = Custom PID	int
Audio Channel 2 PID	r/w	p	au2	0 = Default Other = Custom PID	int
Data PID	r/w	p	dat	0 = Default Other = Custom PID	int
Metadata PID	r/w	p	met	0 = Default Other = Custom PID	int
Return Data PID	r/w	p	ccu	0 = Default Other = Custom PID	int

Type d Messages for Data Commands

Function	R/W	Block	Command	Data	Type
Data Mode	r/w	d	inp	0 = Off Standard Mode... 1 = 8 bit no parity 2 = 8 bit even parity 3 = 8 bit odd parity 5 = 7 bit no parity 6 = 7 bit even parity 7 = 7 bit odd parity Mode 2... 17 = 8 bit no parity 18 = 8 bit even parity 19 = 8 bit odd parity 21 = 7 bit no parity 22 = 7 bit even parity 23 = 7 bit odd parity	int
Input Data Baudrate	r/w	d	bau	0 = 1200 baud 1 = 2400 baud 2 = 4800 baud 3 = 9600 baud 4 = 19200 baud 5 = 38400 baud 6 = 57600 baud 7 = 115200 baud	int
Data Packet Length	r/w	d	pln	0 = Default 1-176 = Bytes per packet	int

Type t Messages for Return Data Commands

Function	R/W	Block	Command	Data	Type
Return Control Data	w	t	rda	Return data maximum of 66 chars	string
Return Buffer Reset	w	t	rrs	1 = Resets return data buffer	int
Return Buffer Occupancy	r	t	roc	Data buffer occupancy	int

Type c Messages for Chaining Commands

Function	R/W	Block	Command	Data	Type
Chaining Input	r/w	c	inp	0=off 1=on 2=Relay	int
Chaining Output	r/w	c	out	0 = Off 1 = On	int
Chaining Loop	r/w	c	hio	0 = Off 1 = Output loop to input for external encryption	int
Chain Number	r/w	c	cha	0 - 9	int
Chaining Source	r/w	g	osw	Bits... 0x02 = Loop mode 0x04 = Chaining JST input (not ASI) 0x08 = Chaining JST output (not ASI)	int
Chaining Status	r	c	sta	0 = Off 1 = Active 2/3 = Overflow	int
ASI Input Status	r	c	asi	0 = Not Locked 3 = ASI Locked	int
Mux Bitrate	r/w	m	bit	Override mux bitrate (kbps) when modulation output is off	double

Type c Messages for Calibration Commands

Function	R/W	Block	Command	Data	Type
Lowest Operating Frequency	r/w	c	flo	Frequency in MHz	double
Highest Operating Frequency	r/w	c	fhi	Frequency in MHz	double

Function	R/W	Block	Command	Data	Type
I Trim Point 0 Q Trim Point 0	r/w	c	cii0 cqq0	-128 to +127 Signed but set and read as unsigned (255 = -1)	int
I Trim Point 1 Q Trim Point 1	r/w	c	cii1 cqq1	-128 to +127 Signed but set and read as unsigned (255 = -1)	int
I Trim Point 2 Q Trim Point 2	r/w	c	cii2 cqq2	-128 to +127 Signed but set and read as unsigned (255 = -1)	int
I Trim Point 3 Q Trim Point 3	r/w	c	cii3 cqq3	-128 to +127 Signed but set and read as unsigned (255 = -1)	int
I Trim Point 4 Q Trim Point 4	r/w	c	cii4 cqq4	-128 to +127 Signed but set and read as unsigned (255 = -1)	int
RF Level Point 0	r/w	c	pl0	See ATTENUATION NOTE above.	int
RF Level Point 1	r/w	c	pl1	See ATTENUATION NOTE above.	int
RF Level Point 2	r/w	c	pl2	See ATTENUATION NOTE above.	int
RF Level Point 3	r/w	c	pl3	See ATTENUATION NOTE above.	int
RF Level Point 4	r/w	c	pl4	See ATTENUATION NOTE above.	int

Calibration Note: Calibration points 0-4 are evenly spaced from lowest to highest operating frequencies.

12. Appendix E – Advanced Chaining Guide

12.1 About the Terms ‘ASI’ and ‘Chaining’

Asynchronous Serial Interface, ASI

Asynchronous Serial Interface, or ASI, is a streaming data format which often carries an MPEG Transport Stream (MPEG-TS).

An ASI signal can carry one or multiple SD, HD or audio programs that are already compressed, not like an uncompressed SD-SDI (270 Mbit/s) or HD-SDI (1.45 Gbit/s).

An ASI signal can be at varying transmission speeds and is completely dependent on the user's engineering requirements.

Generally, the ASI signal is the final product of video compression, either MPEG2 or MPEG4, ready for transmission to a transmitter or microwave system or other device. Sometimes it is also converted to fibre or RF for other types of transmission.

Broadcasters often use ASI to link broadcast devices together.

Chaining

In DTC, we use the term **Chaining** when we are linking devices together. This is because we *maybe* using ASI to link them or we may be using a *different* technique.

You can consider the terms **Chaining** and **ASI** interchangeable.

SOLH264TX Uses Both Terms

On many DTC products, you'll see the term '**Chaining**' in the software.

On SOLH264TX, the Field Controller Window on the side of the unit has a menu item called '**ASI**'. We did this to make the unit more familiar to our broadcast customers.

However, if you connect our Transmitter Control software to the SOLH264TX, you'll see the control is labelled '**Chaining**'. Remember, the terms are interchangeable.

12.2 About Hexadecimal and Decimal PID Numbers

In broadcast environments, PID numbers are generally expressed as **decimal** numbers.

In some earlier DTC products we used **Hexadecimal** numbers for PIDs.

Later DTC products used in the broadcast environment now use only decimal numbers when referring to PIDs.

12.3 What is an MPEG Transport Stream?

MPEG Transport Stream (MPEG-TS) is a standard format for transmission and storage of **audio, video** and **Program and System Information Protocol** (PSIP) data. It is used in Broadcast systems such as DVB.

Transport stream specifies a **container format** encapsulating **packetized elementary streams**, with **error correction** and stream synchronization features for maintaining transmission integrity when the signal is degraded.

A Transport Stream may carry multiple programs.

12.4 What is a PID?

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.

12.5 About DTC Default PIDs

DTC transmitters have a set of Default values for PIDs.

PID	Default Value
PMT	32
Video	300
Audio 1	200
Audio 2	500
RS232 Data	100
CCU Return Data	400
Metadata	600
PCR	8190

Table 12-1 – DTC Default PIDs

12.6 About Program Number

Transport stream has a concept of **programs**. Each single program is described by a **Program Map Table (PMT)** which has a unique PID, and the elementary streams associated with that program have PIDs listed in the PMT.

For instance, a transport stream used in digital television might contain three programs, to represent three television channels. Suppose each channel consists of one video stream, one or two audio streams, and any necessary metadata. A receiver wishing to decode a particular "channel" merely has to decode the payloads of each PID associated with its program. It can discard the contents of all other PIDs.

12.7 The Relationship between PIDs, Program Number and Chaining Number

We saw above that DTC transmitters have a set of default PIDs which is fine if you are sending just one program.

When we start chaining devices together to send multiple video programs over one RF link for example, we need to **identify** those programs so that the receiver can decode them separately.

We saw above that the **Program Number** is used to uniquely identify a 'channel' in a Multiple Program Transport Stream (MPTS).

Chaining Numbers vs. Program Numbers

When we are setting up chaining we need to give each encoding device a separate **Chaining Number**.

If you use the Chaining Number 0 for example, *zero* is added to the default PIDs and this gives you **Program Number 1**.

If you use Chaining Number 5, five is added to the default PIDs and this gives you **Program Number 6**.

A table makes it clear:

Chaining Number	Program Number	What happens to the Default PIDs?
0	1	Adds 0
1	2	Adds 1
2	3	Adds 2
3	4	Adds 3
4	5	Adds 4
5	6	Adds 5
6	7	Adds 6
7	8	Adds 7
8	9	Adds 8
9	10	Adds 9

Table 12-2 – Relationship between Chaining Number and Program Number

Chaining Numbers and the Default PIDs

We saw that if you use Chaining Number 5, five is added to the default PIDs and this gives you **Program Number 6**.

Program 6 now looks like this:

PID	Default PID Value	Program 6 PID Value
PMT	32+5	37
Video	300+5	305
Audio 1	200+5	205
Audio 2	500+5	505
RS232 Data	100+5	105
CCU Return Data	400+5	405
Metadata	600+5	605

PID	Default PID Value	Program 6 PID Value
PCR	8190-5	8185

Table 12-3 – Relationship between Chaining Number and Program Number

Note: Take a close look at the last line of the table, PCR. For this one PID, we **take away** the value of the chaining number instead of adding it.

12.8 About Service Name and Unit Name – TX End

Program numbers are easy for machines to interpret, but it is often easier for us to use a human friendly name. When you set up a Program Number, whatever you type in the service name box (or Unit name box), is mapped to that number.

On DTC Transmitters, if you are set up for DVB-T operations, you use the **Service Name** field to uniquely identify your program.

If you are set up for narrowband operations, you use the **Unit Name** field to uniquely identify your program.

12.9 About the Receiver End of the Link

Program Numbers

We know that the **Program Number** is used to uniquely identify a 'channel' in a Multiple Program Transport Stream (MPTS) at the transmitter end of the link.

At the receiver end, we use that same Program Number to ensure we only decode the elements making up that channel.

Service Names and Unit Names

If the transmitter is using Service Names or Unit Names, then these can be used at the receive end of the link to uniquely identify programs.

Note: If you type in a Program Number and a Service or Unit name, one takes precedence over the other. Program Number has priority over Service Name at the receiver.

12.10 About Chaining Modes

Three modes of operation are supported:

- No chaining (default)
- **Relay** mode
- **Chaining** mode

Chaining enables you to:

- Create a **Relay** System – this is **Relay Mode**
- Send **two Video** services in **one RF link** System – this is **chaining Mode**

12.11 Setting up Relay Mode

The **relay mode** allows just the remote service to be transmitted, turning off the local service.

Note: When set in Relay mode the TX will not allow selection of video/audio encoder or data modes (they are forced to OFF) until the unit is no longer in relay mode.

A **Digital Relay** system can be made by using the chaining interface. A **relay** uses a **receiver** to receive the digital signal on one frequency, and then uses the **transmitter** to re-modulate the signal onto another frequency. This technique has the following advantages:

- Maintains Video Quality
- Does not increase delay
- Maintains encryption.

CAUTION: On the transmitter, you must set up a modulation bit rate which is equal to or greater than the ASI bit rate coming in. If the ASI bit rate exceeds the modulation bit rate the link won't work and you'll see an Overflow message in the Unit Information page.

Before you Begin

You'll need:

- A Receiver with ASI out capability
- A Transmitter
- A Chaining Cable
- A PC with the Transmitter Controller software loaded
- A CA0343-2 USB to Lemo communications cable.

Step 1 – Connect the System

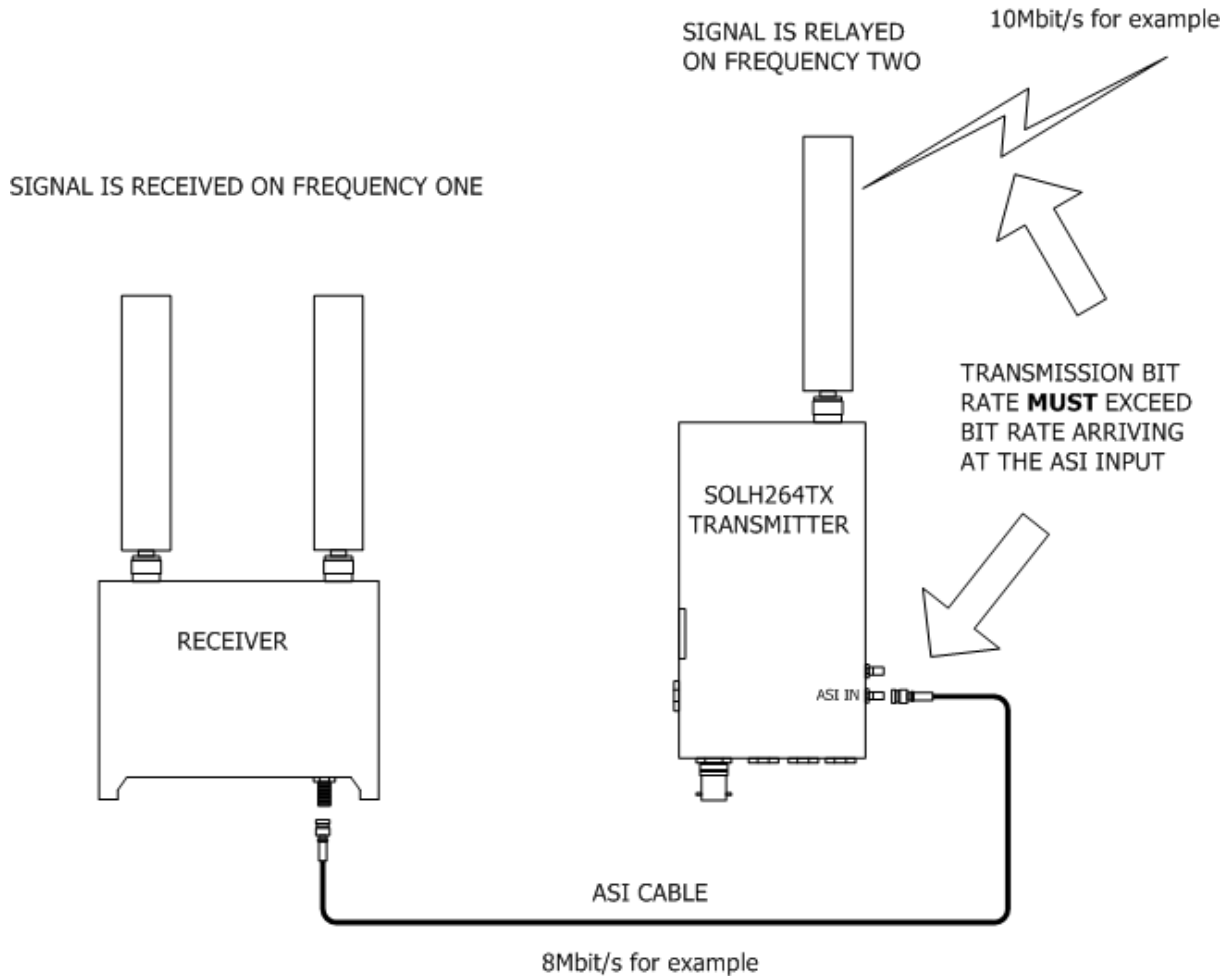


Figure 12-1 – Connecting for Relay Mode

Step 2 - Configure the Transmitter for Relay

1. Connect the **SOLH264TX** Transmitter to your **Windows PC** and start the **Control Application**.
2. Click the **Advanced** button.
3. The **Advanced Options** window opens.
4. Select the **Unit Parameters** tab
5. In the **Chaining Input** drop-down box, choose **Relay**.
6. Click the **Apply** button.
7. Click the **Unit Information** tab.
8. The Unit Information tab opens. You may need to press the **Refresh** button.
9. Ensure the Chaining field shows the **Active** caption.

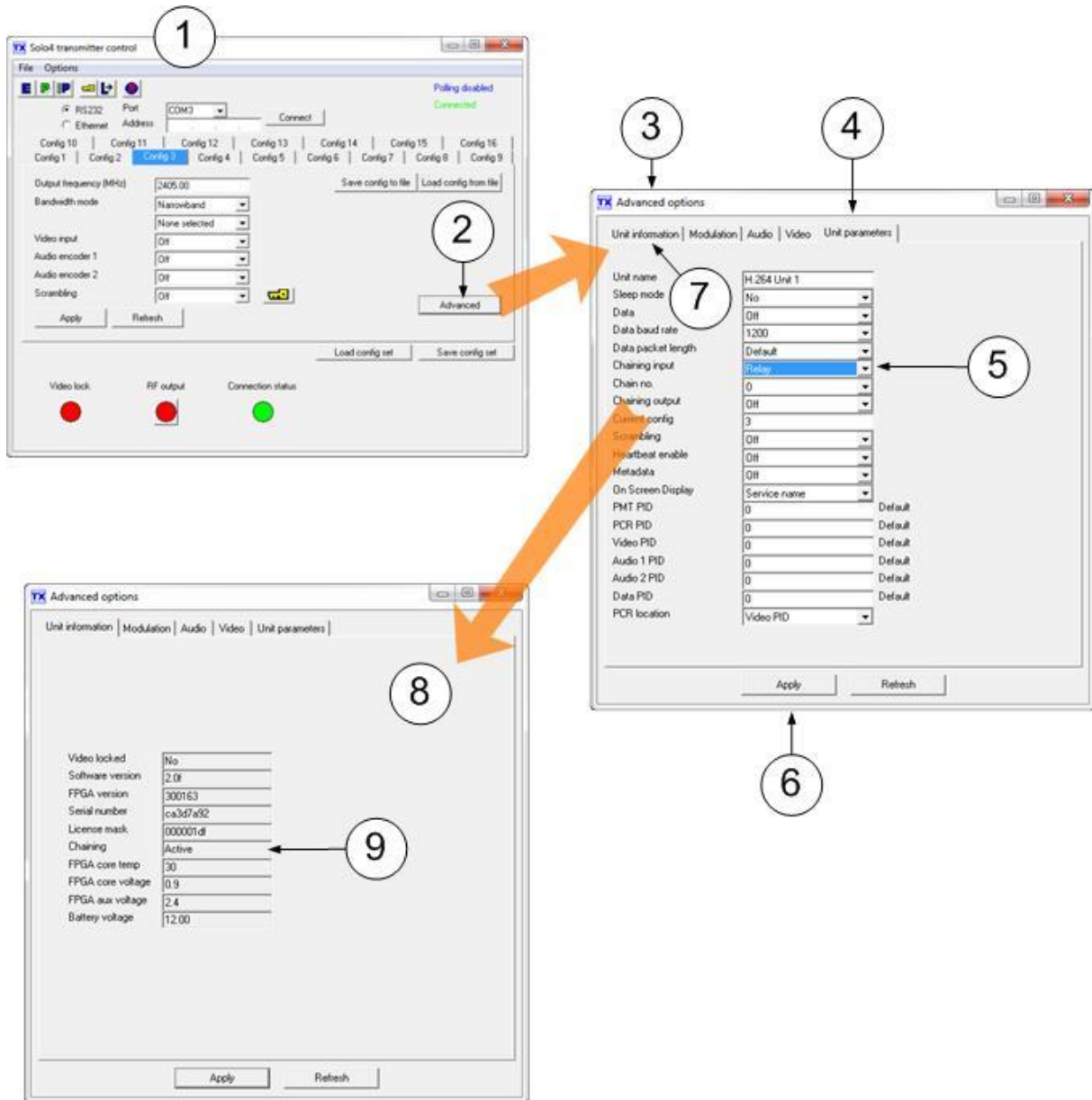


Figure 12-2 – Configuring the Transmitter for Relay Mode

Troubleshooting

☹ In the **Unit Information** tab the **Chaining** field said '**Overflow**' instead of active and my relay didn't work.

☺ This means the Transmission bit rate is less than the incoming ASI bit rate. In the modulation tab, try increasing the modulation bandwidth which will increase modulation bit rate.

☹ In the **Unit Information** tab the **Chaining** field said '**Not Active**' instead of active and my relay didn't work.

☺ You must press the **Apply** button after you select **Relay**.

You may need to press the **Refresh** button when you switch to the Unit Information tab.

Is the ASI stream connected to the **correct port** on the transmitter? (**ASI IN**, not ASI OUT).

Is the ASI stream really running? The caption will **only** switch to Active if **Relay** is set correctly **and** there is an **ASI stream available** at the input port of the transmitter.

Note: In this example I have used a receiver which is demodulating an off-air signal and passing the ASI stream to the transmitter to relay onwards.

Naturally, you could use *any* ASI source to replace the receiver in my example.

The only rule is: The ASI bit rate must be less than the modulation bit rate.

12.12 Setting up Chaining Mode

The chaining mode allows two or more services to be combined.

For example, a system can be configured to carry two video signals using only one RF link. One transmitter modulates the RF output; the second transmitter is used as an encoder only. Naturally, this arrangement needs to divide the two video signals equally in bit rate.

CAUTION: For chaining mode to operate correctly, the RF transmitter unit in the chain must operate at **twice** the transmit bit rate of the encoder only transmitter unit.

The units **must** have:

- Different Chaining Numbers
- Different Unit Names

Before you Begin

You'll need:

- At least one Receiver.
- Two SOLH264TX Transmitters each configured to accept an SD video source.
- A video source for each transmitter (I'm using SD in my example)
- A Chaining Cable (ASI Cable).
- A PC with the Transmitter Controller software loaded.
- A CA0343-2 USB to Lemo communications cable.

Step 1 – Connect the System

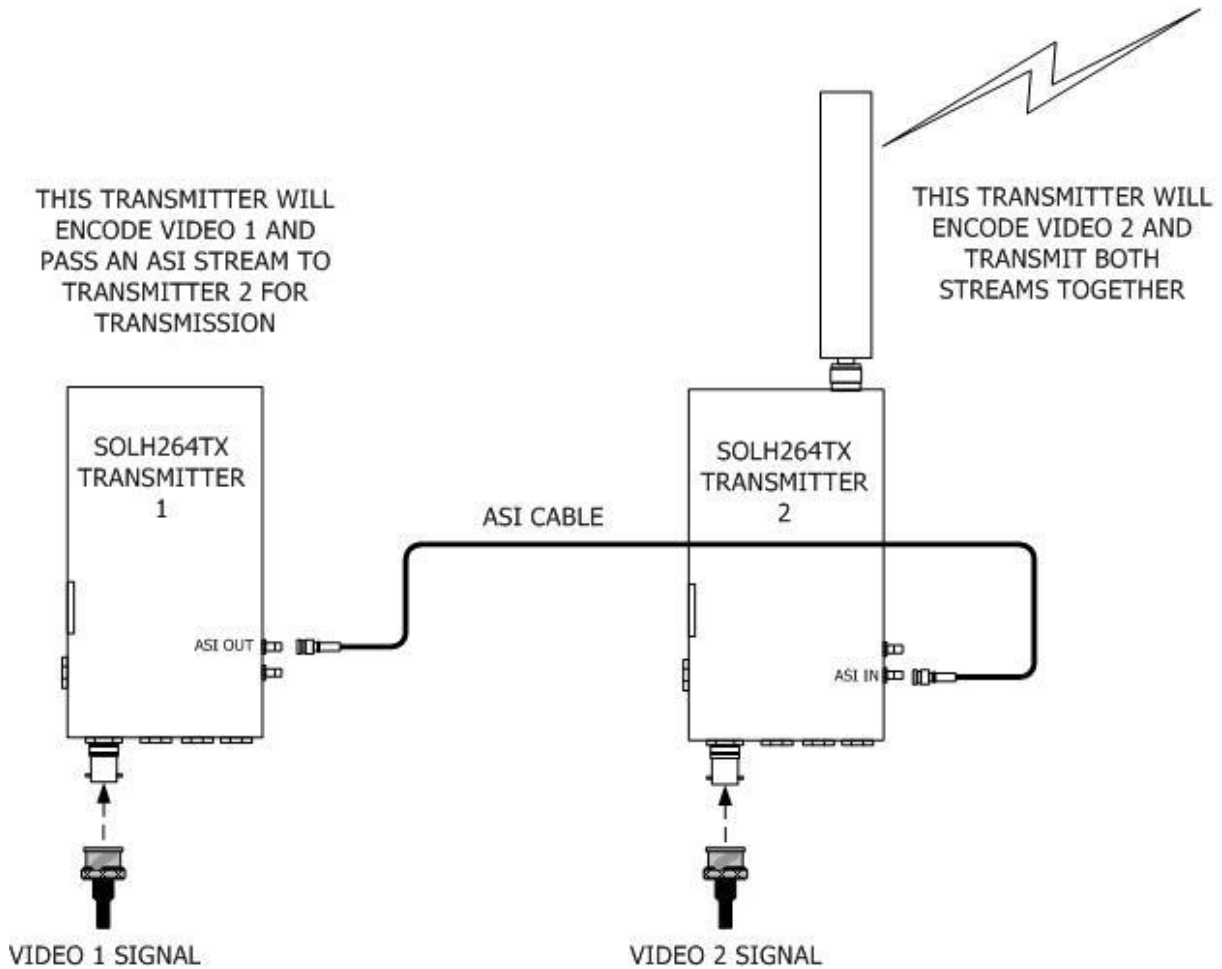


Figure 12-3 – Connecting for Chaining Mode

Step 2 - Configure Transmitter 1 for Chaining

1. Connect **Transmitter 1** to your **Windows PC** and start the **Control Application**.
2. Click the **Advanced** button.
3. The **Advanced Options** window opens.
4. Select the **Modulation** tab.
5. Set **Modulation output** to **OFF**.
6. Click the **Apply** button.
7. Select the **Unit Parameters** tab.
8. Set the **Unit Name** to **Transmitter1**.
9. Set the **Chaining Input** to **ON**.
10. Set the **Chain No.** to **0**.
11. Set the **Chaining Output** to **ON**.
12. Click the **Apply** button.

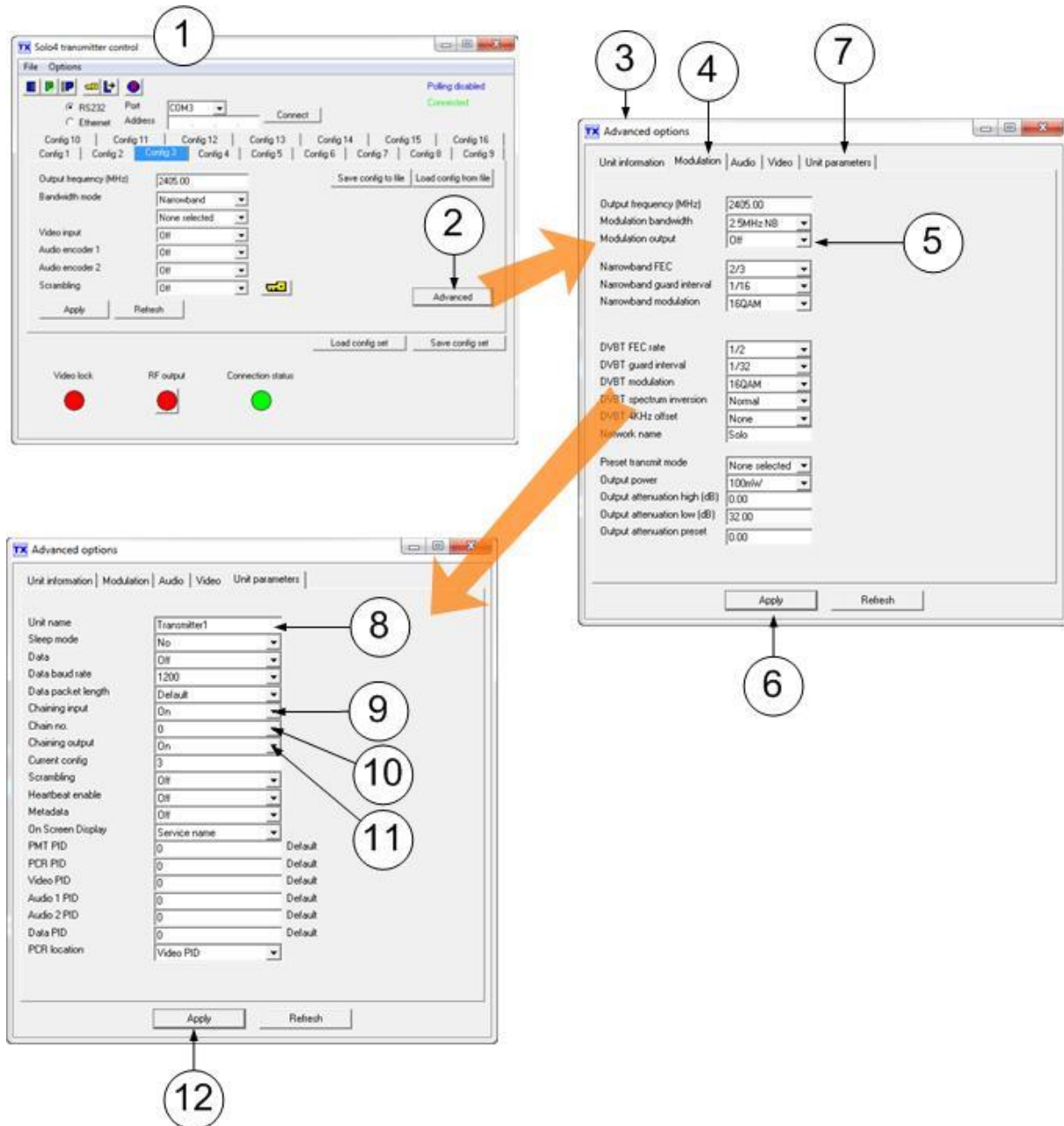


Figure 12-4 – Configuring Transmitter 1 for Chaining

Step 3 - Configure Transmitter 2 for Chaining

1. Connect Transmitter 2 to your **Windows PC** and start the **Control Application**.
2. Click the **Advanced** button.
3. The **Advanced Options** window opens.
4. Select the **Modulation** tab.
5. Set **Modulation output** to **ON**.
6. Click the **Apply** button.
7. Select the **Unit Parameters** tab.
8. Set the **Unit Name** to **Transmitter2**.
9. Set the **Chaining Input** to **ON**.

10. Set the **Chain No.** to 1.
11. Click the **Apply** button.
12. Click the **Unit Information** tab.
13. The Unit Information tab opens. You may need to press the **Refresh** button.
14. Ensure the Chaining field shows the **Active** caption.

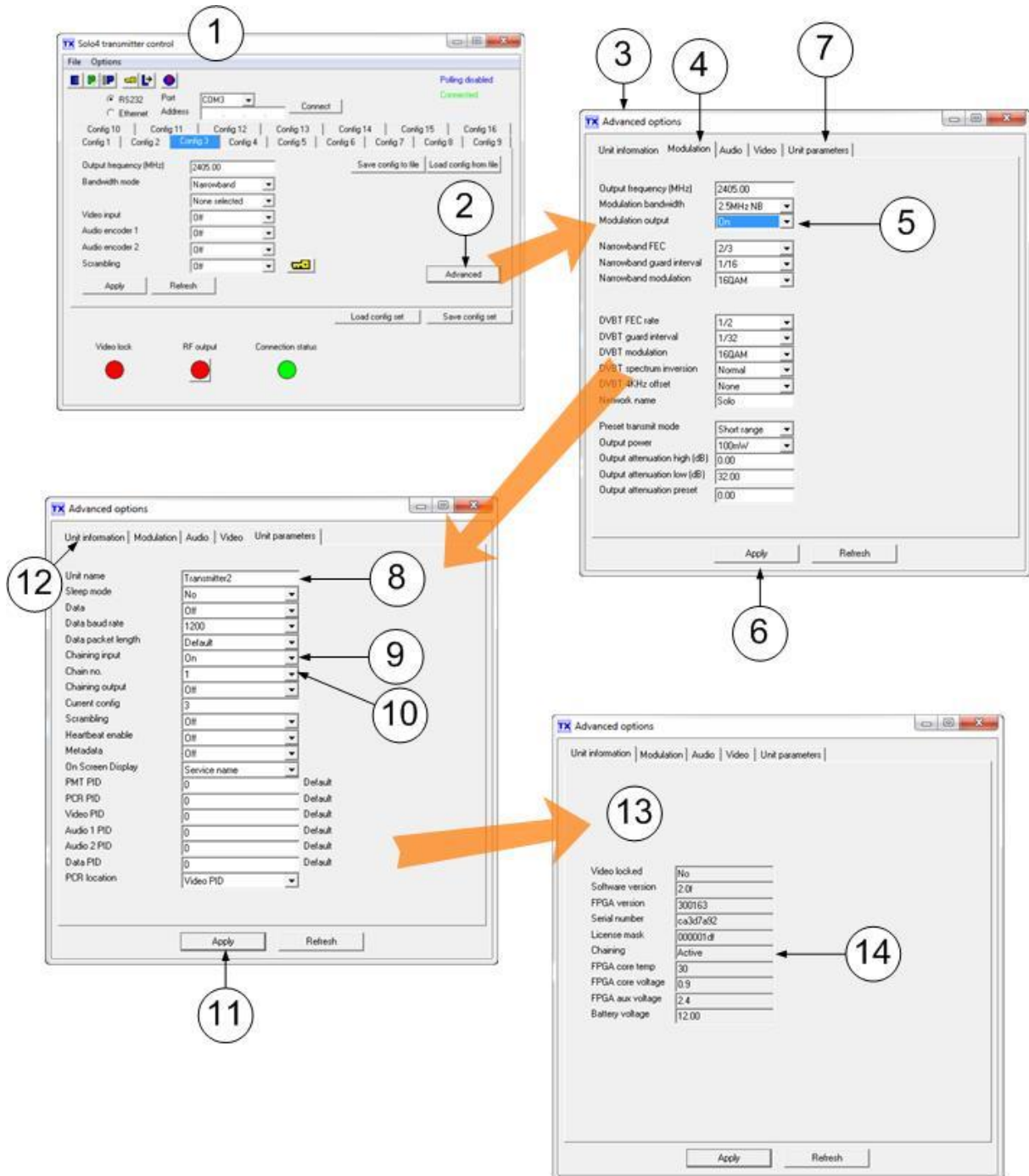


Figure 12-5 – Configuring Transmitter 2 for Chaining

Step 4 – Configure the Receiver to Show Transmitter 1

1. Ensure all the modulation and video parameters are correctly set as in a conventional link

2. To see Transmitter 1 set your **Default Service** to Transmitter1 or set your default **Program ID** to 1.
(Remember, Chain no 0 is Program Number 1).

Note: Remember the priority rule. If you **only** set a Service Name then the Program ID might match the wrong program and take priority. A good rule of thumb is to **always** set Program ID.

Step 5 – Configure the Receiver to Show Transmitter 2

1. Ensure all the modulation and video parameters are correctly set as in a conventional link
2. To see Transmitter 2 set your **Default Service** to Transmitter2 or set your default **Program ID** to 2.
(Remember, Chain no 1 is Program Number 2).

Note: Remember the priority rule. If you **only** set a Service Name then the Program ID might match the wrong program and take priority. A good rule of thumb is to **always** set Program ID.

12.13 About the Terms at the Receiver End

There are many receiver types manufactured by DTC and they work with many transmitter types.

In my example above, I was using a ProRX receiver which uses the terms **Default Service** and **Program ID**.

On other DTC receivers you may see other Variations of these names but as we said earlier, many of these terms are interchangeable.

Here are some examples:

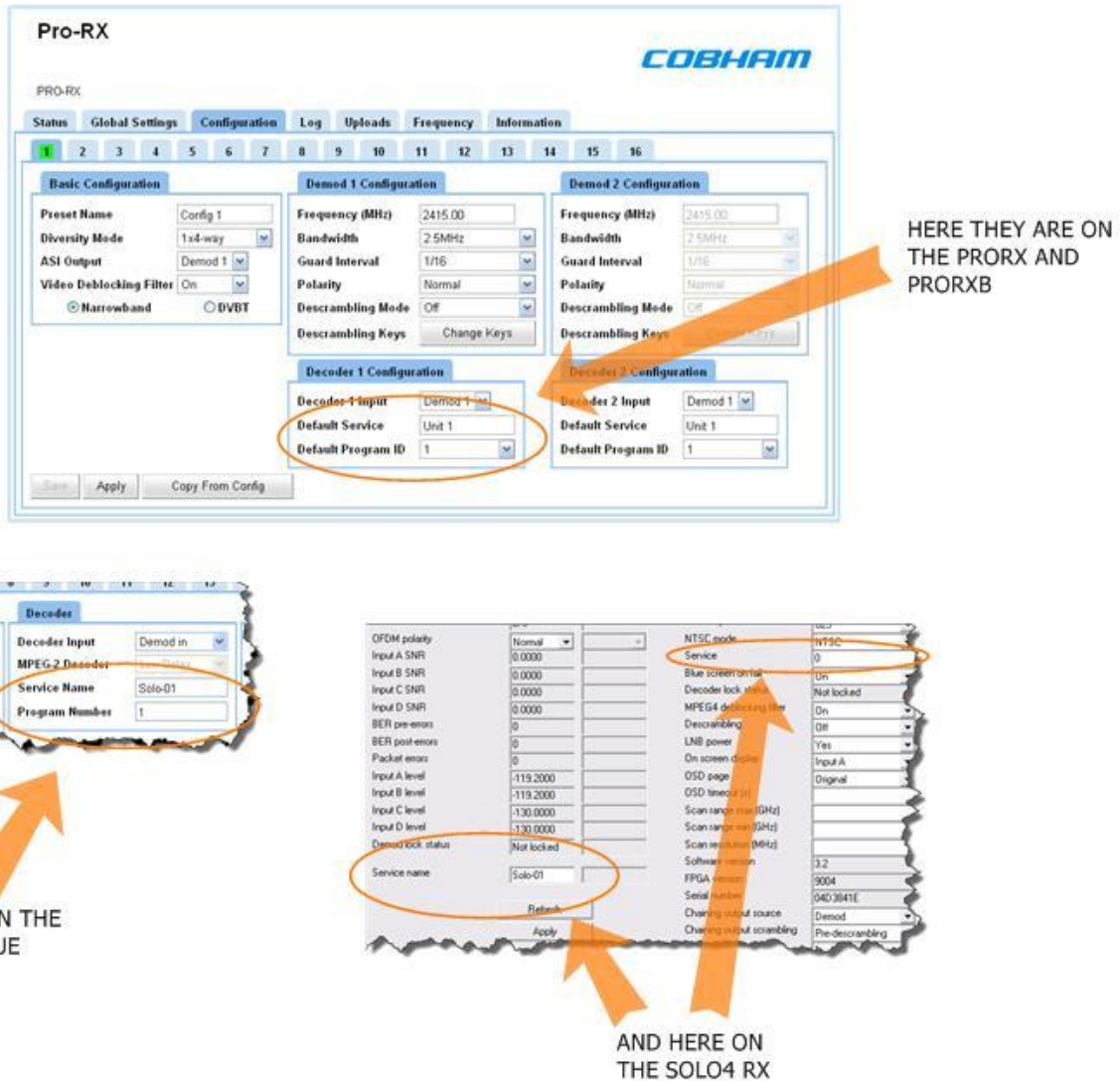


Figure 12-6 – About the Terms at the Receiver End

12.14 How does SOLO 6 do Chaining?

A SOLO6 Transmitter is really two transmitters in one box and naturally, it can do chaining.

The way you set it up is a little different because instead of using a Transmitter Control Application, you use our **Mission Commander** software which has a **Solo 6 Transmitter Configuration** window.

This is a graphical interface that makes setting up chaining really simple because it does all of the bit rate calculations for you when you click the Chaining button.

A very useful feature is the **Bit Rate Balance Slider**:

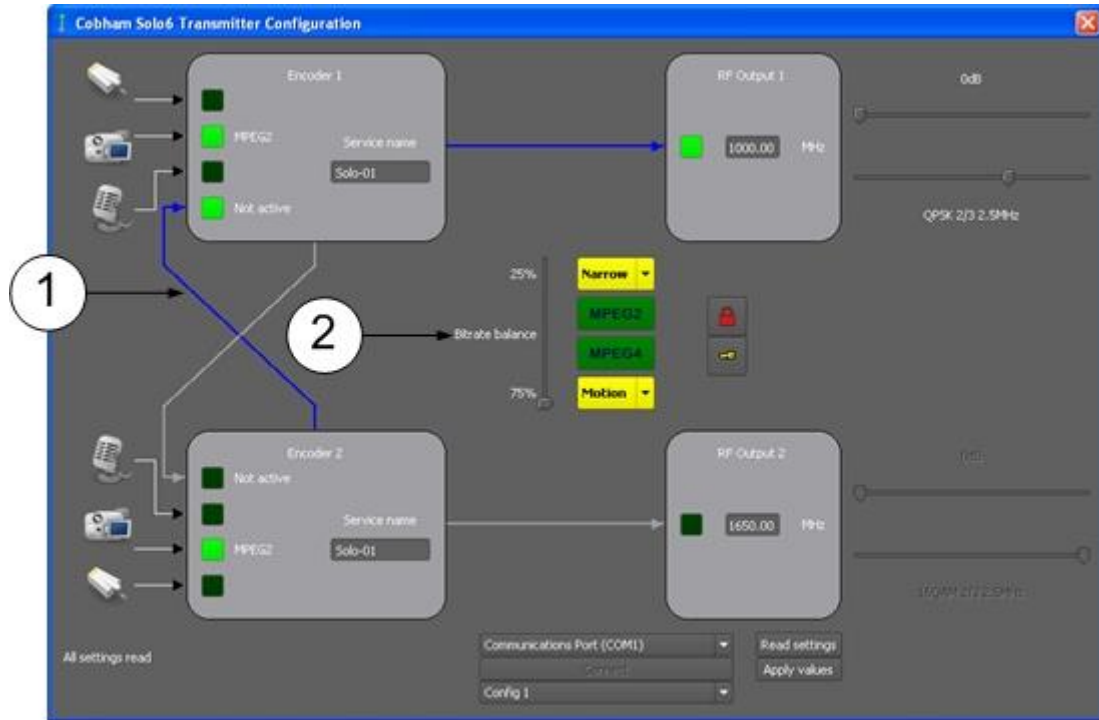
The **Bit Rate Balance** slider is **only** important when you have decided to **chain** your transmitters together. In this case, the slider enables you to allocate bit rate to one transmitter or the other to suit your operation.

For example, **transmitter one** may have a **wide shot** of the target house requiring only **low bit rate** so you can see the door open or the car arrive.

Transmitter two might have a **high resolution camera** on a close up of the door so you can identify the target. This will require **high bit rate**.

Let's see how we might do this:

1. **Chain** your transmitters together.
2. Move the **Bit Rate Balance** slider to suit your operation.



In my example I have chained encoder two into encoder one so I can transmit two video products over the single frequency of RF Output 1 (1000MHz).

Then, I moved the Bit Rate Balance slider to allocate 75% of the available bit rate to Encoder two and 25% to Encoder one.

12.15 Dividing Bit Rate using a Manual Method

You can see the great advantage of being able to divide the Bit Rate unequally using the SOLO 6 Bit Rate Balance Slider, but what if you don't have SOLO 6?

There is a manual way of doing this same exercise using two conventional transmitters.

Before you Begin

You'll need:

- At least one Receiver.
- Two SOLH264TX Transmitters each configured to accept an SD video source.
- A video source for each transmitter (I'm using SD in my example)
- A Chaining Cable (ASI Cable).
- A PC with the Transmitter Controller software loaded.
- A CA0343-2 USB to Lemo communications cable.

CAUTION: You must configure transmitter 2 to provide a known bit rate for the radio link. Then, the bit rate for Video 1 and Video 2 when added together must not exceed the total RF bit rate.

In my example, I've set transmitter 2 for Narrowband, short range mode. In this gives me an available bit rate of about 4.8Mbit/s on the radio link. I'm planning to set transmitter one to have a video bit rate of 3.8Mbit/s and transmitter two, 1.0Mbit/s. If I add those together, they will fit down my 4.8Mbit/s radio pipe.

Step 1 – Connect the System

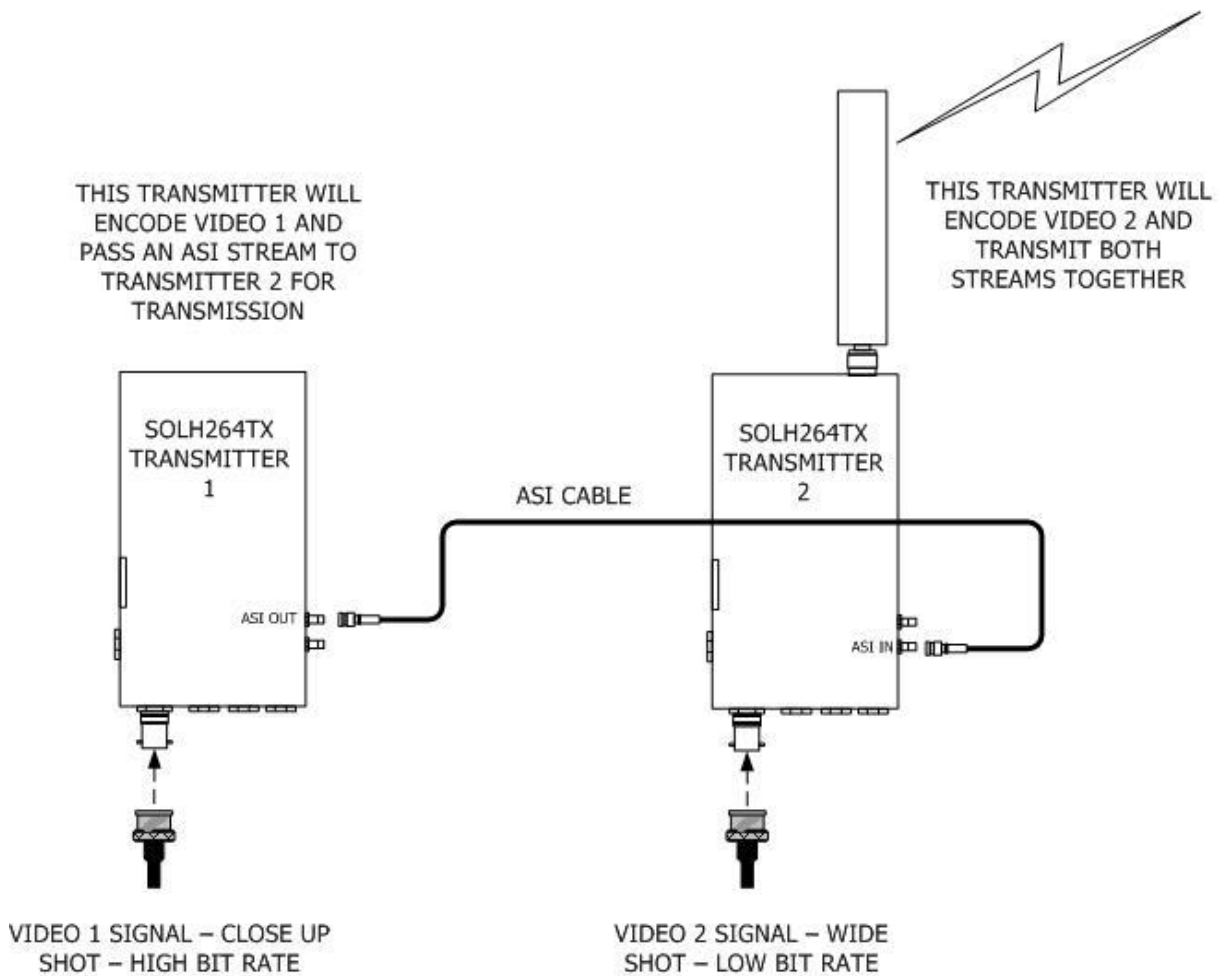


Figure 12-7 – Connecting for Chaining Mode

Step 2 - Configure Transmitter 1 for Chaining at High Bit Rate

1. Connect Transmitter 1 to your Windows PC and start the Control Application.
2. Click the Advanced button.
3. The Advanced Options window opens.
4. Select the Unit Parameters tab.
5. Set the Unit Name to Transmitter1.
6. Set the Chaining Input to OFF.
7. Set the Chain No. to 0.
8. Set the Chaining Output to ON.
9. Click the Apply button.
10. Select the Modulation tab.
11. Set Modulation output to OFF.
12. Click the Apply button.
13. Select the Video tab.

14. Check the Manual Checkbox next to the Video Bitrate (Mbit/s) field.
15. Type the Bit Rate you want to use for the high bit rate transmitter (say 3.8 in my example).
16. Click the Apply button.

Note1: Notice in step 2.6 above, we have switched **Chaining Input** to OFF? In our earlier example, this was switched ON and you may have wondered why as nothing is attached to this transmitter's ASI IN port.

The reason we switched it ON in the earlier example is because it has the function of halving the bit rate of the unit **automatically**.

This time, we want to **choose** the video bit rate so we switched it off so our Manual bit rate selections will apply. If we left it on, anything we type in manual bit rate will be overridden by the automatic system.

Note2: For what we just discovered in Note 1, you can see that the transmitter which is going to be configured with the higher bit rate **must** be transmitter one because it's Chaining Input is switched off and our manual bit rates will apply.

Transmitter two in this example **must** have its Chaining Input switched ON (so it can see transmitter one), and this is going to automatically halve the bit rate as we discovered earlier. However, our manual settings will be **less than** half the bit rate, and so will apply.

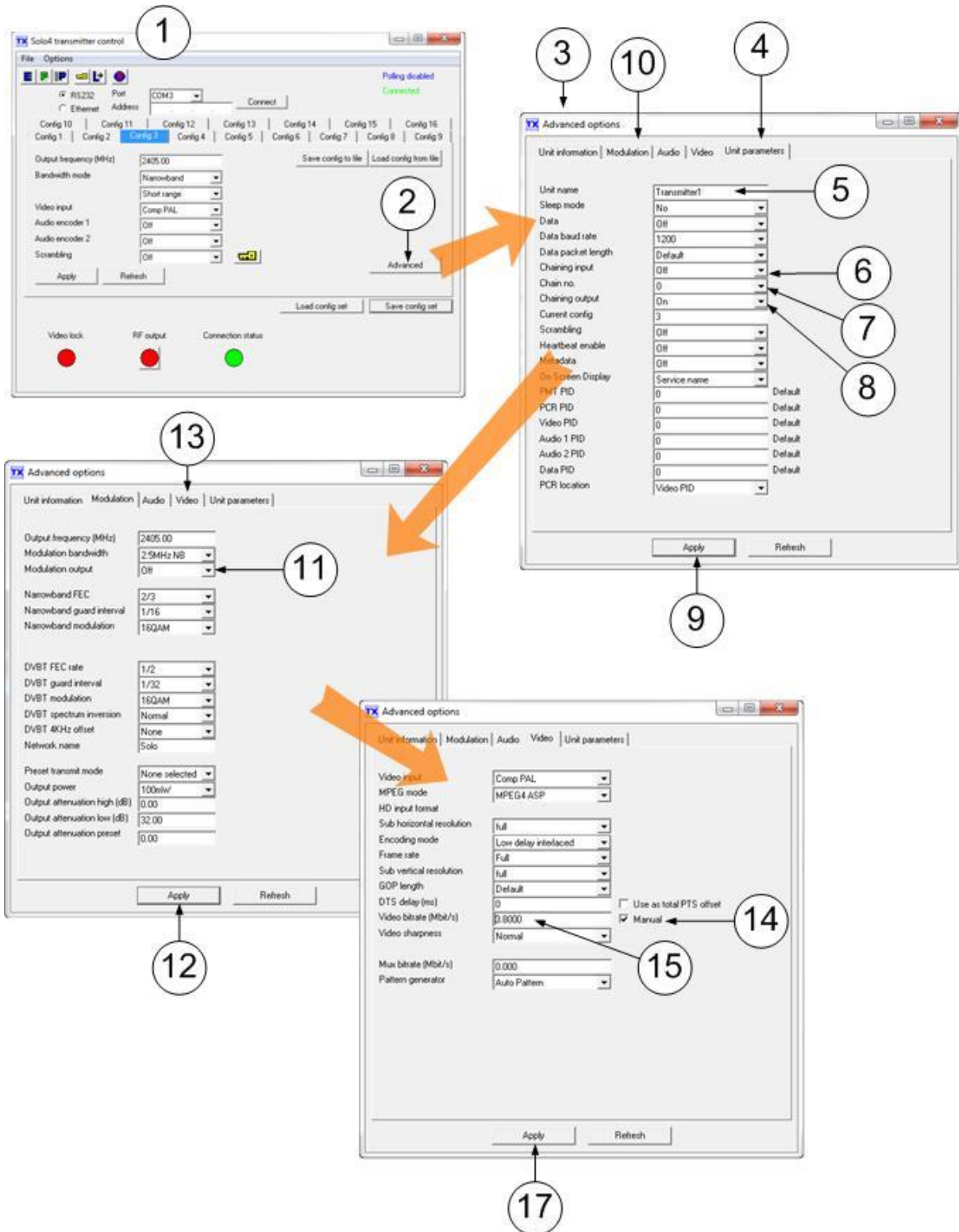


Figure 12-8 – Configuring Transmitter 1 for Chaining with Manual Bit Rate

Step 3 - Configure Transmitter 2 for Chaining at Low Bit Rate

1. Connect Transmitter 2 to your Windows PC and start the Control Application.
2. Click the Advanced button.

3. The Advanced Options window opens.
4. Select the Unit Parameters tab.
5. Set the Unit Name to Transmitter2.
6. Set the Chaining Input to ON.
7. Set the Chain No. to 1.
8. Click the Apply button.
9. Select the Modulation tab.
10. Set Modulation output to ON.
11. Click the Apply button.
12. Select the Video tab.
13. Check the Manual Checkbox next to the Video Bitrate (Mbit/s) field.
14. Type the Bit Rate you want to use for the high bit rate transmitter (say 1.0 in my example).
15. Click the Apply button.



Figure 12-9 – Configuring Transmitter 2 for Chaining with Manual Bit Rate

Step 4 – Configure the Receiver to show Transmitter 1

1. Ensure all the modulation and video parameters are correctly set as in a conventional link

2. To see Transmitter 1 set your **Default Service** to Transmitter1 or set your default **Program ID** to 1.
(Remember, Chain no 0 is Program Number 1).

Note: Remember the priority rule. If you **only** set a Service Name then the Program ID might match the wrong program and take priority. A good rule of thumb is to **always** set Program ID.

Step 5 – Configure the Receiver to show Transmitter 2

1. Ensure all the modulation and video parameters are correctly set as in a conventional link
2. To see Transmitter 2 set your **Default Service** to Transmitter2 or set your default **Program ID** to 2.
(Remember, Chain no 1 is Program Number 2).

Note: Remember the priority rule. If you **only** set a Service Name then the Program ID might match the wrong program and take priority. A good rule of thumb is to **always** set Program ID.