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Solo7 Nano Transmitter

Video, Transmitters, Solo7 Nano Transmitter

Tactical Communications and Surveillance

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

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

0.2 Who Should Read this Book

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 Cobham 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 Cobham in good faith. However, it is acknowledged that 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	Cobham Tactical Communications and Surveillance
IP Concept Guide	Cobham Tactical Communications and Surveillance

0.10 Document History

This document was written and produced by the Cobham 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
SharePoint			

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1. Systems Description

The subject equipment of this User Guide is:

Equipment Title	Part Number
SOLO7 Nano Transmitter	SOL7NTX-
SOLO7 HD Nano Transmitter	SOL7HDNTX-



Figure 1-1 – SOLO7 Nano Transmitter

1.1 What is the SOLO7 Nano Transmitter?

The SOLO7 Nano Transmitter is an ultra-miniature COFDM digital video transmitter from Cobham Tactical Communications and Surveillance, designed specifically for covert video installations and body-worn applications.

With proven Cobham COFDM technology at its core, the exceptionally small size and low power consumption (typically 3.7W @ 100mW RF power) of the SOLO7 Nano transmitter make it the product of choice for covert video hides, or applications requiring long term battery power deployments, small unmanned aerial vehicles, and body-worn or body-wire use.

The SOLO7 Nano Transmitter employs ultra-low latency High Profile H.264 (MPEG-4 AVC) encoding for excellent image quality retention over the wireless link. MPEG-4 ASP video encoding is also available for backward compatibility with older Cobham video transmission products. Equipped with integral COFDM modulation, the SOLO7 Nano Transmitter is ideal for establishing rugged wireless video links in numerous environments, including mobile and urban. Offering several user-selectable modes that trade off image quality against range, the SOLO7 Nano Transmitter is very well suited to all mission types.

The SOLO7 Nano Transmitter supports both industry standard DVB-T modulation and Cobham Narrowband (2.5 MHz), Ultra Narrowband (1.25 MHz) and Ultra-X (625 kHz) bandwidths. The narrowband modes allow users to share scarce spectrum allocation extremely efficiently.

The SOLO7 Nano Transmitter is supplied in a simple aluminium lightweight case and features an industry standard reliable SMA transmit connector. Video, control and power interfaces use two Micronetics connectors.

The SOLO7 Nano Transmitter can be controlled via either USB or via RS232. The versatile and intuitive Cobham Field Controller can also be used to configure and control the SOLO7 Nano transmitter.

Security is ensured with optional AES128/256 Encryption.

The SOLO7 Nano Transmitter will transmit images in a non-line of sight environment up to 750m, depending on mode and frequency.

1.2 What are the Features and Benefits of the Nano 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 – Nano Transmitter

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, high quality video encoding in MPEG-4	High reliability - Use a radio system just like it was a line. You can choose between MPEG-4 ASP and H.264 encoding standard to suit your application.
Compliant DVB-T Modulator and proprietary narrowband.	True multi-mode operation - Perfect integration with your current equipment.
100mW RF Up-Converter	Excellent range in non-line of sight environments like cities, stadiums and airports.
Compact and Power Efficient Transmitters	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.
Composite Video Interfaces	Low cost of ownership - Easy connection to your current cameras.
Integral Encryption at AES128 or AES256 (Optional).	Secure - Preserve your security of transmission with powerful, simple to operate encryption.

Choice of UHF, L, S or C 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.
Low Latency	Enables real time operations like remote vehicle control or UAV operations.
Sixteen Presets Available	Better use of assets and resources - You can preset frequencies 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 one button.
High reliability and availability	Reduced maintenance requirement, reduced spares holding, resulting in significant cost benefits over the life of the system.
Low Mass (51g)	Suitable for discrete operation in the field.

Table 1-1 – Features and Benefits

1.3 What is the SOLO7 HD Nano Transmitter?

The SOLO7 **HD** Nano Transmitter is an ultra-miniature COFDM digital video transmitter from Cobham Tactical Communications and Surveillance, designed specifically for Point-of-View (PoV) and body-worn applications.

With proven Cobham COFDM and H.264 encoder technology at its core, the exceptionally small size and ultra-low power consumption (typically 7.5W) HD Nano Transmitter enables production teams to offer viewers stunning high definition images from the heart of the action, in situations never previously possible due to equipment size and battery run-time constraints.

The small size and ultra-low power consumption make the HD Nano TX ideal for UAV ‘Octocopter’ installations, enabling true long range HD broadcasting from these increasingly popular devices for the first time. Optional lightweight, low power consumption amplifiers are also available for even greater range capability.

The HD Nano Transmitter employs ultra-low latency High Profile H.264 (MPEG-4 AVC) encoding for excellent image quality retention over the wireless link and supports composite, SDI, HD-SDI and HDMI video input formats.

The HD Nano Transmitter offers numerous modulation options to suit various deployment scenarios:

- Industry standard DVB-T modulation for full HD quality and compatibility with existing systems
- Cobham UMLV modulation for enhanced high speed operation (motorsports) and improved performance at high frequencies (6 & 7GHz)

- Cobham Narrowband (2.5 MHz), Ultra Narrowband (1.25 MHz) and Ultra-X (625 kHz) bandwidths. The narrowband modes allow users to share scarce spectrum allocation extremely efficiently.

The HD Nano Transmitter is supplied in a simple aluminium lightweight case and features an industry standard SMA RF connector. Composite video, audio, control and power interfaces use two latching Omnetics connectors. A latching DIN 1.0/2.3 co-axial connector is used for the SDI / HD-SDI input and a micro HDMI (with optional cable clamp) for the HDMI input.

The HD Nano Transmitter can be controlled via either USB or via RS232. The versatile and intuitive Cobham Field Controller can also be used.

1.4 Getting an Overview of the Nano Transmitter

Diagram: Nano Transmitter Main System

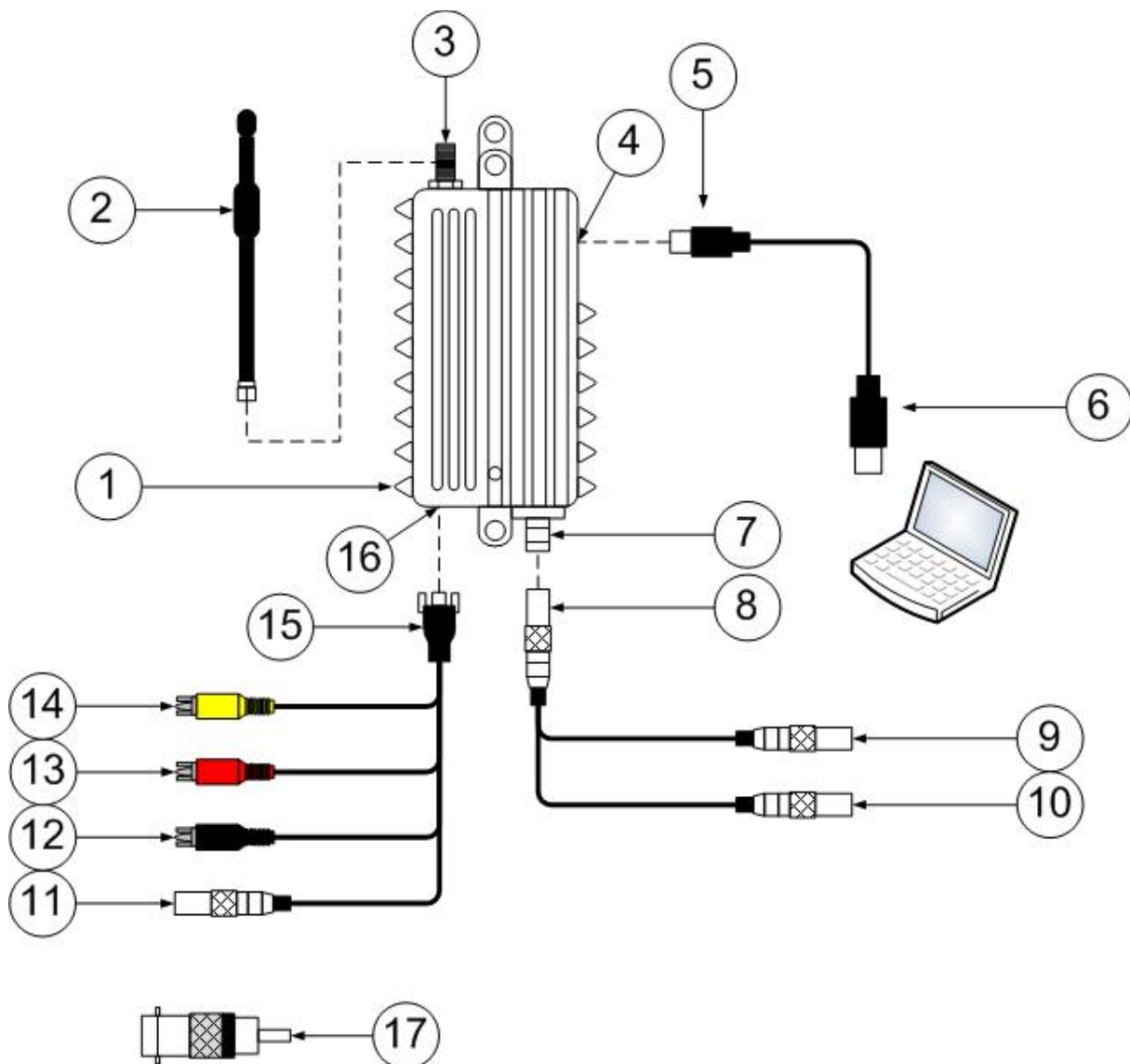


Figure 1-2 Main System Diagram

No	Item	Function
1	SOLO7 Nano Transmitter.	Main Unit.
2	Antenna.	SMA Fitting. Must be band matched.
3	SMA 2-way receptacle (socket) for antenna.	Antennas connect here. Do not over tighten – hand tight only.
4	USB Micro-B 4-way receptacle (socket).	USB Control Port for configuring unit.
5	USB Micro-B 4-way plug (pin).	Connects to the USB Micro-B receptacle on the side of the Nano TX. Used to configure the unit.
6	USB Type A 4-way plug (pin).	Connects to your PC that you'll use to configure the Nano Transmitter.
7	Omnetics Nano Circular 6-way receptacle (pin).	Power and Serial Control Port.
	Note: They <i>look</i> like sockets but they really are pins.	
8	Omnetics Nano Circular 6-way plug (socket).	Connects to the 6-way receptacle on the base of the Nano Transmitter. Carries Power and Serial Control signals.
9	Lemo OB 3-way plug (socket).	Serial Control. You'll connect your Serial control cable from your PC to this plug when configuring the unit.
10	Lemo OB 4-way plug (socket).	Power. You'll connect your Lemo 4-way plug (pin) from your power supply to this plug to power the unit.
11	Lemo OB 3-way plug (socket).	Data Input. You'll connect your Serial data cable from your device to this plug.
12	RCA Phono 2-way plug (socket).	For audio left (black) input.
13	RCA Phono 2-way plug (socket).	For audio right (red) input.
14	RCA Phono 2-way plug, (socket).	For video (yellow) input.

No	Item	Function
15	Omnetics Tri-Lobe Latching 9-way plug (pin).	Carries video, audio and data.
16	Omnetics Tri-Lobe Latching 9-way receptacle (socket).	Carries video, audio and data.
	Note: They <i>look</i> like pins but they really are sockets.	
17	Phono (pins) to BNC (socket) adapter.	Enables you to connect equipment with a BNC plug to the video (yellow) RCA Phono 2-way plug, (socket) on CA2254.

Table 1-2 – Main System Diagram Key

1.1 Getting an Overview of the HD Nano Transmitter

Diagram: HD Nano Transmitter Main System

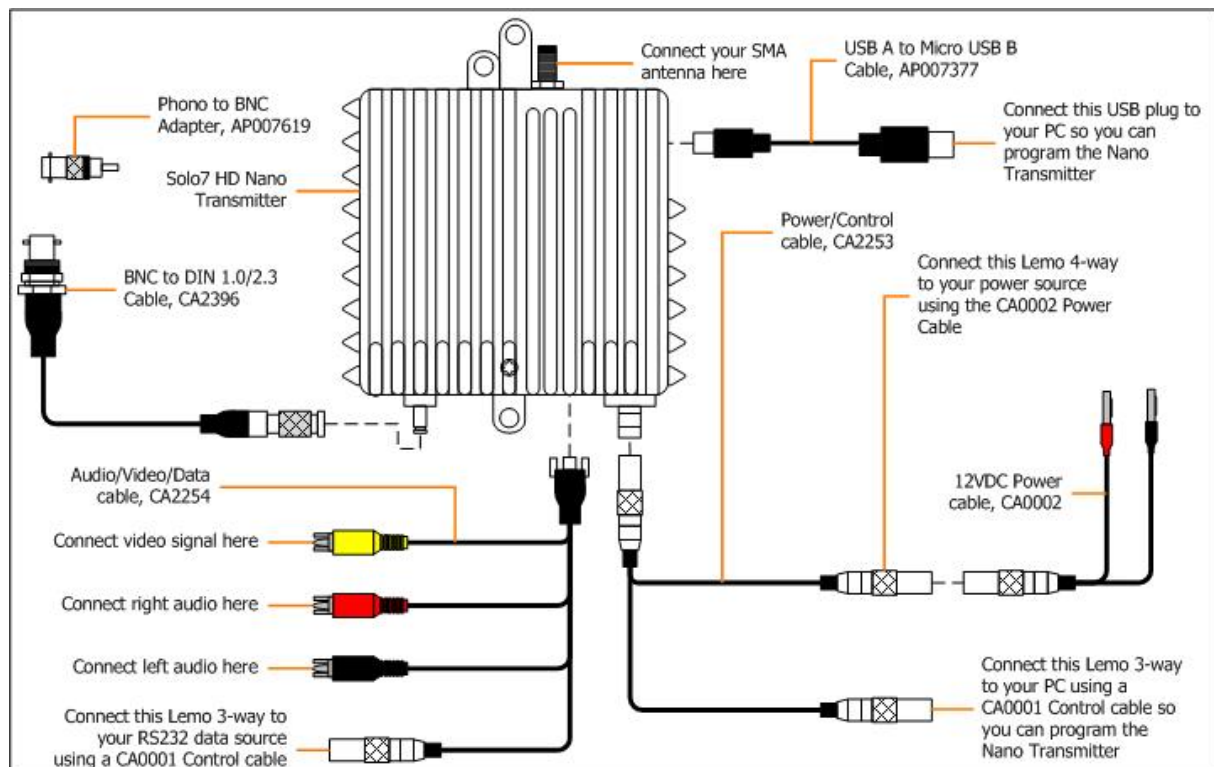


Figure 1-3 HD Nano Transmitter Main System Diagram

2. Getting Started

2.1 Identifying your Device

There are two types of Nano Transmitter described in this User Guide.



This is a **SOLO7 Nano Transmitter**.

Its type designation is: **SOL7NTX-**

Size: 58mm (L) x 38mm (W) x 17mm (H).

Weight: 51g.

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

Power Consumption: Typically 3.7W with 100mW RF.

DC Input 5.9 to 17.8VDC Reverse polarity protected.



This is a **SOLO7 HD Nano Transmitter**.

Its type designation is: **SOL7HDNTX-**

Size: 67mm (L) x 68mm (W) x 22mm (H).

Weight: 135g.

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

Power Consumption: Typically 7.5W with 100mW RF.

DC Input 5.9 to 17.8VDC Reverse polarity protected.

Figure 2-1 – SOLO7 Nano and HD Nano Transmitters

2.2 Unpacking your Nano 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.

Diagram: Unpacking your Nano Transmitter

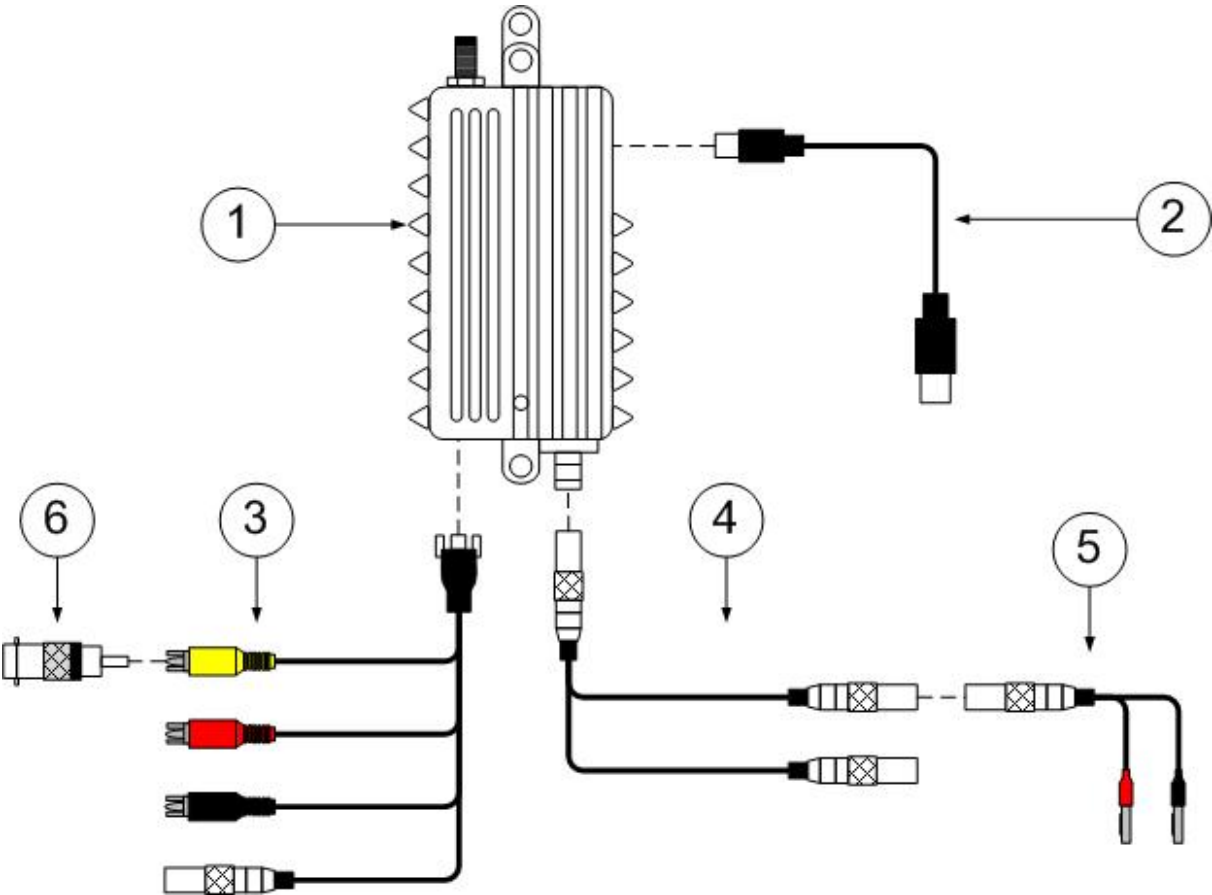


Figure 2-2 – Nano Transmitter Packing Diagram

No	Item	Notes
1	SOLO7 Nano Transmitter	SOL7NTX-100150 with a frequency range of 1.00 GHz to 1.50 GHz in this example. Other frequencies are available.
2	USB2.0 CABLE 1 Metre, A TO MICRO-B, AP007377	USB Micro-B 4-way plug (pin) to USB Type A 4-way plug (pin).

No	Item	Notes
3	Audio / Video / Data Cable Assembly, CA2254	Audio / Video / Data Cable Assembly (16.5 centimetres) Omnetics Tri-Lobe Latching 9-way plug (socket) to RCA Phono 2-way plug (socket), yellow, video and RCA Phono 2-way plug (socket), red, audio right and RCA Phono 2-way plug (socket), black, audio left and Lemo OB 3-way plug (socket), data.
4	Power / Control Cable Assembly, CA2253	Power / Control Cable Assembly (16.5 centimetres) Omnetics Nano Circular 6-way plug (pin).to Lemo OB 3-way plug (socket), Control and Lemo OB 4-way plug (socket), Power
5	Power Cable Assembly, CA0002	Power Cable Assembly (3 metres) Lemo OB 4-way plug (pin) to Banana 1-way plug (pin) red and Banana 1-way plug (pin) black
6	Phono (pins) to BNC (socket) adapter.	Enables you to connect equipment with a BNC plug to the video (yellow) RCA Phono 2-way plug, (socket) on CA2254.

Table 2-1 – Parts in the Nano Transmitter Package

Troubleshooting



I don't have all the parts you described!



Call your Cobham contact right away and we'll get this solved for you.

The Cobham Centre – Solent Fusion 2
1100 Parkway, Solent Business Park
Whiteley, Hampshire
PO15 7AB, England

+44 (0)1489 566 750

Note: There is a kit version of the Nano transmitter which comes complete with a camera and battery and other cables. Please refer to the Quick Start Guide included with the kit for details.

2.3 Unpacking your HD Nano 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.

Diagram: Unpacking your HD Nano Transmitter

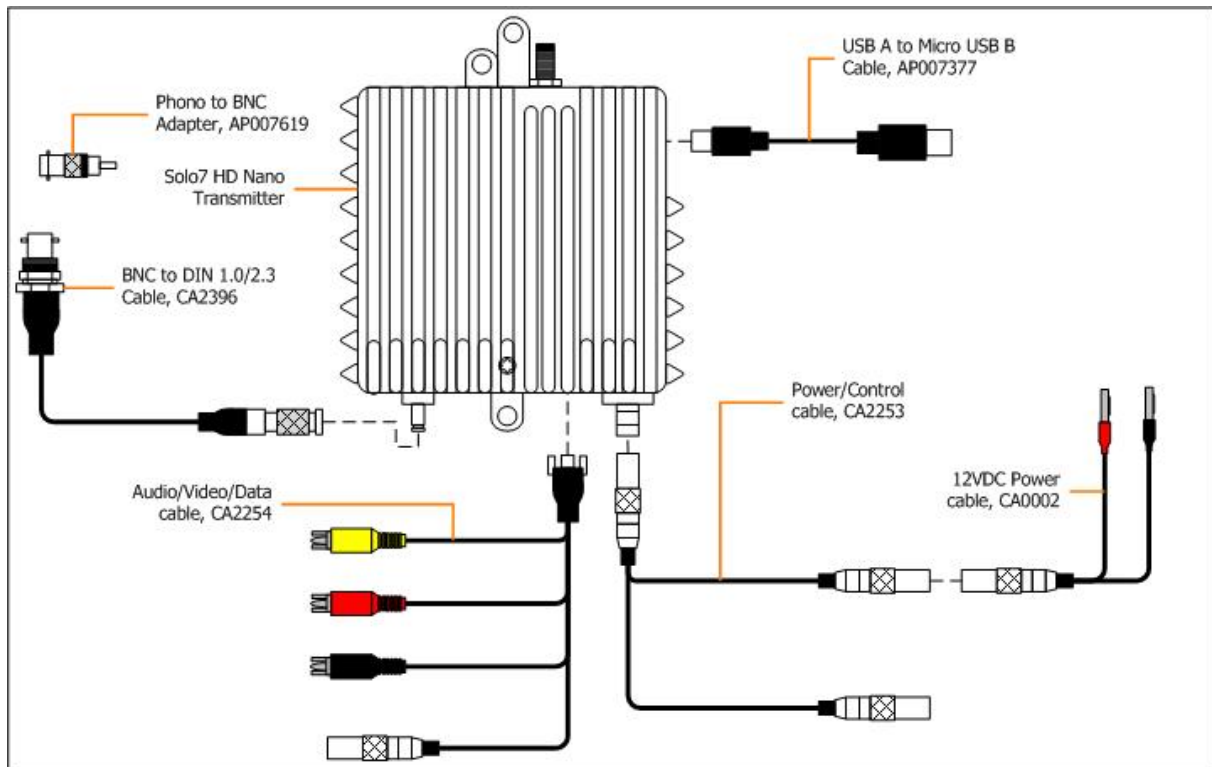


Figure 2-3 – HD Nano Transmitter Packing Diagram

2.4 About the Labels on your Nano Transmitter

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 Product Label

Diagram: SOLO7 Nano Transmitter Label

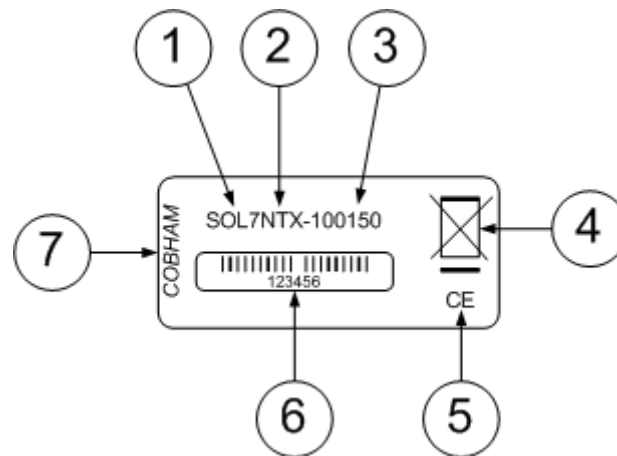


Figure 2-4 – SOLO7 Nano Transmitter Label

No	Item
1	SOLO7 Group.
2	Nano Transmitter family of products.
3	Frequency range, 1.00GHz to 1.50GHz in this example.
4	Disposal mark.
5	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.
6	Barcode with six digit serial number. We'll nearly always ask you for this number during a support call.
7	Manufacturer.

Table 2-2 – SOLO7 Nano Transmitter 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 left and right 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 Nano Transmitter

Step 1: Identify the Variants

Equipment Title	Part Number
SOLO7 Nano Transmitter 200-300MHz	SOL7NTX-020030
SOLO7 Nano Transmitter 300-470MHz	SOL7NTX-030047
SOLO7 Nano Transmitter 1.00-1.50GHz	SOL7NTX-100150
SOLO7 Nano Transmitter 1.65-2.40GHz	SOL7NTX-165240
SOLO7 Nano Transmitter 1.98-2.70GHz	SOL7NTX-198270
SOLO7 Nano Transmitter 3.00-3.70GHz	SOL7NTX-300370
SOLO7 Nano Transmitter 4.40-5.00GHz	SOL7NTX-440500
SOLO7 Nano Transmitter 5.50-6.00GHz	SOL7NTX-550600

Table 2-3 – Nano Transmitter Variants

2.7 Identifying the Options of Nano Transmitter

The Nano Transmitter has **two** types of options:

- Accessory Options
- Licensing Options

Step 1: Identify the Accessory Options

Equipment Title	Part Number
Lemo to Dsub9 RS232 Control Cable	CA0001
NTX DC Power Cable	CA2250
NTX DC Power / FCON Cable	CA2370
NTX 9-way Breakout Cable	CA2298
NTX 7.4V Battery Pack (2250mAh)	NTXBAT
NTX Battery Charger (multi-region)	NTXBATCH

Table 2-4 – Nano Transmitter Accessory Options

Step 2: Identify the Licensing Options

Equipment Title	Part Number
Enables 1.25MHz Narrowband modulation and backward compatible MPEG-4 ASP encoder	TX-UN
Enables 625kHz Narrowband modulation (requires TX-UN)	TX-UXN
Enables UMLV modulation	TX-UMVLUP
AES 128 Bit encryption	AES128TX
AES 256 Bit encryption	AES256TX

Table 2-5 – Nano Transmitter Licensing Options

2.1 Identifying the Variants of HD Nano Transmitter

Step 1: Identify the Variants

Equipment Title	Part Number
SOLO7 HD NanoTX 5.50-6.00GHz	SOL7HDNTX-550600
SOLO7 HD NanoTX 4.40-5.00GHz	SOL7HDNTX-440500
SOLO7 HD NanoTX 3.00-3.70GHz	SOL7HDNTX-300370
SOLO7 HD NanoTX 1.98-2.70GHz	SOL7HDNTX-198270

Equipment Title	Part Number
SOLO7 HD NanoTX 1.65-2.40GHz	SOL7HDNTX-165240
SOLO7 HD NanoTX 1.00-1.50GHz	SOL7HDNTX-100150
SOLO7 HD NanoTX 300-470MHz	SOL7HDNTX-030047
SOLO7 HD NanoTX 200-300MHz	SOL7HDNTX-020030

Table 2-6 – HD Nano Transmitter Variants

2.2 Identifying the Options of HD Nano Transmitter

The HD Nano Transmitter has **two** types of options:

- Accessory Options
- Licensing Options

Step 1: Identify the Accessory Options

Equipment Title	Part Number
Lemo to Dsub9 RS232 Control Cable	CA0001
NTX DC Power Cable	CA2250
NTX DC Power / FCON Cable	CA2370
NTX 9-way Breakout Cable	CA2298
NTX 7.4V Battery Pack (2250mAh)	NTXBAT
NTX Battery Charger (multi-region)	NTXBATCH
500mW booster PA, 4W power consumption	SOLAMP500mW-<freq>

Table 2-7 – Nano Transmitter Accessory Options

Step 2: Identify the Licensing Options

Equipment Title	Part Number
Enables 1.25MHz Narrowband modulation and backward compatible MPEG-4 ASP encoder	TX-UN
Enables 625kHz Narrowband modulation (requires TX-UN)	TX-UXN

Equipment Title	Part Number
Enables UML modulation	TX-UMVLUP
AES 128 Bit encryption	AES128TX
AES 256 Bit encryption	AES256TX

Table 2-8 – Nano Transmitter Licensing Options

2.3 About the Software with your Nano Transmitter

The Nano Transmitter has **two** software elements:

- **Firmware** that runs inside the device on the D1500 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.

The Control Application enables you to set up sixteen presets in the radio and have control over many parameters of the unit.

Here's what the Nano Transmitter Control Application looks like:

Screenshot: Nano Transmitter Control Application

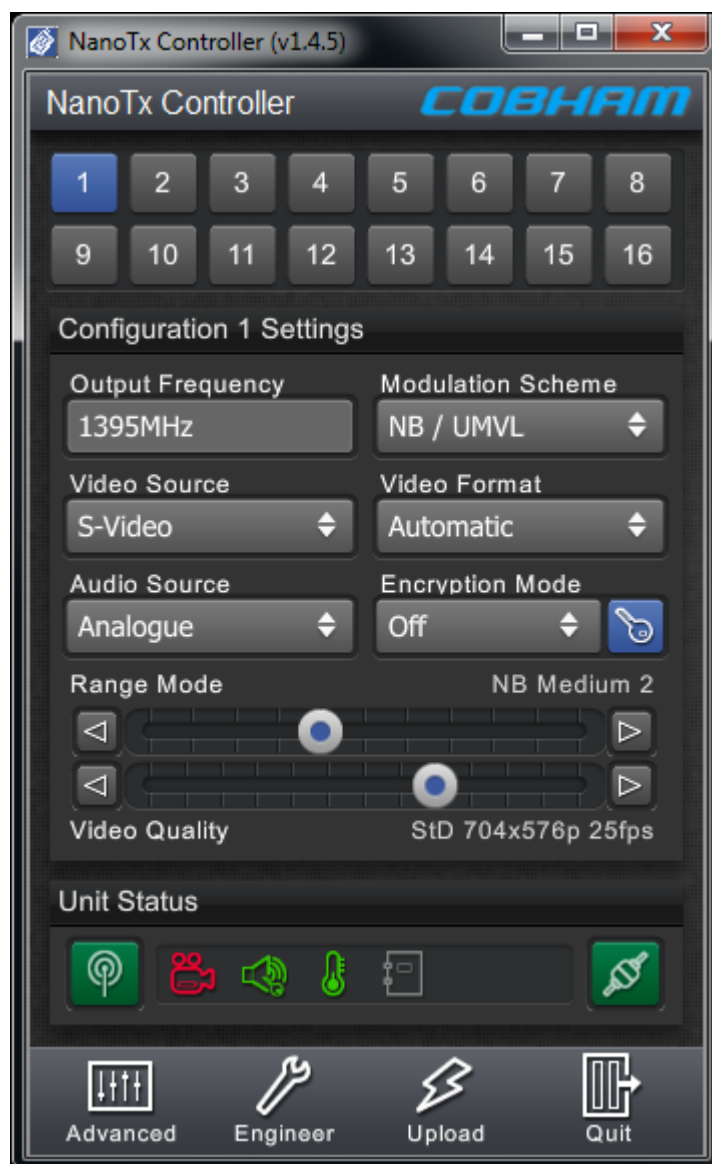


Figure 2-5 – Nano Transmitter Control Application

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 Nano Transmitter has **top**, **bottom** and **side** panels which contain all the interface connections for the units and the controls and indicators.

3.2 Exploring the Top Panel – Nano Transmitter

Diagram: Top Panel

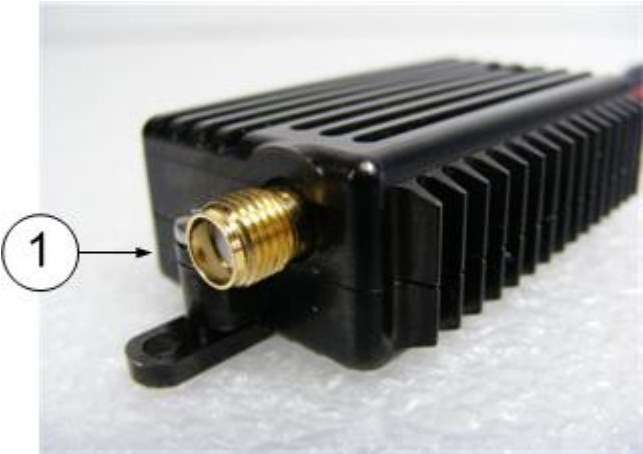


Figure 3-1 Nano Transmitter Top Panel

No	Item	Used for...
1	SMA receptacle 2-way (socket).	Connect the antenna to the SMA receptacle on the top panel of the transmitter unit.
		CAUTION: Do not over tighten the antenna – hand tight only!

Table 3-1 – Nano Transmitter Top Panel Key

3.3 Exploring the Bottom Panel – Nano Transmitter

Diagram: Bottom Panel

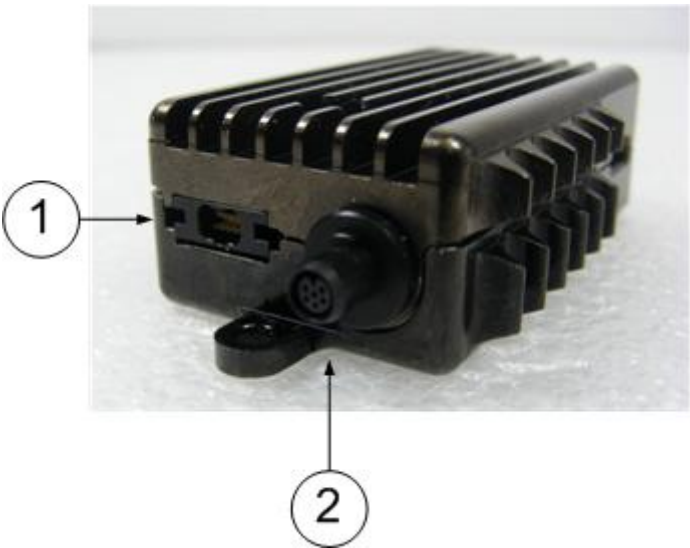


Figure 3-2 Nano Transmitter Bottom Panel

No	Item	Used for...
1	Omnetics Tri-Lobe Latching 9-way receptacle (socket).	Video, audio left / right and data inputs.
	Note: They <i>look</i> like pins but they really are sockets.	
2	Omnetics Nano Circular 6-way receptacle (pin).	Power Input and Serial Control Port.
	Note: They <i>look</i> like sockets but they really are pins.	

Table 3-2 – Nano Transmitter Bottom Panel Key

3.4 Exploring the Side Panel – Nano Transmitter

Diagram: Side Panel

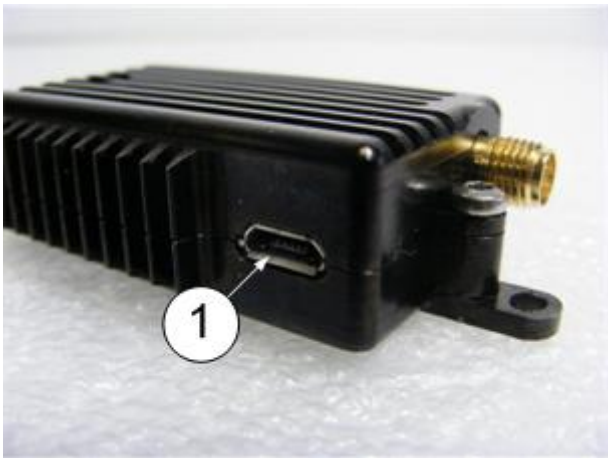


Figure 3-3 Nano Transmitter Side Panel

No	Item	Used for...
1	USB Micro-B 4-way receptacle (socket).	USB Control Port for configuring unit.

Table 3-3 – Nano Transmitter Side Panel Key

3.5 Exploring the Top Panel – HD Nano Transmitter

Diagram: Top Panel



Figure 3-4 HD Nano Transmitter Top Panel

No	Item	Used for...
1	SMA receptacle 2-way (socket).	Connect the antenna to the SMA receptacle on the top panel of the transmitter unit.
		CAUTION: Do not over tighten the antenna – hand tight only!

Table 3-4 – Nano Transmitter Top Panel Key

3.6 Exploring the Bottom Panel – HD Nano Transmitter

Diagram: Bottom Panel

**Figure 3-5 HD Nano Transmitter Bottom Panel**

No	Item	Used for...
1	DIN 1.0/2.3	SD/SD-SDI
2	Micro HDMI Type-D	HDMI Input.
3	Omnetics Tri-Lobe Latching 9-way receptacle (socket).	Video, audio left / right and data inputs.
	Note: They <i>look</i> like pins but they really are sockets.	
4	Omnetics Nano Circular 6-way receptacle (pin).	Power Input and Serial Control Port.
	Note: They <i>look</i> like sockets but they really are pins.	

Table 3-5 – HD Nano Transmitter Bottom Panel Key

3.7 Exploring the Side Panel – HD Nano Transmitter

Diagram: Side Panel



Figure 3-6 HD Nano Transmitter Side Panel

No	Item	Used for...
1	USB Micro-B 4-way receptacle (socket).	USB Control Port for configuring unit.

Table 3-6 – HD Nano Transmitter Side Panel Key

4. Setting up your Nano Transmitter

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 Nano Transmitter. 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 Nano Transmitter.

Step 1: Attach the Antenna

1. Connect the antenna to the SMA receptacle on the top panel of the Nano Transmitter.
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

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

Before you Begin

You'll need:

- A 12VDC Power Source
- Nano Transmitter
- CA0002 Power Cable Assembly.
- CA2253 Omnetics Nano Circular Power Cable.

Step 1: Connect the DC Power

1. Connect the Lemo OB 4-way plug (pin) to the Lemo OB 4-way 12V plug (socket) on the Omnetics Nano Circular Power Cable.
2. Connect the Omnetics Nano Circular Power Cable to the Omnetics Nano Circular 6-way receptacle on the Nano Transmitter.
3. Connect the Red Banana plug to the positive terminal of the DC source.
4. Connect the Black Banana plug to the negative terminal of the DC source.

Next Steps

Connect Video Signals.

4.3 Connecting AC Power

Before you Begin

You'll need:

- A 12V AC Adapter (Optional)
- Nano Transmitter.
- CA2253 Omnetics Nano Circular Power Cable.

Step 1: Connect the AC Power

1. Connect the **Lemo OB 4-way plug** (pin) from the AC adaptor to the **Lemo OB 4-way plug** (socket) on the Omnetics Nano Circular Power Cable.
2. Connect the Omnetics Nano Circular Power Cable to the Omnetics Nano Circular 6-way receptacle on the Nano Transmitter.
3. Now connect the **IEC mains 3-way plug** (socket) to the **IEC mains 3-way receptacle** on the AC adaptor.
4. Connect IEC mains plug to your **local AC supply** and switch on.

Next Steps

Connect Video Signals.

4.4 Connecting Video Signals – Composite 1

Before you Begin

You'll need:

- Nano Transmitter
- CA2254 Omnetics Tri-Lobe Latching 9-way plug (socket) AV Cable Assembly
- A Video Source.

Step 1: Connect Video Signal – Composite 1

1. Connect the 9-way plug (socket) to the AV receptacle of the Nano Transmitter.
2. Connect the RCA Phono 2-way plug (socket), yellow, to the video source.
3. Switch on the Video source.

Next Steps

Connect Audio Signals.

Note: The generic Omnetics 9-way Breakout accessory cable can be used to access two video inputs. Here's how you can use them:

For **Composite Video**, you can use one or the other (but not both at the same time).

Video 1: Composite 1 Input.

Video 2: Composite 2 Input.

For **S-Video**, you'll use **both** like this:

Video 1: S-Video Luma Input.

Video 2: S-Video Chroma Input.

4.5 Connecting Audio Signals

Before you Begin

You'll need:

- Nano Transmitter
- CA2254 Omnetics Tri-Lobe Latching 9-way plug (socket) AV Cable Assembly
- An Audio Source.

Step 1: Connect Audio Signal

1. Connect the 9-way plug (socket) to the AV receptacle of the Nano Transmitter.
2. Connect the 2 x RCA Phono 2-way plugs (socket), red and white, to the audio source.
3. Switch on the Audio source.
4. Ensure the radio is configured to send audio (Audio is off by default).

Next Steps

Connect Data Signals.

4.6 Connecting Data Signals

Before you Begin

You'll need:

- Nano Transmitter
- CA2254 Omnetics Tri-Lobe Latching 9-way plug (socket) AV Cable Assembly
- A Data Source.

Step 1: Connect Data Signal

1. Connect the 9-way plug (socket) to the AV receptacle of the Nano Transmitter.
2. Connect the Lemo OB 3-way plug (socket) to the data source.
3. Switch on the data source.
4. Ensure the radio is configured to send data (data is off by default).

4.7 Connecting Control Signals

Before you Begin

You'll need:

- Nano Transmitter
- AP007377 USB Type A to USB Micro-B Cable Assembly.
- A PC with the latest Nano Transmitter Controller loaded.

Step 1: Connect Control Signal

1. Connect the USB Micro-B 4-way plug (pin) to the USB receptacle of the Nano Transmitter.
2. Connect the USB Type A 4-way plug (pin) to the USB receptacle on your PC.

5. Basic Operation

5.1 Starting and Stopping the Nano Transmitter

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

Before you Begin

You'll need:

- A Nano Transmitter
- A source of power.

Step 1: Powering Up

1. Power-on the Nano Transmitter using one of the procedures in *Setting up your Nano Transmitter* earlier.

Step 2: Shutting Down

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 Nano Transmitter.
3. The system is shut down safely.

5.2 Wearing the Nano Transmitter on your Body

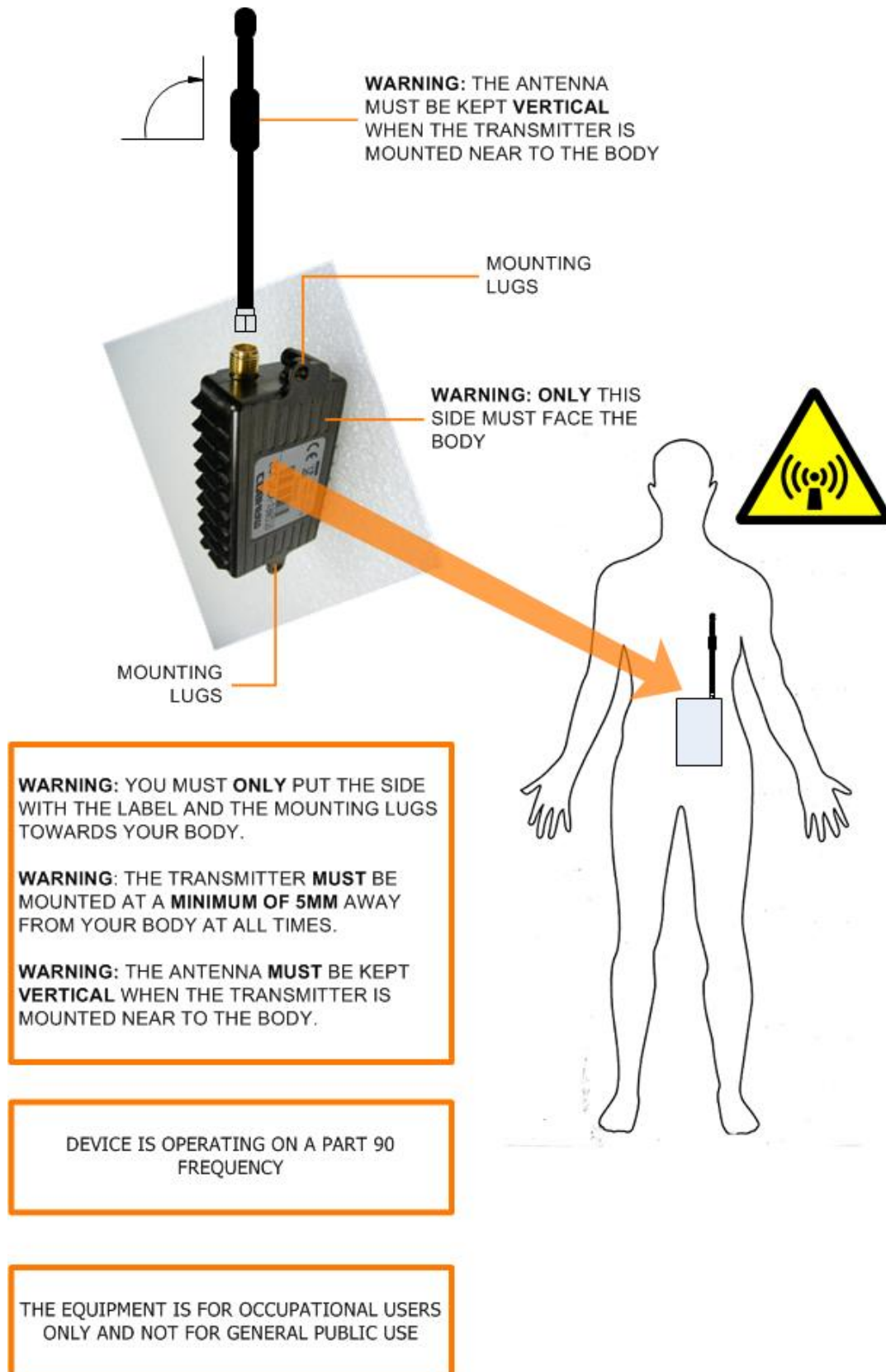


Figure 5-1 Wearing the Nano Transmitter on your Body

6. Advanced Operation

6.1 About Encryption

The target is focused on 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. The mere fact that you are operating gives them valuable information. It tells them that you are in the area and by the number of stations operating on the same frequency they can estimate the size of the operation against them. If your radio net is operating in the clear, the target specialists can see or hear exactly what is being transmitted for even more information. When analysing the traffic patterns, the target can work out which station is the net control station and identify the headquarters.

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 Nano Transmitter
- The correct license loaded on the Nano Transmitter for the Encryption you want to use.
- A PC connected to the Nano Transmitter with the latest Nano Transmitter Control Application open.

Step 1: Select the Encryption Mode

1. In the **Encryption Mode** drop-down box 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).

1. Click the **Encryption Key Entry** button (the blue key).
2. The **Encryption Key Entry** dialog box opens.
3. Ensure the **Encryption mode** box is displaying the Encryption Mode you set in Step 1. If not, set it now.
4. In the **<Mode> key** text box, type the encryption key you want to use.
5. When you have entered the key, click the **Check Mark**.
6. Click the **Apply** button.
7. You'll see the **Setting Encryption Keys** message, then your encryption is set.

Screenshot: Setting up Encryption



Figure 6-1 Setting up Encryption

Remarks

In our example above we used ABS encryption. ABS was the only item in the list because this Nano Transmitter is not licenced for AES128 or AES256.

ABS needed a key of eight characters. If we had chosen AES256 for example, it would need a 64 character key which we spread over two fields.

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

6.3 About High Linearity and Low Power Modes

CAUTION: The combination of 100mW output power and High Linearity Mode must only be used with additional cooling, either extra heat sinking or a fan.

The SOLO7 Nano Transmitter has two modes of operation:

- Low Power Mode
- High Linearity Mode

6.3.1 Low Power Mode

Low Power Mode optimises DC power consumption but to do this it must compromise the quality of the COFDM waveform 'shoulders'. This compromising of the shoulders often makes little difference operationally when you just need to get a short range link in a reasonable RF environment.

What Low Power Mode *does* do however is save a considerable amount of power so you can deploy a unit on batteries for extended times.

Take a look at these power consumption figures when in Low Power Mode:

RF Output Power	VHF / UHF	L-Band	S-Band
10mW	3.1W	3.3W	3.4W
50mW	3.4W	3.6W	3.7W
100mW	3.7W	3.9W	4W

Table 6-1 – Typical Power Consumption in Low Power Mode

6.3.2 High Linearity Mode

High Linearity Mode optimises the quality of the COFDM waveform 'shoulders' , but to do this it must increase DC power consumption.

This mode can be very useful when you are using an external amplifier which always expects very high quality shoulders to work at its best.

Also, in busy RF environments you'll need excellent shoulders to reject adjacent channel interference.

Take a look at these charts to make a comparison between the modes:

DC Power	RF Power Out	Current I(mA)	Mode	Wattage
10	20	395	Low	3.95
10	17	330	Low	3.30
10	10	300	Low	3.00
10	20	455	High	4.55

DC Power	RF Power Out	Current I(mA)	Mode	Wattage
10	17	380	High	3.80
10	10	320	High	3.20

Table 6-2 – Typical Power Consumption 1650 to 2400MHz (High L and S-Band)

DC Power	RF Power Out	Current I(mA)	Mode	Wattage
10	20	390	Low	3.90
10	17	355	Low	3.55
10	10	325	Low	3.25
10	20	465	High	4.65
10	17	375	High	3.75
10	10	340	High	3.40

Table 6-3 – Typical Power Consumption 200 to 300MHz (VHF)

6.3.3 About DC Power Use

SOLO7 Nano Transmitter is very power efficient. In earlier models of transmitter, if you switched from high to low RF power, the same DC power level would be used, although the RF signal was attenuated.

In these newer transmitters, when you select lower RF powers the DC power level is dropped too, using just the power needed to achieve the RF power required.

This stepping down of the DC power level applies to both Low Power Mode and High Linearity Mode.

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 Nano Transmitter uses the **Nano TX Controller** software running on your PC which enables you to perform many configuration tasks quickly and easily. These next topics tell you how to connect your PC to the Nano Transmitter and then use your Nano TX Controller to configure the unit.

IMPORTANT NOTE FOR HD NANO TX USERS: The newly released "Cobham Device Controller" is required for control. This supersedes the Nano TX specific controller and can be used for both.

7.2 Installing the Nano TX Controller on your PC

Before you Begin

You'll need:

- A PC running **Windows XP** or better.
- The PC needs to have a spare USB port.
- A copy of the **Nano TX Controller** software.

Note: You can download the latest version of the Controller from the Cobham Website.

Step 1: Install the Controller on your PC

1. The Installer package is called: **NanoTXController.exe**. Double-click this file.
2. The **Nano TX Controller** software will be installed on your PC.

Next Steps

Connect the Nano Transmitter to your PC using a Serial Connection.

7.3 Connecting your PC to the Nano TX using Serial

Before you Begin

You'll need:

- A Personal Computer with the Nano TX Controller Application installed.

- A USB Type A to USB Micro-B Cable.
- A powered Nano Transmitter unit.

Step 1: Install the Nano TX Controller 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 Cobham website.

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

1. Connect the USB Micro-B 4-way plug (pin) on the Control Cable to the USB Micro-B 4-way receptacle (socket) on the Nano Transmitter.
2. Now connect the USB Type A 4-way plug (pin) to the USB receptacle (socket) on your personal computer.

Diagram: Nano Transmitter Serial Connection

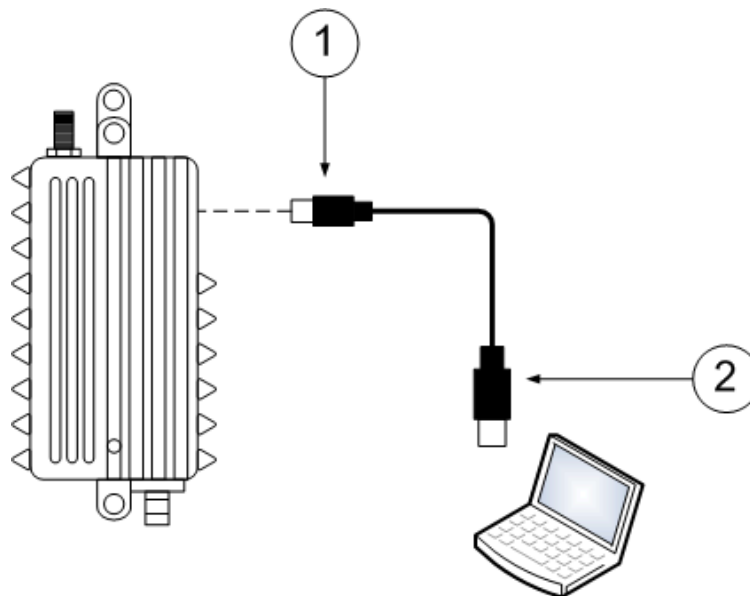


Figure 7-1 Nano Transmitter Serial Connection

Step 3: Start the Nano TX Controller

1. Double-click the **Nano TX Controller** icon on the computer desktop.
2. The **Nano TX Controller** opens.
3. From the **Language** box, select the Language you want to use.
4. You'll see the **Click to Connect** message.
5. Click the **Connect** button.
6. The **Device Connection** Window opens.
7. Select **USB**.
8. Click the **Refresh** button.
9. You'll see the **Identification Number** of the Nano Transmitter's USB interface.

10. Click the **Connect** button.

11. The Nano TX Controller **main window** opens.

Screenshot: Start the Nano TX Controller

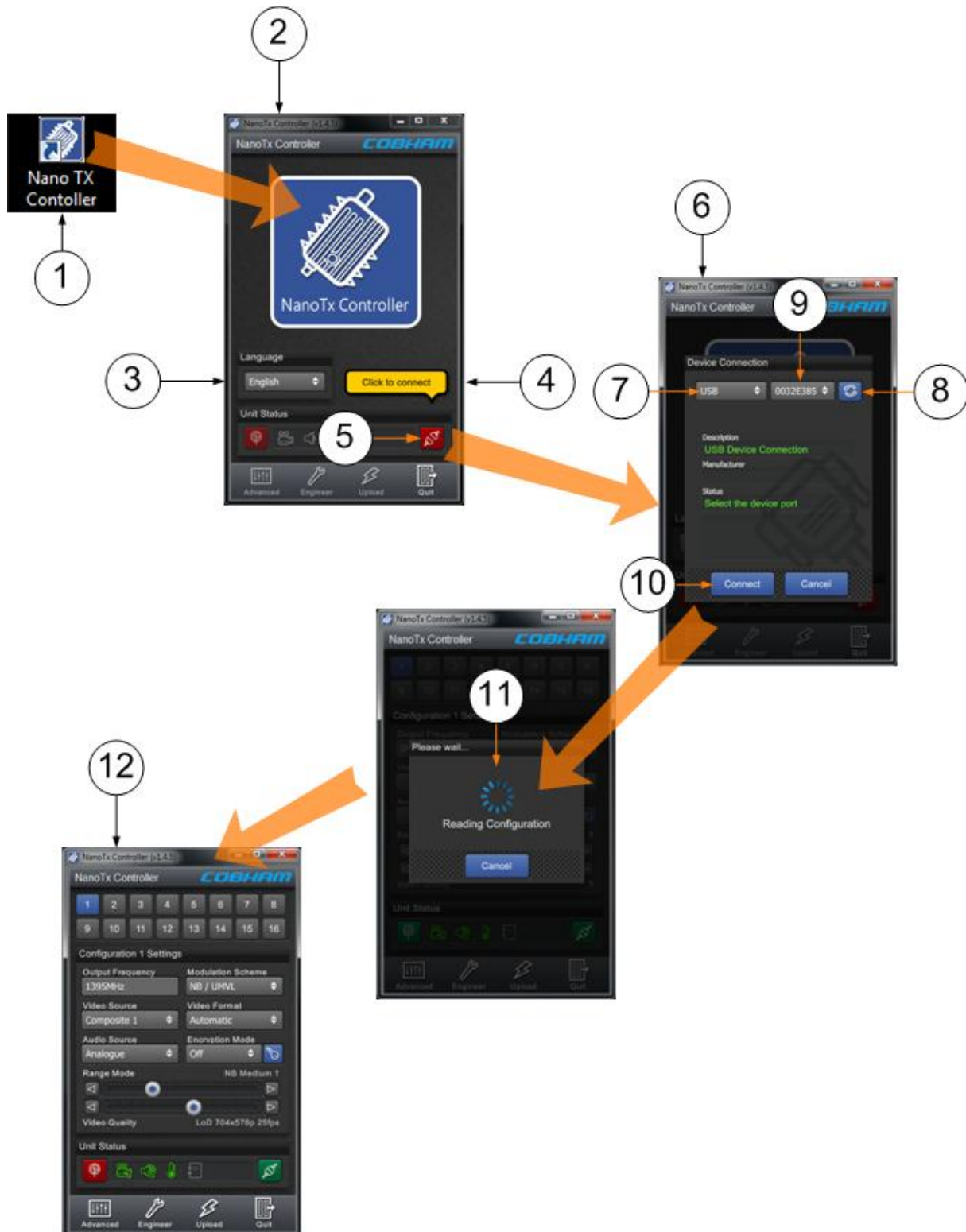


Figure 7-2 Start the Nano TX Controller

Next Steps

Explore the Main Window.

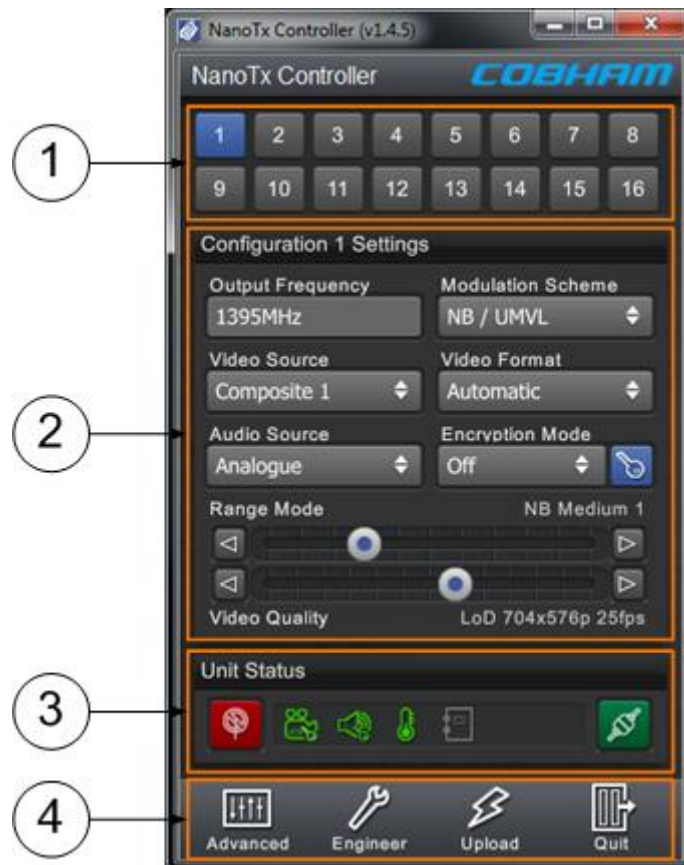
7.4 Exploring the Nano TX Controller Main Window

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green **Connect** button showing).

Screenshot: Explore the Nano TX Controller Main Window

**Figure 7-3 Explore the Nano TX Controller Main Window**

No	Name	Notes
1	Configuration Buttons.	Sixteen (or eight) configurations can be stored. The Blue button is the currently active configuration. You can set up just one of them if you want but it can be very useful to have all 16 populated. Try having different frequencies and range settings available.
2	Basic Settings for the Active Configuration	When you have selected a configuration button above, this section shows the core settings for that configuration. These are repeated in the Advanced window along with many more settings. You can edit these settings right here to make quick changes.
3	Unit Status Panel	A group of indicators to report things like: RF Status, Video Lock, Audio Lock, Temperature and Connection Status.
4	Switch Panel	Buttons to take you to: The Advanced window, the Engineer window, the Upload window and to quit the Nano TX Controller.

Table 7-1 – Control Application Main Window Key

7.5 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).

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Choose a Configuration

1. Click one of the sixteen configuration buttons.
2. You'll see the **Reading Configuration** message.
3. The button is illuminated in **blue** and the **Configuration Settings** are ready to edit.

Step 2: Work with the Configuration Settings

1. Click one of the **Configuration Settings** boxes.
2. The box turns **white** and **check mark** and **cross** buttons appear.
3. When you start to edit, the check mark button becomes **active** (shaded in **blue**).

4. When you have completed your edit, click the **check mark** button to **accept** the change or click the **cross** button to **discard** the change.
5. This technique applies to **any** drop-down box you'll edit on Nano TX Controller.

Screenshot: Work with the Configuration Settings



Figure 7-4 Work with the Configuration Settings

Step 3: Perform a Basic Configuration Setting

Basic Setting	Options	Notes
Output frequency (MHz)	Any frequency in the range of the unit. A SOL7NTX-100150 for example can use frequencies from 1.00GHz to 1.50GHz.	Type in the frequency that you want this device to use in megahertz (MHz). If you type in a frequency which is out of range , the unit will automatically round to the highest or lowest frequency which actually is available. The transmitter frequency can be set in step sizes of 125kHz.
Video Source	Off Composite 1 Composite 2 S-Video	With the conventional Omnetics Tri-Lobe Latching AV cable, there is one yellow RCA Phono plug for Video input. This is Composite 1. The generic Omnetics 9-way Breakout accessory cable can be used to access two video inputs. Here's how you can use them:
	HD Nano TX Only: SDI (DIN 1.0/2.3 receptacle) HDMI (Micro HDMI Type D receptacle).	For Composite Video , you can use one or the other (but not both at the same time). Video 1: Composite 1 Input. Video 2: Composite 2 Input.
		For S-Video , you'll use both like this: Video 1: S-Video Luma Input. Video 2: S-Video Chroma Input. You can switch video off, leaving all the bandwidth available for audio and data.
Audio Source	Off Analogue Differential	You can switch audio off, leaving all the bandwidth available for video and data. Analogue – When selected the audio input cable can be used for mono left, mono right or stereo pair. Differential – When selected the audio input cable can be used as a differential pair for long cable runs on high quality microphones (mono only).
Modulation Scheme	NB / UML DVB-T	This box enables you to select Cobham's Narrowband / UML modes (NB / UML) or DVB-T .

Basic Setting	Options	Notes
Video Format	Automatic	Select the Video format that matches the camera you are using. Alternatively the Automatic setting enables the Nano TX to determine if the signal is PAL or NTSC automatically. Power up standard in Automatic mode defaults to PAL. This can be changed by setting the input to NTSC NP for example and then back to Automatic.
	PAL	
	NTSC	
	NTSC NP	
	HD Nano TX Only:	
	720p50, 720p59, 720p60, 1080i50, 1080i59, 1080i60, 1080p23, 1080p24, 1080p25, 1080p29, 1080p30, 1080psf23, 1080psf24, 1080psf25, 1080psf29, 1080psf30.	
Encryption Mode	Off ABS AES128 AES256	In this drop-down you'll see a list of Encryption Modes available on this unit. All Nano Transmitters have ABS but the AES modes are all license dependant. If you are not licenced for AES128, you won't see it in this list. Select the Encryption Mode you want to use or choose off to transmit in clear.
Encryption Key	Opens the Encryption Key Entry dialog.	Check the Encryption mode is correct (you can change it here if required) and then enter your Key. ABS=8 characters AES=32 characters AES=64 characters Must be: ASCII hexadecimal characters (0..9, A..F).

Basic Setting	Options	Notes
Range Mode	Custom NB Short 1 NB Short 2 NB Medium 1 NB Medium 2 NB Long 1 NB Long 2 NB ULong 1 NB ULong 2 NB XLong 1 NB XLong 2 UMVL Short 1 UMVL Short 2 UMVL Medium 1 UMVL Medium 2 UMVL Long 1 UMVL Long 2 DVB-T XShort 1 DVB-T XShort 2 DVB-T Short 1 DVB-T Short 2 DVB-T Medium 1 DVB-T Medium 2 DVB-T Medium 3 DVB-T Long 1 DVB-T Long 2 DVB-T Long 3	Move the slider towards the left to get shorter ranges but higher picture and audio quality. Move the slider to the right to increase the range but reduce the picture and audio quality. Custom enables you to make up your own setting which we'll look at later. NB types apply when you have selected the Narrowband Modulation scheme. UMVL types apply when you have selected the UMVL Modulation scheme. DVB-T types apply when you have selected the DVB-T Modulation scheme.

Basic Setting	Options	Notes
Video Quality	LoD 176x144p 25fps LoD 176x288p 25fps LoD 352x288p 25fps LoD 352x576i 25fps LoD 470x576i 25fps LoD 528x576i 25fps LoD 704x576p 25fps StD 704x576p 25fps StD 704x576p 12fps StD 704x576p 6fps StD 704x576p 3fps StD 704x576p 1fps These settings taken with Range Mode set to NB Medium 1 and Video Format at PAL. They will be different for other Range Modes and Video Formats.	The centre point corresponds to our recommended compromise for the current available bandwidth or range mode. Move the slider to the left to get lower resolution at a higher frame rate. Move the slider to the right to get higher resolution at a lower frame rate. LoD=Low Delay ULoD=Ultra Low Delay StD=Standard Delay Fps=Frames per second 25 for PAL, 30 for NTSC. P=Progressive I=Interlace

Table 7-2 – Perform a Basic Configuration Setting

Note-1: Some **Modulation Schemes** are **licensed** features. If you are not licensed for these modes you will not be able to select them.

Check **Advanced Settings > Unit** to see your licence status.

Unlicensed features in option lists are marked with a padlock icon.

Note-2: Some encryption modes are **licensed** features. If you are not licensed for these modes you will not be able to see them in the Encryption Mode list.

Check **Advanced Settings > Unit** to see your licence status.

7.6 Working with the Unit Status Panel

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Screenshot: The Unit Status Panel

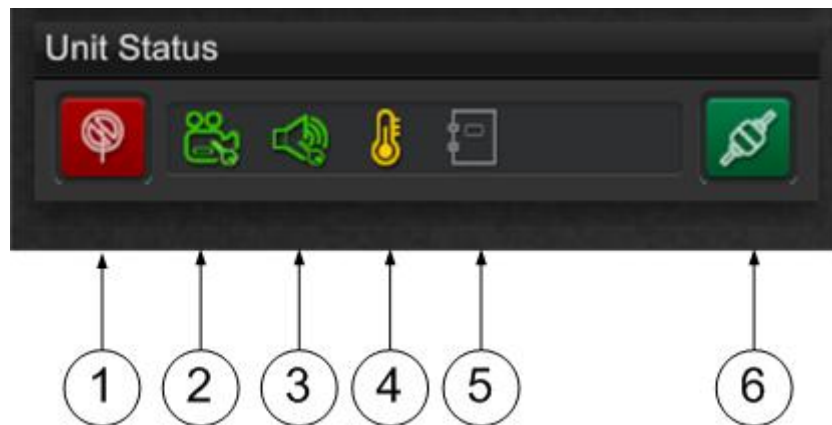


Figure 7-5 The Unit Status Panel

Step 1: Interpret the Toolbar

No	Name	Options	Notes
1	RF Button	Red=RF Off Green=RF On	Click to toggle RF on or Off.
2	Video Lock	Red=Unlocked Green=Locked	Tells you if the unit has successfully locked to the video source. Unlocked will also be shown if video is disabled.
3	Audio Lock	Red=Unlocked Green=Locked	Tells you if the unit has successfully locked to the audio source. Unlocked will also be shown if audio is disabled.
4	Temperature	Green Symbol Yellow Symbol Red Symbol	An indication of the temperature of the FPGA. Attempt to keep it green. CAUTION: If it changes to red, switch the unit off and allow it to cool. 0 to 59 degrees Celsius shown in green. 60 to 84 degrees Celsius shown in yellow. 85 degrees Celsius or above shown in red.
5	Logging	Dimmed-Unavailable White-Logging running	Logging is normally off by default. Logging is enabled by using a command line switch which is fully described in Appendix D, <i>Reference Material</i> .

No	Name	Options	Notes
6	Connect Button	Red=Disconnected Green-Connected	Click to toggle Serial Connection. Indicates the status of the serial connection between the Nano TX Controller software on your PC and the Nano Transmitter. You must be connected to control the unit.

Table 7-3 – Unit Status Panel Key

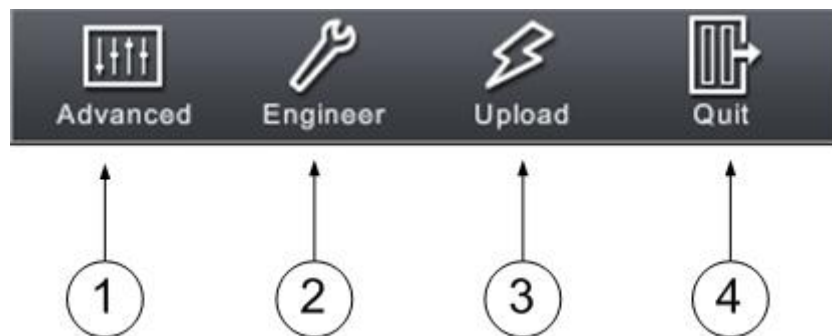
7.7 Working with the Switch Panel

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Screenshot: The Switch Panel

**Figure 7-6 The Switch Panel**

Step 1: Interpret the Switch Panel

No	Name	Options	Notes
1	Advanced	Click to open the Advanced Window. The Back Button will always return you to the Main Window.	The Advanced Window gives access to five windows: Unit – Software versions, licenses etc. Modulation – Frequency, power, FEC etc. Audio – Audio source, sample rate etc. Video – Video source, format etc. Misc – Data settings etc. The Advanced Windows are fully described later.

No	Name	Options	Notes
2	Engineer	Click to open the Engineering Options window. The Back Button will always return you to the Main Window.	This gives access to the diagnostic pane where you can send serial commands direct to the unit and get results back. This pane is designed advanced users. The Engineering Options are fully described in Appendix D, <i>Reference Material</i> .
3	Upload	Click to open the Upload File window. The Back Button will always return you to the Main Window.	This gives access to the Upload File window where you can upgrade your license files to get more features or upgrade your firmware to the latest version. This procedure is fully described in Appendix D, <i>Reference Material</i> .
4	Quit	Click to quit the Nano TX Controller application.	You'll see a Confirmation message box. Click OK button to really quit or Cancel to return to the application.

Table 7-4 – Switch Panel Key

7.8 Working with the Unit Tab

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Advanced Window > Unit Tab

1. On the Main Window in the Switch Panel, click the **Advanced** button.
2. Click the **Unit** Tab.

Screenshot: Unit Tab

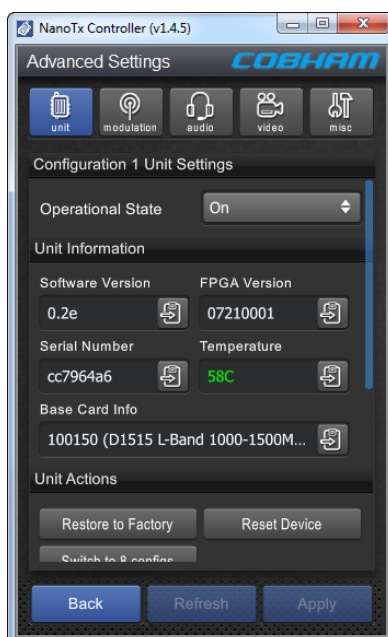
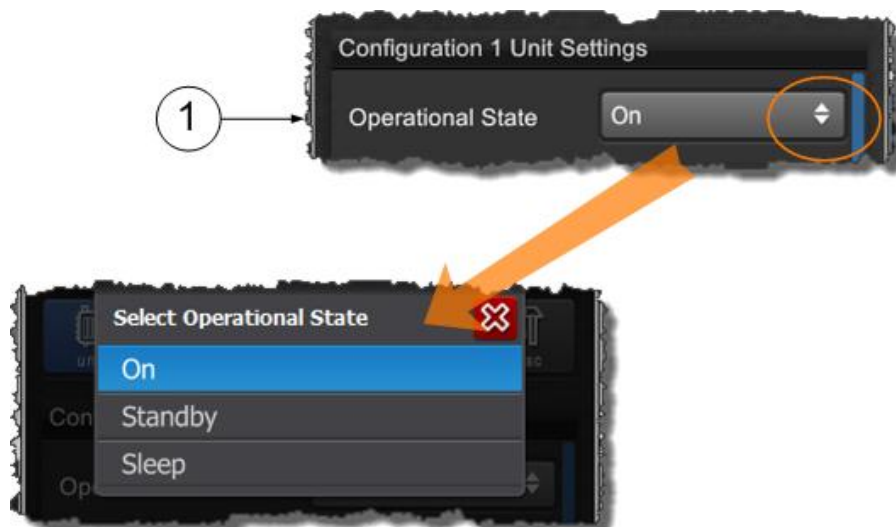


Figure 7-7 Unit Tab

Step 2: Configure the Unit Settings

Screenshot: Unit Settings

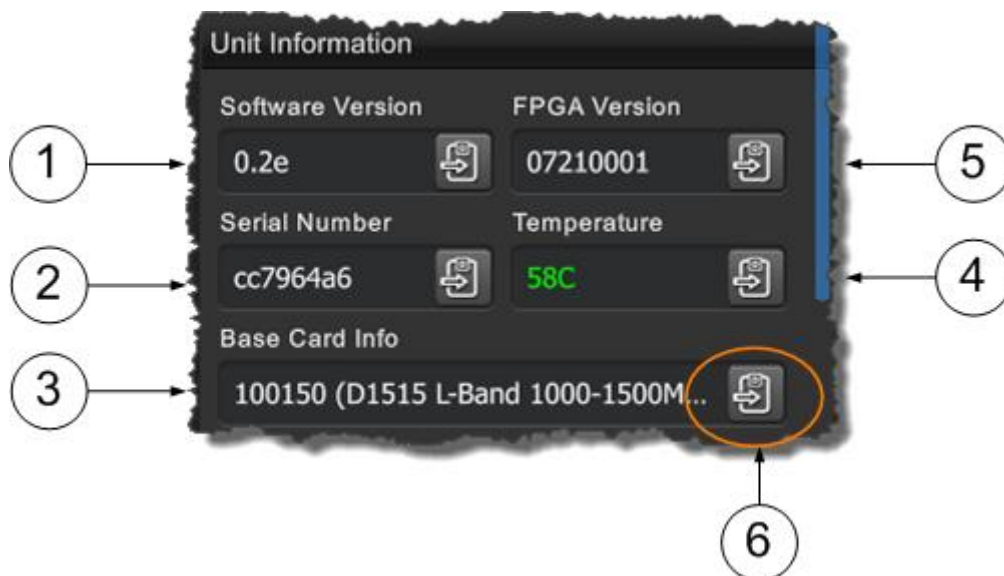


No	Name	Options	Notes
1	Operational State	On Standby Sleep	On – The unit is fully powered and in an operational state. Standby – The unit is using less power but can be brought back to operation rapidly. Sleep – The unit is consuming the least amount of power but needs to be woken before being able to operate fully.

Table 7-5 – Unit Settings Key

Step 3: Configure the Unit Information Settings

Screenshot: Unit Information Settings



No	Name	Options	Notes
1	Software Version	0.2e or any valid software release number.	This is the version of the firmware running on the board. We may ask you for this during a support call.

No	Name	Options	Notes
2	Serial Number	cc7964a6	The Electronic Serial Number of the unit. We may ask you for this during a support call. 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.
3	Base Card Info	100150 (D1515 L-Band 1000-1500MHz).	The frequency band details for the RF card in the unit. See <i>Getting Started, Identifying the Variants</i> for more versions.
4	Temperature	Any temperature in degrees Celsius.	0 to 59 shown in green. 60 to 84 shown in yellow. 85 or above shown in red. An indication of the temperature of the FPGA. Attempt to keep it green. CAUTION: If it changes to red, switch the unit off and allow it to cool.
5	FPGA Version	07210001 or any valid version number.	The version of FPGA firmware currently running on the D1500 board. We may ask for this number during a support call.
6	Copy to Clipboard Button	Click to copy contents of the field to your Windows clipboard.	If you need to gather some data about the unit these buttons make it simple to get a copy of the field onto your clipboard. Then, you can paste it into a Word document for example. You'll find these buttons on most fields in the Nano TX Controller.

Table 7-6 – Unit Information Settings Key

Step 4: Configure the Unit Actions Settings

Screenshot: Unit Actions Settings

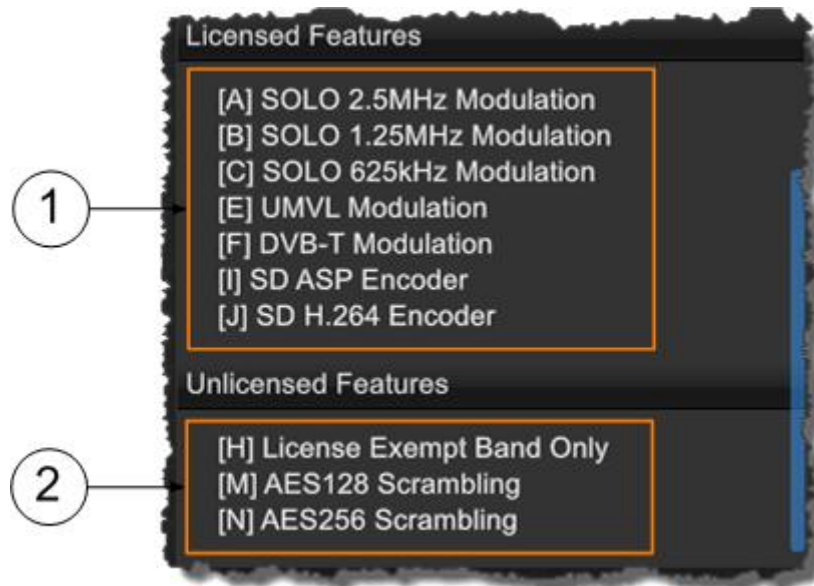


No	Name	Options	Notes
1	Restore to Factory Button	Click to Restore factory settings.	If you have been working on a complex setup and need to get back to a simple setup, click Restore to Factory. The unit will put all parameters back to a default know state from where you can start again.
2	Switch to 8 / 16 Configs Button	Click to toggle between 8 and 16 configurations.	It is possible to toggle the unit into eight configurations mode instead of sixteen. You'll see the Confirmation warning message. Click the OK button if you are sure, Cancel returns you to the previous menu. Some options are stored on a global or configuration basis depending on the number of configurations used.
3	Reset Device	Click to reset.	This performs a power cycle on the device. You'll see the Confirmation warning message. Click the OK button if you are sure, Cancel returns you to the previous menu.

Table 7-7 – Unit Action Settings Key

Step 5: Interpret the Licensed Features Settings

Screenshot: Licensed Features Settings



No	Name	Options	Notes
1	Licensed Features	Any license which is available for the Nano Transmitter.	Licenses are given letter codes in square brackets [A] and a note of what that license does, SOLO2.5MHz Modulation for example. Codes shown in the Licensed Features group box are loaded on your device and all these features are available to use.
2	Unlicensed Features	Any license which is available for the Nano Transmitter.	Codes shown in the Unlicensed Features group box are available for the Nano Transmitter, but have not been purchased for your device yet. To load new licenses see Appendix D, <i>Reference Material</i>.

Table 7-8 – Licensed Features Key

7.9 Working with the Modulation Tab

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Advanced Window > Modulation Tab

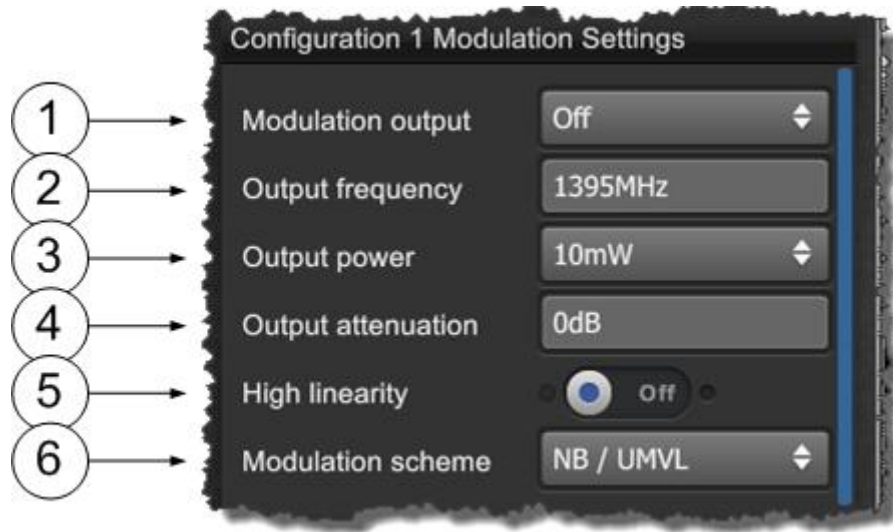
1. On the Main Window in the Switch Panel, click the **Advanced** button.
2. Click the **Modulation** Tab.
3. Click and drag the **scrollbar** on the right of the screen to see the whole display.

Screenshot: Modulation Tab



Figure 7-8 Modulation Tab

Step 2: Configure the Modulation Settings



No	Name	Options	Notes
1	Modulation Output	Off or On	Toggles the RF on or Off. Exactly repeats the action of the RF Button on the Unit Status panel on the Main Window.
2	Output Frequency	UHF, L, S and C Bands Range dependant on unit type and licensing.	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 nearest available frequency automatically.
3	Output Power	10mW 50mW 100mW	Choose the power output you want to use for your transmission. For short range applications for example you may choose low power to protect the receiver and to reduce the possibility of detection. A lower power output will significantly lower power consumption of the unit, increasing battery life. The unit will also run cooler which may be important for enclosed / body worn applications. CAUTION: The combination of 100mW output power and high linearity must only be used with additional cooling, either extra heat sinking or a fan.
4	Output Attenuation	0 to 31.75dB	0 to 31.75dB of attenuation can be applied to the output of the transmitter.

No	Name	Options	Notes
5	High Linearity Option Button	Blue=OFF Orange=ON	When on, high linearity mode improves shoulder performance by several dB at the expense of power consumption. Often used when working with power amplifiers which expect excellent shoulder performance to operate, or for improved adjacent channel performance. CAUTION: The combination of 100mW output power and high linearity must only be used with additional cooling, either extra heat sinking or a fan.
6	Modulation Scheme	NB /UMVL DVB-T	This box enables you to select Cobham's Narrowband / UML modes (NB / UML) or DVB-T .

Table 7-9 – Modulation Settings Key

Step 3a: Configure the NB /UMVL Settings

If you selected NB /UMVL for the Modulation scheme earlier, then these next settings need to be configured.

If you selected DVB-T then see *Configure the DVB-T Settings* later.



No	Name	Options	Notes
1	Bandwidth	Narrowband: 2.5MHz 1.25MHz 625kHz UMVL: 6MHz 7MHz 8MHz	Cobham Narrowband, Ultra-Narrowband and Ultra-X modes provide excellent range and efficient use of available channel bandwidth. Cobham Ultra Mobile Video Link modes provide higher data throughput than Narrowband by using the same bandwidths as DVB-T. UMVL will provide an advantage over DVB-T at C/X-band in short range mobile environments.
2	Constellation	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.
3	FEC Rate	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.

No	Name	Options	Notes
4	Guard Interval	1/16 or 1/8	The guard interval which is being applied. 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.

Table 7-10 – NB / UMLV Settings Key

Step 3b: Configure the DVB-T Settings

If you selected DVB-T for the Modulation scheme earlier, then these next settings need to be configured.

If you selected NB / UMLV then see *Configure the NB / UMLV Settings* previously.



No	Name	Options	Notes
1	Bandwidth	DVB-T: 6MHz 7MHz 8MHz	DVB-T modes provide excellent data throughput but shorter range than Cobham Narrowband modes. Typically bandwidth requirements for DVB-T depend on location and channel licensing. User data rates and range also vary slightly between bandwidths.

No	Name	Options	Notes
2	Constellation	QPSK, 16QAM and 64QAM	The COFDM constellation in use. QPSK-less user data, more robust, more range. 16QAM-more user data, less robust, less range. (link performance reduced by 5db) 64QAM-max user data, least robust, least range.
3	FEC Rate	1/2, 2/3, 3/4, 5/6 and 7/8	The forward error correction (FEC) rate which is being applied to the DVBT mode in use. Think 'data bits/all bits' 1/2 means 1 bit out of 2 bits is data and therefore 1 bit is used for error correction. Little user data means less picture quality, but more error correction means a more robust signal and therefore more range. 7/8 means 7 bits out of 8 bits are data and therefore 1 bit is used for error correction. More user data means better picture quality, but less error correction means less robust signal and therefore less range.
4	Guard Interval	1/32, 1/16, 1/8 and 1/4	The guard interval which is being applied to the DVBT mode in use. The guard interval is a deliberate extension of the RF symbol period to give immunity to reflections. 1/32, short extension, deals with fast reflections, more data, less range. 1/4, long extension, deals with slower reflections, less data, more range.

Table 7-11 – DVB-T Settings Key

7.10 Working with the Audio Tab

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Advanced Window > Audio Tab

1. On the Main Window in the Switch Panel, click the **Advanced** button.
2. Click the **Audio** Tab.

Screenshot: Audio Tab

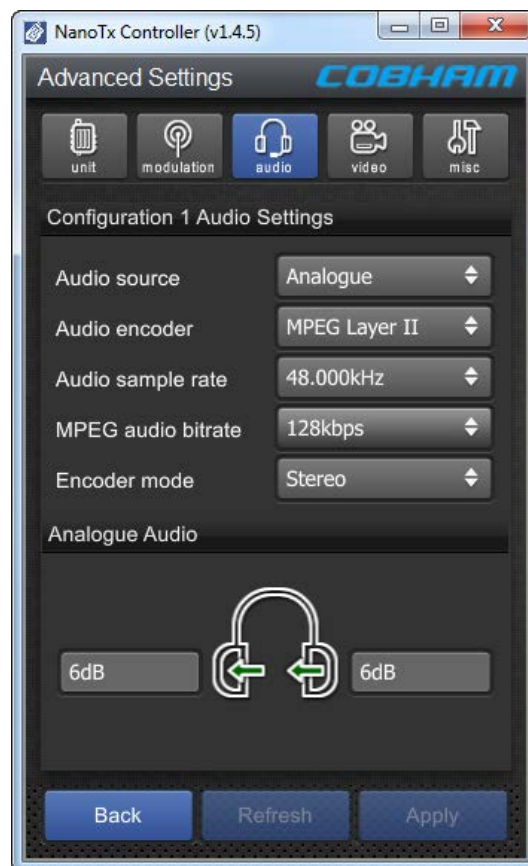
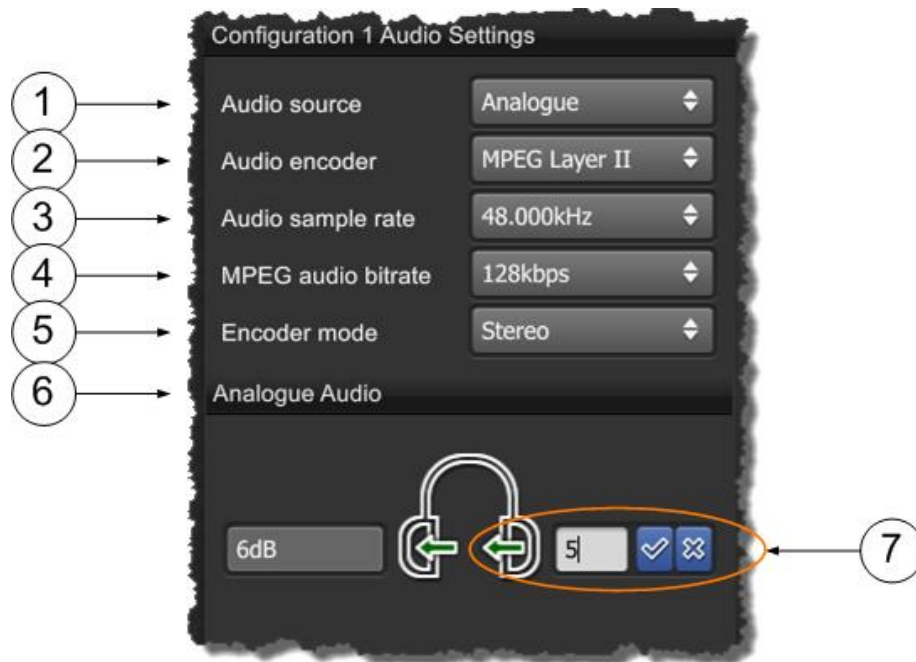


Figure 7-9 Audio Tab

Step 2: Configure the Audio Settings



No	Name	Options	Notes
1	Audio Source	Off Analogue Differential HD Nano TX Only: Embedded. (Digital audio from either SDI or HDMI).	You can switch audio off, leaving all the bandwidth available for video and data. Analogue – When selected the audio input cable can be used for mono left, mono right or stereo pair. Differential – When selected the audio input cable can be used as a differential pair for long cable runs on high quality microphones (mono only).
2	Audio Encoder	MPEG Layer I MPEG Layer II	You can select one of two 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.
3	Audio Sample Rate	48.000kHz 32.000kHz	This is the MPEG audio encoding sample-rate. Generally the higher the number the better the audio quality.

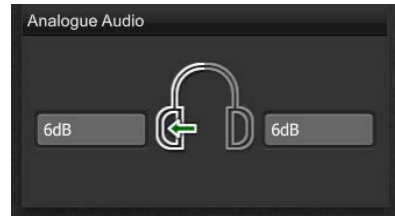
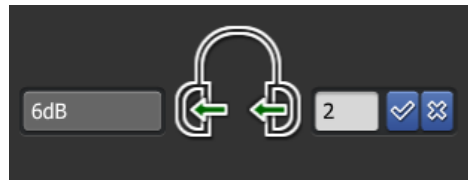
No	Name	Options	Notes
4	MPEG Audio Bit rate	Available rates depend on current audio encoder. Layer I: 64 – 448kbps Layer II: 32 – 384kbps	This is the MPEG audio encoding bit-rate. Generally the higher the number the better the quality.
5	Encoder Mode	Stereo Left mono Right mono Dual mono	Select the audio mode you want to use. Dual mono allows for different Gain values on the left and right channel. Stereo uses just one.
6	Analogue Audio	Graphic	Note how the Analogue Audio graphic changes to reflect the Encoder mode you have chosen. The arrows point to the applicable gain value(s) in the selected mode. Stereo and Left mono uses left gain. Right mono uses right gain. Dual mono uses both gains. 
7	Gain	0 to 66dB	You can apply different levels of gain to each channel as required. Encoder mode determines which gain value is used.  0= +4dBu 6= -2dBu are useful examples.

Table 7-12 – Audio Settings Key

7.11 Working with the Video Tab

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Advanced Window > Video Tab

1. On the Main Window in the Switch Panel, click the **Advanced** button.
2. Click the **Video** Tab.

Screenshot: Video Tab

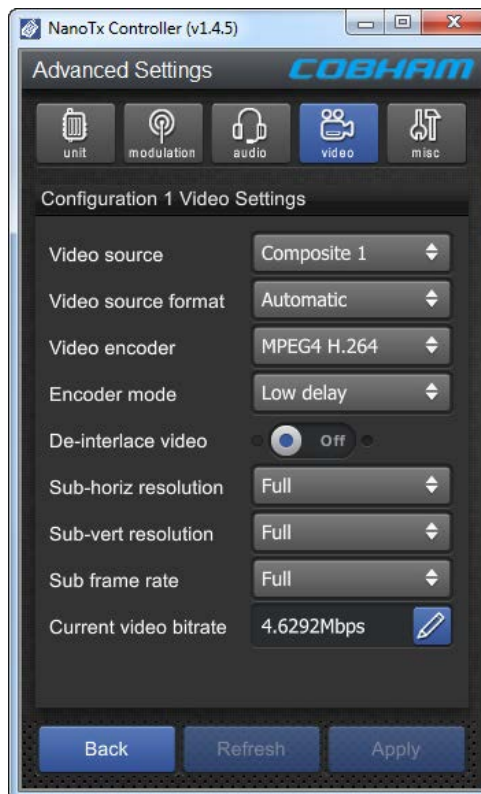
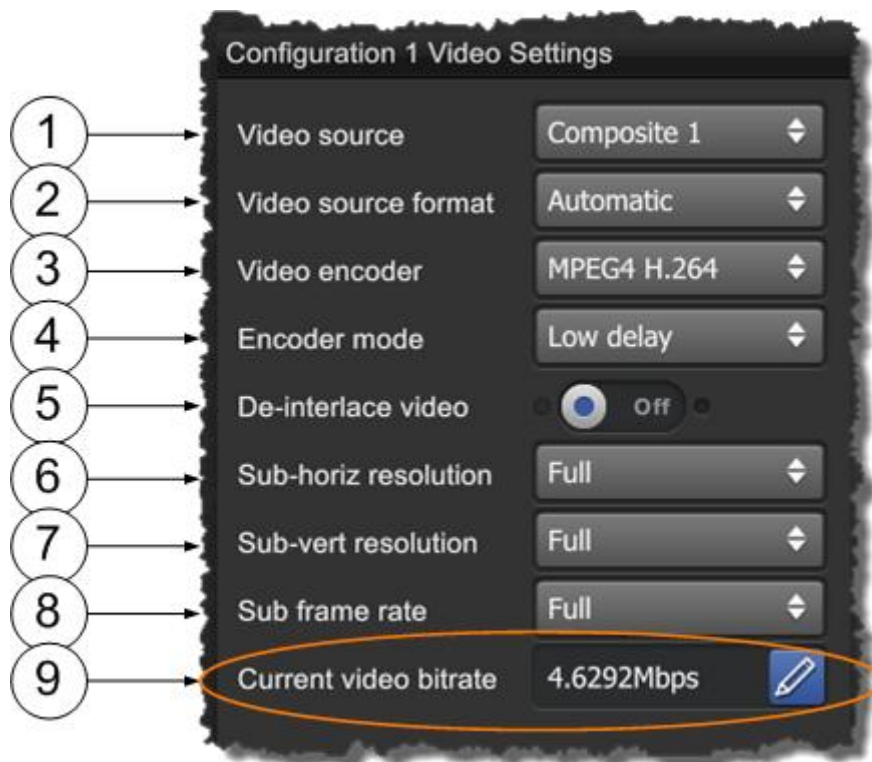


Figure 7-10 Video Tab

Step 2: Configure the Video Settings



No	Name	Options	Notes
1	Video Source	Off Composite 1 Composite 2 S-Video HD Nano TX Only: SDI (DIN 1.0/2.3 receptacle) HDMI (Micro HDMI Type D receptacle). 	With the conventional Omnetics Tri-Lobe Latching AV cable, there is one yellow RCA Phono plug for Video input. This is Composite 1. The generic Omnetics 9-way Breakout accessory cable can be used to access two video inputs. Here's how you can use them: For Composite Video, you can use one or the other (but not both at the same time). Video 1: Composite 1 Input. Video 2: Composite 2 Input. For S-Video, you'll use both like this: Video 1: S-Video Luma Input. Video 2: S-Video Chroma Input. You can switch video off, leaving all the bandwidth available for audio and data.

No	Name	Options	Notes
2	Video Source Format	Automatic PAL NTSC NTSC NP	Select the Video format that matches the camera you are using. Alternatively the Automatic setting enables the Nano TX to determine if the signal is PAL or NTSC automatically.
		HD Nano TX Only: 720p50, 720p59, 720p60, 1080i50, 1080i59, 1080i60, 1080p23, 1080p24, 1080p25, 1080p29, 1080p30, 1080psf23, 1080psf24, 1080psf25, 1080psf29, 1080psf30.	Power up standard in Automatic mode defaults to PAL. This can be changed by setting the input to NTSC NP for example and then back to Automatic.
3	Video Encoder	MPEG4 ASP MPEG4 H.264	Select the Video Encoder mode to suit your operation. MPEG4 ASP may be required backward compatibility with older receivers. MPEG4 H.264 generally provides improved picture quality over ASP.
4	Encoder Mode	Standard Delay Low Delay Ultra Low Delay	Select the level of delay you can accept. Standard Delay mode provides higher picture quality at the expense of delay. Should be used with long range modulation parameters. Ultra Low Delay mode provides exceptionally low delay at the expense of picture quality. Short range modulation parameters will generally be required.

No	Name	Options	Notes
5	De-interlace Option Button	Blue=OFF Orange=ON	When on, the de-interlace option converts interlaced fields to a progressive frame. This improves picture quality on PC monitor type devices. Having a progressive type of image is also easier to encode so you save bit rate too. Use it when you want to display video on a computer monitor and save bit rate. Don't use it when you want to preserve Vertical resolution or interlaced field rate.
6	Sub-horiz resolution	Full, 3/4, 2/3, 1/2, 1/4	This is the fraction of the horizontal resolution for whatever format you have selected. Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1920 is the horizontal resolution. If you choose Full then you'll see all 1920 pixels, if you choose 1/2 you'll see a down-sampled picture which requires much less bit-rate to encoder.
7	Sub vert resolution	Full, 1/2, 1/4	This is the fraction of the vertical resolution for whatever format you have selected. Let's say you chose an HD 1080 format. This is actually 1920 x 1080 where 1080 is the vertical resolution. If you choose Full then you'll see all 1080 lines, if you choose 1/2 you'll see a down-sampled picture which requires much less bit-rate to encoder. Note: Depending on the type of video content, when using a sub-vertical resolution you may want to enable the de-interlace option as well.

No	Name	Options	Notes
8	Sub frame rate	Full, 1/2, 1/4, 1/8, 1/24	If full frame rate is giving poor quality, you can step this down until you get an acceptable picture.
			Note: Using a sub-frame rate will force the Encoding mode to Standard delay progressive.
9	Current Video Bitrate	Pencil Return Symbol	Normally left in automatic. Press the Pencil Button and then the Video bit rate box will become active. Now you can manually set the video bit rate you want to use. Click the return symbol to return to automatically calculated bitrate.

Table 7-13 – Video Settings Key

7.12 Working with the Misc Tab

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Advanced Window > Misc Tab

1. On the Main Window in the Switch Panel, click the **Advanced** button.
2. Click the **Misc** Tab.

Screenshot: Misc Tab



Figure 7-11 Misc Tab

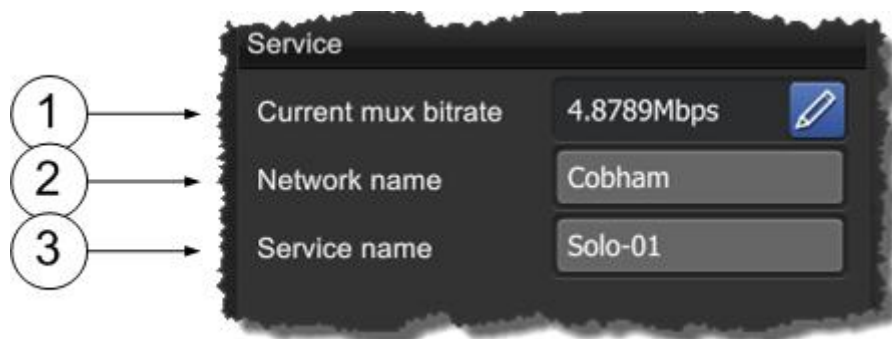
Step 2: Configure the Miscellaneous Options



No	Name	Options	Notes
1	Data Input	Off On	Selects if RS232 data is passed over the link.
2	Data Format	8b None 8b Even 8b Odd 7b None 7b Even 7b Odd	When you have switch data on, you can 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.
3	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.

Table 7-14 – Miscellaneous Options Key

Step 3: Configure the Service Options



No	Name	Options	Notes
1	Current Mux Bitrate	Any valid Bitrate.	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.
2	Network Name	Cobham is the default or you can use any valid name.	The Network Name applies to the whole transport stream (TS). Inside that TS there may be many Services each with a Service Name.
3	Service Name	Solo-01	The default is Solo-1. This is an identifier for the service within the transport stream (TS). This must match the name at the receiver for the service to be decoded. Inside that TS there may be many Services each with a Service Name.

Table 7-15 – Service Options Key

8. Appendix A – Cautions and Warnings

8.1 Cautions and Warnings

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

Serial	Area	Note
10	Thermal Control System	Any powered device will always produce heat as a by product of its operation. If you operate this device in an enclosed space you must ensure it has adequate airflow to keep it cool. Also, if worn close to the body, care must be taken to protect the operator from excessive temperatures.
11	RF Emission System	When using this device please ensure a distance of 20cm is maintained between your device and your body while the device is transmitting.
12	Aircraft Safety	Use of this equipment on board aircraft is strictly forbidden. Use of radio transmitter equipment in an aircraft can endanger navigation and other systems.
13	RF Emissions	WARNING: When wearing the Nano Transmitter on the body, you must only put the side with the label and the mounting lugs towards your body.
14	RF Emissions	WARNING: The transmitter must be mounted at a minimum of 5mm away from your body at all times.
15	RF Emissions	WARNING: The antenna must be kept vertical when the transmitter is mounted near to the body.
16	RF Emissions	The device is operating on a Part 90 frequency.
17	RF Emissions	WARNING: The equipment is for occupational users only and not for general public use.

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 SOLO5 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 radio to physical abuse, excessive shock or vibration
- Do not drop, jar or throw the radio
- Do not carry the radio by the antenna
- Avoid exposure to excessive moisture or liquids
- Do not submerge the radio unless it is designed to be submersible
- Do not expose the radio to corrosives, solvents, cleaners or mineral spirits
- Avoid exposure to excessive cold and heat
- Avoid prolonged exposure to direct sunlight
- Do not place or leave radios on surfaces that are unstable
- Always turn the radio off before installing optional accessories
- Only use accessories intended for the specific make and model of your radio, especially batteries, chargers and power adapters

9.2 Charging

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

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

9.5 Storage

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

9.6 Repairs

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

9.7 Getting Technical Support

Step 1 – Contact Client Services

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

Post: The Cobham Centre-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: tcs.whiteley.support@cobham.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.

9.8 Using the Cobham RMA Service

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

Step 1 – Email Cobham

To return something to Solent please Email tcs.whiteley.rma@cobham.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 foam) 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 Cobham

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.

A	Means...
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.
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 Cobham 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.

D	Means...
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.
Elementary Stream (ES)	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. You must be in RTSP mode to use Elementary streams.
Encoder	A processor in a video transmitter which converts analogue video from a camera to digital data.

F	Means...
FEC	Forward Error Correction is a system of error control for data transmission, whereby the sender adds redundant data to its messages, also known as an error-correction code . This allows the receiver to detect and correct errors (within some bound) without the need to ask the sender for additional data. The advantage of forward error correction is that a back-channel is not required, or that retransmission of data can often be avoided, at the cost of higher bandwidth requirements on average. FEC is therefore applied in situations where retransmissions are relatively costly or impossible.
Firmware	Software which is installed directly on a device and is intended specifically for that device and is used to control it.
FOV	Field of View - The field of view (also field of vision) is the angular extent of the observable world that is seen at any given moment.

F	Means...
Fading	A periodic decrease in received signal strength
Frequency	The rate at which a process repeats itself. In radio communications, frequency is expressed in cycles per second. Signals also have a property called wavelength, which is inversely proportional to the frequency.
Frequency Modulation	The process of varying the frequency of a carrier wave, usually with an audio frequency, in order to convey intelligence. Also called FM .
FPGA	Field-Programmable Gate Array - an integrated circuit designed to be configured by the customer or designer after manufacturing, hence "field-programmable".

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

H	Means...
Hertz	One cycle per second.

I	Means...
IP Address	Internet Protocol Address – A unique numeric ID for a device within a network.
IR	Infra Red - Infrared (IR) radiation is electromagnetic radiation whose wavelength is longer than that of visible light.
Impedance	The total opposition offered by a circuit or component to the flow of alternating current.

L	Means...
LOS and NLOS	Line-of-sight propagation refers to electro-magnetic radiation including light emissions travelling in a straight line. The rays or waves are diffracted, refracted, reflected, or absorbed by atmosphere and obstructions with material and generally cannot travel over the horizon or behind obstacles. NLOS is Non Line-of-sight.
Load	A device that consumes electrical power.
Lux	The lux (symbol: lx) is the SI unit of 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).

N	Means...
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 lightening or electrical equipment.

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

P	Means...
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.

R	Means...
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.
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.

T	Means...
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.
USB	Universal Serial Bus
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.

W	Means...
Waveguide	A specially form hollow metal tube, usually rectangular in shape in cross section, used to connect a High Power amplifier to the antenna.

R1.3

11. Appendix D – Reference Material

11.1 Licensing your Unit

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Upload Tab

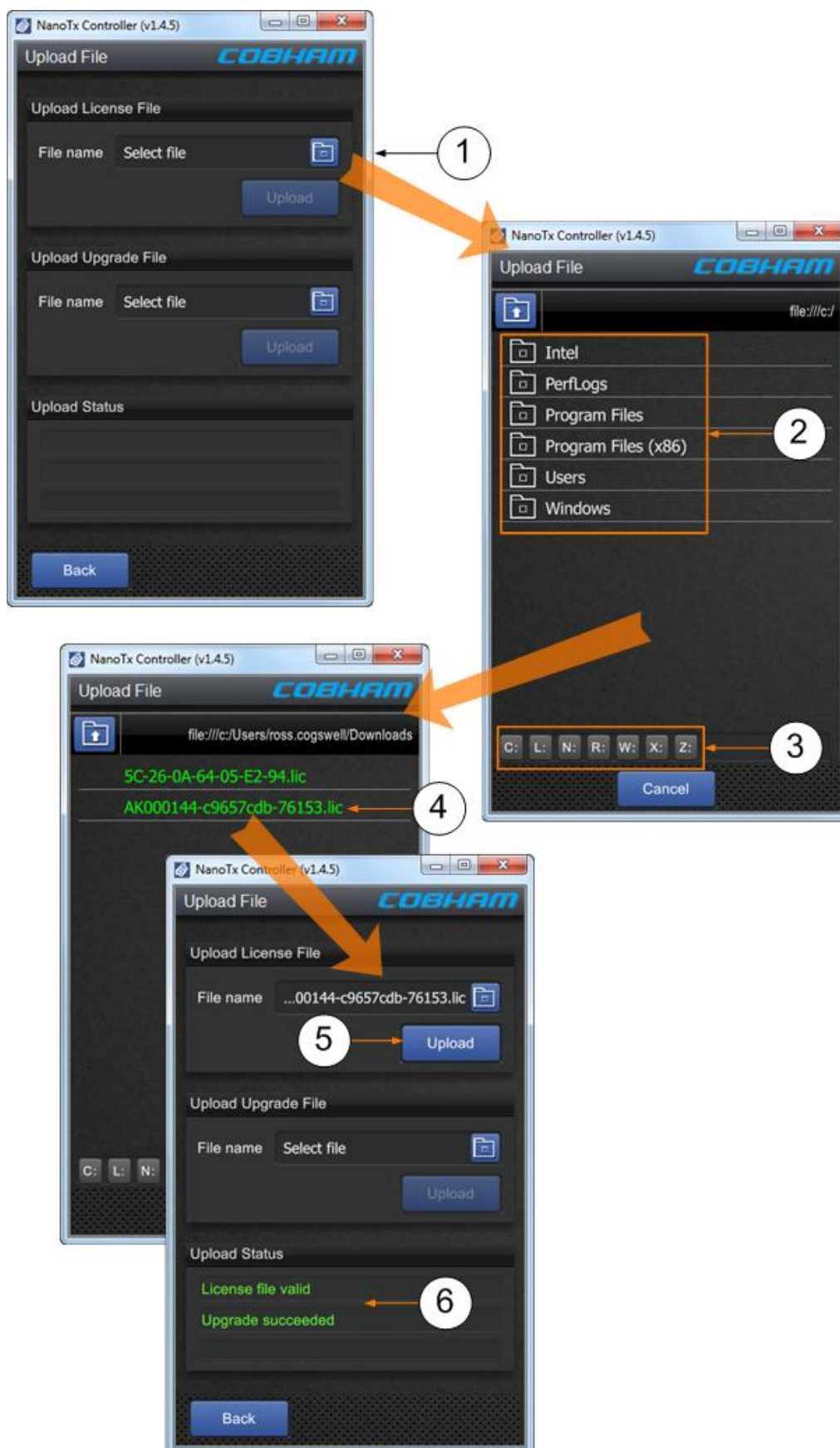
1. On the Main Window in the Switch Panel, click the **Upload** button.
2. The **Upload** tab opens.

Step 2: License your Unit

1. On the **Upload License File** pane, click the blue **Folders** button.
2. **Navigate** to where you have placed your license file.
3. You can use these buttons to explore any **mapped drives** you have on your PC.
4. In my example, the license files are located in my **Downloads** folder. They always end in .lic. Click the **license** file you want to use and it will appear in the File name box.

Note: If you are unsure which licence is for your device, look at the filename. It will contain an Electronic Serial Number (ESN). If it matches your unit's ESN then this is your licence. In this example, the middle part of the filename is -c9657cdb- which is the ESN for my Nano Transmitter.

5. Click the **Upload** button.
6. You'll see the **Upload Status** change to **Upgrade Succeeded**.



11.2 Upgrading your Firmware

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Open the Upload Tab

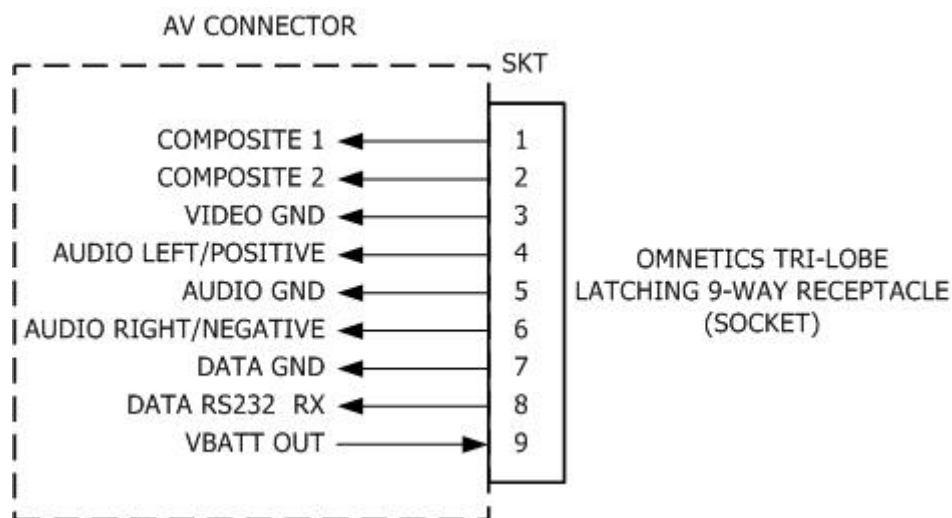
1. On the Main Window in the Switch Panel, click the **Upload** button.
2. The **Upload** tab opens.

Step 2: Upgrade your Firmware

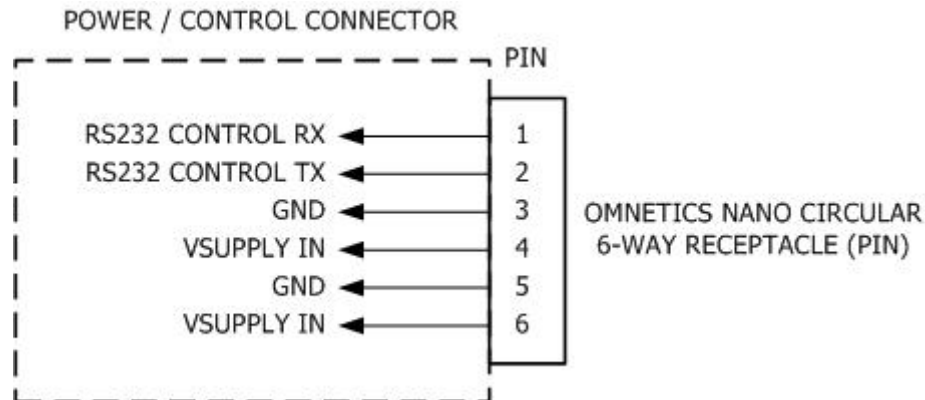
1. On the **Upload Upgrade File** pane, click the blue **Folders** button.
2. **Navigate** to where you have placed your upgrade file.
3. You can use these buttons to explore any **mapped drives** you have on your PC.
4. Click the **upgrade** file you want to use and it will appear in the File name box.
5. Click the **Upload** button.
6. You'll see the **Upload Status** change to **Upgrade Succeeded**.

11.3 Pinouts

11.3.1 AV Connector – Omnetics Tri-Lobe Latching 9-way Receptacle



11.3.2 Power / Control Connector – Omnetics Nano Circular 6-way Receptacle

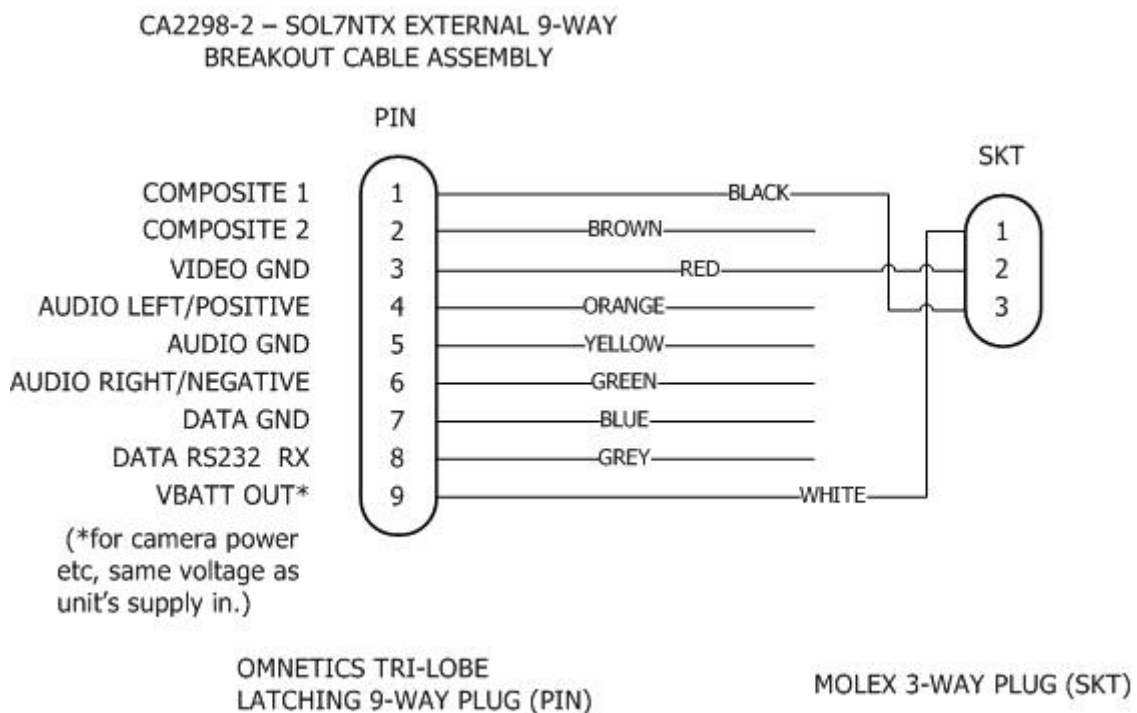


11.3.3 CA2298 SOL7NTX External 9-way Breakout Cable Assembly

This cable assembly has a 9-way plug at one end and a 3-way Molex plug at the other for you to connect to the cameras supplied in the kit version of SOL7NTX Nano Transmitter.

There are five bare wires which you can use to make cables to suit your own application. Of course you can remove the Molex plug to get at those cables too.

The diagram shows the signal / power on the Molex and bare wires.



11.4 Running the Nano TX Controller in Logging Mode

Before you Begin

You'll need:

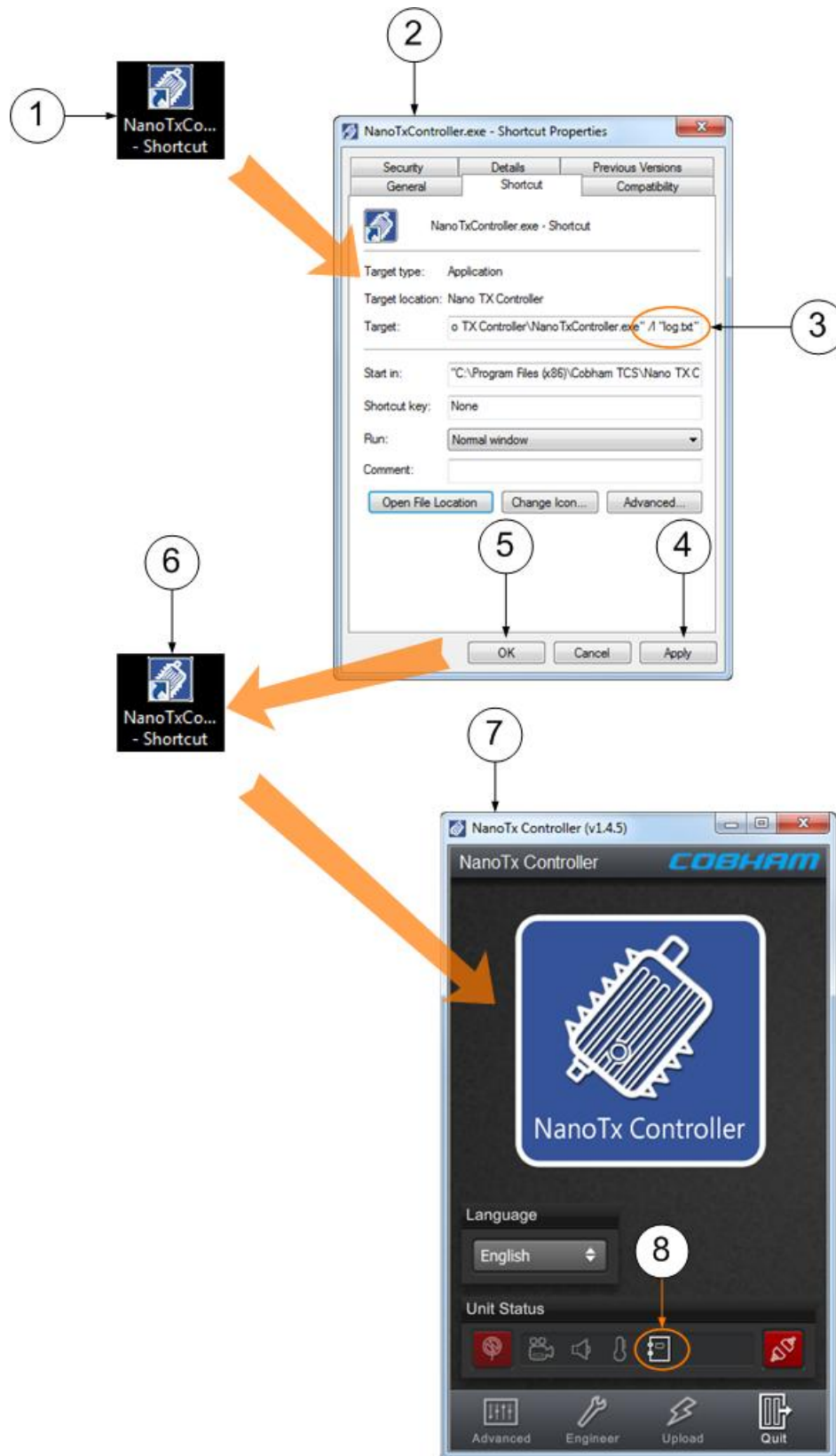
- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Set up Logging Mode

1. Create a shortcut to the Nano TX Controller on your desktop and right-click it.
2. The **Shortcut Properties** window opens.
3. In the Target box add **// "log.txt"** to the end of the line.
4. Click the **Apply** button.
5. Click the **OK** button.
6. Double-click your Nano **TX Controller shortcut** on your desktop.
7. The Nano TX Controller application opens.
8. The logging symbol is now white indicating logging is running.

Note: In the target box you must leave the quote marks on the original target line, leave a space then forward slash, lowercase L, quote mark, log.txt, close quote.

Screenshot: Set up Logging Mode



11.5 Recovering the Logging File

Before you Begin

You'll need:

- To have connected your PC to the Nano Transmitter using Serial.
- To have established a serial connection. (Green Connect button showing).

Step 1: Recover the Logging File

1. Right-click the Nano TX Controller shortcut on your desktop.
2. The **Shortcut Properties** window opens.
3. Click **Open File Location** button.
4. Windows Explorer opens where your Nano TX Controller application (and Log file) is located.
5. Double-click the log.txt file.
6. The log.txt file opens and displays your logged events.

Note: You may have to close the Nano TX Controller application to force all log contents to be written to disk.

