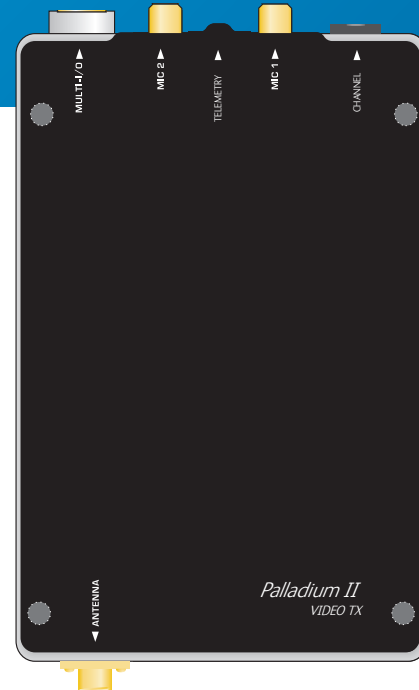# Palladium II Digital

COFDM Transmitter
Model Pd2-TX-100 100 mW Output

The most important thing we build is trust

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how to contact COBHAM

For operator and troubleshooting information, customers are encouraged to refer to the details in this manual. For additional
clarification or instruction, or to order parts, contact COBHAM.

Customer Service is available Monday through Friday between the hours of 9:00 AM and
5:00 PM EST at:

Tel: 603-880-4411

Fax: 603-880-6965

Website: www.cobham.com/dtc

Email: dtc.info@cobham.com

DTC Communications

dba Cobham Surveillance

486 Amherst Street

Nashua, New Hampshire 03063

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disclaimer

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manual conventions

☑ **NOTE**: Describes special issues you should be aware of while using a particular function.

✸ **WARNING**: Calls out situations in which equipment could be damaged or a process could be incorrectly implemented, but in which operator safety is not a factor.

✚ **TIP**: Describes application hints.

RF EXPOSURE STATEMENT

FOR BODY-WORN APPLICATIONS, only the S-Band unit, DTC Part# PD2-TX-100-S, has been FCC-approved (FCC ID H25PD2TX100S), **AND only** when used in conjunction with DTC's Palladium Digital VidiVest DTC Part# Pd-VidiVest-S(-RC), or Digital Video Jacket DTC Part# Pd-VIDI-DJ-S(-RC).

FOR _ANY_ CONFIGURATION OTHER THAN THAT DESCRIBED ABOVE, a separation distance of at least 20 cm **MUST** be maintained between the antenna and the body of the user or nearby persons.

When the unit is used consistent with the two previous notices, it complies with FCC radiation exposure limits set forth for an uncontrolled environment, per FCC Rules & Regulations, sections 1.1307, 2.1091 & 2.1093, as required by section 90.1217.

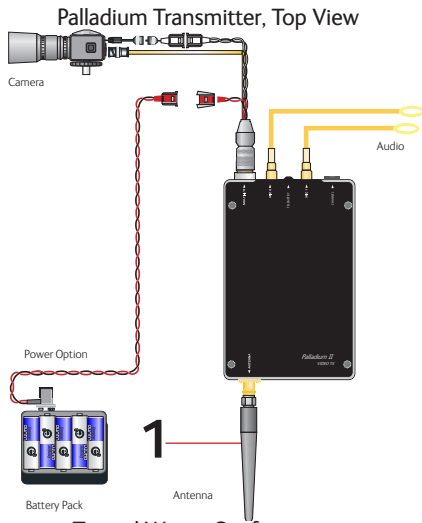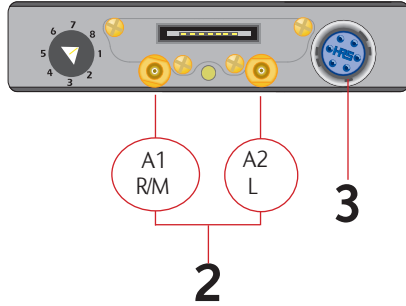☑ **NOTE**: Unless specifically designed for body-worn applications, the antenna must be kept at least 20 cm away from the body of the user.

☑ **NOTE**: Do not allow the device to directly contact the skin due to warm operating temperatures.

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Palladium Transmitter, Top View

A1
R/M

A2
L

3

2

Camera

Audio

Power Option

1

Battery Pack

Antenna

Typical Wiring Configuration

Complete these steps:

1 Connect the transmitter antenna to the SMA connector on the bottom of the Palladium unit.

2 If you plan to use audio, connect one or two microphones to the Audio 1 and/or Audio 2 LEMO connectors. If using monaural, use Audio 1.

3 Connect power and video input via the Multi I/O cable to the 6-pin Hirose connector:

a Attach your camera video input (75 ohm composite video source in PAL or NTSC) to the Multi I/O cable BNC connector.

b Apply the necessary power to your camera (use supplied cable or external source) and turn ON.

c Attach a 12 VDC power source (such as the supplied battery pack or the AC power adapter) to the Multi I/O cable via the Molex connector. The input voltage range is from 10 to 16 VDC.

WARNING: Do not apply power to the transmitter unless an antenna or non-radiating load is connected to the Antenna SMA connector.

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4 Set to the required configuration as indicated by the channel numbers. Refer to the Programming section on page 10 for more information on channel settings. Your Transmitter is now operational. Confirm its signal with your Palladium Receiver.

Accessories
- 10 cell AA Battery Pack
- 12 VDC 2.5A Power Supply & AC Line Cord
- Microphone, Body-Worn, (2)
- Power & Video Cable
- Camera Power Cable (2.1 mm plug)
- DC Power Cable, flying lead
- Camera Power Cable, flying lead
- Programming Cable
- Antenna, ANT2A
- VidiWire on-body antenna system, VW-ANT
- Palladium II Configuration Software
- 16-Pin Data Chaining & Control Connector Cable
- Transport Case

4

Antenna Connector
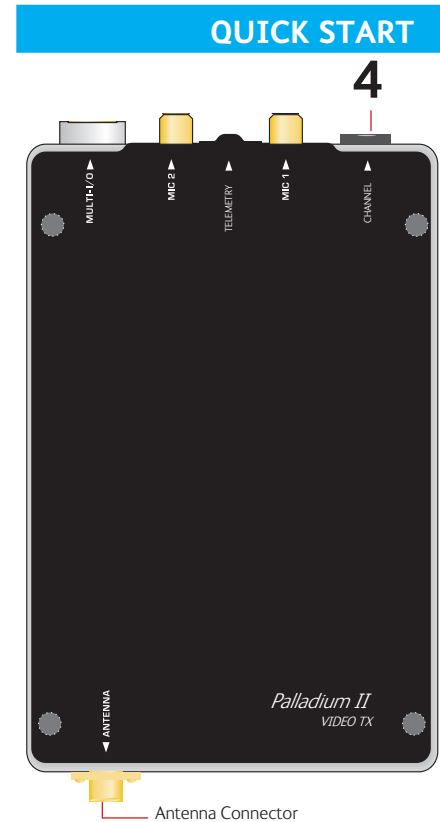
Palladium Pd2-TX-100 Transmitter, Front View

Palladium Pd2-TX-100
100-Milliwatt Digital Transmitter

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Palladium II

The Palladium II Series of digital video transmitters provide exceptional video quality in high multipath environments. They are ideal for use inside buildings, in urban areas, and in other applications where multipath would normally cause video tearing or breakup.

All Palladium II Series transmitters offer three bandwidth modes: DVB-T (6, 7, 8 MHz), Narrow (2.5 MHz), and Ultra Narrow (1.25 MHz) channel spacing. DVB-T utilizes 2000 carriers to transmit video and two channels of voice and data. Palladium II transmitters may be located on adjacent channels without a guard band. AES 128-bit encryption ensures users of secure communications.

The Palladium 100 is a small transmitter with a 100 mW RF power output. This unit is ideal for concealments and shorter range robotic and UAV applications. The package is only 4.2" x 2.6" x 0.65" (approximate dimensions not including connectors). Power consumption is 7.5 Watts. Operation time on a fresh set of Lithium batteries is approximately three hours. All connections are conveniently located off the ends of the unit. Many users will want to power this device with disposable batteries.

NOTE: Use only Lithium batteries with this device.

Using your Palladium II Transmitter

Follow the instructions given in the Quick Start section on pages 4-5. When power is first applied to the Palladium, the unit reverts to the indicated channel and RF ON state. The Alarm LED may be ON, which indicates that there is no active video input.

Changing your Transmitter Configuration

The Palladium Transmitter can store up to 8 different configurations, which can be selected with the Channel Control. Each of these configurations can be programmed into the Transmitter with the supplied DTC
Programming Software and a Windows PC. Refer to the Programming section on page 10 for more information.

To cycle through your preconfigured channels rotate the knob to the next setting.

COMPONENTS

MULTI I/O
POWER / VIDEO IN/
CONFIG

MICROPHONE

TI CONNECTOR

MICROPHONE

CHANNEL SWITCH

MULT/IO
MIC 1
MIC 2

MULTI-I-/O

MIC 2

TELEMETRY

MIC 1

CHANNEL

MOUNTING
HOLES
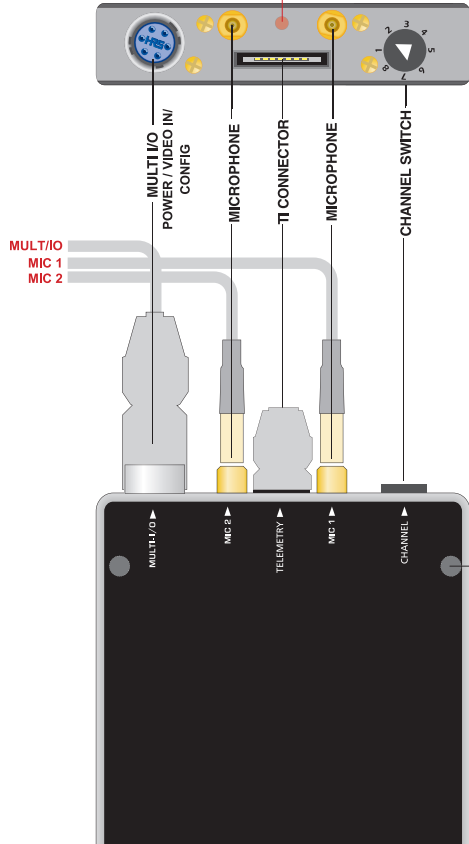
Top Controls/Connectors

Multi-I/O Connector The Multi-I/O Connector is covered on page 9.

Data Chaining & Control Connector This connector is normally covered.

Audio 2 (left) and Audio 1 (right/mono) LEMO Conn. These connectors provide the audio input connections to the transmitter. Either one or two audio inputs can be used with the Palladium II Transmitter.

ALARM LED This red LED indicates a valid video signal is not present.

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Palladium II
VIDEO TX

ANTENNA

ANTENNA

Transmitter Antenna Connector (SMA) This connector attaches to the transmitter antenna and carries the RF output signal. Always ensure the transmitter antenna is attached before operating the Palladium Transmitter.
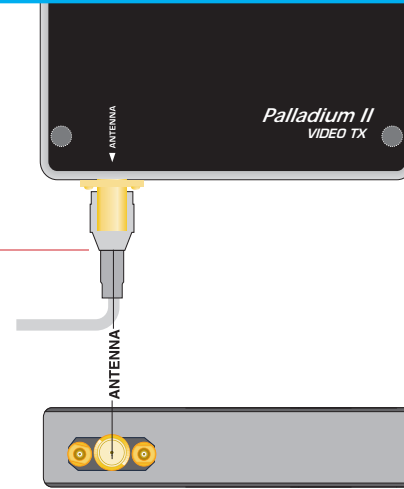
Muiti I/O Connector (6-pin Hirose) This connector provides connections for the DC Power Input, DC Camera Power, Programming, and 75 Ohm Composite Video Signal.

Video In 75 Ohm **6**   **1** Ground

RS232 In **5**   **2** +V Power
                            10V - 16V

RS232 Out **4**   **3** Camera Power Out 10V -16V

**HIROSE
MULTI I/O CONNECTOR**
WIRING DIAGRAM
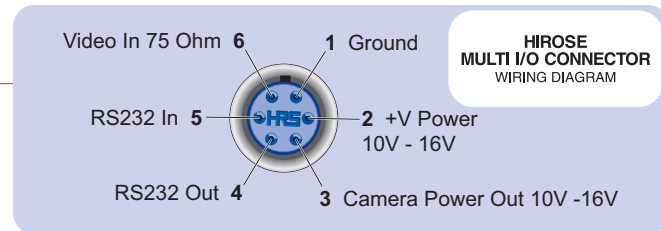
Getting Started

- Use the supplied programming cable to connect the chosen COM port of your PC to the transmitter to be configured.

- Launch the application by double clicking or using the `Run...` command.

- Connection with a transmitter should be automatic, but the user can force selection of the correct COM port using the drop down, followed by the Connect button.

- Select the channel to be configured from the unit's front panel Channel Switch.

- Click Refresh in the application to display the current configuration.

- Update the current settings in the application, then click Apply to save to memory.
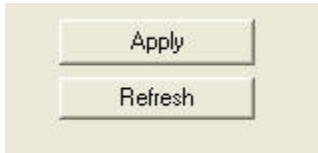
System PC Controller Application Software

Advanced control of the system is available by using the PC control application software. Typically users may want to customize the default configurations to control settings such as frequency, scrambling keys, modulation parameters, and video resolution.

The transmitter is controlled by the application `DTC_tx_ctrl_v1_3.exe` (or higher) available on the CD delivered with the product.

A PC is required with an available RS232 Serial COM port to control the transmitter.

Installation of the control program is as simple as copying the file from the CD to a suitable location on the PC. No install shield routine is launched. Note that the application generates its own log and initialization files, so it is best to create a dedicated directory for these applications, perhaps with links to the applications from the desktop of the PC.

PROGRAMMING CABLE to PC SERIAL RS-232 PORT

Audio

Power Option

10 AA BATTERY PACK

Battery Pack

Antenna

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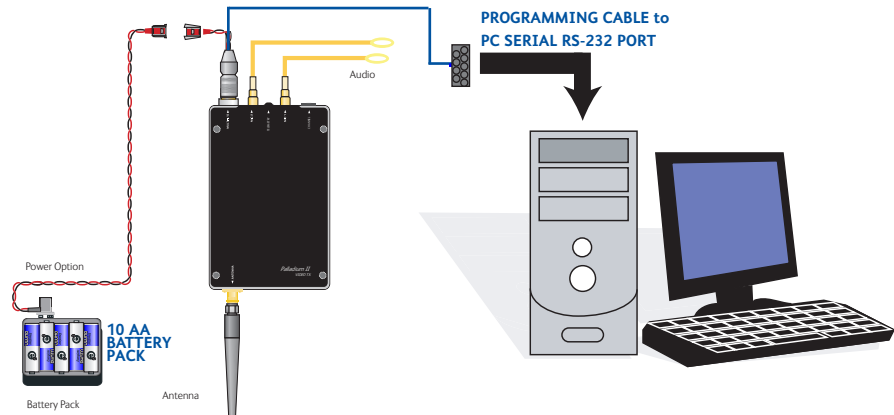
Transmitter Control Application

Output Frequency (MHz)
The Output Frequency setting allows selection of TX output frequency in increments of 0.250 MHz within the allowed tuning range of the unit. If the unit is set to a frequency that is not an integer multiple of 0.25 MHz, the unit will be automatically set to the closest frequency that is an integer multiple of 0.25MHz.

Modulation Bandwidth
Modulation Bandwidth is the actual channel bandwidth that the wireless video link will occupy. The DVB-T compliant mode requires a bandwidth setting of 6, 7 or 8 MHz. The narrowband mode bandwidth is either 1.25 or 2.5 MHz. Narrower bandwidths increase receiver sensitivity and extend the maximum distance of the link, however video quality and latency will suffer. Normal default for good quality video is 2.5MHz. The modulation bandwidth may be set to 1.25 MHz, 2.5 MHz, 6 MHz, 7 MHz, or 8 MHz.

Modulation Output
This control is used to turn ON and OFF the RF output. It must be ON for operation. Turn the transmitter RF power ON by selecting ON and Apply from the application.

Narrowband FEC
Narrowband FEC sets the forward error correction rate in the narrow bandwidth modes of 1.25 or 2.5 MHz. The two rates are available are 1/3 and 2/3; the normal default setting for good quality video is 2/3. Changing the FEC rate to 1/3 will extend the receiver sensitivity by 2 to 3 dB at the

expense of degraded video quality and longer latency.

Narrowband Guard Interval
Narrowband guard interval is used in the narrowband modes of 1.25 and 2.5MHz to adjust for varying multi-path delay conditions. The default is
1/16 however 1/8 can be selected if necessary to deal with extreme multi-path delays on long links.

Selecting 1/8 guard interval could cause a degradation in video quality and latency.

Narrowband Modulation
Narrowband modulation is used in the narrowband modes to select between QPSK and 16QAM modulation. For best range with good video quality, QPSK is used; 16QAM will give better video quality but will cut down the link range by

approximately 50%.

Unit parameters	
Output frequency (MHz)	4500.0000
Modulation bandwidth	2.5MHz
Modulation output	Off
Narrowband FEC	2/3
Narrowband guard interval	1/16
Narrowband modulation	QPSK

DVBT service name	Unit 1
DVBT FEC rate	1/2
DVBT guard interval	1/32
DVBT modulation	QPSK
DVBT spectrum inversion	normal
DVBT 4KHz offset	none

DVBT Service Name

DVB-T service name is a place to assign a name for the DVB-T configuration. Press Apply to save the new name.

DVBT FEC Rate

DVB-T FEC rate selects forward error correction rates in the wideband DVB-T modes. Options are 1/2, 2/3, and 3/4, with 1/2 giving best range and 3/4 possibly giving better video quality under certain conditions, recommended default is 1/2.

DVBT Guard Interval

DVB-T guard interval selects guard intervals in the wideband DVB-T modes between 1/32 and 1/4. Use the smallest guard interval that will allow reliable low error rate communications, this parameter may need to be adjusted when the link is relocated; the recommended default is 1/16.

DVBT Modulation

DVB-T modulation selects the modulation used in the wideband DVB-T mode. Modulations QPSK, 16QAM, or 64QAM can be selected. QPSK will give best distance and in most cases very good video quality and low latency.

DVBT Spectrum Inversion

DVB-T spectrum inversion allows flipping the modulated spectrum to compensate for spectrum inversion that may take place on the receiver side due to high side LO injection.

DVBT 4 KHz Offset

DVB-T 4 KHz offset is not normally used but might improve BER in cases where the TX upconverter I/Q balance is poor.

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Preset Transmit Mode

Preset transmit mode allows the user a convenient means of automatically setting bandwidth, FEC, modulation and video frame rate/compression based on link distance requirements. Options are: None (preset mode not used), Short Range, Medium Range, Long Range, Ultra Long Range.

Output Power

Output power selects one of two output power attenuator settings; low power or high power, typically the low power setting is the larger of the two attenuator settings and is used, for instance, if a power amplifier is added to the transmitter and the output power needs to be lowered substantially to prevent overloading the input of the power amplifier.

Output Attenuation (dB)

Output attenuation (dB) is the high power attenuator setting.

This control can be used to make minor adjustments to the output power level, but in normal operation should NOT be changed from factory settings. (0 attenuation = full output power, greater than 0 attenuation = reduced power in 0.25 dB steps.)

Output Attenuation low (dB)

Output attenuation low (dB) is the low power attenuator setting.

Preset transmit mode	None
Output power	High
Output attenuation (dB)	0.00
Output attenuation low (dB)	32.00

Video input	PAL
MPEG mode	MPEG2
MPEG4 encoding mode	Low delay interlace
MPEG4 frame rate	Full
Video bitrate	2.3204
Horizontal resolution	528

Video Input

Video input selects the video format going into the MPEG video compressor. Options are: OFF (no video input typically used when link is used for data only), PAL, NTSC, NTSC no pedestal, S-Video PAL, S-Video NTSC, S-Video NTSC no pedestal.

MPEG Mode

MPEG mode selects the MPEG compression being used, options are: MPEG2 or MPEG4. MPEG4 mode has to be used when in the 1.25 MHz bandwidth mode since this mode uses a nonstandard frame rate that is not supported by MPEG2.

MPEG4 Encoding Mode

MPEG4 encoding mode selects the characteristics of the MPEG4 compression. Options are: low delay interlaced, standard delay interlaced, low delay progressive, standard delay progressive, and SIF. Interlaced scanning is what is used in conventional over-the-air video. Progressive scan is available on some cameras and involves scanning an entire frame in one pass rather than two in interlaced scanning. SIF is a bandwidth-conserving camera scan mode that cuts resolution in half in both the horizontal and vertical.

MPEG4 Frame Rate

MPEG4 frame rate selects the frame rate used in the MPEG4 mode, full frame rate is 30 fps for NTSC and 25 fps for PAL a frame rate of 1/2 or less has to be used in 1.25 MHz bandwidth mode. Options are: Full, 1/2, 1/4, 1/8. or 1/24.

Video Bitrate (status only)

Video bitrate is a status window that will display the video transport data rate, this varies with bandwidth, modulation, FEC rate and guard interval. The rate will increase with bandwidth and higher levels of modulation, it will go down as the FEC rate and guard interval are increased. The video bit rate will also decrease as other service options are activated such as audio and data channels. As a rule video quality and latency improve as the bit rate is increased.

Horizontal Resolution

Horizontal resolution determines the maximum number of horizontal Pixels that can be sampled by the video encoder. For optimal performance this setting should be set to the first value that exceeds the horizontal resolution of the camera in use. Options are: 352, 480, 528, 704 pixels.

Video Sharpness

Video sharpness is a filter that may be switched in to smooth out blockiness in the video.

Audio Encoder

Audio encoder selects quantity of active audio channels (2 maximum), sampling rate (8, 16 or 32 KHz) which determines upper frequency response, and sampling bits (8 or 12) which determines audio signal to noise. Options are: Off, 8 KHz 8 bit stereo, 16 KHz 8 bit mono, 16 KHz 8 bit stereo, 32 KHz 8 bit mono, 32 KHz 8 bit stereo, 32 KHz 12 bit mono, 32 KHz 12 bit stereo.

Audio Input Level

Audio input level selects the audio preamp gain level, options are:
0 dB, 12 dB, 24 dB, 36 dB, 48 dB. Use 24 dB for DTC supplied microphones. Note: 3.5 VDC phantom power is at the microphone input for powering electret condenser microphones.

Unit Name

Unit name allows the user to enter a name (up to 8 characters) for the transmitter that will be stored in memory.

Sleep Mode

Sleep mode shuts down most functions in the transmitter except the control functions. This can be used to conserve battery power and yet allow the transmitter to become active again with a simple command.

Data

Data allows activation of the RS232 half duplex serial data channel and to select parity mode.

Data Baud Rate

Data baud rate selects data channel baud rate, standard rates between 1200 and 115,200 baud are available.

NOTE: Chaining is digital signal input and output through the 16-pin Data, Chaining, and Control Connector.

Chaining Input

Chaining input activates the chaining data port. This is not normally used except in repeaters and high speed data transmission products.

Chain Number

Chain no. (not normally used) assigns a chaining tag number to the stream associated with the transmitter's video encoder. This can be user-defined to 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. Normally 0.

Chaining Output

Chaining output (not normally used) assigns the output of the video encoder to the chaining port. Normally OFF.

Current Configuration

Current config indicates the preset that is currently being programmed or viewed, this should be the same as the preset selected by the channel switch.

Scrambling

Scrambling selects 3 different scrambling options: OFF (no scrambling), AES128, AES256 (optional), or ABS (a proprietary 32 bit scrambling algorithym).

Heartbeat Enable

Heartbeat enable activates a beating heart on the screen video graphic to indicate that a link is still functioning even if there is no motion on screen.

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File

Change Logfile – opens a standard Windows file save dialog box which allows the user to change the path and name of the log file generated by the application.

Exit – exits the control application.

Options

Timeouts – password protected access to change timeouts used during the serial communications between the unit and the controller.

Engineering – password protected access to further diagnostic and calibration features.

Write License Code – open a further password protected box for entering license codes for future upgrade.

Change RS232 address – Changes RS232 address of configuration port, which is normally set to 1.

Write AES Key – opens a dialog box for entering a customer-selected scrambling key. A key is a combination of 32 hexadecimal characters (64 for optional 256-bit encryption). Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F. The receiver and transmitter must have identical AES keys.

Restore Defaults – restores factory default settings in the transmitter. User should NOT select Restore Defaults.

Polling Enabled – selecting this option makes the control application automatically refresh the data presented to the user every few seconds.

Polling Options – selecting this option opens a dialog box for entering a customer-selected polling interval (in milliseconds).
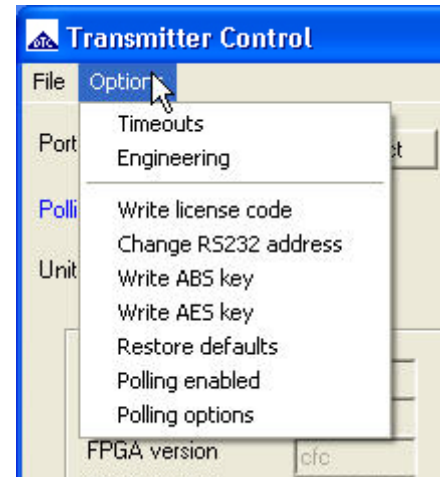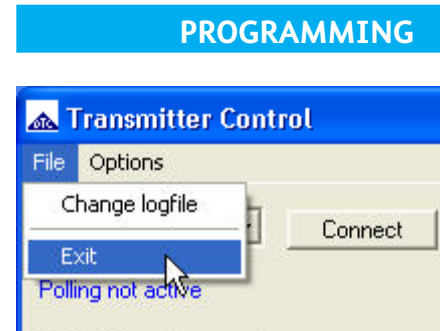
SPECIFICATIONS

Physical

Unit Dimensions (approx.)	4.2" x 2.6" x 0.65" (not including connectors)
	10.67 mm x 6.6 mm x 1.65 mm

Environmental

Operational Temp	-10 degrees C to 50 degrees C

Power

Input Voltage	10 to 16 VDC
Power Consumption	Fully Operational ˜ 7.5 W, Sleep Mode < 0.5 W

Control

PC Control Interface	RS-232.
Memory	Eight user-programmable configurations

Video Encoding

Compression Standard	MPEG-2 w/ non-DVB modes, MPEG-4
	DVB-T Compliant
Chrominance Profile	4:2:0
Line Standard	PAL 625 or NTSC 525
Horizontal Resolution	704, 528, 480, 352 pixels (528 as standard)
Vertical Resolution	576 (625 lines) or 480 (525 lines)
Video Bitrates	1Mbps to 10 Mbps
Video Latency	End to end delay of 54 milliseconds

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Audio Encoding

Input	Stereo or Dual Mono pair
Bitrates	28 kbps to 72 kbps depending on configuration
Sampling Frequency	32 kHz, 16 kHz or 8kHz
THD	< 0.1% max
Response	20Hz to 15KHz, +/- 0.25dB depending on configuration
Crosstalk	> 55 dB min
S/N	60 dB RMS

Composite Video Input

Standards	NTSC (with and without pedestal) or PAL
Specification	Rec. ITU-R BT.470-4
Connector	Hirose
Composite PAL and NTSC decoding	Eight-bit comb filtering composite decoder

Analog Audio

Analog Audio Input	+10 dBu
Nominal Level	+4 dBu

Scrambling

Scrambling type	Fixed key scrambling system
	Algorithms offered include AES.

COFDM RF output

Output Frequency	Band Dependent
Occupied Bandwidth	1.22/2.44 MHz
Power	100 mW
Connector	SMA
COFDM Standard	Proprietary, 2.5 MHz channel bandwidth.
DVB-T	1.25 MHz

NOTES

TWO YEAR WARRANTY

DTC Communications, Inc. (DTC) warrants its RF transmitting and receiving products to be free from defects in workmanship or material for a period of two (2) years from the date of shipment unless otherwise stated.

The liability of DTC, Inc. under this warranty is limited to replacing, repairing, or issuing credit, at option, for any products, which are returned by the purchaser during such warranty period, provided:

DTC is notified and a Repair Authorization Number is issued by DTC Customer Service within 30 days after discovery of such defects by Customer.

The defective units are returned to DTC with transportation charged Prepaid by the Customer.

Product damaged in shipment must be reported to and claim forms filed with the Carrier by the Customer. In shipments to the factory, notice and claim procedures will be initiated by DTC.

DTC's examination of such products shall disclose to its satisfaction that such defects exist and have not been caused by misuse, misapplication, neglect, improper installation, improper storage, alteration, physical damage or accidents.

The warranty shall not apply to material or accessories ordinarily susceptible to field damage or of a disposable nature. Examples include batteries, antennas, microphones, headsets, cases, accessory bags, etc. The warranty shall not apply to Engineering Prototypes or Customer requested modifications to electronic circuits.

This warranty does not apply to and DTC does not independently warrant items or systems sold by DTC which are produced by other manufacturers. With respect to such items, the Customer shall look to the warranty of the original manufacturer and DTC disclaims all warranty, expressed or implied.

Nothing in this warranty, or any statement, brochure, bulletin, or advertisement is to be interpreted as establishing the suitability of any product for particular application or use. Applications of the product and the determination of suitability for any application, is the sole responsibility of the Customer.

Contact Information

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(F) 603 880-6965

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Inside Sales

Law Enforcement
1-800 233-8639

Military
1-800 233-8639

OEM
1-800 233-8639

A complete listing of Contact Individuals can be located on our website at:

www.cobham.com/dtc

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