PALLADIUM™ SERIES

Digital Transmitter

COFDM Transmitter

Model Pd-TX-100 100 mW Output

Model Pd-TX-250 250 mW Output

DTC COMMUNICATIONS, INCORPORATED

how to contact DTC

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 DTC.

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

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Fax: 603-880-6965

Website: www.dtccom.com

Email: info@dtccom.com

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- MiniPIX®
- DynaPIX®

Other product names used in this manual are the properties of their respective owners.

warranty

DTC warrants its manufactured components against defects in material and workmanship for a period of two (2) years, commencing on the date of original purchase.

Products manufactured by others that are approved for use with DTC equipment are warranted for the manufacturer's warranty period, commencing from the date of shipment from DTC.

FCC information

The following information is provided as a service to our law enforcement customers who require a Part 90 station license for video surveillance operations.

You will need to provide two documents:

- Form 600 (the application form)
- Form 159 (the filing fee form)

Forms can be obtained from the FCC on their website at:

www.fcc.gov

You can also contact the FCC using their FAX back service at: (888) 418-3676

Additional instructions are available by telephone at: (888) 225-5322

The filing fee form is returned to:

Federal Communications Commission

1270 Fairfield Road

Gettysburg, PA 17325-7245

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

A separation distance of at least 20 cm must be maintained between the antenna and the body of the user or nearby persons.

NOTE: This device is for occupational use only. Occupational users are those persons who are exposed as a consequence of their employment, provided these persons are fully aware of and exercise control over their exposure.

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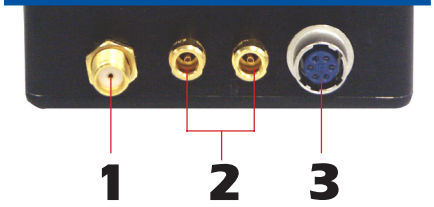
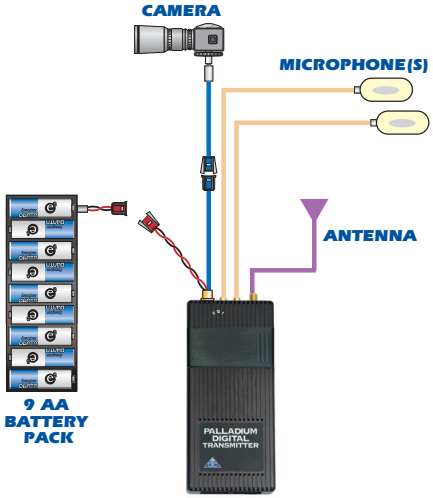
QUICK START



Palladium Transmitter, Top View



Typical Wiring Configuration

Complete these steps:

1. Connect the transmitter antenna to the SMA connector on the top 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.
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 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 18 VDC.

NOTE: Eight Channel LEDs are located under the sliding control panel door. If all 8 green LEDs are flashing, this indicates that your battery source is low.

Thermal Issues

Higher power Palladium Pd-TX-250 Transmitters feature mounting tabs for convenient mounting and heat dissipation. If your Palladium Transmitter has these tabs, proper heat sink mounting is recommended for optimal performance. An optional heat sink can be purchased from DTC. See page 8 for heat sinking instructions.

4 Slide the control panel door open (to the right).

5 When power is applied, the transmitter will power-up to its last state. Ensure that the green RF LED turns ON indicating the unit is transmitting. If needed, push the RF button to begin transmitting. The channel number LED also turns ON, representing the most recent channel setting from the last time the transmitter was used.

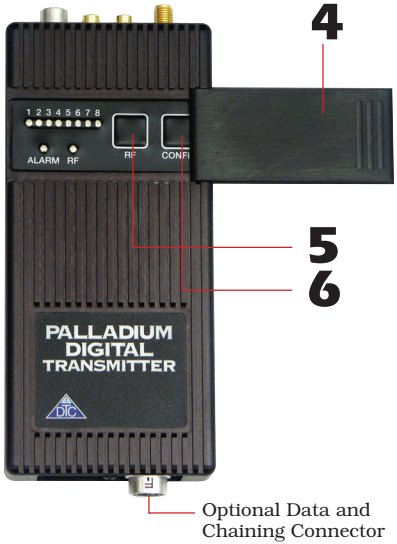
6 If you need to change the operating channel, press the CONFIG button to cycle through the 8 available channels indicated by the channel number LEDs. Refer to the Programming section on page 10 for more information on channel settings. When you change the channel configuration, the RF transmission is automatically switched OFF to prevent accidental interference. When you have selected the channel you need, push the RF button to start transmitting again. The RF LED will turn ON.

NOTE: A red ALARM LED indicates that no video is connected.

Your Transmitter is now operational. Confirm its signal with your Palladium Receiver.

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

NOTE: The RF switch should remain ON during normal use. The RF automatically shuts off during programming to prevent accidental transmissions on unintended frequencies.



Palladium Pd-TX-100 Transmitter, Front View

INTRODUCTION

Palladium Pd-TX-100
100-Milliwatt Digital Transmitter

The Palladium 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 Series transmitters are designed for spectrum-efficient 2.5 MHz channel spacing. Approximately 400 carriers are used to transmit video and two channels of voice and data. Palladium 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 7.5” x 2.5” x 0.75”. Power consumption is 6 Watts. All connections are conveniently located off the ends of the unit. Many users will want to power this device with disposable batteries.

The Palladium 250 incorporates an internal power amplifier bringing total power output to 250 mW. Height and width are identical to the Palladium 100, with the depth of the unit increasing an additional 0.5”. The Palladium 250 is ideal for many surveillance applications and short to mid-range robotic and UAV applications.

Both versions are built out of rugged milled aluminum housings. The Palladium 250 features mounting tabs for convenient heatsinking (page 8).

NOTE: Use only Lithium batteries with this device.

Using your Palladium 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 last used channel and RF (ON/OFF) state. One of the green channel LEDs will turn ON indicating the active channel. The Alarm LED may be ON, which indicates that there is no active video input.

NOTE: Since the Palladium transmitter always returns to the last configuration on power-up, the unit should always be deployed with the RF switch ON. Therefore, once deployed, control of the unit must be restricted to applying and removing power. See the *Quick Start* (pages 4-5), and *Heatsinking* (page 8) for more installation guidance.

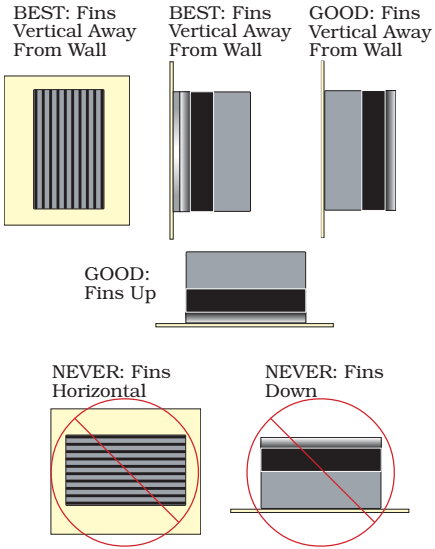
Changing your Transmitter Configuration

The Palladium Transmitter can store up to 8 different configurations, which can be selected on the front panel. 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 press the CONFIG button once to advance to the next setting. By default, the Palladium will turn OFF the transmitted signal while you are changing channels. This is to prevent accidental interference. Push the RF button after channel selection to resume RF transmission of your video image.

Palladium Pd-TX-250
250 Milliwatt Digital Transmitter
with Mounting Tabs

HEAT SINKING



When to Use a Heat Sink

The Palladium 100 does not require heat sinking in normal service. The Palladium 250 should be attached to a heat sink or heat sinking surface if the unit is to be installed in an enclosure, or in deployments where the ambient temperature could exceed 50°C.

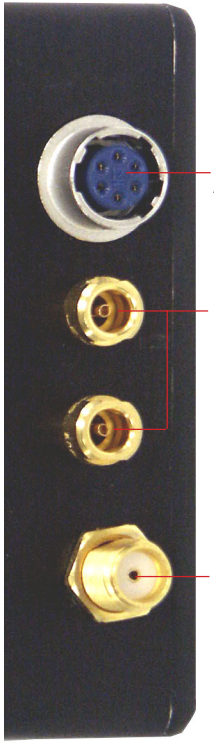
Typical Palladium Operating Temperatures

A wide range of variables can affect the temperature of electronic devices including ambient temperature, air flow, heat sink and mounting considerations. In a typical test performed at room temperature, the Palladium 250 without a heatsink has been observed to have a baseplate operating temperature of 40°C (104°F). The Palladium 100 has been observed to have a baseplate operating temperature of 37°C (99°F) in a similar test.

Heat Sink Installation

To install the heat sink, complete the following steps:

1. Align the transmitter and heatsink, with the back of the transmitter mating with the front, flat surface of the heatsink.
2. Secure the heatsink with four (4) 6-32 x 1” screws. Install the screws from the transmitter side.
3. Make sure there is good contact between the transmitter and the heatsink. They should be mounted flush to one another.

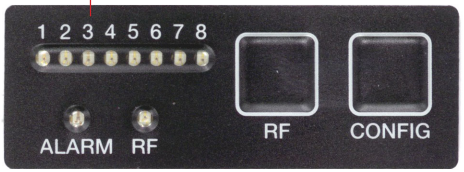


Muiti I/O Connector (6-pin Hirose) This connector provides connections for the DC power input, programming, and 75 Ohm composite video signal.

Audio 1 and 2 Connectors (LEMO) These connectors provide the microphone connections to the transmitter. Either one or two microphones can be used with the Palladium Transmitter.

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.

Channel LEDs These green LEDs, numbered 1 through 8, indicate the channel number currently selected. Each channel represents a set of preconfigured settings.

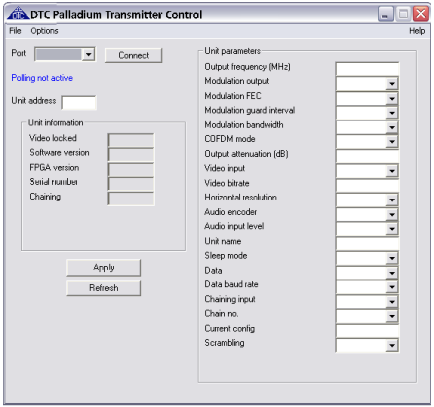


ALARM LED This red LED indicates a valid video signal is not present.

RF LED This green LED indicates that the RF output is ON.

RF Button This membrane switch toggles ON/OFF the RF output. Normally this should be left ON.

CONFIG Button This membrane switch cycles through the eight channels.



System PC Controller Application Software

Advanced control of the system is available by using PC control applications. 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.exe` available on the CD delivered with the product.

A PC is required with two RS232 Serial COM ports to control both a transmitter and receiver simultaneously. Where changes are to be made to either a transmitter, or a receiver, at different times, a PC with a single RS232 Serial COM part can be used.

Installation of the two control programs is as simple as copying them from the CD to a suitable location on the PC. No install shield routine is launched. Note that the controllers generate their 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.

Getting Started

•Use the supplied cables to connect the chosen COM port(s) of the PC to unit(s) to be configured.
•Launch each application in turn 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.
•Errors may appear during the connection process if the PC is unable to automatically ascertain which unit is connected to which COM port.

Transmitter Control Application

Output Frequency (MHz)

Output frequency (MHz) (your frequency)

The transmit frequency can be changed by entering the new desired frequency in this field. Values outside the range supported by a particular transmitter type will be rounded to the highest or lowest supported frequency as appropriate. The resolution of the transmit frequency is complex and resolved to the closest achievable within the constants of the supported step sizes of 1MHz, 1.6667 MHz and 2.5 MHz.

Modulation Output

Modulation output OFF

This control is used to turn on and off the RF output. After a configuration change, the output always reverts to OFF. It must be ON for operation.

Modulation FEC

Modulation FEC 2/3

The default FEC is 2/3, however improved range operation can be achieved by selecting FEC 1/3. FEC 1/3 will improve signal range by 3dB. However FEC 1/3 reduces link capacity to 1.2Mb/s therefore reducing picture quality.

FEC Link Bitrate Sensitivity 2/3 2.4Mb/s: -99dBm,
1/3 1.2Mb/s: -102dBm

Modulation Guard Interval

Modulation guard interval 1/16

The Guard Interval is fixed at 1/16 in current software releases.

Modulation Bandwidth

Modulation bandwidth 2.5 MHz

For the Palladium transmitter products, the modulation bandwidth is fixed at 2.5MHz.

COFDM Mode

COFDM mode QPSK

The COFDM mode can be changed between QPSK and 16QAM. QPSK is the default mode and will give the strongest most rugged RF link performance. Selecting 16QAM reduces the link performance by 5dB but improves the link data throughput, giving significantly better video quality.

Default values are shown in red.

Output attenuation (dB)	(As Desired)
Video input	NTSC
Video bitrate	1.1
Horizontal resolution	528
Audio encoder	OFF

Default values are shown in red.

Output Attenuation
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.

Video Input
This control is used to select the composite video input standard. Options are PAL, and NTSC both with and without 7.5 IRE pedestal.

Video Bitrate
The video bit rate is automatically maximized in each configuration when Chaining Input is turned off. This control can be used to set the video bitrate within the constraints of capacity available in the channel, but only when Chaining Input is set to ON.Chaining CANNOT be enabled on normal transmitters, and as such video bit rate control is automatic.

Horizontal resolution
The video coding resolution can be selected from 704, 528, 480 and 352 pixels. Changing the horizontal resolution to lower values will make the coded picture softer.
Care should be taken to match the horizontal resolution to the resolution of the camera connected to the transmitter; this will give best image results.

Audio Encoder
The Audio can be turned on and off with this control. Audio is OFF by default, but there are several audio modes that vary from very high quality to speech grade that can be selected with this control. Enabling Audio encoding will degrade the video quality, because some of the available data capacity is diverted away from video to audio. Selecting high fidelity audio modes will degrade the video quality more than lower fidelity audio modes.

Audio Input Level
This control is used to define the audio gain to be applied to the audio input signal. 0dB is used for line level audio and various options up to 48dB of gain can be applied for microphone inputs.

Audio input level	24 dB

Unit Name
Future Use.

Unit name	(As Desired)

Sleep Mode
This control allows the unit to be forced into a Sleep Mode where main functions are disabled, and the power consumption is significantly reduced.

Sleep mode	NO

Data
Future use.

Data	OFF

Data Baud Rate
Future use.

Data baud rate	1200

Chaining Input
Future use.

Chaining input	OFF

Chain Number
Future use.

Chain no.	0

Default values are shown in red.

Current config (Ch. No.)

Current Config
This field reports the last loaded configuration number. Note that for the Palladium transmitter, changes applied after the configuration has been loaded are saved immediately into the current configuration.

Scrambling OFF

Scrambling
If the AES scrambling option has been purchased for the system in use, then it is possible to encrypt the link. Scrambling must be enabled at the transmitter by selecting AES in the scrambling field. At this point the user will need to ensure that the correct key is in use and this is done by using Options/Write AES key. The key is 128 bits and is entered as 32 ASCII hexadecimal characters (0-9 and A-F).

Video locked

Video Locked (Status Only)
This status information indicates whether the transmitter is successfully locked to the incoming composite video signal. Unlocked status may indicate cabling faults, or poor quality incoming video feeds to the unit.

Software version

Software Version (Status Only)
This status information describes the version of the software running the transmitter product.

FPGA version

FPGA Version (Status Only)
Engineering use only.

Serial number

Serial Number (Status Only)
This status information is the electronic serial number of the transmitter PCB. This number can be used for upgrades or support.

Chaining

Chaining (Status Only)
Future use.

Default values are shown in red.

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 use.
Change RS232 address – prompts the user to change the units RS-232 address, which can be useful when connecting multiple units together via a multi drop RS-485 bus for control purposes.
Write AES Key – opens a dialogue box for entering a 128bit AES scrambling key, as 32 ASCII hexadecimal characters (0…F)
Restore Defaults – restores factory default settings in the transmitter.
Polling Enabled – selecting this option makes the control application automatically refresh the data presented to the user every few seconds.

File

Load Config – used for loading configuration data to text file.
Save Config - used for saving configuration data to text 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.

SPECIFICATIONS

Physical	
Unit Dimensions	
Pd-TX-100	7.5 x 2.5 x 0.75 in (127 mm x 70 mm x 30 mm)
Pd-TX-250	7.5 x 2.5 x 1.25 in (127 mm x 70 mm x 43 mm)
Environmental	
Operational Temp	-10 degrees C to 70 degrees C
Power	
Input Voltage	10 to 18 VDC
Power Consumption	
Pd-TX-100	Fully Operational ~ 6.5 W, Sleep Mode < 0.5 W
Pd-TX-250	Fully Operational ~ 10 W, Sleep Mode < 0.5 W
Control	
PC Control Interface	RS-232.
Memory	Ten user-programmable configurations
Video Encoding	
Compression Standard	MPEG-2 with non-DVB modes
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
System Latency	End to end delay of 43 milliseconds

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 6KHz, +/- 0.25dB
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
Data	
Baud Rate	Up to 115 kbaud
Connector	LEMO
Scrambling	
Scrambling type	Fixed key scrambling system Algorithms offered include AES.
COFDM RF output	
Output Frequency	Band Dependent
Occupied Bandwidth	2.44 MHz
Power	100 mW or 250 mW
Connector	SMA
COFDM Standard	Proprietary, 2.5 MHz channel spacing, OFDM bandwidth of 2.44 MHz with 400 carriers.

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 microphones, batteries, antennas, crystals or material ordinarily susceptible to field damage or any accessories of a disposable nature. 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.

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