1/4 Watt Video Transmitter
Operator Guide

VBS-250 Frequency 2400-2500MHz

VBL-250 Frequency 1700-1850MHz

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:

Tel: 603-880-4411
Fax: 603-880-6965
Website: www.dtccom.com
Email: info@dtccom.com

486 Amherst Street
Nashua, New Hampshire 03063
USA

Copyright Notice

Disclaimer

The information in the document is subject to change without notice. DTC makes no representations or warranties with respect to the contents hereof, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. DTC reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of DTC to notify any person of such revision or changes.

Trademarks

Trademarks of DTC Communications, Inc. include:

- DTC
- 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 using the 2450 to 2483.5 MHz band.

You will need to provide:

- Form 600 (the application 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.

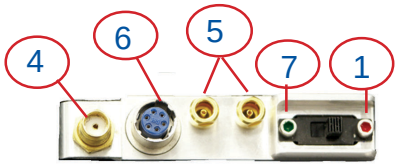
WARNING Calls out situations in which equipment could be damaged or a process could be incorrectly implemented, but in which operator safety is not a factor.

TIP Describes application hints.

RF EXPOSURE STATEMENT

In bodyworn deployments, when installed as directed, this equipment complies with the FCC radiation exposure limits set forth for an Occupational/Controlled environment. Only antennas specifically designed and tested by DTC for on-body applications should be used.
In General Population/Uncontrolled environments, proper spacing must be maintained between the radiating surface of the antenna and any person's body. In the case of a simple dipole antenna with (2.1 dBi gain), a minimum spacing of 2.5" must be maintained. In the case of gain antennas up to (17dBi), a minimum spacing of 12.5" must be maintained.

VBS/VBL-250 Video Transmitter



1 Make sure that the ON/OFF switch is set to OFF. **(Red** dot is OFF)**.**

2 Install 4 “AA” batteries in the internal battery compartment of the module. (Lithium batteries are recommended)

☑ Note: The module is power efficient, enabling 3 hours of operation.

3 Using a screwdriver, turn the channel selector to the correct transmission channel number.

4 Connect an antenna to the ANTENNA connector on the module.

5 Connect the microphone or microphones to the MIC-1 and MIC-2 connectors on the module.

6 Connect a video source to the Video/Multi I/O connector.

7 Slide the power switch to the ON position (**Green** dot is ON) to apply power to the transmitter.

☑ Note: While installing the batteries, observe proper polarity as printed in the battery compartment. Reverse polarity protection is a built-in design feature of the transmitter. If a battery is installed backwards, this feature prevents the transmitter from powering up, without damaging the transmitter or battery.

Warning: Do not apply power to the transmitter until an antenna has been connected in step 4.

What should you expect to receive with your 250mW Transmitter?

1 VBS/VBL Video Transmitter
1 Dipole antenna with right angle SMA connector
1 One Video and Power In "Y" cable
1 DTC programming software and cable

☑ NOTE: The dipole antenna included is not recommended for normal use! This antenna enables you to quickly set up your transmitter and ensure proper operation. DTC highly recommends the use of circularly polarized antennas for the best rejection of multi-path.

☑ NOTE: DTC has provided you with a "Y" cable (power and video) terminated with a BNC connector for your convenience.

The VBS and VBL transmitters are small module transmitters designed for both on and off body applications. They are part of a family of video transmitters from DTC that provide 250mW, 2 Watts and 5 Watts output power.

Feature	Description
Programmable	User programmable video channels, selectable in 250kHz steps. Two user programmable audio sub carriers, selectable in 10kHz steps from 6 MHz to 7.5MHz. • Audio sub carriers are OFF unless microphones are attached. The transmitter automatically senses when a microphone has been attached. • The audio sub carriers are phase locked, and will not drift into the video signal. • Automatic Gain Control is provided on each audio input, amplifying soft sounds.
Efficient Switching Power Supply	• They generate far less heat than a traditional video transmitters. • They operate significantly longer than traditional video transmitters on the same power source.

FEATURES

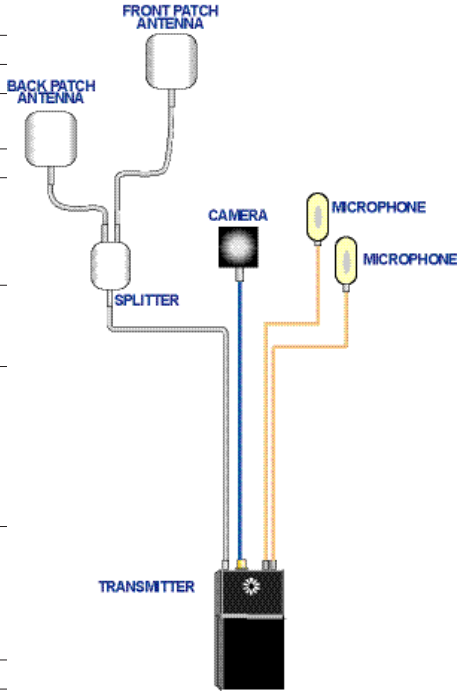
Feature	Description
Remote Switching Capability	• You may turn the device ON or OFF, remotely, by attaching a switch to one of the pins on the Multi I/O connector. DTC provides hard-wired and wireless switches for this application.
External Power Loop Through	• The power applied to the Multi I/O pin is automatically looped through the unit, and available on a second pin to power a remote device, such as a camera. If you apply 9 Volts in, you will get 9 Volts out.  WARNING:Make sure your camera will operate on the voltage being supplied to the transmitter.
Encryption Option	• The VBL/S series supports Ovation Micro ViewLock II encryption, which adds approximately .35” to the width of the unit.

Specifications for the Module (VBS/VBL-250)

Power Supply	Internal batteries 4 “AA”lithium batteries or external 9-16Vdc.
Power Consumption	2.5 Watts (not including camera)
Battery life	3 hours
Reverse polarity protection	yes
Dimensions	2.5x4.5x0.675”
Camera Power	**Using external power input:** Same as supply voltage, switched (200mA max) **Using internal batteries:** 5Vdc@175mA,switched (internal regulator)
Controls	10 channel select rotary switch Panel mounted, slide ON/OFF switch VMx -2000 2 Watt Unit only
Connectors	**2 pin Lemo:** Mic 1 **2 pin Lemo:** Mic 2 **SMA:** Antenna **6 pin Multi I/O:** Video in, Data in, DC input 9-16Vdc, camera power, Remote ON/OFF, Multiplexed Data out, Ground
Programmability	**Video:** 2400-2500MHz (VBS-250) 1700-1850MHz (VBL-250) 250KHz resolution steps **Audio:** User programmable from 6.0-7.5 MHz, in 10kHz steps
Chassis notes	Machined solid aluminum with rounded edges.

Audio	
General	Mic level input (line level factory opt.) 50-3000Hz Phased locked with AGC on both inputs. Sub-carrier auto sensing, only active when microphone is attached.
Number of sub-carriers	2
Sub-carriers frequencies	6.0-7.5MHz , user programmable

SPECIFICATIONS



SPECIFICATIONS

Sub-carrier ON/OFF control	Subcarriers are activated when mic is connected.
Subcarrier frequency stability	+/- 0.003%, -30 to +70°C
Sub-Carrier Deviation	50kHz peak
Audio S/N	45dB min.
Frequency Response	$BW_{1.5dB}$ = 50-3000Hz
Total Harmonic Distortion	<2%
Input Level	8 mVpp@400Hz for 50 kHz peak dev.
Pre-Emphasis	75uS
Input Impedance	10k Ohm

Video

Video Frequency Response	$BW_{1.5dB}$ = 6 Hz - 5.0 MHz
Input Input Impedance	75 Ohms
Input Level	$1V_{p-p}$ Max.
S/N	60 dB min.
Pre-Emphasis	Per CCIR 405 525 line curve
Differential Gain	5%

RF

Operating Frequency	1700-1850MHz, 250KHz resolution steps 2400-2500MHz, 250KHz resolution steps
Power output	250 mW min. @ nominal supply voltage, 25 Deg. C. -3dB @ 3.6Vdc int -2 dB over temp.
Output Impedance	50 Ohms
Spurs and Harmonics output	-50 dBc
Load Pull Stability	8:1 VSWR

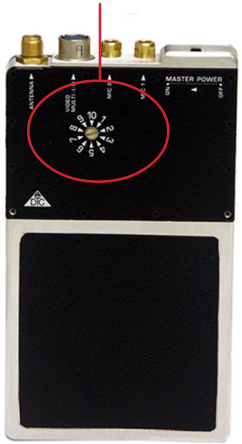
Frequency Stability	+/- 0.003%, -30 to +50°C
Modulation Sensitivity	8MHz/V nom.
Modulation Sensitivity Variation	+/- 5% across the band
Peak Carrier Deviation	4 MHz nom.
Number of channels	10 max. (user programmable)
Sub-carrier sideband level	-28dBc, +/- 2dB
Environmental Temperature Range	-30 - +70°C
Humidity	90% (non-condensing)

Battery Drain

Battery Type	With Camera	Without Camera
lithium	3 Hours Min.	5 Hours Min.
Alkaline	Not Recommended	3 Hours Min.

CONNECTIONS

Channel Select Switch



CHANNEL SELECT SWITCH

Select a transmission channel by using the rotary switch located on the front surface of the transmitter. Use a screwdriver to rotate the switch to the desired channel number.

MATING CONNECTORS

Lemo Male Part# (FFS.01.250.DLAE31)
DTC Male Part # (8570003)

Hirose Part# HR10A-7P-6P (02)
DTC Part # 954020

Standard Male SMA connector

ANTENNAS

A standard SMA connector is used as the antenna connector on both the VBS/VBL-250. Refer to a list of DTC antennas available on page 21.

TIP You may use the VBS/VBL series transmitters with other manufacturers antennas. Verify that they are suited for the band you are operating in.

Antenna Connector

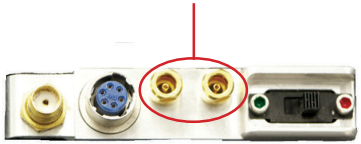
On/OFF Switch

CHASSIS MOUNTED POWER ON/OFF SWITCH

A slide switch is provided for local control of power ON and OFF. **Green** dot is ON, **Red** dot is OFF.

NOTE: REMOTE ON overrides the chassis mounted ON/OFF switch. (i.e. When the chassis mounted power switch is set to OFF, REMOTE ON can be used to turn the transmitter ON.)

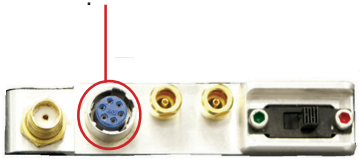
Microphone Connectors



MICROPHONE CONNECTORS

Two connectors accommodate two microphone inputs. Each connector has two contacts and provides power to the microphone as well as connecting the audio signal into the transmitter. The audio sub-carriers are activated by the presence of the microphone. If a microphone is removed, that sub-carrier is removed from the transmit signal. Turning off the unused sub-carrier saves power and may improve picture quality.

Multi I/O Connector

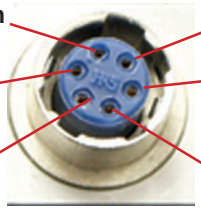


MULTI I/O CONNECTOR

The multi I/O (6-pin Multi I/O) connector is mainly used as the video and external power input connector. It also provides access to many transmitter functions, such as:

- Programming the device
- Video in
- Power in
- Remote on
- Camera power

USING THE MULTI I/O CONNECTION FOR DIFFERENT EQUIPMENT CONFIGURATIONS



Pin 6: Video in

Pin 5: RS-232 in

Pin 4: Remote On, switched to ground multiplexed RS-232 out

NOTE: Remote On overrides the chassis mounted ON/OFF switch.

Pin 1: Ground

Pin 2: Ext power input 9-16VDC

Pin 3: Camera Power Output

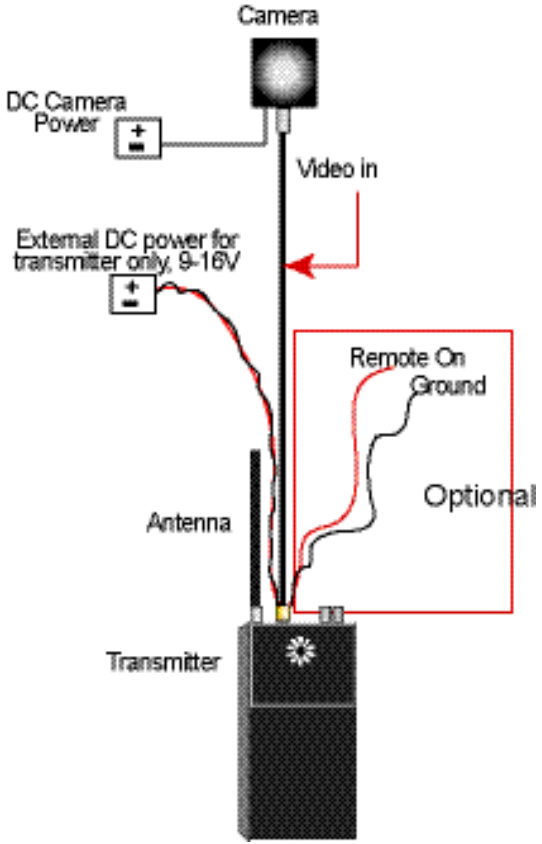
NOTE: Same as supply voltage. Do not exceed 200mA.

Video In, External DC for Transmitter, External DC for Camera and optional Remote On

NOTE: You will need external camera power if voltage to the transmitter is not compatible with your camera's operating voltage, and/or you need greater battery life, and/or your camera draws more than 200mA.

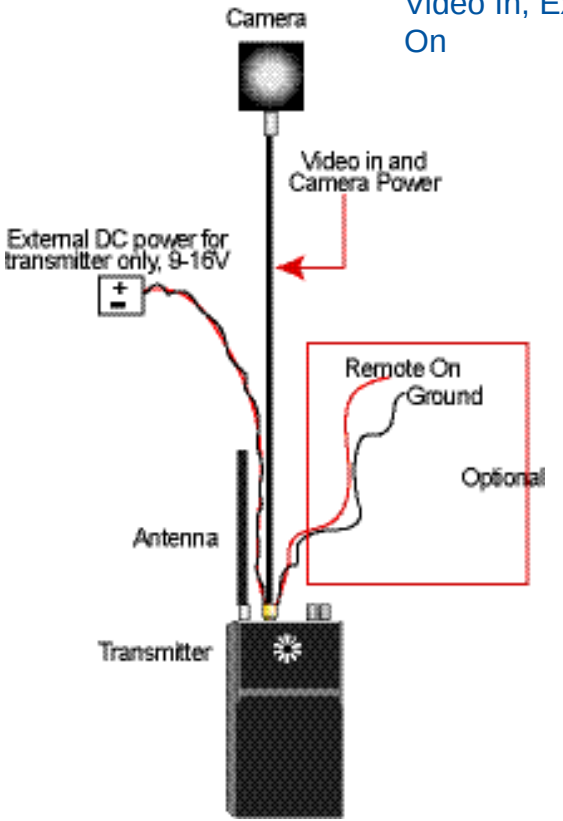
This equipment configuration shows the video signal coming in, and an external DC Power source for the transmitter only at 9-16V. It is also configured with a seperate DC power source for the camera.The "remote on" function is accomplished by connecting the remote on to ground (optional feature).

USING A SEPARATE CAMERA POWER SOURCE



USING LOOP THROUGH, SINGLE POWER SOURCE, FOR TRANSMITTER AND CAMERA

Video In, External DC, Camera Power, and optional Remote On



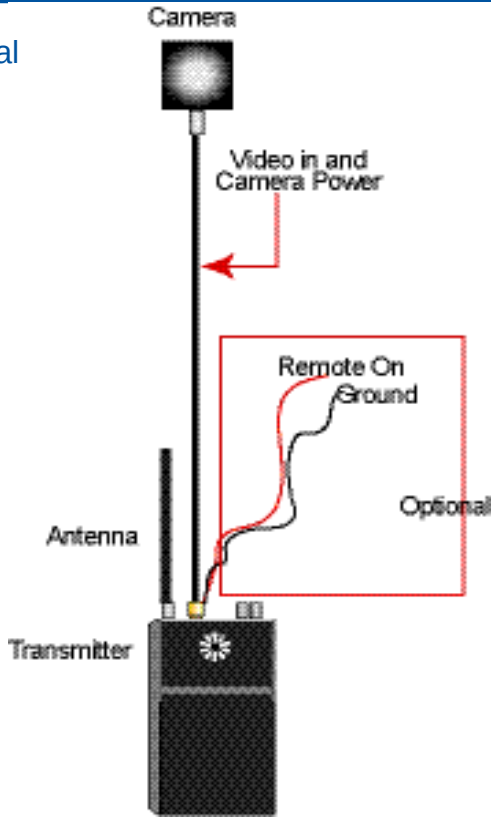
☑ NOTE: You will need external camera power if voltage to the transmitter is not compatible with camera's operating voltage, and/or you need greater battery life, and/or your camera draws more than 200mA.

This equipment configuration shows the video signal coming in, and an external DC Power source for the transmitter and camera at 9-16V. The power source for the camera is an internal loop. The "Remote On" function is accomplished by connecting the Remote On to ground.

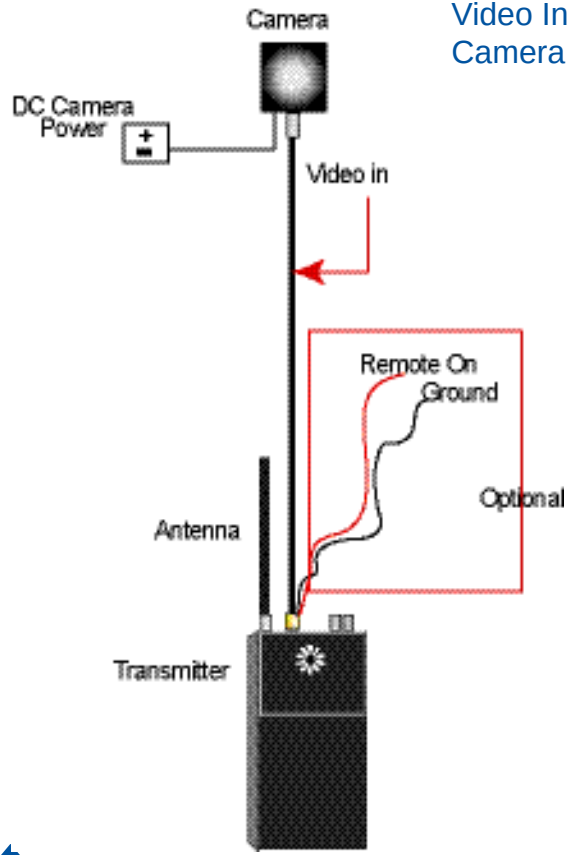
USING LOOP THROUGH, BATTERY POWER SOURCE, FOR TRANSMITTER AND CAMERA

Video In, Internal Battery Power, Camera Power, and optional Remote On

This equipment configuration shows the video signal coming in, with an internal battery power source loop which powers the camera and the transmitter. The “Remote On” function is accomplished by connecting the Remote On to ground.



USING A SEPARATE CAMERA POWER SOURCE



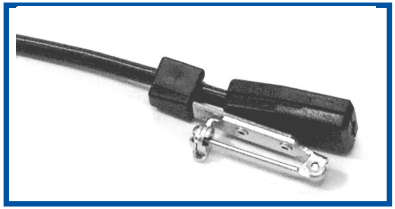
Video In, Battery Powered Transmitter, External Power for Camera only and Remote On

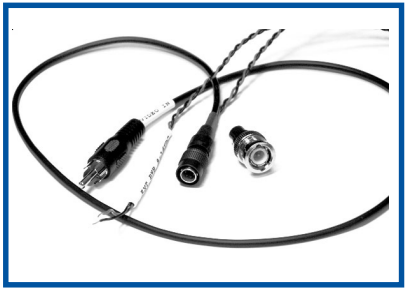
NOTE: You will need external camera power if voltage to the transmitter is not compatible with camera's operating voltage, and/or you need greater battery life, and/or your camera draws more than 200mA.

This equipment configuration uses internal battery power for the transmitter and an external power source for the camera. The video signal comes into the transmitter. The "Remote On" function is accomplished by connecting the "Remote On" to ground.

List of Optional Accessories

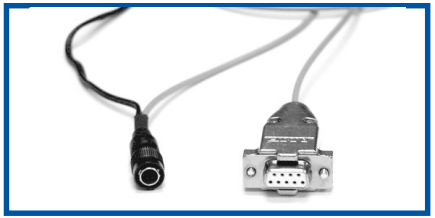
Part Number	Description
7011145-012	Microphone, 12” length
7011145-024	Microphone, 24” length
7011145-036	Microphone, 36” length
7011145-048	Microphone, 48” length
7011145-072	Microphone, 6’ length
7011145-144	Microphone 12’ length
4045170-024	Video In cable, Mullti-I/O to RCA(M) with RCA/BNC adaptor, 24” standard
4045171-024	Video In/EXT Power cable, 24”standard **Video In:** Multi I/O to RCA(M) with BNC adaptor Ext. Power: 24 AWG wire stripped and tinned leads.

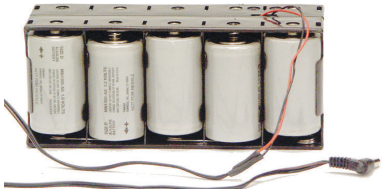




NOTE: To order a custom cable length, change the-xxx in the part number to reflect the dimension in inches.

List of Optional Accessories



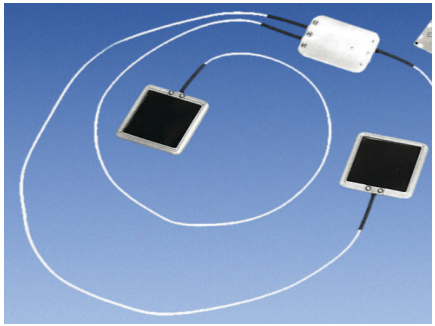


Part Number	Description
4045173	Programming cable (Connects from the Multi I/O connector to the DB9 connec tor)
4045174-006	Antenna cable, SMA to TNC, 6”standard length
	D cell battery pack

NOTE: To order a custom cable length, change the -xxx in the part number to reflect the dimension in inches.

List of Optional Accessories

Part Number	Description
VW-ANT-2-SMA	VidiWire antenna system 2.4-2.5 GHz
VW-ANT-1-SMA	VidiWire antenna system 1.7-1.9 GHz

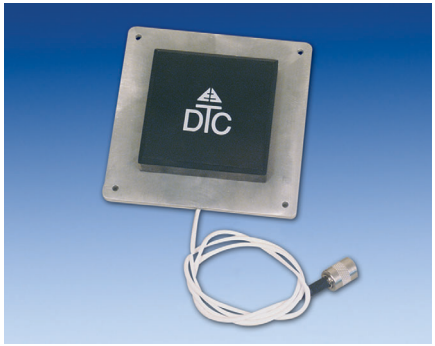


The VidiWire™ antenna system was specifically designed for video transmission from on-body transmitters. This DTC Proprietary system provides the best possible omnidirectional video transmission from a body-worn system. The system is composed of three parts: two special patch-type antennas, and a phasing module. When used in conjunction with a DynaPix™ diversity receiver system, the best possible performance will be obtained.

WARNING: VidiWire Antennas are housed in a milled aluminum cover which shields the wearer from RF energy. Make sure the antennas radiating side is directed away from the body.

WARNING: Do not use the VidiWire antenna system on the body with any transmitter outputting more than 250mW of RF energy.

ANT-5-PIG	5 dBi Patch Antenna Connector: SMA or TNC Male on 18" coax. “pigtail”.



DTC has developed a series of circularly polarized patch antennas for use in the 2.0 to 2.5 GHz indoor and short-term outdoor installations. The ANT-5-P is a 5dbi gain, 90 degree wide beamwidth, antenna, mounted on a 0.125 in. thick aluminum plate. Typical uses include disguised transmitters (i.e. tissue box), and vehicular-mounted transmitter antennas and in a variety of receive applications.

ANTENNAS

List of Optional Accessories

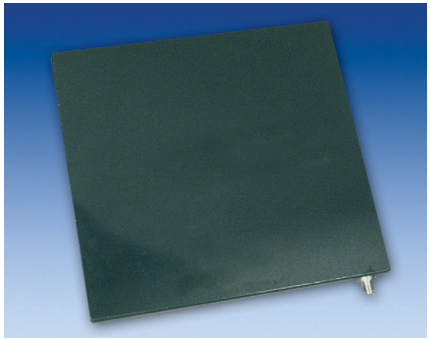
Part Number	Description
ANT-VIL	Dipole Antenna 1.70-1.85 GHz with right angle SMA adaptor
ANT-VIS	Dipole Antenna 2.4-2.5 GHz with right angle SMA adaptor

The ANT-VIL/S is a 1/2 wave coaxial dipole portable duck antenna. It can be mounted directly to the video transmitter, or at a right angle using the adaptor provided.

7011129	ANT-2 2dB: Dipole 1.7-1.85GHz *Must be used with SMA to TNC antenna cable (4045174-006).
7011131	ANT-2 2dB: Dipole 2.4-2.5 GHz*Must be used with SMA to TNC antenna cable (4045174-006).

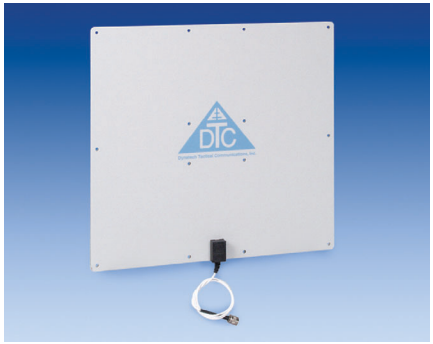
ANT-2 is a rugged, lightweight linearly polarized dipole for use in the 2.4 to 2.5 GHz and 1.7-1.85 GHz bands. It can be mounted at the end of a cable with a compatible connector. This antenna is ground plane independent.

Part Number	Description
ANT-109	dBic Wideband Panel Connector: TNC Female



DTC has developed a series of circularly polarized panel antennas for use in wideband transmit and receive applications from 1.7 to 2.7 GHz.
The ANT-10-R is a very wide bandwidth, unidirectional log-spiral array. This antenna has useful gain, with some sidelobe variation, to 4 GHz.
It can be mounted to a wall or swivel mounted with the MAF-1 grip on two surfaces, via two pairs of “1¦4-20” tapped holes located in the rear center and the bottom center of the aluminum housing. The front of the
antenna is a radome made of a polycarbonate material. The antenna is suitable for indoor and short-term outdoor use. It must be protected for extended outdoor use and installations since it is not waterproof.

ANT-17-R	17 dBic Directional Patch Array Connector: TNC Male on 18" coax. “pigtail”



DTC developed this very high gain RHCP antenna for the 2.4 to 2.5 GHz band. It provides unidirectional broadside coverage. Unlike conventional Yagi antennas, this antenna is especially suitable for wall mounting. This panel antenna is useful in long-range receive applications, applications in high, multi-path environments, where it is impractical or impossible to mount a dish antenna.

Introduction

DTC has built in a lot of flexibility in the programming options you have on the VBL and VBS series transmitters. You can choose to use some, all or none of this flexibility.

When you order a VBL or VBS transmitter, DTC will factory program your frequencies at no additional charge to you. You may want to place a sticker over the rotary switch on the chassis, so users in the field don't attempt to change frequencies. This is often the best path for state and local agencies with limited frequencies available to them.

DTC will also provide you with free software and a free programming cable, enabling you to change your video frequencies and their associated audio sub-carriers. This ideal if you often work with other agencies, or anticipate the equipment being used by a multi-jurisdictional task force. You can program up to ten channel settings per unit. In general, this allows you to program most variations you might encounter in the field at the depot level.

As a practical matter, your VBL or VBS transmitter's video frequencies and audio sub-carriers will be dictated by the frequency and sub-carriers(s) of your receiver and/or repeater. In many cases, these devices are crystal controlled or have few channel options.

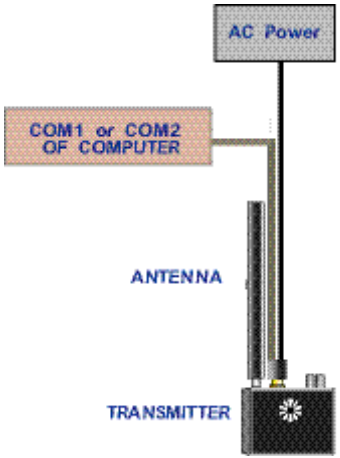
TIP: Make sure that you program your transmitter to match the frequencies and audio sub-carriers or your receiver, and test the components as a system prior to going into the field!

Installing DTC Universal Programming Software on your PC

NOTE: Uninstall any previous versions by going to Add/Remove Programs, clicking on DTC Universal Programming, and clicking on uninstall.

1. Click on Start, click on run.
2. Click on the Browse button.
3. Click on or find your CD drive.
4. Install the JAVA Runtime Environment Application first (CD provided).
5. Follow the install wizard screens.
6. Install the Universal Programming software next (floppy provided).
7. Click on Start, click on run.
8. Click on the Browse Button.
9. Click on your floppy drive.
10. Double click on the setup.
11. Follow the install wizard screens.
12. Your programming software is installed.

Programming



1. Make sure the video transmitter ON/OFF. The red dot is OFF.
2. Make sure the transmitter has an antenna installed into the antenna connector prior to programming.
3. Install the programming cable into the Multi I/O connector on the transmitter
4. Connect the programming cable into a power source.
5. Plug the serial cable of the programming cable into the COM1 or COM2 port of your computer and turn the transmitter switch to ON. The green dot is ON.
6. Select Start, programs, DTC communications on your computer.
7. The system allows you to select device COM1 or COM2, depending on which serial port you are connected to.
8. Follow the instructions on the DTC Universal Programming screens to begin the download process.
9. The frequency settings that are currently in your transmitter are downloaded to your computer.
10. Click on the “Tx Channel” tab in the programmer screen.
11. Select a channel and click on the Edit Channel button to change settings.
12. Enter your new frequency and settings.
13. To change any of the MIC-2 or MIC-1 settings, click on the settings provided, then click OK.
14. Click on the Upload button to upload your new settings to the transmitter.

Your new settings have been installed.

486 Amherst Street • Nashua, New Hampshire 03063 • 603-880-4411 www.dtccom.com