2 Watt
Video Transmitter
Operator Manual

VMS-2000 Frequency 2450-2500 MHz

DTC COMMUNICATIONS INCORPORATED

OP1920147 Rev B

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
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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

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
This product is NOT to be used in a bodyworn application. Refer to Appendix A in this manual for instruction in the proper use of antennas with this device. When in use a separation distance of at least 50 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.

FCC ID# H25VMS2000

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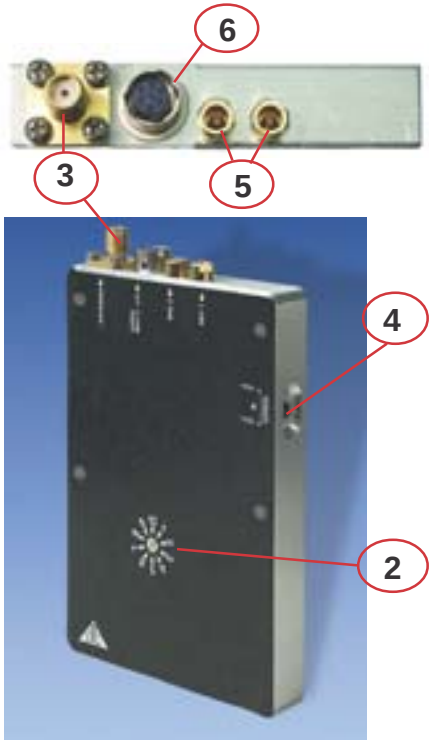
What should you expect to receive with your 2W Transmitter?

1 VMS Video Transmitter
1 Dipole antenna with right angle SMA connector
1 DTC programming software package
1 DTC programming cable
1 One Video and Power In “Y” cable

QUICK START



1 Make sure that the power to the transmitter is OFF.
2 Using a screwdriver, turn the channel selector to the correct channel number.
3 Connect an antenna to the ANTENNA connector on the module.
4 Select Hi or Lo Power using the recessed switch.
5 Connect the microphone or microphones to the MIC-1 and MIC-2 connectors on the module.
6 Connect a video source and external power (11 -16 VDC) to the Video/Multi-I/O connector.
7 Apply power to the transmitter

Warning: Do not apply power to the transmitter until an antenna has been connected in step 3.

Warning: Refer to **Appendix A** of this manual for information on the proper use of antennas.

NOTE: DTC has provided you with a “Y” cable (power and video) terminated with an RCA connector and a BNC adapter for your convenience.

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.

OVERVIEW

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

Feature	Description
Programmable	User programmable video channels, selectable in 250 kHz steps. Two user programmable audio sub carriers, selectable in 10 kHz steps from 6 MHz to 7.5 MHz.
Audio Sub-Carriers	Audio sub carriers are OFF unless microphones are connected. The transmitter automatically senses when a microphone has been connected. 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 traditional video transmitters. They operate significantly longer than traditional video transmitters on the same power source.
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, with a maximum current drain of 200mA
Encryption Options	The VMS series supports Ovation Micro ViewLock II™ encryption, which adds approximately .35" to the thickness of the unit.

SPECIFICATIONS

General Specifications

ITEM	SPECIFICATION
Power Input Voltage	External 11-16 Vdc
Power Consumption	7.2 Watts (not including camera)
Reverse Polarity Protection	YES
Dimensions	3.9 x 2.7 x 0.512”
Camera Power	Same as supply voltage going into the transmitter. Current limited to 200 mA.
Controls	10 channel select rotary switch Panel mounted, recessed slide power selection switch
Connectors	2 pin Lemo: Mic 1 2 pin Lemo: Mic 2 SMA: Antenna 6 pin Multi I/O: Video in, Data in, DC input 11-16 Vdc, camera power, Remote ON/OFF, Multiplexed Data out, Ground
Programmability	Video: 2450-2500 MHz (VMS-2000) 250 KHz resolution steps Audio: User programmable from 6.0-7.5 MHz, in 10 kHz steps
Chassis notes	Machined, solid aluminum with rounded edges

RF Specifications

ITEM	SPECIFICATION
Operating Frequency	2450-2500 MHz, 250 KHz resolution steps
Power output	2000 mW min. @ nominal supply voltage, 25 Deg. C. -3db @ 7VDC ext. -2 dB over temp. 2.5W maximum
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	8 MHz/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	-28 dBc, +/- 2 dB
Environmental Temperature Range	-30-+70°C
Humidity	90% (non-condensing)

SPECIFICATIONS

Audio Specifications

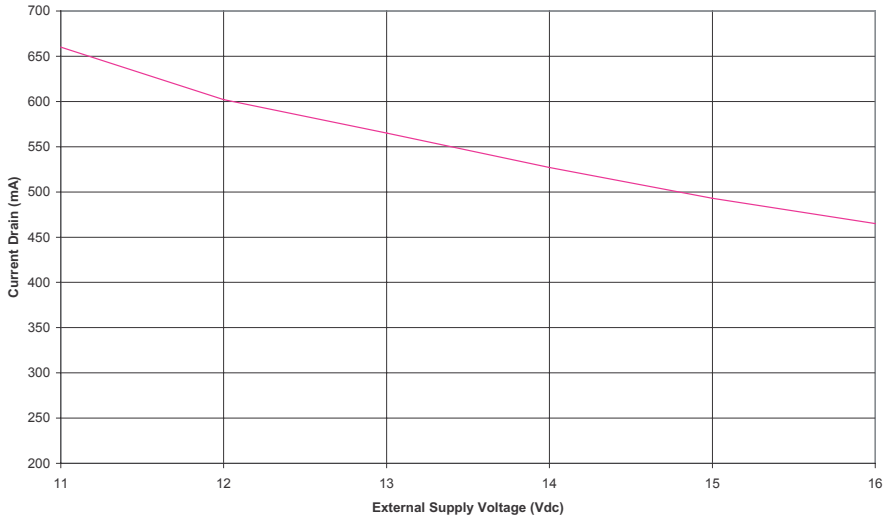
ITEM	SPECIFICATION
General	Mic level input (line level factory opt.) 50-3000 Hz Phased locked AGC on both inputs. Sub-carrier auto sensing, only active when microphone is attached.
Number of sub-carriers	2
Sub-carrier frequencies	6.0-7.5 MHz , user programmable
Sub-carrier ON/OFF Control	Subcarriers are activated when mic is connected.
Subcarrier Frequency Stability	+/- 0.003%, -30 to +70°C
Sub-Carrier Deviation	50 kHz peak
Audio S/N	45 dB min.
Frequency Response	BW1.5dB = 50-3000 Hz
Total Harmonic Distortion	<2%
Input Level	8 mVpp@400 Hz for 50 kHz peak dev.
Pre-Emphasis	75 uS
Input Impedance	10k Ohm

Video Specifications

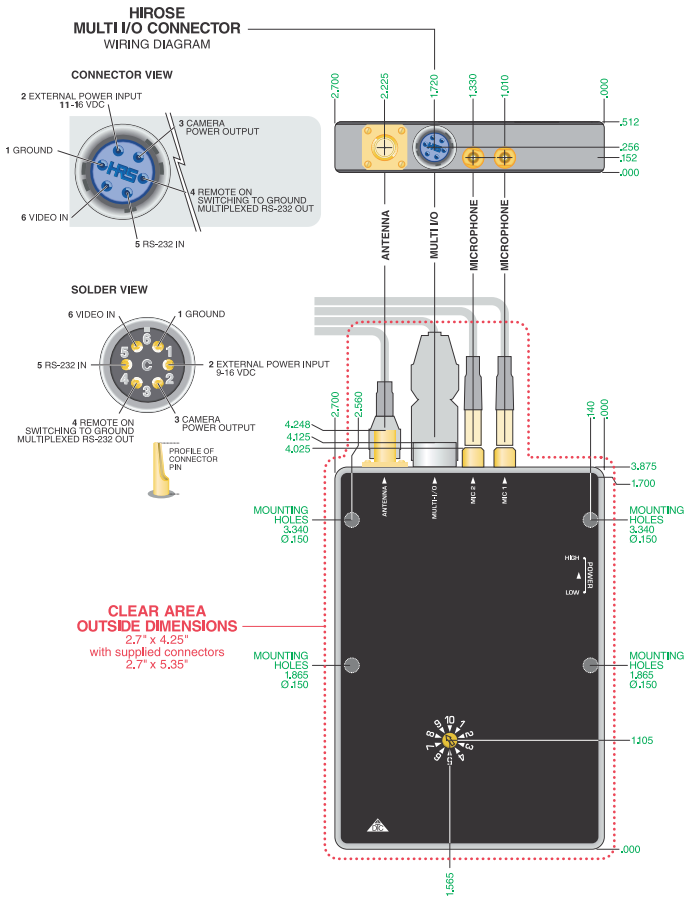
ITEM	SPECIFICATION
Video Frequency Response	BW1.5dB = 6 Hz - 5.0 MHz
Input Impedance	75 Ohms
Input Level	1Vp-p M
S/N	60 dB min.
Pre-Emphasis	Per CCIR 405 525 line curve
Differential Gain	5%

SPECIFICATIONS

Approximate VMS-2000 Current vs. External Supply Voltage
(Camera NOT included)



Battery Type	Part Number	Transmitter Only	Transmitter and Camera 12V @120mA
10 D-Cell Alkaline Pack	4045177	9.5 hours	8 hours

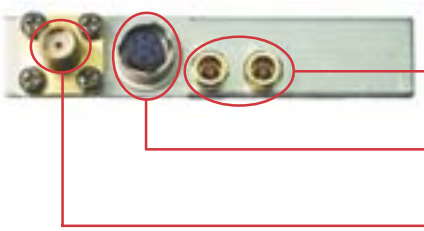


HEATSINK INFORMATION

Baseplate operating temperature is -20° to + 80°C. Most applications will not require a heatsink. In applications where the baseplate temperature will exceed +80°, add “-HO” to any VMXX-2000 transmitter part number for the optional heat sink at no additional charge. The drawing on the left clearly marks the mounting holes for the heatsink installation when required. To install the heatsink.

1. Align the mounting holes of the transmitter to the mounting holes on the heatsink.
2. Secure the heatsink with four (4) 6-32 x 1” screws.

CONNECTORS



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

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 improves picture quality.

ANTENNAS

A standard SMA connector is used as the antenna connector on the VMS-2000. Refer to a list of DTC antennas available on page 17.

WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.

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

CONNECTIONS

CHANNEL SELECT SWITCH

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

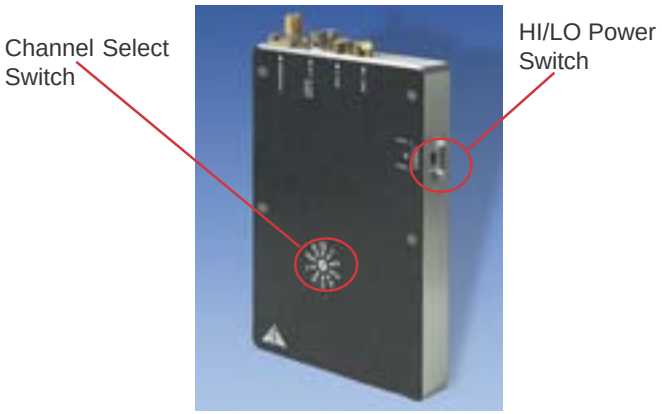
HI/LOW OUTPUT POWER SWITCH

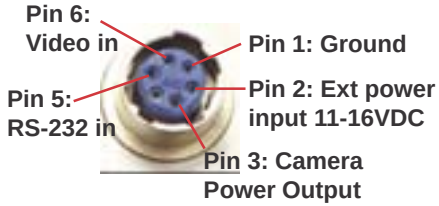
Select Hi or Low power by using the recessed power switch. Switching to Hi power
is equal to 2 Watt output power. Switching to Low power is equal to 1/4 Watt output power.

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:

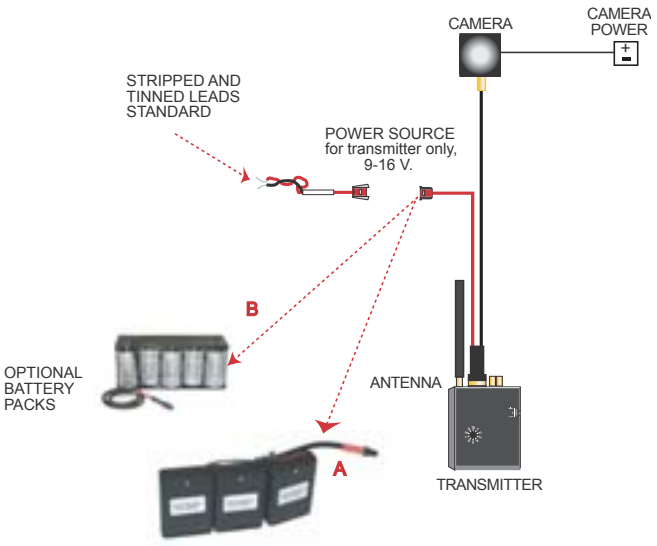
- Programming the device
- Video in
- Power in
- Remote on
- Camera power





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

BASIC VIDEO TRANSMITTER



The basic VMS-2000 configuration consists of the video transmitter, dipole antenna, and DTC cable part number **4045171-024.** This cable is connected to the multi I/O port of the transmitter.
It is configured to supply:

- The video signal to the transmitter from the camera.
- Power to the transmitter through a molex connector that can easily be connected to DTC's battery packs. It also comes standard with stripped and tinned leads for a customer suppled power source. A few of the DTC battery packs are listed below and shown in the illustration:

A 4045130 (AA Rechargeable)

B 4045177 (D-Cell battery pack) Alkaline

The cable does not supply power to the camera. The camera is powered separately with a customer supplied power source. DTC offers other cables that will supply power to the camera as an option.

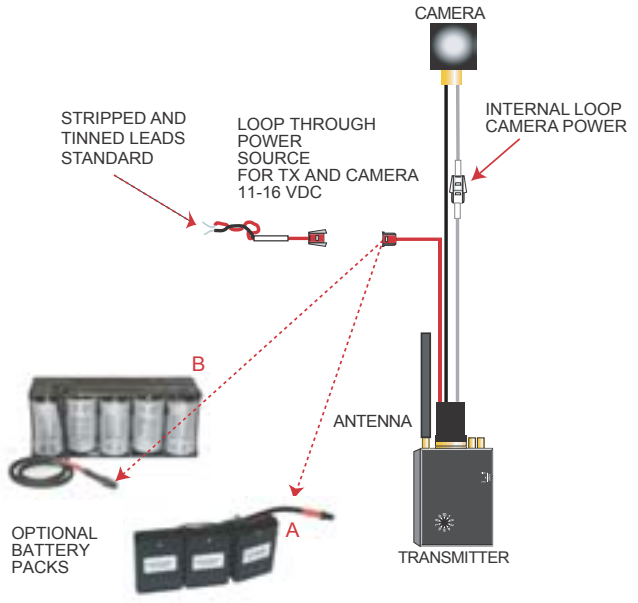
SINGLE POWER SOURCE

The VMS-2000 configuration, which uses the loop through power source for the camera, consists of the video transmitter, dipole antenna, and DTC cable part number **405189-024 .** This cable is connected to the multi I/O port of the transmitter.

It is configured to supply:

- The video signal to the transmitter from the camera.
- Power to the transmitter through a molex connector that can be easily connected to DTC's battery packs.
- Power to the camera through a molex connector that can easily be connected to DTC's optional cameras.

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 200 mA.



COMPONENTS

Part Number	Description
4045171-024	Video In/EXT Power/Cam. Power cable, 24"standard.

Specifications

Video In:	Multi I/O to RCA(M) with BNC adaptor (YELLOW)
Ext. Power:	24 AWG wire with a molex connector and stripped and tinned leads. (RED)

Part Number	Description
4045189-024	Video In/EXT Power/Cam. Power cable, 24"standard.

Specifications

Video In:	Multi I/O to RCA(M) with BNC adaptor (YELLOW)
Ext. Power:	24 AWG wire with a molex connector and stripped and tinned leads. (RED)
Camera Power:	24 AWG wire with a molex connector and stripped and tinned leads. (GRAY)

Part Number	Description
4045174-006	Antenna Cable 6" standard
4045174-012	Antenna Cable 12" Option

Specifications

Connectors	SMA to TNC

COMPONENTS

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
7011145-360	Microphone 30’ length

Part Number	Description
4045177	D cell battery pack with locking Molex Micro-fit Connector

Part Number	Description
4045173	Programming cable

(Connects from the Multi I/O connector to the DB9 connector) This cable plugs into COM1 or COM2, serial ports of a PC. It allows for the programming of the Video transmitter with the DTC Programming software.

COMPONENTS

TO CLOSE:
PUSH CONNECTORS TOGETHER UNTIL THE MOLEX LOCKING MECHANISM CLICKS AND LOCKS

TO OPEN:
PUSH THIS TAB DOWN TO RELEASE THE MOLEX LOCKING MECHANISM, THEN PULL CONNECTORS APART.

Part Number	Description
4045130	AA (13.5 V) Rechargeable battery pack (NiMH) with Molex Micro-fit Connector

Part Number	Description
8590138	Terminal, Crimp, Female, micro-fit (3.0) wire size 20-24 AWG plt gold. Molex Part # 43030-0009
8550104	Receptacle, 2 circuit, micro-fit (3.0) in line. Molex Part # 43645-0200

Part Number	Description
8590139	Terminal, Crimp, Male, Micro-fit (3.0) wire size 20-24 AWG plt. gold. Molex Part # 43031-0009
8550101	Plug, 2 circuit, Micro-fit (3.0) In line. Molex Part # 43640-0200

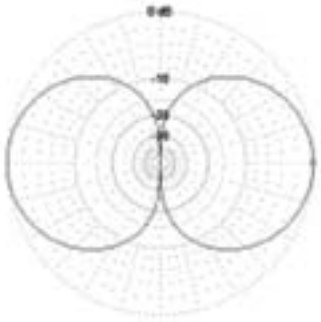
Part Number	Description
ANT-VIL	Dipole Antenna 1.70-1.85 GHz with right angle SMA adaptor
ANT-VIS	Dipole Antenna 2.4-2.5 GHz with right angle SMA adaptor

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.

Part Number	Description
7011129	ANT-2 2dB: Dipole 1.7-1.85 GHz 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.

ANT-2



Specifications

Type	Sleeve Dipole
Polarization	Linear
Peak Gain	2 dBi
Horizontal Beamwidth	Omnidirectional
Vertical Beamwidth	77°
Nominal Impedance	50 Ohms
Groundplane Req.	Not required
Size	4.0" x 0.75" D (101mm x 19 mm)
Weight	1 oz. (28g)

DTC Part Number	Frequency Range
7011129	1.8 to 1.9 GHz
7011130	2.0 to 2.1 GHz
7011131	2.4 to 2.5 GHz

WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.

ANTENNAS

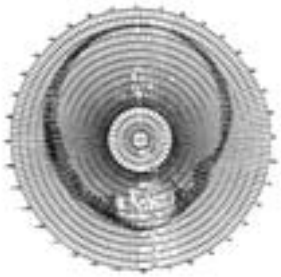
Specifications

Type	Patch antenna with integral ring hybrid
Polarization	RHCP
Peak Gain	5dBic
Horizontal Beamwidth	90°
Vertical Beamwidth	90°
Nominal Impedance	50 Ohms
Groundplane Req.	Built-in
Size	4.0" W x 4.0" H X 0.625" D (102mm x 102mm x 16mm)
Weight	6.4 Oz. (180 g)
DTC Part Number	Frequency Range
ANT-5-P-SMA	2.0 to 2.5 GHz with SMA male connector
ANT-5-P-TNC	2.0 to 2.5 GHz with TNC with male connector

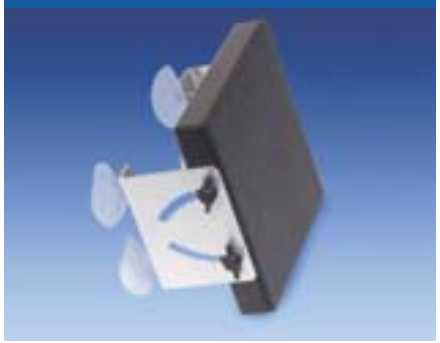
Part Number	Description
ANT-5-PIG	5 dBi Patch Antenna Connector: SMA or TNC Male on 18" coax. "pigtail".

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 and vehicular-mounted transmitter antennas and in a variety of receive applications.

ANT-5P



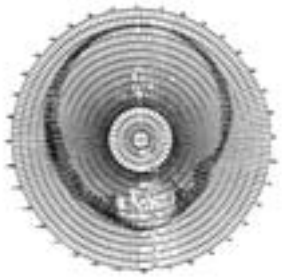
WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.



Part Number	Description
VDAR-1	Single 5 dBic “Hybrid-Patch”™ Antenna with mounting options. Connector: TNC Female on chassis

The VDAR video antennas are designed to operate with traditional single video receivers and multiple antenna configurations for diversity receivers. The antenna uses the DTC Hybrid-Patch™ system to ensure pure circular polarization. This ensures the highest possible performance in video reception, especially in diversity systems. It is available in four different bands. Reversible and adjustable suction cup mounts come standard for quick and easy installation on the inside or outside of window or other hard, smooth surfaces.

VDAR-1



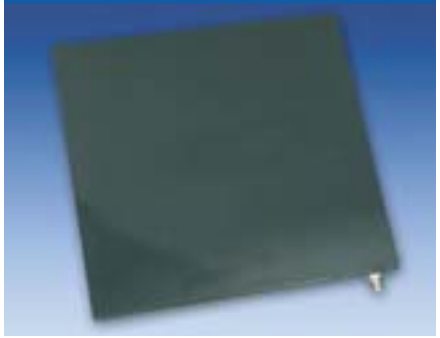
WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.

Specifications

Type	Three Hybrid Patch™ elements
Polarization	RHCP
Peak Gain	5dBic
Horizontal Beamwidth	90°
Vertical Beamwidth	90°
Nominal Impedance	50 Ohms
Groundplane Req.	Built-in
Size	6.6” H x 6.6” W (167mm x 167 mm)
Weight	12 Oz. (34g)

DTC Part Number	Frequency Range
7011156-1	1700 to 1850 MHz
7011156-3	1990 to 2110 MHz
7011156-2	2400 to 2500 MHz
7011156-2	2200 to 2300 MHz

ANTENNAS



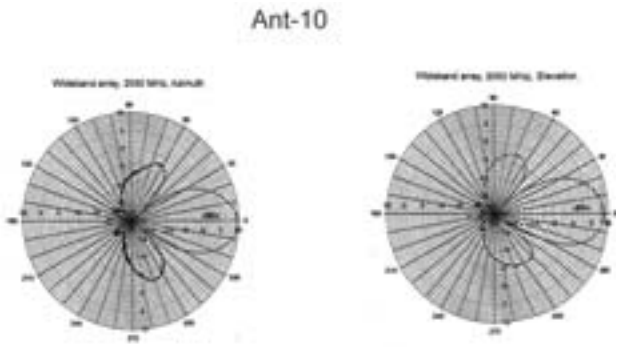
Specifications

Type	Log-spiral slot array, absorber loaded
Polarization	RHCP
Peak Gain	9dBic
Horizontal Beamwidth	30°at 2.0 GHz
Vertical Beamwidth	30°at 2.0 GHz
Nominal Impedance	50 Ohms
Groundplane Req.	Not required
Size	9" W x 9" H x 1.2" D (227mm x 227 mm x 30 mm)
Weight	1.7 lb. (750g)

DTC Part Number	Frequency Range
4044411	1.7 to 2.7 GHz; RHCP
7011142	1.7 to 2.7 GHz; RHCP with MAF - 1 grip included

Part Number	Description
ANT-10	9dBic 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.



WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.

Part Number	Description
QHA-4	Quadrifilar Helix Antenna with Ring-Hybrid feed Connector: TNC Female Must be used with SMA to TNC antenna cable (4045174-006).

The QHA family of antennas was developed to provide a compact solution for pattern-tailored circularly polarized antennas. This rugged antenna is omnidirectional when the antenna is vertical. The pattern is slightly elevated to allow overhead coverage. The base of the antenna includes a special flat with #10-32 threaded hole, 0.25-in. deep for mounting. It is available in both RHCP and LHCP versions.

QHA-4

Specifications

Type	Quadrifilar Helix with Ring-hybrid feed
Polarization	Circular
Peak Gain	4dBiC at 24° above horizon
Horizontal Beamwidth	Omnidirectional
Vertical Beamwidth	46°
Nominal Impedance	50 Ohms
Groundplane req.	Not Required
Size	8.0" L x 1.25" dia (203 mm x 32 mm dia)
Weight	3.7 oz. (105 g)

DTC Part Number	Frequency Range
QHA-4-2-R	2.4 to 2.5 GHz, RHCP
QHA-4-2-L	2.4 to 2.5 GHz, Lhcp
QHA-4-1-R	1.7 to 1.9 GHz, RHCP
QHA-4-1-L	1.7 to 1.9 GHz, LHCP

WARNING: Refer to Appendix A of this manual for information on the proper use of antennas.

ANTENNAS

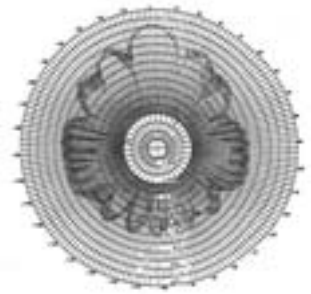
Part Number	Description
ANT-17-R	17 dBic Directional Patch Array Connector TNC Male on 18” coaxial

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 antenna, this antenna is especially suitable for wall mounting. This panel antenna is useful in long-range receive applications, applications in high-multipath environments, where it is impractical or impossible to mount a dish antenna.

Specifications

Type	16-patch array with progressive feed
Polarization	RHCP or LHCP
Peak Gain	17 dBic
Horizontal Beamwidth	16°
Vertical Beamwidth	16°
Nominal Impedance	50 Ohms
Groundplane req.	Not Required
Dimensions	16.0”W x 14.5”H x 0.125”D (406 mm x 368 mm x 3.2 mm)
Weight	47 oz. (1333g)
DTC Part Number	Frequency Range
ANT-17-R	2.4 to 2.5 GHz

Ant-17r



APPENDIX A

Using Antennas with the VMS-2000 Video Transmitter

Any suitable antenna may be used, however to insure safe operation, it is imperative that proper spacing be maintained between the radiating surface of the antenna and any persons body. No antenna should be placed closer than 19 inches (48 cm) to the body. To insure that proper spacing is maintained, locate the transmitter or arrange physical barriers in such away that people are prevented from approaching too closely.

PROGRAMMING

Introduction

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

When you order a VMS 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 is 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 VMS 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!

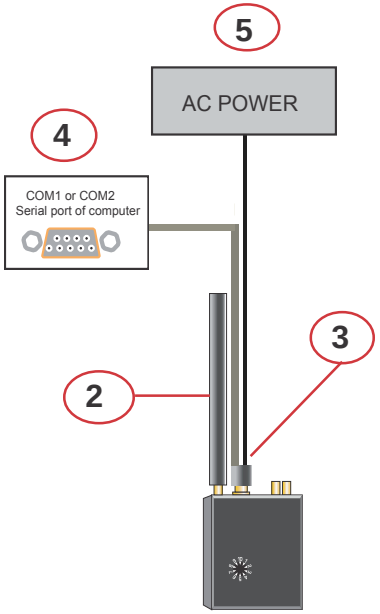
Installing DTC Universal Programming Software on your PC

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

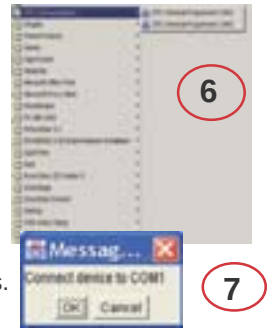
1 Click on Start, click on run.
2 Click on the Browse button.
3 Click on or find your CD drive.
4 Install the JAVA Runtime Environment Application first (CD provided).
5 Follow the install wizard screens.
6 Install the Universal Programming software next (floppy provided).
7 Click on Start, click on 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.

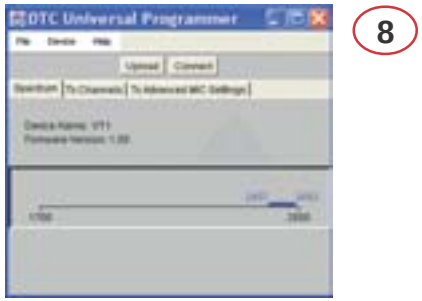
Your programming software is installed

PROGRAMMING



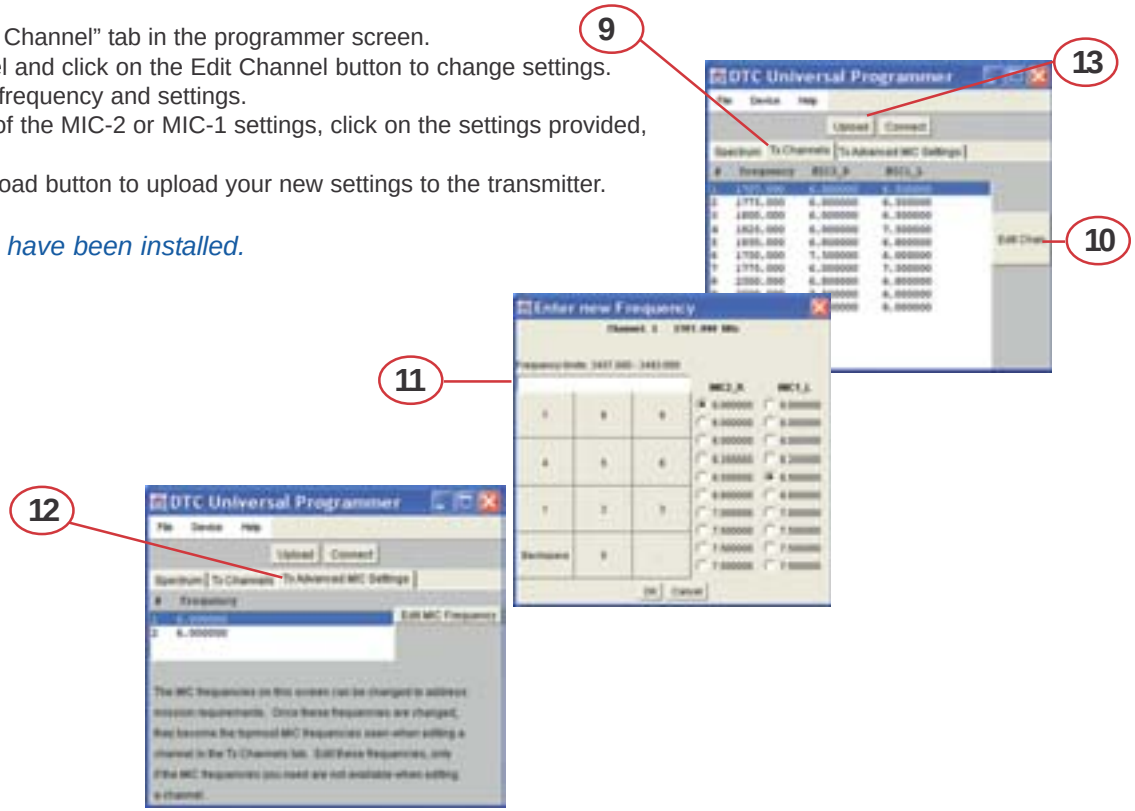
1 Make sure that the power to the video transmitter is off.
2 Make sure the transmitter has an antenna installed into the antenna connector prior to programming.
3 Install the programming cable into the Multi I/O connector on the transmitter.
4 Plug the serial cable of the programming cable into the COM1 or COM2 port of your computer.
5 Connect the programming cable into a power source.
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 Click on the “Tx Channel” tab in the programmer screen.
10 Select a channel and click on the Edit Channel button to change settings.
11 Enter your new frequency and settings.
12 To change any of the MIC-2 or MIC-1 settings, click on the settings provided, then click OK.
13 Click on the Upload button to upload your new settings to the transmitter.

Your new settings have been installed.



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