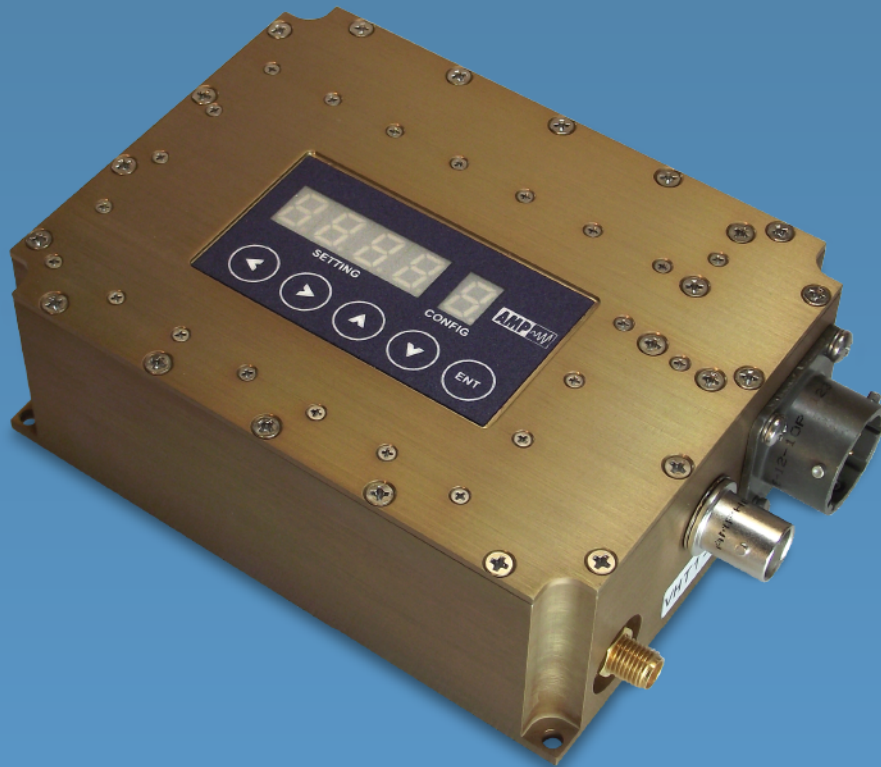


Operation Manual

VHT1

Analog FM Video / Audio/Data Transmitter



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1. INTRODUCTION

Thank you for choosing this AMP Wireless Video Product. Every effort has been made to design and manufacture a quality product that will meet your surveillance needs for many years. Please visit our website (www.advmw.com) for information on other products and for datasheets, quick start guides, model number builders, operation manuals, and other related materials.

If you have any questions regarding this product or if you require technical assistance, please feel free to contact us at (775) 345-9933.

Purpose and Function

VHT1 series Video/Audio/Data Transmitters are developed and manufactured by Advanced Microwave Products (AMP), and are designed for color or monochrome video, audio, and/or data transmission. VHT1 series transmitters are best operated with AMP's V or P series receivers but are compatible with most other analog FM video receivers on the market.

Capabilities

AMP Transmitters are designed for harsh environments and feature robust packaging and connectors. Compact package sizes provide versatility in unit placement and system applications.

AMP Transmitters require no tuning or adjustments. All units operate directly with any standard video camera or display. Power can be derived from batteries, simple power supplies, or vehicle power.

Whip or "rubber duck" antennas are adequate for most applications.

Environmental Requirements

AMP Transmitters are designed for indoor or outdoor use. Precautions should be taken when exposing the products to the elements. Do not expose to 100% humidity.

Transmitters should be located in areas where the ambient temperature does not exceed the maximum operating temperature indicated in the specifications. Placement in confined locations with minimal airflow, in direct sunlight in areas of temperature extremes, or in proximity to other devices that generate heat, such as power supplies, heating systems, etc., should be avoided. Temperatures exceeding +75°C may cause permanent damage to the equipment.

When not used for extended periods of time, external connections, including power cable, video cable, and antenna, should be removed and the units covered, boxed, or crated and stored in a clean, dry place.

2. VHT1 TRANSMITTER

VHT1 Specifications

RF Characteristics

Frequency Range (Specify):	UHF:	340.0-399.9 MHz	100 kHz Channels
(Other Ranges Available)	Lower L-Band:	1435-1535 MHz	1 MHz Channels
	Upper L-Band:	1700-1850 MHz	1 MHz Channels
	Lower S-Band:	2200-2399 MHz	1 MHz Channels
	Upper S-Band:	2400-2499 MHz	1 MHz Channels
	Full S-Band:	2200-2499 MHz	1 MHz Channels
	Lower C-Band:	4400-4900 MHz	1 MHz Channels
	Upper C-Band:	4900-4999 MHz	1 MHz Channels
	Full C-Band:	4400-4999 MHz	1 MHz Channels
	5.8 GHz:	5725-5875 MHz	1 MHz Channels
Frequency Selection:	Full Band Channelized - Remote Control and Local		
Frequency Stability:	±5 ppm Over -20°C to +60°C		
Output Power (Specify):	4 Watt or 10 Watts, Nominal (Selectable)		
Output Power, PA Disabled:	<0 dBm		
Power Modes (Specify):	One (Fixed), Two (Specify)		
Power Leveling:	Within ±0.5 dB Over 6 Equal Width Sub-Bands, Typical		
Output Impedance:	50 Ω Nominal, VSWR 2:1 Maximum		
Output Protection:	Internal Isolator (Most Bands) - Open/Short Indefinitely		
Spurious Output:	-13 dBm Maximum		

Video Characteristics

Modulation Type:	Analog FM, Standard (Positive) or Inverted (Negative) Sense, (Selectable)
Video Standard (Specify):	NTSC (10Hz to 4.2MHz, 525 Line P/E) or PAL (10Hz to 5.0MHz, 625 Line P/E), +/- 1.5dB
Modulation Sensitivity:	±4 MHz / 1 Vpk-pk @ Crossover Frequency
Input Impedance:	75 Ω Nominal, Unbalanced, Shunted by 30 pF Maximum
Distortion:	2% Maximum
Incidental FM:	10 kHz RMS Maximum

Audio/Data Subcarrier Characteristics

Subcarriers (Specify):	None, One, or Two - Audio or Data
Subcarrier Frequency (Specify):	5.8, 6.0, 6.2, 6.5, 6.8, 7.2, 7.5, 8.3, or 8.59 MHz, or Custom
Subcarrier Separation (Two):	700 kHz Minimum
Frequency Stability:	±0.5% Over -20°C to +60°C
Subcarrier Insertion Level:	-26 dBc Nominal (Audio) or -22 dBc Nominal (Data)
Subcarrier On/Off Control:	Local, Remote, and Programmable Switch
Modulation Type:	Analog FM, Positive Sense
Frequency Response:	100 Hz to 10 kHz ±1.5 dB (Audio) or DC to 50 kbps (Data)
Pre-Emphasis:	75 μsec NTSC or 50 μsec PAL (Audio) or None (Data)
Modulation Sensitivity:	150 kHz pk-pk @ 1 kHz rate (Audio) or 150 kHz pk-pk (Data)
Input Level:	-55 dBV Mic/-10 dBV Line Audio or RS232/TTL Data (Selectable)
Input Impedance:	>4 kΩ Unbalanced (Audio) or 10 kΩ to Gnd (Data)
Mic DC Supply (Audio Input(s)):	2.0 Vdc Thru 4.7 kΩ Pull-Up

Configuration Interface Characteristics

Interface Type:	Two-Way UART
Signaling Type (Specify):	RS232, RS422, or 3.3V TTL
Interface Parameters:	9600/8/1/None/None (Baud/Data Bits/Stop Bits/Parity/Handshake) custom configurations are available

Power Requirements

Input Voltage:	+11 to +16 Vdc, Reverse Polarity Protected
Current Draw (Typical at 12V):	2.5 A (10W) 1.5 A (4W)
Current Draw, PA Disabled:	130 mA, Typical

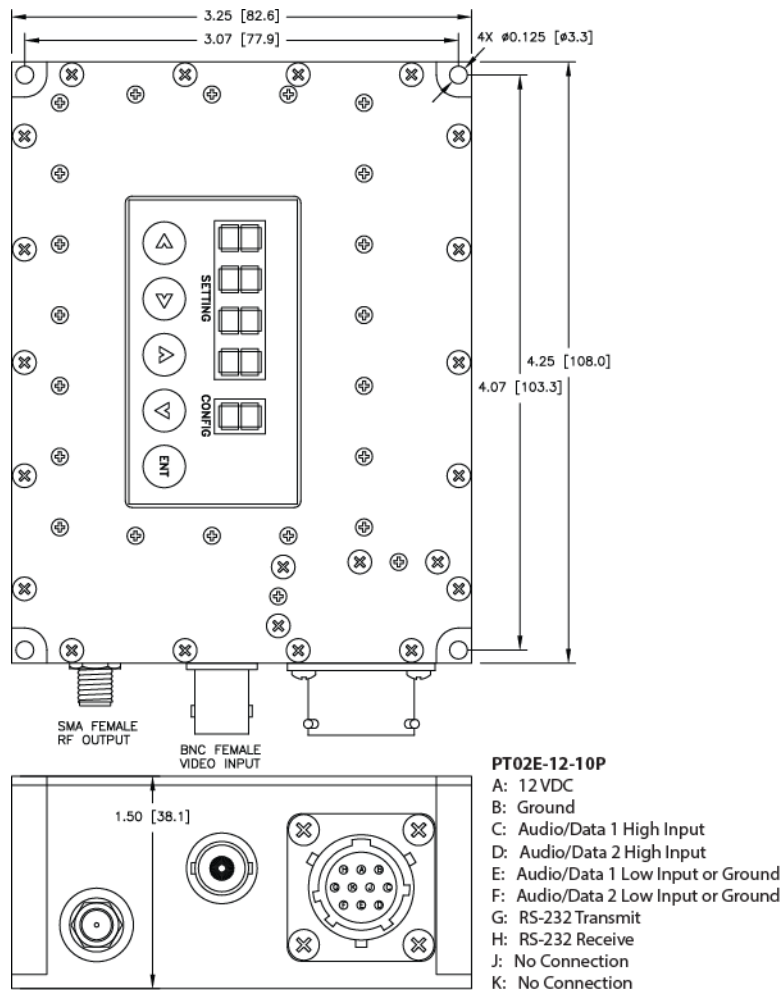
Mechanical

Material:	CNC Machined T6061-T6 Aluminum		
Finish (Specify):	Nickel Plated or Gold Iridite		
Dimensions:	3.25" W x 4.25" L x 1.5" H		
Weight:	16 oz.		
Connectors:	RF Output:	SMA Female	
	Video Input:	BNC Female	
	DC Supply, Comms, Audio, Data:	PT02E-1 2-10P	

Environmental

Temperature (Operating):	-20°C to +60°C
Acceleration:	100 g, 3 Axis
Altitude:	Unlimited
Humidity:	Up to 95% @ Any Temperature Forming Frost or Condensation

VHT1 Mechanical Drawing and Connector Pin-Outs



List of Items Furnished

- (1) VST1 Transmitter (configured as ordered)

List of Items Required

- Antenna, Type SMA Plug (Male) Connector
- Video Source, Type BNC Jack (Female) Connector
- Power/Audio/Comms Mating Connector (Mates with PT02E-12-10P)
- Heatsink

3. SAFETY PRECAUTIONS

Transmitters should be handled with caution like any electrical or electronic device. Do not handle the units or associated cabling with wet hands or materials.

Connections should be made only to previously-tested, active power sources (outlets or batteries) of the correct voltage, and each connector should be inserted only into its designated port. All connections should be checked to ensure they are firmly in place.

WARNING! RF RADIATION HAZARD

In order to keep the RF Exposure within the FCC 1.1310 limit, a safe personal distance from the antenna must be maintained according to the below tables. The first table is for transmitters operating 1500 MHz or higher where the Maximum Permissible Exposure (MPE) is 10 Watts/meter². See following for details on calculation of safe personal distances.

Operating Frequency 1500 MHz and Higher (MPE = 10 W/m ²)										
Antenna Gain (dBi)	Transmitter Power 0.25 Watts		Transmitter Power 0.5 Watts		Transmitter Power 1 Watt		Transmitter Power 2 Watts		Transmitter Power 5 Watts	
	EIRP (Watts)	Minimum Distance (Meters)	EIRP (Watts)	Minimum Distance (Meters)	EIRP (Watts)	Minimum Distance (Meters)	EIRP (Watts)	Minimum Distance (Meters)	EIRP (Watts)	Minimum Distance (Meters)
0	0.25	>0.20	0.5	>0.20	1	>0.20	2	>0.20	5	>0.20
2	0.4	>0.20	0.79	>0.20	1.58	>0.20	3.17	>0.20	7.9	0.25
5	0.79	>0.20	1.58	>0.20	3.16	>0.20	6.32	0.22	15.8	0.35
10	2.5	>0.20	5	>0.20	10	0.28	20	0.4	50	0.63
15	7.91	0.25	15.8	0.35	31.6	0.5	63.2	0.71	158.1	1.12
20	25	0.45	50	0.63	100	0.89	200	1.26	500	1.99
25	79.1	0.79	158.1	1.12	316.2	1.59	632.5	2.24	1581.1	3.55
30	250	1.41	500	1.99	1000	2.82	2000	3.99	5000	6.31

MAINTAIN A SAFE PERSONAL DISTANCE FROM THE ANTENNA WHILE TRANSMITTER IS OPERATIONAL.

FAILURE TO MAINTAIN A SAFE PERSONAL DISTANCE FROM THE ANTENNA MAY RESULT IN PERSONAL INJURY.

4. PREPARATION FOR USE

Unpacking

Carefully remove the product from the shipping container and make sure all listed furnished items are included as noted in the respective section. Inspect all items for damage. If any item is omitted from the shipment or appears damaged, contact AMP with detailed description of problem.

Transmitter Pre-Test

Although each unit is thoroughly tested at the factory for both functional and environmental performance, a minimal amount of pre-testing should be done by the operator before placing the transmitter into service. The transmitter, an appropriate receiver, transmit and receive antennas, a video camera, a video monitor, proper cabling, and DC power supplies are the only components required to perform a functional test of the transmitter. If testing audio or data, an audio source (microphone or line level) or data source and a speaker or headphones (audio) or data monitor will also be required.

Verify DC power supplies are between +11 and +16 Vdc. With the DC Power Cable (PT02E-12-10P connector) DISCONNECTED from the transmitter, connect DC power supply to DC Power Cable (Pin A = positive DC input, Pin B = negative DC input (ground)). Do not connect DC Power Cable to transmitter until all other connections are complete.

Connect the transmit antenna to transmitter RF output connector (SMA). Connect the Video to the transmitter video input connector (BNC). Connect the Video Cable between the Video Adapter Cable and video camera. If testing audio or data, connect the audio or data source to the Power/Audio/Data/Comms Cable (PT02E-12-10P connector) and cable to the transmitter. Refer to Section 0 for a complete transmitter wiring diagram.





Configure transmitter as instructed in Section 5. Connect DC Power Cable to transmitter (mates to PT02E-12-10P connector on transmitter). Video should be observed on the monitor and audio heard through the speaker / headphones (or data present) once the transmitter locks on frequency (requires several seconds). If no video, data, or audio is present, refer to Section 0 for troubleshooting instructions.

5. INSTALLATION AND OPERATING INSTRUCTIONS

Transmitter configuration is available via "Local", "Preset", or "Remote" modes. See the V Series ICD for details on controlling your transmitter remotely or reprogramming its presets. Local configuration and Presets can be set on the display on the transmitter.

Local Programming

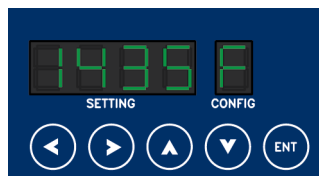
The transmitter display is always active regardless of whether the unit is in "Local", "Preset", or "Remote" mode. The unit responds to local button presses and remote commands in the same manner and updates whatever parameter is being changed accordingly. When a transmitter is turned on, it will be in the last mode it was on when it was last turned off.

To activate or change modes, press the  button on the display and the CONFIG character will be flashing. Use the   buttons to scroll through the available modes. When the CONFIG character displays the mode you want to configure, press the  button to select it.

The display has 1 "Preset" mode (C) and up to 7 "Local" configuration modes:

Local Configuration Modes		
Mode	Description	Selectable Options
F	Frequency	Frequency in 1 MHz Steps
d	Data Type	3.3V TTL (3.3) or RS232 (232)
A	Audio Type	Mic -55 dBV (-55) or Line -10 dBV (-10)
S	Subcarrier	On or OFF
I	Video Inversion	On or OFF
P	Output Power	HI (10W) or Lo (4W)
r	RF Enable	On or OFF
Preset Mode		
C	Presets	1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

“F” – Frequency Mode:



When you select Frequency Mode or “F” you will notice that the last digit of the displayed frequency is now flashing. Use the ▲▼ buttons to move through the available frequencies. You can use the ◀▶ buttons to move through the digits (ones, tens, and hundreds). The active digit will be flashing. Once you have the frequency you desire, press the ENT button and the “F” will be flashing. Press the ENT button a second time to confirm your frequency selection, at which time the “F” will no longer be flashing.

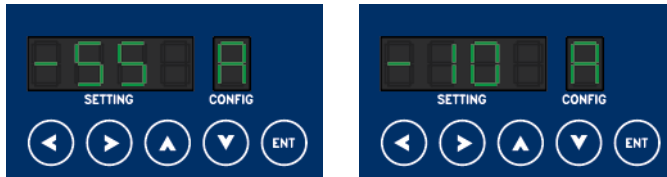
“d” – Data Type Mode:



The Data Type mode or “d” will only be available on transmitters equipped with a data subcarrier.

When you select Data Type mode or “d” you will notice that the currently selected Data Type is now flashing. Use the ▲▼ buttons to select between 3.3V TTL (3.3) or RS232 (232). Once you have the option you desire, press the ENT button and the “d” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “d” will no longer be flashing.

“A” – Audio Type Mode:



The Audio Type mode or “A” will only be available on transmitters equipped with an audio subcarrier.

When you select Audio Type mode or “A” you will notice that the currently selected Audio Type is now flashing. Use the ▲▼ buttons to select between Mic -55 dBV (-55) or Line -10 dBV (-10). Once you have the option you desire, press the ENT button and the “A” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “A” will no longer be flashing.

“S” – Subcarrier Mode:



The Subcarrier mode or “S” will only be available on transmitters equipped with one or two subcarriers (audio or data). If your transmitter is equipped with two subcarriers, the selection will apply to both.

When you select Subcarrier mode or “S” you will notice that the current subcarrier status is now flashing. Use the ▲▼ buttons to select between On and OFF. Once you have the option you desire, press the ENT button and the “S” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “S” will no longer be flashing.

“I” – Video Inversion Mode:



The Video Inversion mode or “I” will apply to all VHT1 transmitters as it is included as standard on all units.

When you select Video Inversion mode or “I” you will notice that the currently selected Video Inversion status is now flashing. Use the ▲▼ buttons to select between On and OFF. Once you have the option you desire, press the ENT button and the “I” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “I” will no longer be flashing.

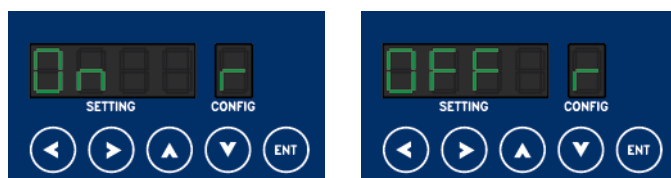
“P” – Output Power Mode:



The Output Power mode or “P” will only be available on transmitters equipped with both 4 watt and 10 watt outputs.

When you select Output Power mode or “P” you will notice that the currently selected Output Power level is now flashing. Use the ▲▼ buttons to select between HI (10W) and Lo (4W). Once you have the option you desire, press the ENT button and the “P” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “P” will no longer be flashing.

“r” – RF Output Mode:



The RF Output mode or “r” will apply to all VHT1 transmitters.

When you select RF Output mode or “r” you will notice that the currently selected RF Output status is now flashing. Use the ▲▼ buttons to select between On and OFF. Once you have the option you desire, press the ENT button and the “r” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “r” will no longer be flashing.

“C” – Preset Mode:



The Preset mode or “C” will apply to all VHT1 transmitters. Preset mode is independent of all the other modes. When you are in Preset mode your transmitter will be set to the last known preset configuration.

When you select Preset mode or “C” you will notice that the current active preset is now flashing. Use the ▲▼ buttons to select a preset from 1 to F (15 total). Once the preset you want to select is displayed, press the ENT button and the “C” will be flashing. Press the ENT button a second time to confirm your selection, at which time the “C” will no longer be flashing.

A set of Presets come preconfigured on your transmitter based on frequency band (see the chart below):

Frequency Band

Preset	U1	L1	L2	S1	S2	S3	C1	C2	C3	5.8
1	340 MHz	1435 MHz	1700 MHz	2200 MHz	2400 MHz	2200 MHz	4400 MHz	4900 MHz	4400 MHz	5725 MHz
2	344 MHz	1442 MHz	1711 MHz	2214 MHz	2407 MHz	2221 MHz	4436 MHz	4907 MHz	4443 MHz	5736 MHz
3	349 MHz	1449 MHz	1721 MHz	2228 MHz	2414 MHz	2243 MHz	4471 MHz	4914 MHz	4486 MHz	5746 MHz
4	353 MHz	1456 MHz	1732 MHz	2243 MHz	2421 MHz	2264 MHz	4507 MHz	4921 MHz	4528 MHz	5757 MHz
5	357 MHz	1464 MHz	1743 MHz	2257 MHz	2428 MHz	2285 MHz	4543 MHz	4928 MHz	4571 MHz	5768 MHz
6	361 MHz	1471 MHz	1754 MHz	2271 MHz	2435 MHz	2307 MHz	4579 MHz	4935 MHz	4614 MHz	5779 MHz
7	366 MHz	1478 MHz	1764 MHz	2285 MHz	2442 MHz	2328 MHz	4614 MHz	4942 MHz	4657 MHz	5789 MHz
8	370 MHz	1485 MHz	1775 MHz	2300 MHz	2450 MHz	2350 MHz	4650 MHz	4950 MHz	4700 MHz	5800 MHz
9	374 MHz	1492 MHz	1786 MHz	2314 MHz	2457 MHz	2371 MHz	4686 MHz	4957 MHz	4742 MHz	5811 MHz
A	379 MHz	1499 MHz	1796 MHz	2328 MHz	2464 MHz	2392 MHz	4721 MHz	4964 MHz	4785 MHz	5821 MHz
B	383 MHz	1506 MHz	1807 MHz	2342 MHz	2471 MHz	2414 MHz	4757 MHz	4971 MHz	4828 MHz	5832 MHz
C	387 MHz	1514 MHz	1818 MHz	2356 MHz	2478 MHz	2435 MHz	4793 MHz	4978 MHz	4871 MHz	5843 MHz
D	391 MHz	1521 MHz	1829 MHz	2371 MHz	2485 MHz	2456 MHz	4829 MHz	4985 MHz	4913 MHz	5854 MHz
E	396 MHz	1528 MHz	1839 MHz	2385 MHz	2492 MHz	2478 MHz	4864 MHz	4992 MHz	4956 MHz	5864 MHz
F	399.9 MHz	1535 MHz	1850 MHz	2399 MHz	2499 MHz	2499 MHz	4900 MHz	4999 MHz	4999 MHz	5875 MHz

In addition to the frequency, the default presets include the following settings, when applicable:

Setting	Preset Default
Data Type	RS232
Audio Type	-10 dBV
Subcarrier	On
Video Inversion	OFF
Output Power	HI
RF Output	On

You can reprogram your presets using RealTerm and the serial comm programming interface. See the V Series ICD for programming details.

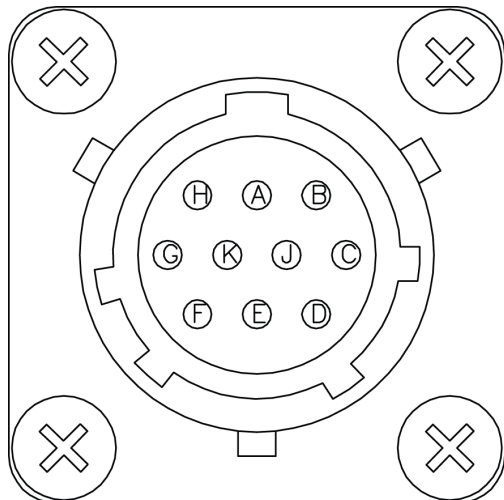
Use of Heat Sink

VHT1 Transmitters require the use of a heat sink or must be securely fastened to an adequate heat sinking object or surface. Use of thermal grease, such as Wakefield Engineering 120 Series Thermal Compound, to improve thermal conduction between transmitter base plate and heat sinking surface will reduce unit temperature and increase product reliability.

Connectors

The VHT1 transmitters use a circular 10 pin MIL Spec connector for DC power, audio or data subcarrier inputs, and RS232 communications. The pin configuration is shown in the diagram below.

The RF output is an industry standard SMA connector. The video input is an industry standard BNC connector.



PT02E-12-10P

A: 12 VDC
 B: Ground
 C: Audio 1 High Input
 D: Audio 2 High Input
 E: Audio 1 Ground
 F: Audio 2 Ground
 G: RS-232 Transmit
 H: RS-232 Receive
 J: No Connection
 K: No Connection

REMOTE COMMANDS

The VHT1 transmitter accepts commands from serial controllers. Setup and commands are detailed in the V Series ICD.

Initial Adjustments and Settings

There are no initial adjustments or settings necessary to use AMP products other than proper configuration of the switches as outlined above in Section 0. To assure optimum performance, the user should be familiar with the camera, monitor, microphone, speaker/headphones used with this video system.

Shut Down

If the transmitter or receiver is to be shut down only briefly, simply remove DC voltage from the DC Power Cable or disconnect DC Power Cable from transmitter. If the unit is to be shut down for an extended period, all external cabling including the antenna should be removed and the unit should be stored in a container and placed in a clean, dry environment.

6. MAINTENANCE INSTRUCTIONS

Cleaning

AMP Transmitters should be periodically wiped off with a clean, damp cloth. For more thorough cleaning, dampen a clean cloth with glass cleaner and wipe off unit. Ensure units are completely disconnected from their power sources before cleaning.

Troubleshooting

To avoid poor performance, ensure all mating connectors are tightly fastened, clean, and have no pins bent or damaged.

Verify the connections and setup in section 5. If poor or no operation is observed, ensure the external DC voltage supply is between +11 and +16 Vdc with correct polarity. All AMP Transmitters have over-voltage

and reverse polarity protection circuits. If the input voltage is over +16 Vdc, remove the DC Power Cable from the unit, reduce the DC voltage to between +11 and +16 Vdc, and reconnect the DC Power Cable. If the input voltage is negative polarity, remove the DC Power Cable from the unit, reverse the connections between the DC voltage supply and DC Power Cable, and reconnect the DC Power Cable.

If all connections are adequate, switches are correctly configured, and DC voltage is correctly applied, check the video camera, video cable, and antenna for damage. A monitor may be connected directly to the camera to verify proper camera operation.

If these efforts fail, do not attempt to repair the unit. Please contact AMP with a detailed description of the problem. Depending on the nature of the problem, AMP may provide further troubleshooting assistance or advise the entire system be returned for repair and retest.

Caution: Removal of the cover constitutes breaking the seal and VOIDS PRODUCT WARRANTY.

Preparation for Reshipment

If the transmitter, receiver, and/or any other purchased item(s) are to be shipped to another location or returned for repair or realignment, use the original packaging or a sturdy box with sufficient protective material to avoid damage from movement or exposure during transit. Remove all external connections (cables, antenna, etc.) prior to shipping.

Returning an Item

Please contact AMP customer service at (775) 345-9933 for a Return Authorization Number before returning an item. The AMP ship-to address is listed below. When returning an item, always include a contact name and phone number and a detailed description of the problem with your shipment.

Advanced Microwave Products

Advanced Microwave Products
PO Box 1437
2465 Old Highway 40 West, Suite 200
Verdi, NV 89439

7. WARRANTY STATEMENT

Advanced Microwave Products (AMP) warrants these products to be free from defects in material and workmanship for a period of one year from date of original shipment. AMP shall, at its option, either repair or replace products which prove to be defective.

No products may be returned to AMP without the permission of AMP. BUYER, after obtaining a return authorization from AMP, shall return the equipment to AMP accompanied by a report stating as completely as possible the reason for return, the defects, and the conditions under which they occurred. BUYER shall pay all shipping charges, duties, and fees for the return of products to AMP. All warranty services will be carried out at AMP's facility. AMP will pay for the return of products to the BUYER.

All articles are to be properly and carefully inspected by BUYER upon receipt. Shipping container damage may indicate equipment damage. All shipping damage must be promptly reported to the carrier. AMP is not liable for shipping damage.

Limitation of Warranty: The above warranty does not apply to defects of, or resulting from the following:

- 1) End items included as part of a system, but not designed by, AMP are subject only to warranty as may be obtained from the original manufacturers. Such items include, but are not limited to, batteries, cameras, monitors, cabling, etc.,
- 2) Operation outside of the environmental specifications of the product,
- 3) Unauthorized modifications, misuse, or mishandling,
- 4) Improper or inadequate maintenance by BUYER,
- 5) Improper or inadequate heat sinking by BUYER,
- 6) Improper installation or improper testing,
- 7) Malfunction of connected hardware.

THIS WARRANTY IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. AMP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedies set forth above are the purchaser's sole and exclusive remedies. In no circumstances shall AMP assume liability for loss, damage, or consequential expense (including loss of profits) whether based on contract, tort, or any other legal theory, arising directly or indirectly from the use of its equipment separately or in combination with other equipment.