Operation Manual

V Series Products
Analog FM Video / Audio / Data Transmitters & Receivers

VST1 Transmitter

VSR1 Receiver

VDR1 Diversity Receiver

Advanced Microwave Products
8748 Technology Way
Reno, NV 89521

www.advmw.com
engineering@advmw.com
(775) 345-9933
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</tbody>
</table>
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.

1.1. Purpose and Function

V series Video/Audio/Data Transmitters and Receivers are developed and manufactured by Advanced Microwave Products (AMP).

V series products are designed for color or monochrome video, audio, and data transmission. V series transmitters/receivers are best operated with AMP’s V or P series receivers/transmitters but are compatible with most other analog FM video receivers/transmitters on the market.

1.2. Capabilities

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

AMP Transmitters and Receivers 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.

1.3. Environmental Requirements

AMP Transmitters and Receivers 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 and Receivers 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. **VST1 TRANSMITTER**

2.1. **VST1 Specifications**

### RF Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range (Specify):</td>
<td>UHF: 340.0-399.9 MHz, 100 kHz Channels</td>
</tr>
<tr>
<td>(Other Ranges Available)</td>
<td>Lower L-Band: 1435-1535 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Upper L-Band: 1700-1835 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Lower S-Band: 2200-2399 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Upper S-Band: 2400-2699 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Full S-Band: 2200-2499 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Lower C-Band: 4000-4999 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Full C-Band: 4400-4999 MHz, 1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>5.8 GHz</td>
</tr>
</tbody>
</table>

- **Frequency Selection (Specify):** Full band Channalized - Remote Control Only or Remote/Programmable Switch/Local BCD
- **Frequency Stability:** ±0.5 ppm Over -20°C to +60°C
- **Output Power (Specify):** 250 mW, 500 mW, 1 Watt, or 2 Watts Nominal (Selectable)
- **Output Power PA Disabled:** <0 dBm
- **Power Modes (Specify):** One (Fixed), Two (Specify), Three (Specify), or Four (Specify)
- **Power Leveling:** Within ±0.5 dB Over 6 Equal Width Sub-Bands, Typical
- **Output Impedance:** 50Ω Nominal, VSWR=2:1 Maximum
- **Output Protection:** Internal Isolator (Most Bands) - Open/Short Indefinitely
- **Spurious Output:** <-13 dBm Maximum

### Video Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation Type:</td>
<td>Analog FM, Standard (Positive) or Inverted (Negative) Sense, Selectable</td>
</tr>
<tr>
<td>Video Standard (Specify):</td>
<td>NTSC (1041 to 3.5795 kHz + 6.25 Line PAL or PAL (1041 to 3.5795 kHz + 6.25 Line PAL, ±1.5 kHz)</td>
</tr>
<tr>
<td>Modulation Sensitivity:</td>
<td>54 MHz / f Typ. for Domestic Frequency</td>
</tr>
<tr>
<td>Input Impedance:</td>
<td>75Ω Nominal, Unbalanced, Shunted by 30 pF Maximum</td>
</tr>
<tr>
<td>Distortion:</td>
<td>2% Maximum</td>
</tr>
<tr>
<td>Incidental FM:</td>
<td>10 kHz RMS Maximum</td>
</tr>
</tbody>
</table>

### Audio/Data Subcarrier Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub carriers (Specify):</td>
<td>One, Two, or Three - Audio or Data</td>
</tr>
<tr>
<td>Subcarrier Frequency (Specify):</td>
<td>5.8, 6.6, 6.7, 7.8, 7.8, 8.8, 8.9 MHz, or Custom</td>
</tr>
<tr>
<td>Subcarrier Separation (two):</td>
<td>200 kHz Minimum</td>
</tr>
<tr>
<td>Frequency Stability:</td>
<td>±0.5% Over -20°C to +60°C</td>
</tr>
<tr>
<td>Subcarrier Insertion Levels:</td>
<td>-36 dBc Nominal (Audio) or -23 dBc Nominal (Data)</td>
</tr>
<tr>
<td>Subcarrier On/Off Control:</td>
<td>Local, Remote, and Programmable Switch</td>
</tr>
<tr>
<td>Modulation Type:</td>
<td>Analog FM, Positive Sense</td>
</tr>
<tr>
<td>Frequency Response:</td>
<td>100 Hz to 10 kHz ±3.0±0 db (Audio) or DC to 50 kHz (Data)</td>
</tr>
<tr>
<td>Pre-Emphasis:</td>
<td>75μspeak NTSC or 50μspeak PAL (Audio) or None (Data)</td>
</tr>
<tr>
<td>Modulation Sensitivity:</td>
<td>150 kHz pk-pk @ 1 kHz rate (Audio) or 150 kHz pk-pk (Data)</td>
</tr>
<tr>
<td>Input Level:</td>
<td>-50 dBV Mic or 10 dBV Line Audio or RS232/TTL Data (Selectable)</td>
</tr>
<tr>
<td>Input Impedance:</td>
<td>&gt;4 kΩ Unbalanced (Audio) or 10 kΩ to Ground (Data)</td>
</tr>
<tr>
<td>Mic/DC Supply (Audio Input(s)):</td>
<td>2.5 Vdc Thru 4.2 Vdc Pull-Up</td>
</tr>
</tbody>
</table>

### Configuration Interface Characteristics

| Interface Type: | Two-Way UART |
| Interface Parameters: | RS232, RS422, or 1.5V TTL |

### Power Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage:</td>
<td>+12 to +16 Vdc, Reverse Polarity Protected</td>
</tr>
<tr>
<td>Current Draw (Typical at 12V):</td>
<td>200 mA for 250mW, 400 mA for 500mW, 600 mA for 1W, or 800 mA for 2W</td>
</tr>
<tr>
<td>Current Draw, PA Disabled:</td>
<td>70 mA, Typical</td>
</tr>
<tr>
<td>Camera Supply Output:</td>
<td>+12 Vdc, 250mA Current Limit</td>
</tr>
</tbody>
</table>

### Mechanical

- **Material:** CNC Machined 6061-T6 Aluminum
- **Finish (Specify):** Nickel Plated or Gold Indicate
- **Dimensions:** 1.25” W x 3.50” L x 0.375” H
- **Weight:** <1.7 oz
- **Connectors:** RF Output: SMA Female

### Environmental

- **Temperature Operating:** -20°C to +60°C
- **Acceleration:** 100 g, 3 Axes
- **Altitude:** Unlimited
- **Humidity:** Up to 95%, @ Any Temperature (No Frost or Condensation)
2.2. VST1 Mechanical Drawing and Connector Pin-Outs

2.3. VST1 List of Items Furnished

- (1) VST1 Transmitter (configured as ordered)

2.4. VST1 Optional Accessories

- WHSMDM9-SSLH0 - MDM-9S (Socket) DC Power Cable
- WHSMDM9-SPLH0 - MDM-9P (Pin) Audio/Data Cable
- CBLVD75-SA360 - 36" SSMA/BNC Coax
- SNK3520-S05B0 - Heatsink

2.5. VST1 List of Items Required

- Antenna, Type SMA Plug (Male) Connector
- Camera, Type BNC Jack (Female) Connector
- Video connector adapter to SSMA adapter
- Microphone(s) (as applicable)
- Heatsink (for 500mW, 1W, 2W versions)
3. VSR1 RECEIVER

3.1. VSR1 Specifications

**RF Characteristics**

<table>
<thead>
<tr>
<th>Frequency Range (Specify):</th>
<th>UHF: 340.0-359.9 MHz</th>
<th>100 kHz Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Other Ranges Available):</td>
<td>Lower L-Band: 1435-1535 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Upper L-Band: 1700-1850 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Lower S-Band: 2200-2350 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Upper S-Band: 2300-2499 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Full S-Band: 2300-2499 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Dual U/S Band: 1700-1850/2200-2499 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Lower C-Band: 4400-4999 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Upper C-Band: 4900-4999 MHz</td>
<td>1 MHz Channels</td>
</tr>
<tr>
<td></td>
<td>Full C-Band: 4400-4999 MHz</td>
<td>1 MHz Channels</td>
</tr>
</tbody>
</table>

- Frequency Selection (Specify): Full Band Channelized - Remote Control Only or Remote Programmable Switch/Local BCD
- Maximum IF Input: +10 dBm Without Damage
- Input Impedance: 50Ω Nominal, VSR1-311 Maximum
- Noise Figure: < 3 dB
- Image Rejection: > 60 dB
- Signal Strength Output: Local Display and Remote Query

**LO/IF Characteristics**

- LO Stability: ±5 ppm Over -20°C to +60°C
- IF Frequency: UHF: 1326 MHz, LF: 374 MHz, C/5.6 GHz: 460 MHz
- IF Bandwidth: 17 MHz Nominal
- Harmonic and Spurious Level: < -25 dB Maximum

**Video Characteristics**

- Modulation Type: Analog FM, Standard (Positive) or Inverted (Negative) Sense, Selectable
- Video Standard (Specify): NTSC (10.5 MHz ± 1.5 MHz or PAL (10.5 MHz ± 1.5 MHz), 0/5 Line Offset, H: +1.50 dB
- Output Level: 1 Vpp ± 1 MHz at Channel Crossover Frequency into 75Ω Load
- Output Impedance: 75Ω Nominal, Unbalanced

**Audio/Data Subcarrier Characteristics**

- Subcarrier (Specify): Noise, One, or Two - Audio or Data
- Subcarrier Frequency (Specify): 5.6, 6.3, 6.4, 7.1, 7.5, 8.2, or 8.59 MHz, or Custom
- Subcarrier Separation (Two): 200 kHz Minimum
- Frequency Stability: ±0.5% Over -20°C to +60°C
- Subcarrier On/Off Control: Local, Remote, and Programmable Switch
- Modulation Type: Analog FM, Positive Sense
- Frequency Response: 100 Hz to 10 kHz ± 0.5 dB (Audio) or DC to 50 kHz (Data)
- Stereophonic: 75% NTSC or Stereo: PAL (Stereophonic) or Mono (Mono)
- Output Level: -18 dBV and ±4 dBu Line / 150 kHz pk-pk @ 1 kHz Refer to 75Ω Load (Audio) or RS232 and TTL / 150 kHz pk-pk Deviation (Data)
- Output Impedance: 100Ω Nominal, Unbalanced (Audio) or 100Ω (Data)

**Configuration Interface Characteristics**

- Interface Type: Two-Way UART
- Signalling Type (Specify): RS232, RS422, or 3.3V TTL
- Interface Parameters: 9600 Baud, None/None (Baud/Data Bits/Stop Bits/Parity/Handshakes)

**Power Requirements**

- Input Voltage: +11 to +16 Vdc, Reverse Polarity Protected
- Current Draw Typical at 12V: 230 mA
- Auxiliary Supply Output: +12 Vdc, 0.5 A Current Limit

**Mechanical**

- Material: CNC Machined T6061-T6 Aluminum
- Finish (Specify): Nickel Plated or Gold Indent
- Dimensions: 2.50" W x 3.50" L x 0.85" H
- Weight: < 6 oz.
- RS232 Display (Specify): LCD Analog Bar Meters or LED Light Bars - Local Display and Intensity Control (LED)

**Connectors**

- RS232: 9 Pin Female
- Video Output: BNC Female
- DC Supply, 12V Out, Common: COM-99
- Audio Output, Data Output: COM-95
- Audio Output: 3.5mm Stereo Jack

**Environmental**

- Temperature Operating: -20°C to +60°C
- Acceleration: 100g, 3 Axes
- Altitude: Unlimited
- Humidity: Up to 95% at Any Temperature, Forming Frost or Condensation
3.2. VSR1 Mechanical Drawing and Connector Pin-Outs

3.3. VSR1 List of Items Furnished

- (1) VSR1 Receiver (configured as ordered)

3.4. VSR1 Optional Accessories

- WHSMDM9-SSLH0 - MDM-9S (Socket) DC Power Cable
- WHSMDM9-SPLH0 - MDM-9P (Pin) Audio/Data Cable

3.5. VSR1 List of Items Required

- Antenna, Type SMA Plug (Male) Connector
- Monitor, Type BNC Jack (Female) Connector
- Type BNC Plug (Male) to BNC Plug (Male) Video Cable
- Video connector adapter to BNC, if monitor does not have BNC connector
- Speaker or Headphones
- 3.5mm Stereo Plug to Dual Mono Adapter (if monitoring two mono audio sources)
4. **VDR1 DIVERSITY RECEIVER**

4.1. **VDR1 Specifications**

**RF Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range (Specify):</td>
<td>UHF: 340.6-399.9 MHz</td>
</tr>
<tr>
<td>(Other Ranges Available):</td>
<td>Lower 1 Band: 1435-1515 MHz</td>
</tr>
<tr>
<td></td>
<td>Upper 1 Band: 1760-1850 MHz</td>
</tr>
<tr>
<td></td>
<td>Lower 2 Band: 2360-2490 MHz</td>
</tr>
<tr>
<td></td>
<td>Upper 2 Band: 2460-2490 MHz</td>
</tr>
<tr>
<td></td>
<td>Full 2 Band: 2460-2490 MHz</td>
</tr>
<tr>
<td></td>
<td>Dual L/F Band: 1760-1850/2200-2490 MHz</td>
</tr>
<tr>
<td></td>
<td>Lower C Band: 4460-4999 MHz</td>
</tr>
<tr>
<td></td>
<td>Upper C Band: 4900-4999 MHz</td>
</tr>
<tr>
<td></td>
<td>Full C Band: 4460-4999 MHz</td>
</tr>
</tbody>
</table>

**Frequency Selection (Specify):** Full Band Channelsized - Remote Control Only or Remote/Programmable Switch/Local DCC

**Maximum RF Input:** +10 dBm Without Damage

**Input Impedance:** 50Ω Nominal, VSWR 2:1 Maximum

**Noise Figure:** < 3 dB

**Image/Interception:** > 60 dB

**Signal Strength Output:** Local Displays and Remote Display

**Voting Characteristics:** RSSI Based, +150 MHz Voting Rate

**LO/AF Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO Frequency (Specify):</td>
<td>±0.5 ppm Over -25°C to +60°C</td>
</tr>
<tr>
<td>LO Bandwidth:</td>
<td>±17 MHz Nominal</td>
</tr>
<tr>
<td>Harmonic and Spurious Level:</td>
<td>-25 dB Minimum</td>
</tr>
</tbody>
</table>

**Video Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation Type:</td>
<td>Analog FM, Standard (Positive) or Inverted (Negative) Sense (Selectable)</td>
</tr>
<tr>
<td>Video Standard (Specify):</td>
<td>NTSC: 10 Hz to 3.5 MHz, 525 Line DTV or PAL: 10 Hz to 3.5 MHz, 625 Line DTV, +5 ± 1.5 dB</td>
</tr>
<tr>
<td>Output Level:</td>
<td>1 Volt peak/4 MHz @ Crossover Frequency into 75Ω Load</td>
</tr>
<tr>
<td>Output Impedance:</td>
<td>75Ω Nominal, Unbalanced</td>
</tr>
</tbody>
</table>

**Audio/Data Subcarrier Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcarrier (Specify):</td>
<td>None, Civic, or Two - Audio or Data</td>
</tr>
<tr>
<td>Subcarrier Frequency (Specify):</td>
<td>5.6, 6, 6.2, 6.5, 6.8, 7, 7.5, 8, 8.59 MHz, or Custom</td>
</tr>
<tr>
<td>Subcarrier Separation (Min):</td>
<td>700 kHz Minimum</td>
</tr>
<tr>
<td>Frequency Stability:</td>
<td>±0.5% Over -20°C to +40°C</td>
</tr>
<tr>
<td>Subcarrier On/Off Control:</td>
<td>Local, Remote, and Programmable Switch</td>
</tr>
<tr>
<td>Modulation Type:</td>
<td>Analog FM, Positive Sense</td>
</tr>
<tr>
<td>Frequency Response:</td>
<td>100 Hz to 10 MHz ±1.5 dB (Audio) or DC to 50 kbps (Data)</td>
</tr>
<tr>
<td>De-emphasis:</td>
<td>75 μsec NTSC, 95 μsec PAL, Audio or None (Data)</td>
</tr>
<tr>
<td>Output Level:</td>
<td>+4 dBm and 4Vrms Line / 750 kHz phase @ 1 kHz Rate into 10 kΩ</td>
</tr>
<tr>
<td>Load (Audio) or RS-322 and TTL / 150 kΩ peak/pulse (Data)</td>
<td></td>
</tr>
<tr>
<td>Output Impedance:</td>
<td>100/120 Nominal, Unbalanced (Audio) or 300Ω (Data)</td>
</tr>
</tbody>
</table>

**Configuration Interface Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Type:</td>
<td>Two-Way UHF</td>
</tr>
<tr>
<td>Signaling Type (Specify):</td>
<td>RS-232, RS-422, or 3.3V TTL</td>
</tr>
<tr>
<td>Interface Protocol:</td>
<td>9600/1200 Baud/Bit/Stop Bits/Parity/Handshake</td>
</tr>
</tbody>
</table>

**Power Requirements**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage:</td>
<td>±11 to ±16 Vdc, Reversed Polarity Protected</td>
</tr>
<tr>
<td>Current Draw (Typical at 12V):</td>
<td>280 mA</td>
</tr>
<tr>
<td>Auxiliary Supply Output:</td>
<td>±12 VDC, 0.5 A Current Limit</td>
</tr>
</tbody>
</table>

**Mechanical**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material:</td>
<td>CNC Machined T6611-T5 Aluminum</td>
</tr>
<tr>
<td>Finish (Specify):</td>
<td>Nickel-Plated or Gold Inlaid</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>2.50” W x 3.50” L x 0.85” H</td>
</tr>
<tr>
<td>Weight:</td>
<td>&lt; 6.5 oz</td>
</tr>
<tr>
<td>RS-232 Displays (Specify):</td>
<td>LCD, Analog Bar Meters or LED Light Bars - Local Enable and Intensity Control (LED)</td>
</tr>
<tr>
<td>Connections:</td>
<td>9P Male, BNC Female</td>
</tr>
<tr>
<td>DC Supply:</td>
<td>12V Out, Current: 1A</td>
</tr>
<tr>
<td>Audio Output, Data Output:</td>
<td>3.5mm Stereo Jack</td>
</tr>
</tbody>
</table>

**Environmental**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (Operating):</td>
<td>-20°C to +60°C</td>
</tr>
<tr>
<td>Acceleration:</td>
<td>100 g, 3 Axis</td>
</tr>
<tr>
<td>Altitude:</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Humidity:</td>
<td>Up to 95% e Any Temperature Forming Frost or Condensation</td>
</tr>
</tbody>
</table>
4.2. VDR1 Mechanical Drawing and Connector Pin-Outs

4.3. VDR1 List of Items Furnished

- (1) VDR1 Receiver (configured as ordered)

4.4. VDR1 Optional Accessories

- WHSMDM9-SSLH0 - MDM-9S (Socket) DC Power Cable
- WHSMDM9-SPLH0 - MDM-9P (Pin) Audio/Data Cable

4.5. VDR1 List of Items Required

- Two (2) Antennas, Type SMA Plug (Male) Connector
- Monitor, Type BNC Jack (Female) Connector
- Type BNC Plug (Male) to BNC Plug (Male) Video Cable
- Video connector adapter to BNC, if monitor does not have BNC connector
- Speaker or Headphones
- 3.5mm Stereo Plug to Dual Mono Adapter (if monitoring two mono audio sources)
5. SAFETY PRECAUTIONS

Transmitters and Receivers 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/meter$^2$. The second table is for transmitters operating in the 340-400 MHz range where the MPE is 2.27 Watts/meter$^2$. See following page for details on calculation of safe personal distances.

<table>
<thead>
<tr>
<th>Antenna Gain (dBi)</th>
<th>Transmitter Power 0.25 Watts</th>
<th>Transmitter Power 0.5 Watts</th>
<th>Transmitter Power 1 Watt</th>
<th>Transmitter Power 2 Watts</th>
<th>Transmitter Power 5 Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EIRP (Watts)</td>
<td>Minimum Distance (Meters)</td>
<td>EIRP (Watts)</td>
<td>Minimum Distance (Meters)</td>
<td>EIRP (Watts)</td>
</tr>
<tr>
<td>0</td>
<td>0.25</td>
<td>&gt;0.20</td>
<td>0.5</td>
<td>&gt;0.20</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0.4</td>
<td>&gt;0.20</td>
<td>0.79</td>
<td>&gt;0.20</td>
<td>1.58</td>
</tr>
<tr>
<td>5</td>
<td>0.79</td>
<td>&gt;0.20</td>
<td>1.58</td>
<td>&gt;0.20</td>
<td>3.16</td>
</tr>
<tr>
<td>10</td>
<td>2.5</td>
<td>&gt;0.20</td>
<td>5</td>
<td>&gt;0.20</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>7.91</td>
<td>0.25</td>
<td>15.8</td>
<td>0.35</td>
<td>31.6</td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td>0.45</td>
<td>50</td>
<td>0.63</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>79.1</td>
<td>0.79</td>
<td>158.1</td>
<td>1.12</td>
<td>316.2</td>
</tr>
<tr>
<td>30</td>
<td>250</td>
<td>1.41</td>
<td>500</td>
<td>1.99</td>
<td>1000</td>
</tr>
</tbody>
</table>

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.
6. PREPARATION FOR USE

6.1. 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.

6.2. 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 AMP 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.

The transmit and receive antennas should be situated at a distance of greater than 25 feet apart to prevent serious damage to or destruction of the receiver's front end. Set up the receiver and make all necessary adjustments in accordance with that unit's Quick Start Guide. Connect the receiver video output to the video monitor and, if testing audio or data, connect the receiver audio or data output to the speaker or headphones (audio) or data monitor as appropriate.

Verify DC power supplies are between +11 and +16 Vdc. With the DC Power Cable (MDM-9S connector) DISCONNECTED from the transmitter, connect DC power supply to DC Power Cable (Pin1 = positive DC input, Pin2 = 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 Adapter Cable to the transmitter video input connector (SSMA, SMB optional). 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 Audio/Data Cable (MDM-9P connector) and Audio/Data Cable to the transmitter (mates to MDM-9S connector on transmitter). Refer to Section 2.2 for a complete VST1 wiring diagram.

Configure switches as instructed in Section 7.2. Connect DC Power Cable to transmitter (mates to MDM-9P connector on transmitter). Video should be observed on the monitor and audio heard through the speaker / headphones once the transmitter locks on frequency (requires several seconds). If no video or audio/data (as applicable) is present, refer to Section 8.2 for troubleshooting instructions.

6.3. Receiver 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 receiver into service. The receiver, an appropriate AMP transmitter, 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 receiver. 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.

The transmit and receive antennas should be situated at a distance of greater than 25 feet apart to prevent serious damage to or destruction of the receiver's front end. Set up the transmitter and make all necessary adjustments in accordance with that unit's Quick Start Guide. Connect the video camera to the transmitter video input and, if testing audio or data, connect the audio or data source to the transmitter audio or data input(s).
Verify DC power supplies are between +11 and +16 Vdc. With the DC Power Cable (MDM-9S connector) DISCONNECTED from the receiver, connect DC power supply to DC Power Cable with the correct polarity (Pin1 = positive DC input, Pin2 = negative DC input (ground)). Do not connect DC Power Cable to receiver until all other connections are complete.

Connect the receive antenna(s) to receiver RF input connector(s) (SMA). Connect the Video Cable between the receiver video output connector (BNC) and the video monitor. If testing audio or data, connect the speaker or data monitor to the I/O Cable or headphones to the 3.5mm Audio Jack. Refer to Section 3.2 (VSR1) or 4.2 (VDR1) for a complete wiring diagram.

Configure switches as instructed in Section 7.2. Connect DC Power Cable to receiver (mates to MDM-9P connector on receiver). Video should be observed on the monitor and audio heard through the speaker / headphones. If no video or audio/data (if applicable) is present, refer to Section 8.2 for troubleshooting instructions.

7. INSTALLATION AND OPERATING INSTRUCTIONS

7.1. Use and Function of Connectors

AMP V series products are simple to install, requiring only connection to the antenna, camera, audio or data (if applicable), and DC power supply using the appropriate cables and jacks for transmitters and requiring only connection to the antenna, monitor, speaker or headphones, and DC power supply using the appropriate cables and jacks for the receivers. The use and function of the connectors are in the respective product sections.

7.2. Use and Function of Switches

The available switches and functionality will depend on the model and configuration of your V series product.

7.2.1. Frequency Selection Switches:

Frequency selectability is standard on all V Series products providing RF frequency control with either rotary switches accessible through the chassis lid, programmable presets, or remote programming.

To program the desired RF frequency using rotary switches, position the rotary switches as shown in the Frequency Selection Chart in Section 10. To program the desired RF frequency using remote interface, refer to the V Series Interface Control Document (ICD).

7.2.2. LINE – MIC Switch (transmitters only)

The Line-Mic slide switch is accessible through the chassis lid on V series products equipped with one or two audio subcarrier. This switch only works when the transmitter or receiver is in manual mode. When in Preset or Remote modes, the switch is bypassed. When switched to LINE the input level is set to -10dBV. When switched to MIC the input level is set to -55 dBV. When you have two subcarriers, both audio levels will be set the same.

7.2.3. RS232 – TTL Switch (transmitters only)

The RS232-TTL slide switch is accessible through the chassis lid on V series products equipped with one or two data subcarrier. This switch only works when the transmitter or receiver is in manual mode. When in Preset or Remote modes, the switch is bypassed. Use this switch to select between RS232 and TTL (3.3V) data inputs. For transmitters equipped with RS422 data subcarriers, the switch will not be functional. When you have two subcarriers, both data subcarriers are controlled by the single switch.
7.2.4. **AUD ON – AUD OFF Switch**

The Aud On – Aud Off slide switch is accessible through the chassis lid on V series products equipped with one or two audio subcarrier. This switch only works when the transmitter or receiver is in manual mode. When in Preset or Remote modes, the switch is bypassed. This switch will turn the audio subcarrier on or off. When you have two subcarriers, it turns on or off both audio subcarriers.

7.2.5. **DAT ON – DAT OFF Switch**

The Dat On – Dat Off slide switch is accessible through the chassis lid on V series products equipped with one or two data subcarrier. This switch only works when the transmitter or receiver is in manual mode. When in Preset or Remote modes, the switch is bypassed. This switch will turn the data subcarrier on or off. When you have two subcarriers, it turns on or off both data subcarriers.

7.2.6. **HIGH PWR – LOW PWR (transmitters only)**

V Series Transmitters may be optionally configured for up to four power output levels. In manual mode, RF output power level is controlled with a HIGH PWR – LOW PWR switch accessible through the chassis lid. Only the highest and lowest power can be selected in manual mode. If your transmitter is configured with 3 or 4 power output levels, you must use the presets or remote mode to select the middle power levels. The switch is inactive if the transmitter is purchased with only one power output.

To select the higher RF output power level, position the slide switch to HIGH PWR as indicated on the unit label. To select the lower RF output power level, position the slide switch to LOW PWR as indicated on the unit label.

7.2.7. **SECURE - CLEAR Switch**

All AMP V series Video Transmitters and Receivers are standard equipped with video inversion, selectable with a Secure-Clear slide switch accessible through the chassis lid. When selected, the phase of the video signal is inverted (shifted 180°) in the transmitter and re-inverted in the receiver, providing a basic level of security. If an inverted video signal is detected by a receiver not configured for inversion, the resulting picture is scrambled.

To select standard video (no inversion), position the slide switch to CLEAR as indicated on the unit label. To select inverted video (phase inversion), position the slide switch to SECURE as indicated on the unit label.

The video inversion switch position on AMP’s Receivers must match that of the transmitter or the picture will appear scrambled. If using AMP’s Transmitters with other receivers or vice-versa, position the Video Inversion slide switch to CLEAR.

7.2.8. **DIM / BRIGHT / OFF (receivers only)**

The Dim/Bright/Off switch is present on VSR1 and VDR1 receivers equipped with LED Received Signal Strength Indicator (RSSI) meters. It is a momentary switch, accessible through the chassis lid, that toggles through DIM, BRIGHT, and OFF for the LED RSSI meters (when applicable).

7.3. **Camera Supply Output (transmitters only)**

V Series Transmitters offer +12 Vdc Camera Supply Output. The Camera Supply Output is linearly regulated with approximately 0.5V Drop-Out Voltage, meaning the Camera Supply Output voltage will be +12 Vdc for all transmitter DC input voltages above +12.5 Vdc. For all transmitter DC input voltages less than +12.5 Vdc, the Camera Supply Output voltage will be approximately 0.5 Vdc less than the input voltage. The output current limit on the +12 Vdc Camera Supply Output is 250 mA. The Camera Supply Output is only active when DC power is applied to the Transmitter.
7.4. Auxiliary Supply Output (receivers only)

V Series receivers offer +12 Vdc Auxiliary Supply Output. The Auxiliary Supply Output is linearly regulated with approximately 0.5V Drop-Out Voltage, meaning the Auxiliary Supply Output voltage will be +12 Vdc for all transmitter DC input voltages above +12.5 Vdc. For all receiver DC input voltages less than +12.5 Vdc, the Auxiliary Supply Output voltage will be approximately 0.5 Vdc less than the input voltage. The output current limit on the +12 Vdc Auxiliary Supply Output is 1.5 A. The Auxiliary Supply Output is only active when DC power is applied to the Receiver.

7.5. Audio Output(s) (receivers only)

V Series Receivers, when equipped for audio, offer dual buffered audio outputs for each channel. Up to two channels may be specified.

When one channel is specified, the audio output signal is available on both pins 1 (-10 dBV level) and 2 (+4 dBu level) of the Audio Connector and the mono prong of the 3.5mm Jack (-10 dBV level). The outputs are buffered providing one audio output for monitoring (3.5mm Jack) and one for recording (Audio Connector). All audio outputs are 100 Ohms output impedance, unbalanced, at the specified line levels.

When two channels are specified, the audio output signals are available on pins 1 (-10 dBV level, Audio Left), 2 (+4 dBu level, Audio Left), 4 (-10 dBV level, Audio Right), and 5 (+4 dBu level, Audio Right) of the Audio Connector and the mono (-10 dBV level, Audio Left) and stereo (-10 dBV level, Audio Right) prongs of the 3.5mm Jack. A 3.5mm Stereo Plug to Dual Mono Jack Adapter may be used to separate the audio signals into two 3.5mm mono ports. All audio outputs are buffered providing simultaneous monitoring and recording of all outputs. All outputs are 100 Ohms output impedance, unbalanced, at the specified line levels.

7.6. Signal Strength Meters (receivers only)

V Series Receivers are standard equipped with single (VSR1) or dual (VDR1) Signal Strength Meters on the chassis. Received signal strength is indicated by the meter(s) when the receiver is powered.

The LCD meter reads similar to an analog fuel gauge, such that when the bar is towards the left signal strength is low (far left ≈ -90 dBm) and when the bar is towards the right signal strength is high (far right ≈ -30 dBm).

The LED meter reads similar to cell phone bars, such that when one LED bar is lit the signal strength is low and when all bars are lit the signal strength is high. A single flashing LED indicates that the signal is at risk of being lost or has been lost. Units equipped with LED Signal Strength meter(s) utilize either a set of slide switches clearly labeled for turning the LED display(s) On/Off and Dim/Bright or a single pushbutton switch which toggles among Dim/Bright/Off when depressed.

The Signal Strength Meters may aide in antenna alignment. The outline drawings for each receiver show the relationship between RF Input ports and RSSI meters. RSSI Meter-1 indicates RSSI for RF Input-1 and RSSI Meter-2 (VDR1) indicates RSSI for RF Input-2. Position the antennas to maximize RSSI on both input ports.

If a meter exhibits a display full of flashing bars, signal strength is excessive and damage to the receiver front end may occur. Do not rely on flashing bars to indicate levels that may cause receiver damage. Damage may occur at lower levels, thereby preventing flashing bars from occurring.

On the VDR1 Series receivers, a proprietary voting circuit continuously samples RSSI from both input ports and passes the higher power signal to the video output. The RSSI output pin on the I/O connector is derived from the higher of the two signals and is proportional to the higher of the two meters at all times.
7.7. Use of Heat Sink

VST1 Transmitters operating at or above 500 mW require the use of a heat sink or must be securely fastened to an adequate heat sinking object or surface. Advanced Microwave Products recommends the SNK3513-S06B0 heat sink for use with the VST1 transmitter.

V Series transmitters should be fastened to AMP heat sinks using provided pan head or socket head screws with lock washers. 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.

7.8. Mating Connectors

The V series transmitters and receivers use an industry standard 9 Pin Micro-D connector for power and communication connections and 9 socket Micro-D connector for audio or data where applicable. AMP offers optional mating connectors to wire your product. AMP mating connector WHSMDM9-SSLH0 is used for power and communication and AMP mating connector WHSMDM9-SPLH0 is used (when applicable) for audio or data. The mating connectors come with 18” flying leads and are colored in compliance with MIL-STD-681E Identification Coding and Application of Hookup and Lead Wires as shown in the diagrams below.
7.9. 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 7.2. To assure optimum performance, the user should be familiar with the camera, monitor, microphone, speaker/headphones, data source, and data monitor used with this video system.

7.10. 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.

8. MAINTENANCE INSTRUCTIONS

8.1. Cleaning

AMP Transmitters and Receivers 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.

8.2. Troubleshooting

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

Verify configuration of all switches (refer to Section 7.2). 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 and Receivers 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.

For audio applications, if receiving video but no audio, check connections between microphone and Audio Cable. Also check microphone and Audio Cable for damage.

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.
8.3. 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.

8.4. 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
9. 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 OF 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.
AMP channelized V Series Transmitters and Receivers can be programmed via three rotary selection switches located on the top of the product. There are three modes for configuration: Manual Mode, Preset Configuration Mode, and Remote Configuration Mode. The Manual Mode utilizes the BCD rotary switches for frequency selection per the diagrams below, the white digits of the frequency will always be the same, so there is no rotary selection switch for those digits. The yellow, green, and blue digits are set via the corresponding rotary switch. Frequencies selected outside the operating frequency of the transmitter will default to closest functional frequency.

Pre-set Mode, selected when the two 10-position (BCD, 0-9) switches are set to zero and the 16-position (binary, 0-F) is set to any position 1-F, allows local selection among 15 pre-set configurations. The VST1 transmitter ships from the factory with the 15 pre-sets configured with all options “ON” and set to their max settings with the frequencies set per the table below. Pre-sets may be changed utilizing HyperTerminal or other devices connected to the communications port. Pre-sets are reprogrammable using Remote Mode, selected when all three rotary switches are set to zero. “Remote Only” VST1 transmitters have no rotary switches installed.

Remote Configuration Mode allows you to program your products Preset Configuration Mode or control the product real time via the communication port (pins 6-9 on the MDM-9S power mating connector). See the Mechanical Drawing and Connector Pin-Outs of the applicable product.

To set the Transmitter or Receiver to Remote Configuration Mode, all three rotary BCD switches must be in the “0” position. See the ICD for details on programming your product.