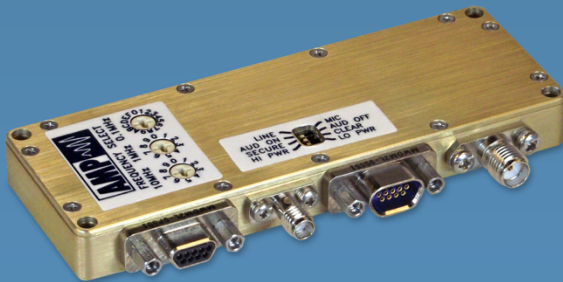


Operation Manual

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

TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1.	Purpose and Function	1
1.2.	Capabilities	1
1.3.	Environmental Requirements	1
2.	VST1 TRANSMITTER	2
2.1.	VST1 Specifications	2
2.2.	VST1 Mechanical Drawing and Connector Pin-Outs	3
2.3.	VST1 List of Items Furnished	3
2.4.	VST1 Optional Accessories	3
2.5.	VST1 List of Items Required	3
3.	VSR1 RECEIVER	4
3.1.	VSR1 Specifications	4
3.2.	VSR1 Mechanical Drawing and Connector Pin-Outs	5
3.3.	VSR1 List of Items Furnished	5
3.4.	VSR1 Optional Accessories	5
3.5.	VSR1 List of Items Required	5
4.	VDR1 DIVERSITY RECEIVER	6
4.1.	VDR1 Specifications	6
4.2.	VDR1 Mechanical Drawing and Connector Pin-Outs	7
4.3.	VDR1 List of Items Furnished	7
4.4.	VDR1 Optional Accessories	7
4.5.	VDR1 List of Items Required	7
5.	SAFETY PRECAUTIONS	8
6.	PREPARATION FOR USE	9
6.1.	Unpacking	9
6.2.	Transmitter Pre-Test	9
6.3.	Receiver Pre-Test	9
7.	INSTALLATION AND OPERATING INSTRUCTIONS	10
7.1.	Use and Function of Connectors	10
7.2.	Use and Function of Switches	10
7.2.1.	Frequency Selection Switches:	10
7.2.2.	LINE – MIC Switch (transmitters only)	10
7.2.3.	RS232 – TTL Switch (transmitters only)	10
7.2.4.	AUD ON – AUD OFF Switch	11
7.2.5.	DAT ON – DAT OFF Switch	11
7.2.6.	HIGH PWR – LOW PWR (transmitters only)	11
7.2.7.	SECURE - CLEAR Switch	11
7.2.8.	DIM / BRIGHT / OFF (receivers only)	11
7.3.	Camera Supply Output (transmitters only)	11
7.4.	Auxiliary Supply Output (receivers only)	12
7.5.	Audio Output(s) (receivers only)	12
7.6.	Signal Strength Meters (receivers only)	12
7.7.	Use of Heat Sink	13
7.8.	Mating Connectors	13
7.9.	Initial Adjustments and Settings	14
7.10.	Shut Down	14

8.	MAINTENANCE INSTRUCTIONS	14
8.1.	Cleaning	14
8.2.	Troubleshooting	14
8.3.	Preparation for Reshipment	15
8.4.	Returning an Item	15
9.	WARRANTY STATEMENT	16
10.	FREQUENCY PROGRAMMING CHART	17

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

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 (Specify):	Full Band Channelized - Remote Control Only or Remote/Programmable Switch/Local BCD		
Frequency Stability:	±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:	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)		

Power Requirements

Input Voltage:	+11 to +16 Vdc, Reverse Polarity Protected		
Current Draw (Typical at 12V):	200mA for 250mW, 300mA for 500mW, 400mA for 1W, or 650mA for 2W		
Current Draw, PA Disabled:	70 mA, Typical		
Camera Supply Output:	+12 Vdc, 250mA Current Limit		

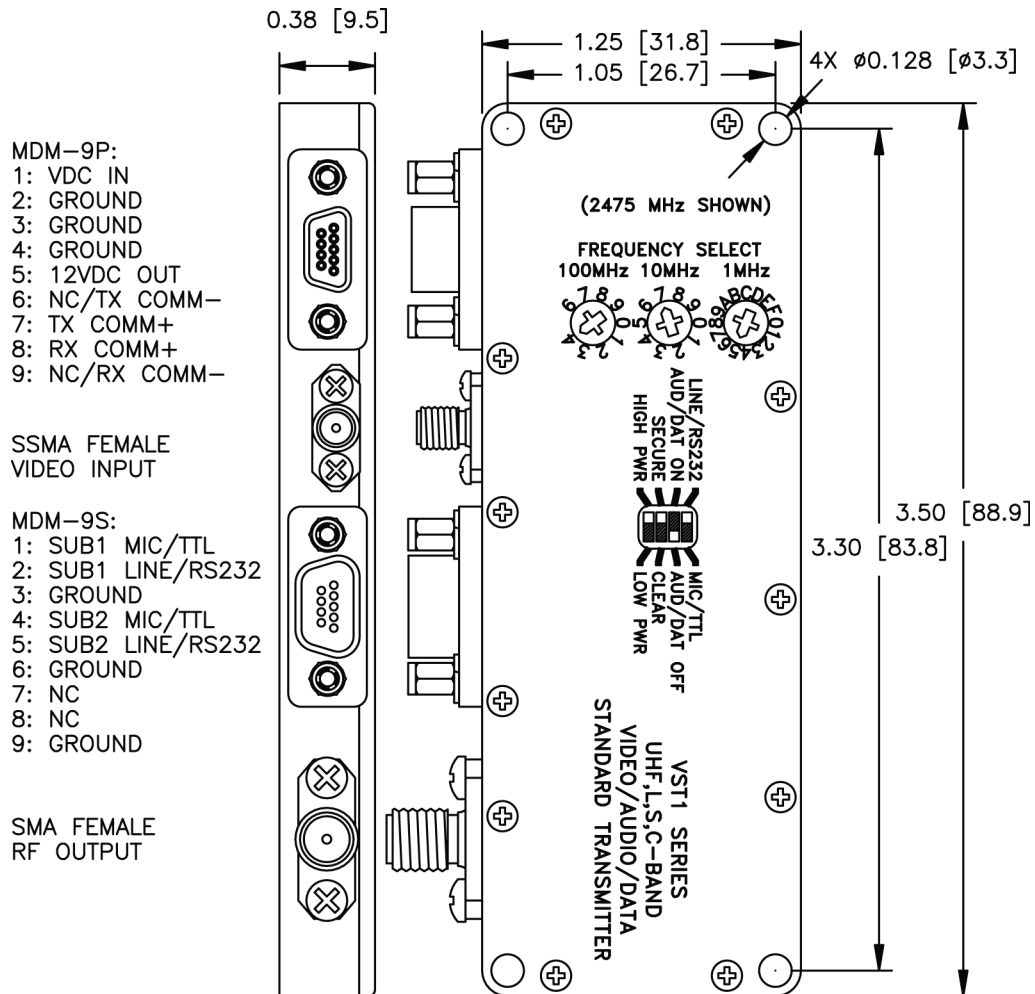
Mechanical

Material:	CNC Machined T6061-T6 Aluminum		
Finish (Specify):	Nickel Plated or Gold Iridite		
Dimensions:	1.25" W x 3.50" L x 0.375" H		
Weight:	<1.7 oz.		
Connectors:	RF Output:	SMA Female	
	Video Input:	SSMA Female	
	DC Supply, Comms, Cam Supply:	MDM-9P	
	Audio Inputs, Data Inputs:	MDM-9S	

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		

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

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
	Dual L/S-Band:	1700-1850/2200-2499 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 (Specify):	Full Band Channelized - Remote Control Only or Remote/Programmable Switch/Local BCD		
Maximum RF Input:	+10 dBm Without Damage		
Input Impedance:	50 Ω Nominal, VSWR 2:1 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: 153.6 MHz, L/S: 374 MHz, C/S: 5.8 GHz; 480 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 (10Hz to 4.2MHz, 525 Line D/E) or PAL (10Hz to 5.0MHz, 625 Line D/E), +/- 1.5db		
Output Level:	1 Vpk-pk/ ± 4 MHz @ Crossover Frequency into 75 Ω Load		
Output Impedance:	75 Ω Nominal, Unbalanced		

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:	$\pm 0.5\%$ 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 ± 1.5 dB (Audio) or DC to 50 kbps (Data)		
De-Emphasis:	75 μ sec NTSC or 50 μ sec PAL (Audio) or None (Data)		
Output Level:	-10 dBV and +4 dBu Line / 150 kHz pk-pk @ 1 kHz Rate into 10 k Ω Load (Audio) or RS232 and TTL / 150 kHz pk-pk Deviation (Data)		
Output Impedance:	100 Ω Nominal, Unbalanced (Audio) or 300 Ω (Data)		

Configuration Interface Characteristics

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

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		

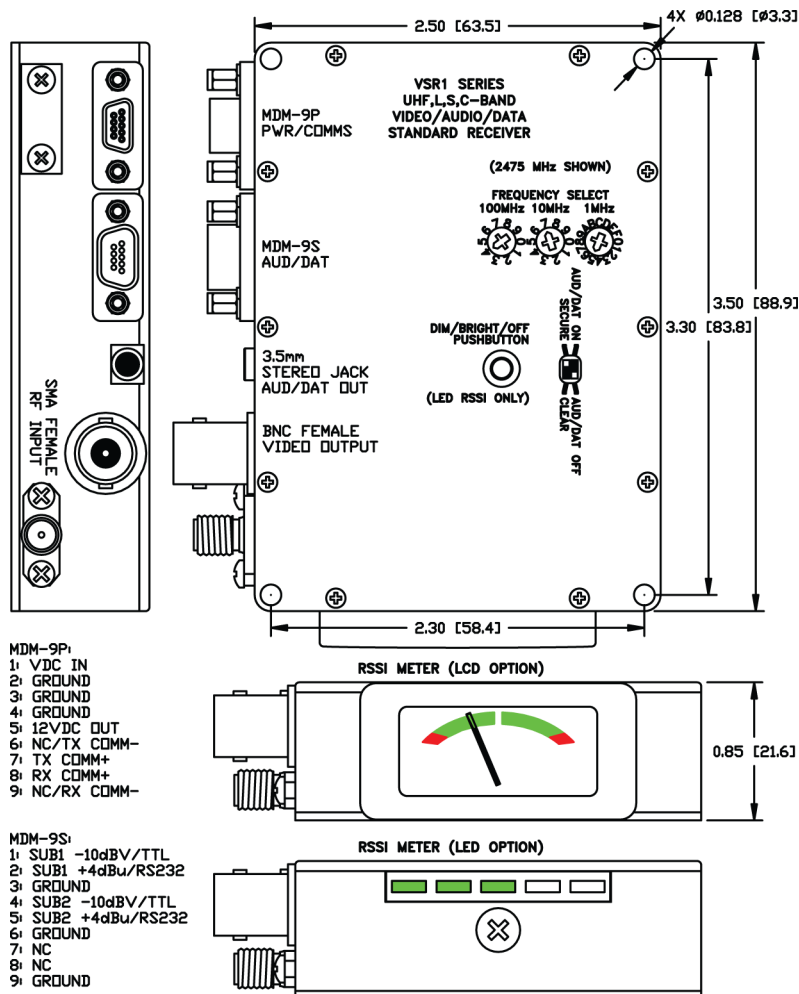
Mechanical

Material:	CNC Machined T6061-T6 Aluminum		
Finish (Specify):	Nickel Plated or Gold Iridite		
Dimensions:	2.50" W x 3.50" L x 0.85" H		
Weight:	<6 oz.		
RSSI Display (Specify):	LCD Analog Bar Meters or LED Light Bars - Local Enable and Intensity Control (LED)		
Connectors:	RF Input:	SMA Female	
	Video Output:	BNC Female	
	DC Supply, 12V Out, Comms:	MDM-9P	
	Audio Output, Data Output	MDM-9S	
	Audio Output:	3.5mm Stereo Jack	

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		

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

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
	Dual L/S-Band:	1700-1850/2200-2499 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 (Specify):	Full Band Channelized - Remote Control Only or Remote/Programmable Switch/Local BCD		
Maximum RF Input:	+10 dBm Without Damage		
Input Impedance:	50Ω Nominal, VSWR 2:1 Maximum		
Noise Figure:	< 3 dB		
Image Rejection:	> 60 dB		
Signal Strength Output:	Local Displays and Remote Query		
Voting Characteristics	RSSI Based, >150 kHz Voting Rate		

LO/IF Characteristics

LO Stability:	±5 ppm Over -20°C to +60°C
IF Frequency:	UHF: 153.6 MHz, L/S: 374 MHz, C/5.8 GHz: 480 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 (10Hz to 4.2MHz, 525 Line D/E) or PAL (10Hz to 5.0MHz, 625 Line D/E), +/- 1.5dB
Output Level:	1 Vpk-pk±4 MHz @ Crossover Frequency into 75Ω Load
Output Impedance:	75 Ω Nominal, Unbalanced

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 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)
De-Emphasis:	75 μsec NTSC or 50 μsec PAL (Audio) or None (Data)
Output Level:	-10 dBV and +4 dBu Line / 150 kHz pk-pk @ 1 kHz Rate into 10 kΩ Load (Audio) or RS232 and TTL / 150 kHz pk-pk Deviation (Data)
Output Impedance:	100Ω Nominal, Unbalanced (Audio) or 300Ω (Data)

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)

Power Requirements

Input Voltage:	+11 to +16 Vdc, Reverse Polarity Protected
Current Draw (Typical at 12V):	280 mA
Auxiliary Supply Output:	+12 Vdc, 0.5 A Current Limit

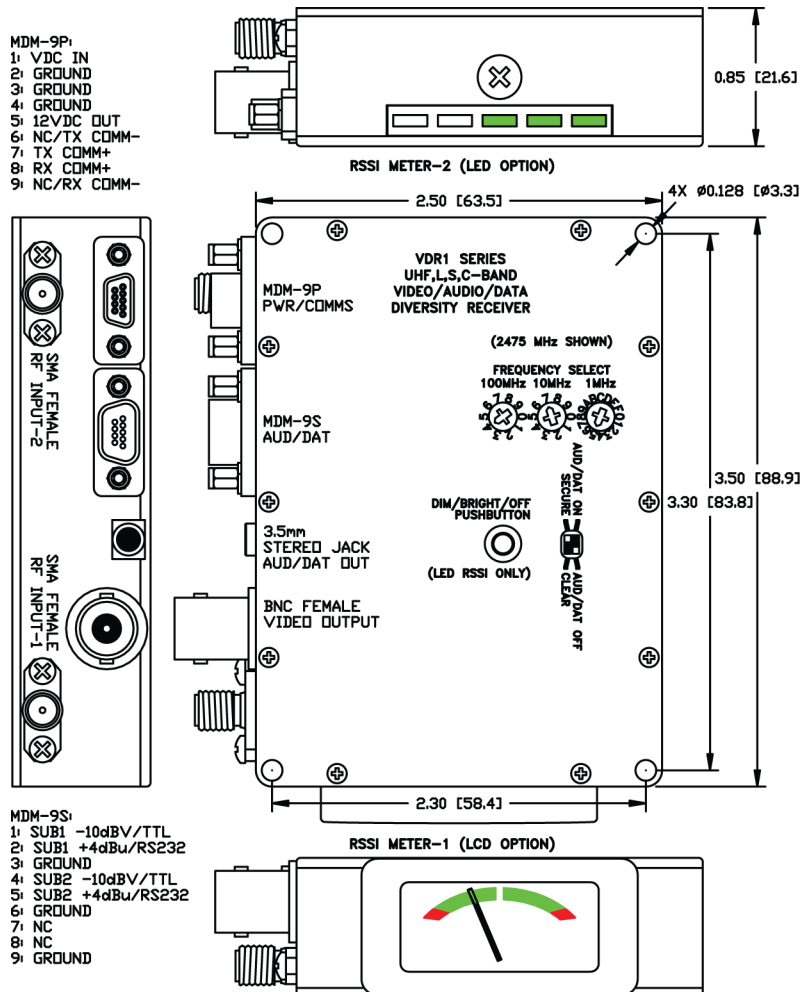
Mechanical

Material:	CNC Machined T6061-T6 Aluminum	
Finish (Specify):	Nickel Plated or Gold Iridite	
Dimensions:	2.50" W x 3.50" L x 0.85" H	
Weight:	<6.5 oz.	
RSSI Displays (Specify):	LCD Analog Bar Meters or LED Light Bars - Local Enable and Intesity Control (LEDs)	
Connectors:	RF Inputs:	SMA Female
	Video Output:	BNC Female
	DC Supply, 12V Out, Comms:	MDM-9P
	Audio Output, Data Output	MDM-9S
	Audio Output:	3.5mm Stereo Jack

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

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/meter². The second table is for transmitters operating in the 340-400 MHz range where the MPE is 2.27 Watts/meter². See following page 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

Operating Frequency 340 - 400 MHz (MPE = 2.27 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		Transmitter Power 10 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)	EIRP (Watts)	Minimum Distance (Meters)
0	0.25	>0.20	0.5	>0.20	1	>0.20	2	0.26	5	0.42	10	0.59
2	0.4	>0.20	0.79	>0.20	1.58	0.24	3.17	0.33	7.9	0.53	15.8	0.75
5	0.79	>0.20	1.58	0.24	3.16	0.33	6.32	0.47	15.8	0.74	31.6	1.05
10	2.5	0.3	5	0.42	10	0.59	20	0.84	50	1.32	100	1.87
15	7.91	0.53	15.8	0.74	31.6	1.05	63.2	1.49	158.1	2.35	316.2	3.33
20	25	0.94	50	1.32	100	1.87	200	2.65	500	4.19	1000	5.92
25	79.1	1.66	158.1	2.35	316.2	3.33	632.5	4.71	1581.1	7.45	3162.3	10.53
30	250	2.96	500	4.19	1000	5.92	2000	8.37	5000	13.24	10000	18.72

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 \approx -90 dBm) and when the bar is towards the right signal strength is high (far right \approx -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 aid 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

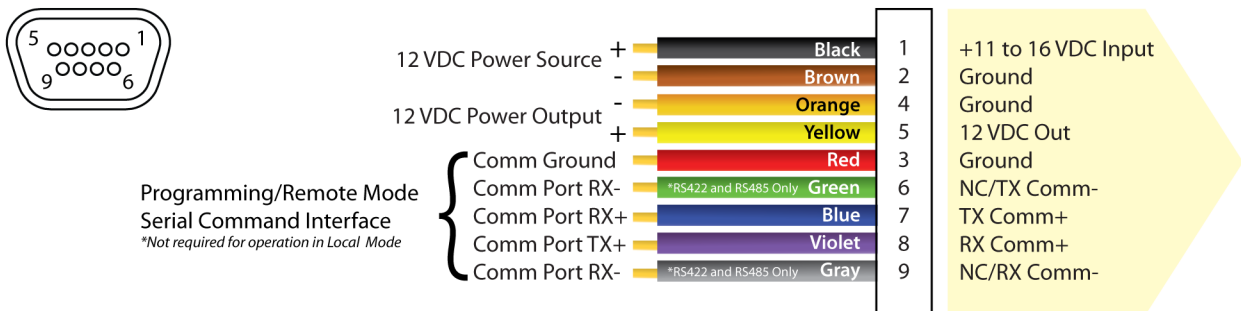
VST1 Transmitters operating at or above 500 mW require the use of a heat sink or must be securely fastened to an adequate heat sinking object or surface. Advanced Microwave Products recommends the SNK3513-S06B0 heat sink for use with the VST1 transmitter.

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.

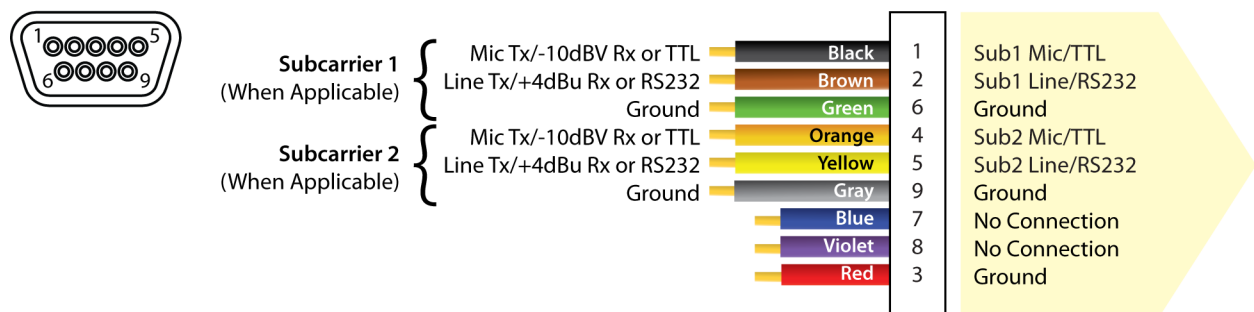
7.8. Mating Connectors

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.

Mating Connector WHSMDM9-SSLH0



Mating Connector WHSMDM9-SPLH0



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:

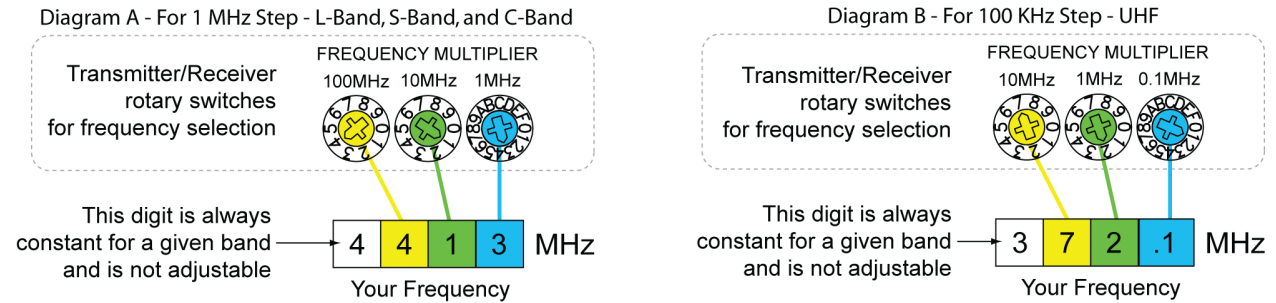
- 1) End items included as part of a system, but not designed by, AMP are subject only to warranty as may be obtained from the original manufacturers. Such items include, but are not limited to, batteries, cameras, monitors, cabling, etc.,
- 2) Operation outside of the environmental specifications of 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 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.

10. FREQUENCY PROGRAMMING CHART

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.

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

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.