VMV-402 Remote Control Protocol Document

Version 4.18

Purpose

This document is intended for use by engineers and coders using the Marshall VMV-402 Quad / Switching processor in a remote control environment.

The Marshall VMV-402-SH is controllable via Ethernet, USB or IR (infra-red optical remote).

The first part of this document covers Ethernet and USB control.

IR control is covered in the second part.

Commands are shown here with hexadecimal values (HEX). This document does not use cumbersome nomenclature like 0xAE or &a7. Each byte is shown here simply as character pairs in **BOLD** and **CAPS**.

Part 1: Ethernet & USB

Ethernet Control – Key Points

Connection

Ethernet mode may be Static or DHCP (auto addressed from router).

Bytes are transmitted via TCP to Port 9760. This is a fixed port number and does not change.
Commands are organized into strings that are typically 5 bytes long with a byte count as the first byte and a checksum as the last. The major exception is label text. Those strings are 26 bytes long.

USB Control – Key Points

Communication via USB is transmitted as RS-232 protocol. That is, connecting to the USB port will create a "Comm Port Number" in the host computer. (The Comm Port number can be viewed in the Windows Device Manager). Transmission is through this Port Number created by the computer, just as it would be with a real hardware RS-232 serial connection. Some applications will automatically select the right settings. When they must be entered manually, the settings in the table MUST be used or communication will fail.

Baud Rate	Data	Stop	Parity	Flow Control
115200	8-bits	1-bit	None	None

As noted above, command strings are the same whether using USB or Ethernet connectivity.

Command Format, Checksums and Response Code

Format

Here, as an example, is the command string for "Switch to Quad Mode".
05 90 09 00 9E
Byte-by-byte description
05 = Count of all Bytes in Command Including Checksum
90 = Command - Main
09 = Command - Sub Type
00 = Data / Value / Selection
9E = Checksum

Calculating a Checksum

The Checksum is a simple sum of all hexadecimal byte values. Any "carry" is discarded.

In the string above, the sum of the command bytes 05 + 90 + 09 + 00 = 9E. When there is a larger sum like 05 + 90 + 90 = 125, the checksum will be 25.

In most of the examples below, the Checksum has already been calculated. You may be able to simply copy/paste these into control applications. Where there are many possible combinations in a string, The example Checksum is shown as "CHK". The actual sum will need to be calculated and added to complete the string.

Note: The calculator tool in Windows and many phones can be set to Programmer mode and then select HEX. After that, the numbers may simply be added up to find the checksum.

Response from the VMV-402-SH

The response to valid commands will be these two three-byte strings.

03 81 84 03 82 85

Invalid commands (such as those with the wrong Checksum) will get the following response.

03 01 04 03 82 85

List of Commands

Switch Individual Inputs

Switch to Input 1 **05 90 00 00 95**
Switch to Input 2 **05 90 00 01 96**
Switch to Input 3 **05 90 00 02 97**
Switch to Input 4 **05 90 00 03 98**

Switch Output to Quad Mode

(all four inputs selected, combined in quadrants)

05 90 09 00 9E

Mute Audio Out

Silences all audio on SDI, HDMI and the front panel headphone output.

Mute **05 90 07 00 9A**
Unmute **05 90 07 01 9B**

Audio Bar Overlay

Audio bars do not appear in Quad output mode.

Audio Bars On **05 90 05 01 9B**
Audio Bars Off **05 90 05 00 9A**

Video Out Levels and Effects

Output levels

Video levels can be adjusted in the range of 00 – FE (0 – 254 decimal).
Default mid-range value is 80 (128 decimal).

Replace XX in the strings below with the desired levels (hex values).
Replace CHK with the calculated Checksum Byte.

Brightness (Pedestal)	**05 90 0F XX CHK**
Saturation (Chroma Level)	**05 90 12 XX CHK**
Contrast (Luma Level)	**05 90 11 XX CHK**
Hue (Rotate Chroma Vectors)	**05 90 10 XX CHK**

Note: "Hue" is a legacy function originally designed to correct errors in NTSC (standard definition) signals. Its use has little benefit with digital signals. "Correcting" one color in this way will offset other colors equally. It may have some value where digital signals have been converted from analog.

Image Orientation and Position

Image Flip (upside-down):	**90 13 01 A9**	**No Flip: 05 90 13 00 A8**
Image Mirror (reverse image horizontally)	**05 90 14 01 AA**	**No Mirror 05 90 14 00 A9**

Note: Mirror and Flip functions affect the entire Output frame.
In Quad mode, the complete Quad display is flipped or mirrored, not the individual sections.

Image Shift

The Output image position can be incrementally shifted horizontally or vertically or both.
Horizontal position offset range is 00 – C8 (0 – 200 decimal). Default center is 64 (100 decimal).

Replace XX in the strings below with the desired position offset value .
Replace CHK with the calculated Checksum byte.

05 90 15 XX CHK

Vertical position range is 00 – 64 (0 – 100 decimal). Default center is 32 (50 decimal).

Replace XX in the strings below with the desired value.
Replace CHK with the calculated Checksum byte.

05 90 16 XX CHK

Quad Mode Functions

Labels On/Off

Labels On **05 90 0C 01 A2**
Labels Off **05 90 0C 00 A1**

Borders On/Off

Borders are black edges that crop each quadrant
Borders On **05 90 0B 01 A1**
Borders Off **05 90 0B 00 A0**

Label Position

Label position may be set independently for each quadrant.

Replace XX in the string below with the desired quadrant number (0 – 3).
Replace YY in the string below with the desired position number from the table.
Replace CHK with the calculated Checksum byte.

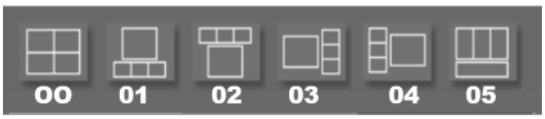
06 90 0A XX YY CHK

00	Top Left	03	Bottom Left
01	Top Mid	04	Bottom Mid
02	Top Right	05	Bottom Right

Pattern Selection

Six different Quad mode patterns are available.
Replace XX in the string below with the desire pattern number.
Replace CHK with the calculated Checksum byte.

05 90 03 XX CHK



Label Text

Labels are more complex than other commands with the following limitations:

- The command string must always be 26 Bytes long
- The first Byte (byte count) will always be 1A (decimal 26 = hex 1A)
- Labels may contain up to 20 displayable characters and numbers (decimal 20 = hex 14)
- When there are fewer than 20 characters, the rest of the space must be “padded” with empty bytes
- Any value may be used for “pad”, but using 00 greatly simplifies Checksum calculation

Character and number codes are from a MODIFIED ASCII table that is shifted by HEX 20. In essence, the commands section of a standard ASCII table are eliminated and the first character, HEX 00 represents “Space”, HEX 21 represents “A” and so on.

Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char
00	Space	10	0	20	@	30	P	40	`
01	!	11	1	21	A	31	Q	41	a
02	"	12	2	22	B	32	R	42	b
03	#	13	3	23	C	33	S	43	c
04	$	14	4	24	D	34	T	44	d
05	%	15	5	25	E	35	U	45	e
06	&	16	6	26	F	36	V	46	f
07	'	17	7	27	G	37	W	47	g
08	(	18	8	28	H	38	X	48	h
09	)	19	9	29	I	39	Y	49	i
0A	*	1A	:	2A	J	3A	Z	4A	j
0B	+	1B	;	2B	K	3B	[	4B	k
0C	,	1C	<	2C	L	3C	\	4C	l
0D	-	1D	=	2D	M	3D	]	4D	m
0E	.	1E	>	2E	N	3E	^	4E	n
0F	/	1F	?	2F	O	3F	_	4F	o

The format for the Label command is:

Byte 1 Byte count (always 1A)
Byte 2 Command Main Type (90)
Byte 3 Command Sub Type (0D)
Byte 4 Quadrant Number (0 – 3)
Byte 5 Number of Message Characters (Including Spaces)
Bytes 5 – 25 Label (ASCII values) + Pad (zeros)
Byte 26 Checksum

Replace XX in the string below with the Quadrant number (00 – 03).
Replace YY in the string below with the length of the text message (including spaces).
Replace Pads (00) with text characters (ASCII values). Replace CHK with the calculated Checksum byte.

1A 90 0D XX YY 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 CHK

Here is a sample string that says “ABCD 1” in the first quadrant

1A 90 0D 00 06 31 32 33 34 00 21 00 00 00 00 00 00 00 00 00 00 00 00 00 18

Video Output Format & Frame Rate

This single command controls both the SDI and HDMI outputs
The SDI output can range from 720p50 up to 1080p60
The HDMI output can range from 720p50 up to UHD 2160p60
When a UHD format is selected, the HDMI output will switch to UHD (4:2:0 sampling) while the SDI output will switch to 1080p at the same frame rate.

For example:
When UHD 2160p59.94 is selected, the HDMI output will be UHD while the SDI output will be 1080p59.94.
Note: UHD output formats are created by internal upscaling.
The 3G SDI inputs do not accept UHD.

Replace XX in the string below with the value from the table.
Replace CHK with the calculated Checksum byte

05 90 01 XX CHK

VALUE	FORMAT	VALUE	FORMAT	VALUE	FORMAT
00	HD 1080p60	01	HD 720p60	1C	UHD 2160p60
11	HD 1080p59.94	17	HD 720p59.94	1D	UHD 2160p59.94
12	HD 1080p50	18	HD 720p50	1E	UHD 2160p50
13	HD 1080p30	19	HD 1080i60	1F	UHD 2160p30
14	HD 1080p29.97	1A	HD 1080i59.94	20	UHD 2160p29.97
15	HD 1080p25	1B	HD 1080i50	21	UHD 2160p25
16	HD 1080p23.98			22	UHD 2160p24

Ethernet Network Modes

A control application is available on the Marshall-USA.com website. This application offers control via USB (RS-232 over USB), Ethernet Static and Ethernet DHCP. The control application will NOT work in DHCP mode until it has first connected via USB or Static IP which allows it to acquire the MAC address of the unit.

The following commands allow changing the network address via Ethernet or USB. When doing this via Ethernet, it should come as no surprise that communication will be lost since the address will have changed and reconnecting via the new IP address will be required.

Note: Changing the IP address will cause the VMV-402-SH to restart.

Setting a Static address

Replace X's in the string below with the desired new IP address.
Replace Y's with the desired Subnet Mask.
Replace Z's with the desired Gateway address.
Add Checksum to end of string.

The string length will always be 24 Bytes so the first Byte is always 18

18 13 01 XX XX XX XX YY YY YY YY ZZ ZZ ZZ ZZ 00 00 00 00 00 00 00 00 CHK
In the example string below:
IP address is set to 192.168.1.110
Subnet Mask is 255.255.255.000
Gateway is 192.168.1.1

18 13 01 C0 A8 01 6E FF FF FF 00 C0 A8 01 01 00 00 00 00 00 00 00 00 6A

Setting DHCP mode (router assigns the address automatically)

Note: When the mode is changed from Static to DHCP, the IP address may change. A method to determine the new address should be considered before doing this. As noted above, the control application from the Marshall-USA.com website will not find the VMV-402-SH in DHCP mode unless it has previously been connected via USB or Static IP.
Discovering the new IP address may include using a network scanner, inspecting the table in the local router or connecting via USB with the Control App.
Set DHCP Mode.
05 90 24 01 BA
Unset DHCP Mode (return to Static address).
05 90 24 00 B9

Get Software Version

04 12 F0 06

The VMV-402-SH responds with 14 Bytes.

Byte #5 starts with ASCII “V”.
This string represents this version.
03 81 84 07 56 65 72 20 34 2E 34 03 82 85
Replacing the ASCII values with text, we see that the version is 4.4
03 81 84 07 V e r 4 . 4 03 82 85

Part 2: IR Remote Commands

The Marshall VMV-402-SH may be controlled via the front panel IR sensor. An extension sensor is provided for situations where the unit may be in an enclosed space. A small hand-held remote transmitter is also included.

The commands are all shown here as strings of hexadecimal (HEX) values.
Functions shown as” On/Off “are toggles. The same code sets On then sent again sets Off.

All strings total 01 F0

Switch Individual Inputs

Switch to Input 1 **86 6B 01 FE**
Switch to Input 2 **86 6B 02 FD**
Switch to Input 3 **86 6B 04 FB**
Switch to Input 4 **86 6B 05 FA**

Quad Output On **86 6B 1E E4**
(To turn Quad Output Off, select any Input)

Audio Meter Bar Overlay On/Off **86 6B 06 F9**

Audio Mute On/Off **86 6B 07 F8**

Quad View Labels On/Off **86 6B 09 F6**

Quad View Borders On/Off **86 6B 08 F7**

Quad Pattern 1 **86 6B 1F E0**
Quad Pattern 2 **86 6B 0C F3**
Quad Pattern 3 **86 6B 0D F2**
Quad Pattern 4 **86 6B 0E F1**
Quad Pattern 5 **86 6B 0F F0**

Info Display **86 6B 0A F5** (displays in quad mode)