KRAMER VM-10H2 4K HDMI Module

KRAMER VM-10H2 4K HDMI Module User Manual

Contents

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Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront video, audio, presentation, and broadcasting professionals daily. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment.
- Review the contents of this user manual. Go to **www.kramerav.com/downloads/VM-10H2** to check for up-to-date user manuals, and application programs, and to check if firmware upgrades are available (where appropriate).

Achieving the Best Performance

- For optimum range and performance, use the recommended Kramer cables available at **www.kramerav.com/product/VM-10H2**.
- Do not secure the cables in tight bundles or roll the slack into tight coils.
- Avoid interference from neighbouring electrical appliances that may adversely influence signal quality.
- Position your Kramer VM-10H2 away from moisture, excessive sunlight and dust. This equipment is to be used only inside a building. It may only be connected to other equipment that is installed inside a building.

Safety Instructions

Caution

- This equipment is to be used only inside a building. It may only be connected to other equipment that is installed inside a building.
- For products with relay terminals and GPI\O ports, please refer to the permitted rating for an external connection, located next to the terminal or in the User Manual.
- There are no operator-serviceable parts inside the unit.

Warning

- Use only the power cord that is supplied with the unit.
- Disconnect the power and unplug the unit from the wall before installing it.
- Do not open the unit. High voltages can cause electrical shock! Servicing by qualified personnel only.
- To ensure continuous risk protection, replace fuses only according to the rating specified on the product label which lis ocated on the bottom of the unit.

Recycling Kramer Products
The Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC aims to reduce the amount of WEEE sent for disposal to landfill or incineration by requiring it to be collected and recycled. To comply with the WEEE Directive, Kramer Electronics has made arrangements with the European Advanced Recycling Network (EARN) and will cover any costs of treatment, recycling and recovery of waste Kramer Electronics branded

equipment on arrival at the EARN facility. For details of Kramer's recycling arrangements in your particular country go to our recycling pages at **www.kramerav.com/support/recycling**.

Overview

Congratulations on purchasing your Kramer VM-10H2 4K HDMI 2.0 1:10 DA. The VM-10H2 is a 1:10 distribution amplifier for up to 4K@60Hz (4:4:4) HDMI 2.0 signals, complying with HDCP 2.2 content protection standards. The unit takes one HDMI input, equalizes and reclocks the signal, and distributes it to ten identical outputs.

Exceptional Quality

- High-Performance Distributor – Professional 1:10 HDMI distributor for up to 4K@60Hz (4:4:4) video resolution signals. One HDMI 2.0 HDCP 2.2 input signal is amplified and distributed to ten identical output signals, with signals rebuilt using Kramer Equalization & re-Klocking™ Technology to gain longer distances.
- HDMI Signal Transmission – HDR, HDMI 2.0 and HDCP 2.2 compliant signal, supporting deep colour, x.v.Color™, lip sync, 7.1 PCM, Dolby TrueHD, DTS-HD, 2K, 4K, and 3D. EDID and CEC (OUT 1 only) signals are passed through from the source to the displays.

Advanced and User-friendly Operation

- User-Friendly Operation – Comprehensive signal distribution features and signal mode-forcing options such as RGB forcing, HDCP authorization, and video-wall synced operation control. Intuitive EDID acquisition, selection, and setting using front panel buttons and LED indications. Auto-EDID feature for even simpler EDID operation.

Flexible Connectivity

- Cost-Effective Field Maintenance – Mini-USB connection for simple field firmware upgrade and easy EDID handling using the Kramer EDID-Designer tool. Selectable distributor maintenance options and status indicators for fast and effective troubleshooting.
- I-EDIDPro™ Kramer Intelligent EDID Processing™ – Intelligent EDID handling, processing and pass-through algorithm that ensures plug-and-play operation for HDMI source and display systems.
- Easy Installation – 19" enclosure for rack mounting a unit in a 1U rack space with included Simple distribution of high-resolution 4K signals in corporate, education, hospitality and government market segments.

Typical Applications

The VM-10H2 is ideal for the simple distribution of high-resolution 4K signals in corporate, education, hospitality and government market segments.

Controlling Your VM-10H2

Control your VM-10H2 by RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller using Protocol 3000 (see Protocol 3000).

Firmware Update

You can update to the latest version of firmware:

1. Set DIP-switch 8 down (to indicate a firmware update).
2. Power VM-10H2 OFF and ON for the new DIP-switch settings to activate. Optionally connect RS-232 to PC to use Hercules to track firmware upgrade progress.
3. Plug a USB cable from your PC to the mini-USB port on the VM-10H2. A toolbox folder (from the VM-10H2 device) opens on the PC.
4. Go to www.kramerav.com/downloads/VM-10H2 and copy the latest firmware file VM_10H2(P0.4F).bin to the open toolbox folder on the PC.
5. Unplug the USB cable. All output LEDs light on. Output LEDs 1-10 light in sequence. When all output LEDs are off, the update is complete. The model name is displayed by Hercules.
6. Set DIP-switch 8 up.
7. Power VM-10H2 OFF and ON for the update to take effect.

Defining the VM-10H2 4K HDMI 2.0 1:10 DA

This section defines the **VM-10H2**.

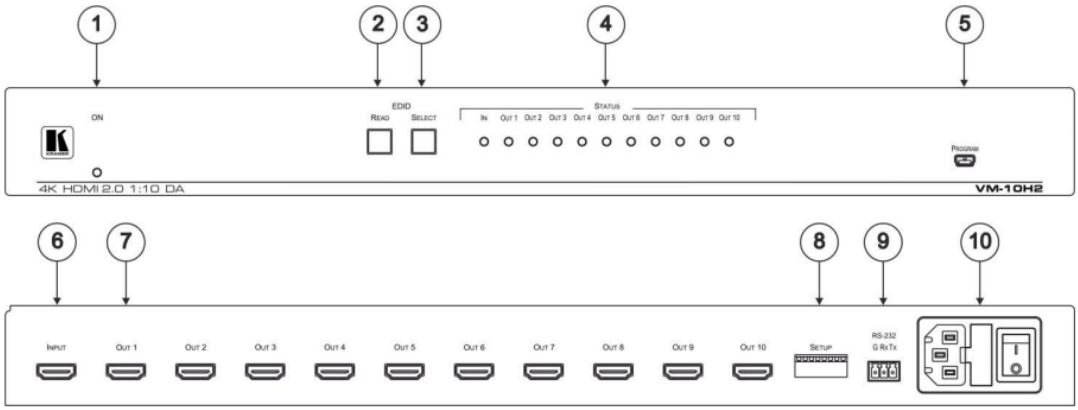


Figure 1: **VM-10H2 4K HDMI 2.0 1:10 DA** Front Panel

#	Feature	Function
1	ON LED	Lights green when the device is powered on.
2	EDID READ Button	Press to select the chosen output (see Operating the VM-10H2 on page 7).
3	EDID SELECT Button	Press to sequentially cycle through the outputs (see Operating the VM-10H2 on page 7).
4	STATUS IN and OUT LEDs	IN LED Lights green when an active input signal is detected. OUT LEDs (1 to 10) Lights green when an active output acceptor is detected, flashes when HDCP is not supported by the acceptor.
5	PROGRAM USB Connector	Use to upgrade the device firmware, also works with the EDID Designer.
6	INPUT HDMI Connector	Connects to the HDMI source.
7	OUT HDMI Connectors (1 to 10)	Connect to up to 10 HDMI acceptors (not all outputs need to be connected).
8	SETUP DIP-switches	Set the DIP-switches (see Setting the DIP-Switches on page 7).
9	RS-232 3-pin Terminal Block Connector	Connects to an RS-232 controller.
10	Power Socket, Fuse and Power Switch	Connects power to and switches the unit on and off.

Mounting VM-10H2

This section provides instructions for rack mounting VM-10H2. Before installing in a rack, verify that the

environment is within the recommended range:

- Operation temperature – 0º to 40ºC (32 to 104ºF).
- Storage temperature – -40º to +70ºC (-40 to +158ºF).
- Humidity – 10% to 90%, RHL non-condensing.
- VM-10H2 must be placed upright in the correct horizontal position.

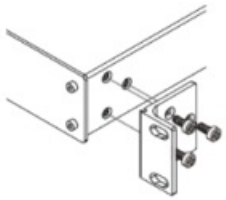
Caution

- Mount VM-10H2 in the rack before connecting any cables or power.

Warning

- Ensure that the environment (e.g., maximum ambient temperature & air flow) is compatible with the device.
- Avoid uneven mechanical loading.
- Appropriate consideration of equipment nameplate ratings should be used to avoid overloading of the circuits.
- Reliable earthing of rack-mounted equipment should be maintained.

To mount the VM-10H2 on a rack
Attach both ear brackets by removing the screws from each side of the machine and replacing those screws through the ear brackets or placing the machine on a table.



- For more information go to **www.kramerav.com/downloads/[Title]**

Connecting the VM-10H2

Always switch off the power to each device before connecting it to your VM-10H2. After connecting your VM-10H2, connect its power and then switch on the power to each device.

To connect the VM-10H2

1. Set the DIP-switches 8 as needed (see Setting the DIP-Switches on).
2. Connect an HDMI source (for example, a Blu-ray player) to the INPUT 6 connector.
3. Connect the ten OUT connectors 7 to up to ten HDMI acceptors (for example, 4K displays). Not all outputs must be connected.
4. Connect the power cord to the mains electricity.
5. Turn ON the POWER 10.
6. Acquire the EDID (see Acquiring and Setting the Current EDID).

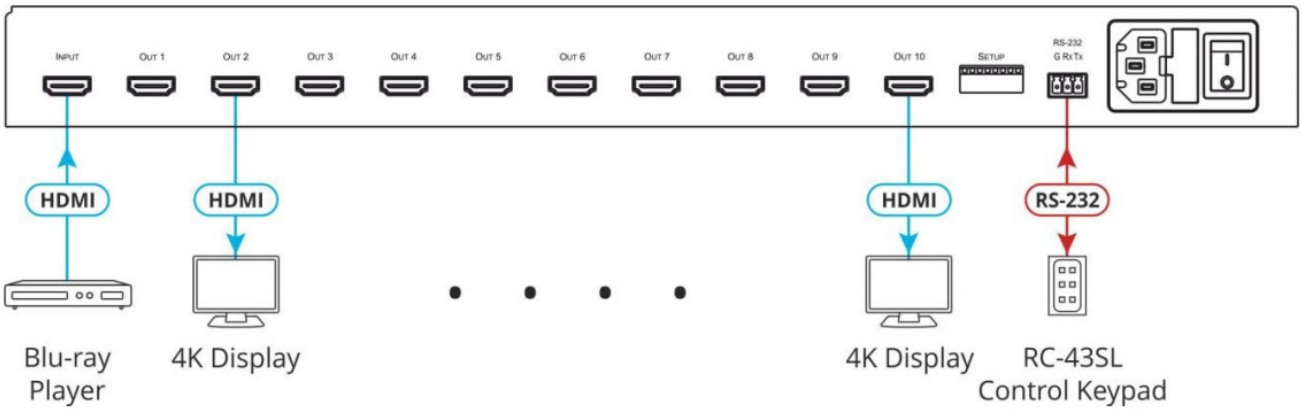
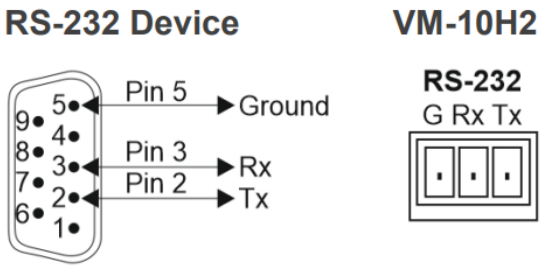


Figure 2: Connecting to the **VM-10H2** Rear Panel

Connecting to VM-10H2 via RS-232
The VM-10H2 features an RS-232 3-pin terminal block connector allowing the RS-232 to control the VM-10H2.

Connect the RS-232 terminal block **9** on the rear panel of the VM-10H2 to a PC/controller, as follows:

- TX pin to Pin 2
- RX pin to Pin 3
- GND pin to Pin 5



Operating the VM-10H2

User operation consists of setting the DIP switches and acquiring an EDID as needed.

Setting the DIP-Switches
The SETUP DIP-switches 8 located on the rear panel are used for video wall, 5V DC, MAC settings and force RGB.

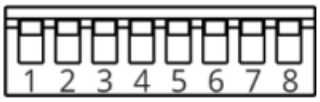


Figure 3: DIP-Switches

#	Function	Status
1	Support HDCP on/off DIP-switch 1 enables the user to control the appearance of an HDCP or non-HDCP input to the source to permit delivery of protection-free content, such as personal clips and charts, without HDCP encryption. HDCP protected content is not passed in non-HDCP mode.	Up – HDCP off. Down – HDCP on (default).
2	Force RGB When the display lacks YCbCr capabilities, the user can force native delivery of the RGB color format in HDMI content to improve picture quality.	Up – Use stored EDID (default). Down – Use stored EDID and force source RGB support.
3	EDID lock	Up – EDID lock on. Down – EDID lock off (default).
4	Auto-EDID	Up – Use stored EDID (default). Down – Use and store EDID of connected output 1 monitor; otherwise, use stored EDID.
5	Force non-deep color on EDID	Up – Use stored EDID (default). Down – Use stored EDID and force source non-deep color support.
6 & 7	Video Wall sync delay (mute all video outputs until all are ready) Flexible output delay options control the coherent and simultaneous unmuted content presentation on all video wall output displays	DIP 6 / DIP 7 / Video Wall Delay Up / Up / None – 0 delay (default) Down / Up / On – 10 sec delay Up / Down / On – 15 sec delay Down / Down / On – 17 sec delay
8	USB mode selection	Up – Normal operation (default). Down – Firmware update (see Firmware Update on page 3).

- The DIP-switch status is sampled when the device is reset. The unit must be powered off and on for the new settings to activate.

Acquiring and Setting the Current EDID

You can acquire and set the EDID Using Front Panel Buttons, RS-232 Serial Commands, and Kramer EDID Designer.

Using Front Panel Buttons

To acquire the current EDID:

- Press the EDID SELECT button 3 . The EDID SELECT and EDID READ buttons light. The output port LED of the currently used EDID lights.
  - If the currently used EDID is the default EDID, then the LEDs of all ports flash.

To set the current EDID:

1. Press the EDID SELECT button 3. The EDID SELECT and EDID READ buttons light.
2. Continue pressing the EDID SELECT button. The output port LEDs light in sequence (even for disconnected ports) until the desired output port is reached. An additional button press after the last port enables the selection of the default EDID and all output port LEDs flash. Another press selects the 1st output port and the sequence begins again.
3. When the desired EDID source is reached, press the EDID READ button 2. VM-10H2 reads the EDID for a few seconds and syncs the displays.
    - Upon displays syncing, an interruption in the video outputs may be noticed.
    - When completed, the EDID SELECT and EDID READ LEDs turn OFF and all LEDs return to the status display mode (i.e., only ports connected to active devices have their corresponding LEDs lit).
    - If a disconnected output port is chosen or the EDID cannot be read, the VM-10H2 loads the default EDID.

Using RS-232 Serial Commands
Connect a PC or other serial controller to VM-10H2 RS-232. Use the Protocol 3000 commands (see Protocol 3000 on page 12 and EDID Handling Commands on page 23) to control the VM-10H2.

Using Kramer EDID Designer
The EDID Designer can be downloaded from the Kramer website at: **www.kramerav.com/product/VM-10H2**.

The EDID for each input can be changed independently by uploading an EDID binary file to each input via the RS-232 port using Kramer EDID Designer.

Default EDID

Monitor

- **Model name**…… VM-10H2
- **Manufacturer……** KMR
- **Plug and Play ID**…… KMR1200
- **Serial number** …… n/a
- **Manufacture date** …… 2016, ISO week 14
- **Filter driver……** None
- **EDID revision**…… 1.3
- **Input signal type**…….. Digital
- **Color bit depth**……. Undefined
- **Display type**……. Monochrome/grayscale
- **Screen size**…….. 520 x 320 mm (24.0 in)
- **Power management**…… Standby, Suspend, Active off/sleep
- **Extension blocs**……. 1 (CEA-EXT) DDC/CI……. Not supported

Colour characteristics

- **Default color space**…… Non-sRGB
- **Display gamma**…… 2.20

- **Red chromaticity**…… Rx 0.674 – Ry 0.319
- **Green chromaticity**……. Gx 0.188 – Gy 0.706
- **Blue chromaticity**…….. Bx 0.148 – By 0.064
- **White point (default)**…. Wx 0.313 – Wy 0.329
- **Additional descriptors**… None

Timing characteristics

- **Horizontal scan range**…. 30-83kHz
- **Vertical scan range**…… 56-76Hz
- **Video bandwidth**……. 170MHz
- **CVT standard**……. Not supported
- **GTF standard**……. Not supported
- **Additional descriptors**… Established timings
- **Preferred timing**…… Yes
- **Native/preferred timing**.. 1920x1080p at 60Hz
- **Modeline……** “1920×1080” 148.500 1920 2008 2052 2200 1080 1084 1089 1125 +hsync +vsync

Standard timings supported

- 640 x 480p at 60Hz – IBM VGA
- 640 x 480p at 72Hz – VESA
- 640 x 480p at 75Hz – VESA
- 800 x 600p at 60Hz – VESA
- 800 x 600p at 72Hz – VESA
- 800 x 600p at 75Hz – VESA
- 1024 x 768p at 60Hz – VESA
- 1024 x 768p at 70Hz – VESA
- 1024 x 768p at 75Hz – VESA
- 1280 x 1024p at 75Hz – VESA
- 1600 x 900p at 60Hz – VESA STD
- 1280 x 800p at 60Hz – VESA STD
- 1600 x 1200p at 60Hz – VESA STD
- 1024 x 768p at 85Hz – VESA STD
- 800 x 600p at 85Hz – VESA STD
- 640 x 480p at 85Hz – VESA STD
- 1152 x 864p at 75Hz – VESA STD
- 1280 x 960p at 60Hz – VESA STD
- 848 x 480p at 60Hz – VESA
- 1280 x 768p at 60Hz – VESA
- 1280 x 1024p at 60Hz – VESA
- 1360 x 768p at 60Hz – VESA
- 1440 x 900p at 60Hz – VESA
- 1400 x 1050p at 60Hz – VESA

- 1650 x 1050p at 60Hz – VESA

EIA/CEA-861 Information

- **Revision number**………. 3
- **IT underscan**…………. Supported
- **Basic audio**………….. Supported
- **YCbCr 4:4:4**………….. Not supported
- **YCbCr 4:2:2**………….. Not supported
- **Native formats**……….. 1
- **Detailed timing #1**……. 720x480i at 30Hz
- **Modeline……………** "720×480" 8.490 720 808 857 981 480 488 498 570 interlace +hsync +vsync
- **Detailed timing #2**……. 852x480p at 60Hz (16:9)
- **Modeline** …………… "852×480" 49.450 852 1380 1429 1572 480 484 489 525 +hsync +vsync
- **Detailed timing #3**……. 1366x768p at 50Hz (16:9)
- **Modeline……………** "1366×768" 84.650 1366 1894 1943 2086 768 772 777 813 +hsync +vsync
- **Detailed timing #4**……. 1366x768p at 60Hz (16:9)
- **Modeline** …………… "1366×768" 101.610 1366 1894 1943 2086 768 772 777 813 +hsync +vsync
- **Detailed timing #5**……. 720x576p at 50Hz (4:3)
- **Modeline** …………… "720×576" 27.370 720 728 841 880 576 578 596 621 -hsync -vsync
- CE video identifiers (VICs) – timing/formats supported
- 1920 x 1080p at 60Hz – HDTV (16:9, 1:1) [Native[
- 1920 x 1080i at 60Hz – HDTV (16:9, 1:1(
- 720 x 480p at 60Hz – EDTV (4:3, 8:9(
- 1920 x 1080i at 50Hz – HDTV (16:9, 1:1(|
- 1920 x 1080p at 50Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 24Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- 1920 x 1080p at 30Hz – HDTV (16:9, 1:1(
- NB: NTSC refresh rate = (Hz*1000/1001

CE audio data (formats supported) LPCM 2-channel, 16/20/24 bit depths at 32/44/48 kHz

CE speaker allocation data

- Channel configuration… 2.0

- Front left/right…… Yes
- Front LFE……. No
- Front center……. No
- Rear left/right……. No
- Rear centre…….. No
- Front left/right centre.. No
- Rear left/right centre… No
- Rear LFE…….. No

CE vendor-specific data (VSDB)

- IEEE registration number. 0x000C03
- CEC physical address….. 1.0.0.3
- Maximum TMDS clock……. 165MHz

Report information

- Date generated…….. 19/02/2019
- Software revision…….. 2.70.0.989
- Data source…….. Real-time 0x0071
- Operating system…… 6.1.7601.2.Service Pack 1

Raw data
00, FF, FF, FF, FF, FF, FF,00,2D, B2,00,12,00,00,00,00,0E,1A,01,03,80,34,20,78, E2, B3,25, AC,51,30, B4,26, 10,50,54,2D, CF,00, A9, C0,81,00, A9,40,61,59,45,59,31,59,71,4F,81,40,02,3A,80,18,71,38,2D,40,58,2C, 45,00,0F,24,21,00,00,1E,00,00,00, FD,00,38,4C,1E,53,11,00,0A,20,20,20,20,20,20,00,00,00, FC,00,56, 4D,2D,31,30,48,32,0A,20,20,20,20,20,00,00,00, F7,00,00,08,42, A2,20,00,00,00,00,00,00,00,00,01, AF, 02,03,23, C1,50,90,05,02,14,1F,20,22,5D,5F,61,62,64,66,67,69,6B,23,09,07,07,83,01,00,00,65,03,0C, 00,10,03,51,03, D0,05,21, F0,2D,00,58,31,45,00,0F,1A,21,00,00,9E,51,13,54, D0,32, E0,2D,10,10,31,45, 80 , BA,88,21,00,00,1E,11,21,56, D0,52,00,2D,30,10,31,45,80, BA,88,21,00,00,1E, B1,27,56, D0,52,00,2D, 30,10,31,45,80, BA,88,21,00,00,1E, B1,0A, D0, A0,20,40,2D,20,08,71,22,01,80, E0,21,00,00,00,00, F1,CF

Technical Specifications

Inputs	1 HDMI	On a female HDMI connector
Outputs	10 HDMI	On female HDMI connectors
Ports	1 Mini-USB	On a female connector for firmware upgrade
	1 RS-232	On a 3-pin terminal block for device control
Video	Max Bandwidth	Up to 17.82Gbps bandwidth (5.94Gbps per graphic channel)
	Max Resolution	Up to 4K@60Hz (4:4:4) resolution
	Compliance	HDR10, HDMI 2.0 and HDCP 2.2 signal compliance
Controls	Rear Panel	DIP-switches
	Front Panel	EDID SELECT and EDID READ buttons
Indication LEDs	Front Panel	10 Output LEDs
		1 Input LED
		1 Power LED
Power	Consumption	100–240V AC, 50/60Hz 15VA
	Source	100–240V AC, 50/60Hz 55VA
Environmental Conditions	Operating Temperature	0° to +40°C (32° to 104°F)
	Storage Temperature	-40° to +70°C (-40° to 158°F)
	Humidity	10% to 90%, RHL non-condensing
Regulatory Compliance	Safety	CE, UL
	Environmental	RoHs, WEEE
Enclosure	Size	Full 19" rack 1U size
	Type	Aluminum
	Cooling	Fan ventilation
General	Net Dimensions (W, D, H)	19" x 7.2 x 1U (43.6cm x 18.3cm 4.4cm)
	Shipping Dimensions (W, D, H)	55cm x 27.6cm x 11cm (21.75" x 10.9" x 4.2")
	Net Weight	1.8kg (3.9lbs) approx.
	Shipping Weight	2.8kg (6.1lbs) approx.
Accessories	Included	Power adapter cord
		Rack ears
Specifications are subject to change without notice at www.kramerav.com		

- Specifications are subject to change without notice at **www.kramerav.com**

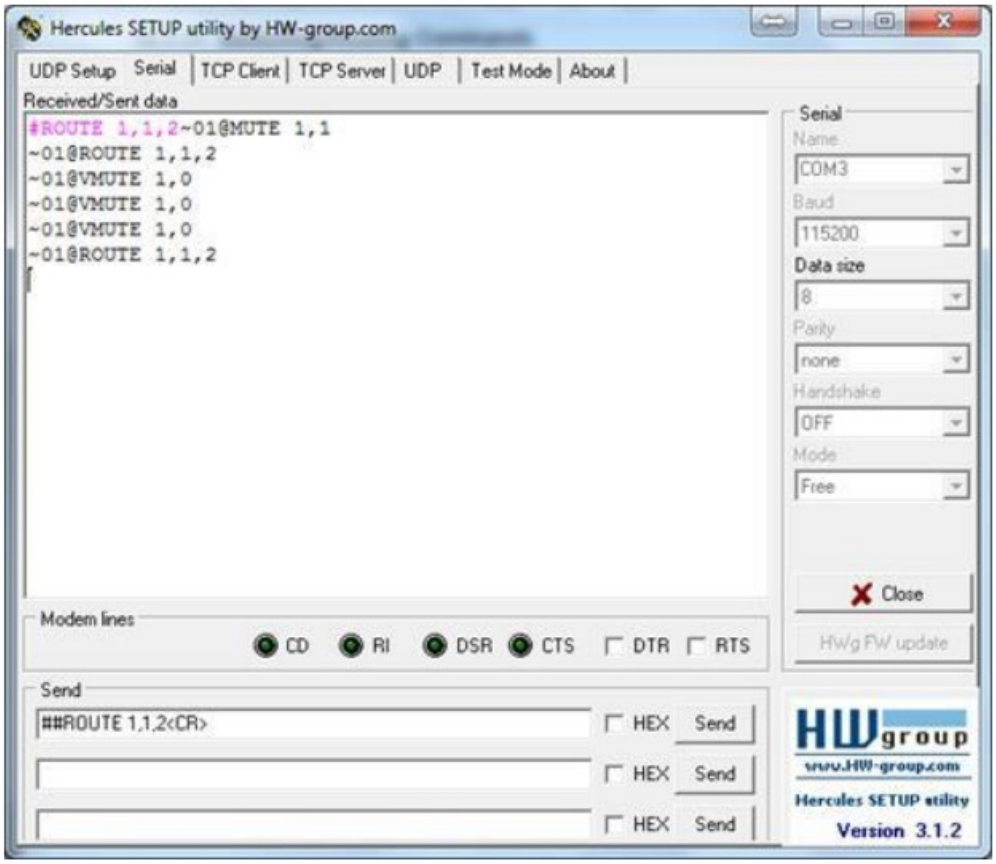
Default Communication Parameters

RS-232	
Baud Rate:	115,200
Data Bits:	8
Stop Bits:	1
Parity:	None
Command Format:	ASCII

Protocol 3000

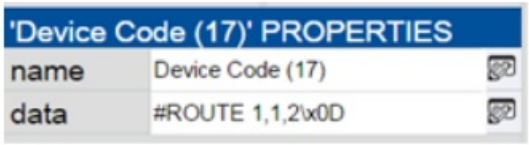
The VM-10H2 4K HDMI 2.0 1:10 DA can be operated using the Kramer Protocol 3000 serial commands. The command framing varies according to how you interface with the VM-10H2. Generally, a basic video input switching command that routes a layer 1 video signal to HDMI out 1 from HDMI input 2 (ROUTE 1,1,2), is entered as follows:

- Terminal communication software, such as Hercules:



The framing of the command varies according to the terminal communication software.

- K-Touch Builder (Kramer software):



- K-Config (Kramer configuration software):

All the examples provided in this section are based on using the K-Config software. You can enter commands directly using terminal communication software (e.g., Hercules) by connecting a PC to the serial or RS-232 port on the VM-10H2. To enter CR press the Enter key (LF is also sent but is ignored by the command parser). Commands sent from various non-Kramer controllers (e.g., Crestron) may require special coding for some characters (such as/X##). For more information, refer to your controller's documentation.

For more information about Protocol 3000 commands, see:

- Understanding Protocol 3000 on
- Kramer Protocol 3000 Syntax on
- Protocol 3000 Commands on

Understanding Protocol 3000

Protocol 3000 commands are structured according to the following:

- Command – A sequence of ASCII letters (A–Z, a–z and -). A command and its parameters must be separated by at least one space.
- Parameters – A sequence of alphanumeric ASCII characters (0–9, A–Z, a–z and some special characters for specific commands). Parameters are separated by commas.
- Message string – Every command entered as part of a message string begins with a message starting character and ends with a message closing character.

A string can contain more than one command. Commands are separated by a pipe (|) character.

- Message starting character:
  # – For host command/query
  ~ – For device response
- Device address – K-NET Device ID followed by @ (optional, K-NET only)
- Query sign –? follows some commands to define a query request
- Message closing character:
  - – Carriage return for host messages (ASCII 13)
  - – Carriage return for device messages (ASCII 13) and line-feed (ASCII 10)
- Command chain separator character – Multiple commands can be chained in the same string. Each command is delimited by a pipe character (|). When chaining commands, enter the message starting character and the message closing character only at the beginning and end of the string.

Spaces between parameters or command terms are ignored. Commands in the string do not execute until the closing character is entered. A separate response is sent for every command in the chain.

Kramer Protocol 3000 Syntax

The Kramer Protocol 3000 syntax uses the following delimiters:

- CR = Carriage return (ASCII 13 = 0x0D)
- LF = Line feed (ASCII 10 = 0x0A)
- SP = Space (ASCII 32 = 0x20)

Some commands have short name syntax in addition to long name syntax to enable faster typing. The response is always in long syntax.

The Protocol 3000 syntax is in the following format:

- Host Message Format:

Start	Address (optional)	Body	Delimiter
#	*Device_id@*	**Message**	CR

- Simple Command – Command string with only one command without addressing:

Start	Body	Delimiter
#	**Command** SP Parameter_1,Parameter_2,…	CR

- Command String – Formal syntax with command concatenation and addressing:

Start	Address	Body	Delimiter
#	*Device_id@*	**Command_1** *Parameter1_1,Parameter1_2,…|* **Command_2** *Parameter2_1,Parameter2_2,…|* **Command_3** *Parameter3_1,Parameter3_2,…|…*	CR

- Device Message Format:

Start	Address (optional)	Body	Delimiter
~	*Device_id@*	**Message**	CR LF

- Device Long Response – Echoing command:

Start	Address (optional)	Body	Delimiter
~	*Device_id@*	**Command** SP **[***Param1 ,Param2 …***]** **result**	CR LF

Protocol 3000 Commands

System Commands

All devices running Protocol 3000 use these commands.

Command	Description	Type	Permission
#	Protocol handshaking	System-mandatory	End User
BUILD-DATE	Get device build date	System-mandatory	End User
FACTORY	Reset to factory default configuration	System-mandatory	End User
HELP	Get command list	System-mandatory	End User
MODEL	Get device model	System-mandatory	End User
PROT-VER	Get device protocol version	System-mandatory	End User
RESET	Reset device	System-mandatory	Administrator
SN	Get device serial number	System-mandatory	End User
VERSION	Get device firmware version	System-mandatory	End User

#

Functions		Permission	Transparency
Set:	#	End User	Public
Get:	-	-	-
Description		**Syntax**	
Set:	Protocol handshaking	#CR	
Get:	-	-	
Response			
~nn@SPOKCR LF			
Parameters			
Response Triggers			
Notes			
Validates the Protocol 3000 connection and gets the machine number Step-in master products use this command to identify the availability of a device			
K-Config Example			
"#",0x0D			

BUILD-DATE

Functions		Permission	Transparency
Set:	-	-	-
Get:	**BUILD-DATE?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get device build date	**#BUILD-DATE?**CR	
Response			
~nn@**BUILD-DATE**SP*date*SP*time*CR LF			
Parameters			
date – Format: YYYY/MM/DD where YYYY = Year, MM = Month, DD = Day *time* – Format: hh:mm:ss where hh = hours, mm = minutes, ss = seconds			
Response Triggers			
Notes			
K-Config Example			
"#BUILD-DATE?",0x0D			

FACTORY

Functions		Permission	Transparency
Set:	**FACTORY**	End User	Public
Get:	-	-	-
Description		**Syntax**	
Set:	Reset device to factory default configuration	**#FACTORY**CR	
Get:	-	-	
Response			
~nn@**FACTORY**SP*OK*CR LF			
Parameters			
Response Triggers			
Notes			
This command deletes all user data from the device. The deletion can take some time. Your device may require powering off and powering on for the changes to take effect.			
K-Config Example			
"#FACTORY",0x0D			

HELP

Functions		Permission	Transparency
Set:	-	-	-
Get:	**HELP**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get command list or help for specific command	2 options: 1. **#HELP**CR 2. **#HELP**SP*command_name*CR	
Response			
1. Multi-line: ~nn@Device available protocol 3000 commands:CR LF*command*,SP*command*...CR LF To get help for command use: HELP (COMMAND_NAME)CR LF 2. Multi-line: ~nn@**HELP**SP*command:*CR LF*description*CR LF USAGE:*usage*CR LF			
Parameters			
Response Triggers			
Notes			
K-Config Example			
1. Get a list of all **VM-10H2** commands: "#HELP",0x0D 2. Get help for the ETH-PORT command: "#HELP ETH-PORT",0x0D			

MODEL

Functions		Permission	Transparency
Set:	-	-	-
Get:	**MODEL?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get device model	**#MODEL?**CR	
Response			
~nn**@MODEL**SP*model_name*CR LF			
Parameters			
model_name – string of up to 19 printable ASCII chars			
Response Triggers			
Notes			
This command identifies equipment connected to Step-in master products and notifies of identity changes to the connected equipment. The Matrix saves this data in memory to answer REMOTE-INFO requests			
K-Config Example			
"#MODEL?",0x0D			

PROT-VER

Functions		Permission	Transparency
Set:	-	-	-
Get:	**PROT-VER?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get device protocol version	**#PROT-VER?**CR	
Response			
~nn**@PROT-VER**SP*3000:version*CR LF			
Parameters			
version – XX.XX where X is a decimal digit			
Response Triggers			
Notes			
K-Config Example			
"#PROT-VER?",0x0D			

RESET

Functions		Permission	Transparency
Set:	**RESET**	Administrator	Public
Get:	–	-	-
Description		**Syntax**	
Set:	Reset device	**#RESET**CR	
Get:	-	-	
Response			
~nn@**RESET**SP*OK*CR LF			
Parameters			
Response Triggers			
Notes			
To avoid locking the port due to a USB bug in Windows, disconnect USB connections immediately after running this command. If the port was locked, disconnect and reconnect the cable to reopen the port.			
K-Config Example			
"#RESET",0x0D			

SN

Functions		Permission	Transparency
Set:	–	-	-
Get:	**SN?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get device serial number	**#SN?**CR	
Response			
~nn@**SN**SP*serial_number*CR LF			
Parameters			
serial_number – 14 decimal digits, factory assigned			
Response Triggers			
Notes			
K-Config Example			
"#SN?",0x0D			

VERSION

Functions		Permission	Transparency
Set:	-	-	-
Get:	**VERSION?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get firmware version number	**#VERSION?**CR	
Response			
~nn**@VERSION**SP*firmware_version*CR LF			
Parameters			
firmware_version – XX.XX.XXXX where the digit groups are: major.minor.build version			
Response Triggers			
Notes			
K-Config Example			
"#VERSION?",0x0D			

System Commands

Command	Description	Type	Permission
AV-SW-TIMEOUT	Set/get auto switching timeout	System	End user
DISPLAY	Get output HPD status	Switch	End User
DPSW-STATUS	Get the DIP-switch status	System	End User
HDCP-STAT	Get HDCP signal status	System	End user
SIGNAL	Get input signal status	System	End User

AV-SW-TIMEOUT

Functions		Permission	Transparency
Set:	**AV-SW-TIMEOUT**	End User	Public
Get:	**AV-SW-TIMEOUT?**	End User	Public
Description		**Syntax**	
Set:	Set auto switching timeout	**#AV-SW-TIMEOUT**SP*action*,*time_out*CR	
Get:	Get auto switching timeout	**#AV-SW-TIMEOUT?**SP*action*CR	
Response			
~nn**@AV-SW-TIMEOUT**SP*action*,*time_out*CR			
Parameters			
action – see Video/Audio Signal Changes *time_out* – timeout in seconds			
Response Triggers			
Notes			
K-Config Example			
Set the auto switching timeout to 5 seconds in the event of video signal lost: "#AV-SW-TIMEOUT 0,5",0x0D			

DISPLAY

Functions		Permission	Transparency
Set:	-	-	-
Get	**DISPLAY?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get output HPD status	**#DISPLAY?**SP*out_id*CR	
Response			
~nn**@DISPLAY**SP*out_id*,*status*CR LF			
Parameters			
out_id – output number *status* – HPD status according to signal validation 0 - Signal or sink is not valid 1 - Signal or sink is valid 2 - Sink and EDID is valid			
Response Triggers			
After execution, response is sent to the com port from which the Get was received Response is sent after every change in output HPD status ON to OFF Response is sent after every change in output HPD status OFF to ON and ALL parameters (new EDID, etc.) are stable and valid			
Notes			
K-Config Example			
Get the output HPD status of OUT 1: "#DISPLAY? 1",0x0D			

DPSW-STATUS

Functions		Permission	Transparency
Set:	-	-	-
Get:	**DPSW-STATUS?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get :	Get the DIP-switch state	# DPSW-STATUS?SP*dp_sw_id*CR	
Response			
~nn**@DPSW-STATUS?**SP*dp_sw_id*,*status*CR LF			
Parameters			
dp_sw_id – 1….num of DIP switches *status* – 0: up, 1: down			
Response Triggers			
Notes			
K-Config Example			
get the DIP-switch 2 status: "#DPSW-STATUS? 2",0x0D			

HDCP-STAT

Functions		Permission	Transparency
Set:	-	-	-
Get:	**HDCP-STAT?**	End User	Public
Description		**Syntax**	
Set:	None	-	
Get:	Get HDCP signal status	**#HDCP-STAT?**SP*stage*,*stage_id*CR	
Response			
Set / Get: ~nn**@HDCP-STAT**SP*stage*,*stage_id*,*status*CR LF			
Parameters			
stage – input/output 0 - Input 1 - Output *stage_id* – number of chosen stage (1.. max number of inputs/outputs) *status* – signal encryption status - valid values ON/OFF 0 - HDCP Off 1 - HDCP On 2 - Follow input 3 - Mirror output			
Response Triggers			
Response is sent to the com port from which the Set (before execution) / Get command was received Response is sent to all com ports after execution if HDCP-STAT was set by any other external control device (button press, device menu and similar) or HDCP mode changed			
Notes			
On output – sink status On input – signal status			
K-Config Example			
Get the HDCP input signal status of the source device connected to HDMI IN 1: "#HDCP-STAT? 0,1",0x0D			

SIGNAL

Functions		Permission	Transparency
Set:	-	-	-
Get	**SIGNAL?**	End User	Public
Description		**Syntax**	
Set:	-	-	
Get:	Get input signal status	**#SIGNAL?**SP*inp_id*CR	
Response			
~nn**@SIGNAL**SP*inp_id*,*status*CR LF			
Parameters			
inp_id – input number *status* – see Input Signal Status			
Response Triggers			
After execution, a response is sent to the com port from which the Get was received Response is sent after every change in input signal status ON to OFF, or OFF to ON			
Notes			
K-Config Example			
Get the input signal status: "#SIGNAL? 1",0x0D			

EDID Handling Commands

Command	Description	Type	Permission
CPEDID	Copy EDID data from the output to the input EEPROM	EDID Handling	End User
GEDID	Set/get EDID data	EDID Handling	End User
LDEDID	Load EDID data	EDID Handling	End User

CPEDID

Functions		Permission	Transparency
Set:	**CPEDID**	End User	Public
Get:	-	-	-
Description		**Syntax**	
Set:	Copy EDID data from the output to the input EEPROM	**#CPEDID**SP*src_type*,*src_id*,*dst_type*,*dest_bitmap*CR or **#CPEDID**SP*src_type*,*src_id*,*dst_type*,*dest_bitmap*,*safe_mode*CR	
Get:	-	-	
Response			
~nn@**CPEDID**SP*src_stg*,*src_id*,*dst_type*,*dest_bitmap*CR LF ~nn@**CPEDID**SP*src_stg*,*src_id*,*st_type*,*dest_bitmap*,*safe_mode*CR LF			
Parameters			
src_type – *EDID* source type (usually output) 0 - Input 1 - Output 2 - Default EDID 3 - Custom EDID *src_id* – number of chosen source stage (1.. max number of inputs/outputs) *dst_type* – *EDID destination* type (usually input) 0 - Input 1 - Output 2 - Default EDID 3 - Custom EDID *dest_bitmap* – bitmap representing destination IDs. Format: XXXX…X, where X is hex digit. The binary form of every hex digit represents corresponding destinations. Setting '1' says that EDID data has to be copied to this destination *safe_mode* – 0 - device accepts the EDID as is without trying to adjust – 1 - device tries to adjust the EDID (default value if no parameter is sent)			
Response Triggers			
Response is sent to the com port from which the Set was received (before execution)			
Notes			
Destination bitmap size depends on device properties (for 64 inputs it is a 64-bit word) Example: bitmap 0x0013 means inputs 1,2 and 5 are loaded with the new EDID In certain products *Safe_mode* is an optional parameter. See the HELP command for its availability			
K-Config Example			
Copy the EDID data from the OUT 1 output (EDID source) to the HDMI IN 1 input: "#CPEDID 1,1,0,0x1",0x0D Copy the EDID data from the default EDID source to HDMI IN 1 and HDMI IN 3: "#CPEDID 2,0,0,0x5",0x0D			

GEDID

Functions		Permission	Transparency
Set:	**GEDID**	Administrator	Public
Get:	**GEDID?**	End User	Public

Description		Syntax
Set:	Set EDID data from device	**#GEDID** SP *stage*,*stage_id* CR
Get:	Get EDID support on certain input/output	**#GEDID?** SP *stage*,*stage_id* CR

Response

Set:
Multi-line response:
~nn**@GEDID** SP *stage*,*stage_id*,*size* CR LF
EDID_data CR LF
~nn**@GEDID** SP *stage*,*stage_id* SP *OK* CR LF
Get:
~nn**@GEDID** SP *stage*,*stage_id*,*size* CR LF

Parameters

stage – input/output
- 0 - Input
- 1 - Output
- 2 - Default EDID
- 3 - Custom EDID

stage_id – number of chosen stage (1.. max number of inputs/outputs)
size – EDID data size. For Set, size of data to be sent from device, for Get, 0 means no EDID support

Response Triggers

Response is sent to the com port from which the Set (before execution) / Get command was received

Notes

For Get, size=0 means EDID is not supported
For old devices that do not support this command, ~nn@ERR 002 CR LF is received

K-Config Example

Set EDID data from device connected to OUT 1:
"#GEDID 1,1",0x0D

LDEDID

Functions		Permission	Transparency
Set:	**LDEDID**	End User	Public
Get:	–	-	-
Description		**Syntax**	
Set:	Write EDID data from external application to device	Multi-step syntax (see following steps)	
Get:	None	None	

Communication Steps (Command and Response)

Step 1: **#LDEDID** SP *dst_type*,*dest_bitmask*,*size*,*safe_mode* CR

Response 1: ~nn**@LDEDID** SP *dst_type*,*dest_bitmask*,*size*,*safe_mode* SP *READY* CR LF or

~nn**@LDEDID** SP *ERRnn* CR LF

Step 2: If ready was received, send EDID_DATA

Response 2: ~nn**@LDEDID** SP *dst_type*,*dest_bitmask*,*size*,*safe_mode* SP *OK* CR LF or

~nn**@LDEDID** SP *ERRnn* CR LF

Parameters

dst_type – EDID destination type (usually input)

0 - Input
1 - Output
2 - Default EDID
3 - Custom EDID

dest_bitmask – bitmap representing destination IDs. Format: 0x********, where * is ASCII presentation of hex digit. The binary presentation of this number is a bit mask for destinations. Setting '1' means EDID data has to be copied to this destination

size – EDID data size

safe_mode –

0 – Device accepts the EDID as is without trying to adjust

1 – Device tries to adjust the EDID

EDID_DATA – data in protocol packets

The packet protocol is designed to transfer large amounts of data, such as files, IR commands, EDID data, etc

Response Triggers

Response is sent to the com port from which the Set (before execution)

Notes

When the unit receives the LDEDID command it replies with READY and enters the special EDID packet wait mode. In this mode the unit can receive only packets and not regular protocol commands.
If the unit does not receive correct packets for 30 seconds or is interrupted for more than 30 seconds before receiving all packets, it sends timeout error ~nn@LDEDID SP *ERR01* CR LF and returns to the regular protocol mode. If the unit received data that is not a correct packet, it sends the corresponding error and returns to the regular protocol mode.
See Protocol Packet reference in Packet Protocol Structure

K-Config Example

Write the EDID data from an external application to the HDMI In 1 input without adjustment attempts:
"#LDEDID 0,0x1,2340,0",0x0D
Write the EDID data from an external application to HDMI In 1 and PC In inputs with adjustment attempts:
"#LDEDID 0,0x5,2340,1",0x0D

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- www.KramerAV.com
- info@KramerAV.com

Documents / Resources

	KRAMER VM-10H2 4K HDMI Module [pdf] User Manual VM-10H2 4K HDMI Module, VM-10H2, 4K HDMI Module, Module

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