



KRAMER ELECTRONICS LTD.

# USER MANUAL

MODEL:

**VM-28H**

2 Input 1:8 HDMI Distributor

**VM-216H**

2 Input 1:16 HDMI Distributor

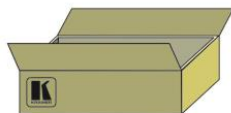


## VM-28H, VM-216H Quick Start Guide

This guide helps you install and use your product for the first time. For more detailed information, go to [http://www.kramerelectronics.com/support/product\\_downloads.asp](http://www.kramerelectronics.com/support/product_downloads.asp) to download the latest manual or scan the QR code on the left.

### Step 1: Check what's in the box

- ✓ **VM-28H, VM-216H** 2 Input  
1:8 or 1:16 HDMI Distributor
- ✓ Power cord
- ✓ 1 Set of rack "ears"
- ✓ 4 Rubber feet
- ✓ 1 Quick Start sheet
- ✓ Kramer RC-IR3 Infrared Remote Control Transmitter with batteries and user manual



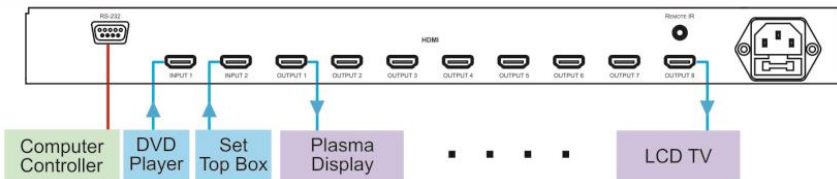
Save the original box and packaging materials in case you need to return your device for service.

### Step 2: Install the VM-28H, VM-216H

Mount the **VM-28H, VM-216H** in a rack (using the included rack "ears") or attach the rubber feet and place on a table.

### Step 3: Connect the inputs and outputs

Always switch off the power on each device before connecting it to your **VM-28H, VM-216H**.



This diagram illustrates connections for the **VM-28H**. The **VM-216H** is identical, only with 16 outputs.

Always use Kramer high-performance cables for connecting AV equipment to the **VM-28H, VM-216H**.

### Step 4: Connect the power



Connect the power cord to the **VM-28H, VM-216H** and plug it into the mains electricity.

### Step 5: Operate the VM-28H, VM-216H

Acquire the EDID.

Operate using the front panel buttons, computer control or IR remote control.

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# 1 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 on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer **VM-28H, VM-216H 2 Input 1:8/16 HDMI Distributor**, which is ideal for the following typical applications:

- Home theater, presentation and multimedia applications
- Rental and staging

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## 2 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 [http://www.kramerelectronics.com/support/product\\_downloads.asp](http://www.kramerelectronics.com/support/product_downloads.asp) to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

### 2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables (we recommend Kramer high-performance, high-resolution cables) to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Do not secure the cables in tight bundles or roll the slack into tight coils
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **VM-28H**, **VM-216H** 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.

## 2.2 Safety Instructions



**Caution:** There are no operator serviceable parts inside the unit

**Warning:** Use only the power cord that is supplied with the unit

**Warning:** Do not open the unit. High voltages can cause electrical shock! Servicing by qualified personnel only

**Warning:** Disconnect the power and unplug the unit from the wall before installing

## 2.3 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 <http://www.kramerelectronics.com/support/recycling/>.

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## 3 Overview

The Kramer **VM-28H** *2 Input 1:8 HDMI Distributor* and **VM-216H** *2 Input 1:16 HDMI Distributor* are high-quality distributors that accept one of two HDMI inputs and distribute the signal to 8/16 outputs, allowing one or more of the outputs to be connected to receiving devices, thus making them a versatile, reliable component in a video system. The **VM-28H/VM-216H** distributes signals having resolutions up to 1080p, including all HDTV formats.

Each high-quality *HDMI Distributor* accepts one of two HDMI inputs, and distributes the selected signal to:

- 8 outputs (the **VM-28H**)
- 16 outputs (the **VM-216H**)

Both machines—the **VM-28H** and **VM-216H**:

- Support up to 6.75Gbps (2.25Gbps per graphic channel)  
Suitable for resolutions up to 1080p, and for all HD resolutions.
- Can read and store, in non-volatile memory, the EDID block, for each input separately, from an output display device, so it can then provide the EDID information to the HDMI source even if the display device is not connected
- Let you acquire the EDID from one output, from several connected outputs or acquire the default EDID for fast and efficient connection of the unit  
Lets you use the EDID default value when no display from which to read the EDID is connected.
- Have a 19" 1U rack-mountable enclosure, and are fed from a 100-240 VAC universal switching power supply

### 3.1 Defining the VM-28H, VM-216H 2 Input 1:8/16 HDMI Distributor

This section defines the **VM-28H**, **VM-216H**.

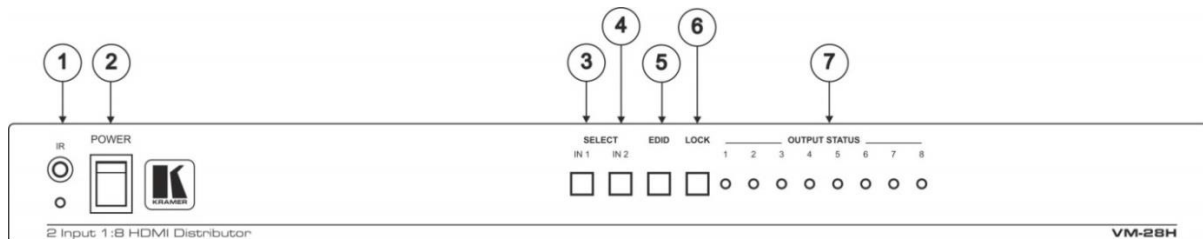


Figure 1: VM-28H 2-Input 1:8 HDMI Distributor Front Panel

#	Feature	Function
1	IR Receiver	The red LED is illuminated when receiving signals from the Kramer Infrared remote control transmitter
2	POWER Switch	Illuminated switch for turning the unit ON or OFF
3	IN 1 Button	Press to select source 1 and distribute this signal to the outputs (when the EDID button does not illuminate). Also used for acquiring/changing the EDID (see <a href="#">Section 5.4</a> ) Illuminates when selected and there is a signal, flashes when selected but there is no signal
4	IN 2 Button	Press to select source 2 and distribute this signal to the outputs (when the EDID button does not illuminate). Also used for acquiring/changing the EDID (see <a href="#">Section 5.4</a> )
5	EDID Button	Press for more than 3 seconds to set to the EDID mode Illuminates when configuring the EDID. When the EDID button does not illuminate the machine is in Distribution mode (lets you distribute an input signal to the outputs)
6	LOCK Button	Press to engage/disengage the front panel switches Illuminates when the front panel switches are locked, pressing another button causes the LOCK button to flash once warning that you need to unlock to regain control via the front panel. The LOCK button also flashes (the IN 1, IN 2 and EDID buttons do not flash at the same time) when the machine is busy (perhaps searching between signals) and no operation is permitted. When powering up, the VM-28H/VM-216H front panel is automatically locked
7	OUTPUT STATUS LEDs	LEDs light when an output(s) is connected and active; LEDs flash when selecting the EDID (see <a href="#">Section 5.4</a> ) or when connecting a non-HDCP display while providing HDCP content to the <b>VM-28H</b> The specific OUTPUT STATUS LEDs flash when the outputs are not HDCP compatible



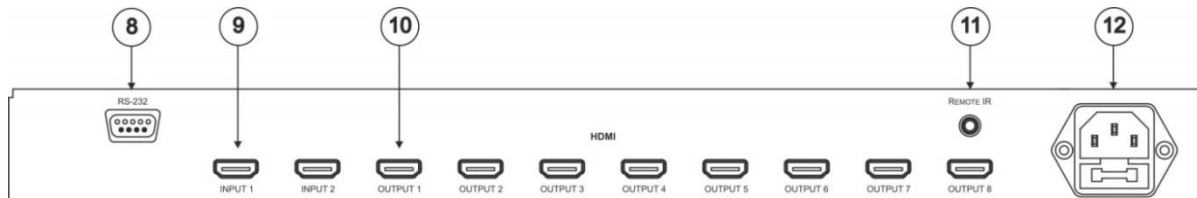


Figure 2: VM-28H 2-Input 1:8 HDMI Distributor Rear Panel

#	Feature	Function
8	RS-232 9-pin D-sub Port	Connects to the PC or the Remote Controller
9	INPUT 1/2 HDMI Connectors	Connects to the HDMI source 1/2
10	OUTPUT HDMI Connector	Connects to the HDMI acceptor from 1 to 8
11	REMOTE IR Opening (for the <b>VM-28H</b> )	<p>Connects to an external IR receiver unit for controlling the machine via an IR remote controller instead of using the front panel IR receiver</p> <p>Covered by a cap. The 3.5mm connector at the end of the internal IR connection cable fits through this opening.</p> <p>Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the machine (only if the internal IR connection cable has been installed)</p>
12	Power Connector with Fuse	AC connector enabling power supply to the unit

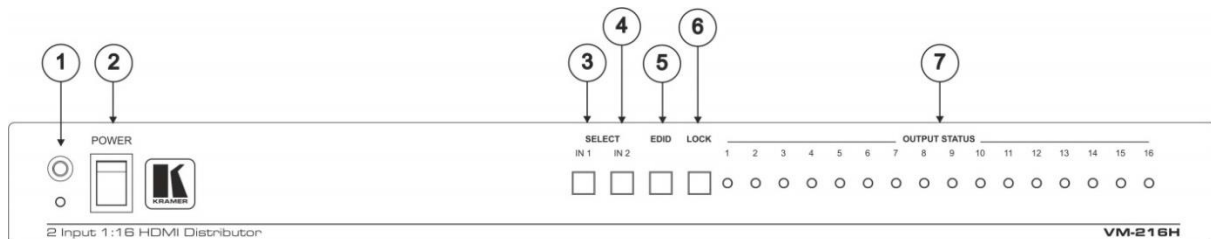


Figure 3: VM-216H 2-Input 1:16 HDMI Distributor Front Panel

#	Feature	Function
1	IR Receiver	The red LED is illuminated when receiving signals from the Kramer Infrared remote control transmitter
2	POWER Switch	Illuminated switch for turning the unit ON or OFF
3	IN 1 Button	Press to select source 1 and distribute this signal to the outputs (when the EDID button does not illuminate). Also used for acquiring/changing the EDID (see <a href="#">Section 5.4</a> ) Illuminates when selected and there is a signal, flashes when selected but there is no signal
4	IN 2 Button	Press to select source 2 and distribute this signal to the outputs (when the EDID button does not illuminate). Also used for acquiring/changing the EDID (see <a href="#">Section 5.4</a> )
5	EDID Button	Press for more than 3 seconds to set to the EDID mode Illuminates when configuring the EDID. When the EDID button does not illuminate the machine is in Distribution mode (lets you distribute an input signal to the outputs)
6	LOCK Button	Press to engage/disengage the front panel switches Illuminates when the front panel switches are locked, pressing another button causes the LOCK button to flash once warning that you need to unlock to regain control via the front panel. The LOCK button also flashes (the IN 1, IN 2 and EDID buttons do not flash at the same time) when the machine is busy (perhaps searching between signals) and no operation is permitted. When powering up, the VM-216H front panel is automatically locked
7	OUTPUT STATUS LEDs	LEDs light when an output(s) is connected and active; LEDs flash when selecting the EDID (see <a href="#">Section 5.4</a> ) or when connecting a non-HDCP display while providing HDCP content to the <b>VM-216H</b> The specific OUTPUT STATUS LEDs flash when the outputs are not HDCP compatible

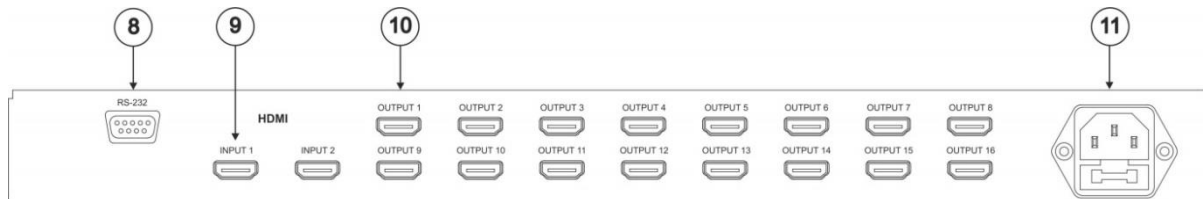


Figure 1: VM-216H 2-Input 1:16 HDMI Distributor Rear Panel

#	Feature	Function
8	RS-232 9-pin D-sub Port	Connects to the PC or the Remote Controller
9	INPUT 1/2 HDMI Connectors	Connects to the HDMI source 1/2
10	OUTPUT HDMI Connector	Connects to the HDMI from 1 to 16
11	Power Connector with Fuse	AC connector enabling power supply to the unit

## 3.1 Using the IR Transmitter

You can use the **RC-IR3** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver (Model: C-A35M/IRR-50). The external IR receiver can be located up to 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables (Model: C-A35M/A35F-50).

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable (P/N: 505-70434010-S) with the 3.5mm connector that fits into the REMOTE IR opening on the rear panel. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

## 4 Installing in a Rack

This section provides instructions for rack mounting the unit.

**Before installing in a rack,** be sure that the environment is within the recommended range:

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



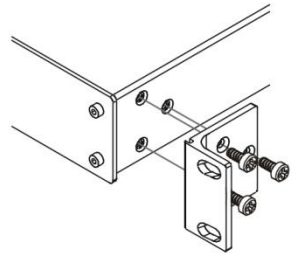
### CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.
2. Once rack mounted, enough air will still flow around the machine.
3. The machine is placed straight in the correct horizontal position.
4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.
5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

### To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

#### Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions available from our Web site

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## 5 Using the VM-28H/VM-216H

This section describes how to:

- Connect the **VM-28H/VM-216H**, see [Section 5.1](#)
- Control the **VM-28H/VM-216H** via RS-232, see [Section 5.2](#)
- Operate the **VM-28H/VM-216H**, see [Section 5.3](#)
- Use the EDID button, see [Section 5.4](#)

### 5.1 Connecting the VM-28H/VM-216H



Always switch off the power to each device before connecting it to your **VM-28H**, **VM-216H**. After connecting your **VM-28H**, **VM-216H**, connect its power and then switch on the power to each device.

This section describes how to connect the:

- **VM-28H**, see [Section 5.1.1](#)
- **VM-216H**, see [Section 5.1.2](#)

#### 5.1.1 Connecting the VM-28H 2 Input 1:8 HDMI Distributor

To connect the **VM-28H**, as the example in [Figure 2](#) shows, do the following:

1. Connect the HDMI OUTPUT connectors (as required, up to 8 outputs can be connected, not all outputs need to be connected) to up to 8 HDMI acceptors, using Kramer HDMI copper cables. In this example, connect the:
  - OUTPUT 1 connector to acceptor 1 (for example, a plasma display)
  - OUTPUT 2 connector to acceptor 2 (for example, an LCD TV)
  - OUTPUT 7 connector to acceptor 7 (for example, an LCD TV)
  - OUTPUT 8 connector to acceptor 8 (for example, a plasma display)
2. Connect the two HDMI sources, for example, a DVD player and a set top box, to the INPUT 1 and INPUT 2 connectors, respectively, using the Kramer HDMI copper cables.

3. If required, connect a PC and/or controller to the RS-232 port (see [Section 5.2](#)).
4. Connect the power cord to the mains electricity.

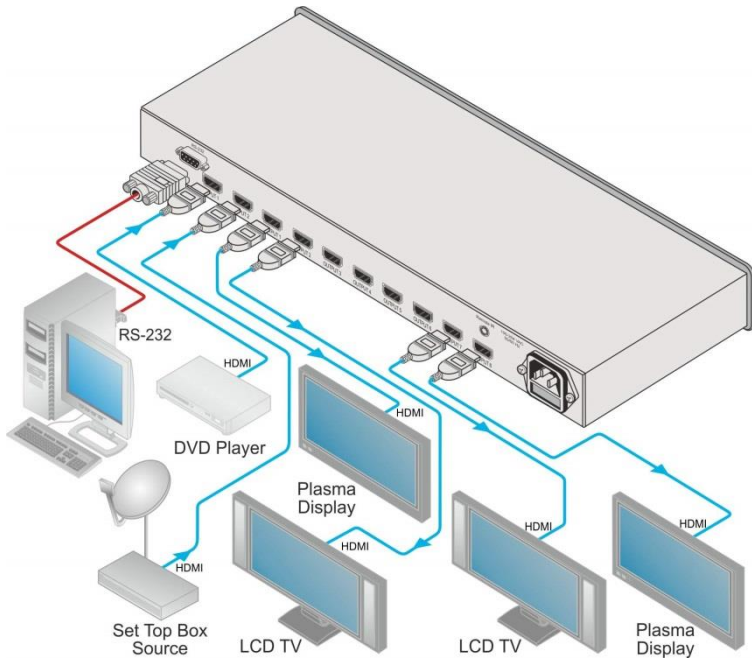


Figure 2: Connecting a VM-28H 2 Input 1:8 HDMI Distributor

### 5.1.2 Connecting the VM-216H 2 Input 1:16 HDMI Distributor

To connect the **VM-216H**, as the example in [Figure 3](#) shows, do the following:

1. Connect the HDMI OUTPUT connectors (as required, up to 16 outputs can be connected, not all outputs need to be connected) to up to 16 HDMI acceptors, using Kramer HDMI copper cables. In this example, connect the:
  - OUTPUT 1 connector to acceptor 1 (for example, a plasma display)
  - OUTPUT 2 connector to acceptor 2 (for example, an LCD TV)
  - OUTPUT 15 connector to acceptor 15 (for example, an LCD TV)
  - OUTPUT 16 connector to acceptor 16 (for example, a plasma display)
2. Connect the two HDMI sources, for example, a DVD player and a set top box, to the INPUT 1 and INPUT 2 connectors, respectively, using the Kramer HDMI copper cables.
3. If required, connect a PC and/or controller to the RS-232 port (see [Section 5.2](#)).
4. Connect the power cord to the mains electricity.



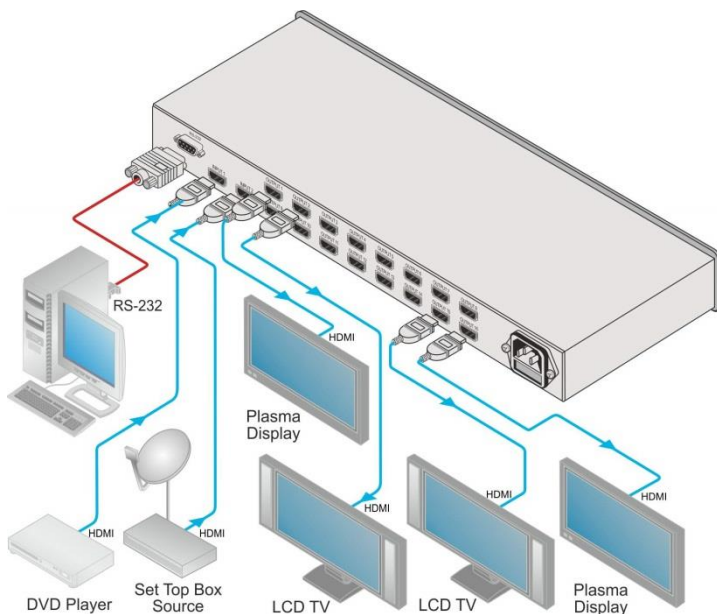


Figure 3: Connecting a VM-216H 2 Input 1:16 HDMI Distributor

## 5.2 Connecting the VM-28H/VM-216H via RS-232

You can connect to the **VM-28H**, **VM-216H** via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the **VM-28H**, **VM-216H** via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the **VM-28H**, **VM-216H** unit via a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected) to the RS-232 9-pin D-sub port on your PC

## 5.3 Operating the VM-28H/VM-216H

To operate the **VM-28H/VM-216H**:

1. Turn ON the POWER.
2. Select the desired input.
3. Press the EDID button to acquire or change the EDID data (see [Section 5.4](#)).

# 5.4 Using the EDID Button

Initially, the **VM-28H/VM-216H** operates with the factory default EDID.

You can acquire the EDID from:

- One output (the selected output LED illuminates)
- The default EDID (all the output LEDs flash)
- Several connected outputs, the Auto-mix Mode (the output LEDs flash in sequence)

The EDID acquired is a weighted average of all the connected outputs. For example, if several displays with different resolutions are connected to the outputs, the acquired EDID supports all the resolutions, as well as other parameters included in the EDID

To cycle between the different modes (One Output, Default and Auto-mix), press the input button (IN 1 or IN 2) to which you want to read the EDID, as defined in the following table. Note, that the EDID feature has a 10 second timeout.

Current EDID Mode	Appearance	To cycle to the Default EDID	To cycle to the Auto-mix EDID	To cycle to the One output EDID
One output	The selected output LED illuminates	Press the IN button once again after selecting output 8 (for <b>VM-28H</b> ) or output 16 (for <b>VM-216H</b> ). The output LEDS flash		
Default	The output LEDs flash		Press the IN button once	
Auto-mix	The output LEDs flash in sequence			Press the IN button to select the required output. The selected output flashes

To acquire or change the EDID of a new output display from:

- One output, see [Section 5.4.1](#)
- The default EDID, see [Section 5.4.2](#)
- Several connected outputs, see [Section 5.4.3](#)

### 5.4.1 Acquiring / Changing the EDID from One Output

To acquire or change the EDID of a new output display:

1. Connect the power supply.
2. Connect the new output display device.
3. Press the EDID button for more than 3 seconds.
4. Press an input button (either IN 1 or IN 2) once (depending if you want to copy the new EDID to input 1 or to input 2).  
The selected input button illuminates.
5. Enter the One output mode as defined in [Section 5.4](#) (with either IN 1 or IN 2).
6. Press that input button to set the appropriate OUTPUT STATUS LED. The OUTPUT STATUS LED illuminates indicating that that output channel is selected.
7. Press the LOCK button to copy the EDID of the selected OUTPUT to the input.  
While the EDID is being copied the EDID button flashes. The new EDID is copied, when the EDID button no longer flashes.

### 5.4.2 Acquiring the Default EDID

To reset the default EDID, do the following:

1. Connect the power supply.
2. Press the EDID button for more than 3 seconds.
3. Press an input button (either IN 1 or IN 2) once.  
The selected input button illuminates.
4. Enter the default mode as defined in [Section 5.4](#) (with either IN 1 or IN 2).  
All the OUTPUT STATUS LEDs flash simultaneously.

5. Press the LOCK to copy the default EDID to the input.  
While the EDID is being copied both the EDID and the Lock buttons flash.  
The new EDID is copied, when the EDID and the Lock buttons no longer flash.

### 5.4.3 Acquiring the EDID from Several Outputs

To acquire or change an EDID via several connected outputs:

1. Connect the power supply.
2. Connect several output display devices.
3. Press the EDID button for more than 3 seconds.
4. Press an input button (either IN 1 or IN 2) once.  
The selected input button illuminates.
5. Enter the Auto-mix mode as defined in [Section 5.4](#) (with either IN 1 or IN 2).  
The OUTPUT STATUS LEDs flash in sequence.
6. Press the LOCK button to copy the EDID of the selected OUTPUT to the input.  
While the EDID is being copied the EDID button flashes. The new EDID is copied when the EDID button no longer flashes.

## 6 Technical Specifications

### VM-28H

INPUTS:	2 on HDMI connectors
OUTPUTS:	8 on HDMI connectors
BANDWIDTH:	Supports up to 2.25Gbps bandwidth per graphic channel
COMPLIANCE WITH HDMI STANDARD:	Supports HDMI and HDCP
CONTROLS:	EDID, IN 1, IN 2, IR remote controller and LOCK buttons
INDICATOR LEDS:	Output status LEDs
POWER CONSUMPTION:	100-240V AC, 50/60Hz 28VA
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
DIMENSIONS:	19" x 7" x 1U W, D, H, rack mountable
WEIGHT:	2.5kg (5.5lbs) approx.
ACCESSORIES:	Power cord, rack "ears", IR remote control transmitter
OPTIONS:	External remote IR receiver cable P/N: C-A35M/IRR-50
Specifications are subject to change without notice at <a href="http://www.kramerelectronics.com">http://www.kramerelectronics.com</a>	

### VM-216H

INPUTS:	2 on HDMI connectors
OUTPUTS:	8 on HDMI connectors
BANDWIDTH:	Supports up to 2.25Gbps bandwidth per graphic channel
COMPLIANCE WITH HDMI STANDARD:	Supports HDMI and HDCP
CONTROLS:	EDID, IN 1, IN 2, IR remote controller and LOCK buttons
INDICATOR LEDS:	Output status LEDs
POWER CONSUMPTION:	100-240V AC, 50/60Hz, 48VA
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
DIMENSIONS:	19" x 7" x 1U W, D, H, rack mountable
WEIGHT:	2.5kg (5.5lbs) approx.
ACCESSORIES:	Power cord, rack "ears", IR remote control transmitter
Specifications are subject to change without notice at <a href="http://www.kramerelectronics.com">http://www.kramerelectronics.com</a>	



**Warning:** These are class A products, for professional applications and environments only.

## 7 Protocol 2000

This RS-232/RS-485 communication protocol uses four bytes of information as defined below.

For RS-232, a null-modem connection between the machine and controller is used. The default data rate is 9600 baud, with no parity, 8 data bits and 1 stop bit.

**Note:** Compatibility with Kramer's Protocol 2000 does not mean that a machine uses all of the commands below. Each machine uses a sub-set of Protocol 2000, according to its needs.

### 7.1 Syntax

MSB				LSB			
1st Byte		DESTINATION		INSTRUCTION			
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0
2nd Byte		INPUT					
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0
3rd Byte		OUTPUT					
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0
4th Byte		MACHINE NUMBER					
1	OV	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

1st Byte: Bit 7 – Defined as 0  
D – DESTINATION:  
0 – Sends information to the switchers (from the PC)  
1 – Sends information to the PC (from the switcher)  
N5...N0 – INSTRUCTION

The 6-bit INSTRUCTION defines the function performed by the switcher(s). If a function is performed using the machine's keyboard, these bits are set with the INSTRUCTION NO. performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value set in N5...N0).

2nd Byte: Bit 7 – Defined as 1  
I6...I0 – INPUT

When switching (i.e. instruction codes 1 and 2), the 7-bit INPUT is set as the input number to be switched. If switching is done using the machine's front panel, these bits are set with the INPUT NUMBER switched. For other operations, these bits are defined according to the table.

3rd Byte: Bit 7 – Defined as 1  
O6...O0 – OUTPUT

When switching (i.e. instruction codes 1 and 2), the 7-bit OUTPUT is set as the output number to be switched. If switching is done using the machine's front panel, these bits are set with the OUTPUT NUMBER switched. For other operations, these bits are defined according to the table.

4th Byte: Bit 7 – Defined as 1  
Bit 5 – Don't care  
OV – Machine number override  
M4...M0 – MACHINE NUMBER

This byte is used to address machines in a system by their machine numbers. When several machines are controlled from a single serial port, they are usually configured together and each machine has an individual machine number. If the OV bit is set, then all machine numbers accept (implement) the command and the addressed machine replies. When a single machine is controlled over the serial port, always set M4...M0 to 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

## 7.2 Instruction Codes

All the values in the table are decimal, unless otherwise stated

Instruction Codes for Protocol 2000				
Instruction		Definition for Specific Instruction		Notes
#	Description	Input	Output	
1	SWITCH VIDEO	Set equal to video input that is switched (0 = disconnect)	Set equal to video output that is switched (0 = to all the outputs)	2, 15
30	LOCK FRONT PANEL	Unlock panel Lock panel	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
61	IDENTIFY MACHINE	1 – Video machine name 2 – Audio machine name 3 – Video software version 4 – Audio software version 5 – RS-422 controller name 6 – RS-422 controller version 7 – Remote control name 8 – Remote software version 9 – Protocol 2000 revision 10 – Control data machine name 11 – Control data software version	For names: 0 – Request first 4 digits 1 – Request first suffix 2 – Request second suffix 3 – Request third suffix 10 – Request first prefix 11 – Request second prefix 12 – Request third prefix  For versions: 0 – main board or the number of external board	13
62	DEFINE MACHINE	1 – Number of inputs 2 – Number of outputs 3 – Number of setups	1 – For video 2 – For audio 3 – For SDI 4 – For remote panel 5 – For RS-422 controller 6 – For control data	14

**NOTES on the above table:**

**NOTE 2** – These are bi-directional definitions. If the switcher receives the code, it performs the instruction. If the instruction is performed (due to a keystroke operation on the front panel), these codes are sent.

For example, if the PC sends HEX code:

01                    85                    88                    83

then the switcher (machine 3) switches input 5 to output 8.

If the user switches input 1 to output 7 using the front panel buttons, the switcher sends HEX code:

41                    81                    87                    83

to the PC.

When the PC sends one of the commands in this group to the switcher, if the instruction is valid, the switcher replies by sending the same four bytes to the PC that it received (except for the first byte, where the DESTINATION bit is set high).

**NOTE 13** – This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine sends its name. The reply is the decimal value of the INPUT and OUTPUT.

For example, for a 2216, the reply to the request to send the audio machine name is HEX code:

7D                    96                    90                    81 (i.e.  $128_{dec} + 22_{dec}$  for 2<sup>nd</sup> byte, and  $128_{dec} + 16_{dec}$  for 3<sup>rd</sup> byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine sends its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it.

For example, for version 3.5, the reply to the request to send the version number would be HEX code:

7D                    83                    85                    81 (i.e.  $128_{dec} + 3_{dec}$  for 2<sup>nd</sup> byte,  $128_{dec} + 5_{dec}$  for 3<sup>rd</sup> byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent.

For example, for the VS-7588YC, the reply to the request to send the first suffix would be HEX code:

7D                    D9                    C3                    81 (i.e.  $128_{dec} + \text{ASCII for "Y"}$ ;  $128_{dec} + \text{ASCII for "C"}$ ).

**NOTE 14** – The number of inputs and outputs refers to the specific machine being addressed, *not* to the system.

For example, if six 16x16 matrices are configured to make a 48x32 system (48 inputs, 32 outputs), the reply to the HEX code:

3E                    82                    81                    82 (i.e. request the number of outputs)

would be HEX code:

7E                    82                    90                    82 (i.e. 16 outputs).

**NOTE 15** – When the OVR bit (4<sup>th</sup> byte) is set, then the video commands have universal meaning.

For example, instruction 1 (SWITCH VIDEO) causes all units (including audio, data, etc.) to switch. Similarly, if a machine is in FOLLOW mode, it performs any video instruction.

**NOTE 16** – The reply to the REQUEST WHETHER PANEL IS LOCKED is the same as in NOTE 4 above, except that OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

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#### SAFETY WARNING

Disconnect the unit from the power supply before opening and servicing



P/N: 2900-000662



Rev: 5