Kramer Electronics, Ltd.

USER MANUAL

Model:

VS-88HDxl
8x8 3G SD/HD-SDI Matrix Switcher
Contents

1 Introduction 1
2 Getting Started 1
  2.1 Achieving the Best Performance 2
  2.2 Safety Instructions 2
  2.3 Recycling Kramer Products 3
  2.4 Quick Start 3
3 Overview 5
4 Your VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher 6
  4.1 Using the IR Transmitter 9
5 Installing the VS-88HDxl in a Rack 10
6 Connecting the VS-88HDxl 11
  6.1 Connecting the VS-88HDxl in the Single Link Mode 11
  6.2 Connecting the VS-88HDxl in the Dual Link Mode 13
  6.3 Setting the Working Mode 15
  6.4 Connecting the RS-232 Port 15
  6.4.1 Determining the Machine Number 15
  6.4.2 Setting the DIP-Switches 16
  6.5 Connecting a PC or Controller to the RS-485 Port 17
  6.5.1 Setting the Address Switches 17
  6.5.2 Setting the Line Termination 17
  6.6 Switching Genlocked Video Signals 18
  6.7 Connecting the Ethernet Port 18
  6.7.1 Connecting the ETHERNET Port Directly to a PC (Crossover Cable) 18
  6.7.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable) 20
  6.8 Configuring the Ethernet Port 20
  6.9 Controlling via the Ethernet Port 20
  6.10 Using the Ethernet Reset Button 20
7 Operating the VS-88HDxl 20
  7.1 Operating the VS-88HDxl from the Front Panel 21
  7.1.1 Power On Display 21
  7.1.2 Using the AT ONCE and CONFIRM Modes 21
  7.1.3 Switching in the AT ONCE Mode 21
  7.1.4 Toggling Between Modes 21
  7.1.5 Switching in the CONFIRM Mode 22
  7.1.6 Storing an Input/Output Configuration 22
  7.1.7 Recalling an Input/Output Configuration 22
  7.1.8 Locking the Front Panel 23
  7.1.9 Switching Protocols 23
  7.1.10 Indicating Errors 23
  7.2 Using Serial Commands 23
Contents

7.3 Using the Infrared Remote Controller 24
8 Technical Specifications 24
9 Using the P3K Wizard 24
  9.1 Changing the Device Parameters 25
  9.2 Updating the VS-88HDxl Firmware 27
10 Kramer Protocol 3000 28
  10.1 Switching Protocols 28
  10.2 Kramer Protocol 3000 Syntax 29
    10.2.1 Host Message Format 29
    10.2.1.1 Simple Command 29
    10.2.1.2 Command String 29
    10.2.2 Device Message Format 29
    10.2.2.1 Device Long Response 29
    10.2.3 Command Terms 30
    10.2.4 Entering Commands 30
    10.2.5 Command Forms 31
    10.2.6 Command Chaining 31
    10.2.7 Maximum String Length 31
    10.2.8 Backward Support 31
  10.3 Kramer Protocol 3000 Commands 32
    10.3.1 Device Initiated Messages 32
    10.3.2 Result and Error Codes 32
    10.3.3 Basic Routing Commands 32
    10.3.4 Preset Commands 33
    10.3.5 Operation Commands 33
    10.3.6 Machine Information Commands 33
    10.3.7 Identification Commands 34
    10.3.8 Network Setting Commands 34
11 Hex Table (Protocol 2000) 35
12 Kramer Protocol 2000 36

Figures

Figure 1: VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher 7
Figure 2: Connecting the VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher 12
Figure 3: VS-88HDxl Dual-Link Inputs and Outputs 14
Figure 4: Connecting the Dual-Link VS-88HDxl 3G HD/SD-SDI Matrix Switcher 14
Figure 5: DIP-Switch Settings 16
Figure 6: Local Area Connection Properties Window 19
Figure 7: Internet Protocol (TCP/IP) Properties Window 19
Figure 8: P3K Wizard Screen 25
Figure 9: Connect Window 26
Figure 10: Device Properties Window 27
Tables

Table 1: Front Panel VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher 8
Table 2: Rear Panel VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher 8
Table 3: Machine # DIP-Switch Settings 16
Table 4: DIP-Switch Settings 16
Table 5: Genlock Settings 18
Table 6: VS-88HDxl Technical Specifications 24
Table 7: VS-88HDxl Hex Codes for Switching via RS-232/RS-485 35
Table 8: Protocol Definitions 36
Table 9: Instruction Codes for Protocol 2000 37
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 14 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; GROUP 11: Sierra Video Products; GROUP 12: Digital Signage; GROUP 13: Audio; and GROUP 14: Collaboration.

Thank you for purchasing the Kramer **VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher**, which is ideal for:

- Professional broadcasting and production studios
- Presentation applications

The package includes the following items:

- The **VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher**
- **RC-IR3** remote control (with manual)
- Power cord¹ and this user manual²

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 [www.kramerav.com/downloads/VS-88HDxl](http://www.kramerav.com/downloads/VS-88HDxl) to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

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¹ We recommend that you use only the power cord supplied with this device  
² Download up-to-date Kramer user manuals from our Web site at [http://www.kramerelectronics.com](http://www.kramerelectronics.com)
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 neighbouring electrical appliances that may adversely influence signal quality
- Position your **VS-88HDxl** 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/.

2.4 Quick Start

This quick start chart summarizes the basic setup and operation:
Step 1: Mount the machine - see section 5
Mount the machine in a rack or stick the 4 rubber feet to the underside.

Step 2: Connect the inputs and outputs - see section 6
If required, connect an RS-232 Control Port, and/or an RS-485 port.
Connect up to 8 single link inputs and outputs.

Step 3: Turn the power ON

Step 4: Set the machine - see section 7
Control the machine remotely:
Set the DIP-switches
Or control via the front panel buttons:

Step 5: Operate the machine
Operate via the front panel buttons, RS-232 and RS-485.
3 Overview

The VS-88HDxl is a high-performance matrix switcher for 3G HD-SDI and HD-SDI dual link signals. The unit can switch up to eight single link inputs to any or all of eight single link outputs or four dual link inputs to any or all of four dual link outputs.

In particular, the VS-88HDxl features:

- Operation of up to 2.97Gbps – enabling it to be used for standard definition, high-definition and 3G high-definition serial digital video signals (SD/HD/3G HD-SDI)
- SMPTE 259M, 292M, 424M, and 372M (dual link) compliance and support for data rates of 270Mbps, 1483.5Mbps, 1485Mbps and 2970Mbps
- Cable equalization up to 350m for SD\(^1\) signals, 140m for 1.5GHz HD\(^2\) signals, and 120m for 3GHz HD signals
- Reclocking and equalization on each input, storing and recalling setups, and a TAKE button for the execution of multiple switches all at once
- The ability to switch genlocked video signals according to the timing of the genlock reference input. Switching according to the bi-level or tri-level genlock\(^3\) input according to SMPTE RP-168

The VS-88HDxl is housed in a 19" 1U rack-mountable enclosure, and is fed from a 100-240 VAC universal switching power supply. The unit can be controlled via the front panel buttons or via:

- An infrared remote control transmitter
- An infrared remote extension cable transmitter
- Remotely, by RS-232 or RS-485 serial commands transmitted by a PC, touch screen system, or other serial controller
- The Ethernet
- By default, the VS-88HDxl is operated using the Kramer 3000 protocol (see section 7.1.9 for details of how to switch to Protocol 2000 and section 9.2 for the relevant protocol commands)

---

1 Standard Definition (SD) means an NTSC or PAL compatible video format, consisting of 480 (for NTSC) or 576 (for PAL) lines of interlaced video
2 High Definition (HD) means a video format, consisting of 720 active lines of progressive video or 1080 lines of progressive or interlaced video
3 The sources must be genlocked to the GENLOCK input in order to switch clearly
4 Your VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher

Figure 1, Table 1, and Table 2 define the VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher.
Figure 1: VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher
Table 1: Front Panel VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher

<table>
<thead>
<tr>
<th>#</th>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IR Receiver</td>
<td>The yellow LED illuminates when receiving signals from the infrared remote control transmitter</td>
</tr>
<tr>
<td>2</td>
<td><strong>POWER LED</strong></td>
<td>Illuminates when the unit is ON</td>
</tr>
<tr>
<td>3</td>
<td><strong>ALL Button</strong></td>
<td>Pressing ALL followed by an INPUT button, connects that input to all outputs</td>
</tr>
<tr>
<td>4</td>
<td><strong>OFF Button</strong></td>
<td>Pressing OFF+OUT disconnects that output from the inputs; pressing OFF+ALL disconnects all the outputs; a long press toggles between dual link and normal mode</td>
</tr>
<tr>
<td>5</td>
<td><strong>IN SELECT Buttons</strong></td>
<td>Select the input to switch to the output; long presses on buttons IN1 to IN5 change the genlock timing (see Table 5)</td>
</tr>
<tr>
<td>6</td>
<td><strong>OUT SELECT Buttons</strong></td>
<td>Select the output to which the input is switched</td>
</tr>
<tr>
<td>7</td>
<td><strong>STO (STORE) Button</strong></td>
<td>Pressing STO followed by an IN / OUT button stores the current setting</td>
</tr>
<tr>
<td>8</td>
<td><strong>RCL (RECALL) Button</strong></td>
<td>Pressing the RCL button and the corresponding INPUT / OUTPUT key recalls a setup from the non-volatile memory</td>
</tr>
<tr>
<td>9</td>
<td><strong>LOCK Button</strong></td>
<td>A long press toggles activation/inactivation of the front panel buttons; pressing LOCK+OUT2 selects Protocol 2000; pressing LOCK+OUT3 selects Protocol 3000</td>
</tr>
<tr>
<td>10</td>
<td><strong>TAKE Button</strong></td>
<td>Pressing TAKE toggles the mode between the CONFIRM mode and the AT ONCE mode (user confirmation per action is unnecessary)</td>
</tr>
<tr>
<td>11</td>
<td>7-segment Display</td>
<td>Displays the selected input switched to the output (marked above each input)</td>
</tr>
</tbody>
</table>

Table 2: Rear Panel VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher

<table>
<thead>
<tr>
<th>#</th>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td><strong>GENLOCK BNC Connector</strong></td>
<td>Connects to the genlock source</td>
</tr>
<tr>
<td>13</td>
<td><strong>TERM HI-Z/75Ω Pushbutton</strong></td>
<td>Press to terminate the genlock source (75Ω) or release for looping</td>
</tr>
<tr>
<td>14</td>
<td><strong>LOOP BNC Connector</strong></td>
<td>Connects to the genlock connector of the next unit in the line</td>
</tr>
<tr>
<td>15</td>
<td><strong>INPUT BNC Connectors</strong></td>
<td>Connects to the serial digital video sources</td>
</tr>
<tr>
<td>16</td>
<td><strong>RS-232 9-pin D-sub (F) Port</strong></td>
<td>Connects to the PC or the remote controller</td>
</tr>
<tr>
<td>17</td>
<td><strong>PROG/RS-485 TERM DIP-switches</strong></td>
<td>PROG DIP-switch enables microcontroller firmware upgrade RS-485 TERM DIP-switch terminates the RS-485 line with a 120Ω load</td>
</tr>
<tr>
<td>18</td>
<td><strong>RS-485 Terminal Block Port</strong></td>
<td>Pins B (−) and A (+) are for RS-485; Pin G may be connected to the shield (if required)</td>
</tr>
<tr>
<td>19</td>
<td><strong>ETHERNET RJ-45 Connector</strong></td>
<td>Connects to the PC or other Serial Controller through computer networking LAN</td>
</tr>
<tr>
<td>20</td>
<td><strong>MACH # DIP-switches</strong></td>
<td>DIP-switches 1-4 for setting the Machine Address of the unit</td>
</tr>
<tr>
<td>21</td>
<td><strong>ETH RESET Button</strong></td>
<td>Press to reset to factory default definitions: IP number – 192.168.1.39, Mask – 255.255.0.0, Gateway – 0.0.0.0</td>
</tr>
<tr>
<td>22</td>
<td><strong>OUTPUT BNC Connectors</strong></td>
<td>Connect to the serial digital video acceptors</td>
</tr>
<tr>
<td>23</td>
<td><strong>REMOTE IR 3.5mm Mini Jack</strong></td>
<td>Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)</td>
</tr>
<tr>
<td>24</td>
<td>Power Connector with Fuse</td>
<td>AC connector enabling power supply to the unit</td>
</tr>
<tr>
<td>25</td>
<td>Power Switch</td>
<td>Turns the power to the unit ON and OFF</td>
</tr>
</tbody>
</table>

1. First disconnect the power cord and then connect it again while pressing the ETH Factory Reset button. The unit powers up and loads its memory with the factory default definitions and erases all stored presets.
2. Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the VS-88HDxl (only if the internal IR connection cable has been installed) (See section 4.1)
4.1 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\(^1\). The external IR receiver can be located 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables\(^2\).

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable\(^3\) 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.

---

1 Model: C-A35M/IRR-50
2 Model: C-A35M/A35F-50
3 P/N: 505-70434010-S
5 Installing the VS-88HDxl in a Rack

This section provides instructions for rack mounting the 1U unit.

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

<table>
<thead>
<tr>
<th>OPERATING TEMPERATURE:</th>
<th>60° to +40°C (32° to 104°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORAGE TEMPERATURE:</td>
<td>-40° to +70°C (-40° to 158°F)</td>
</tr>
<tr>
<td>HUMIDITY:</td>
<td>10% to 90%, RH non-condensing</td>
</tr>
</tbody>
</table>

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
6 Connecting the VS-88HDxl

This section describes how to connect the VS-88HDxl in single link mode (see section 6.1) and in dual link mode (see section 6.2).

6.1 Connecting the VS-88HDxl in the Single Link Mode

The VS-88HDxl can switch one of the eight SD/HD/3G HD-SDI inputs to any or all of the eight SD/HD/3G HD-SDI outputs, as the example in Figure 2 shows.

To connect the VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher, do the following:

1. Connect up to eight SDI sources to the SDI INPUT BNC connectors (for example, an HD/SD camera to INPUT 1 and an SDI player to INPUT 8).
2. Connect the SDI OUTPUT BNC connectors to up to eight SDI acceptors (for example, OUTPUT 1 to a non-linear editor, and OUTPUT 8 to an HD SDI display).
3. Set the DIP-switches (see section 6.4.2).
4. Optionally, connect:
   - A genlock source to the GENLOCK BNC connector
   - The LOOP BNC connector to the GENLOCK connector of the next unit in the line, and release the TERM button for looping.
5. Connect a PC and/or controller (if required), to the:
   - RS-232 port (see section 6.4), and/or
   - RS-485 port (see section 6.5), and/or
   - ETHERNET connector (see section 6.7)
6. Connect the power cord.

1 Switch OFF the power on each device before connecting it to your VS-88HDxl. After connecting your VS-88HDxl, switch on its power and then switch on the power on each device.
2 Not illustrated in Figure 2
3 Pushed in terminates the input. Release when the input extends to another unit
4 We recommend that you use only the power cord that is supplied with this machine.
Figure 2: Connecting the VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher
6.2 Connecting the VS-88HDxl in the Dual Link Mode

You can use your VS-88HDxl in the dual-link mode to switch any of the four dual-link SDI inputs to any or all of the four dual-link SDI outputs, as shown\(^1\) in the examples in Figure 3 and Figure 4.

To connect the VS-88HDxl 3G HD/SD-SDI Matrix Switcher in the dual-link mode, do the following\(^2\):

1. Connect up to 4 of the SDI sources to the INPUT DUAL LINK BNC connectors. For example, a dual-link HD/SD camera to DUAL LINK 1 (inputs 1 and 2) and a dual-link 3G HD video server to DUAL LINK 4 (inputs 7 and 8).

2. Connect the SDI OUTPUT BNC connectors to up to four SDI acceptors. For example, OUTPUT DUAL LINK 3 (outputs 5 and 6) to a dual-link preview display and OUTPUT DUAL LINK 4 (outputs 7 and 8) to a dual-link HD SDI mixer.

3. Set the DIP-switches (see section 6.4.2).

4. Optionally\(^3\), connect:
   - A genlock source to the GENLOCK BNC connector
   - The LOOP BNC connector to the GENLOCK connector of the next unit in the line, and release the TERM button for looping\(^4\)

5. Connect a PC and/or controller (if required), to the:
   - RS-232 port (see section 6.4), and/or
   - RS-485 port (see section 6.5), and/or
   - ETHERNET connector (see section 6.7)

6. Connect the power cord\(^5\).

7. Set the machine to the dual-link mode (see section 6.3).

**Note:** In dual link mode only the first input status LED lights when both inputs are connected. For example, if inputs 3 and 4 are connected as a dual link, only the input status LED 3 lights.

---

1 The graphic on the rear panel does not indicate the dual link connections
2 Switch OFF the power on each device before connecting it to your VS-88HDxl. After connecting your VS-88HDxl, switch on its power and then switch on the power on each device
3 Not illustrated in Figure 2
4 Pushed in terminates the input. Release when the input extends to another unit
5 We recommend that you use only the power cord that is supplied with this machine
Connecting the VS-88HDxl

**Figure 3:** VS-88HDxl Dual-Link Inputs and Outputs

**Figure 4:** Connecting the Dual-Link VS-88HDxl 3G HD/SD-SDI Matrix Switcher
6.3 Setting the Working Mode

To enter the dual-link mode:
- Press and hold the OFF front panel button for 3 seconds until the 7-segment display shows 4 dual-link devices in the first 4 outputs of the display and “dl” in the rest of the outputs

To exit the dual-link mode:
- Press and hold the OFF front panel button for 3 seconds until the 7-segment display shows devices in all the 8 outputs

Notes:
1. The unit stays in the last working mode even after being powered down or after rebooting. It only changes after you perform the above procedure.
2. The error sign \[=\] appears when switching to an illegal configuration. It can also appear momentarily during switching\(^1\).

6.4 Connecting the RS-232 Port

You can connect to the VS-88HDxl via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the VS-88HDxl via RS-232:
- Connect the RS-232 9-pin D-sub rear panel port on the VS-88HDxl 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

6.4.1 Determining the Machine Number

Each unit must be identified by a unique Machine #. Determine the Machine # according to Table 3.
- When using a single unit, set the unit to Machine # 1.
- A master unit must be Machine #1.

When connecting more than one VS-88HDxl unit, set a different Machine # on each unit. The units do not have to be numbered sequentially but each unit must have a unique machine number.

---

\(^1\) In this case it can be ignored
Connecting the VS-88HDxl

Table 3: Machine # DIP-Switch Settings

<table>
<thead>
<tr>
<th>Machine #</th>
<th>DIP-SWITCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Single or master unit)</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>ON</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>8</td>
<td>OFF</td>
</tr>
<tr>
<td>9</td>
<td>ON</td>
</tr>
<tr>
<td>10</td>
<td>OFF</td>
</tr>
<tr>
<td>11</td>
<td>ON</td>
</tr>
<tr>
<td>12</td>
<td>OFF</td>
</tr>
<tr>
<td>13</td>
<td>ON</td>
</tr>
<tr>
<td>14</td>
<td>OFF</td>
</tr>
<tr>
<td>15</td>
<td>ON</td>
</tr>
</tbody>
</table>

Note: After changing the address, the device must be reset by turning OFF and ON.

6.4.2 Setting the DIP-Switches

When controlling a unit via the RS-232 or RS-485 ports set the DIP-switches on the rear of the unit. Figure 5 and Table 4 define the DIP-switches:

![Figure 5: DIP-Switch Settings](image)

Table 4: DIP-Switch Settings

<table>
<thead>
<tr>
<th>DIPS</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-485 Term</td>
<td>RS-485 line termination</td>
<td>OFF for no RS-485 line termination ON for RS-485 120Ω line termination</td>
</tr>
<tr>
<td>PROG</td>
<td>Firmware update</td>
<td>Set ON only to update device firmware</td>
</tr>
<tr>
<td>MACH # 1, 2, 3, 4</td>
<td>Self Address</td>
<td>Sets the MACHINE # (see section 6.4.1)</td>
</tr>
</tbody>
</table>

1 A single or master unit can have the address 0 or 1
2 The default address is 0 (all DIP-switches are OFF)
The RS-485 TERM DIP-switch is used only when the RS-485 port is connected (see section 6.4.2). The first and last units on the RS-485 line (for example, the controller and the last VS-88HDxl) must be terminated; the units in between must not be terminated.

Set the PROG DIP-switch ON only while updating the unit firmware, otherwise the switch must be OFF.

### 6.5 Connecting a PC or Controller to the RS-485 Port

You can operate the VS-88HDxl via the RS-485 port from a distance of up to 1200 meters (3900ft) using any device equipped with an RS-485 port (for example, a PC). For successful communication, you must set the RS-485 machine number and bus termination.

To connect a device with a RS-485 port to the VS-88HDxl:
- Connect the A (+) pin on the RS-485 port of the PC to the A (+) pin on the RS-485 port on the rear panel of the VS-88HDxl
- Connect the B (–) pin on the RS-485 port of the PC to the B (–) pin on the RS-485 port on the rear panel of the VS-88HDxl
- Connect the G pin on the RS-485 port of the PC to the G pin on the RS-485 port on the rear panel of the VS-88HDxl

### 6.5.1 Setting the Address Switches

To set the address DIP-switches:
- Assign Master Machine #1 to the master unit with the address 0 or 1 set in the DIP-switches
- Assign a unique Machine # from 2 to 15 for each VS-88HDxl slave unit using Table 3. The units do not have to be sequentially numbered but they must have unique addresses

### 6.5.2 Setting the Line Termination

To ensure correct operation, the RS-485 line must be terminated at both ends. The master unit may be located at any part of the line, but when it is at the end of the line, the termination switch must be set ON.

To set line termination, as shown in Figure 5:
- For the VS-88HDxl unit located at the end of the RS-485 line, set the RS-485 TERM DIP-switch ON
- For all other VS-88HDxl units in the middle of the line, set the RS-485 TERM DIP-switch OFF
6.6 Switching Genlocked Video Signals

The genlock feature lets you switch genlocked video signals according to timing of the GENLOCK reference input\(^1\).

1. Connect the GENLOCK cable.
2. To set the genlock timing, press and hold for 3 seconds the appropriate input button as follows\(^2\):

<table>
<thead>
<tr>
<th>To Set</th>
<th>Press and Hold for 3 Seconds</th>
<th>Displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1080i/p @60Hz</td>
<td>IN 1</td>
<td>1080 60H</td>
</tr>
<tr>
<td>1080i/p @50Hz</td>
<td>IN 2</td>
<td>1080 50H</td>
</tr>
<tr>
<td>720p @60Hz</td>
<td>IN 3</td>
<td>720P 60H</td>
</tr>
<tr>
<td>PAL @50Hz</td>
<td>IN 4</td>
<td>PAL 50H</td>
</tr>
<tr>
<td>NTSC @60Hz</td>
<td>IN 5</td>
<td>NTSC 60H</td>
</tr>
</tbody>
</table>

Table 5: Genlock Settings

**Note:** When turning the machine ON, the last stored setup is shown in the 7-segment display.

6.7 Connecting the Ethernet Port

You can connect the **VS-88HDxl** via the ETHERNET in the following ways:

- For direct connection to the PC, use a crossover cable (see section 6.7.1)
- For connection via a network hub or network router, use a straight-through cable (see section 6.7.2)

6.7.1 Connecting the ETHERNET Port Directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-88HDxl** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP address\(^3\) of the **VS-88HDxl** during the initial configuration

After connecting the Ethernet port, configure your PC as follows:

---

\(^1\) According to SMPTE RP-168. The sources must be genlocked to the GENLOCK input in order to switch cleanly
\(^2\) The unit will detect automatically when SD-SDI inputs are used
\(^3\) The default IP address is 192.168.1.39
1. Right-click the My Network Places icon on your desktop.
2. Select Properties.
3. Right-click Local Area Connection Properties.
4. Select Properties. The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the Properties Button (see Figure 6).

**Figure 6: Local Area Connection Properties Window**

6. Select Use the following IP Address, and fill in the details as shown in Figure 7.
7. Click OK.

**Figure 7: Internet Protocol (TCP/IP) Properties Window**
6.7.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the VS-88HDx1 to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

6.8 Configuring the Ethernet Port

After connecting the VS-88HDx1 to the Ethernet port, configure your local Ethernet port using K-LAN Configuration Software by following the instructions in the Ethernet Configuration (K-LanConfigurator) Guide available from http://www.kramerelectronics.com/support/product_downloads.asp or from the downloads section of the VS-88HDx1 Web page.

6.9 Controlling via the Ethernet Port

You can control the VS-88HDx1 via RS-232/RS-485 or the Ethernet using the Kramer K-Router application.

If you are controlling a standalone unit via RS-232 or the Ethernet, configure the unit as master (Mach No. 1), see section 6.4.1.

6.10 Using the Ethernet Reset Button

To reset Ethernet parameters to the factory defaults:

1. Turn the power switch OFF and then ON while pressing the ETH RESET button.
2. The unit powers up and loads its memory with the factory default definitions.
3. The unit also erases all stored presets, returns to the default Protocol 3000 and indicates “F-rst” on the 7-segment display.

7 Operating the VS-88HDx1

You can operate your VS-88HDx1 using:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- RC-IR3 infrared remote control transmitter
7.1 Operating the VS-88HDxl from the Front Panel

The following operations are performed by using the front panel buttons.

7.1.1 Power On Display

When the VS-88HDxl is powered on, the display briefly shows the 4-digit firmware version number, the genlock timing setting, and then the display changes to its normal operating display.

7.1.2 Using the AT ONCE and CONFIRM Modes

Choose to work in either the AT ONCE or the CONFIRM modes. When the VS-88HDxl operates in the AT ONCE mode, pressing an OUT-IN combination implements the switch immediately. In the CONFIRM mode, the change does not take place until the TAKE button is pressed.

The AT ONCE mode is faster since execution is immediate and actions require no user confirmation. However, no protection is offered against changing an action in error.

In the CONFIRM mode:

- You can key-in several actions and then confirm them by pressing the “TAKE” button, to simultaneously activate the multiple switches
- Every action requires user confirmation, protecting against erroneous switching due to human error (pressing the wrong button)
- Execution is delayed until the user confirms the action

7.1.3 Switching in the AT ONCE Mode

To switch an input to an output in the AT ONCE mode, do the following:

1. Press an OUT SELECT button\(^1\) or the ALL button. The 7-segment display flashes.
2. Press an IN SELECT button\(^1\) or the OFF button\(^2\). The selected input switches to the selected output. The digits displayed in the 7-segment display change as appropriate.

7.1.4 Toggling Between Modes

To toggle between the AT ONCE and CONFIRM modes, do the following:

---

\(^1\) From 1 to 8
\(^2\) For immediate switching
1. Press the TAKE button to toggle from the AT ONCE mode (in which the TAKE button is not lit) to the CONFIRM mode (in which the TAKE button illuminates). Actions now require user confirmation and the TAKE button illuminates.

2. Press the illuminated TAKE button to toggle from the CONFIRM mode back to the AT ONCE mode. TAKE button turns off and actions no longer require user confirmation.

7.1.5 Switching in the CONFIRM Mode

To switch in the CONFIRM mode, when the TAKE button is illuminated, do the following:

1. Press an OUT-IN combination. The 7-segment display flashes\(^1\).
2. Press the TAKE button to confirm the action. The 7-segment display stops flashing. The TAKE button stays lit.

To confirm several actions (in CONFIRM mode), do the following:

1. Press each OUT-IN combination in sequence. The 7-segment display flashes.
2. Press the TAKE button to confirm all the actions. The 7-segment display stops flashing. The TAKE button stays lit.

7.1.6 Storing an Input/Output Configuration

You can store up to 16 configurations in memory and recall them as presets using the eight IN SELECT buttons and the eight OUT SELECT buttons.

To store the current configuration, do the following:

1. Press the STO button. The STO button flashes.
2. Press one of the IN / OUT SELECT buttons. The current configuration is stored in memory at the chosen preset #.

7.1.7 Recalling an Input/Output Configuration

To recall an input/output configuration, do the following:

1. Press the RCL button. The RCL button flashes.

---

\(^1\) The timeout lasts for 10 seconds
2. Press the appropriate IN / OUT SELECT button (the button # corresponding to the preset #).
   The chosen preset configuration is restored from memory.

   **Note:** Recalling an invalid setup gives an error indication (see section 7.1.10).

If you cannot remember which of the eight input/output configurations is the one that you want, set the **VS-88HDxl** to the CONFIRM mode and manually scan all the input/output configurations until you locate it.

### 7.1.8 Locking the Front Panel

Lock the front panel buttons to prevent unwanted key presses from changing the existing setup.

- To lock the front panel, press and hold the LOCK key for three seconds.
  The LOCK key illuminates and the front panel keys are inactivated
- To unlock the front panel, press and hold the illuminated LOCK key until the light turns off.
  The front panel keys are activated

### 7.1.9 Switching Protocols

You can operate the **VS-88HDxl** using either the KRAMER 2000 or the default KRAMER 3000 serial protocol.

- To choose the Kramer 2000 protocol instead of the default Protocol 3000, press LOCK and OUT 2 at the same time.
  LOCK flashes briefly if the change was made correctly
- To revert to the Kramer 3000 protocol, press LOCK and OUT 3 at the same time.
  LOCK flashes briefly if the change was made correctly

### 7.1.10 Indicating Errors

If the front panel buttons were incorrectly pressed, such as pressing two keys at once, or an invalid setup # was chosen for recall, the following error indication occurs:

- The STO, RCL, LOCK, and TAKE buttons all flash together for one second and return to their previous state

If an error is indicated, retry the previous action or choose a new action.

### 7.2 Using Serial Commands

To operate the **VS-88HDxl** using serial commands, Kramer offers control software that can do this. You can download free software from the Kramer Electronics Web site.
For an explanation of all KRAMER 3000 commands, see section 9.2
For an explanation of all KRAMER 2000 commands, see section 11

7.3 Using the Infrared Remote Controller

To operate the VS-88HDxl using the RC-IR3 infrared remote controller, see the User Manual packed with the remote controller\(^1\).

**Note:**
- The remote control cannot set single or dual mode operation or change genlock timing. They can only be set from the front panel
- The IR remote can only set 8 preset configurations equivalent to OUT1 to OUT8

8 Technical Specifications

The VS-88HDxl technical specifications are shown in Table 6:

<table>
<thead>
<tr>
<th>INPUTS:</th>
<th>8 SMPTE-259M, 344M, 292M, 372M, 424M serial video, 75Ω on BNC connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUTS:</td>
<td>8 equalized and reclocked SMPTE-259M, 344M, 292M, 424M, 372M (dual link) outputs 75Ω on BNC connectors</td>
</tr>
<tr>
<td>MAX. OUTPUT LEVEL:</td>
<td>800mVpp /75Ω</td>
</tr>
<tr>
<td>DATA RATE:</td>
<td>Up to 2.97Gbps</td>
</tr>
<tr>
<td>CONTROLS:</td>
<td>Front-panel, RS-232, RS-485, ETHERNET, remote infrared</td>
</tr>
<tr>
<td>POWER SOURCE:</td>
<td>Universal, 100-240V AC, 50/60Hz 24VA</td>
</tr>
<tr>
<td>DIMENSIONS:</td>
<td>19” x 7” x 1U W, D, H, rack mountable</td>
</tr>
<tr>
<td>WEIGHT:</td>
<td>2.6kg (5.7lbs) approx.</td>
</tr>
<tr>
<td>ACCESSORIES:</td>
<td>Power cord, IR remote control transmitter</td>
</tr>
<tr>
<td>OPTIONS:</td>
<td>External remote IR receiver cable</td>
</tr>
</tbody>
</table>

9 Using the P3K Wizard

P3K is a Kramer software program for upgrading the machine firmware and accessing and changing device parameters. The P3K program can be downloaded from the Kramer Web site at [www.kramerelectronics.com](http://www.kramerelectronics.com).

---

\(^1\) See also the Kramer Web site: [www.kramerelectronics.com](http://www.kramerelectronics.com)

\(^2\) Specifications are subject to change without notice
9.1 Changing the Device Parameters

To change the device parameters do the following:

1. Connect a PC to the **VS-88HDxl** using any one of the following connections:
   - Connect a serial cable from an RS-232 9-pin D-sub rear panel port on the PC to the **VS-88HDxl** as explained in section 6.4.
   - Connect an RJ-45 Ethernet cable from the Ethernet port on the PC to the Ethernet port on the **VS-88HDxl**.

2. Open the P3K Wizard by double-clicking the desktop icon **P3K Wizard**. The **P3K Wizard** screen appears:

![P3K Wizard Screen](image)

*Figure 8: P3K Wizard Screen*

3. Click the **Connect** button to open the **Connect** window.

---

1 The screens appearing in this manual are examples of the process. The actual screens may differ in their content.
4. Choose the appropriate type of connection: Ethernet BY IP, BY NAME, or SERIAL/USB, and click **OK**.

The Connect window disappears and the Device Properties window appears.
Figure 10: Device Properties Window

5. Change the parameters in the white fields as required and click SET.

9.2 Updating the VS-88HDxl Firmware

The VS-88HDxl uses a microcontroller that runs firmware located in FLASH memory.

The latest version of firmware and installation instructions can be downloaded from the Kramer Web site at www.kramerelectronics.com.
10 Kramer Protocol 3000

The VS-88HDxl can be operated using serial commands from a PC, remote controller, or touch screen. The unit communicates using the default Kramer Protocol 3000 but can also use Kramer Protocol 2000.

This section describes:

- How to switch between Protocol 3000 and Protocol 2000 (see section 10.1)
- Kramer Protocol 3000 syntax (see section 10.2)
- Kramer Protocol 3000 commands (see section 10.3)

10.1 Switching Protocols

Protocols can be switched either from the front panel buttons or by transmitting protocol commands.

To switch protocols using the front panel buttons:

- To choose Protocol 2000, press LOCK and OUT 2 at the same time
- To choose the Protocol 3000, press LOCK and OUT 3 at the same time

To switch protocols using protocol commands:

- To switch from Protocol 3000 to Protocol 2000, send the following command:
  #P2000<CR>
- To switch from Protocol 2000 to Protocol 3000, send the following command:
  0x38, 0x80, 0x83, 0x81

Note: If you are using Kramer’s Windows®-based control software it operates only with Protocol 2000. If the VS-88HDxl is set to Protocol 3000, it automatically switches to Protocol 2000.

---

1 Download the latest software from our Web site at http://www.kramerelectronics.com
10.2 Kramer Protocol 3000 Syntax

Protocol 3000 communicates at a data rate of 115200 baud, no parity, 8 data bits and 1 stop bit.

10.2.1 Host Message Format

<table>
<thead>
<tr>
<th>Start</th>
<th>Address (optional)</th>
<th>Body</th>
<th>Delimiter</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>Destination_id@</td>
<td>Message</td>
<td>CR</td>
</tr>
</tbody>
</table>

10.2.1.1 Simple Command

Command string with only one command without addressing:

<table>
<thead>
<tr>
<th>Start</th>
<th>Body</th>
<th>Delimiter</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>Command SP Parameter_1,Parameter_2,…</td>
<td>CR</td>
</tr>
</tbody>
</table>

10.2.1.2 Command String

Formal syntax with commands concatenation and addressing:

<table>
<thead>
<tr>
<th>Start</th>
<th>Address</th>
<th>Body</th>
<th>Delimiter</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>Destination_id@</td>
<td>Command_1 Parameter_1,Parameter_1_2,…</td>
<td>CR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Command_2 Parameter_2,Parameter_2_2,…</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Command_3 Parameter_3,Parameter_3_2,…</td>
<td></td>
</tr>
</tbody>
</table>

10.2.2 Device Message Format

<table>
<thead>
<tr>
<th>Start</th>
<th>Address (optional)</th>
<th>Body</th>
<th>Delimiter</th>
</tr>
</thead>
<tbody>
<tr>
<td>~</td>
<td>Sender_id@</td>
<td>Message</td>
<td>CR LF</td>
</tr>
</tbody>
</table>

10.2.2.1 Device Long Response

Echoing command:

<table>
<thead>
<tr>
<th>Start</th>
<th>Address (optional)</th>
<th>Body</th>
<th>Delimiter</th>
</tr>
</thead>
<tbody>
<tr>
<td>~</td>
<td>Sender_id@</td>
<td>Command SP [Param1.Param2 …] result</td>
<td>CR LF</td>
</tr>
</tbody>
</table>

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

**Command**
A sequence of ASCII letters ('A'-'Z', 'a'-'z' and '-').
Command and parameters must be separated by at least one space.

**Parameters**
A sequence of alphanemic 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.

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

**Message starting character**
'#' – For host command/query
'-' – For machine response

**Device address** (Optional, for K-NET)
K-NET Device ID followed by '@'

**Query sign**
'?' follows some commands to define a query request.

**Message closing character**

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>For host messages; carriage return (ASCII 13)</td>
</tr>
<tr>
<td>CRLF</td>
<td>For machine messages; carriage return (ASCII 13) + line-feed (ASCII 10)</td>
</tr>
</tbody>
</table>

**Command chain separator character**
When a message string contains more than one command, a pipe ( '|' ) character separates each command.

Spaces between parameters or command terms are ignored.

10.2.4 Entering Commands

You can directly enter all commands using a terminal with ASCII communications software, such as HyperTerminal, Hercules, etc. Connect the terminal to the serial or Ethernet port on the Kramer device. To enter CR press the Enter key.

( LF is also sent but is ignored by command parser).

For commands sent from some non-Kramer controllers like Crestron, some characters require special coding (such as, /X##). Refer to the controller manual.
10.2.5 Command Forms

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

10.2.6 Command Chaining

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 once, at the beginning of the string and at the end.

Commands in the string do not execute until the closing character is entered.

A separate response is sent for every command in the chain.

10.2.7 Maximum String Length

64 characters

10.2.8 Backward Support

Protocol 2000 is transparently supported by Protocol 3000. You can switch between protocols using a switch protocol command from either platform.
10.3 Kramer Protocol 3000 Commands

10.3.1 Device Initiated Messages

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switcher actions:</td>
<td></td>
</tr>
<tr>
<td>Video channel has switched</td>
<td>VID IN&gt;OUT</td>
</tr>
<tr>
<td>(breakaway mode)</td>
<td></td>
</tr>
</tbody>
</table>

10.3.2 Result and Error Codes

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Protocol Errors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command ran successfully, no error.</td>
<td>COMMAND PARAMETERS OK</td>
</tr>
<tr>
<td>Syntax error</td>
<td>ERR001</td>
</tr>
<tr>
<td>Command not available for this device</td>
<td>ERR002</td>
</tr>
<tr>
<td>Parameter is out of range</td>
<td>ERR003</td>
</tr>
<tr>
<td>Unauthorized access</td>
<td>ERR004</td>
</tr>
</tbody>
</table>

10.3.3 Basic Routing Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch video</td>
<td>VID IN&gt;OUT, IN&gt;OUT, ..</td>
<td>VID IN&gt;OUT, IN&gt;OUT, ..</td>
</tr>
<tr>
<td>Read video connection</td>
<td>VID? OUT, VID? IN&gt;OUT</td>
<td>VID IN&gt;OUT, IN&gt;1, IN&gt;2, ..</td>
</tr>
<tr>
<td>Parameter Description:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN = Input number or '0' to disconnect output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'&gt;' = Connection character between in and out parameters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT = Output number or '*' for all outputs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Examples:

- Switch video input 2 to output 4
  - #V 2>4\text{CR}
  - ~VID 2>4 OK\text{CRLF}

- Switch video input 4 to output 2 in machine number 6
  - #6@VID 4>2\text{CR}
  - ~6@VID 4>2 OK\text{CRLF}

- Disconnect video output 4
  - #AV 0>4\text{CR}
  - ~AV 0>4 OK\text{CRLF}

- Switch video input 3 to all outputs
  - #V 3>*\text{CR}
  - ~VID 3>* OK\text{CRLF}

Chaining multiple commands:

- #V 1>* | V 3>4, 2>2, 2>1, 0>2 | V 3>9 | V? * \text{CR}
  1. Switch video from input 1 to all outputs.
  2. Switch video input 3 to output 4, video input 2 to output 2, video input 2 to output 1 and disconnect video output 2.
  3. Switch video input 3 to output 9 (non-existent).
  4. Get status of all video links.
  Command processing begins after entering \text{CR}. A response is sent for each command after processing.

- ~VID 1>* OK\text{CRLF}
- ~VID 3>4, 2>2, 2>1, 0>2 OK\text{CRLF}
- ~VID ERR003\text{CRLF}
- ~VID 2>1, 0>2, 1>3, 3>4\text{CRLF}
### 10.3.4 Preset Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store current connections to preset</td>
<td>PRST-STO[PRESET]</td>
<td>PRST-STO[PRESET]RESULT</td>
</tr>
<tr>
<td>Recall saved preset</td>
<td>PRST-RCL[PRESET]</td>
<td>PRST-RCL[PRESET]RESULT</td>
</tr>
<tr>
<td>Delete saved preset</td>
<td>PRST-DEL[PRESET]</td>
<td>PRST-DEL[PRESET]RESULT</td>
</tr>
<tr>
<td>Read video connections from saved preset</td>
<td>PRST-VID?[PRESET]OUT</td>
<td>PRST-VID[PRESET]IN&gt;OUT</td>
</tr>
<tr>
<td>Read saved presets list</td>
<td>PRST-LST?</td>
<td>PRST-LST[PRESET]PRESET,...</td>
</tr>
</tbody>
</table>

**Parameter Description:**

- **PRESET** = Preset number.
- **OUT** = Output in preset to display, """" for all.

**Examples:**

- Store current video connections to preset 5: `#PRST-STO 5CR`  
  Response: `~PRST-STR 5 OKCRLF`
- Recall video connections from preset 3: `#PRCL 3CR`  
  Response: `~PRST-RCL 3 OKCRLF`
- Show source of video output 2 from preset 3: `#PRST-VID? 3,2CR`  
  Response: `~PRST-VID 3: 4>2 CRLF`

### 10.3.5 Operation Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock front panel</td>
<td>LOCK-FP LOCK-MODE</td>
<td>LOCK-FP LOCK-MODERESULT</td>
</tr>
<tr>
<td>Get front panel locking state</td>
<td>LOCK-FP?</td>
<td>LOCK-FP LOCK-MODE</td>
</tr>
</tbody>
</table>

**Parameter Description:**

- **LOCK-MODE** = Front panel locking state:
  - '0' or 'off' to unlock front panel buttons
  - '1' or 'on' to lock front panel buttons

**Examples:**

- Reset device: `RESET`  
  Response: `RESET OK`
- Switch to protocol 2000*: `P2000`  
  Response: `P2000 OK`

* Protocol 2000 has a command to switch back to ASCII protocol (like Protocol 3000)

### 10.3.6 Machine Information Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read in/out count</td>
<td>INFO-IO?</td>
<td>INFO-IO: IN [INPUTS_COUNT] OUT [OUTPUTS_COUNT]</td>
</tr>
<tr>
<td>Read max preset count</td>
<td>INFO-PRST?</td>
<td>INFO-PRST: VID [PRESET_VIDEO_COUNT]</td>
</tr>
<tr>
<td>Reset to factory default configuration</td>
<td>FACTORY</td>
<td>FACTORY RESULT</td>
</tr>
</tbody>
</table>
### 10.3.7 Identification Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol handshaking</td>
<td><code>#CR</code></td>
<td><code>~OK CRLF</code></td>
</tr>
<tr>
<td>Read device model</td>
<td><code>MODEL?</code></td>
<td><code>MODEL [MACHINE_MODEL]</code></td>
</tr>
<tr>
<td>Read device serial number</td>
<td><code>SN?</code></td>
<td><code>SN [SERIAL_NUMBER]</code></td>
</tr>
<tr>
<td>Read device firmware version</td>
<td><code>VERSION?</code></td>
<td><code>VERSION [MAJOR] [MINOR] [BUILD] [REVISION]</code></td>
</tr>
<tr>
<td>Set machine name</td>
<td><code>NAME [MACHINE_NAME]</code></td>
<td><code>NAME [MACHINE_NAME] RESULT</code></td>
</tr>
<tr>
<td>Read machine name</td>
<td><code>NAME?</code></td>
<td><code>NAME [MACHINE_NAME]</code></td>
</tr>
<tr>
<td>Reset machine name to factory default*</td>
<td><code>NAME-RST</code></td>
<td><code>NAME-RST [MACHINE_FACTORY_NAME] RESULT</code></td>
</tr>
</tbody>
</table>

*Note:* The machine name is not the same as the model name. The machine name is used to identify a specific machine or a network in use (with DNS feature on). 

*MACHINE_NAME* = Up to 14 alphanumeric chars.

*M Machine factory name = Model name + last 4 digits from serial number.

### 10.3.8 Network Setting Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set IP address</td>
<td><code>NET-IP [IP_ADDRESS]</code></td>
<td><code>NET-IP [IP_ADDRESS] RESULT</code></td>
</tr>
<tr>
<td>Read IP address</td>
<td><code>NET-IP?</code></td>
<td><code>NET-IP [IP_ADDRESS]</code></td>
</tr>
<tr>
<td>Read MAC address</td>
<td><code>NET-MAC?</code></td>
<td><code>NET-MAC [MAC_ADDRESS]</code></td>
</tr>
<tr>
<td>Set subnet mask</td>
<td><code>NET-MASK [SUBNET_MASK]</code></td>
<td><code>NET-MASK [SUBNET_MASK] RESULT</code></td>
</tr>
<tr>
<td>Read subnet mask</td>
<td><code>NET-MASK?</code></td>
<td><code>NET-MASK [SUBNET_MASK]</code></td>
</tr>
<tr>
<td>Set gateway address</td>
<td><code>NET-GATE [GATEWAY_ADDRESS]</code></td>
<td><code>NET-GATE [GATEWAY_ADDRESS] RESULT</code></td>
</tr>
<tr>
<td>Read gateway address</td>
<td><code>NET-GATE?</code></td>
<td><code>NET-GATE [GATEWAY_ADDRESS]</code></td>
</tr>
<tr>
<td>Set DHCP mode</td>
<td><code>NET-DHCP [DHCP_MODE]</code></td>
<td><code>NET-DHCP [DHCP_MODE] RESULT</code></td>
</tr>
<tr>
<td>Read subnet mask</td>
<td><code>NET-DHCP?</code></td>
<td><code>NET-DHCP [DHCP_MODE]</code></td>
</tr>
</tbody>
</table>

**DHCP_MODE** =

'0' – Don’t use DHCP (Use IP set by factory or IP set command).

'1' – Try to use DHCP, if unavailable use IP as above.

<table>
<thead>
<tr>
<th>Change protocol Ethernet port</th>
<th><code>ETH-PORT [PROTOCOL] [PORT]</code></th>
<th><code>ETH-PORT [PROTOCOL] [PORT] RESULT</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Read protocol Ethernet port</td>
<td><code>ETH-PORT? [PROTOCOL]</code></td>
<td><code>ETH-PORT [PROTOCOL]</code></td>
</tr>
</tbody>
</table>

**PROTOCOL** = TCP/UDP (transport layer protocol)

**PORT** = Ethernet port that accepts Protocol 3000 commands

1-65535 = User defined port

0 - Reset port to factory default (50000 for UDP, 5000 for TCP)
## Hex Table (Protocol 2000)

Table 7 lists the Hex values for a single machine (MACHINE # 1):

### Table 7: VS-88HDxl Hex Codes for Switching via RS-232/RS-485

<table>
<thead>
<tr>
<th>IN 1</th>
<th>OUT 1</th>
<th>OUT 2</th>
<th>OUT 3</th>
<th>OUT 4</th>
<th>OUT 5</th>
<th>OUT 6</th>
<th>OUT 7</th>
<th>OUT 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>81</td>
<td>81</td>
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<td>81</td>
<td>81</td>
<td>81</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>IN 2</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<tr>
<td>82</td>
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<td>81</td>
<td>81</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>IN 3</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<tr>
<td>83</td>
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<td>81</td>
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</tr>
<tr>
<td>IN 4</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<td>81</td>
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</tr>
<tr>
<td>IN 5</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<td>01</td>
<td>01</td>
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<td>81</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>IN 6</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<td>86</td>
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<tr>
<td>IN 7</td>
<td>01</td>
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<td>01</td>
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<td>81</td>
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<td>81</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>IN 8</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
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<tr>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
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<td>88</td>
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<td>88</td>
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<td>81</td>
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</tr>
</tbody>
</table>
12  Kramer Protocol 2000

The VS-88HDxl is compatible with Kramer’s Protocol 2000\(^1\), version 0.50. This RS-232/RS-485 communication protocol uses four bytes of information as defined below. The default data rate is 9600 baud, with no parity, 8 data bits, and 1 stop bit.

Table 8: Protocol Definitions

<table>
<thead>
<tr>
<th>MSB</th>
<th>DESTINATION</th>
<th>INSTRUCTION</th>
<th>LSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>N5 N4 N3 N2 N1 N0</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>5 4 3 2 1 0</td>
<td>1st byte</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>2nd byte</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>3rd byte</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MACHINE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>4th byte</td>
</tr>
</tbody>
</table>

1st BYTE: Bit 7 – Defined as 0.
D – “DESTINATION”: 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – “INSTRUCTION”
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine’s keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – “INPUT”.
When switching (i.e. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine’s front-panel, then these bits are set with the INPUT NUMBER which was 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 OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine’s front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don’t care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.

\(^1\) You can download our user-friendly “Software for Calculating Hex Codes for Protocol 2000” from the technical support section on our Web site at: [http://www.kramerelectronics.com](http://www.kramerelectronics.com)
For a single machine controlled via the serial port, always set M4...M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

### Table 9: Instruction Codes for Protocol 2000

Note: All values in the table are decimal, unless otherwise stated.

<table>
<thead>
<tr>
<th>#</th>
<th>INSTRUCTION</th>
<th>DEFINITION FOR SPECIFIC INSTRUCTION</th>
<th>OUTPUT</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>RESET DEVICE</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>SWITCH VIDEO</td>
<td>Set equal to video input which is to be switched (0 = disconnect)</td>
<td>Set equal to video output which is to be switched (0 = to all the outputs)</td>
<td>2, 15</td>
</tr>
<tr>
<td>3</td>
<td>STORE VIDEO STATUS</td>
<td>Set as SETUP #</td>
<td>0 - to store 1 - to delete</td>
<td>2, 3, 15</td>
</tr>
<tr>
<td>4</td>
<td>RECALL VIDEO STATUS</td>
<td>Set as SETUP #</td>
<td>0</td>
<td>2, 3, 15</td>
</tr>
<tr>
<td>5</td>
<td>REQUEST STATUS OF A VIDEO OUTPUT</td>
<td>Set as SETUP #</td>
<td>Equal to output number whose status is required</td>
<td>4, 3</td>
</tr>
<tr>
<td>15</td>
<td>REQUEST WHETHER SETUP IS DEFINED / VALID INPUT IS DETECTED</td>
<td>SETUP # or Input #</td>
<td>0 - for checking if setup is defined 1 - for checking if input is valid</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>ERROR / BUSY</td>
<td>For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #</td>
<td>0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input</td>
<td>9, 25</td>
</tr>
<tr>
<td>30</td>
<td>LOCK FRONT PANEL</td>
<td>0 - Panel unlocked 1 - Panel locked</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>31</td>
<td>REQUEST WHETHER PANEL IS LOCKED</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>56</td>
<td>CHANGE TO ASCII</td>
<td>0</td>
<td>3 – Protocol 2000</td>
<td>19</td>
</tr>
<tr>
<td>61</td>
<td>IDENTIFY MACHINE</td>
<td>1 - video machine name 3 - video software version</td>
<td>0 - Request first 4 digits 1 - Request first suffix</td>
<td>13</td>
</tr>
<tr>
<td>62</td>
<td>DEFINE MACHINE</td>
<td>1 - number of inputs 2 - number of outputs 3 - number of setups</td>
<td>1 - for video 3 - for SDI 4 - for remote panel 5 - for RS-422 controller</td>
<td>14</td>
</tr>
</tbody>
</table>

**NOTES on the above table:**

**NOTE 1** - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

**NOTE 2** - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code 01 85 88 83 was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes: 41 81 87 83 to the PC.

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

**NOTE 3** - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

**NOTE 4** - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code 0B 80 80 85 would be HEX codes 4B 80 81 85.
NOTE 8 - The reply is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined / no valid input is detected; or 1 if it is defined / valid input is detected.

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed via the front panel. Reception of this code by the switcher is not valid.

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 will send 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 machine name would be (HEX codes):

```
7D 96 90 81
```

(i.e. 128_{dec}+ 22_{dec} for 2\textsuperscript{nd} byte, and 128_{dec}+ 16_{dec} for 3\textsuperscript{rd} byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send 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 codes):

```
7D 83 85 81
```

(i.e. 128_{dec}+ 3_{dec} for 2\textsuperscript{nd} byte, 128_{dec}+ 5_{dec} for 3\textsuperscript{rd} 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 codes):

```
7D D9 C3 81
```

(i.e. 128_{dec}+ ASCII for “Y”; 128_{dec}+ ASCII for “C”).

NOTE 14 - The number of inputs and outputs refers to the specific machine which is 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 codes 7E 82 90 82.

NOTE 15 – When the OVR bit (4\textsuperscript{th} byte) is set, then the “video” commands have universal meaning. For example, instruction 1 (SWITCH VIDEO) will cause all units (including data, etc.) to switch. Similarly, if a machine is in “FOLLOW” mode, it will perform any “video” instruction.

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

NOTE 19 – After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 25 – For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time). For example, if input 3 is detected as invalid, the unit will send the HEX codes 10 83 84 81. If input 7 is detected as valid, then the unit will send HEX codes 10 87 85 81.
LIMITED WARRANTY

The warranty obligations of Kramer Electronics for this product are limited to the terms set forth below:

What is Covered
This limited warranty covers defects in materials and workmanship in this product.

What is Not Covered
This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Kramer Electronics to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover cartons, equipment enclosures, cables or accessories used in conjunction with this product.

Without limiting any other exclusion herein, Kramer Electronics does not warrant that the product covered hereby, including, without limitation, the technology and/or integrated circuit(s) included in the product, will not become obsolete or that such items are or will remain compatible with any other product or technology with which the product may be used.

How Long Does this Coverage Last
Seven years as of this printing; please check our Web site for the most current and accurate warranty information.

Who is Covered
Only the original purchaser of this product is covered under this limited warranty. This limited warranty is not transferable to subsequent purchasers or owners of this product.

What Kramer Electronics will do
Kramer Electronics will, at its sole option, provide one of the following three remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Kramer Electronics will also pay any returning costs necessary to return the repaired product.
2. Replace this product with a direct replacement or with a similar product deemed by Kramer Electronics to perform substantially the same function as the original product.
3. Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

What Kramer Electronics will not do Under This Limited Warranty
If this product is returned to Kramer Electronics or the authorized dealer from which it was purchased or any other party authorized to repair Kramer Electronics products, this product must be insured during shipping, with the insurance and shipping charges prepaid by you. If this product is returned uninsured, you assume all risks of loss or damage during shipment. Kramer Electronics will not be responsible for any costs related to the re-installation of this product from or into any installation. Kramer Electronics will not be responsible for any costs related to any setting up this product, any adjustment of user controls or any programming required for a specific installation of this product.

How to Obtain a Remedy under this Limited Warranty
To obtain a remedy under this limited warranty, you must contact either the authorized Kramer reseller from whom you purchased this product or the Kramer Electronics office nearest you. For a list of authorized Kramer resellers and/or Kramer Electronics authorized service providers, please visit our web site at www.kramerelectronics.com or contact the Kramer Electronics office nearest you.

In order to pursue any remedy under this limited warranty, you must possess an original, dated receipt as proof of purchase from an authorized Kramer reseller. If this product is returned under this limited warranty, a return authorization number, obtained from Kramer Electronics will be required. You may also be directed to an authorized reseller or a person authorized by Kramer Electronics to repair the product.

If it is decided that this product should be returned directly to Kramer Electronics, this product should be properly packed, preferably in the original carton, for shipping. Cartons not bearing a return authorization number will be refused.

Limitation on Liability
THE MAXIMUM LIABILITY OF KRAMER ELECTRONICS UNDER THIS LIMITED WARRANTY SHALL NOT EXCEED THE ACTUAL PURCHASE PRICE PAID FOR THE PRODUCT. TO THE MAXIMUM EXTENT PERMITTED BY LAW, KRAMER ELECTRONICS IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY. Some countries, states, or jurisdictions do not allow the exclusion or limitation of liability, so the above limitations or exclusions may not apply to you.
For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerAV.com, where updates to this user manual may be found. We welcome your questions, comments and feedback.

Caution

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.