Kramer Electronics, Ltd.

USER MANUAL

Model:

VS-44HDxl

3G HD/SD-SDI 4x4 Matrix Switcher

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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 the video, audio, presentation, and broadcasting professional 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[1] that are clearly defined by function.

Congratulations on purchasing your Kramer **VS-44HDxl** *3G HD/SD-SDI 4x4 Matrix Switcher*. This product is ideal for:

- Broadcasting and production studios
- Presentation applications

The package includes the following items:

- **VS-44HDxl** 3G HD/SD-SDI 4x4 Matrix Switcher
- Null-modem adapter, infrared remote control transmitter and power cord
- This user manual[2]

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
- Use Kramer high performance high resolution cables[3]

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.

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1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; 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 Products

2 Download up-to-date Kramer user manuals from the Internet at this URL: http://www.kramerelectronics.com

3 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

Step 1: Mount the machine

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

Connect a GENLOCK source
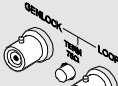
Connect the LOOP connector

CONNECT THE INPUTS AND THE OUTPUTS

In the dual-link mode, connect the dual-link source 1 to DUAL LINK INPUT 1 and 2

CONTROL VIA THE REMOTE CONNECTOR

STEP I

Temporarily connect an OUTPUT PIN to PIN G (ground)

STEP II

Temporarily connect an INPUT PIN to PIN G (ground)

HD/SD SDI Camera

3G HD Video Server

SET THE DIPSWITCHES

By default, the dipswitches are set to OFF

Preview

HD SDI Mixer
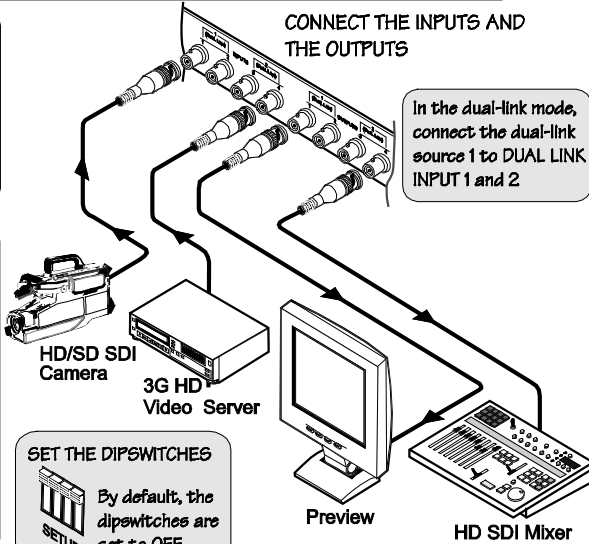
Step 3: Turn the power ON

Step 4: Operate the machine - see section 7

Use the SELECTOR buttons to switch the inputs to the outputs

Connect a selected input to ALL the outputs; disconnect an output (OFF) from an input

Press TAKE to confirm actions

TAKE **ALL** **OFF**

Press and hold OFF for 3 seconds to enter or exit the dual-link mode

Store (STO) and recall (RCL) the status

STO **RCL** **LOCK**

LOCK the front panel

Operate via the front panel buttons, RS-232, RS-485 and the Ethernet

3 Overview

The Kramer **VS-44HDxl** can be used as a high performance 4x4 matrix switcher or as a dual-link 2x2 switcher that lets you simultaneously route any of the inputs to any or all of the outputs for all SDI video signals, using BNC connectors.

In particular, the **VS-44HDxl**:

- Supports up to 300m cable equalization (300m for SD[1] signals, 200m for 1.5GHz HD[2] signals, and 100m for 3GHz HD signals)
- Operates up to 2.97Gbps – enabling it to be used for standard definition, high definition and the new 3G high definition serial digital video signals (SD/HD-SDI)
- Is SMPTE 259M, 292M, 424M and 372M (for dual-link HD-SDI signals) compliant and supports data rates of 270Mbps, 1483.5Mbps, 1485Mbps and 2970Mbps
- Features reclocking and equalization on each input, the storing and recalling of setups, and a TAKE button for the execution of multiple switches all at once
- Has selector buttons that automatically light up in different colors—green, when the **VS-44HDxl** detects a 'standard definition' signal, or blue, when it detects a 'high definition' signal
- Features the ability to switch genlocked video signals according to timing of the GENLOCK reference input. Switching according to the Bi-level or Tri-level Genlock input according to SMPTE RP-168[3]

The **VS-44HDxl**, which is housed in a 19" 1U rack mountable enclosure, and is fed from a 100-240 VAC universal switching power supply, can be controlled via the front panel buttons or via the:

- Infrared remote control transmitter
- Infrared remote extension cable transmitter
- Remotely, by RS 232 or RS 485 serial commands transmitted by a touch screen system, PC, or other serial controller
- ETHERNET
- Remote contact closure for forced operation

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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 cleanly

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **VS-44HDxl** away from moisture, excessive sunlight and dust

4 Your VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

Figure 1, Table 1, and Table 2 define the **VS-44HDxl** *3G HD/SD-SDI 4x4 Matrix Switcher.*

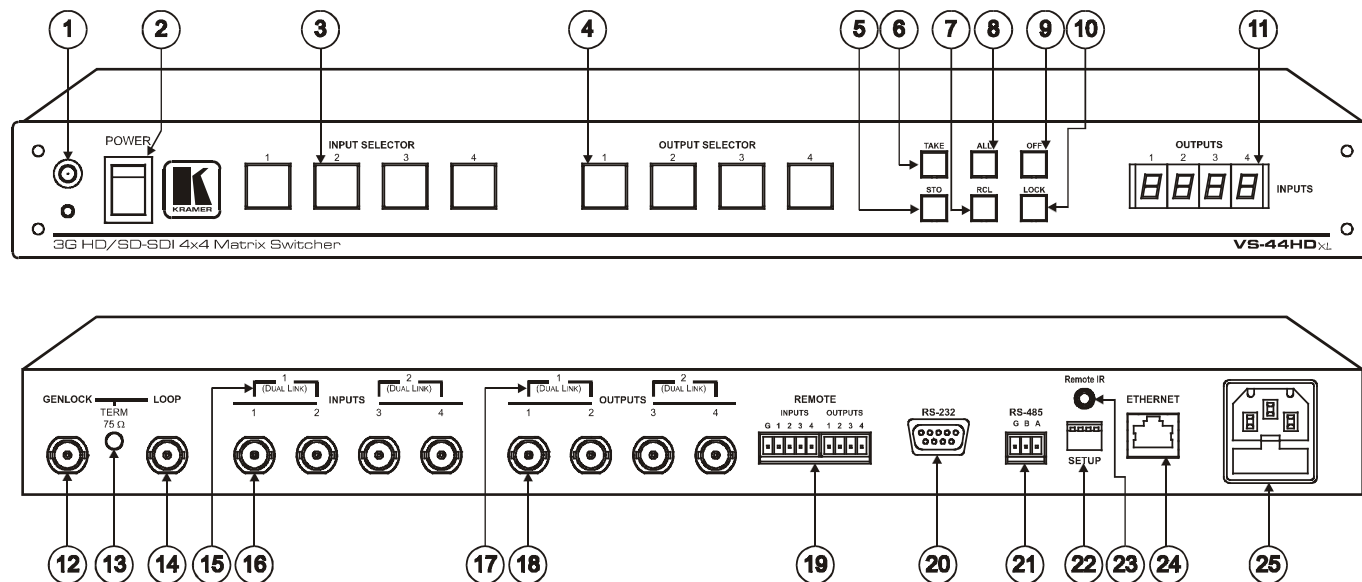*Figure 1: VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher*

Table 1: Front Panel VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

#	Feature	Function
1	IR Receiver	The red LED is illuminated when receiving signals from the Infra-red remote control transmitter
2	*POWER* Switch	Illuminated switch for turning the unit ON or OFF
3	*INPUT SELECTOR (DUAL LINK)* Buttons	Select the input to switch to the output (from 1 to 4). In the dual-link mode, select input 1 or 2 to switch dual-link 1 or 2 to the outputs. Press IN buttons 1, 2 and 3 simultaneously, to reset the machine to its factory default values[1] (see section 6.6). Use to set the resolution when switching genlocked video signals (see section 6.7)
4	*OUTPUT SELECTOR (DUAL LINK)* Buttons	Select the output to which the input is switched (from 1 to 4). In the dual-link mode, select output DUAL LINK 1 or DUAL LINK 2 to which the input is switched
5	*STO* (STORE) Button	Pressing STO followed by an INPUT / OUTPUT button stores the current setting[2]
6	*TAKE* Button	Pressing *TAKE* toggles the mode between the *CONFIRM* mode[3] and the *AT ONCE* mode (user confirmation per action is unnecessary). When in CONFIRM mode, the TAKE button implements a pending operation[4]
7	*RCL* (*RECALL*) Button	Pressing the *RCL* button and the corresponding INPUT / OUTPUT key recalls a setup from the non-volatile memory. After pressing the same memory location the second time, the settings will take effect
8	*ALL* Button	Pressing *ALL* followed by an *INPUT* button, connects that input to all outputs[5]
9	*OFF* Button	An *OFF-OUT* combination disconnects that output from the inputs; an *OFF-ALL* combination disconnects all the outputs. Press and hold[6] to toggle between the 4x4 switcher mode and the dual-link 2x2 switcher mode
10	*LOCK* Button	Disengages the front panel buttons
11	7-segment Display	Displays the selected input switched to the output (marked above each input)

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1 The 7-segmant display shows 1234 indicating that the operation mode is normal, and that the setups stored via the INPUT/OUTPUT buttons have been erased

2 For example, press STO and then the Output button # 3 to store in Setup # 3

3 When in Confirm mode, the TAKE button illuminates

4 See section 7.2

5 For example, press ALL and then Input button # 2 to connect input # 2 to all the outputs

6 For more than 3 seconds

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Table 2: Rear Panel VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

#	Feature	Function
12	*GENLOCK* BNC Connector	Connect to the Genlock source
13	*TERM* 75Ω Button	Press to terminate the Genlock source (75Ω) or release for looping[1]
14	*LOOP* BNC Connector	Connect to the GENLOCK connector of the next unit in the line
15	*DUAL LINK INPUT* BNC Connectors	In the dual-link mode, connect the source to inputs 1 and 2 and/or inputs 3 and 4 (DUAL LINK 1 and/or DUAL LINK 2)
16	*INPUT* BNC Connectors	Connect to the serial digital video sources (from 1 to 4)
17	*DUAL LINK OUTPUT* BNC Connectors	In the dual-link mode, connect the acceptors to outputs 1 and 2 and/or outputs 3 and 4 (DUAL LINK 1 and/or DUAL LINK 2)
18	*OUTPUT* BNC Connectors	Connect to the serial digital video acceptors (from 1 to 4)
19	REMOTE Terminal Block Connector	Connect to contact closure switches (see section 6.9)
20	*RS-232* 9-pin D-sub Port	Connects to the PC or the Remote Controller[2]
21	*RS-485* Detachable Terminal Block Port	Pin G is for the Ground connection[3]; pins B (-) and A (+) are for RS-485
22	SETUP DIP-switches	DIP-switches for setup of the unit
23	*REMOTE IR* Opening[4]	Connects to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[5]
24	ETHERNET Connector	Connects to the PC or other Serial Controller through computer networking
25	Power Connector with Fuse	AC connector enabling power supply to the unit

4.1 Using the IR Transmitter

You can use the **RC-IR2** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[6]. 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[7].

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable[8] 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.

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1 Push in to terminate the input. Release when the input extends to another unit

2 Via a null-modem connection

3 The ground connection is sometimes connected to the shield of the RS-485 cable. In most applications, the ground is not connected

4 Covered by a cap. The 3.5mm connector at the end of the internal IR connection cable fits through this opening

5 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)

6 Model: C-A35M/IRR-50

7 Model: C-A35M/A35F-50

8 P/N: 505-70434010-S

5 Installing on a Rack

This section describes what to do before installing in a rack and how to rack mount.

Before Installing in a Rack

|	
Before installing in a rack, be sure that the environment is within the recommended range:	
Operating temperature range	+5º to +45º C (41º to 113º F)
Operating humidity range	10 to 90% RHL, non-condensing
Storage temperature range	-20º to +70º C (-4º to 158º F)
Storage humidity range	5 to 95% 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.

How to Rack Mount

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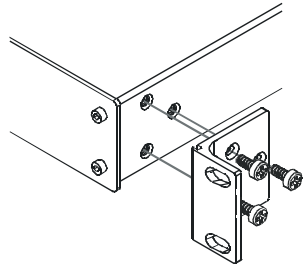
2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note that:

- **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 (you can download it at: http://www.kramerelectronics.com)

6 Connecting Your VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

This section describes how to connect the **VS-44HDxl**.

Section 6.1 describes how to connect the VS-44HDxl in the dual-link mode.

You can use your **VS-44HDxl** to switch any of the four SDI inputs to any or all of the four SDI outputs, as the illustration in Figure 2 shows.

To connect the **VS-44HDxl** *3G HD/SD-SDI 4x4 Matrix Switcher*, do the following[1]:

1. Connect up to four SDI sources to the INPUT BNC connectors (for example, an HD/SD SDI camera to input 1 and a 3G HD video server to input 4).

2. Connect the OUTPUT BNC connectors to up to[2] four SDI acceptors (for example, output 1 to a Preview display, and output 4 to an HD SDI mixer).

3. Set the DIP-switches (see section 6.3).

4. If required[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 6.8)

6. If required[3], connect a remote contact closure switch (refer to section 6.9).

7. Connect[3] the power cord[5].

8. If required, exit the dual-link mode (see section 6.2).

---

1 Switch OFF the power on each device before connecting it to your VS-44HDxl. After connecting your VS-44HDxl, switch on its power and then switch on the power on each device

2 When only one output is required, connect that output, and leave the other outputs unconnected

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

Figure 2: Connecting the VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

6.1 Connecting the VS-44HDxl in the Dual-Link Mode

You can use your **VS-44HDxl** in the dual-link mode to switch any of the two dual-link SDI inputs to any or all of the two dual-link SDI outputs, as the illustration in Figure 3 shows.

To connect the **VS-44HDxl** *3G HD/SD-SDI 4x4 Matrix Switcher* in the dual-link mode, do the following[1]:

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

2. Connect the SDI OUTPUT BNC connectors to one or both[2] SDI acceptors. For example, OUTPUT DUAL LINK 1 (outputs 1 and 2) to a dual-link preview display, and OUTPUT DUAL LINK 2 (outputs 3 and 4) to a dual-link HD SDI mixer.

3. Set the DIP-switches (see section 6.2).

4. If required[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 6.8)

6. If required[3], connect a remote contact closure switch (refer to section 6.9).

7. Connect[3] the power cord[5].

8. Set the machine to the dual-link mode (see section 6.2).

---

1 Switch OFF the power on each device before connecting it to your VS-44HDxl. After connecting your VS-44HDxl, switch on its power and then switch on the power on each device

2 When only one output is required, connect that output, and leave the other output unconnected

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
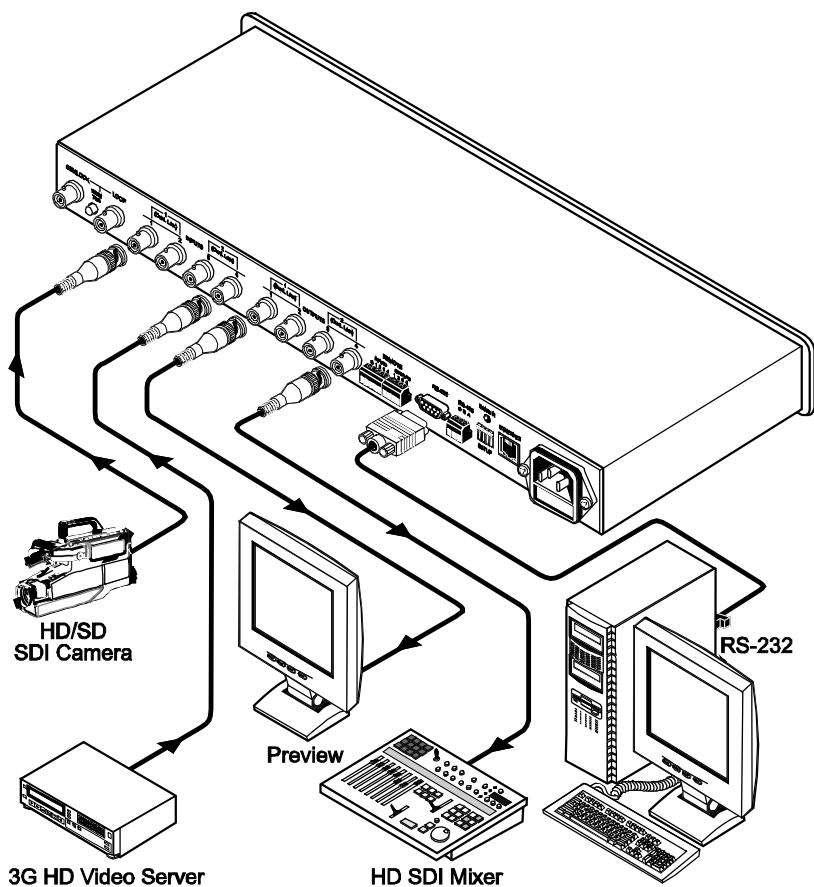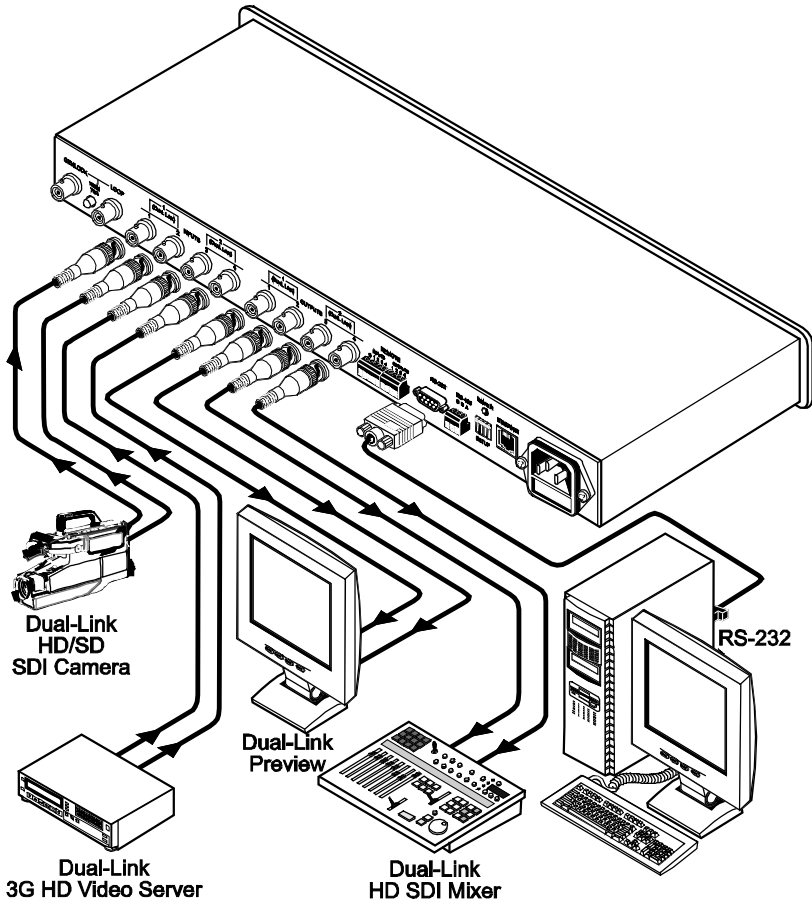
Figure 3: Connecting the Dual-Link VS-44HDxl 3G HD/SD-SDI 4x4 Matrix Switcher

6.2 Working Mode Setting

You can set the **VS-44HDxl** to work in the dual-link mode as follows:

- To switch to the dual-link mode, press and hold the OFF front panel button for 3 seconds until a red dot illuminates on the display (on the second segment of the 7-segment display) and the OFF button blinks
- To exit the dual-link mode, press and hold the OFF front panel button for 3 seconds until the red dot on the display disappears and the OFF button blinks

6.3 DIP-switch Setting

By default, all the DIP-switches are set to OFF. Figure 4 illustrates the
VS-44HDxl DIP-switches:
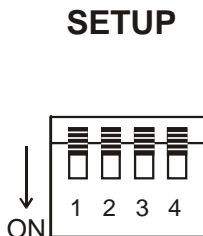
SETUP

Figure 4: VS-44HDxl SETUP DIP-switches

6.3.1 Setting the Machine # DIP-switches

The Machine # determines the position of a **VS-44HDxl** unit, specifying which
VS-44HDxl unit is being controlled when several **VS-44HDxl** units connect to a
PC or serial controller. Set the Machine # on a **VS-44HDxl** unit via SETUP DIPS
1, 2, 3 and 4, according to Table 3.

When using a standalone **VS-44HDxl** unit, set the Machine # to 1. When
connecting more than one **VS-44HDxl** unit, set the first machine (the Master) that
is closest to the PC, as Machine # 1 (DIP-switches are set to OFF).

Table 3: Machine # DIP-switch Settings

Mach. #	DIP 1	DIP 2	DIP 3	DIP 4
1 (default)	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	ON
3	OFF	OFF	ON	OFF
4	OFF	OFF	ON	ON
5	OFF	ON	OFF	OFF
6	OFF	ON	OFF	ON
7	OFF	ON	ON	OFF
8	OFF	ON	ON	ON

6.4 Controlling via RS-232 (for example, using a PC)

To connect a PC to the **VS-44HDxl** unit, using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 9-pin D-sub rear panel port on the **VS-44HDxl** unit to the Null-modem adapter and connect the Null-modem adapter with a 9-wire flat cable to the RS-232 9-pin D-sub port on your PC

To connect a PC to the **VS-44HDxl** unit, without using a Null-modem adapter:

- Connect the RS-232 9-pin D-sub port on your PC to the RS-232 9-pin D-sub rear panel port on the **VS-44HDxl** unit, as Figure 5 illustrates
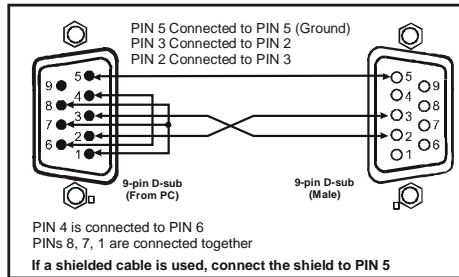
Figure 5: Connecting a PC without using a Null-modem Adapter

6.5 Controlling via the RS-485 Port

To cascade up to eight individual **VS-44HDxl** units[1], via RS-485 (with control via a Master Programmable Remote Control system such as the Kramer **RC-3000**), as Figure 6 illustrates, do the following:

1. Connect the "A" (+) and "B" (-) PINS on the RS-485 terminal block port of the **RC-3000** to the "A" (+) and "B" (-) PINS, respectively, on each of the eight **VS-44HDxl** units. (If using shielded twisted pair cable, the shield is usually connected to the "G" (Ground) PIN of the first unit).

2. Set the first **VS-44HDxl** unit as MACHINE # 1 and the following seven **VS-44HDxl** units as MACHINE # 2 to MACHINE # 8, according to Table 3.
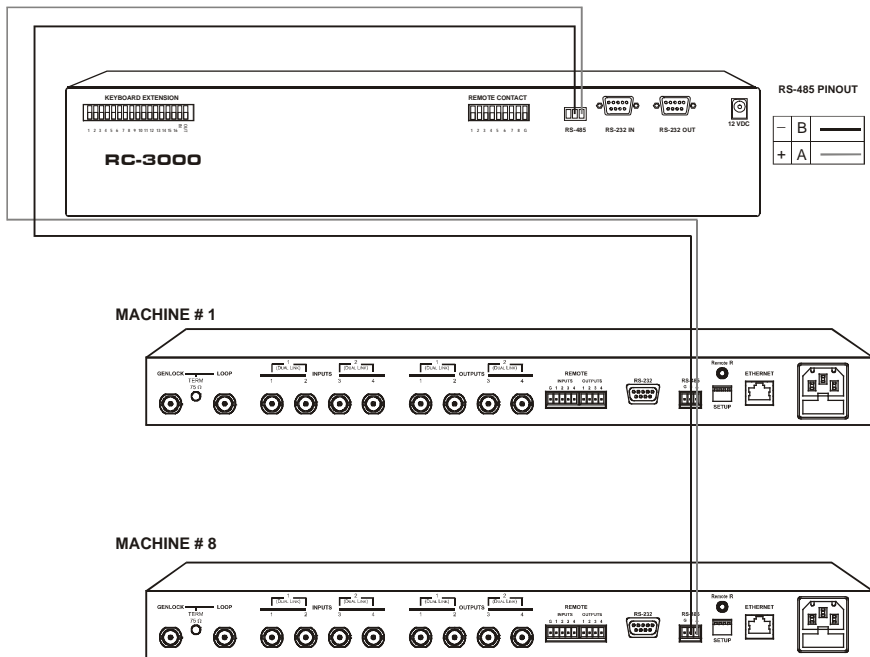
Figure 6: Controlling via RS-485 (for example, using an RC-3000)

6.6 Factory Reset

Press and hold the input buttons 1, 2 and 3 simultaneously for 3 seconds until the three buttons flash to reset the machine to its default values.

---

1 Regular and/or dual-link units

6.7 Switching Genlocked Video Signals

The genlock feature lets you switch genlocked video signals according to timing of the GENLOCK reference input[1].

Connect the GENLOCK cable.

If the HD input signal[2] that is connected is one of the following, it is necessary to set it up as follows:

- 1080i@60Hz: press and hold INPUT 1 button for 3 seconds. The button will flash[3] to indicate that the set up was completed

- 1080i@50Hz or 720p@50Hz: press and hold INPUT 2 button for 3 seconds. The button will flash[3] to indicate that the set up was completed

- 720p@60Hz: press and hold INPUT 3 button for 3 seconds.
 The button will flash[3] to indicate that the set up was completed

When turning the machine ON, the appropriate button will flash to indicate the latest setup (last setup is saved).

6.8 Controlling via ETHERNET

You can connect the **VS-44HDxl** via the Ethernet, using a crossover cable (see section 6.8.1) for direct connection to the PC or a straight through cable (see section 6.8.2) for connection via a network hub or network router.

To connect and configure the Ethernet port of the VS-44HDxl, refer to the Ethernet Configuration (Lantronix) Guide on our Web site: http://www.kramerav.com.

Default IP address – 192.168.1.39

TCP port – 10001

6.8.1 Connecting the ETHERNET Port directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-44HDxl** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

---

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 If a change is made to the resolution or refresh rate. The button will not flash if the new timing is the same as that previously selected

---

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> This type of connection is recommended for identification of the factory default
> IP Address of the **VS-44HDxl** during the initial configuration

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

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 7).
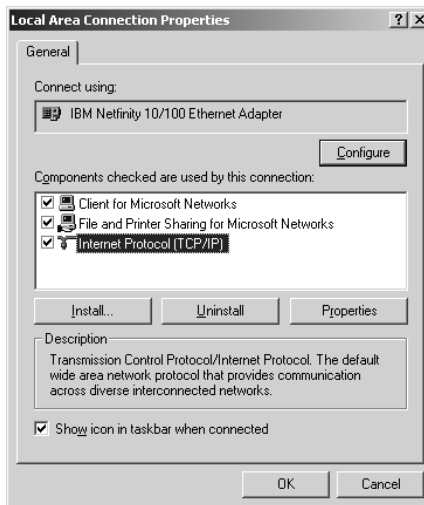
Figure 7: Local Area Connection Properties Window

6. Select Use the following IP address, and fill in the details as shown in Figure 8.

7. Click **OK**.
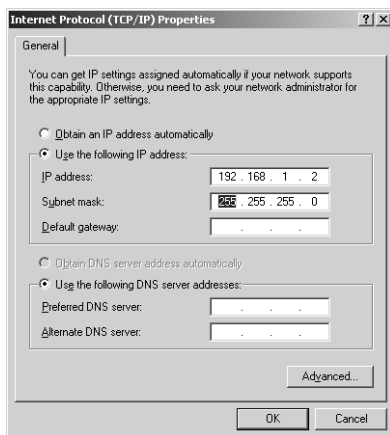
Figure 8: Internet Protocol (TCP/IP) Properties Window

6.8.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the **VS-44HDxl** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

6.8.3 Configuring the Ethernet Port

After connecting the Ethernet port, you have to install and configure it.
For detailed instructions on how to configure your Ethernet port, refer to the Ethernet Configuration (Lantronix) Guide on our Web site:
http://www.kramerav.com.

6.9 Controlling via the REMOTE Connector

You can force the routing of one of the four inputs to any of the four outputs[1] by remote control. To do so, connect the appropriate REMOTE input terminal block connector pins to a contact closure switch.

---

1 In the dual-link mode, you can force the routing of any of the two inputs to any of the two outputs

To route input 1 to output 4, as the example in Figure 9 illustrates, momentarily touch, firstly, output # 4 to the Ground, and then secondly, input # 1 to the Ground.
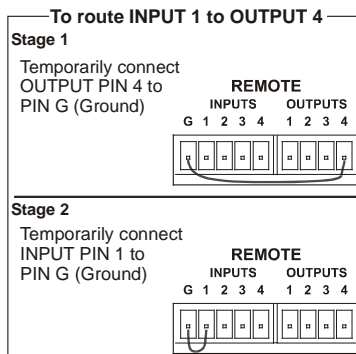
Figure 9: Using the REMOTE Connector

In the dual-link mode, only inputs and outputs 1 and 2 are used (as are the INPUT and OUTPUT selector buttons). Remote PINs 3 and 4 and Selector buttons 3 and 4 are not used.

7   Operating the VS-44HDxl

You can operate your **VS-44HDxl** via:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a PC, touch screen system, or other serial controller
- The Kramer **RC-IR2** Infra-Red Remote Control Transmitter
- The Infra-red remote extension cable transmitter
- The ETHERNET

7.1 Switching OUT-IN Combinations

Section 7.1.1 describes how to switch OUT-IN combinations and section 7.1.2 how to switch OUT-IN combinations in the dual link mode.

Note that:

- The OUTPUT button color changes during routing according to the input button color: green (for standard definition) or blue (for high definition)
- If an OUTPUT button is not selected, that button will not illuminate
- If a source is connected to an INPUT, that INPUT button will illuminate

7.1.1   Switch OUT-IN Combinations

To switch an input to an output, via the front panel buttons[1], in the AT ONCE mode (see section 7.2), do the following:

1. Press an OUTPUT button (either 1, 2, 3, 4 or ALL).
   The selected OUTPUT button illuminates brightly, as does the 7-segment display.
2. Press an INPUT button (either 1, 2, 3, 4 or OFF)[2].
   The selected input switches to the selected output, and that input button illuminates brightly. The digits displayed in the 7-segment display change as appropriate.

---

1 For details of how to route an input to an output using the REMOTE connector, see section 6.9

2 For immediate switching

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7.1.2   Switch OUT-IN Combinations in the Dual-Link Mode

To switch an input to an output in the dual-link mode, via the front panel buttons[1], in the AT ONCE mode (see section 7.2), do the following:

1. Press an OUTPUT button (either 1, 2 or ALL).
   The selected OUTPUT button illuminates brightly, as does the 7-segment display.

2. Press an INPUT button (either 1, 2 or OFF)[2].
   The selected input switches to the selected output, and that input button illuminates brightly. The digits displayed in the 7-segment display change as appropriate.

7.2 Confirming Settings

Choose to work in the AT ONCE or the CONFIRM mode (see section 7.2.1). When the **VS-44HDxl** operates in the AT ONCE mode, pressing an OUT-IN combination implements the switch immediately. In the CONFIRM mode, the TAKE button must be pressed to authorize the switch.

In the AT ONCE mode, you save time as 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

- Execution is delayed until the user confirms the action

Note that after ten seconds the **VS-44HDxl** will go to standby mode and the buttons and the 7-segment display will illuminate less brightly.

7.2.1   Toggling between the AT ONCE and CONFIRM Modes

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

1. Press the dim TAKE button to toggle from the AT ONCE mode (in which the TAKE button is dim) 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.

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1 For details of how to route an input to an output using the REMOTE connector, see section 6.9

2 For immediate switching

Actions no longer require user confirmation and the TAKE button no longer illuminates.

7.2.2   Confirming a Switching Action

To confirm a switching action[1] (in CONFIRM mode where the TAKE button is illuminated), do the following:

1. Press an OUT-IN combination.
   The 7-segment Display blinks[2].

2. Press the TAKE button to confirm the action.
   The 7-segment Display no longer blinks. The TAKE button illuminates.

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

1. Press each OUT-IN combination in sequence.
   The 7-segment Display blinks.

2. Press the TAKE button to confirm all the actions.
   The 7-segment Display no longer blinks. The TAKE button illuminates.

7.3 Storing/Recalling Input/Output Configurations

You can store and recall up to eight setup configurations using the four INPUT buttons and the four OUTPUT buttons. The setup also includes the working mode.

7.3.1   Storing an Input/Output Configuration

To store the current status in memory, do the following:

1. Set the working mode, see section 6.2.

2. Press the STO button.
   The STO button illuminates.

3. Press one of the 8 INPUT / OUTPUT buttons (this will be the setup # in which the current status is stored).
   The selected INPUT / OUTPUT button illuminates in blue. The memory stores the data at that reference.

> To confirm the setup, press the INPUT/OUTPUT button again.
> To cancel the setup, press the STO button once again

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1 when operating the machine in the CONFIRM mode, the remote RS-232 control is disabled

2 The timeout lasts for 10 seconds

7.3.2 Recalling an Input/Output Configuration

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

1. Press the RCL button.
   The RCL button illuminates.

2. Press the appropriate INPUT / OUTPUT button (the button # corresponding to the setup #). That setup configuration will blink in the 7-segment Display.
   The memory recalls the stored data from that reference.
   After pressing the same memory location the second time, the settings will take effect.

> To cancel this action, press the RCL button once again

7.4 Locking the Front Panel

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock[1] your **VS-44HDxl**. Unlocking releases the protection mechanism.

To lock the **VS-44HDxl**:

- Press the LOCK button for three seconds, until the LOCK button is illuminated.
  The front panel is locked. Pressing a button will have no effect

To unlock the **VS-44HDxl**:

- Press the illuminated LOCK button until the LOCK button is no longer illuminated
  The front panel unlocks

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1 Nevertheless, even though the front panel is locked you can still operate via RS-232 or RS-485, as well as via the Kramer IR Remote Control Transmitter

8 Technical Specifications

Table 4 includes the technical specifications:

Table 4: Technical Specifications[1] of the VS-44HDxl 3G HD/SD-SDI Matrix Switcher

INPUTS:	4 SMPTE-259M / 292M / 424M / (372M for dual-link HD-SDI signals) serial video, 75 ohms on BNC connectors 1 GENLOCK 75Ω / Hi-Z on a BNC connector, hi-level or tri-level sync
OUTPUTS:	4 equalized and reclocked SMPTE-259M, 292M (372M for dual-link HD-SDI signals) outputs 75 ohms on BNC connectors 1 Looped GENLOCK 75Ω / Hi-Z on a BNC connector
MAX. OUTPUT LEVEL:	800mVpp /75 ohms
DATA RATE:	Up to 2.97Gbps
CONTROLS:	Front-panel, RS-232; RS-485, ETHERNET, infra-red remote, contact closure, and panel lock
POWER SOURCE:	Universal, 100-240VAC, 50/60Hz 22VA
DIMENSIONS:	19 inch (W), 7 inch (D), 1U (H) rack mountable
WEIGHT:	2.6kg (5.7lbs) approx.
ACCESSORIES:	Power cord, Null-modem Adapter
OPTIONS:	External remote IR receiver cable[2]

9 Table of Hex Codes for Serial Communication

Table 5 lists the Hex values for a single machine (*MACHINE # 1*):

Table 5: VS-44HDxl Hex Codes for Switching via RS-232/RS-485

IN/OUT 1	IN/OUT 2	IN/OUT 3	IN/OUT 4
01	01	01	01
81	82	83	84
81	81	81	81
81	81	81	81

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1 Specifications are subject to change without notice

2 P/N: C-A35M/IRR-50

10 Kramer Protocol 2000[1]

The **VS-44HDxl** is compatible with Kramer's Protocol 2000 (version 0.50) (below). 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.

Table 6: Protocol Definitions

MSB ... **LSB**

	DESTI-NATION	INSTRUCTION					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

1st byte

	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0

2nd byte

	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0

3rd byte

			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

4th byte

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 (ie. 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 (ie. 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.

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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

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 7: Instruction Codes for Protocol 2000

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

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET VIDEO	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2
3	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
10	REQUEST SIGNAL STANDARD SETTING	Input number	0	4, 5
15	REQUEST WHETHER SETUP IS DEFINED	SETUP #	0 - for checking if setup is defined	8
16	ERROR / BUSY	0	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 6 - RX buffer overflow	9
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
61	IDENTIFY MACHINE	1 - video machine name 3 - video software version	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 10 - Request first prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video	14

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. For example, if the present status of output number 3 is "connected to input number 2", then the reply to the HEX code

05	80	83	81

would be HEX codes

45	80	82	81

NOTE 5 - The reply to the "REQUEST SETTING" instruction is as NOTE 4 above, except that here the OUTPUT is assigned with the value 0 – if there is no signal on the input, 1 – if the signal on the input is SD, or 2 – if the signal on the input is HD.

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 audio machine name would be (HEX codes):

      7D   96   90   81 (i.e. 128dec+ 22dec for 2nd byte, and 128dec+ 16dec for 3rd 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. 128dec+ 3dec for 2nd byte, 128dec+ 5dec for 3rd 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. 128dec+ ASCII for "Y"; 128dec+ 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 (ie. request the number of outputs)

would be HEX codes

7E   82   90   82

ie. 16 outputs

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 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

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.

2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.

3. Damage, deterioration or malfunction resulting from:
   i)   Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii)   Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv)   Any shipment of the product (claims must be presented to the carrier)
   v)   Removal or installation of the product
   vi)   Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.

2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.

3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.

2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).

3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:

2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.

- Use the supplied DC power supply to feed power to the machine.

- Please use recommended interconnection cables to connect the machine to other components.

  * FCC and CE approved using STP cable (for twisted pair products)

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