

Kramer Electronics, Ltd.



USER MANUAL

Model:

VS-88HDxl

8x8 3G SD/HD-SDI 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 groups¹ that are clearly defined by function.

Thank you for purchasing the Kramer **VS-88HDx1 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-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher**
- **RC-IR3** remote control (with manual)
- Power cord²
- This user manual³

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 cables⁴

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

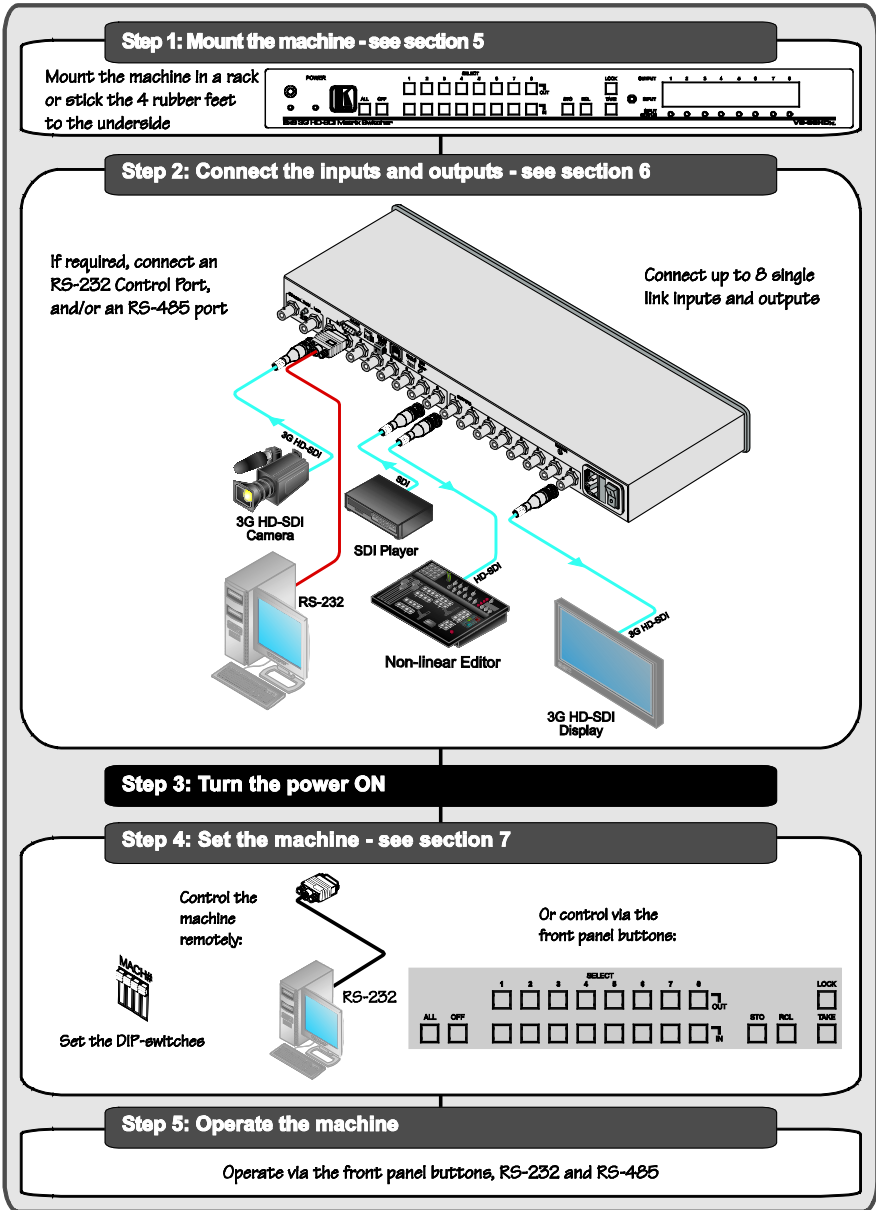
2 We recommend that you use only the power cord supplied with this device

3 Download up-to-date Kramer user manuals from our Web site at <http://www.kramerelectronics.com>

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

2.1 Quick Start

This quick start chart summarizes the basic setup and operation:



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 SD¹ signals, 140m for 1.5GHz HD² 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 genlock³ 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

To achieve the best performance:

- Use only good quality connection cables¹ to avoid 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-88HDx1** away from moisture, excessive sunlight and dust

4 Your VS-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher

[Figure 1](#), [Table 1](#), and [Table 2](#) define the **VS-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher**.

¹ Available from Kramer Electronics on our Web site at <http://www.kramerelectronics.com>

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

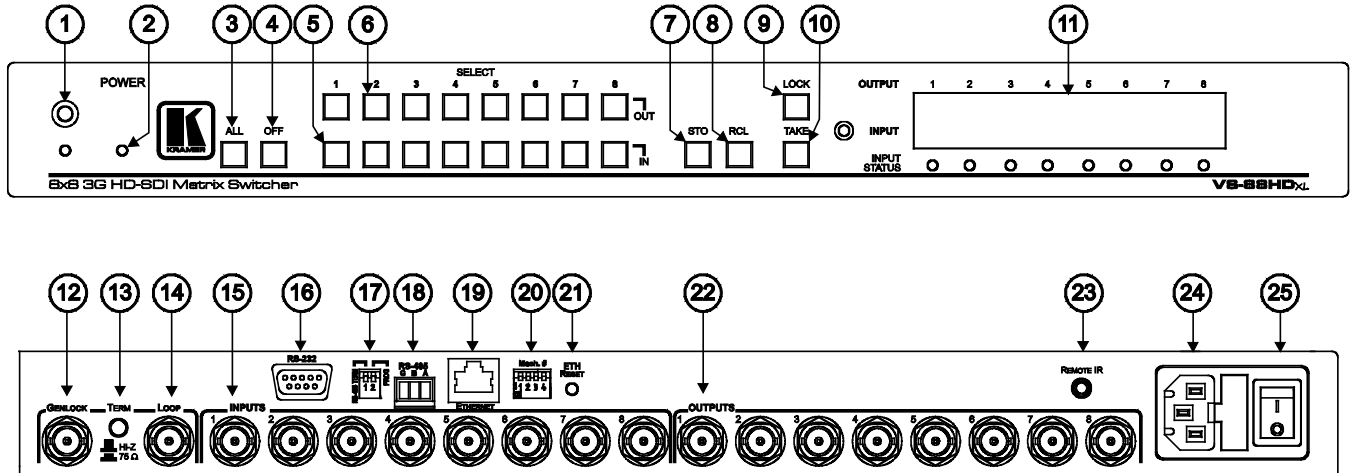


Figure 1: VS-88HDxl 8x8 3G SD/HD-SDI Matrix Switcher

Table 1: Front Panel VS-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher

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

Table 2: Rear Panel VS-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher

| # | Feature | Function |
|----|-------------------------------|---|
| 12 | GENLOCK BNC Connector | Connects to the genlock source |
| 13 | TERM HI-Z/75Ω Pushbutton | Press to terminate the genlock source (75Ω) or release for looping |
| 14 | LOOP BNC Connector | Connects to the genlock connector of the next unit in the line |
| 15 | INPUT BNC Connectors | Connects to the serial digital video sources |
| 16 | RS-232 9-pin D-sub (F) Port | Connects to the PC or the remote controller |
| 17 | PROG/RS-485 TERM DIP-switches | PROG DIP-switch enables microcontroller firmware upgrade RS-485 TERM DIP-switch terminates the RS-485 line with a 120Ω load |
| 18 | RS-485 Terminal Block Port | Pins B (-) and A (+) are for RS-485; Pin G may be connected to the shield (if required) |
| 19 | ETHERNET RJ-45 Connector | Connects to the PC or other Serial Controller through computer networking LAN |
| 20 | MACH # DIP-switches | DIP-switches 1-4 for setting the Machine Address of the unit |
| 21 | ETH RESET Button | Press to reset to factory default definitions ¹ ; IP number – 192.168.1.39, Mask – 255.255.0.0, Gateway – 0.0.0.0 |
| 22 | OUTPUT BNC Connectors | Connect to the serial digital video acceptors |
| 23 | REMOTE IR 3.5mm Mini Jack | Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver) ² |
| 24 | Power Connector with Fuse | AC connector enabling power supply to the unit |
| 25 | Power Switch | Turns the power to the unit ON and OFF |

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-88HDx1 (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 receiver¹. 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 cables²

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable³ 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

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

| | |
|-----------------------------|--------------------------------|
| Operating temperature range | +5° to +45° C (41° to 113° F) |
| Operating humidity range | 10 to 90% RHL, non-condensing |
| Storage temperature range | -20° to +70° C (-4° to 158° F) |
| Storage humidity range | 5 to 95% RHL, non-condensing |



CAUTION!

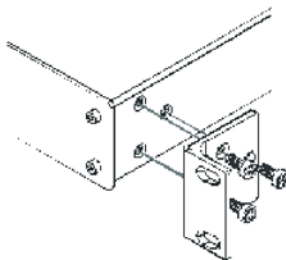
When installing on a 19" rack, avoid hazards by taking care that:

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:

- 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: <http://www.kramerelectronics.com>

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 following¹:

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. Optionally², 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 looping³
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 cord⁴.

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

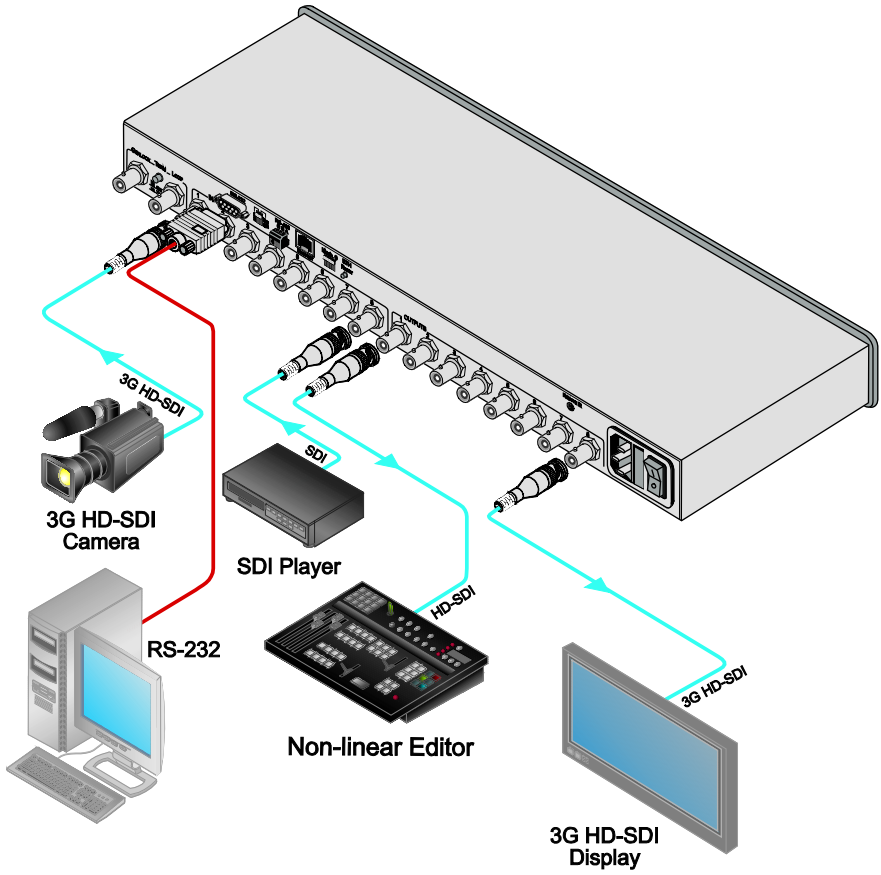


Figure 2: Connecting the VS-88HDx1 8x8 3G SD/HD-SDI Matrix Switcher

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 shown¹ 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 following²:

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. Optionally³, 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 looping⁴
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 cord⁵.
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

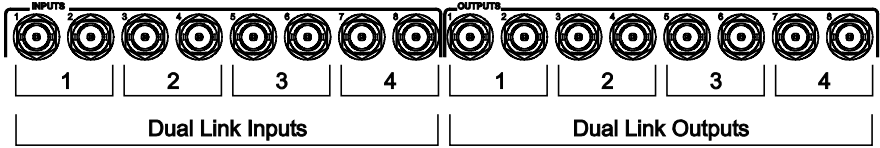


Figure 3: VS-88HDxl Dual-Link Inputs and Outputs

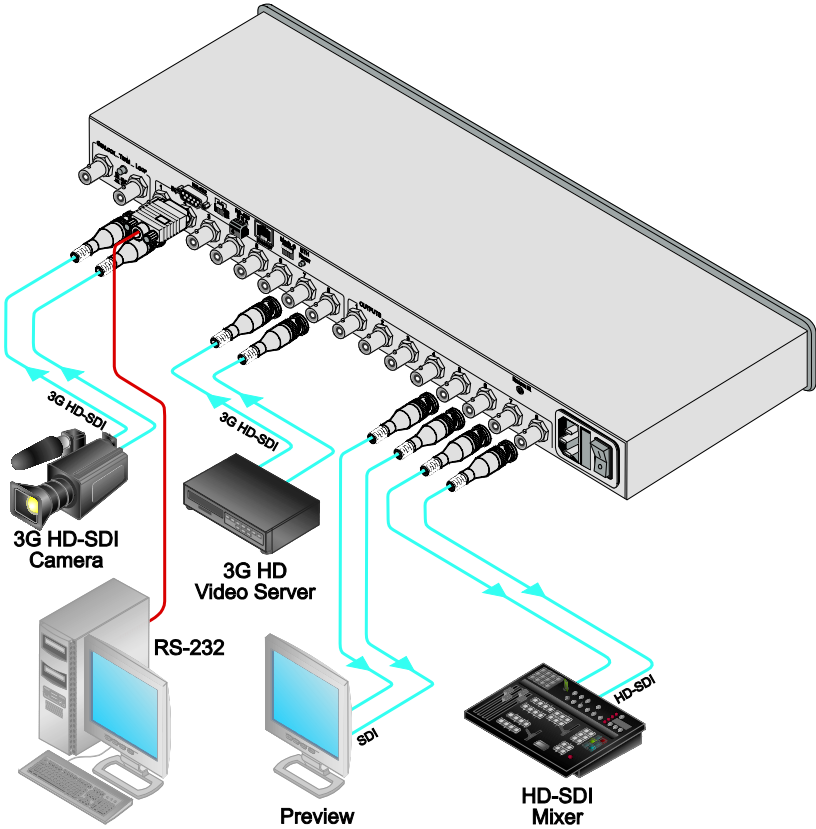


Figure 4: Connecting the Dual-Link VS-88HDxl 3G HD/SD-SDI Matrix Switcher

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 \equiv appears when switching to an illegal configuration. It can also appear momentarily during switching¹.

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

Table 3: Machine # DIP-Switch Settings

| Machine # | DIP-SWITCH | | | |
|---|------------|------------|------------|------------|
| | 1 | 2 | 3 | 4 |
| 1 (Single or master unit ¹) | OFF ON | OFF OFF | OFF OFF | OFF OFF |
| 2 | OFF | ON | OFF | OFF |
| 3 | ON | ON | OFF | OFF |
| 4 | OFF | OFF | ON | OFF |
| 5 | ON | OFF | ON | OFF |
| 6 | OFF | ON | ON | OFF |
| 7 | ON | ON | ON | OFF |
| 8 | OFF | OFF | OFF | ON |
| 9 | ON | OFF | OFF | ON |
| 10 | OFF | ON | OFF | ON |
| 11 | ON | ON | OFF | ON |
| 12 | OFF | OFF | ON | ON |
| 13 | ON | OFF | ON | ON |
| 14 | OFF | ON | ON | ON |
| 15 | ON | ON | ON | ON |

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-switches²:

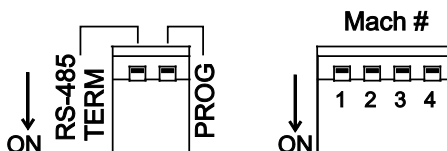


Figure 5: DIP-Switch Settings

Table 4: DIP-Switch Settings

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

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 input¹.

1. Connect the GENLOCK cable.
2. To set the genlock timing, press and hold for 3 seconds the appropriate input button as follows²:

Table 5: Genlock Settings

| To Set | Press and Hold for 3 Seconds | Displayed |
|---------------|------------------------------|-----------|
| 1080i/p @60Hz | IN 1 | 1080 60H |
| 1080i/p @50Hz | IN 2 | 1080 50H |
| 720p @60Hz | IN 3 | 720P 60H |
| PAL @50Hz | IN 4 | PAL 50H |
| NTSC @60Hz | IN 5 | NtSC 60H |

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 address³ 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](#)).

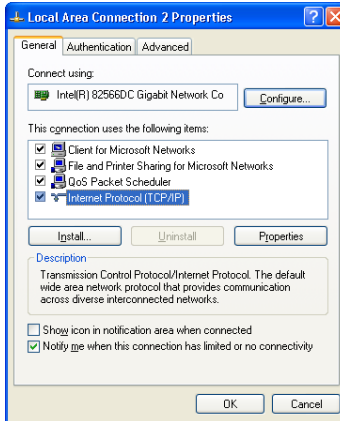


Figure 6: Local Area Connection Properties Window

6. Select Use the following IP Address, and fill in the details as shown in [Figure 7](#).
7. Click **OK**.

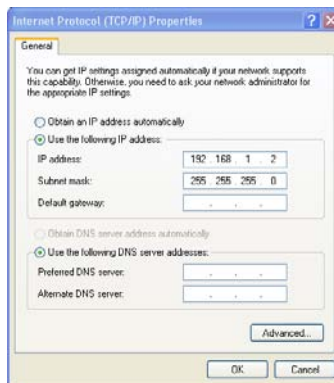


Figure 7: Internet Protocol (TCP/IP) Properties Window

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

You can connect the Ethernet port of the **VS-88HDxl** 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

To configure the Ethernet port, download the *Device Properties* Ethernet configuration software. Extract the file to a folder and create a shortcut on your desktop to the file.

Follow these steps to configure the port:

1. Double click the desktop icon.
The Connect screen appears as follows:

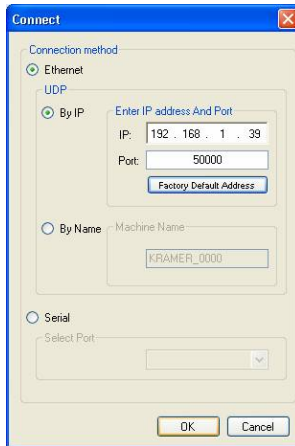


Figure 8: Connect Screen

2. Select the method to connect to the Ethernet port of the **VS-88HDxl**.
Select:
 - Ethernet, if you know the IP address number¹ or the machine name. The default name for the machine is **KRAMER_XXXX**²
 - Serial, if you are connected via a serial port

¹ The default IP address is 192.168.1.39

² The four digits are the last four digits of the machine's serial number.

3. Click OK.

The Device Properties window appears:

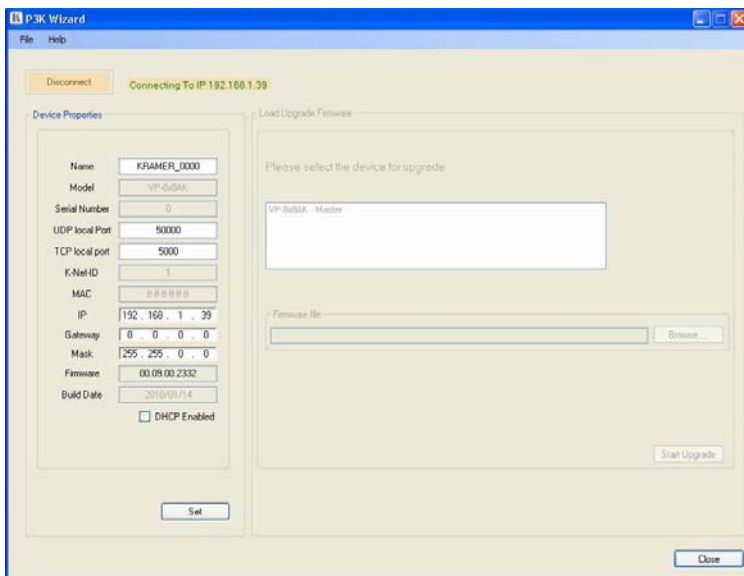


Figure 9: Device Properties Screen

4. If required, make changes and press Set. If not, click Close.

6.9 Controlling via the Ethernet Port

You can control the **VS-88HDxl** 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-88HDxl

You can operate your **VS-88HDxl** 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 button¹ or the ALL button.
The 7-segment display flashes.

¹ From 1 to 8

2. Press an IN SELECT button¹ or the OFF button¹.
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. 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 flashes².
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 #.

¹ For immediate switching

² The timeout lasts for 10 seconds

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.
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 controller¹.

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 6: VS-88HDxl Technical Specifications²

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

¹ See also the Kramer Web site: www.kramerelectronics.com

² Specifications are subject to change without notice

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.

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 appears¹:

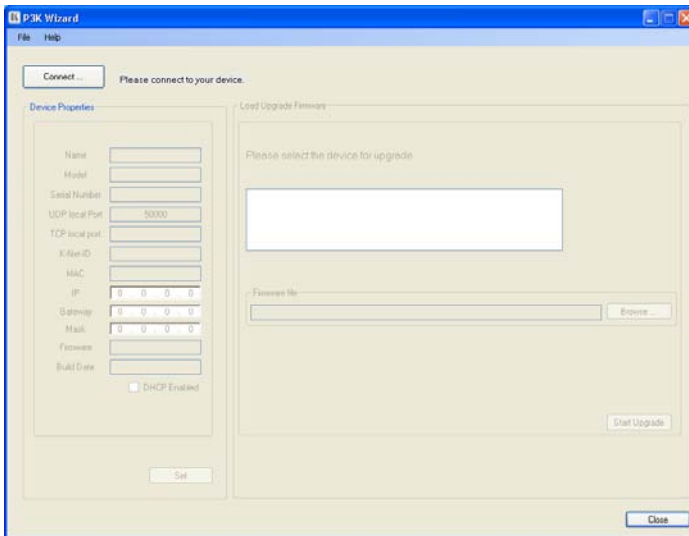


Figure 10: P3K Wizard Screen

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.

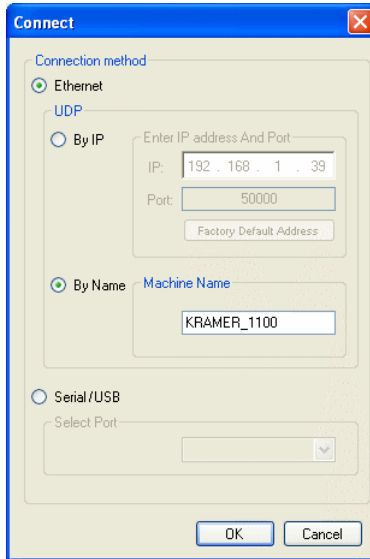


Figure 11: Connect Window

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.

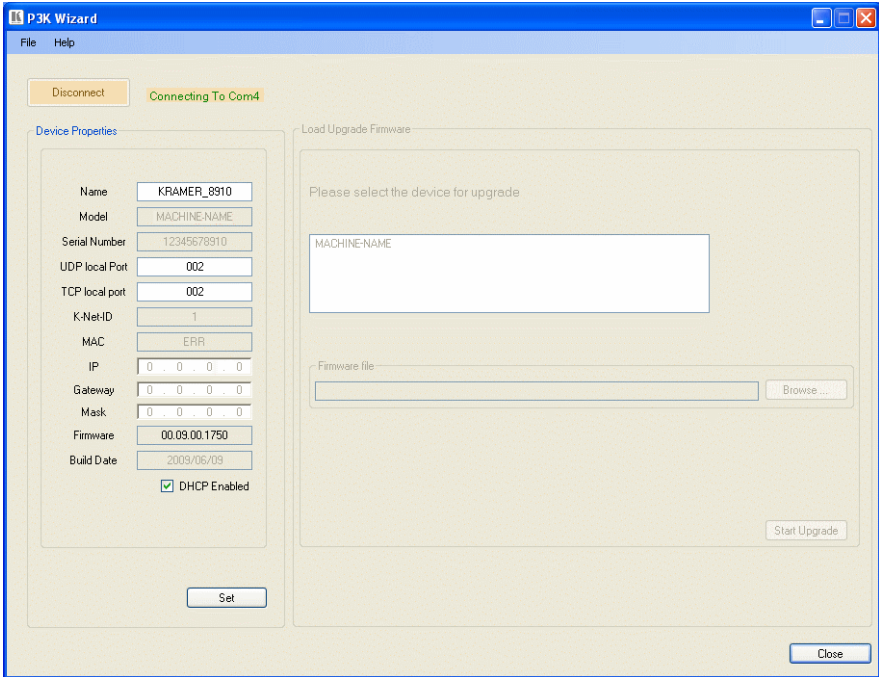


Figure 12: Device Properties Window

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 software¹ 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

| Start | Address (optional) | Body | Delimiter |
|-------|------------------------|---------|-----------|
| # | <i>Destination_id@</i> | Message | CR |

10.2.1.1 Simple Command

Command string with only one command without addressing:

| Start | Body | Delimiter |
|-------|--|-----------|
| # | Command SP <i>Parameter_1,Parameter_2,...</i> | CR |

10.2.1.2 Command String

Formal syntax with commands concatenation and addressing:

| Start | Address | Body | Delimiter |
|-------|------------------------|---|-----------|
| # | <i>Destination_id@</i> | Command_1 <i>Parameter1_1,Parameter1_2,... </i> Command_2 <i>Parameter2_1,Parameter2_2,... </i> Command_3 <i>Parameter3_1,Parameter3_2,... ...</i> | CR |

10.2.2 Device Message Format

| Start | Address (optional) | Body | delimiter |
|-------|--------------------|---------|---------------------|
| ~ | <i>Sender_id@</i> | Message | CR LF |

10.2.2.1 Device Long Response

Echoing command:

| Start | Address (optional) | Body | Delimiter |
|-------|--------------------|---|---------------------|
| ~ | <i>Sender_id@</i> | Command SP [<i>Param1 ,Param2 ...</i>] result | CR LF |

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 alphanumeric ASCII characters ('0'-'9','A'-'Z','a'-'z' and some special characters for specific commands). Parameters are separated by commas.

Message string

Every command entered as part of a message string begins with a **message starting character** and ends with a **message closing character**.

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

CR – For host messages; carriage return (ASCII 13)

CRLF – For machine messages; carriage return (ASCII 13) + line-feed (ASCII 10)

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

| Command | Syntax |
|---|------------------------------|
| <i>Switcher actions:</i> | |
| Video channel has switched (breakaway mode) | VID <code>[IN>OUT]</code> |

10.3.2 Result and Error Codes

| Syntax | |
|---|--|
| Command ran successfully, no error. | <code>[COMMAND] [PARAMETERS] OK</code> |
| <i>Protocol Errors:</i> | |
| Syntax error | ERR001 |
| Command not available for this device | ERR002 |
| Parameter is out of range | ERR003 |
| Unauthorized access (command run without the matching login). | ERR004 |

10.3.3 Basic Routing Commands

| Command | Syntax | Response |
|-----------------------|--|--|
| Switch video | VID <code>[IN]>[OUT], [IN]>[OUT], ...</code> Short form: V <code>[IN]>[OUT], [IN]>[OUT], ...</code> | VID <code>[IN]>[OUT], [IN]>[OUT], ... [RESULT]</code> |
| Read video connection | VID? <code>[OUT]</code> Short form: V? <code>[OUT]</code> VID? * | VID <code>[IN]>[OUT]</code> VID <code>[IN>1], [IN>2], ...</code> |

Parameter Description:

`[IN]` = Input number or '0' to disconnect output.

`>` = Connection character between in and out parameters.

`[OUT]` = Output number or "*" for all outputs.

Examples:

| | | |
|--|--|--|
| Switch video input 2 to output 4 | <code>#V 2>4 [CR]</code> | <code>~VID 2>4 OK [CRLF]</code> |
| Switch video input 4 to output 2 in machine number 6 | <code>#6@VID 4>2 [CR]</code> | <code>~6@VID 4>2 OK [CRLF]</code> |
| Disconnect video output 4 | <code>#AV 0>4 [CR]</code> | <code>~AV 0>4 OK [CRLF]</code> |
| Switch video input 3 to all outputs | <code>#V 3>* [CR]</code> | <code>~VID 3>* OK [CRLF]</code> |
| Chaining multiple commands | <code>#V 1>* V 3>4, 2>2, 2>1, 0>2 V 3>9 V? * [CR]</code> 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 <code>[CR]</code> . A response is sent for each command after processing. | <code>~VID 1>* OK [CRLF]</code> <code>~VID 3>4, 2>2, 2>1, 0>2 OK [CRLF]</code> <code>~VID [ERR003] [CRLF]</code> <code>~VID 2>1, 0>2, 1>3, 3>4 [CRLF]</code> |

10.3.4 Preset Commands

| Command | Syntax | Response |
|--|---|--|
| Store current connections to preset | PRST-STO <u>PRESET</u> Short form: PSTO <u>PRESET</u> | PRST-STO <u>PRESET</u> <u>RESULT</u> |
| Recall saved preset | PRST-RCL <u>PRESET</u> Short form: PRCL <u>PRESET</u> | PRST-RCL <u>PRESET</u> <u>RESULT</u> |
| Delete saved preset | PRST-DEL <u>PRESET</u> Short form: PDEL <u>PRESET</u> | PRST-DEL <u>PRESET</u> <u>RESULT</u> |
| Read video connections from saved preset | PRST-VID? <u>PRESET</u> <u>OUT</u> Short form: PVID? <u>PRESET</u> <u>OUT</u> PRST-VID? <u>PRESET</u> , * | PRST-VID <u>PRESET</u> , <u>IN</u> <u>OUT</u> PRST-VID <u>PRESET</u> , <u>IN</u> >1, <u>IN</u> >2,... |
| Read saved presets list | PRST-LST? Short form: PLST? | PRST-LST <u>PRESET</u> , <u>PRESET</u> , ... |

Parameter Description:

PRESET = Preset number.

OUT = Output in preset to display, '*' for all.

Examples:

| | | |
|---|--------------------------|------------------------------|
| Store current video connections to preset 5 | #PRST-STO 5 <u>CR</u> | -PRST-STR 5 OK <u>CRLF</u> |
| Recall video connections from preset 3 | #PRCL 3 <u>CR</u> | -PRST-RCL 3 OK <u>CRLF</u> |
| Show source of video output 2 from preset 3 | #PRST-VID? 3,2 <u>CR</u> | -PRST-VID 3: 4>2 <u>CRLF</u> |

10.3.5 Operation Commands

| Command | Syntax | Response |
|-------------------------------|--|--|
| Lock front panel | LOCK-FP <u>LOCK-MODE</u> Short form: LCK <u>LOCK-MODE</u> | LOCK-FP <u>LOCK-MODE</u> <u>RESULT</u> |
| Get front panel locking state | LOCK-FP? | LOCK-FP <u>LOCK-MODE</u> |

Parameter Description:

LOCK-MODE = Front panel locking state:

'0' or 'off' to unlock front panel buttons

'1' or 'on' to lock front panel buttons

| | | |
|--------------------------|-------|----------|
| Reset device | RESET | RESET OK |
| Switch to protocol 2000* | P2000 | P2000 OK |

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

10.3.6 Machine Information Commands

| Command | Syntax | Response |
|--|------------|--|
| Read in/out count | INFO-IO? | INFO-IO: IN <u>INPUTS_COUNT</u> , OUT <u>OUTPUTS_COUNT</u> |
| Read max preset count | INFO-PRST? | INFO-PRST: VID <u>PRESET_VIDEO_COUNT</u> |
| Reset to factory default configuration | FACTORY | FACTORY <u>RESULT</u> |

10.3.7 Identification Commands

| Command | Syntax | Response |
|--|-----------------------------|--|
| Protocol handshaking | # CR | -OK CRLF |
| Read device model | MODEL? | MODEL MACHINE_MODEL |
| Read device serial number | SN? | SN SERIAL_NUMBER |
| Read device firmware version | VERSION? | VERSION MAJOR MINOR BUILD REVISION |
| Set machine name | NAME MACHINE_NAME | NAME MACHINE_NAME RESULT |
| Read machine name | NAME? | NAME MACHINE_NAME |
| Reset machine name to factory default* | NAME-RST | NAME-RST MACHINE_FACTORY_NAME RESULT |

***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.

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

10.3.8 Network Setting Commands

| Command | Syntax | Response |
|---------------------|---|--|
| Set IP address | NET-IP IP_ADDRESS Short form: NTIP | NET-IP IP_ADDRESS RESULT |
| Read IP address | NET-IP? Short form: NTIP? | NET-IP IP_ADDRESS |
| Read MAC address | NET-MAC? Short form: NTMC? | NET-MAC MAC_ADDRESS |
| Set subnet mask | NET-MASK SUBNET_MASK Short form: NTMSK | NET-MASK SUBNET_MASK RESULT |
| Read subnet mask | NET-MASK? Short form: NTMSK? | NET-MASK SUBNET_MASK |
| Set gateway address | NET-GATE GATEWAY_ADDRESS Short form: NTGT | NET-GATE GATEWAY_ADDRESS RESULT |
| Read subnet mask | NET-GATE? Short form: NTGT? | NET-GATE GATEWAY_ADDRESS |
| Set DHCP mode | NET-DHCP DHCP_MODE Short form: NTDH | NET-DHCP DHCP_MODE RESULT |
| Read subnet mask | NET-DHCP? Short form: NTDH? | NET-DHCP DHCP_MODE |

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.

| | | |
|----------------------------------|--|--|
| Change protocol Ethernet port | ETH-PORT PROTOCOL PORT Short form: ETHP | ETH-PORT PROTOCOL PORT RESULT |
| Read protocol Ethernet port | ETH-PORT? PROTOCOL Short form: ETHP? | ETH-PORT PROTOCOL PORT |

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)

11 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

| | OUT 1 | OUT 2 | OUT 3 | OUT 4 | OUT 5 | OUT 6 | OUT 7 | OUT 8 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| IN 1 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 2 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 3 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 4 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 5 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 6 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 7 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| IN 8 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |

12 Kramer Protocol 2000

The **VS-88HDx1** is compatible with Kramer's Protocol 2000¹, 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

| MSB | | | | | | | | LSB |
|----------|----------------|----|-------------|----|----|----|----|-----|
| | DESTINATION | | 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 (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>

Kramer Protocol 2000

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.

| INSTRUCTION | | DEFINITION FOR SPECIFIC INSTRUCTION | | NOTE |
|-------------|--|--|--|----------|
| # | DESCRIPTION | INPUT | OUTPUT | |
| 0 | RESET DEVICE | 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, 15 |
| 3 | STORE VIDEO STATUS | Set as SETUP # | 0 - to store 1 - to delete | 2, 3, 15 |
| 4 | RECALL VIDEO STATUS | Set as SETUP # | 0 | 2, 3, 15 |
| 5 | REQUEST STATUS OF A VIDEO OUTPUT | Set as SETUP # | Equal to output number whose status is required | 4, 3 |
| 15 | REQUEST WHETHER SETUP IS DEFINED / VALID INPUT IS DETECTED | SETUP # or Input # | 0 - for checking if setup is defined 1 - for checking if input is valid | 8 |
| 16 | ERROR / BUSY | For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input # | 0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input | 9, 25 |
| 30 | LOCK FRONT PANEL | 0 - Panel unlocked 1 - Panel locked | 0 | 2 |
| 31 | REQUEST WHETHER PANEL IS LOCKED | 0 | 0 | 16 |
| 56 | CHANGE TO ASCII | 0 | 3 - Protocol 3000I | 19 |
| 61 | IDENTIFY MACHINE | 1 - video machine name 3 - video software version | 0 - Request first 4 digits 1 - Request first suffix | 13 |
| 62 | DEFINE MACHINE | 1 - number of inputs 2 - number of outputs 3 - number of setups | 1 - for video 3 - for SDI 4 - for remote panel 5 - for RS-422 controller | 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. 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 2nd byte, and 128_{dec}+ 16_{dec} 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. 128_{dec}+ 3_{dec} for 2nd byte, 128_{dec}+ 5_{dec} 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. 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

i.e. 16 outputs

NOTE 15 - When the OVR bit (4th 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

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.

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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)



**For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.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.



Kramer Electronics, Ltd.

Web site: www.kramerelectronics.com

E-mail: info@kramerel.com

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