

**Kramer Electronics, Ltd.**



# **USER MANUAL**

**Model:**

**VS-5x5**

*5x5 Video Audio Matrix Switcher*

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## 1 Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite range of problems that confront the video, audio and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 350-plus different models now appear in 8 Groups<sup>1</sup>, which are clearly defined by function.

Congratulations on purchasing your **VS-5x5** *5x5 Video Audio Matrix Switcher*, which is ideal for the following typical applications:

- Professional display systems requiring true 5x5 matrix operation
- Multimedia and presentation source and acceptor selection, and remote monitoring of computer activity in schools and businesses

The package includes the following items:

- **VS-5x5** *5x5 Video Audio Matrix Switcher*
- Power cord
- Null-modem adapter
- Windows®-based Kramer control software<sup>2</sup>
- Infra-red remote control transmitter (including the required battery and a separate user manual<sup>3</sup>)
- This user manual<sup>3</sup>

## 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<sup>4</sup>

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1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Sealers; and GROUP 8: Cables and Connectors

2 Downloadable from our Web site at <http://www.kramerelectronics.com>

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>

### 3 Overview

The **VS-5x5** is a true 5x5 matrix switcher for composite video signals and balanced stereo audio signals. The high quality **VS-5x5** lets you simultaneously route any or all of the 5 inputs to any or all of the 5 outputs.

The **VS-5x5 5x5 Video Audio Matrix Switcher** includes:

- Video bandwidth of 70MHz that ensures transparent performance
- Easy-to-connect detachable terminal block connectors for the audio signals
- Glitch-free transitions, which are produced when sources share a common reference sync, as switching occurs during the vertical interval<sup>1</sup>. Any input or special external sync input may be selected as the vertical interval source
- DC coupled inputs and outputs
- Audio-follow-video and breakaway options
- Storing and recalling setups
- “Take” button for precise switch control
- “Lock” button to prevent tampering with the front panel
- Gain control for all inputs and all outputs
- The ability to control via the front panel buttons, via the Infra-red remote control transmitter, and remotely by RS-485 or RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller

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-5x5** away from moisture, excessive sunlight and dust

### 4 Your VS-5x5 5x5 Video Audio Matrix Switcher

Figure 1, Table 1 and Table 2 define the **VS-5x5 5x5 Video Audio Matrix Switcher**:

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<sup>1</sup> When one video signal replaces another video signal, the switching process causes a random interruption in the first video signal (in the middle of a frame) and a random entrance into the second video signal (also in the middle of a frame). The result is a visible jump in the edited tape. This deteriorates when the tape is copied, and the disturbance on playback is more serious. Avoid this by switching at a very specific point during the vertical interval, allowing smooth replacement of a whole frame by a second whole frame as long as the video sources are Genlocked to each other

## Your VS-5x5 5x5 Video Audio Matrix Switcher

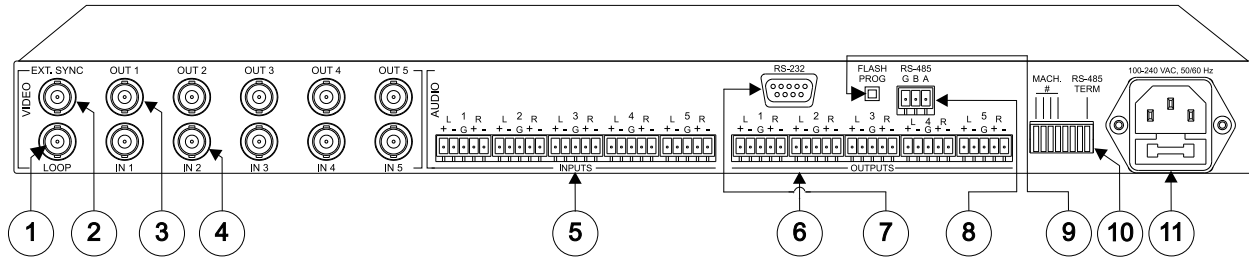
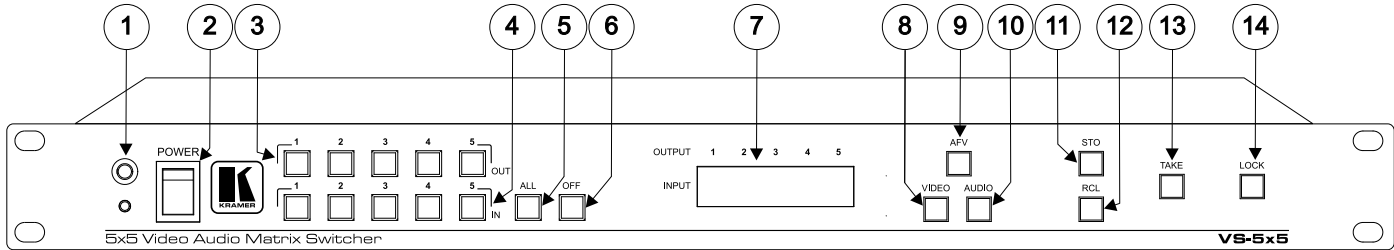


Figure 1: VS-5x5 5x5 Video Audio Matrix Switcher

Table 1: Front Panel VS-5x5 5x5 Video Audio Matrix Switcher Features

#	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	OUT Buttons	Select the output to which the input is switched
4	IN Buttons	Select the input to switch to the output
5	ALL Button	Pressing <i>ALL</i> followed by an <i>INPUT</i> button, connects that input to all outputs <sup>1</sup>
6	OFF Button	An <i>OFF-OUT</i> combination disconnects that output from the inputs; an <i>OFF-ALL</i> combination disconnects all the outputs
7	7-segment Display	Displays the selected audio <sup>2</sup> or video <sup>3</sup> input switched to the output (marked above each input) <sup>4</sup>
8	VIDEO Button	When pressed <sup>5</sup> actions relate to video
9	AFV Button	When pressed <sup>6</sup> actions relate to video and audio channels. Audio channels follow the video channels
10	AUDIO Button	When pressed <sup>7</sup> actions relate to audio
11	STO (STORE) Button	Pressing <i>STO</i> followed by an output button stores the current setting <sup>8</sup>
12	RCL (RECALL) Button	Pressing the <i>RCL</i> button and the corresponding OUTPUT key recalls a setup from the non-volatile memory. The stored status blinks. Pressing a different OUTPUT button lets you view <sup>9</sup> another setup. After making your choice, pressing the <i>RCL</i> button again implements the new status
13	TAKE Button	Pressing <i>TAKE</i> toggles the mode between the <i>CONFIRM</i> mode <sup>10</sup> and the <i>AT ONCE</i> mode (user confirmation per action is unnecessary)
14	LOCK Button	Disengages the front panel switches

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

2 When the Audio button illuminates, that is, when the audio breakaway mode is selected

3 When the Video button illuminates, that is, when the video breakaway mode is selected

4 Also displays the number of IN and OUT ports, the firmware version number, and the MACHINE #. Refer to section 7.1

5 The VIDEO button is illuminated when the video breakaway mode is selected

6 The AFV button is illuminated when the AFV mode is selected

7 The AUDIO button is illuminated when the audio breakaway mode is selected

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

9 Only view, nothing is implemented at this stage

10 When in Confirm mode, the TAKE button illuminates

Table 2: Rear Panel VS-5x5 5x5 Video Audio Matrix Switcher Features

#	Feature	Function
1	<i>LOOP</i> BNC Connector	For looping the inputs
2	<i>EXT. SYNC</i> BNC Connector	Connects to the external SYNC source
3	Composite BNC OUT Connectors	Connects to the composite video acceptors (from 1 to 5)
4	Composite BNC IN Connectors	Connects to the composite video sources (from 1 to 5)
5	<i>INPUTS</i> Terminal Block Connectors	Connect to the balanced stereo audio sources (from 1 to 5)
6	<i>OUTPUTS</i> Terminal Block Connectors	Connect to the balanced stereo audio acceptors (from 1 to 5)
7	<i>RS-232 DB 9F</i> Port	Connects to the PC or the Remote Controller
8	<i>RS-485</i> Terminal Block Port	Pin G is for Ground connection; Pins B (-) and A (+) are for RS 485
9	<i>FLASH PROG</i> Button	Push in <sup>1</sup> for "Program" to upgrade to the latest Kramer firmware (see section 8), or release for Normal (the factory default) <sup>2</sup>
10	Dipswitches	Dipswitches for setup of the unit (1, 2, 3 and 4 are for setting the Machine #; 5 is for the Vertical Interval Source; 8 is for RS-485 Termination)
11	Power Connector with Fuse	AC connector enabling power supply to the unit

Figure 2 illustrates the **VS-5x5** underside, including the Flash Program Reset button (see section 8.2).

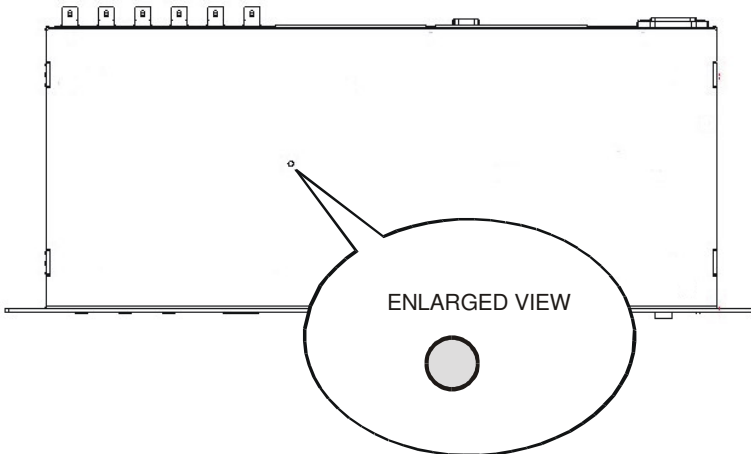


Figure 2: VS-5x5 5x5 Video Audio Matrix Switcher Underside View

1 Using a screwdriver if required

2 Note that the FLASH PROG "Reset" button is located on the underside of the unit. Push in for "Reset"(Figure 2), or release for Normal (see section 8)



## 5 Connecting the VS-5x5

This section describes how to connect the **VS-5x5**. In particular, how to:

- Connect the **VS-5x5** rear panel (see section 5.1)
- Control via RS-232, for example, using a PC (see section 5.2)
- Control via RS-485 (see section 5.3)
- Connect the audio inputs/outputs (see section 5.4)
- Set the dipswitches (see section 5.5)

### 5.1 Connecting the VS-5x5 Rear Panel

To connect the **VS-5x5**, do the following<sup>1</sup>:

1. Connect up to 5 composite video sources<sup>2</sup> to the 5 BNC input connectors, and connect<sup>3</sup> up to 5 balanced stereo audio sources<sup>4</sup> to the “AUDIO INPUTS” terminal block connectors.
2. Connect<sup>5</sup> the 5 composite video output connectors to up to 5 composite video acceptors<sup>2</sup> and connect the corresponding “AUDIO OUTPUTS” terminal block connectors to the balanced stereo audio acceptors<sup>4</sup>.
3. Set the dipswitches (see section 5.5).
4. Connect a PC and/or controller (if required) to the RS-232 port (see section 5.2) and/or RS-485 port (see section 5.3).
5. Connect<sup>4</sup> the power cord<sup>6</sup>.

---

1 Switch OFF the power on each device before connecting it to your VS-5x5. After connecting your VS-5x5, switch on its power and then switch on the power on each device. DO NOT push in the rear panel Flash Program “Program” button (item 9 in Table 2) and DO NOT push in the underside Flash Program “Reset” button. These are only used for upgrade to the latest Kramer firmware (see section 8)

2 For example, VCR machines

3 See section 5.4 for a description of how to connect a balanced/unbalanced stereo audio input/output

4 Not illustrated in Figure 3

5 When less than five outputs are required, connect only those outputs of the VS-5x5 that are required, and leave the other outputs unconnected

6 We recommend that you use only the power cord that is supplied with this machine

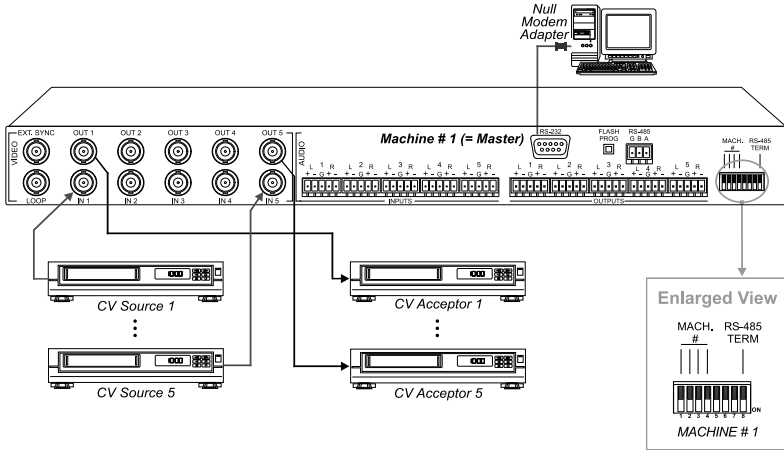


Figure 3: Connecting the VS-5x5 5x5 Video Audio Matrix Switcher

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

To connect a PC to the **VS-5x5** unit, using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 DB9 rear panel port on the Master **VS-5x5** unit to the Null-modem adapter and connect the Null-modem adapter with a 9 wire flat cable to the RS-232 DB9 port on your PC

To connect a PC to the **VS-5x5** unit, *without* using a Null-modem adapter:

- Connect the RS-232 DB9 port on your PC to the RS-232 DB9 rear panel port on the Master **VS-5x5** unit, as Figure 4 illustrates (depending on whether the PC has a 9-pin or 25-pin connector)

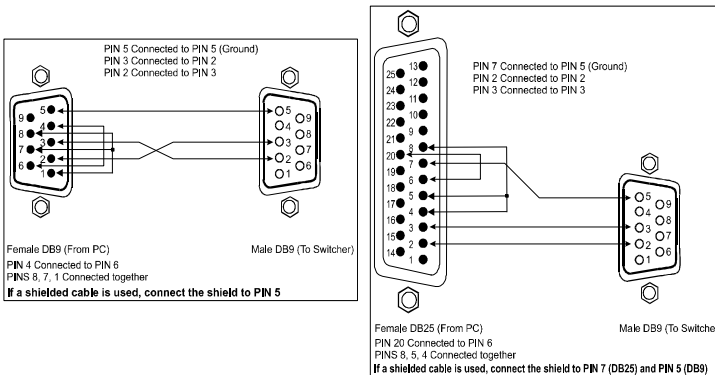


Figure 4: Connecting a PC without using a Null-modem Adapter

### 5.3 Controlling via RS-485

You can control a **VS-5x5** unit via an RS-485 controller, for example, a PC (equipped with an RS-485 interface) or a Master Programmable Remote Control system such as the Kramer **RC-3000**<sup>1</sup>.

To connect an **RC-3000** to a **VS-5x5** unit (see Figure 5):

1. Connect the RS-485 terminal block port on the **RC-3000** to the RS-485 port on the **VS-5x5** unit, as follows:
  - Connect the “A” (+) PIN on the RS-485 rear panel port of the **RC-3000** to the “A” (+) PIN on the RS-485 rear panel port of the **VS-5x5** unit
  - Connect the “B” (-) PIN on the RS-485 rear panel port of the **RC-3000** to the “B” (-) PIN on the RS-485 rear panel port of the **VS-5x5** unit
  - If shielded twisted pair cable is used, the shield may be connected to the “G” (Ground) PIN on one of the units (for example, on the **RC-3000**)
2. Set the **VS-5x5** unit as MACHINE # 1, according to Table 4 (that is, DIP 1, DIP 2, DIP 3, and DIP 4 OFF), and set the other dipswitches on the **VS-5x5** unit, as follows:
  - Set DIP 5 to OFF for an external vertical interval source (factory default) or ON for an input #1 (or programmable – see Table 10, instruction # 7) vertical interval source
  - Set DIP 6 and DIP 7 OFF on all **VS-5x5** units
  - Set Dip 8 ON (for RS-485 Line Termination with 120Ω)

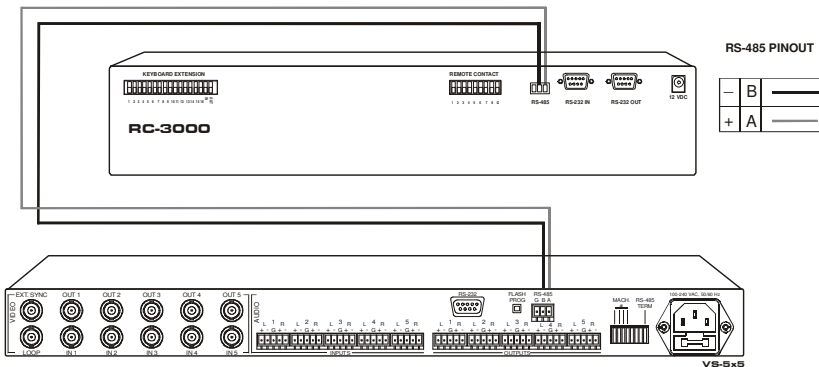


Figure 5: Controlling via RS-485 (for example, using an RC-3000)

<sup>1</sup> Previously known as the VS-3000

## 5.4 Connecting the Balanced/Unbalanced Stereo Audio Input/Output

Figure 6, Figure 7, and Figure 8 illustrate how to wire a balanced/unbalanced input and/or output connection:

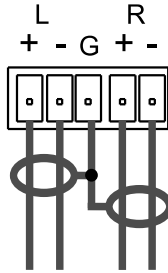


Figure 6: Connecting the Balanced Stereo Audio Input/Output

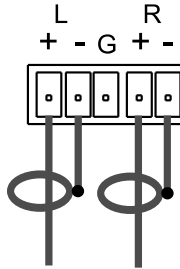


Figure 7: Connecting the Unbalanced Stereo Audio Input

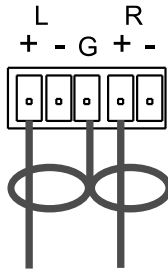


Figure 8: Connecting the Unbalanced Stereo Audio Output

## 5.5 Setting the Dipswitches

Figure 9 illustrates the factory default dipswitches and Table 3 describes them.

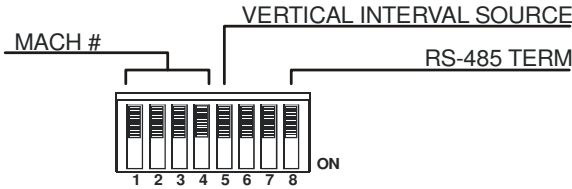


Figure 9: Dipswitch Settings

Table 3: Dipswitch Settings

DIPS	Function	Description
1, 2, 3, 4	Machine #	Determines the position of a unit in the sequence (see section 5.5.1)
5	Vertical Interval Source	ON for Input # 1 (or programmable <sup>1</sup> ) Vertical Interval Source; OFF for External Vertical Interval Source (default)
6	Reserved	OFF
7	Reserved	OFF
8	RS-485 Termination	ON for RS-485 Line Termination with 120Ω; OFF for no RS-485 Line Termination

### 5.5.1 Setting the MACHINE #

The *MACHINE #* determines the position of a **VS-5x5** unit, specifying which **VS-5x5** unit is being controlled when several **VS-5x5** units connect to a PC or serial controller. Set the *MACHINE #* on a **VS-5x5** unit via DIPS 1, 2, 3 and 4, according to Table 4.

When using a stand-alone **VS-5x5** unit, set the *MACHINE #* to 1. When connecting more than one **VS-5x5** unit, set the first machine (the Master) that is closest to the PC, as *MACHINE # 1*<sup>2</sup>.

Table 4: Machine # Dipswitch Settings

MACHINE #	DIPSWITCH				MACHINE #	DIPSWITCH			
	1	2	3	4		1	2	3	4
1 <sup>Master</sup>	OFF	OFF	OFF	OFF	9	ON	OFF	OFF	OFF
2	OFF	OFF	OFF	ON	10	ON	OFF	OFF	ON
3	OFF	OFF	ON	OFF	11	ON	OFF	ON	OFF
4	OFF	OFF	ON	ON	12	ON	OFF	ON	ON
5	OFF	ON	OFF	OFF	13	ON	ON	OFF	OFF
6	OFF	ON	OFF	ON	14	ON	ON	OFF	ON
7	OFF	ON	ON	OFF	15	ON	ON	ON	OFF
8	OFF	ON	ON	ON	16	ON	ON	ON	ON

<sup>1</sup> See Table 10, instruction # 7

<sup>2</sup> Set the dipswitches to OFF

## 6 Controlling via RS-232 and RS-485

You can cascade up to 16 **VS-5x5** units with control from a PC or serial controller.

To cascade up to 16 individual **VS-5x5** units, via RS-232 and RS-485, do the following:

1. Connect the composite video sources and acceptors, as well as the appropriate stereo audio sources and acceptors, as section 5.1 describes.
2. Connect the RS-232 port<sup>1</sup> on the first **VS-5x5** unit to the PC using the Null-modem adapter provided with the machine (recommended), as section 5.2 describes.
3. Connect the RS-485 terminal block port on the first **VS-5x5** unit to the RS-485 port on the second **VS-5x5** unit and so on, connecting all the RS-485 ports.
4. Set the dipswitches, as section 5.5 describes. In particular:
  - Set the first **VS-5x5** unit as MACHINE # 1 and the following 15 **VS-5x5** units as MACHINE # 2 to MACHINE # 16, according to Table 4
  - Set DIP 8 ON on the first and last **VS-5x5** units (terminating the RS-485 line at 120Ω). Set DIP 8 OFF on the other **VS-5x5** units
  - Set DIP 5 to OFF for an external vertical interval source (factory default) or ON for an input #1 (or programmable – see Table 10, instruction # 7) vertical interval source
  - Set DIP 6 and DIP 7 OFF on all **VS-5x5** units

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<sup>1</sup> Alternatively, the RS-485 port could be used for PC control (instead of RS-232)

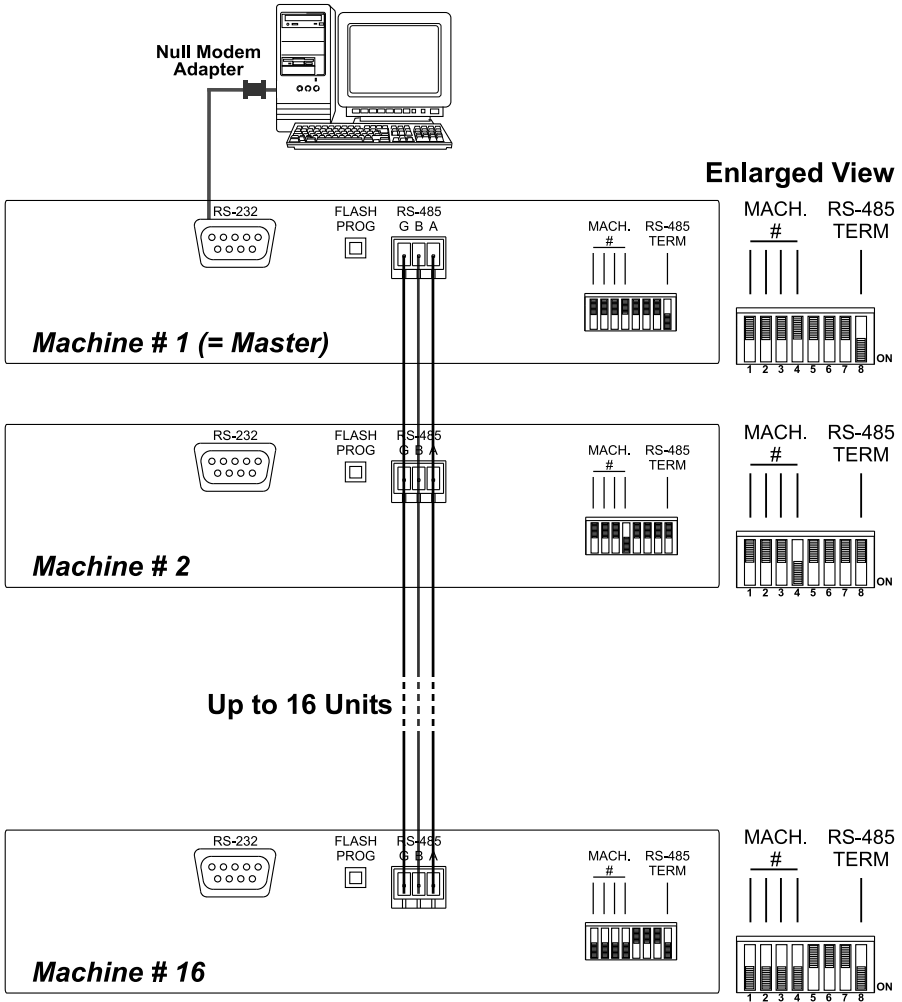


Figure 10: Cascading Individual Units in a Control Configuration via RS-232 and RS-485

## 7 Operating the VS-5x5

You can operate your **VS-5x5** via:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- Infra-red remote control transmitter

### 7.1 Displaying Unit Characteristics

The **VS-5x5** unit characteristics are displayed in the following circumstances:

- Immediately (and automatically) after switching on the power; and
- When simultaneously pressing the 3 “IN” buttons 1, 2 and 3, for 3 seconds

The following information is displayed in the 7-segment Display<sup>1</sup>:

- The number of IN and OUT ports (shown during the “First Display<sup>2</sup>”)
- The firmware version number and the MACHINE # (shown during the “Second Display<sup>2</sup>”)

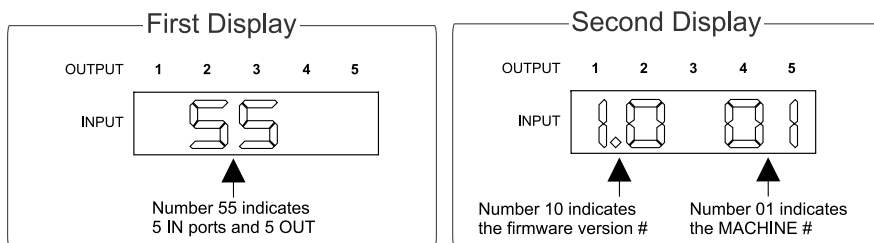


Figure 11: VS-5x5 Unit Characteristics

### 7.2 Choosing the Audio-Follow-Video or Breakaway Option

You can switch stereo audio signals in one of 2 ways, either:

- Audio-follow-video (AFV), in which all operations and status indicators relate to both the video and the audio channels<sup>3</sup>; or
- Breakaway, in which video and audio channels switch independently

<sup>1</sup> Item 7 in Table 1

<sup>2</sup> The “First Display” appears initially, followed a few seconds later by the “Second Display”

<sup>3</sup> Audio and video connections are the same



### 7.2.1 Setting the Audio-Follow-Video Option

To set the Audio-follow-video (AFV) option:

1. Press the AFV button.  
The AFV button illuminates. The audio will follow the video.
  - If the audio configuration differs from the video configuration, the audio input(s), which will be changed, will blink in the 7-segment Display, and the AUDIO and TAKE buttons will also blink<sup>1</sup>.
2. Press the TAKE button to confirm the modification (reconfiguring the audio according to the video).

### 7.2.2 Setting the Breakaway Option

To set the Breakaway option, press either the AUDIO (for audio control only) or the VIDEO (for video control only) button.

- If the AUDIO button illuminates, all switching operations, and the 7-segment Display, relate to the Audio section
- If the VIDEO button illuminates, all switching operations, and the 7-segment Display, relate to the Video section

## 7.3 Switching OUT-IN Combinations

To switch a video/audio input to a video/audio output, do the following:

1. Press an OUT button (either 1, 2, 3, 4 or ALL).  
The 7-segment Display blinks.
2. Press an IN button (either 1, 2, 3, 4 or OFF).  
The selected input switches to the selected output.

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

## 7.4 Confirming Settings

Choose to work in the AT ONCE or the CONFIRM mode, as section 7.4.1 describes. When the VS-5x5 operates in the AT ONCE mode (TAKE button is not lit), pressing an OUT-IN combination implements the switch immediately. In the CONFIRM mode (TAKE button is lit), the TAKE button must be pressed to authorize the switch.

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<sup>1</sup> Warning that changes are about to occur in the audio section

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<sup>1</sup> until the user confirms the action

#### 7.4.1 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.  
Actions no longer require user confirmation and the TAKE button no longer illuminates.

#### 7.4.2 Confirming a Switching Action

To confirm a switching action (in CONFIRM mode), do the following:

1. Press an OUT-IN combination.  
The corresponding 7-segment Display blinks. The TAKE button also blinks.
2. Press the blinking TAKE button to confirm the action.  
The corresponding 7-segment Display no longer blinks. The TAKE button illuminates.
3. To confirm several actions (in CONFIRM mode), do the following:  
Press each OUT-IN combination in sequence.  
The corresponding 7-segment Display blinks. The TAKE button also blinks.
4. Press the blinking TAKE button to confirm all the actions.  
The corresponding 7-segment Display no longer blinks. The TAKE button illuminates.

---

<sup>1</sup> Failure to press the TAKE button within one minute (the Timeout) will abort the action

## 7.5 Storing/Recalling Input/Output Configurations

You can store and recall<sup>1</sup> up to 10 input/output configurations using the 5 input buttons and the 5 output buttons, as Figure 12 illustrates:

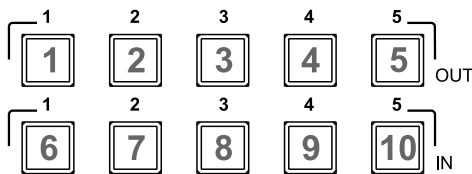


Figure 12: Storing and Recalling using the Input / Output Buttons<sup>2</sup>

### 7.5.1 Storing an Input/Output Configuration

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

1. Press the STO button.  
The STO button blinks.
2. Press one of the 10 Input / Output buttons (this will be the setup # in which the current status is stored). If in the CONFIRM mode, press the blinking TAKE button to confirm the action.  
The memory stores the data at that reference.

### 7.5.2 Recalling an Input/Output Configuration

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

1. Press the RCL button.  
The RCL button blinks.
2. Press the appropriate Input / Output button (the button # corresponding to the setup #). If in the CONFIRM mode, that setup configuration will blink in the 7-segment Display, together with the RCL button and the TAKE button, and will only be implemented after pressing the TAKE button.  
The memory recalls the stored data from that reference.

**Tip:** If you cannot remember which of the 10 input/output configurations is the one that you want, set the **VS-5x5** to the CONFIRM mode and manually scan all the input/output configurations until you locate it.

<sup>1</sup> The 10 input/output configurations (or setups) also include the relevant audio-follow-video / breakaway option definition

<sup>2</sup> The gray numbers (1 to 10) in Figure 12 that illustrate the corresponding store/recall configuration numbers, are for the purpose of illustration only and do not appear on the buttons

### 7.5.3 Deleting an Input/Output Configuration

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

1. Press the STO and RCL buttons simultaneously.  
Both the STO and RCL buttons blink.
2. Press the appropriate Input / Output button.  
This erases that specific input/output configuration from the memory, leaving it empty and available<sup>1</sup>.

### 7.6 Locking the Front Panel

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock<sup>2</sup> your **VS-5x5**. Unlocking releases the protection mechanism.

To lock the **VS-5x5**:

- Press the LOCK button for more than two seconds, until the LOCK button is illuminated  
The front panel is locked. Pressing a button will have no effect, except to cause the LOCK button to blink<sup>3</sup>

To unlock the **VS-5x5**:

- Press the illuminated LOCK button for more than two seconds, until the LOCK button is no longer illuminated  
The front panel unlocks

### 7.7 Adjusting the Audio Gain Control

You can adjust the gain control for each input and output using the latest<sup>4</sup> K-Router Windows®-based control software (provided). (See the tables of Hex Codes for Audio Input/Output Gain Control in section 11, if you want to program a serial controller to control the audio gain).

---

1 Storing a new configuration over a previous configuration (without deleting it first) replaces the previous configuration

2 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

3 Warning that you need to unlock to regain control via the front panel

4 Version 3.9 or higher

## 8 Flash Memory Upgrade

The **VS-5x5** firmware is located in FLASH memory, which lets you upgrade to the latest Kramer firmware version in minutes! The process involves:

- Downloading from the Internet (see section 8.1)
- Connecting the PC to the RS-232 port (see section 8.2)
- Upgrading Firmware (see section 8.3)

### 8.1 Downloading from the Internet

You can download the up-to-date file from the Internet. To do so:

1. Go to our Web site at [www.kramerelectronics.com](http://www.kramerelectronics.com) and download the file: “FLIP\_VS5x5.zip” from the Technical Support section.
2. Extract the file: “*FLIP\_VS5x5.zip*” to a folder (for example, C:\Program Files\Kramer Flash).
3. Create a shortcut on your desktop to the file: “*FLIP.EXE*”.

### 8.2 Connecting the PC to the RS-232 Port

Before installing the latest Kramer firmware version on a **VS-5x5** unit, do the following:

1. Connect the RS-232 DB9 rear panel port on the **VS-5x5** unit to the Null-modem adapter and connect the Null-modem adapter with a 9 wire flat cable to the RS-232 DB9 COM port on your PC (see section 5.2).
2. Connect the power on the **VS-5x5** unit and switch it ON.
3. Set the underside Flash Program switches, as follows:
  - Push the rear panel Flash Program button<sup>1</sup> to **Program**
  - On underside panel push reset button, using a screwdriver (see Figure 2)

---

<sup>1</sup> Item 9 in Table 2

### 8.3 Upgrading Firmware

Follow these steps to upgrade the firmware:

1. Double click the desktop icon: “*Shortcut to FLIP.EXE*”.  
The Splash screen appears as follows:



Figure 13: Splash Screen

2. After a few seconds, the Splash screen is replaced by the “*Atmel – Flip*” window:



Figure 14: Atmel – Flip Window

3. Press the keyboard shortcut key *F2* (or select the “*Select*” command from the *Device* menu, or press the integrated circuit icon in the upper right corner of the window).  
The “*Device Selection*” window appears:



Figure 15: Device Selection Window

4. Click the button next to the name of the device and select from the list:  
AT89C51RD2:

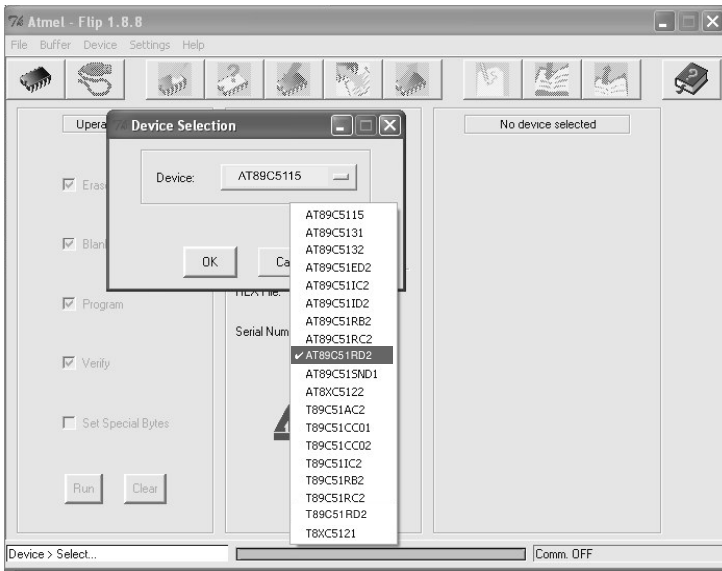


Figure 16: Device Selection window

5. Click OK and select “*Load Hex*” from the *File* menu.

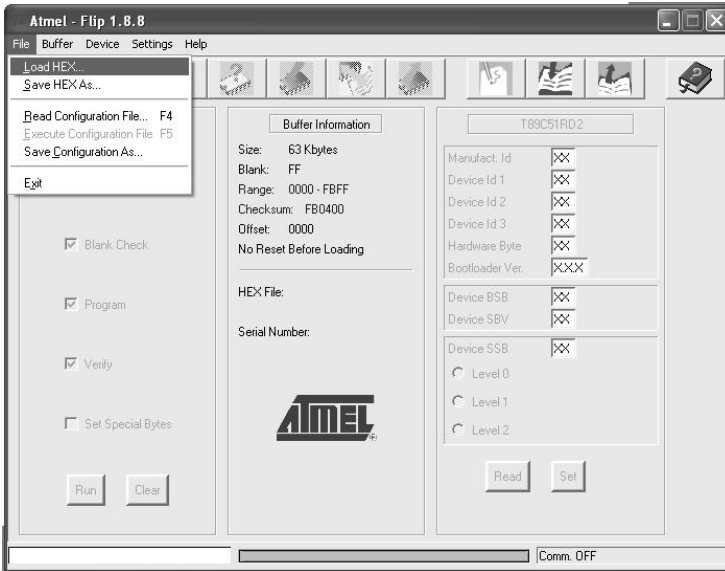


Figure 17: Loading the Hex

6. The Open File window opens. Select the correct HEX file that contains the updated version of the firmware for **VS-5x5** (for example **5x5M\_V1p2.hex**) and click Open.
7. Press the keyboard shortcut key *F3* (or select the “*Communication / RS232*” command from the *Settings* menu, or press the keys: *Alt SCR*). The “*RS232*” window appears. Change the COM port according to the configuration of your computer and select the 9600 baud rate:

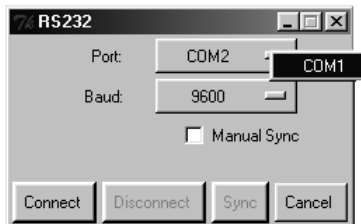


Figure 18: RS-232 Window

8. Click Connect.  
In the “*Atmel – Flip*” window, in the *Operations Flow* column, the *Run* button is active, and the name of the chip appears as the name of the third column: *AT89C51RD2*.



Verify that in the *Buffer Information* column, the “*HEX File: VSSx5.hex*” appears.

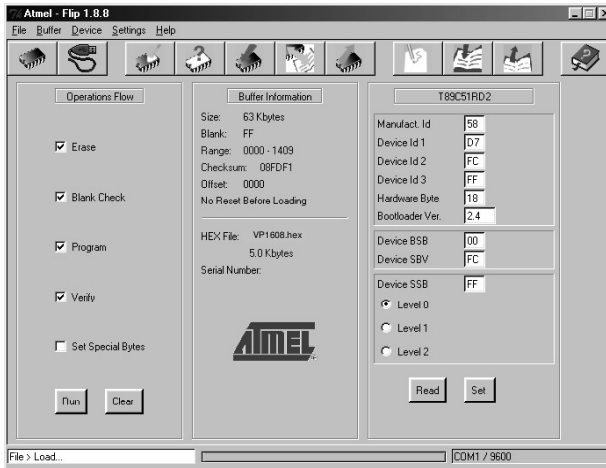


Figure 19: Atmel – Flip Window (Connected)

9. Click *Run*.

After each stage of the operation is completed, the check-box for that stage becomes colored green<sup>1</sup>.

When the operation is completed, all 4 check-boxes will be colored green and the status bar message: *Memory Verify Pass* appears<sup>2</sup>:

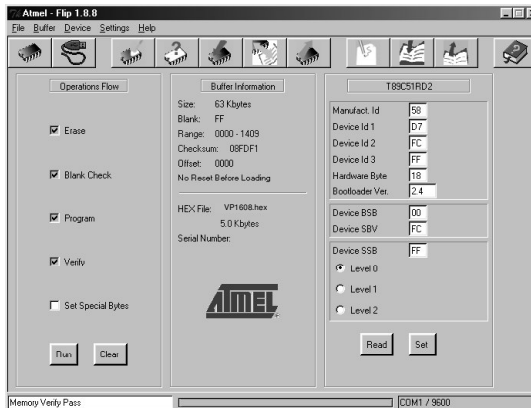


Figure 20: Atmel – Flip Window (Operation Completed)

<sup>1</sup> See also the blue progress indicator on the status bar

<sup>2</sup> If an error message: “Not Finished” shows, click Run again

10. Close the “Atmel – Flip” window.
11. Disconnect the power on the **VS-5x5**.
12. Disconnect the **RS-232** rear panel port on the **VS-5x5** unit from the Null-modem adapter.
13. Release FLASH PROG button on rear panel (Table 2).
14. Connect the power to the **VS-5x5**.  
Upon initialization, the new **VS-5x5** software version shows in the INPUT STATUS 7-segment Display (see section 7.1).

## 9 Technical Specifications

Table 5 includes the technical specifications:

*Table 5: Technical Specifications<sup>1</sup> of the VS-5x5 5x5 Video Audio Matrix Switcher*

INPUTS:	5 composite video 1Vpp / 75Ω on BNC connectors 5 balanced stereo audio, +4dBm (nominal)/25kΩ on detachable terminal blocks	
OUTPUTS:	5 composite video 1Vpp / 75Ω on BNC connectors 5 balanced stereo audio, +4dBm (nominal)/47Ω on detachable terminal blocks	
MAX. OUTPUT LEVEL:	VIDEO: 2Vpp	AUDIO: +19dBm
BANDWIDTH (-3dB):	VIDEO: 70MHz, Fully Loaded	AUDIO: 29kHz
DIFF. GAIN:	0.02%	
DIFF. PHASE:	0.44 Deg	
K-FACTOR:	<0.05%	
S/N RATIO:	VIDEO: 75.1dB	AUDIO: 74dB
CROSSTALK (all hostile):	VIDEO: -51.4dB @ 5MHz	AUDIO: 105dB
CONTROLS:	Audio gain level control by K-Router software, -91dB to +26dB	
COUPLING:	VIDEO: DC	AUDIO: DC at input, AC at output
AUDIO THD + NOISE:	0.102%	
AUDIO 2nd HARMONIC:	0.053%	
POWER SOURCE:	100-240 VAC, 50/60 Hz; 112mA switching power supply	
DIMENSIONS:	19-inch (W), 7-inch (D) 1U (H) rack-mountable	
WEIGHT:	2.7 kg (6 lbs.) approx.	
ACCESSORIES:	Power cord, Null modem adapter, Windows®-based Kramer control software, Infra-red remote control transmitter	

<sup>1</sup> Specifications are subject to change without notice

## 10 Table of Hex Codes for Serial Communication

Table 6 lists the Hex values for a single machine (*MACHINE # 1*):

Table 6: VS-5x5 Hex Codes for Switching via RS-232/RS-485

	Switching Video Channels					Switching Audio Channels				
	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5
IN 1	01	01	01	01	01	02	02	02	02	02
	81	81	81	81	81	81	81	81	81	81
	81	82	83	84	85	81	82	83	84	85
	81	81	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	02	02	02	02	02
	82	82	82	82	82	82	82	82	82	82
	81	82	83	84	85	81	82	83	84	85
	81	81	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	02	02	02	02	02
	83	83	83	83	83	83	83	83	83	83
	81	82	83	84	85	81	82	83	84	85
	81	81	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	02	02	02	02	02
	84	84	84	84	84	84	84	84	84	84
	81	82	83	84	85	81	82	83	84	85
	81	81	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	02	02	02	02	02
	85	85	85	85	85	85	85	85	85	85
	81	82	83	84	85	81	82	83	84	85
	81	81	81	81	81	81	81	81	81	81

## 11 Tables of Hex Codes for Audio Input/Output Gain Control

Sections 11.1 and 11.2 contain the tables of hex codes for input and output signal gain control adjustment, respectively.

### 11.1 Tables of Hex Codes for Audio Input Gain Control

Before adjusting the audio inputs gain, instruction 42, the AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25 is sent<sup>1</sup>:

2A	86	80	81
----	----	----	----

This command is sent once, and the “audio inputs gain adjustment” mode continues until instruction 42 changes to the “audio outputs gain adjustment” mode.

Table 7 lists the Hex values for the audio gain control of the 5 inputs.

<sup>1</sup> See Protocol 2000 description in section 12

Tables of Hex Codes for Audio Input/Output Gain Control

Table 7: VS-5x5 Hex Codes for Audio Input Gain Control<sup>1</sup>

	INPUTS					
	1	2	3	4	5	ALL
Audio Level = 0	16	16	16	16	16	16
	81	82	83	84	85	80
	80	80	80	80	80	80
	81	81	81	81	81	81
Audio Level = 1	16	16	16	16	16	16
	81	82	83	84	85	80
	81	81	81	81	81	81
	81	81	81	81	81	81
Audio Level = 2	16	16	16	16	16	16
	81	82	83	84	85	80
	82	82	82	82	82	82
	81	81	81	81	81	81
Audio Level = 127	16	16	16	16	16	16
	81	82	83	84	85	80
	FF	FF	FF	FF	FF	FF
	81	81	81	81	81	81
Audio Level = 128	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	80	80	80	80	80	80
	81	81	81	81	81	81
Audio Level = 216 (1:1)	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	D8	D8	D8	D8	D8	D8
	81	81	81	81	81	81
Audio Level = 255 (3:1)	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	FF	FF	FF	FF	FF	FF
	81	81	81	81	81	81

<sup>1</sup> See Protocol 2000 description in section 12

## 11.2 Tables of Hex Codes for Audio Output Gain Control

Before adjusting the audio outputs gain, instruction 42, the AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25 is sent<sup>1</sup>:

2A	87	80	81
----	----	----	----

The command is sent once, and the “audio outputs gain adjustment” mode continues until instruction 42 changes to the “audio inputs gain adjustment” mode. Table 8 lists the Hex values for the audio gain control of the 5 outputs.

---

<sup>1</sup> See Protocol 2000 description in section 12

Tables of Hex Codes for Audio Input/Output Gain Control

Table 8: VS-5x5 Hex Codes for Audio Output Gain Control<sup>1</sup>

	OUTPUTS					
	1	2	3	4	5	ALL
Audio Level = 0 (Mute*)	16	16	16	16	16	16
	81	82	83	84	85	80
	80	80	80	80	80	80
	81	81	81	81	81	81
Audio Level = 1	16	16	16	16	16	16
	81	82	83	84	85	80
	81	81	81	81	81	81
	81	81	81	81	81	81
Audio Level = 2	16	16	16	16	16	16
	81	82	83	84	85	80
	82	82	82	82	82	82
	81	81	81	81	81	81
Audio Level = 127	16	16	16	16	16	16
	81	82	83	84	85	80
	FF	FF	FF	FF	FF	FF
	81	81	81	81	81	81
Audio Level = 128	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	80	80	80	80	80	80
	81	81	81	81	81	81
Audio Level = 216 (1:1)	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	D8	D8	D8	D8	D8	D8
	81	81	81	81	81	81
Audio Level = 255 (3:1)	3F	3F	3F	3F	3F	3F
	80	80	80	80	80	80
	81	81	81	81	81	81
	81	81	81	81	81	81
	16	16	16	16	16	16
	81	82	83	84	85	80
	FF	FF	FF	FF	FF	FF
	81	81	81	81	81	81

\*In the Mute state, the audio output is physically disconnected from the input

<sup>1</sup> See Protocol 2000 description in section 12

## 12 Kramer Protocol 2000<sup>1</sup>

The **VS-5x5** is compatible with Kramer's Protocol 2000 (version 0.42) (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 9: Protocol Definitions

MSB		INSTRUCTION						LSB	
		DESTINATION							
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. 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.

<sup>1</sup> You can download our user-friendly “Software for Calculating Hex Codes for Protocol 2000” from our Web site: <http://www.kramerelectronics.com>

Table 10: 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, 18	RESET	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
2	SWITCH AUDIO	Set equal to audio input which is to be switched (0 = disconnect)	Set equal to audio output which is to be switched (0 = to all the outputs)	2
3, 19	STORE VIDEO and AUDIO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4, 20	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 reqd	4, 3
6	REQUEST STATUS OF AN AUDIO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
7	VIS SOURCE	Set as input # (for OUTPUT byte = 6) or set = 0	0 - No VIS (immediate) 1 - Input # 1 3 - External analog sync 4 - Dynamic sync 6 - Input # (INPUT byte)	2, 5, 17, 17A
8	BREAKAWAY SETTING	0	0 - audio-follow-video 1 - audio breakaway	2
10	REQUEST VIS SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - VIS source	3, 4, 6, 7
11	REQUEST BREAKAWAY SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - Request audio breakaway setting 1 - Request "FOLLOW" setting	3, 4, 6, 15
12	REQUEST VIDEO / AUDIO TYPE SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - for video 1 - for audio	3, 4, 6
15	REQUEST WHETHER SETUP IS DEFINED	Set as SETUP #	0	8
16	ERROR / BUSY	0	0 - error 1 - invalid instruction 2 - out of range	9
22	SET AUDIO PARAMETER	Equal to input / output number whose gain is to be set (0 = all)	Set as parameter value	2, 11, 23
24	INCREASE / DECREASE AUDIO PARAMETER	Equal to input / output number whose parameter is to be increased / decreased (0 = all)	0 - increase output 1 - decrease output 6 - increase input 7 - decrease input	23
25	REQUEST AUDIO PARAMETER	Equal to input / output number whose parameter is requested	0	6, 23
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
42	AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25	INPUT Bit: I0 - 0=input; 1=output I1 - Left I2 - Right	0 - Gain	23
57	SET AUTO-SAVE	I3 - no save I4 - auto-save	0	12, 2
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version	0 - Request first 4 digits	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio	14
63	EXTENDED DATA	7 MSBs for INPUT data	7 MSBs for OUTPUT data	19



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 5** - For the OUTPUT byte set as 6, the VIS source is the input selected using the OUTPUT byte. Similarly, for the OUTPUT byte set as 7, the VIS source is the output selected using the OUTPUT byte. Note also, that on some machines the sync source is not software selectable, but is selected using switches, jumpers, etc!

**NOTE 6** - If INPUT is set to 127 for these instructions, then, if the function is defined on this machine, it replies with OUTPUT=1. If the function is not defined, then the machine replies with OUTPUT=0, or with an error (invalid instruction code).

If the INPUT is set to 126 for these instructions, then, if possible, the machine will return the current setting of this function, even for the case that the function is not defined. For example, for a video switcher which always switches during the VIS of input #1, (and its VIS setting cannot be programmed otherwise), the reply to the HEX code

0A        FE        80        81 (i.e. request VIS setting, with INPUT set as 126dec)

would be HEX codes

4A        FE        81        81 (i.e. VIS setting = 1, which is defined as VIS from input #1).

**NOTE 7** - Setting OUTPUT to 0 will return the VIS source setting as defined in instruction #7. Setting to 1 will return the input # or output # of the sync source (for the case where the VIS source is set as 6 or as 7 in instruction #7). Setting to 2 returns the vertical sync frequency (0 for no input sync, 50 for PAL, 60 for NTSC, 127 for error).

**NOTE 8** - The reply to the "REQUEST WHETHER SETUP IS DEFINED" is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined; or 1 if it is defined.

**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 10** - This code is reserved for internal use.

**NOTE 11** - For machines where the video and / or audio gain is programmable.

**NOTE 12** - Under normal conditions, the machine's present status is saved each time a change is made. The "power-down" save (auto-save) may be disabled using this code. Note that whenever the machine is turned on, the auto-save function is set.

**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
----	----	----	----

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 audio, 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 17** - Delayed execution allows switching after a delay dictated by RS-232. To do this, the user sends instruction 7 with the "Set for delayed switch" option (64dec) before sending the switch command (instruction 1) or pressing via front panel. The switch is not executed (unless timed-out) until the "Execute delayed switch" code is sent, or the ""Set for delayed switch" code is sent again. (The mode is automatically cancelled after implementation of the switch if the "execute" command is used).

For example, to connect input 4 to output 3 after a delay, send HEX codes

07	80	C0	81 (set for delayed switch)
01	84	83	81 (switch code)

then, after the required delay, send HEX codes

07	80	C1	81 (execute delayed switch)
----	----	----	-----------------------------

to implement the switch.

**NOTE 17A** - For clean switching of RGBHV video, the "seamless switching" option may be used. The blanking period for the transition of the RGB sources may be set in this case, in steps of 25 milliseconds.

For example, to set for 350ms blanking time (14 steps), send HEX codes:

07	8E	A0	81
----	----	----	----

**NOTE 18** - After this instruction is sent, the unit will respond to the ASCII command set. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

**NOTE 19** - When data (ie. the INPUT and/or OUTPUT bytes) of more than 7 bits is required, this instruction is sent before sending the instruction needing the additional bits. The data in this instruction then becomes the Most Significant Bits of that next instruction. For example, to set the audio gain (instruction 22) of output 3 to 681dec (2A9hex), you would first send HEX codes

3F	80	85	81
----	----	----	----

and then send HEX codes

16	83	A9	81
----	----	----	----

To set the audio gain of output 6 to 10013dec (271Dhex), first send HEX codes

3F	80	CE	81
----	----	----	----

followed by HEX codes

16	86	9D	81
----	----	----	----

**NOTE 20** - To store data in the non-volatile memory of the unit, e.g. the EEPROM for saving SETUPS. The EEPROM address is sent using the INPUT byte, and the data to be stored is sent using the OUTPUT byte. To use this instruction, it is necessary to understand the memory map, and memory structure of the particular machine.

**NOTE 21** - Instruction 59 and instruction 60 load data for sending to the crosspoint switcher (or for storing in a SETUP), i.e. the data is "lined-up" to be executed later. Instruction 58 executes the loaded data.

**NOTE 22** - If the INPUT byte is set as 127dec, then the data stored in a SETUP is loaded. The SETUP # is in the OUTPUT byte.

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**NOTE 23** – Further information needed in instructions 21, 22, 25 and 26, is sent using instruction 42 – which is sent prior to the instruction. For example, to request the audio gain value of right input # 9, send hex codes

2A	84	80	81
and then send HEX codes			
19	89	81	81

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## LIMITED WARRANTY

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

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

### WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

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

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2. Any product, on which the serial number has been defaced, modified or removed.
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
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1. To obtain service on your 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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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.

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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.





**For the latest information on our products and a list of Kramer distributors, visit our Web site: [www.kramerelectronics.com](http://www.kramerelectronics.com), where updates to this user manual may be found. We welcome your questions, comments and feedback.**



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**Kramer Electronics, Ltd.**

Web site: [www.kramerelectronics.com](http://www.kramerelectronics.com)

E-mail: [info@kramerelect.com](mailto:info@kramerelect.com)

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