KRAMER ELECTRONICS, Ltd.

USER MANUAL

Vertical Interval Switcher

Model:

VS-5x4

IMPORTANT: Before proceeding, please read paragraph entitled

"Unpacking and Contents"

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1. INTRODUCTION

Congratulations on your purchase of this Kramer Matrix switcher. Since 1981 Kramer has been dedicated to the development and manufacture of high quality video/audio equipment. The Kramer industrial line has become an integral part of many of the best video/audio production and presentation facilities around the world. In recent years, Kramer has redesigned and upgraded most of the industrial line, making the best even better. Kramer's line of professional video electronics is one of the most versatile and complete available, and is a true leader in terms of quality, workmanship, price/performance ratio and innovation. In addition to the Kramer line of high quality video switchers, such as the one you have just purchased, Kramer also offers a full line of high quality industrial and broadcast distribution amplifiers, processors, interfaces, controllers and computer-related products. Kramer welcomes your inquiries for Kramer equipment or custom-manufactured products, engineering, private labeling and OEM manufacturing per your specifications. This manual includes configuration, operation and accessory information for the **VS-5x4**.

1.1 A Word on Video/Audio Switchers

A video/audio switcher usually switches between several sources (inputs) and one or more acceptors (outputs). A switcher that allows inputs to be connected to several outputs simultaneously is called a Matrix Switcher. Switchers may be of the electronic or mechanical type. Most matrices are of the active electronic type, with many crosspoints. Vertical Interval Switching, frequently used in video, ensures that the transition from one video source to another (such as switching between two genlocked cameras) is smooth and without interference. The switching and changeover is done during the blanked vertical interval period, when the transition is hidden. Vertical Interval Switching is needed when recording or transmitting a video program involving several video sources, as in live broadcast, to ensure clean, undisturbed picture transitions. Matrices and switchers can be controlled by touch buttons on the front panel, or by a PC, via the built-in RS-232 or RS-485/422 communication ports. Each of these is a way of remotely controlling a video/audio device (switcher, SEG, etc.) using a PC with a serial port, or another device that uses a similar communication protocol. Several machines can be controlled from one PC. Its wide bandwidth permits this switcher to be used in the most demanding of applications.

1.2 Factors Affecting Quality of Results

➢ There are many factors affecting the quality of results when signals are transmitted from a source to an acceptor:

➢ **Connection cables** - Low quality cables are susceptible to interference; they degrade signal quality due to poor matching and cause elevated noise levels. They should therefore be of the best quality.

➢ **Sockets and connectors of the sources and acceptors** - So often ignored, they should be of highest quality, since "Zero Ohm" connection resistance is the objective. Sockets and connectors also must match the required impedance (75ohms in video). Cheap, low quality connectors tend to rust, thus causing breaks in the signal path.

➢ **Amplifying circuitry** - Must have quality performance when the desired end result is high linearity, low distortion and low noise operation.

➢ **Distance between sources and acceptors** - Plays a major role in the result. For long distances (over 15 meters) between sources and acceptors, special measures should be taken in order to avoid cable losses. These include using higher quality cables or adding line amplifiers.

➢ **Interference from neighboring electrical appliances** - These can have an adverse effect on signal quality. Balanced audio lines are less prone to interference, but unbalanced audio and video lines should be installed far from any mains power cables, electric motors, transmitters, etc. even when the cables are shielded.

2. SPECIFICATIONS

	VS-5x4
Function	5x4 Composite Video / Audio Stereo Vertical Interval Matrix.
Inputs	5 video, 1Vpp/75Ω Composite on BNCs. 5 stereo audio 1Vpp/ 50kΩ on RCAs. DB-9 connector for RS-232 control.
Outputs	4 video, 1Vpp/75Ω Composite on BNCs. 4 stereo audio 1Vpp/100Ω on RCAs.
Video S/N Ratio	74 dB.
Audio S/N Ratio	89 dB.
Video Bandwidth	Exceeding 30 MHz.
Audio Bandwidth	20-20000 Hz, -1dB.
Audio THD	0.02%.
Differential Gain	0.13%.
Differential Phase	0.8 Deg.
K-Factor	<0.05%
Video Crosstalk	-47dB
Audio Crosstalk	-53 dB.
Switch System	During vertical interval.
Switch Time	< 1frame.
Control Type	1 DB-9 connector for RS-232, or touch switches.
Weight	2.7 kg. (6 lbs.) Approx.
Dimensions (W x D x H)	19 " x 7 " x 1U; 48 cm x 17.78 x 4.5cm.
Power Source	230 VAC 50/60 Hz (115VAC U.S.A), 6 VA.
Accessories	Power cord, Windows 95/98/NT control software, Null modem adapter.

3. HOW DO I GET STARTED?

The fastest way to get started is to take your time and do everything right the first time. Taking 15 minutes to read this manual may save you a few hours later. You don't even have to read the whole manual. If the section doesn't apply to you, you don't have to spend your time reading it.

4. UNPACKING AND CONTENTS

The items contained in your Kramer VS switcher package are listed below. Please save the original box and packaging materials for possible future shipment.

> ➢ The **VS-5x4** Matrix
> ➢ AC power cable
> ➢ User's Manual
> ➢ DB-9 to DB-25 or DB-9 to DB-9 Serial (Null Modem) Adapter
> ➢ PC-Control Software
> ➢ A Concise Directory of KRAMER Products

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4.1 Optional Accessories

The following accessories, which are available from Kramer, can enhance implementation of your switcher. For information regarding them and about cables and additional accessories, contact your Kramer dealer.

➢ **FC-10D -** (Composite-YC Comb Filter/Transcoder) can be serially connected to the switcher for video format conversion (bi-directionally between two popular video formats - composite video and YC (Super-Video). The decoding from composite to Y/C is done digitally using an adaptive comb filter and DSP techniques to minimize dot-crawl and cross-color. A built-in vertical enhancer circuit reduces noise and dot-crawl on the Y signal. In addition, the **FC-10D** provides an independent Y/C to Composite route, for simultaneous bi-directional operation. The Kramer **FC-10D** is very small, and is fed from an external 12VDC supply, thus ideal for fieldwork.

➢ **FC-4041C -** (Genlock RGB/Component to Composite Video/YC Encoder) can be serially connected to the switcher for video format conversion. It is a state-of-the-art Encoder, designed for studio and other demanding applications. The **FC-4041C** encodes RGBS or Y, R-Y and B-Y signals to composite video and Super-video signals. All inputs are looped through with termination switches, allowing parallel connection to other RGBS / Component acceptors. The **FC-4041C** allows the user, via front panel switches, to select whether the Sync is separate or riding on Green. The user can also select whether to convert RGBS or Component (Y, R-Y, B-Y) signals to Composite and Y/C. The outputs are DC coupled and Black-Level clamped.

➢ **VM-19N -** (RGB Decoder) can be serially connected to the switcher for video format conversion. It is an industrial level decoder, which converts both composite video and Super-video to their RGB components.

➢ **VM-1411** (Video/Balanced Stereo Audio Distribution Amplifier) can be serially connected between the switcher and the acceptors for video and audio distribution. It is a full broadcast, state-of-the-art machine, designed for studio and other applications. The VM-1411 has two inputs, video and audio, each splitting to 5 outputs. The user may select 2 x 1:5 or 1:10 operation via front panel control switches. Several VM-1411 units may be chained through the looping inputs. Output signals are (user selectable) DC or AC coupled for highest flexibility. Audio outputs are buffered and isolated from each other, allowing Hi-Fi Balanced audio distribution.

➢ **SP-11** - (Video/Audio Processor) can be serially connected between the video/audio source and the switcher for video and audio control/correction. The machine provides camera control and luminance/white balance correction. The SP-11 is also capable of performing composite to Y/C conversion and bi-directional transcoding. The machine allows full control over the video signal: video gain down to full fade, log or linear definition control, log or linear contrast control, color saturation control, black level control, red, green and blue controls and a screen splitter control for "before-after" comparison. The input control is "audio-follow-video".

➢ **VIDEO TESTER** - A new, unique, patented, indispensable tool for the video professional, the Video Tester is used to test a video path leading to/from an amplifier. By pressing only one touch switch it can trace missing signals, and distinguish between good and jittery (VCR sourced) signals. Whenever a video signal is missing, because of bad connections, cable breaks or faulty sources, the Video Tester is all you need.

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5. KRAMER VS-5X4 MATRIX

This section shows you all of the controls and connections of your switcher. Understanding these helps you realize its full power. The switcher is equipped with RS-232 Connector (for PC Control) and the connector wiring is described later on.

The Kramer **VS-5x4** is a high performance 5x4 vertical interval matrix switch for composite video and stereo audio signals. It is a true matrix, allowing the user to route any input to any or all outputs simultaneously. Since the **VS-5x4** switches during the vertical interval, transitions are glitch-free when sources share common reference sync. Audio signals are always switched together with the corresponding video signal, and the large LED display makes it easy to see the current settings. Each audio output may be configured to have 0, 2, 4 or 6dB gain by using the front panel switches or RS-232.

Like most Kramer switchers, front panel buttons or RS-232 serial commands can control the VS-5x4. For applications requiring remote control via a Windows-based personal computer, Kramer's new K-Switch software is provided at no additional cost. It is easy to use, dependable, rugged, and fits in one vertical space of a standard 19" rack.

5.1 Features of the VS-5x4 Matrix Switcher

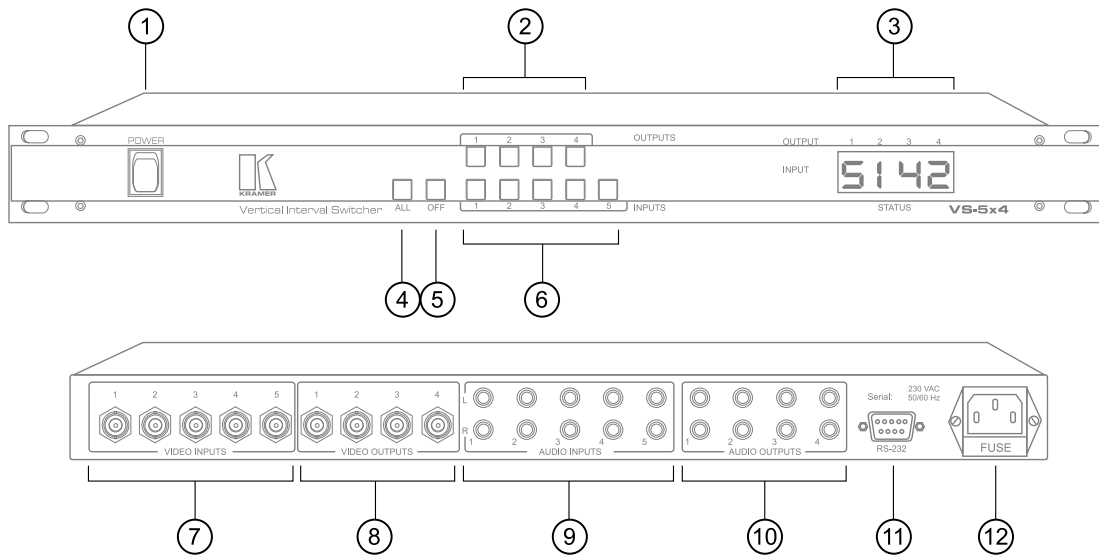Front/Rear panel features of the **VS-5x4** are shown in Figure 1; the features are described in Table 1.

Figure 1: VS-5x4 Front/Rear Panel Features

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Table 1: VS-5x4 Front / Rear Panel Features

No.	Feature	Function
1.	**POWER** Switch	Illuminated switch: supplies power to the unit.
2.	**OUTPUT SELECTOR**	Four buttons to select the desired output connection.
3.	**STATUS** display	Displays which Video/Audio input is switched to which output.
4.	**ALL**	When pressed, followed by an input button, connects that audio/video input to all audio/video outputs.
5.	**OFF**	When pressed after pushing an output button, disconnects that video/audio output from the video/audio input. To disconnect all the outputs, press the **ALL** button followed by the **OFF** button.
6.	**INPUT SELECTOR**	Five buttons to select the desired input connection.
7.	**VIDEO INPUTS**	Video inputs used to connect the video sources, on BNCs.
8.	**VIDEO OUTPUTS**	Video outputs used to connect the video acceptors, on BNCs.
9.	**AUDIO INPUTS**	Audio inputs used to connect the stereo audio input sources, on RCA's.
10.	**AUDIO OUTPUTS**	Audio outputs used to connect the stereo audio output acceptors, on RCA's.
11.	**RS-232**	Used to control the Matrix Switcher from a PC, or remote control device, through an RS-232 interface and a null-modem adapter (provided with the machine). **NOTE:** *Operation of the machine from a remote PC may be done using the **K-Switch** control Software (provided with the machine).*
12.	**Power Connector**	A 3-prong AC connector allows power to be supplied to the unit. Directly underneath this connector, a fuse holder houses the appropriate fuse.

6. SOLUTIONS PROVIDED WITH THE VS-5X4

➤ Video recording and playback frequently involving the use of several devices such as Video Cassette Recorders, Video Disc Players, Cameras, Video monitors, Video processors, Special Effects Generators, Live or Satellite Feeds or any combination of the above.

➤ Hooking up a complex setup of several devices may result in a maze of wires, which is difficult to manage, cumbersome and possibly dangerous.

➤ The **VS-5x4 Vertical Interval Switcher** offers an innovative solution to many of the problems arising from switching, editing and signal distribution.

➤ The **VS-5x4 Vertical Interval Switcher** is simple-to-operate having five Composite video and five stereo audio inputs; and four Composite video and four stereo audio outputs. This allows you to simultaneously connect five sources and four acceptors efficiently and safely.

7. APPLICATIONS OF THE VS-5X4

a. *A fully buffered and amplified matrix switching system.*

b. *A four output Composite video and stereo-audio distribution amplifier with selectable inputs.*

c. *A production, routing and program/preview switcher.*

In the **VS-5x4,** video signals are switched by means of digital control pulses during the Vertical Interval.

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8.   INSTALLATION

8.1   Rackmounting

The **VS-5x4** may be rackmounted in a standard 19" (1U) EIA rack assembly and includes rack "ears" at the ends of the front panel. The device does not require any specific spacing above or below the unit for ventilation. To rack mount the matrix, simply place the unit's rack ears against the rack rails of the rack, and insert standard screws through each of the four corner holes in the rack ears.

9.   CONNECTING TO VIDEO DEVICES

Video sources (such as cameras and VCRs) and output devices (such as monitors, projectors or recorders) may be connected to the switcher through the connectors located on the back of the unit.

10.   CONNECTING to AUDIO DEVICES

Audio sources and output devices (such as amplifiers or recorders) may be connected to the **VS-5x4** switcher through the RCA type connectors located on the back of the unit. The **VS-5x4** supports unbalanced stereo audio signal types.

11.   USING the VS-5X4

11.1   Turning On the Matrix

The matrix should only be turned on after all connections are completed, and all source devices have been turned on. Do not attempt to connect or disconnect any video, audio or control signals to the switcher while it is turned on. Turn on the matrix by pressing the toggle switch on the far-left front panel to the up position. In the up position, the toggle switch glows.

11.2   Using the Front Panel Controls

The front panels of Kramer switchers and Matrices are designed to be simple to operate, and accomplish the basic function of selecting an input source and output device.

11.2.1   Keystrokes

➢   Press the appropriate output key followed by the appropriate input key in order to switch an input to an output.
➢   Press "ALL" followed by the appropriate input key to connect an input to all the outputs.
➢   Pressing "OFF" instead of an input key will disconnect an output.
➢   For the above instructions, the display will flash the appropriate output(s) while waiting for the second keystroke (if the second key is not pressed within one minute, the pending operation is canceled).
➢   Pressing input keys 1, 2 and 3 simultaneously will reset the machine.

11.3   DIP SWITCH Settings

The Dip switches are situated on the main board within the machine. These switches are used for control of several machines via one RS-232 controller or for operating machines in parallel. The factory default setting is for a "Master" machine, i.e., either the first in the chain or stand-alone operation.

➢   If only one machine is used in the system, it must be set up as the master.
➢   If more than one machine is used, set up one as the master, and the others as slaves, each slave having its own unique "slave number" - except for the case where machines are hooked up in parallel (see below).
➢   The **VS-5x4** reads the dip-switch setting on initialization (only), so if the settings are changed, the new switch settings are realized when the machine is turned on. *Do not change the DIP switch settings while the machine is powered on.*

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> ➤ If several machines are to be used "in parallel" to switch together, e.g.. when using 4 machines together to make a 5X4 RGBS switcher, then all the parallel machines should be set up to have the same slave number and switch 4 should be ON for the machine which switches the syncs. A 9-pin flat cable should be used to interconnect the machines via their RS-232 ports.
> The dip-switch settings are as follows:

	1	2	3	4	5	6	7	8
UNIT 1 (Master)	OFF	OFF	OFF	ON	ON	ON	ON	ON
UNIT 2	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 3	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 4	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 5	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
UNIT 6	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
UNIT 7	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
UNIT 8	ON	ON	ON	OFF	OFF	OFF	OFF	OFF

12. RS-232 CONTROL

1. To control the **VS-5x4** using RS-232, connect the "9 pin to 9 pin adapter" (provided with the machine) to the 9 pin serial port of the PC. Use a flat cable to connect from the 9 pin of the **VS-5x4** to the 9 pin of the null modem adapter. (The adapter is a null-modem plug and 9-pin to 9-pin converter - see diagram below).
2. The DOS based PC program may be downloaded from the Internet at the Kramer Website / Technical support section. The website address is: www.kramerelectronics.com .The program allows control and monitoring of the **VS-5x4** via an IBM compatible PC. Please read the readme.txt file before installation.
3. The Windows ™ based program, the **K-SWITCH** software, which comes with the machine, is fully described in the software manual. Please follow the instructions carefully. If needed, you may download the latest version of the program from the site above.
4. The protocol used for contro1ling the **VS-5x4** may be found below.
5. If several machines are used (in a master / slave setup, or if they are connected in parallel to switch together), then the machines should be daisy-chained via their 9 pin interface sockets using a flat-cable.

13. AUDIO LEVEL CONTROL

To select the audio gain for one of the outputs, simultaneously press this output key together with the "ALL" key. Then, while both these keys are being held down, press the input key according to the required gain defined as:
1- 0 dB gain
2- 2 dB gain
3- 4 dB gain
4- 6 dB gain

14. PROTOCOLS USED FOR RS-232 COMMUNICATION

The factory default of the VS 5x4 switcher is set for Protocol 2000. There are 2 built-in communication protocols. Choose to operate your VS 5x4 switcher using:
➤ Protocol 2000 (via the K-ontrol or K-Router software) to control different switchers or switchers/matrix groups from one screen.
➤ The old protocol (via the K-switch software) for simple and fast control of a single switcher or several interconnected machines.
When not using the K-switch, K-ontrol or K-Router software, it is recommended to operate using Protocol 2000, which provides more control over the switchers, and is more advanced than the old protocol supported by the K-switch software.

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Set your VS 5x4 switcher to Protocol 2000 by setting DIP 5 OFF.

Set your VS 5x4 switcher to the old protocol by setting DIP 5 ON.

Get full details of Protocol 2000 via the Technical Support section of our Web site (http://www.kramerelectronics.com).

Communication with the VIS-5X4 is defined using 2 bytes of information. Data transfer is at 9600 baud, with no parity, 8 data bits and one stop bit.

MSB		1st byte				LSB			MSB		2nd byte				LSB	
N7	N6	N5	N4	N3	N2	N1	N0		N15	N14	N13	N12	N11	N10	N9	N8

Where:
N7 = 0 (continue bit).

N6N5N4N3 = 1000 (transmitted by the machine (to the PC), but not necessary when transmitting to the machine).
 N2N1N0 is the binary value of the machine being addressed (or of the machine sending its data) minus one, e.g.. N2N1N0=000 to address machine #1 (the master);
N2N1N0=101 to address machine #6.
N15 = 1 (continue bit).
N14 = 0 for all communication from the PC.
N13N12 N11N10N9N8 = 10 0001 instructs a machine to send its present status. The machine returns 16 bytes. 4 pairs of bytes are sent for the status of the 4 outputs as defined by the table below, and 4 pairs for the gain settings of the 4 audio outputs as defined below.
N13N12 N11N10N9N8 = 10 0010 success code (the machine acknowledges the requested change in status).
N13N12 N11N10N9N8 = 10 0011 non-success code (the machine cannot perform the requested instruction).
NB:- Success/non-success codes, (according to the validity of the request), are returned from the machine which was instructed to change its status.
N13N12 N11N10N9N8 = 10 01GG set audio gain of output 1
N13N12 N11N10N9N8 = 10 10GG set audio gain of output 2
N13N12 N11N10N9N8 = 10 11GG set audio gain of output 3
N13N12 N11N10N9N8 = 11 00GG set audio gain of output 4 where GG is defined as follows:
  00 = 0dB gain
  01 = 2dB gain
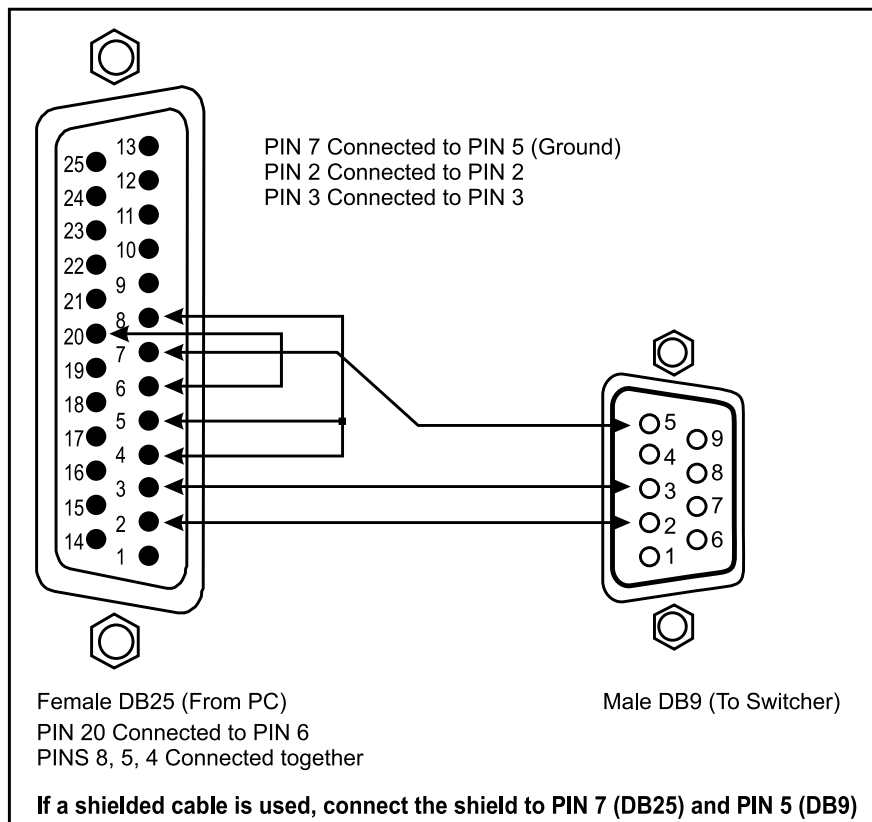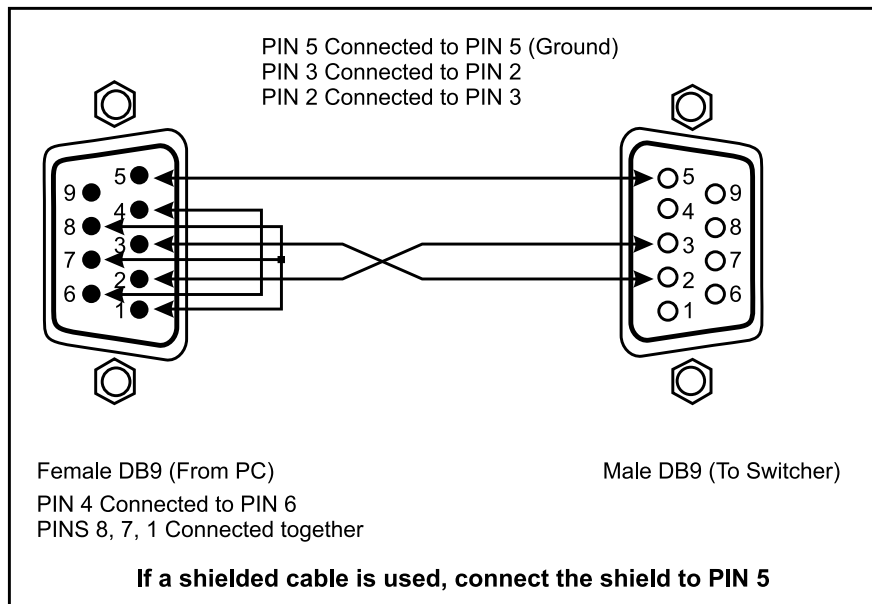 10 = 4dB gain
  11 = 6dB gain
The above gain setting codes are bi-directional, i.e., if the change was made on the machine, then the code is sent to the PC; and if the PC sends the code, then the change is made on the machine.
When N13 is low then N12N11N10N9N8 corresponds to the status (or the required change in status) of the machine, as described in the table below. These are bi-directional codes.

	OUTPUT1	OUTPUT2	OUTPUT3	OUTPUT4	ALL
FROM INPUT 1	1	2	3	4	21
FROM INPUT 2	5	6	7	8	22
FROM INPUT 3	9	10	11	12	23
FROM INPUT 4	13	14	15	16	24
FROM INPUT 5	17	18	19	20	25
OFF	26	27	28	29	30

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For example, to connect input 4 to output 2, N12N11N10N9N8 should be set up as 01110 (=14). To connect input 3 to all the outputs, set N12N11N10N9N8 = 11011 (=27). To disconnect output 1, set N12N11N10N9N8 = 11010 (=26). Similarly, if the front panel switches were pressed to connect input 2 to output 3, then N12N11N10N9N8 would be transmitted as 00111 (=7).

RS-232 Null Modem Connection

PIN 5 Connected to PIN 5 (Ground)
PIN 3 Connected to PIN 2
PIN 2 Connected to PIN 3

Female DB9 (From PC)   Male DB9 (To Switcher)
PIN 4 Connected to PIN 6
PINS 8, 7, 1 Connected together

If a shielded cable is used, connect the shield to PIN 5

PIN 7 Connected to PIN 5 (Ground)
PIN 2 Connected to PIN 2
PIN 3 Connected to PIN 3

Female DB25 (From PC)   Male DB9 (To Switcher)
PIN 20 Connected to PIN 6
PINS 8, 5, 4 Connected together

If a shielded cable is used, connect the shield to PIN 7 (DB25) and PIN 5 (DB9)

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15. TAKING CARE OF YOUR MATRIX SWITCHER

Do not locate your matrix in an environment where it is susceptible to dust or moisture. Both of these may damage the electronics, and cause erratic operation or failure. Do not locate your switcher where temperature and humidity may be excessive. Doing so may also damage the electronics, and cause erratic operation or failure of your switcher. Do not clean your switcher with abrasives or strong cleaners. Doing so may remove or damage the finish, or may allow moisture to build up. Take care not to allow dust or particles to build up inside unused or open connectors.

16. TROUBLESHOOTING

NOTES

1. *Please note that if the output signal is disturbed or interrupted by very strong external electromagnetic interference, it should return and stabilize when such interference ends. If not, turn the power switch off and on again to reset the machine.*
2. *If the following recommended actions still do not result in satisfactory operation, please consult your KRAMER Dealer.*

16.1 Power and Indicators

Problem	Remedy
No power	1. Confirm that the rocker switch is in the "ON" position, and that the lamp is illuminated. 2. Confirm that power connections are secured at the amplifier and at the receptacle. Make sure the receptacle is active, outputting the proper mains voltage. 3. If there is still no power, check the fuse. Remove power cord from the AC outlet and from the machine and then, using a flat head screwdriver, remove the fuse holder located directly below the power connector. Confirm that the fuse is good by looking at the wire connected to the ends of the fuse. If the wire is broken, replace the fuse with another.

16.2 Video Signal

Problem	Remedy
No video at the output device, regardless of input selected.	1. Confirm that your sources and output device are turned on and connected properly. Video signals connected to the input of your switcher should be of an identical signal format at the output of your source. Video signals at the output of your switcher should be of an identical signal format as at the input of your display or recorder. 2. Confirm that any other switchers in the signal path have the proper input and/or output selected. 3. Use the Video Tester to test the video path leading to/from your switcher (see section 4.1 " Video Tester")
Video level is too high or too dim.	1. Verify that the video line is well matched through 75ohm impedance, otherwise it results in a video level that is too high or too dim when looping is performed and the termination switches are not in proper position. 2. Confirm that the connecting cables are of high quality, properly built and terminated with 75ohm BNC connectors. Check level controls located on your source input device or output display or recorder.

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Problem	Remedy
Noise bars "roll" up or down in the output image or: Low frequency hum in the output signal	Hum bars (ground loop) are caused by a difference in the ground potential of any two or more devices connected to your signal path. This difference is compensated by passing that voltage difference through any available interconnection, including your video cables. **WARNING**! *Do not disconnect the ground from any piece* *of video equipment in your signal path!* Check the following to remove hum bars: 1. Confirm that all interconnected equipment is connected to the same phase of power, if possible. 2. Remove equipment connected to that phase that may introduce noise, such as motors, generators, etc. 3. Disconnect all interconnect cables and reconnect them one at a time until the ground loop reappears. Disconnect the affected cable and replace, or insert an isolation transformer in the signal path.

16.3 Audio Signal

Problem	Remedy
No audio at the output device, regardless of input selected	1. Confirm that your sources and output device are turned on and connected properly. Audio signals connected to the input of your switcher should be properly wired to the output of your source. Audio signals connected to output of your switcher should be properly wired to the input of your switcher or recorder. 2. Confirm that any other switchers in the signal path have the proper input and/or output selected.
Audio level is too low	1. Confirm that the connecting cables are of high quality and properly built. Take special care in noting the wiring configuration of balanced to unbalanced cables. 2. Check level controls located on your source input device or output display or recorder.

16.4 Control

Problem	Remedy
No control of switcher from PC software	1. Confirm the wiring of the connecting cable. Cable length should not exceed 25 feet. 2. Confirm that all DIP switches on the switcher have been set properly. Keep in mind that if you are only controlling one switcher on a specific port, that switcher must be assigned as unit "**1**". 3. Confirm that the baud rate of your computer COM port is set to the same as that of your switcher (9600-Baud). Confirm that the proper COM port is selected in the control software. 4. Confirm that bi-directional communication is enabled on all switchers. With custom software, do not send multiple commands at the same time. The switcher must complete one command and send a reply before receiving another. 5. Make sure that all switchers are powered up. Communication between the machines can only be done when all machine are turned on.

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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 three 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.
3) Damage, deterioration or malfunction resulting from:
    a) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature.
    b) Product modification, or failure to follow instructions supplied with the product.
    c) Repair or attempted repair by anyone not authorized by Kramer.
    d) Any shipment of the product (claims must be presented to the carrier).
    e) Removal or installation of the product.
    f) Any other cause, which does not relate to a product defect.
    g) 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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LIMITATION OF IMPLIED WARRANTIES

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

EXCLUSION OF DAMAGES

Kramer's liability for any defective 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.

NOTICE

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.

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Kramer Electronics, Ltd.
Web site: www.kramerelectronics.com
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