

Kramer Electronics, Ltd.



USER MANUAL

Model:

VS-121HCA

12 x 1 Stereo Audio - S/PDIF 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-121HCA** *12 x 1 Stereo Audio - S/PDIF Switcher*. This product is ideal for the following typical applications:

- Presentation and conference rooms, board rooms and auditoriums
- Production studios, rental and staging
- Home cinema

The package includes the following items:

- **VS-121HCA** 12 x 1 Stereo Audio - S/PDIF Switcher
- Power cord², null-modem adapter and rack ears
- Windows[®]-based Kramer control software³
- **RC-IR2** Infrared remote control transmitter (including the required battery and a separate user manual⁴)
- This user manual⁴

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 cables⁵

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

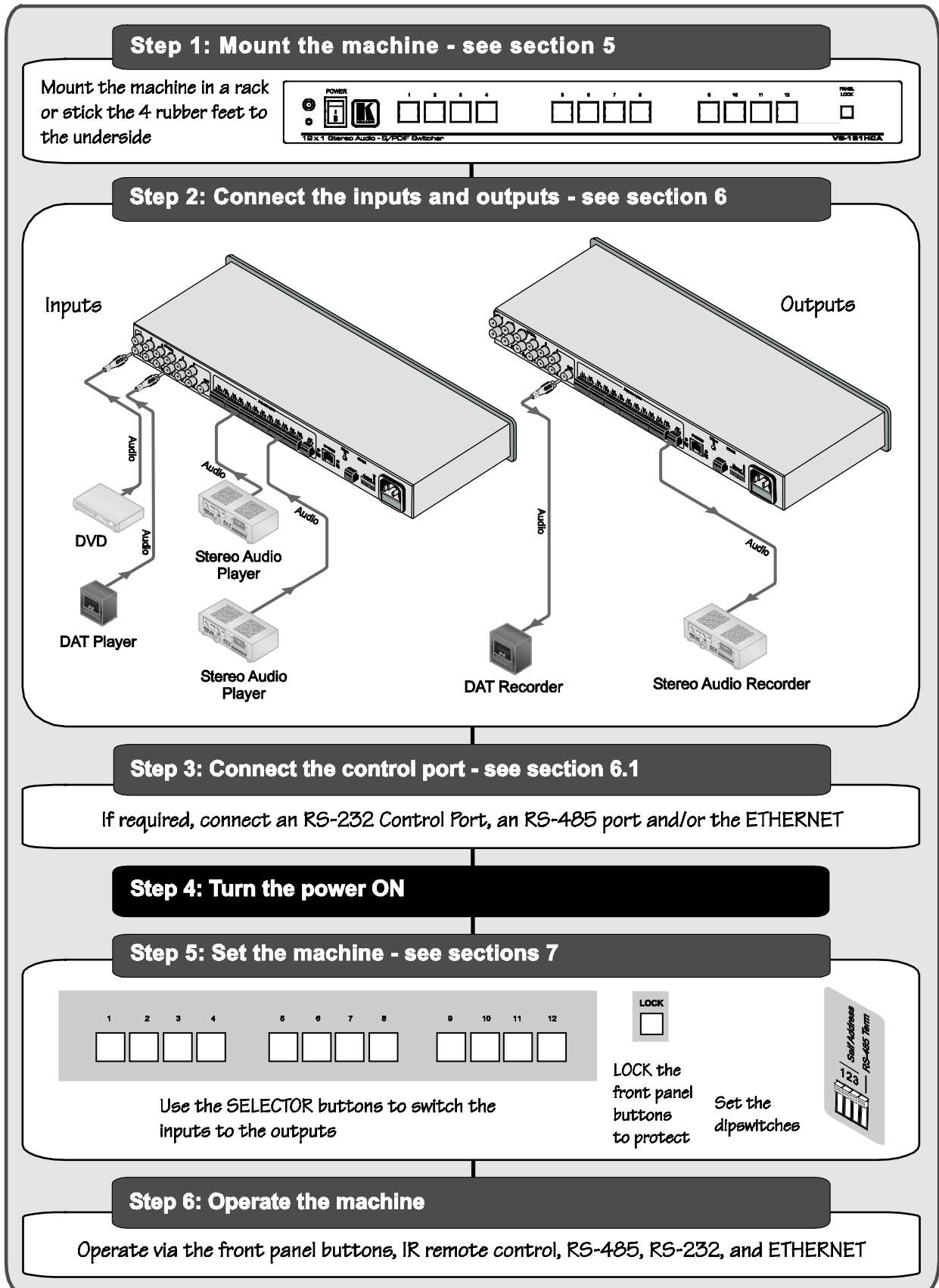
3 Downloadable from our Web site at <http://www.kramerelectronics.com>

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

5 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 steps.



3 Overview

The Kramer **VS-121HCA** is a high-quality *12 x 1 Stereo Audio - S/PDIF Switcher* designed for home cinema applications. The **VS-121HCA** inputs up to 12 S/PDIF digital audio and 12 analog audio channels and switches them to one S/PDIF and one analog output. The digital and analog audio channels switch together and are not converted into the other format. The **VS-121HCA** is also a companion product to the **VS-121HC** *12 x 1 Component Video Switcher / -Transcoder* in addition to its use as a standalone switcher/transcoder. The **VS-121HCA** features:

- 12 S/PDIF digital audio inputs on RCA connectors that switch to 1 S/PDIF digital audio output on an RCA connector
- 12 analog audio inputs on terminal blocks that switch to 1 analog audio output on a terminal block
- A front panel with 12 input selector buttons, as well as a panel lock button to prevent unintentional tampering with the front panel
- Individual volume control on each input adjusted by IR remote control or RS-232. The volume settings are saved in non-volatile memory
- The ability to operate it in tandem with the **VS-121HC**

Operate the **VS-121HCA** using the front panel buttons, or remotely using:

- RS-232 and RS-485 serial commands transmitted by PC, a touch screen system, or other serial controller
- The ETHERNET
- The Kramer Infrared remote control transmitter

The **VS-121HCA** is housed in a 19" 1U rack-mountable enclosure, and is powered by a 100-240 VAC universal switching power supply.

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 **VS-121HCA** away from moisture, excessive sunlight, and dust

4 Your VS-121HCA Stereo Audio S/PDIF Switcher

[Figure 1](#), [Table 1](#), and [Table 2](#) define the front and rear panels of the **VS-121HCA** *12 x 1 Stereo Audio - S/PDIF Switcher*.

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

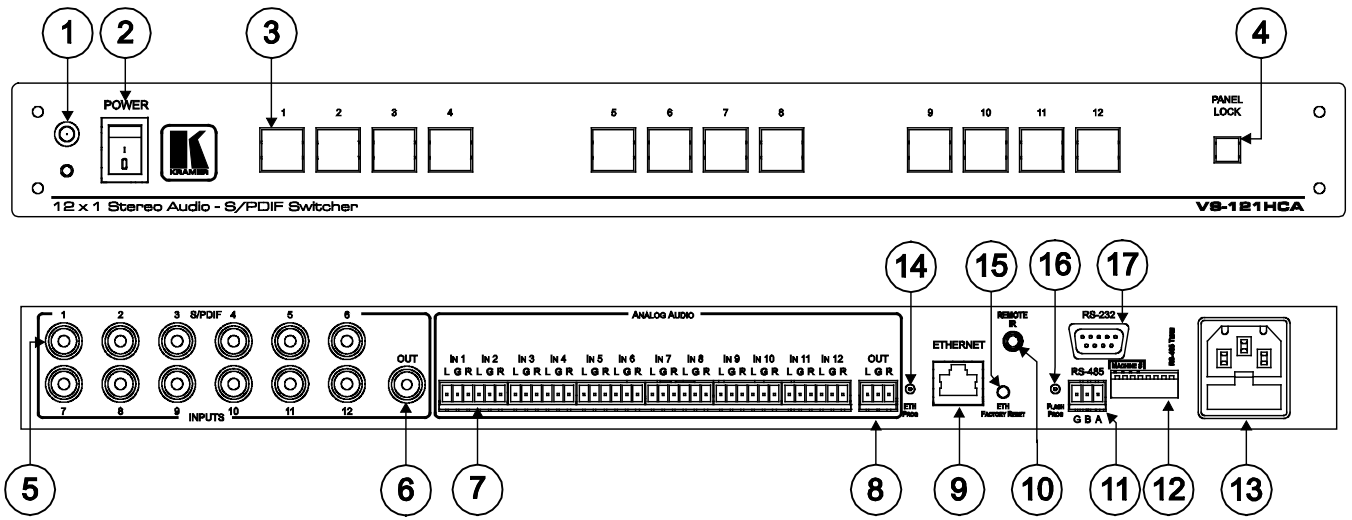


Figure 1: VS-121HCA 12 x 1 Stereo Audio - S/PDIF Switcher

Table 1: VS-121HCA Front Panel Features

#	Feature	Function
1	IR Receiver	The red LED is illuminated when receiving signals from the Infrared remote control transmitter
2	POWER Switch	Illuminated switch for turning the unit ON or OFF
3	Input Selector Buttons	Select the audio input (1 to 12) to switch to the outputs
4	PANEL LOCK Button	Disengages/engages the front panel buttons

Table 2: VS-121HCA Rear Panel Features

#	Feature	Function
5	S/PDIF INPUT RCA Connectors	Connect to the digital audio source (1 to 12)
6	S/PDIF OUT RCA Connector	Connect to digital audio acceptor
7	ANALOG AUDIO IN Terminal Blocks	Connect to analog audio source (IN1 to IN12)
8	ANALOG AUDIO OUT Terminal Block	Connect to analog audio acceptor
9	ETHERNET RJ-45 Connector	Connects to the PC or other Controller through computer networking LAN
10	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) ¹
11	RS-485 Terminal Block Port	Pins B (-) and A (+) are for RS-485; Pin G may be connected to the shield (if required)
12	Setup DIP-switches	DIP-switches for setup of the unit (1 to 4 are for setting the machine number; and 8 is for RS 485 termination)
13	Power Connector with Fuse	AC connector enabling power supply to the unit
14	ETH PROG Button	Push in to upgrade ETH firmware (see section 9.2); release for normal operation
15	ETH FACTORY RESET Button	Press to reset to factory default definitions ² : IP number – 192.168.1.39 Mask – 255.255.255.0 Gateway – 192.168.1.1
16	FLASH PROG Button	Push in ³ for “Program” to upgrade the switcher microcontroller to the latest Kramer firmware (see section 9.1.1), or release (the factory default) for normal operation
17	RS-232 9-pin D-sub (F) Port	Connect to the PC or the Remote Controller via a null-modem connection

1 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the VS-121HCA (only if the internal IR connection cable has been installed)

2 Turn the machine OFF, then turn the machine ON while pressing the FACTORY RESET button. The unit powers up and loads its memory with the factory default definitions

3 Using a screwdriver if required

5 Installing the VS-121HCA in a Rack

This section provides instructions for rack mounting the 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!

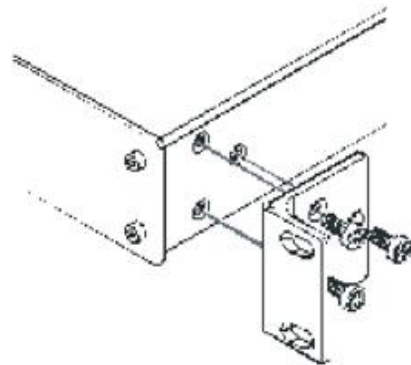
When installing on a 19" rack, avoid hazards by taking care that:

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 (you can download it from <http://www.kramerelectronics.com>)

6 Connecting the VS-121HCA

To connect devices to the **VS-121HCA**, as illustrated in the example in [Figure 2](#), perform the following¹:

1. Connect the following input sources (up to 24 input devices can be connected²):
 - One S/PDIF input source (for example, a DVD) to the IN 7 RCA connector
 - One S/PDIF input source (for example, a DAT player) to the IN 10 RCA connector
 - One analog audio input source (for example, a stereo audio player) to the IN 4 terminal block connector
 - One analog audio input source (for example, a stereo audio player) to the IN 10 terminal block connector
2. Connect the outputs to acceptors (1 or 2 output devices can be connected¹):
 - One S/PDIF output acceptor (for example, a DAT recorder) to the S/PDIF OUT RCA connector
 - One analog output acceptor (for example, a stereo audio recorder) to the analog audio OUT terminal block connector
3. Connect the power cord (not shown in [Figure 2](#)).
4. Optionally, you can connect a PC or controller to the RS-232, RS-485, or Ethernet ports (see section [7](#)) and/or an IR remote transmitter (see section [7.5](#)).

1 Switch OFF the power on each device before connecting it to your VS-121HCA. After connecting your VS-121HCA, switch on its power and then switch on the power on each device

2 Not all input or output ports need to be connected

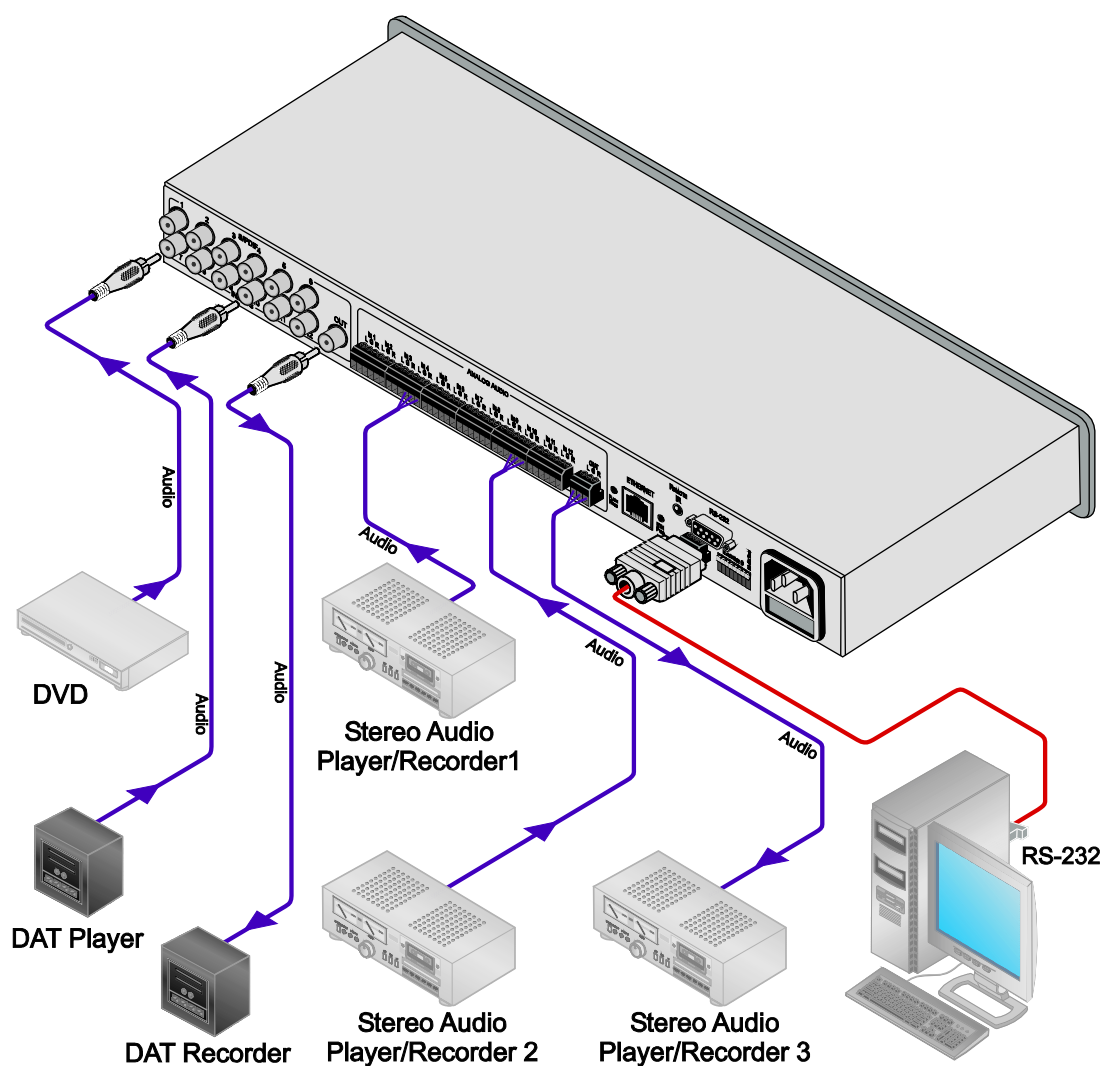


Figure 2: Connecting the VS-121HCA Stereo Audio S/PDIF Switcher

7 Operating the VS-121HCA

You can operate the **VS-121HCA** using:

- The front panel buttons (see section [7.1](#))
- The RS-232 port (see section [7.2](#))
- The RS-485 port (see section [7.3](#))
- An Ethernet network (see section [7.4](#))
- The **RC-IR2** remote control transmitter¹ (see section [7.5](#))

This section also describes:

- How to set the DIP-switches (see section [7.6](#))
- How to operate the **VS-121HCA** in tandem with the **VS-121HC** (section [7.7](#))

¹ Refer to the separate user manual. Download it from our Web site at <http://www.kramerelectronics.com>

7.1 Operating Using the Front Panel Buttons

The front panel includes 12 input selector buttons and one PANEL LOCK button.

To operate the unit:

- Press one of the 12 INPUT SELECTOR buttons to choose the relevant audio signal.
The selected button illuminates in red¹ and the switched signals are outputted to the audio outputs²

To lock the input buttons (to prevent tampering with the unit):

- Press and hold the PANEL LOCK button for two seconds—it illuminates. When the panel is locked and a channel selector button is pressed, the PANEL LOCK button flashes
- Press and hold the button again for two seconds to unlock the buttons

7.2 Operating via the RS-232 Port

The **VS-121HCA** can be operated via a PC, touch screen, or serial controller by means of serial commands transmitted through the RS-232 port. For a description of the serial commands, see section [11](#).

To operate your device using serial commands, you need to install Kramer's control software that can be downloaded from the Kramer Electronics Web site.

7.2.1 Connecting the RS-232 Port

You can connect to the unit via a crossed RS-232 connection, using for example, a PC. A crossed cable or null-modem is required as shown in method A and B respectively. If a shielded cable is used, connect the shield to pin 5.

Method A ([Figure 3](#))—Connect the RS-232 9-pin D-sub port on the unit via a crossed cable (pin 2 to pin 3, pin 3 to pin 2, and pin 5 to pin 5) to the RS-232 9-pin D-sub port on the PC.

Note: There is no need to connect any other pins.

¹ Pressing an illuminated button for more than 2 seconds will disconnect the output and the button will no longer illuminate

² The **VS-121HCA** does not convert the signals from digital to analog or vice versa. Digital and analog channels switch in parallel with no contact between them

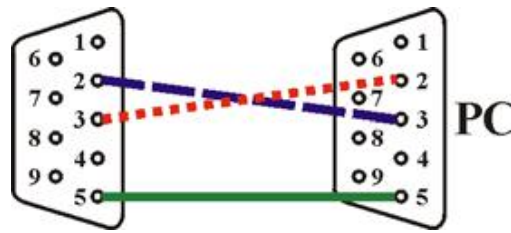


Figure 3: Crossed Cable RS-232 Connection

Hardware flow control is not required for this unit. In the rare case where a controller requires hardware flow control, short pin 1 to 7 and 8, and pin 4 to 6 on the controller side.

Method B (Figure 4)—Connect the RS-232 9-pin D-sub port on the unit via a straight (flat) cable to the null-modem adapter, and connect the null-modem adapter to the RS-232 9-pin D-sub port on the PC. The straight cable usually contains all nine wires for a full connection of the D-sub connector. Because the null-modem adapter (which already includes the flow control jumpering described in Method A above) only requires pins 2, 3 and 5 to be connected, you are free to decide whether to connect only these 3 pins or all 9 pins.

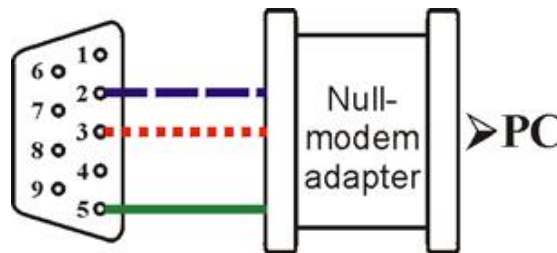


Figure 4: Straight Cable RS-232 Connection with a Null Modem Adapter

7.3 Operating via the RS-485 Port

You can operate the **VS-121HCA** 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-121HCA:

- Connect the TxD+ 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-121HCA**
- Connect the TxD- 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-121HCA**
- If shielded twisted pair cable is used, the shield may be connected to the G (ground) pin on the unit

7.3.1 Setting the Address Switches

Set the first or master device to machine #1. Set all other devices to other unique machine numbers, as defined in [Table 4](#).

7.3.2 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-121HCA** units located at the ends of the RS-485 line (whether master or slave), set DIP 8 ON
- For all other **VS-121HCA** units in the middle of the line, set DIP 8 OFF

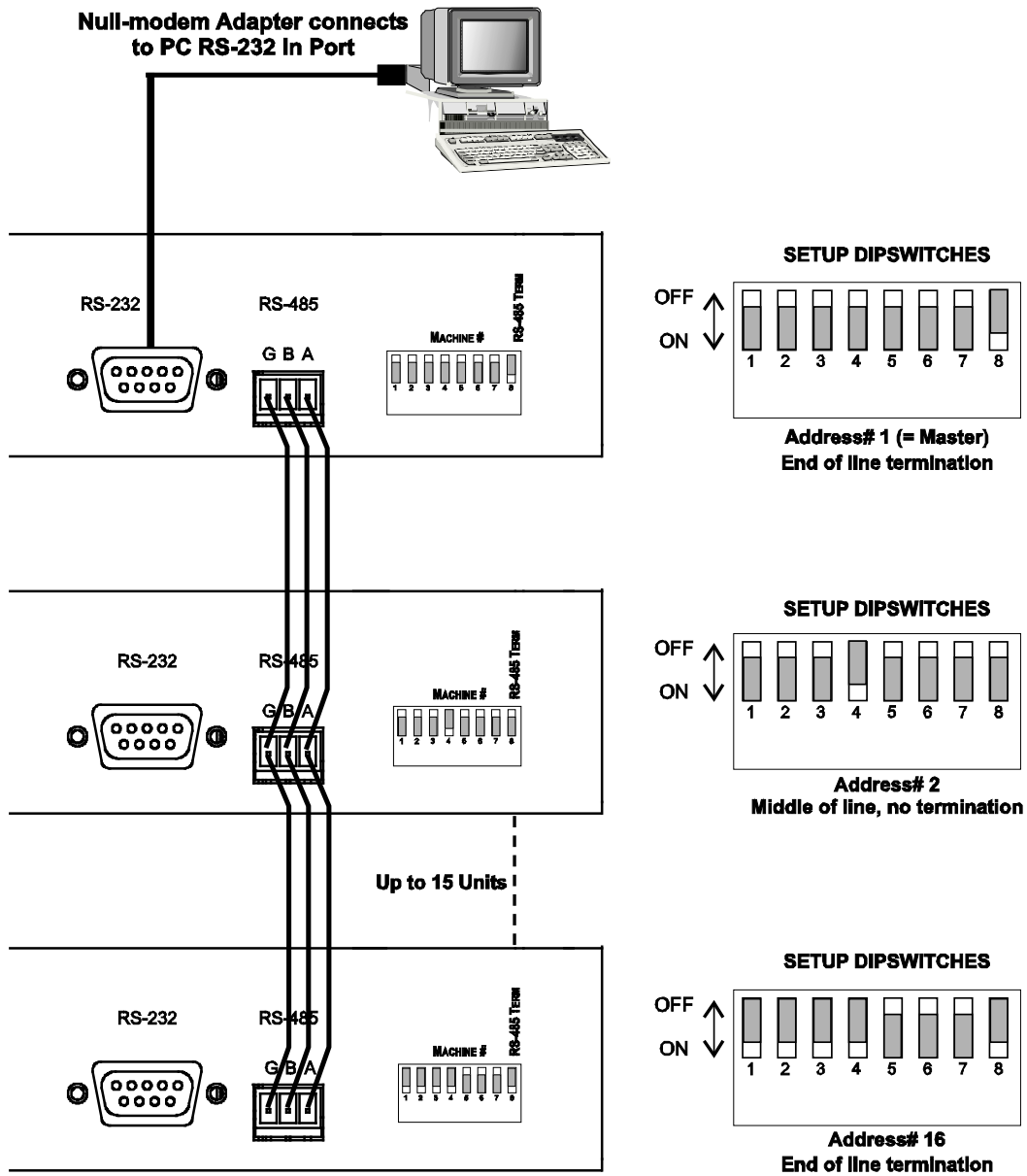


Figure 5: Master/Slave Configuration

7.4 Operating via the ETHERNET Port

You can operate the **VS-121HCA** via the Ethernet, using a crossover cable (see section [7.4.1](#)) for direct connection to the PC or a straight through cable (see section [7.4.2](#)) for connection via a network hub or network router.

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

You can connect the Ethernet port of the **VS-121HCA** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP Address of the **VS-121HCA** during the initial configuration

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

1. Right-click the My Network Places icon on your desktop.
2. Select **Properties**.
3. Right-click Local Area Connection Properties.
4. Select **Properties**.
The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the **Properties** Button (see [Figure 6](#)).

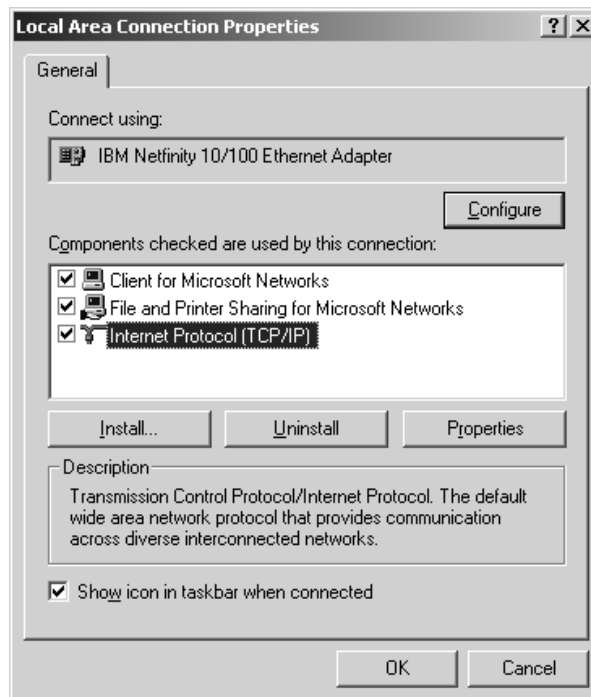


Figure 6: Local Area Connection Properties Window

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

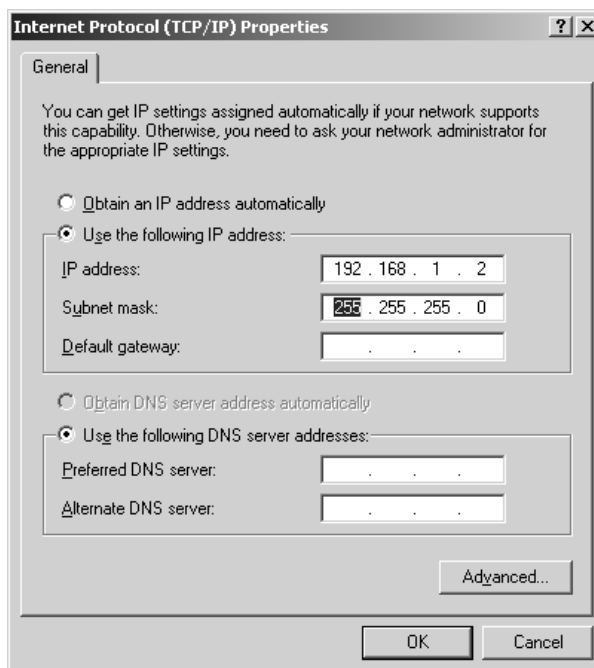


Figure 7: Internet Protocol (TCP/IP) Properties Window

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

You can connect the Ethernet port of the **VS-121HCA** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

7.4.3 Configuring the Ethernet Port

After connecting the Ethernet port, you must install and configure the port. For detailed instructions on how to install and configure your Ethernet port, see the “Ethernet Configuration (FC-11) guide.pdf” on our Web site: <http://www.kramerelectronics.com>

7.5 Operating via the Infrared Remote Controller

You can use the **RC-IR2** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR 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 cables¹

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert an internal IR connection cable², which is required so that the REMOTE IR 3.5mm connector can be used. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

To operate your device using the Infrared remote controller, see the User Manual packed with the remote controller.

7.5.1 Adjusting the Input Volume

Use the **RC-IR2** remote controller to adjust the input volume on any of the individual input channels. The setting is saved in non-volatile memory and remains even after the unit is turned OFF and ON.

To adjust the volume:

1. On the remote controller, press the VOL+ or VOL- button to choose an increase or decrease in the volume.
2. Then press the number key of the desired input to perform the change and hold the button to continue the change.

7.6 Setting the DIP-switches

This section describes the **VS-121HCA** DIP-switch settings that configure RS-485 bus termination, the **VS-121HCA** machine number, and DIP-switch 7 that lets you operate the **VS-121HCA** in tandem with the **VS-121HC**.

[Figure 8](#) illustrates the factory default DIP-switch positions.

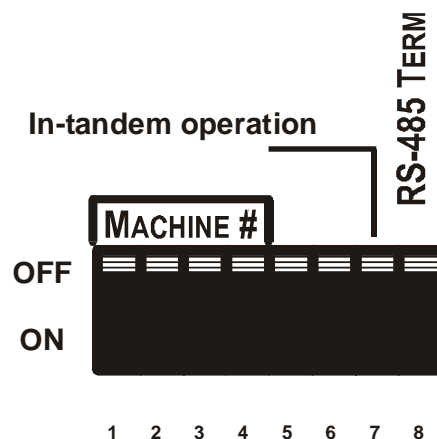


Figure 8: Product DIP-switches

1 P/N: 95-0103050

2 P/N: 505-70434010-S

Table 3: DIP-switch Settings

DIP-switch Number	Function
1, 2, 3, 4	Machine number (see Table 4)
5, 6	Not used
7	Operation in tandem with VS-121HC
8	RS-485 Termination

DIP-switches 1, 2, 3, and 4 determine the machine number of the **VS-121HCA**.

DIP-switches 5 and 6 are not used.

DIP-switch 7 determines operation in tandem with the Kramer **VS-121HC**.

DIP-switch 8 determines the RS-485 bus termination for the **VS-121HCA**.

When several **product** units are connected, the machine number determines the unique identity of the **VS-121HCA** in the sequence (see section [7.6](#)).

- When using a standalone **product** unit, or when operating in tandem with the **VS-121HC**, set the machine number to 1 (factory default)
- When connecting more than one **VS-121HCA**, set the first machine (only when connected via RS-232) to be machine number 1. The other **VS-121HCA** units must each be set to a unique machine number between 2 and 16

Table 4: Machine Number DIP-switch Settings

Machine Number	DIP-switch			
	1	2	3	4
1 (Master, factory default)	OFF	OFF	OFF	OFF
2 (Slave)	OFF	OFF	OFF	ON
3 (Slave)	OFF	OFF	ON	OFF
4 (Slave)	OFF	OFF	ON	ON
5 (Slave)	OFF	ON	OFF	OFF
6 (Slave)	OFF	ON	OFF	ON
7 (Slave)	OFF	ON	ON	OFF
8 (Slave)	OFF	ON	ON	ON

Machine Number	DIP-switch			
	1	2	3	4
9 (Slave)	ON	OFF	OFF	OFF
10 (Slave)	ON	OFF	OFF	ON
11 (Slave)	ON	OFF	ON	OFF
12 (Slave)	ON	OFF	ON	ON
13 (Slave)	ON	ON	OFF	OFF
14 (Slave)	ON	ON	OFF	ON
15 (Slave)	ON	ON	ON	OFF
16 (Slave)	ON	ON	ON	ON

When connecting more than one **VS-121HCA** unit, set a different Machine # on each unit. You do not have to number the units in the order in which they connect to the PC, but each unit must be assigned a unique machine number.

7.7 Operating the VS-121HCA in Tandem with the VS-121HC

The **VS-121HCA** can operate in tandem with the Kramer **VS-121HC 12x1 Component Video Switcher / Transcoder**. Once the units are connected, you can operate the system via the front panel buttons of the **VS-121HC** or via the RS-232 or the Ethernet ports of the **VS-121HC**.

To set the **VS-121HCA** to operate in tandem with the **VS-121HC**:

1. Set the machine number on both units to 1 (DIP-switches 1, 2, 3 and 4 are set OFF).
2. Connect the **VS-121HCA** to the **VS-121HC** via the RS-485 port (see section [7.3](#)).
3. Set DIP-switch 7 on both units to ON.
4. To control the **VS-121HC/VS-121HCA** system via RS-232 or via the Ethernet, connect the PC to the **VS-121HC**, as illustrated in [Figure 9](#).

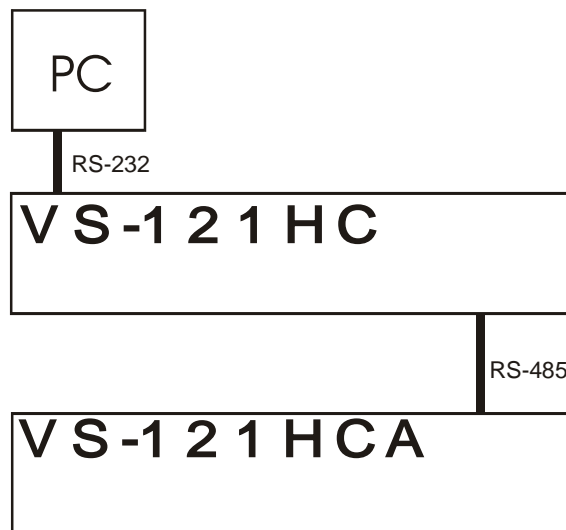


Figure 9: Operating the VS-121HCAA in Tandem with the VS-121HC

8 Technical Specifications

[Table 5](#) lists preliminary technical specifications and [Table 6](#) defines the communication parameters:

Table 5: VS-121HCA Technical Specifications¹

INPUTS:	12 unbalanced stereo on 6-pin terminal block connectors; 12 S/PDIF on RCA connectors
OUTPUTS:	1 unbalanced stereo on 6-pin terminal block connector; 1 S/PDIF on RCA connector
MAX OUTPUT LEVEL:	6Vpp
BANDWIDTH (-3dB):	46kHz
S/N RATIO:	80dB @1kHz
CROSSTALK (all hostile):	-75dB @1kHz
CONTROLS:	12 input selector buttons, RS-232, RS-485, Ethernet, IR
COUPLING:	Input: AC, output: DC
AUDIO THD + NOISE:	0.062% @1kHz
AUDIO 2nd HARMONIC:	0.02% @1kHz
POWER SOURCE:	100-240V AC, 50/60Hz, (115V AC, U.S.A.) 8VA
DIMENSIONS	19" x 7" x 1U W, D, H, rack mountable
WEIGHT:	2.6kg (8lbs) approx
ACCESSORIES:	Power cord, null-modem adapter, rack ears, RC-IR2 remote control transmitter, Windows®-based Kramer control software
OPTIONS:	External remote IR receiver cable

Table 6: Communication Parameters

EDID	
EDID data is passed between Input 1 and Output 1	
RS-232	
Protocol 2000	
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Command Format:	HEX
Example (Output 1 to Input 1):	0x01, 0x81, 0x81, 0x81
Ethernet	
Default Settings	Reset Settings
IP Address: 192.168.1.39	Power cycle the unit while holding in the Factory Reset button, located on the rear panel of the unit.
TCP Port #: 5000	
UDP Port #: 50000	

¹ Specifications are subject to change without notice

9 Upgrading the VS-121HCA Firmware

The **VS-121HCA** functions by means of a device microcontroller and an Ethernet microcontroller that run firmware located in FLASH memory. The latest version of firmware can be downloaded from the Kramer Web site and upgraded in minutes using the following procedures:

- To upgrade the device firmware, see section [9.1](#)
- To upgrade the Ethernet firmware, see section [9.2](#)

Note: The firmware upgrade should be carried out by skilled technical personnel. Failure to upgrade correctly can cause machine malfunction.

9.1 Upgrading the Device Firmware

To upgrade the **VS-121HCA** device firmware:

- Download the file from the Internet (see section [9.1.1](#))
- Connect a PC to the RS-232 port (see section [9.1.2](#))
- Install the latest firmware (see section [9.1.3](#))

9.1.1 Downloading from the Internet

To download the latest file¹ from the Internet:

1. Go to our Web site at www.kramerelectronics.com.
2. Select the appropriate device from the drop-down list.
3. Click the appropriate firmware link.
4. Click **Download File Now**.
5. Extract the downloaded file to a folder (for example, C:\Program Files\Kramer Flash).
6. Create a shortcut on your desktop to the file: “*FLIP.EXE*”.

9.1.2 Connecting a PC to the RS-232 Port

To connect a PC to the RS-232 port of the **VS-121HCA**:

1. Power the **VS-121HCA** OFF.
2. Connect a serial cable from the **VS-121HCA** RS-232 9-pin D-sub rear panel port to a PC as explained in section [7.2.1](#).
3. On the rear panel of the device, press the FLASH PROG switch inward using a small screwdriver (see [Figure 1](#)).

¹ The files indicated in this section are given as an example only. File names are liable to change from time to time

4. Power the **VS-121HCA** ON.

Note: This sequence is critical – first operate the FLASH PROG switch and then power on the unit

9.1.3 Installing the Device Firmware

To install the firmware, perform the following steps:

1. Double-click the desktop icon **Shortcut to FLIP.EXE**.
The Splash screen appears¹:



Figure 10: Splash Screen

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

¹ The screens appearing in this manual are examples of the process. The actual screens may differ in their content.

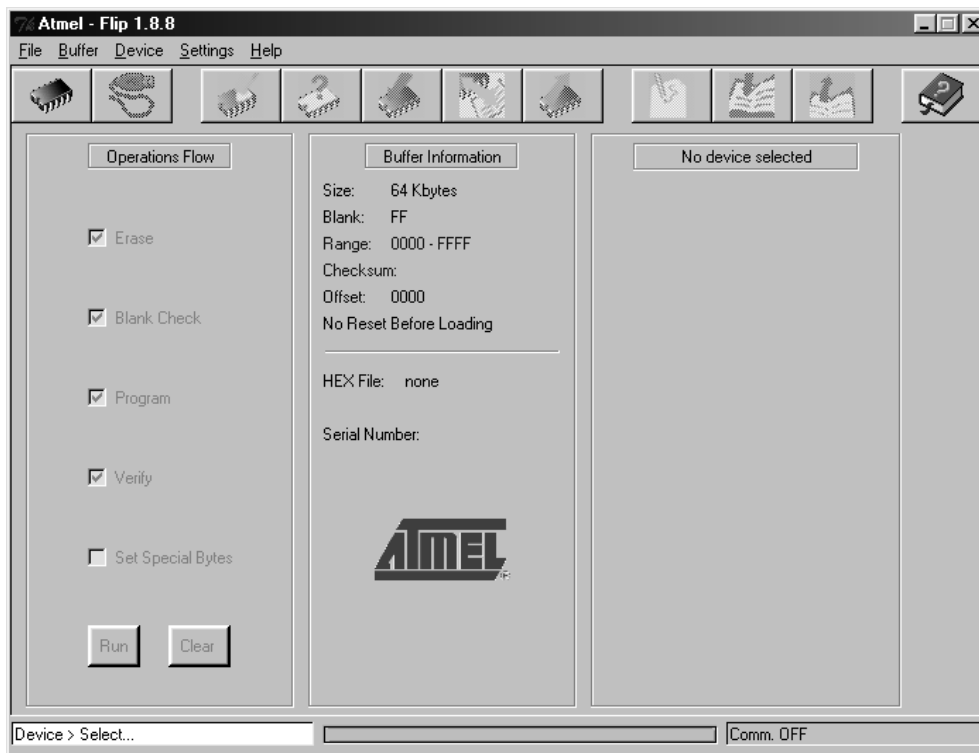


Figure 11: Atmel – Flip Window

3. Open the Device Selection window by:
 - Pressing the keyboard shortcut key **F2**, or
 - Choosing the **Select** command from the Device menu, or
 - Pressing the integrated circuit icon in the upper right corner of the window).The Device Selection window appears:

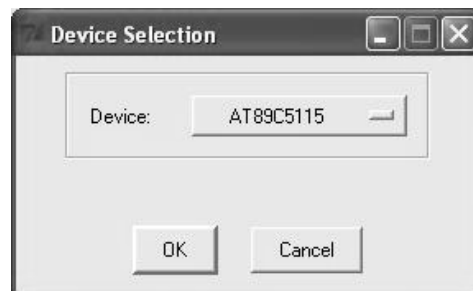


Figure 12: Device Selection Window

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

Upgrading the VS-121HCA Firmware

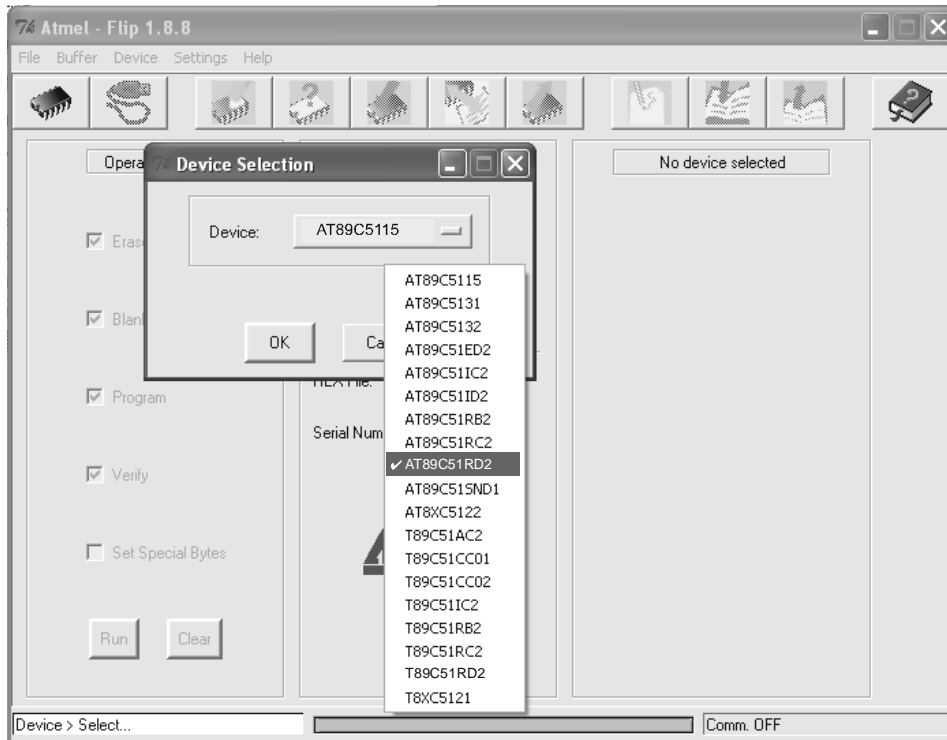


Figure 13: Device Selection Window

5. Click **OK**.
6. From the File menu, select **Load Hex**.

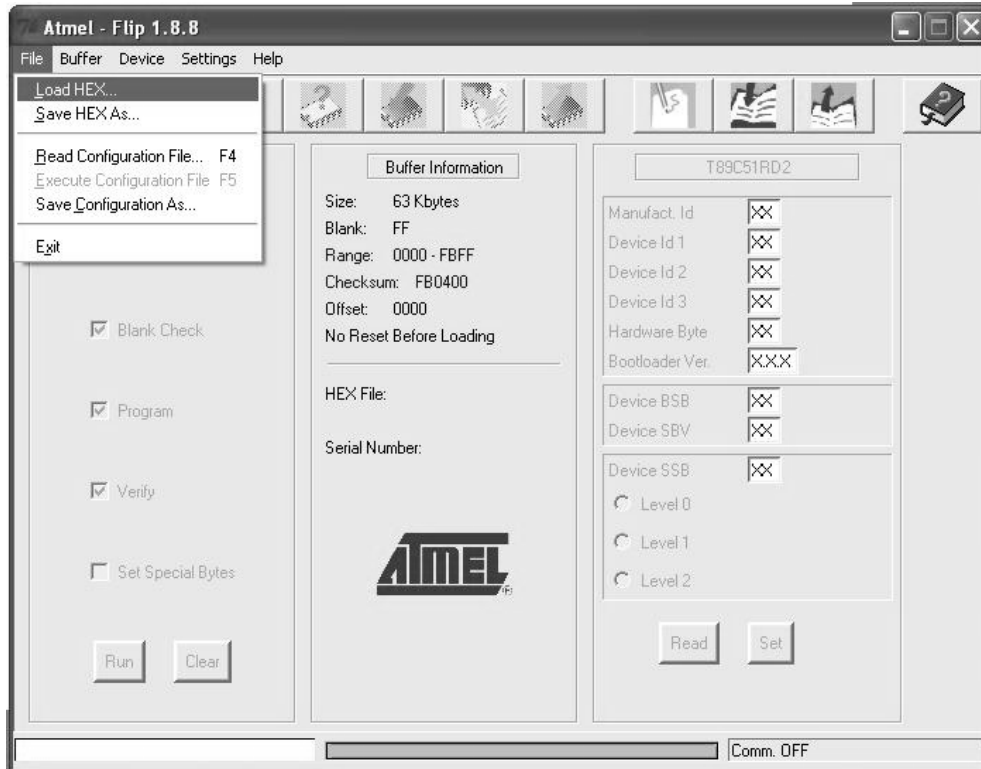


Figure 14: Loading the Hex

7. The Open File window opens. Select the correct HEX file that contains the upgraded version of the **VS-121HCA** firmware (for example, **PL3_V1p2.hex**) and click **Open**.
8. Open the RS-232 window by pressing 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.
9. Change the COM port settings according to the configuration of your computer and select the 9600 baud rate:

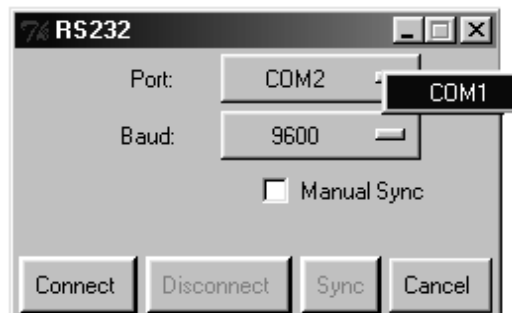


Figure 15: RS-232 Window

10. Click **Connect**.
In the Operations Flow column of the Atmel – Flip window, 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: PL3.hex” appears.

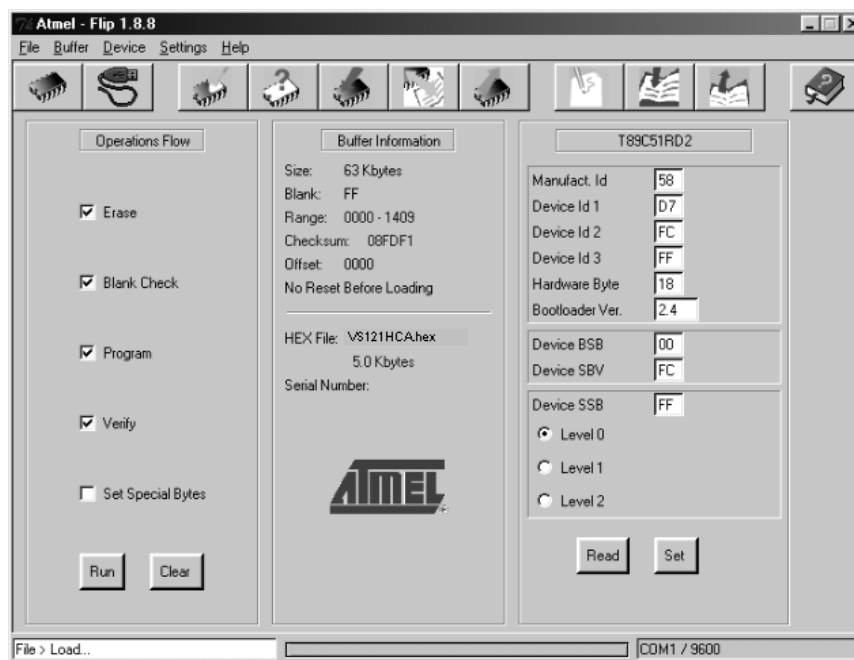


Figure 16: Atmel – Flip Window (Connected)

11. Click **Run**.

As each stage of the operation completes, the check-box for that stage changes to green¹.

When the operation is complete, all four check-boxes are green and the message Memory Verify Pass appears² in the status bar.

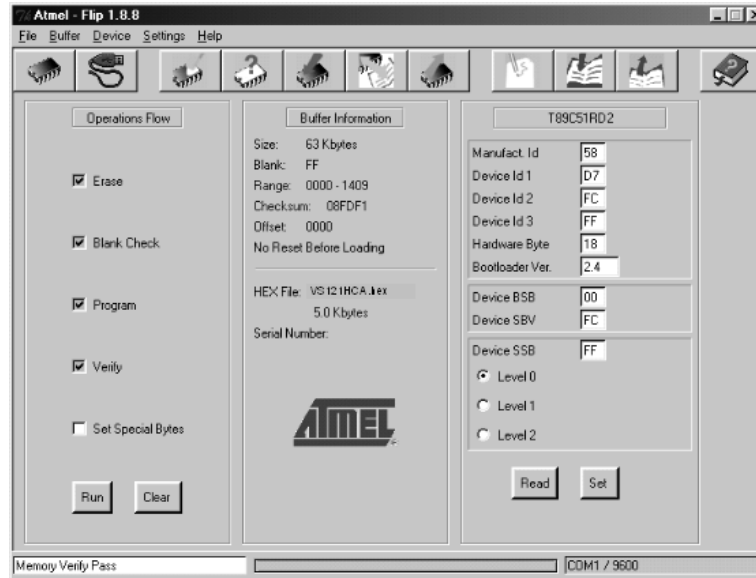


Figure 17: Atmel – Flip Window (Operation Completed)

12. Close the Atmel – Flip window.
13. Power OFF the **VS-121HCA**.
14. If required, disconnect the null-modem adapter from the **VS-121HCA**.
15. Press the FLASH PROG button on the front panel of the **VS-121HCA** outward to its original position (see [Figure 1](#)).
16. Power ON the **VS-121HCA**.

9.2 Upgrading the Ethernet Firmware

To upgrade the **VS-121HCA** Ethernet firmware:

- Download the file from the Internet (see section [9.2.1](#))
- Connect a PC to the RS-232 port (see section [9.2.2](#))
- Install the latest firmware (see section [9.2.3](#))

¹ See also the blue progress indicator on the status bar

² If an error message: “Not Finished” shows, click Run again

9.2.1 Downloading from the Internet

To download the latest file¹ from the Internet to your PC:

1. Go to our Web site at <http://www.Kramerelectronics.com>
2. From the technical support section, download the file:
SetKFRETH11-xx.zip.
3. Extract the file “*SetKFRETH11-xx.zip*” (that includes the KFR-Programmer application setup and the *.s19* firmware file) to a folder (for example, C:\Program Files\KFR Upgrade).
4. Install the KFR-Programmer Application.

9.2.2 Connecting the PC to the RS-232 Port

To connect a PC to the RS-232 port of the **VS-121HCA**:

1. Power the **VS-121HCA** OFF.
2. Connect a serial cable from the **VS-121HCA** RS-232 9-pin D-sub rear panel port to a PC as explained in section [7.2.1](#).
3. On the back panel of the device, press the ETH PROG switch inward using a small screwdriver (see [Figure 1](#)).
4. Power the **VS-121HCA** ON.

¹ The files indicated in this section are given as an example only. File names are liable to change from time to time

9.2.3 Installing the Ethernet Firmware

To install the firmware, perform the following steps:

1. Double-click the KFR-Programmer desktop icon.
The KFR-Programmer window appears (see [Figure 18](#)).

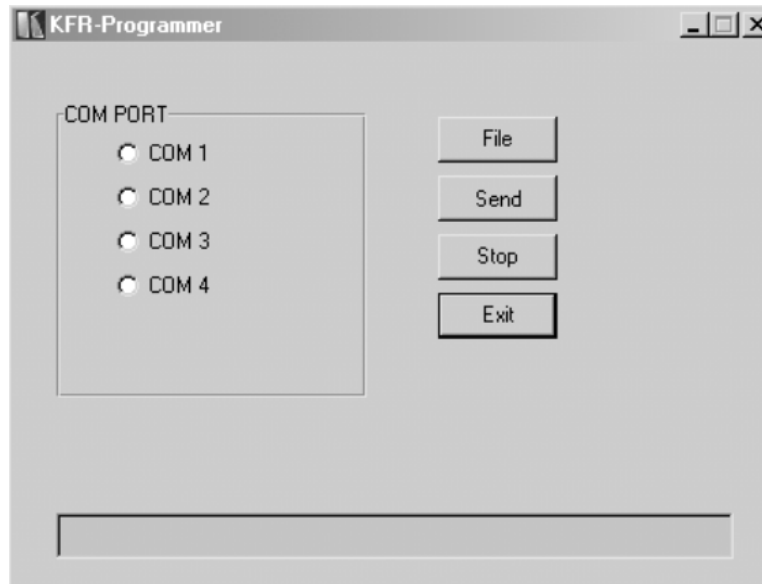


Figure 18: The KFR-Programmer Window

2. Select the required COM Port¹.
3. Press the **File** button to select the `.s19` firmware file included in the package.
4. Press the **Send** button to download the file. The Send button lights red.
5. Wait until the download is complete and the red Send button turns off.
6. Power OFF the **VS-121HCA**.
7. Press the ETH PROG button on the front panel of the **VS-121HCA** outward to its original position (see [Figure 1](#)).
8. Power ON the **VS-121HCA**.

¹ To which the **VS-121HCA** is connected on your PC

10 Hex Tables

[Table 7](#) lists the hex values of instruction #2 – Switch Audio and [Table 8](#) lists the hex values for increasing or decreasing the audio gain. For more detail on Kramer Protocol 2000 instructions, see section [11](#).

Table 7: VS-121HCA Hex Table

Inputs	Digital/Analog Audio OUT
IN 1	02 81 81 81
IN 2	02 82 81 81
IN 3	02 83 81 81
IN 4	02 84 81 81
IN 5	02 85 81 81
IN 6	02 86 81 81
IN 7	02 87 81 81
IN 8	02 88 81 81
IN 9	02 89 81 81
IN 10	02 8A 81 81
IN 11	02 8B 81 81
IN 12	02 8C 81 81

Table 8: VS-121HCA Increase/Decrease Audio Gain Hex Table

	Increase	Decrease
IN 1	18 81 86 81	18 81 87 81
IN 2	18 82 86 81	18 82 87 81
IN 3	18 83 86 81	18 83 87 81
IN 4	18 84 86 81	18 84 87 81
IN 5	18 85 86 81	18 85 87 81
IN 6	18 86 86 81	18 86 87 81
IN 7	18 87 86 81	18 87 87 81
IN 8	18 88 86 81	18 88 87 81
IN 9	18 89 86 81	18 89 87 81
IN 10	18 8A 86 81	18 8A 87 81
IN 11	18 8B 86 81	18 8B 87 81
IN 12	18 8C 86 81	18 8C 87 81

11 Kramer Protocol 2000

VS-121HCA is compatible with Kramer's Protocol 2000 (version 0.50) (below). This RS-232/RS-485 communication protocol uses four bytes of information as defined below. For RS-232, a null-modem connection between the machine and controller is used. The default data rate is 9600 baud, with no parity, 8 data bits and 1 stop bit.

Table 9: 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	M6	M5	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.
 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.

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	RESET	0	0	1
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	2
6	REQUEST STATUS OF AN AUDIO OUTPUT	0	1	4
16	ERROR / BUSY	0	0 - error 1 - invalid instruction 2 - out of range	9, 25
18	RESET AUDIO	0	0	1
22	SET AUDIO GAIN	Equal to input number whose gain is to be set (0 = all)	Set as parameter value	2, 11, 24
24	INCREASE / DECREASE AUDIO GAIN	Equal to input / output number whose parameter is to be increased / decreased	6 - increase input 7 - decrease input	24
25	REQUEST AUDIO GAIN	Equal to input number whose gain is requested	0	24
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
55	REPLY ON	0	0 - Off 1 - On	26
57	SET AUTO-SAVE	13 - no save 14 - auto-save	0	12, 2
61	IDENTIFY MACHINE	2 - audio machine name 4 - audio software version	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 10 - Request first prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio 3 - for SDI	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

02 85 81 83
was sent from the PC, then the switcher (machine 3) switches input 5 to the output. If the user switched input 1 to the output via the front panel keypad, then the switcher sends HEX codes:

42 81 81 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 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 reply to instruction 6 is as per the definitions in instruction 2. For example, if the present status of the output of machine number 5 is input 12, then the reply to the HEX code

0B 80 81 85
would be HEX codes
4B 80 8C 85

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 11 – For machines where the video and / or audio parameter 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 2, the machine sends its name. The reply is the decimal value of the INPUT and OUTPUT. For **VS-121HCA**, the reply to the request to send the audio machine name would be (HEX codes):

7D 81 95 81 (i.e. $128_{dec} + 1_{dec}$ for 2nd byte, and $128_{dec} + 15_{dec}$ for 3rd byte).

If the request for identification is sent with the INPUT set as 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 the **VS-121HCA**, the reply to the request to send the first suffix would be (HEX codes):

7D C8 C3 81 (i.e. $128_{dec} + \text{ASCII for "H"}$; $128_{dec} + \text{ASCII for "C"}$).

NOTE 14 – The number of inputs and outputs refers to the specific machine which is being addressed, not to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code

3E 82 81 82 (ie. request the number of outputs)

would be HEX codes

7E 82 90 82 ie. 16 outputs

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

NOTE 26 – After this instruction is sent with OUTPUT defined OFF, the unit will not send reply to the protocol commands. In order to return to working with REPLY, this instruction must be sent with OUTPUT defined ON. In cases where there is hardware control of the REPLY, (eg a DIP-switch to disable replying), this instruction is only valid when the hardware REPLY is set ON.

LIMITED WARRANTY

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

HOW LONG IS THE WARRANTY

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

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

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

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
 - i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
 - ii) Product modification, or failure to follow instructions supplied with the product
 - iii) Repair or attempted repair by anyone not authorized by Kramer
 - iv) Any shipment of the product (claims must be presented to the carrier)
 - v) Removal or installation of the product
 - vi) Any other cause, which does not relate to a product defect
 - vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

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

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

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

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

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

EXCLUSION OF DAMAGES

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

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

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

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

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

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

CAUTION!

- ☒ Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- ☒ Use the supplied DC power supply to feed power to the machine.
- ☒ Please use recommended interconnection cables to connect the machine to other components.
* FCC and CE approved using STP cable (for twisted pair products)



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.

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E-mail: info@kramerel.com

P/N: 2900-000355 REV 4