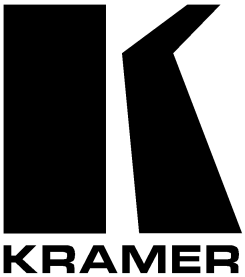
Kramer Electronics, Ltd.



USER MANUAL

Model:

VP-1608

16x8 RGBHV / Balanced Audio Matrix

Contents

Figures

Tables

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[1], which are clearly defined by function.

Congratulations on purchasing your Kramer **VP-1608** *16x8 RGBHV / Balanced Audio Matrix***,** which is ideal for the following typical applications:

- Any professional system requiring outstanding value in a 16x8 matrix
- Production and duplications facilities

The package includes the following items:

- **VP-1608** *16x8 RGBHV / Balanced Audio Matrix*
- Power cord and Null-modem adapter
- Windows®-based Kramer control software
- This user manual[2]

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high resolution cables[3]

3 Overview

The high performance **VP-1608** *16x8 RGBHV / Balanced Audio Matrix* is a true matrix switcher, routing any input to any or all outputs simultaneously. The **VP-1608** includes 16 input and eight output selector buttons, as well as:

- A bandwidth of 400MHz (Fully Loaded) for RGB signals
- A unique vertical and horizontal sync-pulse solution
- Audio-follow-video or audio breakaway option (to switch audio

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 Scalers; and GROUP 8: Cables and Connectors

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

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

independently from video)

- 15 preset memory locations for quick access to common configurations
- A "TAKE" button for precise switch control, letting you place multiple switches in a queue, and then activate them, with one touch of this button or a single serial command
- A delayed switching mode (ranging from 0 to 3.5sec[1]), for clean transitions when switching between non-genlocked sources

Control the **VP-1608** using the front panel buttons, or remotely via:

- RS-485 or RS-232 serial commands—that also support audio gain adjustments for each input and output—transmitted by a touch screen system, PC, or other serial controller
- The Kramer **RC-IR1**[2] Infra-Red Remote Control Transmitter

The **VP-1608** is dependable, rugged and fits into three vertical spaces (3U) of a standard 19" rack. 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 and position your Kramer **VP-1608** away from moisture, excessive sunlight and dust

4 Summary of how to Operate a Single Machine

By default, the **VP-1608** is setup for use as a single machine. This means that it is a 16x8 RGBHV / Balanced Audio Matrix (in audio-follow-video mode), with all setups empty and each input connected to its corresponding output (for example, input 1 to output 1). The dipswitches are set up for a typical application using a single machine (see Figure 1):

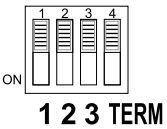


Figure 1: Dipswitch Setup on a Single Machine

5 Your VP-1608 16x8 RGBHV / Balanced Audio Matrix

Figure 2 illustrates the front and rear panels of the **VP-1608**. Tables 1 and 2 define the front and rear panels of the **VP-1608**, respectively.

1 In increments of 0.5sec

2 Previously known as **IR-1 / IR-1-01**

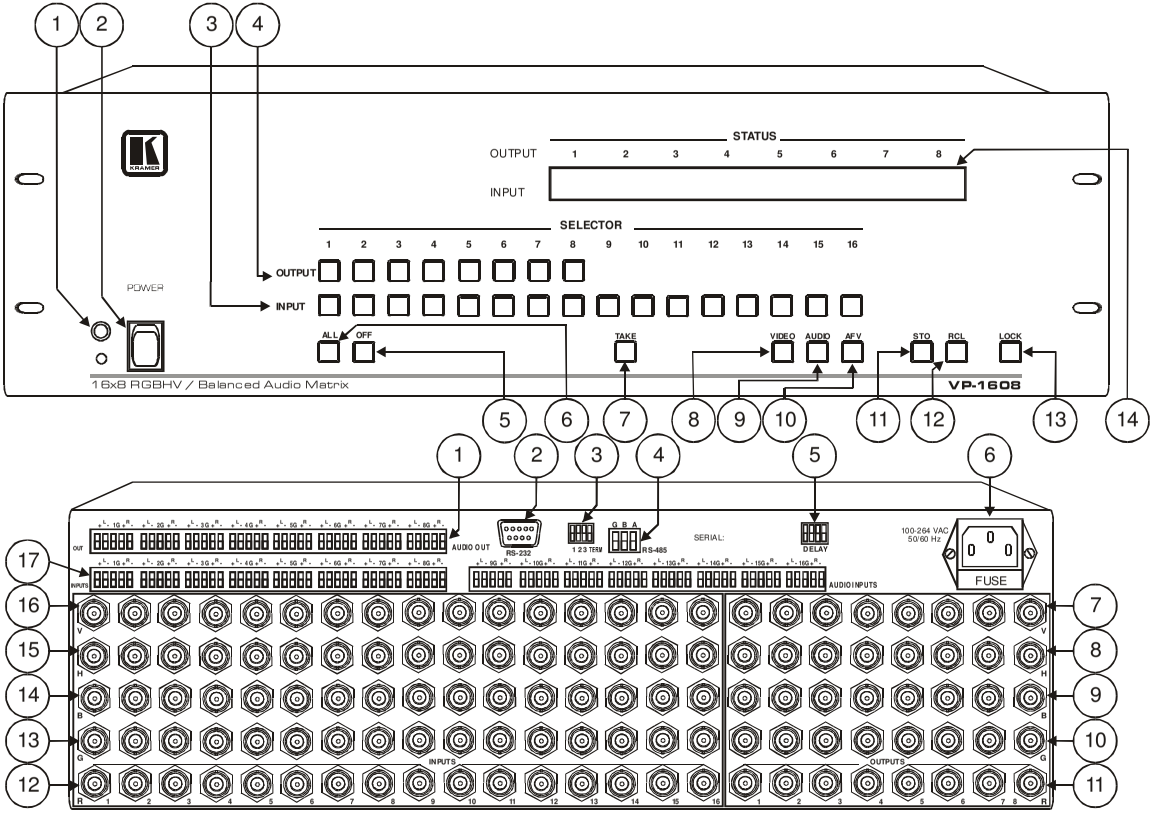


Figure 2: VP-1608 16x8 RGBHV / Balanced Audio Matrix

Table 1: Front Panel VP-1608 16x8 RGBHV / Balanced Audio Matrix Features

#	Feature	Function
1	*IR* Receiver	The red LED is illuminated when receiving signals from the Kramer Infra-red remote control transmitter
2	*POWER* Switch	Illuminated switch supplying power to the unit
3	*INPUT SELECTOR* Buttons[1]	Select the input to switch to the output (from 1 to 16)
4	*OUTPUT SELECTOR* Buttons	Select the output to which the input is switched (from 1 to 8)
5	*OFF* Button	Pressing *OFF* after pressing an *OUTPUT* button disconnects that output from the inputs. To disconnect all the outputs, press the *ALL* button and then the *OFF* button
6	*ALL* Button	Pressing *ALL* followed by an *INPUT* button, connects that input to all outputs[2]
7	*TAKE* Button	Pressing *TAKE* toggles the mode between the *CONFIRM* mode[3] and the *AT ONCE* mode (user confirmation per action is unnecessary)
8	*VIDEO* Button	When pressed actions relate to video
9	*AUDIO* Button	When pressed actions relate to audio
10	*AFV* Button	When pressed audio channels follow the video channels. The button is illuminated when the *AFV* mode is selected
11	*STO* Button	Pressing STO (STORE) followed by an input button stores the current setup
12	*RCL* Button	Pressing the *RCL* (*RECALL*) button and the corresponding input button recalls a setup After pressing the button, the stored status blinks. Pressing a different input button lets you view[4] another setup. After making your choice, pressing the *RCL* button again implements the new status
13	*LOCK* Button	Pressing the *LOCK* button for more than 2 seconds, engages/disengages the front panel switches
14	*INPUT STATUS* 7-segment Display	Displays the selected input switched to the output (marked above each input)[5]

1 The INPUT SELECTOR buttons are also used to store/recall the input/output configurations (refer to section 8.4)

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

3 When in Confirm mode, the TAKE button illuminates

4 Only view, nothing is implemented at this stage

5 Also displays the number included in the product name and the firmware version number, as section 5.1 describes

Table 2: Rear Panel VP-1608 16x8 RGBHV / Balanced Audio Matrix Features

#	Feature	Function
1	*AUDIO OUT* Terminal Block Connectors	Connect to the audio acceptors (from 1 to 8)
2	*RS-232* DB 9F Connector	Connects to the PC or other Serial Controller
3	Setup Dipswitches	DIPS 1, 2, and 3 for setup of the Machine #; DIP 4 for RS-485 termination
4	*RS-485* Connector	RS-485 port on detachable terminal block
5	*DELAY* Dipswitches	Dipswitches for setup of the delay time[1]
6	Power Connector with *Fuse*	AC connector enabling power supply to the unit
7	*V* (Vertical Sync) *OUTPUT* BNC Connectors[2]	Connect to the RGBHV video acceptors (1 to 8)
8	*H* (Horizontal Sync) *OUTPUT* BNC Connectors[2]	
9	*B OUTPUT* BNC Connectors	
10	*G OUTPUT* BNC Connectors	
11	*R OUTPUT* BNC Connectors	
12	*R INPUT* BNC Connectors	Connect to the RGBHV video sources (1 to 16)
13	*G INPUT* BNC Connectors	
14	*B INPUT* BNC Connectors	
15	*H* (Horizontal Sync) *INPUT* BNC Connectors[2]	
16	*V* (Vertical Sync) *INPUT* BNC Connectors[2]	
17	*AUDIO INPUTS* Terminal Block Connectors	Connect to the audio sources (from 1 to 16)

Figure 3 and Table 3 define the two Flash Program switches[3] on the underside of the **VP-1608** unit:

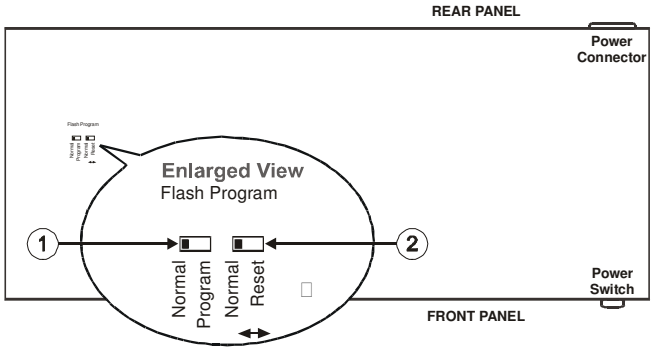


Figure 3: VP-1608 Underside Flash Program Switches

Table 3: VP-1608 Underside (Flash Program Switches) Features

#	Feature	Function
1	*Flash Program* Switch 1	Move to the right for Program[3], or move to the left for Normal[4]
2	*Flash Program* Switch 2	Move to the right for Reset[3], or move to the left for Normal[4]

1 Ranging from 0sec to 3.5sec (in increments of 0.5sec)

2 For RGBS applications, one of the sync channels (H or V) may be used for the S channel

3 Used to upgrade to the latest Kramer firmware (see section 9)

4 The factory default

5.1 Displaying Unit Characteristics

Switching on and/or resetting[1] the **VP-1608** unit, momentarily displays the following characteristics on the front panel (as Figure 4 illustrates):

- The number included in the product name (for example, **1608**)
- The Firmware Version Number

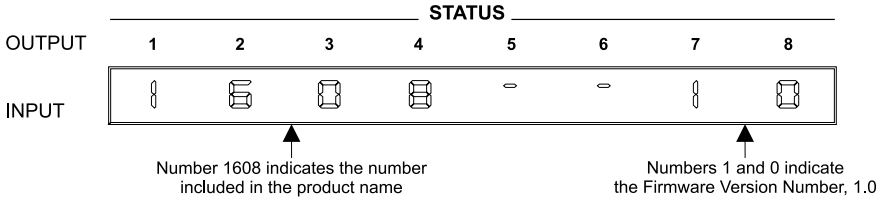


Figure 4: VP-1608 Unit Characteristics

1 To the Current Status (see section 8.7.1) or to the Factory Default State (see section 8.7.2)

6 Connecting a VP-1608 16x8 RGBHV / Balanced Audio Matrix

To connect a single[1] **VP-1608** *16x8 RGBHV / Balanced Audio Matrix*, do the following[2]:

1. Connect to the rear panel, the:
   - Video sources and acceptors (see the illustration[3] in Figure 5)
   - Appropriate audio sources and acceptors (see section 6.1)
   - Power cord
2. Set the dipswitches, as follows:
   - The MACHINE # dipswitches to MACHINE # 1, according to Table 4, that is, set all OFF. See the example illustrated in Figure 1
   - The DELAY dipswitches, if required (see section 6.4)
3. Connect to a PC or other controller, if required, via RS-232 (see section 6.1) or RS-485 (see section 6.3).

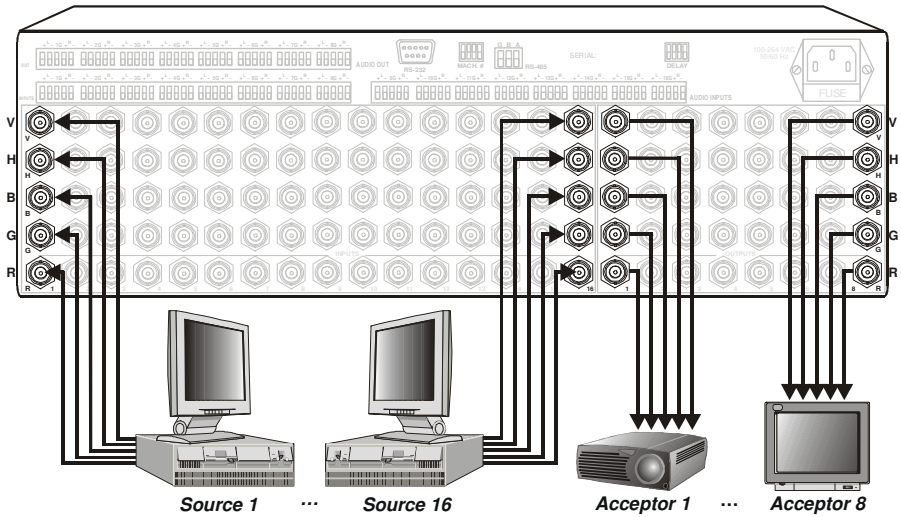


Figure 5: Connecting the Video Sources and Acceptors to the Rear Panel

1 Note that you can connect up to 8 VP-1608 units to a PC or other RS-232 or RS-485 controller (see section 7)

2 Switch OFF the power on each device before connecting it to your VP-1608. After connecting your VP-1608, switch on its power and then switch on the power on each device

3 Which shows a grayed-out rear panel except for how to connect the sources, one to 16, and the acceptors, one to eight

6.1 Connecting the Balanced/Unbalanced Stereo Audio Input/Output

This section illustrates how to wire:

- A balanced input/output connection, see Figure 6
- An unbalanced audio input, see Figure 7
- An unbalanced audio output, see Figure 8

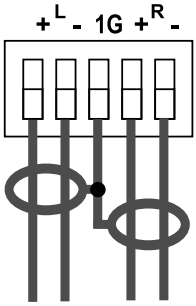


Figure 6: Connecting the Balanced Stereo Audio Input/Output

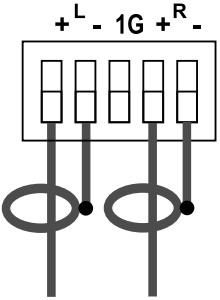


Figure 7: Connecting the Unbalanced Stereo Audio Input

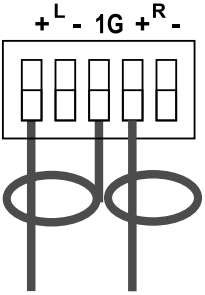


Figure 8: Connecting an Unbalanced Output

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

To connect a PC to the **VP-1608** unit[1], using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 DB9 rear panel port on the **VP-1608** unit to the Null-modem adapter and connect the Null-modem adapter with a 9 wire flat cable[2] to the RS-232 DB9 port on your PC

To connect a PC to the **VP-1608** unit[1], 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 **VP-1608** unit, as Figure 9 illustrates[2] (depending on whether the PC has a 9-pin or 25-pin connector)

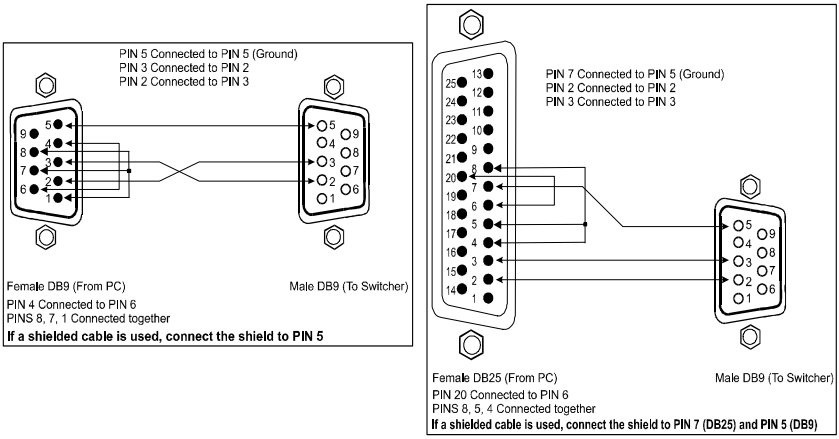


Figure 9: Connecting a PC without using a Null-modem Adapter

1 When connecting a single VP-1608 unit via RS-232, set the MACH. # dipswitches to Machine # 1, according to Table 4

2 Up to 50 feet of cabling may be used for the RS-232 connection

6.3 Controlling via RS-485

You can control a **VP-1608** unit via an RS-485 controller[1], for example, a PC (equipped with an RS-485 interface) or a Master Programmable Remote Control system, such as the Kramer **RC-3000**[2].

To connect an **RC-3000** to a single **VP-1608** unit (see Figure 10):

1. Connect the RS-485 terminal block port on the **RC-3000** to the RS-485 port on the **VP-1608** 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 **VP-1608** 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 **VP-1608** 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 MACH. # dipswitches on the **VP-1608** unit to a Machine # between 2 and 16, according to Table 4. Do not set as Machine # 1 (the Master). Terminate the RS-485 line on both the **VP-1608** unit (set DIP 4 to ON) and on the **RC-3000**[3].

1 RS-485 can be used for control even for distances exceeding 1km

2 Previously known as the VS-3000

3 Refer to the RC-3000 user manual for details of how to terminate the RS-485 line

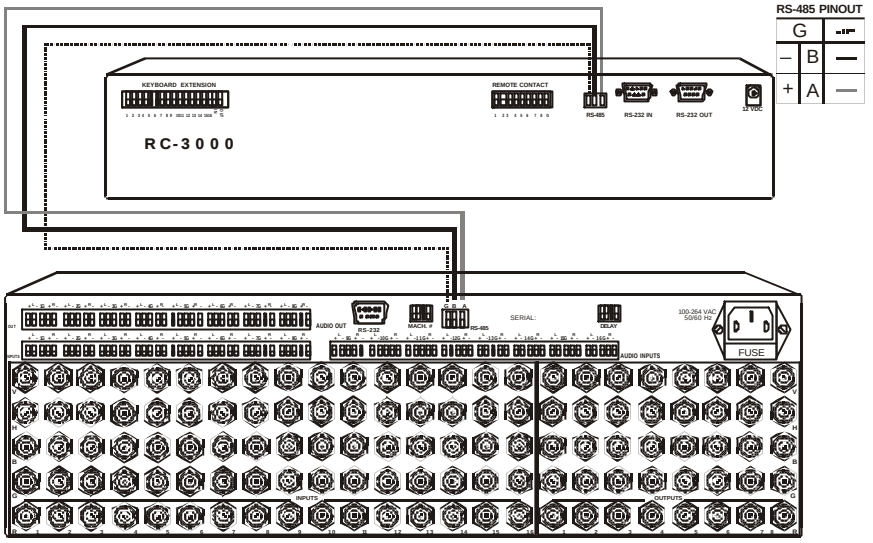


Figure 10: Controlling via RS-485 (for example, using an RC-3000)

6.4 Setting the MACHINE # Dipswitches

The MACHINE # determines the position of a **VP-1608** unit in the sequence, specifying which **VP-1608** unit is being controlled when several **VP-1608** units are controlled by a PC or serial controller. Set the MACHINE # on a **VP-1608** unit via DIPS 1, 2, and 3 (DIP 4 is for RS-485 termination), according to Table 4.

When using a stand-alone **VP-1608** unit, set the MACHINE # to 1 (see Figure 1).

When connecting more than one **VP-1608** unit, set the first machine (the Master) connected via RS-232, as MACHINE # 1. The Master connects to the PC via the RS-232 port. The other **VP-1608** slave units (each set to a MACHINE # between 2 and 8) interconnect via their RS-485 ports to the RS-485 port on the Master.

Table 4: MACHINE # Dipswitch Settings

MACHINE #	DIPS		
	1	2	3
1 Master	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	ON	OFF
4	OFF	ON	ON
5	ON	OFF	OFF
6	ON	OFF	ON
7	ON	ON	OFF
8	ON	ON	ON

6.5 Setting the DELAY Dipswitches

You can achieve clean transitions when switching between non-genlocked sources by setting the delay time—ranging from 0sec to 3.5sec[1]—via the DELAY dipswitches, as Table 5 defines. The **VP-1608** unit is shipped (its factory default state) with no delay, that is, the DELAY dipswitches set up for a 0sec delay.

Table 5: DELAY Dipswitch Settings

sec	DIP 1	DIP 2	DIP 3	DIP 4
0	OFF	OFF	OFF	OFF
0.5	OFF	OFF	OFF	ON
1.0	OFF	OFF	ON	OFF
1.5	OFF	OFF	ON	ON
2.0	OFF	ON	OFF	OFF
2.5	OFF	ON	OFF	ON
3.0	OFF	ON	ON	OFF
3.5	OFF	ON	ON	ON

7 Controlling 16x8 RGBHV / Balanced Audio Matrix Units

You can connect up to eight single[2] **VP-1608** units with control from a PC or serial controller via RS-232 and RS-485 (see section 7.1), or up to seven single[3] **VP-1608** units via RS-485 (see section 7.2).

7.1 Control Configuration via RS-232 and RS-485

To control up to eight single **VP-1608** units—with control from a PC or serial controller—via RS-232 and RS-485, as Figure 11 illustrates, do the following[4]:

1. Connect the video sources and acceptors, the appropriate audio sources and acceptors, and the power cord to each **VP-1608** unit.
2. On each **VP-1608** unit, set the MACHINE # dipswitches, as required[5] (see section 6.4).

1 In increments of 0.5sec

2 To connect a single VP-1608 unit to a PC or other RS-232 controller, see section 6.1

3 To connect a single VP-1608 unit to a PC or other RS-485 controller, see section 6.3

4 Switch OFF the power on each device before connecting it to your VP-1608. After connecting your VP-1608, switch on its power and then switch on the power on each device

5 Set the first unit to MACHINE # 1 (Master), the second unit to MACHINE # 2, and so on - up to MACHINE # 16 for the sixteenth unit

3. Connect the RS-232 port on the first **VP-1608** unit to the PC using the Null-modem adapter provided with the machine (see section 6.1).
4. Interconnect the RS-485 ports on all the **VP-1608** units: from the RS-485 port on the first **VP-1608** unit, to the RS-485 port on the second **VP-1608** unit, and so on – up to the RS-485 port on the eighth **VP-1608** unit.

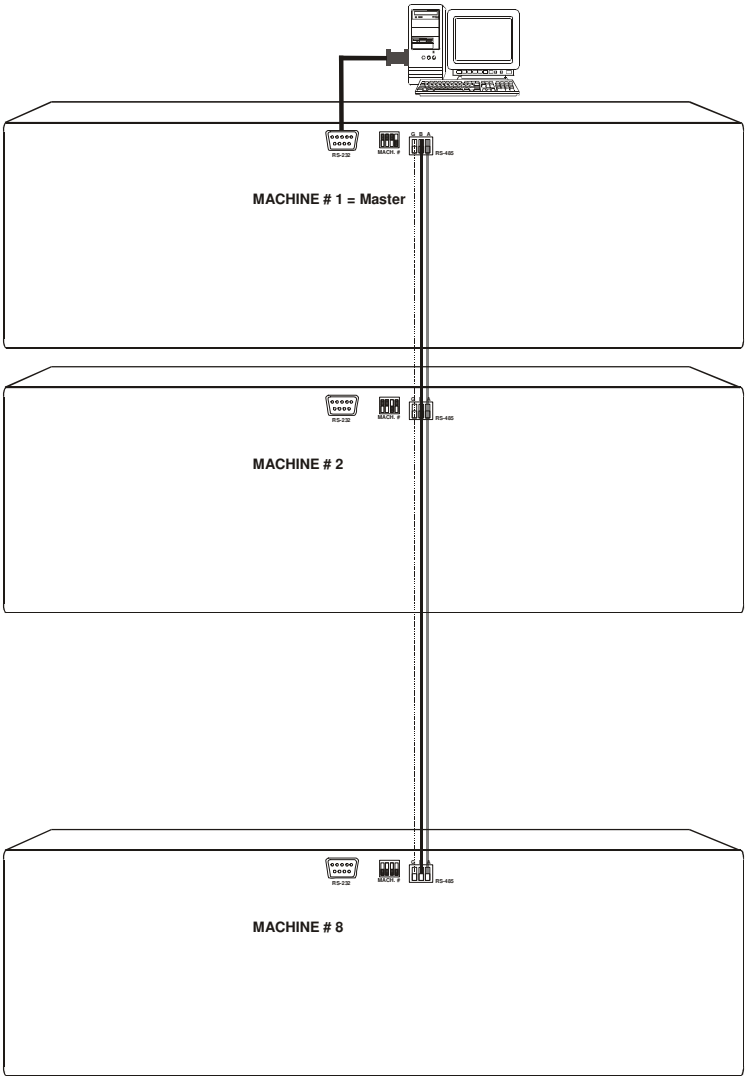


Figure 11: Control Configuration via RS-232 and RS-485

7.2 Control Configuration via RS-485

To control up to seven single **VP-1608** units via an RS-485 controller, for example, a Master Programmable Remote Control system, such as the Kramer **RC-3000**[1], or a PC (equipped with an RS-485 interface), as Figure 12 illustrates, do the following[2]:

1. Connect the video sources and acceptors, the appropriate audio sources and acceptors, and the power cord to each **VP-1608** unit.
2. On each **VP-1608** unit, set the MACHINE # dipswitches, as required. For example, set the first **VP-1608** unit to MACHINE # 2, the second **VP-1608** unit to MACHINE # 3, and so on - up to MACHINE # 8 for the seventh **VP-1608** unit (see section 6.4).
3. Terminate the RS-485 line on both the **RC-3000**[3] and on the last **VP-1608** unit (set DIP 4 to ON).
4. Connect the RS-485 ports on the **RC-3000** to the RS-485 ports on each of the **VP-1608** units, 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 ports of the **VP-1608** units
   - 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 ports of the **VP-1608** units
   - 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**)

1 Previously known as VS-3000

2 Switch OFF the power on each device before connecting it to your VP-1608. After connecting your VP-1608, switch on its power and then switch on the power on each device

3 Refer to the RC-3000 user manual for details of how to terminate the RS-485 line

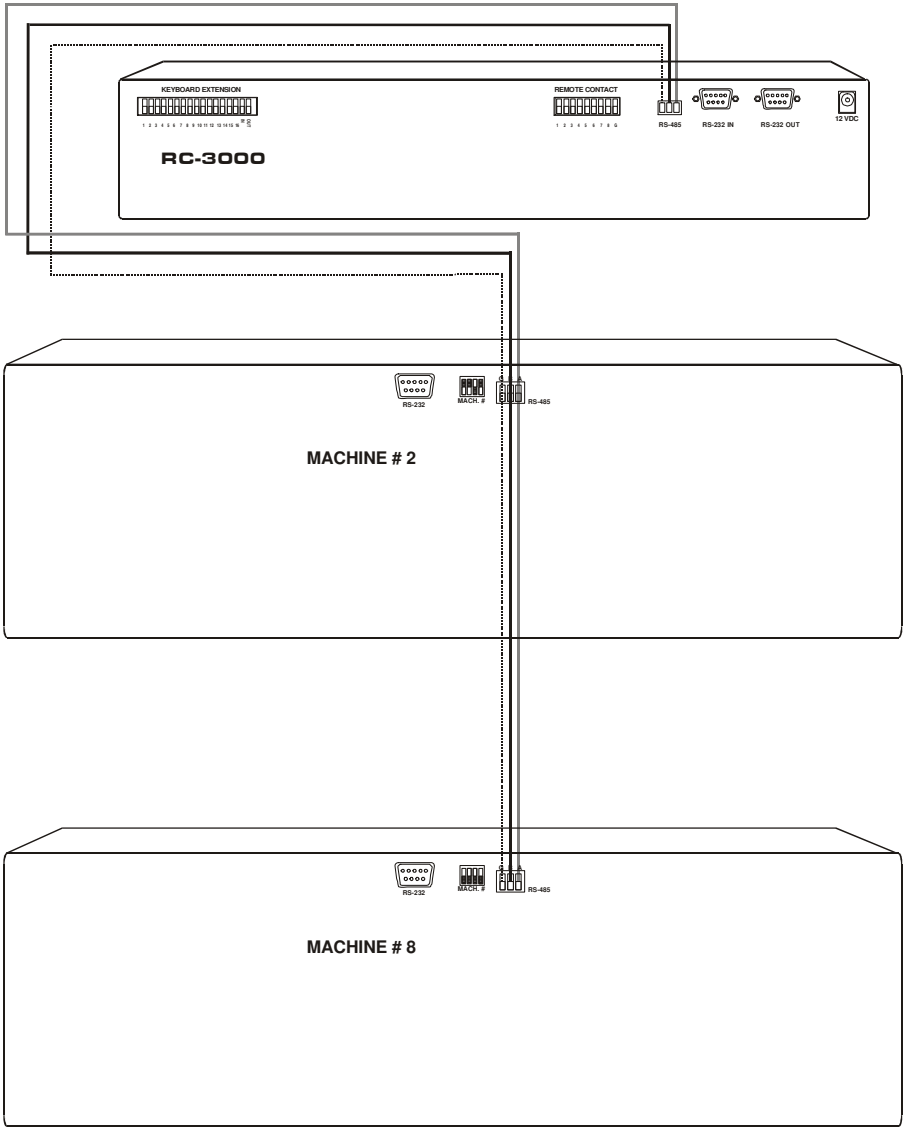


Figure 12: Control Configuration via RS-485

8 Operating Your VP-1608 16x8 RGBHV / Balanced Audio Matrix

Operate your **VP-1608** via:

- The front panel buttons
- RS-232 / RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- The Kramer **RC-IR1**[1] Infra-Red Remote Control Transmitter

8.1 Choosing the Audio-Follow-Video or Breakaway Option

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

- Audio-follow-video (AFV), in which all operations relate to both the video and the audio channels; or
- Breakaway, in which video and audio channels switch independently

8.1.1 Setting the Audio-Follow-Video Option

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

- If the AUDIO and VIDEO configurations are the same, then the AFV button illuminates. The audio will follow the video
- If the AUDIO differs from the VIDEO, then the TAKE and the AUDIO buttons will flash. Also, the audio outputs in the INPUT STATUS 7-segment display, which will be changed, will flash[2]. Press the TAKE button to confirm the modification. The audio will follow the video

8.1.2 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, switching operations relate to Audio
- If the VIDEO button illuminates, switching operations relate to Video

1 Previously known as **IR-1 / IR-1-01**

2 Warning that you are about to modify the audio configuration for AFV operation

8.2 Switching OUT-IN Combinations

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

1. Press an OUTPUT SELECTOR button.
   The corresponding input number that is displayed in the *INPUT STATUS* 7-segment Display blinks.
2. Press an INPUT SELECTOR button.
   The selected input switches to the selected output.

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

8.3 Confirming Settings

Choose to work in the AT ONCE or the CONFIRM mode, as section 8.3.1 describes. When the **VP-1608** operates in the AT ONCE mode, pressing an OUT-IN combination implements the switch immediately. In the CONFIRM mode, the TAKE button must be pressed to authorize the switch.

In the AT ONCE mode, you save time as execution is immediate and actions require no user confirmation. However, no protection is offered against changing an action in error.

In the CONFIRM mode:

- You can key-in several actions and then confirm them by pressing the TAKE button, to simultaneously activate the multiple switches
- Every action requires user confirmation, to protect against erroneous switching
- Execution is delayed[1] until the user confirms the action

8.3.1 Toggling between the AT ONCE and CONFIRM Modes

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

1. Press the TAKE button to toggle from the AT ONCE mode[2] to the CONFIRM mode[3].
   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.

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

2 The TAKE button does not illuminate

3 The TAKE button illuminates

8.3.2 Confirming a Switching Action

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

1. Press an OUT-IN combination.
   The corresponding input number that is displayed in the *INPUT STATUS* 7-segment Display blinks. The TAKE button also blinks.
2. Press the blinking TAKE button to confirm the action.
   The corresponding input number that is displayed in the *INPUT STATUS* 7-segment Display no longer blinks. The TAKE button illuminates.

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

1. Press each OUT-IN combination in sequence.
   The corresponding input numbers that are displayed in the *INPUT STATUS* 7-segment Display blink. The TAKE button also blinks.
2. Press the blinking TAKE button to confirm all the actions.
   The corresponding input numbers that are displayed in the *INPUT STATUS* 7-segment Display no longer blink. The TAKE button illuminates.

8.4 Storing/Recalling Input/Output Configurations

You can store and recall up to 15 input/output configurations (or setups) in non-volatile memory, using the INPUT SELECTOR buttons 1 to 15. The 15 input/output configurations also include the relevant audio-follow-video / breakaway option definition, the video configurations, the audio configurations, the audio gain level for each of the 16 inputs, and the audio gain level for each of the eight outputs.

8.4.1 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 INPUT SELECTOR buttons from 1 to 15 (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.

8.4.2 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 SELECTOR button (the INPUT SELECTOR button # corresponding to the setup #). If in the CONFIRM mode, the setup will blink on the display and will only be implemented after pressing the TAKE button.
   The memory recalls the stored data from that reference.

To view the saved input/output configurations, set the **VP-1608** to the CONFIRM mode and manually scan all the input/output configurations[1].

8.4.3 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 SELECTOR button.
   This erases that specific input/output configuration from the memory, leaving it empty and available[2].

8.5 Adjusting the Audio Gain Control

You can adjust the gain control for each input and output signal using the latest[3] K-Router Windows®-based control software (provided). See the Tables of Hex Codes for Audio Input/Output Gain Control in section 12.

1 Press RCL followed by an INPUT SELECTOR button to display a configuration. To recall this configuration, press TAKE to select it. If not, repeat the above to display another configuration

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

3 Version 3.9 or higher

8.6 Locking and Unlocking the Front Panel

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock[1] your **VP-1608**. Unlocking releases the protection mechanism.

To lock the **VP-1608**:

- Press the LOCK button for more than two seconds
  The front panel is locked and the LOCK button blinks

To unlock the **VP-1608**:

- Press the LOCK button for more than two seconds
  The front panel unlocks and the LOCK button no longer blinks

8.7 Resetting the VP-1608 16x8 RGBHV / Balanced Audio Matrix

You can reset the **VP-1608** unit to the:

- Current status[2] (reloads the current setup[3])
- Factory default (resets to the pre-installed factory default state[4])

8.7.1 Resetting to the Current Status

You can reset the **VP-1608** unit to the current status (reloads the current setup)

To reset a **VP-1608** unit to the current status, do the following:

- Press INPUT buttons 1 and 5 simultaneously for 3 seconds
  The **VP-1608** unit resets to the current status, momentarily displaying[5] the unit characteristics, as section 5.1 describes

8.7.2 Resetting to the Factory Default State

You can reset the **VP-1608** unit to the factory default state.

To reset a **VP-1608** unit to the factory default state, do the following:

- Press OUTPUT buttons 1 and 5 simultaneously for 3 seconds
  The **VP-1608** unit resets to its factory default state, momentarily displaying[5] the unit characteristics, as section 5.1 describes

1 Nevertheless, even though the front panel is locked you can still operate via RS-232 or RS-485 serial (remote controller or PC), as well as via the Kramer RC-IR1 Infra-Red Remote Control Transmitter

2 Sometimes called a "soft reset"

3 Without having to switch the power off and on

4 Each VP-1608 unit ships in its factory default state that is a 16x8 RGBHV / Balanced Audio Matrix (in audio-follow-video mode), with all setups empty and each input connected to its corresponding output (for example, 1-to-1)

5 In addition, the unit characteristics also appear immediately (and automatically) after switching on the power

9 Flash Memory Upgrade

The **VP-1608** 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 9.1)
- Connecting the PC to the RS-232 port (see section 9.2)
- Upgrading Firmware (see section 9.3)

9.1 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 http://www.kramerelectronics.com and download the file: "*FLIP_VP1608.zip*" from the Technical Support section.
2. Extract the file: "*FLIP_VP1608.zip*" to a folder (for example, C:\Program Files\Kramer Flash).
3. Create a shortcut on your desktop to the file: "*FLIP.EXE*".

9.2 Connecting the PC to the RS-232 Port

Before installing the latest Kramer firmware version on a **VP-1608** unit, do the following:

1. Connect the *RS-232* DB9 rear panel port on the **VP-1608** 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 6.2).
2. Connect the power on the **VP-1608** unit and switch it ON.
3. Set the underside Flash Program switches (see Figure 13), as follows:
   - Set Flash Program switch 1 to **Program**
   - Set Flash Program switch 2 to **Reset**
   - Set Flash Program switch 2 to **Normal**

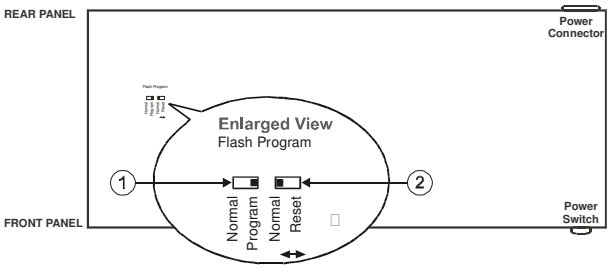


Figure 13: VP-1608 Underside Flash Program Switches Set for Upgrade

9.3 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:

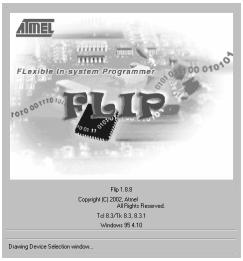


Figure 14: Splash Screen

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

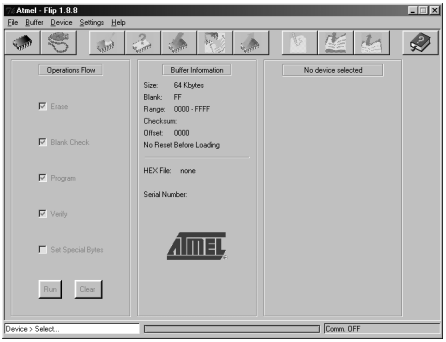


Figure 15: Atmel – Flip Window

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 16 Device Selection Window

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

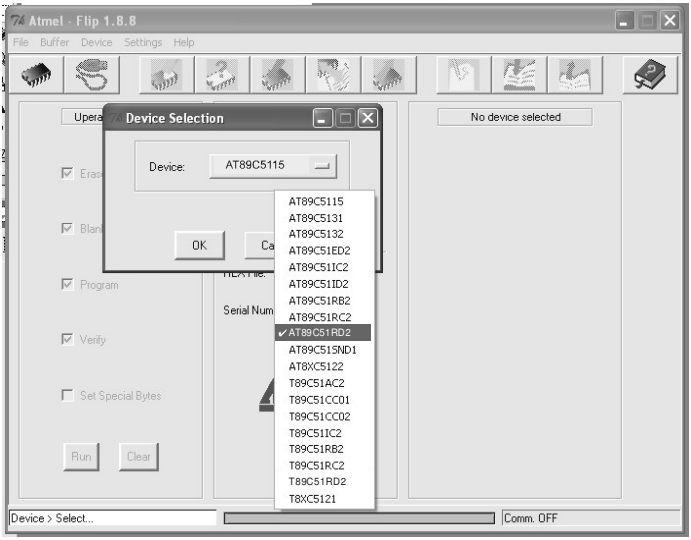


Figure 17: Device Selection Window

5. Click OK and select "Load Hex" from the File menu.

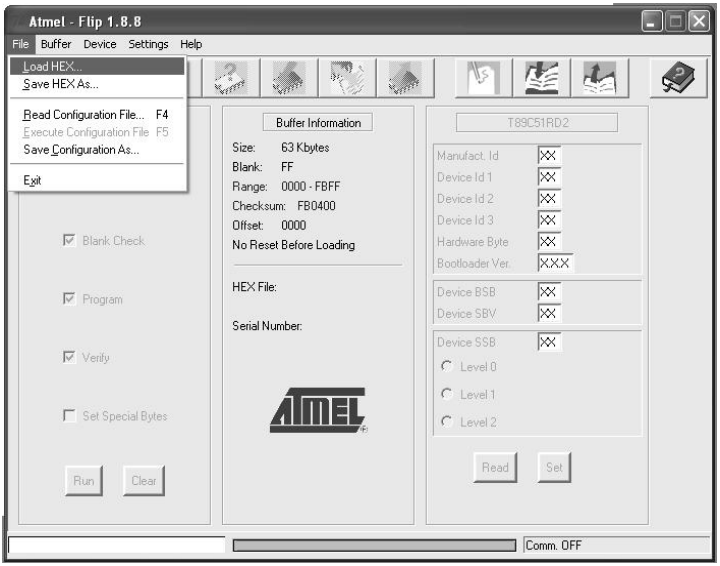


Figure 18: Loading the Hex

6. The Open File window opens. Select the correct HEX file that contains the updated version of the firmware for VP-1608 (for example 1608M_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:

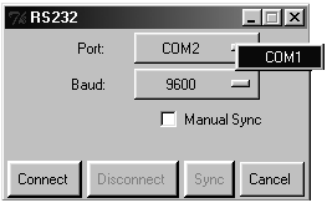


Figure 19: RS-232 Window

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: VP1608.hex" appears.

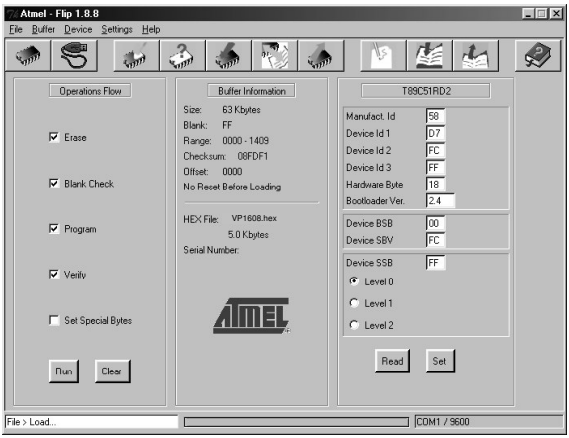


Figure 20: Atmel – Flip Window (Connected)

9. Click Run. After each stage of the operation is completed, the check-box for that stage becomes colored green[1].
   When the operation is completed, all 4 check-boxes will be colored green and the status bar message: Memory Verify Pass appears[2]:

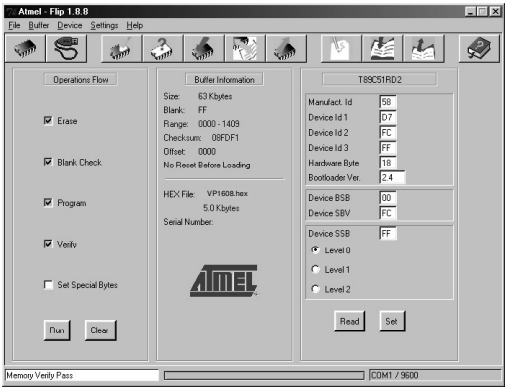


Figure 21: Atmel – Flip Window (Operation Completed)

10. Close the "Atmel – Flip" window.
11. Disconnect the power on the VP-1608.
12. Disconnect the RS-232 rear panel port on the VP-1608 unit from the Null-modem adapter.
13. Set both the underside switches: Flash Program switch 1 and Flash Program switch 2 (see Figure 3) to Normal.
14. Connect the power on the VP-1608.
    Upon initialization, the new VP-1608 software version shows in the INPUT STATUS 7-segment Display.

1 See also the blue progress indicator on the status bar

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

10 Technical Specifications

Table 6 includes the technical specifications:

Table 6: Technical Specifications[1] *of the VP-1608*

INPUTS:	16x3 video (RGB) 0.7Vpp/75Ω on BNC connectors 16x2 H&V, TTL level on BNC connectors 16 balanced audio stereo up to 14dBm/33kΩ on detachable terminal blocks	
OUTPUTS:	8x3 video (RGB) 0.7Vpp/75Ω on BNC connectors 8x2 H&V, TTL level/75Ω on BNC connectors 8 balanced audio stereo 19dBm/50Ω on detachable terminal blocks	
MAX. OUTPUT LEVEL:	VIDEO: 2Vpp	AUDIO: ±10Vpp (gain=1); ±20Vpp (total gain>2)
BANDWIDTH (-3dB):	VIDEO: 400MHz Fully Loaded	AUDIO: 30kHz
DIFF. GAIN:	0.06%	
DIFF. PHASE:	0.04%	
K-FACTOR:	0.01	
S/N RATIO:	VIDEO: 71.7dB	AUDIO: 74.5 dB unweighted (1Vpp)
CROSSTALK (all hostile):	VIDEO: < -62.5dB @ 5MHz	AUDIO: –71.4dB@1kHz
CONTROLS:	Front panel switches, RS-232, RS-485, IR remote control, Audio gain Inputs: –48dB to +10dB; Outputs: Mute, –46dB to +10dB via RS-232, RS 485, IR	
COUPLING:	VIDEO: DC	AUDIO: AC
AUDIO THD + NOISE:	0.028% (1kHz)	
AUDIO 2nd HARMONIC:	0.012%	
POWER SOURCE:	230 VAC, 50/60 Hz (115 VAC, USA)	
DIMENSIONS:	19 inch (W), 7 inch (D), 3U (H) rack mountable	
WEIGHT:	5.5 kg. (12.2 lbs.) approx.	
ACCESSORIES:	Power cord, Null modem adapter, Windows®-based control software	

11 Table of Hex Codes for Serial Communication

Table 7 lists the Hex values for a single machine (*MACHINE #* 1):

1 Specifications are subject to change without notice

Table 7: VP-1608 Hex Codes for Switching via RS-232/RS-485 in Breakaway Mode

	Switching Video Channels								Switching Audio Channels							
OUT	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
IN 1	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 6	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
	81	82	83	84	81	82	83	84	81	82	83	84	81	82	83	84
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 7	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 8	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 9	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 10	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 11	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B	8B
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 12	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C	8C
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 13	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D	8D
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 14	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E	8E
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 15	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F	8F
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
IN 16	01	01	01	01	01	01	01	01	02	02	02	02	02	02	02	02
	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
	81	82	83	84	85	86	87	88	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81

12 Tables of Hex Codes for Audio Input/Output Gain Control

Sections 12.1 and 12.2 contain the tables of hex codes for input and output signal gain control adjustment, respectively.

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

2A	86	80	81

Table 8 lists the Hex values for the audio gain control of the 16 inputs:

Table 8: VP-1608 Hex Codes for Audio Input Gain Control

		INPUTS																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ALL
Instruction # 22	Audio Level = 0	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22	Audio Level = 1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22	Audio Level = 10	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22	Audio Level = 127	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 63	Audio Level = 128	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F
		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 63	Audio Level = 216 (1:1)	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F
		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8	D8
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 63	Audio Level = 255 (3:1)	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F	3F
		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Instruction # 22		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	80
		FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81

12.2 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. The command sends once, and the "audio outputs gain adjustment" mode continues until instruction 42 changes to the "audio inputs gain adjustment" mode:

2A	87	80	81

Table 9 lists the Hex values for the audio gain control of the eight outputs:

Table 9: VP-1608 Hex Codes for Audio Output Gain Control

		OUTPUTS								
		1	2	3	4	5	6	7	8	ALL
Instruction # 22	Audio Level = 0 (Mute*)	16 81 80 81	16 82 80 81	16 83 80 81	16 84 80 81	16 85 80 81	16 86 80 81	16 87 80 81	16 88 80 81	16 80 80 81
Instruction # 22	Audio Level = 1	16 81 81 81	16 82 81 81	16 83 81 81	16 84 81 81	16 85 81 81	16 86 81 81	16 87 81 81	16 88 81 81	16 80 81 81
Instruction # 22	Audio Level = 10	16 81 8A 81	16 82 8A 81	16 83 8A 81	16 84 8A 81	16 85 8A 81	16 86 8A 81	16 87 8A 81	16 88 8A 81	16 80 8A 81
Instruction # 22	Audio Level = 127	16 81 FF 81	16 82 FF 81	16 83 FF 81	16 84 FF 81	16 85 FF 81	16 86 FF 81	16 87 FF 81	16 88 FF 81	16 80 FF 81
Instruction # 63	Audio Level = 128	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81
Instruction # 22		16 81 80 81	16 82 80 81	16 83 80 81	16 84 80 81	16 85 80 81	16 86 80 81	16 87 80 81	16 88 80 81	16 80 80 81
Instruction # 63	Audio Level = 216 (1:1)	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81
Instruction # 22		16 81 D8 81	16 82 D8 81	16 83 D8 81	16 84 D8 81	16 85 D8 81	16 86 D8 81	16 87 D8 81	16 88 D8 81	16 80 D8 81
Instruction # 63	Audio Level = 255 (3:1)	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81	3F 80 81 81
Instruction # 22		16 81 FF 81	16 82 FF 81	16 83 FF 81	16 84 FF 81	16 85 FF 81	16 86 FF 81	16 87 FF 81	16 88 FF 81	16 80 FF 81

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

13 Kramer Protocol 2000

The **VP-1608** 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 10: Protocol Definitions

MSB							LSB
	DESTINATION	**INSTRUCTION**					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0
1st byte							
	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0
2nd byte							
	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0
3rd byte							
			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0
4th byte							

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (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 (i.e. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
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 11: Instruction Codes for Protocol 2000

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

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET VIDEO	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2, 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	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3, 15
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is 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 as output # (for OUTPUT byte = 7), or set = 0	0 - No VIS (immediate) 1 - Input # 1 2 - External digital sync 3 - External analog sync 4 - Dynamic sync 5 - Inter-machine sync 6 - Input # (INPUT byte) 7 - Output # (INPUT byte) 8 - User-defined sync 64 - Set for delayed switch 65 - Execute delayed switch 66 - Cancel delayed switch setting	2, 5, 17
8	BREAKAWAY SETTING	0	0 - audio-follow-video 1 - audio breakaway	2
		1	0 - FOLLOW mode 1 - Normal mode	15
9	VIDEO / AUDIO TYPE SETTING	0 - for video	0 - CV 4 - SDI 1 - YC 5 - CV+YC 2 - YUV 6 - VGA scaler 3 - RGBS	2
		1 - for audio	O0=0 – Unbalanced audio O0=1 – Balanced audio O1=0 – Digital audio O1=1 – Analog audio O4=0, O3=0, O2=0-Mono O4=0, O3=0, O2=1-Stereo	
		2 - for VGA	1 - 640X480 2 - 800X600 3 - 1024X768	
10	REQUEST VIS SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - VIS source 1 - Input # or output # of source 2 - Vertical sync freq (Hz)	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 2 - for VGA	3, 4, 6
13	SET HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	Set equal to highest machine address	2
14	REQUEST HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	0	4
15	REQUEST WHETHER SETUP IS DEFINED	Set as SETUP #	0	8
16	ERROR / BUSY	0	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy	9
17	RESERVED	- - - -	- - - -	10

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
18	RESET AUDIO	0	0	1
19	STORE AUDIO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3
20	RECALL AUDIO STATUS	Set as SETUP #	0	2, 3
21	SET VIDEO PARAMETER	Equal to input / output number whose video parameter is to be set (0 = all)	Set as parameter value	2, 11, 23
22	SET AUDIO PARAMETER	Equal to input / output number whose gain is to be set (0 = all)	Set as parameter value	2, 11, 23
23	INCREASE / DECREASE VIDEO PARAMETER	Equal to input / output number whose video parameter is to be increased / decreased (0 = all)	0 - increase video gain 1 - decrease video gain 2 - increase contrast 3 - decrease contrast 4 - increase brightness 5 - decrease brightness 6 - increase color 7 - decrease color 8 - increase hue 9 - decrease hue 16 - increase H-phase 17 - decrease H-phase 18 - increase V-position 19 - decrease V-position	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 2 - increase left output 3 - decrease left output 4 - increase right output 5 - decrease right output 6 - increase input 7 - decrease input 8 - increase left input 9 - decrease left input 10 - increase right input 11 - decrease right input	23
25	REQUEST AUDIO PARAMETER	Equal to input / output number whose parameter is requested	0	6, 23
26	REQUEST VIDEO PARAMETER	Equal to input / output number whose video 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
32	RESERVED	- - - -	- - - -	10
33	RESERVED	- - - -	- - - -	10
34	RESERVED	- - - -	- - - -	10
35	RESERVED	- - - -	- - - -	10
40	DIRECT MEMORY SAVE	Memory address	Data	20
42	AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25	INPUT Bit: I0 - 0=input; 1=output I1 - Left I2 - Right	0 - Gain 1 - Bass 2 - Treble 3 - Midrange	23
43	VIDEO PARAMETER SETTINGS FOR INSTRUCTIONS 21, 23, 26	1 – Input 2 – Output	0 - video gain 1 - contrast 2 - brightness 3 - color 4 - hue 4 - H-phase 5 - V-position	23
56	CHANGE TO ASCII	0	0	18
57	SET AUTO-SAVE	I3 - no save I4 - auto-save	0	12, 2
58	EXECUTE LOADED DATA	Set as 0, or as SETUP #	1-Take 2-Cancel	21, 3
59	LOAD VIDEO DATA	Set equal to video input (0 = disconnect) (127 = load SETUP #)	Set equal to video output (0 = to all the outputs) or SETUP #	21, 22

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
60	LOAD AUDIO DATA	Set equal to audio input (0 = disconnect) (127 = load SETUP #)	Set equal to audio output (0 = to all the outputs) or SETUP #	21, 22
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version 5 - RS422 controller name 6 - RS422 controller version 7 - remote control name 8 - remote software version 9 - Protocol 2000 revision	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 3 - Request third suffix 10 - Request first prefix 11 - Request second prefix 12 - Request third 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 4 - for remote panel 5 - for RS-422 controller	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 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.

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

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

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

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

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

HOW YOU CAN GET WARRANTY SERVICE

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

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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.

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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.

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