VP-23

Presentation Switcher

Introduction

The Kramer **VP-23** is a high quality Presentation Switcher designed for a wide variety of presentation and multimedia applications. It combines the functions of a 4x1 switcher for composite video and audio, a 4x1 switcher for s-Video and audio, and a 4x1 switcher for VGA-type signals with audio, all into a single high performance unit. The **VP-23** is designed to become a one-box solution for systems, which would otherwise require several separate products. Each section can be controlled independently from the others. The **VP-23** can be controlled by front panel buttons or by RS-232 serial commands transmitted by a touch screen system, personal computer, or other serial controller.

The **VP-23** has an additional audio switching section which routes one of the pre-selected audio inputs from the other switching sections to a separate output. This switching section can insert an additional microphone channel - either by switching, mixing or talk-over. Front-panel controls allow adjustment of VGA/XGA output level and EQ, Master audio output level and Microphone level.

Handling Graphics signals

A computer generated graphics signal is usually comprised of 5 signals: Red, Green, Blue – which are analog level signals and two TTL (logic) level signals – Horizontal Sync and Vertical Sync signals. (Digital graphics cards and monitors use a different signal format, and will not be discussed here, as they are not relevant to the DA.)

Computer graphics resolution is measured in pixels and signal bandwidth. The more pixels (picture elements) on the screen, the more the image is detailed.

VGA, S-VGA, XGA, S-XGA and U-XGA are terms describing the graphics resolution and the color depth. Color depth represents the maximum number of simultaneously displayed colors on the screen and is measured in bits. 24 and 32-36 bits of color depth represent millions to billions of color shades available on the screen at any given moment.

It should be born in mind though that the human eye can resolve only a few thousands colors! The more the image is detailed (higher resolution) and higher the color depth the more real the image will look.

The standard VGA highest resolution was 640x480 pixels with 4 bits of color (16 colors). The VGA standard was able to use more colors (256) but at a lower resolution- around 320x200 pixels, which was very crude.

Common resolutions used nowadays for computer graphics vary between 1024x768 up to 2000x1600 pixels with "high color" – 16 bits of color, representing 64,000 different colors, up to "true color" – 24 bits or more, representing from 16.7 million colors up to several billion.

Displaying such a detailed and colorful image on the screen needs enormous graphics memory per frame, as well as very high speeds for "writing" so many pixels on the screen in real time.

The amplifiers that carry those signals should be able to handle those speeds and hence signal bandwidth. The standard VGA at 640x480 resolution needed amplifiers with 20-30 MHz bandwidth.

At 1600x1200 or even at 1280x1024 (S-XGA), those amplifiers will completely fail.

In order to faithfully amplify and transmit modern high-resolution graphics, amplifiers with bandwidths of 300 MHz and more are needed.

Those amplifiers, besides the enormous bandwidth they should handle, need to be linear, to have very low distortion and be stable. Stability of an amplifier is its ability to avoid bursting into

uncontrolled oscillation, which is in adverse relationship to the speed it can handle.

The tendency to oscillate is further enhanced by the load impedance. The load impedance of a system is usually not just a resistor. A cable connected to an amplifier (leading to the receiver or monitor) may present a capacitive and/or an inductive load to the amplifier.

This is the main cause for instability. The non-ideal behavior of a load or cable may severely degrade the performance of the amplifier – it's bandwidth, linearity, and stability - and in general, it's ability to faithfully reproduce the signal.

The cables affect image resolution. Longer cables, due to non-ideal characteristics, cause high frequency deterioration and hence image "smear" and loss of resolution. In computer graphics especially, this adverse effect is very much accentuated.

The amplifiers should cope then with an additional task - compensating for cable losses up to the maximum useful operation distance. High-resolution graphics systems must use very high quality cables for image transmission. The cables should be shielded – to eliminate externally induced interference but the shield might increase the capacitance of the cable, and therefore, cause deterioration in the image's resolution and clarity. The standard cables can only be a few meters long. For longer distances, the compound cable is broken into five individual coax cables, which are bulky and cumbersome for use. Even so, the distance is limited to several tens of meters.

The non-ideal behavior of a cable may create other problems resulting from the failure to accurately match the system's required impedance. The result of this, especially at high frequencies, is "shadows" or "ghosts" on the image, resulting from standing waves and electronic reflections running back and forth between transmitter and receiver.

Another aspect to consider is the sync. As those signals are logic signals, which are not treated as analog signals, the receiver does not terminate the line, and therefore the line is not matched. A host of problems might occur when the signals are sent over long, unterminated, unmatched cables.

The result might be image breakdown or distortion due to improper sync information. The amplifier that drives the analog section of the graphics data should also be able to buffer, recover and send the sync information in such a way that it would be received properly at the receiver end.

Preparation:

- Verify that all the devices to be interconnected – the **VP-23**, the video sources, the PCs etc. are turned OFF.
- Connect all Composite / YC video / VGA/XGA sources and acceptors to the rear panel of the **VP-23**. Pay proper attention to the quality of your cables.
- Connect all appropriate audio sources and acceptors to the sockets on the rear panel of the machine.
- Connect a microphone to the rear panel socket via the 6.5mm connector. Select with the rear panel switch adjacent to the microphone connector if you use a condenser (CON) or dynamic microphone (DYN).
- Connect, if necessary, the RS-232 socket on the rear panel of the VP-23 to the Null-modem adapter, which was provided with the machine, and connect the adapter with a 9 wire flat cable to the available RS-232 port on your PC.
- Adjust the dip-switch on the back panel of the machine according to the table 1.
- Connect, if necessary, the Master Audio output sockets to the acceptor.
- Verify that the VGA level, Audio level and Mic level control knobs on the front panel is at their mid position.
- Choose if you want microphone talk over (when the microphone is used it fades out all the other audio channels.) When the front control button is pressed in this function is activated.

- ❖ Install in the controlling PC, if necessary, the provided K-Switch software. Follow the instructions in the software manual.
- ❖ Plug-in the power cord.
- ❖ Turn on the Switcher and all other sources and acceptors. The lamp within the power switch will become lit.

Operation:

- ⌦ Select the appropriate video / s-Video and VGA/XGA source by touching the relevant front panel switch. The audio channel of the selected vide/VGA sources will be selected as well.
- ⌦ Select the necessary master audio output by touching the relevant switch on the front panel in the Master Audio Selector section. The switch will become lit.
- ⌦ If you choose CV for example in the master audio selector section, the audio channel of the previously selected CV source (in the Video-Audio Selector section) will be routed to the Master Audio out sockets as well as to the Audio (composite video) output socket.
- ⌦ If you chose microphone talk-over, then whenever you talk to the microphone, your voice will be heard, fading out the selected audio channel. The talk-over function is not active when Mic is selected in the Master audio selector.
- ⌦ The overall audio output level at the Master Audio output socket may be controlled with the front panel Audio Level control knob. This knob is affecting only the Mater Audio output, and not the other audio outputs.
- ⌦ The Mic level control has two functions - adjusting microphone levels at the Master Audio outputs, and adjusting the threshold of the talk-over function. The best results for the Master Audio outputs when the microphone is used may be achieved after some experimentation with the Audio Level and the Mic level controls.
- ⌦ If the VGA/XGA image is dim or lacking details due to long cables used, it maybe adjusted using the VGA level control knob. This control allows to change (increase or decrease) the VGA/XGA Red, Green and Blue levels as well as some cable equalization control. The cable equalization is automatically adjusted alongside with the level control adjustment.
- ⌦ If long cables need to be used, then the use of line amplifiers is needed. Line amplifiers such as the Kramer **VM-9S** or the **104L** may be used for Composite video, **VM-9YC** or **103YC** may be used for Y/C (s-Video) and **VP-2xl** or **VP-22** may be used for VGA/XGA cables.

Communication Protocol for the VP-23

(VER-1.0)

Communication with the **VP-23** uses four bytes of information as defined below. Data is transferred at 9600 baud with no parity, 8 data bits and 1 stop bit.

1st byte

	Destination	**INSTRUCTION**					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0
MSB							LSB

2nd byte

				INPUT			
1	0	0	0	0	I2	I1	I0
7	6	5	4	3	2	1	0

3rd byte

						OUTPUT	
1	0	0	0	0	0	O1	O0
7	6	5	4	3	2	1	0

4th byte

				Machine Number			
1	0	0	0	M3	M2	M1	M0
7	6	5	4	3	2	1	0

1st BYTE: Bit 7 – Defined as 0.

D – "DESTINATION BIT".
This bit is always low, when sending from the PC to the switchers, and high for information sent to the PC.
N5…N0 – "INSTRUCTION".
The function that is to be performed by the switcher(s) is defined by this 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.
Bits 3 – 6 - Defined as 0.
I2… I0 – "INPUT".
For disconnect, set as 0. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – defined as 1.
Bits 2-6 defined as 0.
O1, O0 – "OUTPUT"

For operations these bits are defined according to the table.
4th BYTE: Bit 7 – Defined as 1.
Bits 3-6 Defined as 0.
M3… M0 – "MACHINE NUMBER".
MACHINE NUMBER = (DIPSWITCH CODE) + 1.

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET MACHINE	0	0	1
1	SWITCH GROUPS	1-4 Set equal to video and audio inputs to be switched for the relative group	1-3 Set equal to group which output to be switched	2
2	SWITCH AUDIO OUTPUTS	1-4 * Set equal to audio output to be switched to Master Audio out.	1	2
5	REQUEST GROUP STATUS	0	1-3 Set equal to the group of which status is required.	3
6	REQUEST STATUS OF MASTER AUDIO OUTPUT	0	1	3
16	ERROR/BUSY	Don't care	Don't care	4
18	RESET MACHINE	0	0	1
57	SET AUTO SAVE	1 – autosave 2 – no save	Don't care	5
61	IDENTIFY MACHINE	1 or 2 – machine name 3 or 4 – program version	Don't care	6

* #4 – for microphone.

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

0000 0001 Instruction "Switch Groups"
1000 0010 Input #2
1000 0001 in composite video group
1000 0001 Machine #1 (master)

Was sent from the PC, then the switcher (machine #1) will switch input 2 in composite video group to its output. If the user switched input 4 in the VGA group via the front panel keypad, then the switcher will send:
0100 0001
1000 0100
1000 0011
1000 0001 to the PC.

When the PC sends instruction #1 or #2 to the switcher, then, if the instruction is valid, the switcher replies by sending the same four bytes to the PC that were sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 – To reply to a "REQUEST" instruction is as follows: the same instruction and input codes as were sent are returned, and the OUTPUT is assigned to the value of the requested parameter. The reply to the instruction #5 (what is the status of the VGA group?):

0000 0101
1000 0000
1000 0011
1000 0001

Would be:

0100 0101
1000 0000
1000 0100
1000 0001

NOTE 4 – An error code is returned to the PC if an invalid code was sent to the switcher (for example, when trying to switch an input or a group which is 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 will not be valid.

NOTE 5 – Under normal conditions, the machine's present status is saved each time a change is made. The power-down save (the auto save) may be disabled using this code. Note that each time that the machine is turned ON, the auto save function is automatically set.

NOTE 6 – This is a request to identify the switchers in a system. If the INPUT is set as 1 or 2, the machine will send its name. The reply is the decimal value of the INPUT and the OUTPUT. For example, the reply to the request to send the machine's name (for machine #001) will be:

0111 1101
1000 0000 (i.e. 128+0)
1001 0111 (i.e. 128+23)
1000 0001

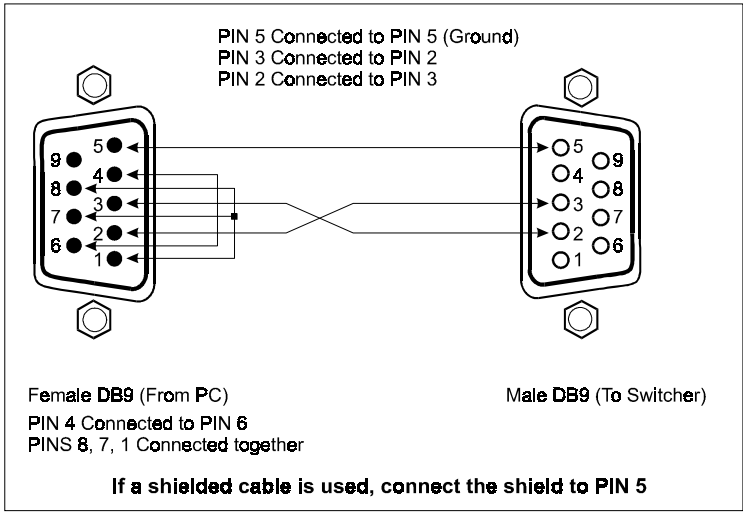
If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT – the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number following the decimal point. For example, for version 3.5 the reply will be:

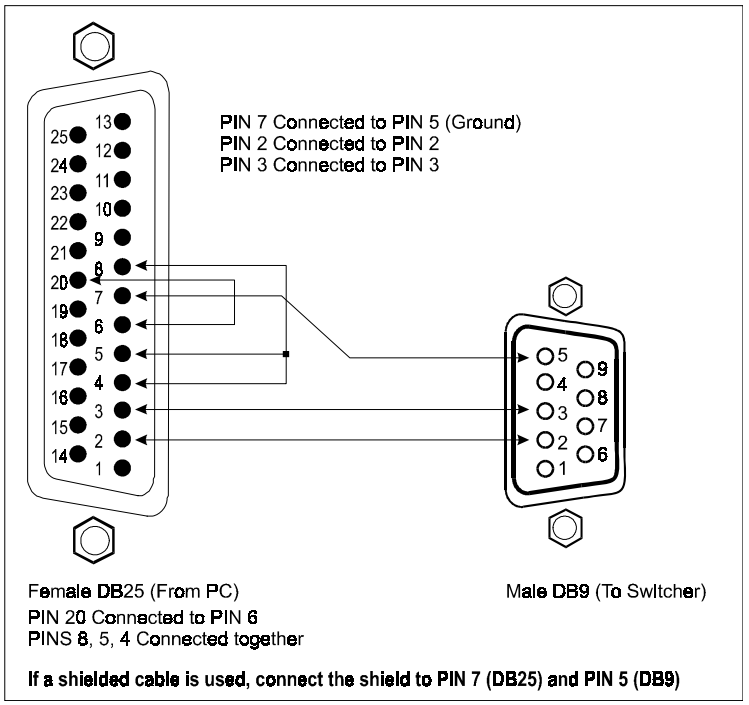
0111 1101
1000 0011 (i.e. 128+3)
1000 0101 (i.e. 128+5)
1000 0001.

Dip Switch settings:

Machine Number	SELF ADDRESS				DIP SWITCH			
	3	2	1	0	3	2	1	0
1 (master)	0	0	0	0	ON	ON	ON	ON
2	0	0	0	1	ON	ON	ON	OFF
3	0	0	1	0	ON	ON	OFF	ON
4	0	0	1	1	ON	ON	OFF	OFF
5	0	1	0	0	ON	OFF	ON	ON
6	0	1	0	1	ON	OFF	ON	OFF
7	0	1	1	0	ON	OFF	OFF	ON
8	0	1	1	1	ON	OFF	OFF	OFF
9	1	0	0	0	OFF	ON	ON	ON
10	1	0	0	1	OFF	ON	ON	OFF
11	1	0	1	0	OFF	ON	OFF	ON
12	1	0	1	1	OFF	ON	OFF	OFF
13	1	1	0	0	OFF	OFF	ON	ON
14	1	1	0	1	OFF	OFF	ON	OFF
15	1	1	1	0	OFF	OFF	OFF	ON
16	1	1	1	1	OFF	OFF	OFF	OFF

RS-232 Null Modem Connection





Technical Specifications:

INPUTS: 4 VGA/XGA on HD-15F connectors, 4 s-Video, 1Vpp (Y), 0.3Vpp (C) / 75 Ω on 4P connectors, 4 Composite Video 1Vpp / 75 Ω on BNCs. Each input is accompanied by the appropriate stereo-audio channels: +4dBm / 50 kΩ on RCAs .Mic: 3 mV/ 10 kΩ condenser/dynamic.

OUTPUTS: 1 x VGA/XGA, 1 s-Video - 1Vpp (Y), 0.3Vpp (C) / 75 Ω on a 4P connector, 1 Composite Video 1Vpp / 75 Ω on a BNCs. Each output is accompanied by the appropriate stereo-audio channel: +4dBm / 150 Ω 1 Master audio +4dBm / 150 Ω̃

BANDWIDTH: XGA/VGA: 315 MHz; s-Video (Y): 260 MHz; Composite Video: 470 MHz; Audio: 40kHz.

DIFF GAIN: <0.07 % all channels.

DIFF PHASE: <0.05 Deg. all channels.

S/N RATIO: Video: 75 dB all channels; Audio: 75 dB / 1Vpp, all channels.

CONTROLS: 16 selector switches; VGA/XGA level: 4 dB; Audio: 6 dB, Mic: up to 49 dB.

MAX OUTPUT: Video: 2.1 Vpp; Audio: 27 Vpp.

DIMENSIONS: 19-inch (W) x 7-inch(D) x 2U(H), rack mountable

POWER: 230 VAC, 50/60 Hz, (115 VAC, U.S.A.) 16 VA.

WEIGHT: 3.6 Kg. (8 Lbs.) Approx.

ACCESSORIES: Power Cord, PC control software.

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VP-23
INSTRUCTION MANUAL