



KRAMER
Electronics

MATRIX ROUTING SWITCHER

K R A M E R E L E C T R O N I C S , L T D

ROUTING SWITCHERS

T A I L O R M A D E

AUDIO

VIDEO

RGBHV

HIGH DEFINITION





KRAMER *Electronics*

MATRIX ROUTING SWITCHER

Kramer Routing Switchers

For 20 years, **KRAMER ELECTRONICS** has been developing, manufacturing and selling audio-video routing switchers. You will find them all over the world: in convention centers, conference rooms, recreation centers, universities, hospitals, national libraries, railway stations, underground stations, theatres, airplanes, ships, yachts, hotels, ministries, military bases, etc.

Kramer switchers continuously benefit from the latest technological upgrades: they are designed to function in any multimedia environment where they are installed.

These are the features that make **KRAMER ROUTING SWITCHERS** the ideal choice:

Tailor made...

1. **Capacity of your choice:** any number of inputs and outputs (fully modular).
2. **Format combination of your choice:** Video, Audio (mono/stereo, balanced/unbalanced), YC, RGB, YUV, RGBHV.
3. **Remote control of your choice:** RS-232/422, PC software, remote touch panel with alphanumeric display.
4. **Particularly interesting optional features:** Vertical Interval switching module, Infra Red control module, sync and color bar generator module, video signal detection and RS-232 signal generation module, audio level control through VCA, text generator module, ...

...But at affordable prices



Video, S-Video, RGBHV Modules

RS 232/422 Control Card

Audio Inputs (Mono)Stereo (un)balanced Card

Audio Outputs (Mono)Stereo (un)balanced Card

Rear view

Description

Metal housing, 19", 3,6,9 or 12 U, equipped with power supply and motherboard to receive the following modules:

1. **Video:** Composite, s-Video, Component YUV, RGB, RGBHV in one block of up to 80 inputs and up to 80 outputs on BNC 's.
2. **Audio:** mono or stereo, balanced or unbalanced, up to 100 inputs and up to 100 outputs on detachable terminal blocks. These modules can be equipped with a VCA (Voltage Control Amplifier) for output level control (option).
3. **Remote control RS 232/422**

The switchers are operated by RS232 or RS422 serial connection only. Each cross-point, whether video, audio, or VCA, has a unique address that can be controlled via a PC or remote touch panel through the RS232/422 connection. The status of the switcher appears on the display.



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1 HARDWARE

1.1 GENERALITIES

The Kramer matrix switchers are used to select and dispatch electric signals, as audio, vidéo and RGB, to several destination simultaneously. The impedances of each machine which is connected on the matrix are well respected, even if a signal goes to two outputs and more. As a matter of fact, a signal under 75 Ohms can't be delivered on several loads without any amplification dispositive.

In fact, each output is able to select one, and only one, input. We can consider the matrix routing switcher as an assembly of several selectors which are adjacents and connected on common inputs. Each selector is fully independent, and individually controlled. When two selectors, or more, request the same source, this last is then distributed. So, it have to be buffered to avoid losses of electric level and reduce of bandwidth. The number of selectors depends of the power and the quality of the buffers.

1.2 RACK DISPOSITION

The cards are housed in a 19 inches rack, with 360 mm depth, and a height which is multiple of 3RU, according to the number and the dimensions of each section.

Many section, as audio, video, RGB, YC, or YUV, can be inserted in the same rack.

The control of the switching and the others commands is provided by an interface RS232/422, via an internal bus.

The routing switcher don't make use of a keyboard in front panel. The access of this keyboard should not be easy, or impossible, when the matrix is at the heart of the audio and video lines, to have the shortest length.

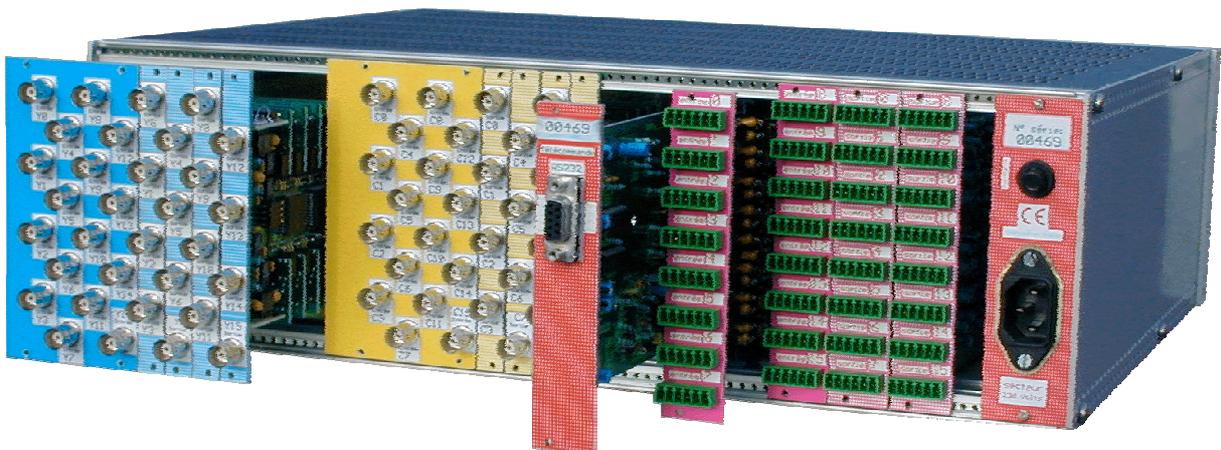
A supervisor, a computer or a remote control panel must necessarily control the matrix by the RS232 and RS422 connectors.

Several LED lights on the front panel shows the receipt of the RS232/422 datas, the kind and the result of the actions.

An electric power supply provides four various tensions the the cards of the machine.

The cards are introduced by the rear panel and support the audio and video plugs.

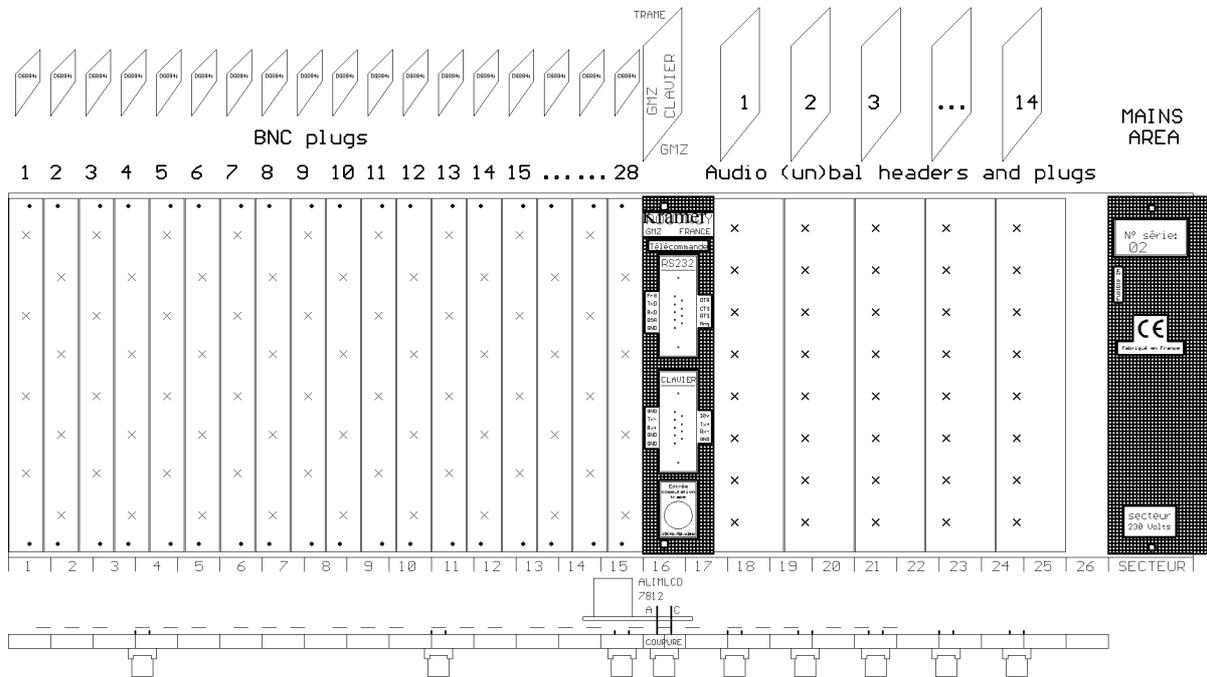
These are BNC for composite video, components, YC and RGB. For the audio, (balanced or unbalanced), the plugs are terminal blocks 6 points detachable.



Rear view.



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1.3 CREATING A MATRIX

The rear panel of the rack is 84 E wide, on 3RU high. (E=5,08 mm). The mains, RS232 and RS422 plugs 12 E. So, the useful area for the audio, vidéo et RGB is 72 E.

The BNC are shared by four, on vertical bands which are 2,5 E wide, on 3RU.

We can house up to 28 vertical bands in this area, i.e. 112 BNC plugs. So, we can realize a 56x56 video matrix, or a 48 X 64, 40 X 72, or 16 X 96 ...

When more, the rack has to be 6RU high. Then the total number of plugs rise to 224, and permits important dimensions. With a 9 RU rack, the number is 336, etc.

The stereo audio plugs are shared by eight, on 5 E bands with 3RU. We can house 14 bands, i.e. 112 stereo audio plugs. For example, we can realize a stereo balanced 56 X 56, etc.

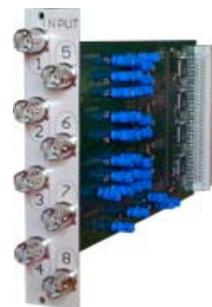
In YC mode, the capacity is divided by two; in component mode, by three; in RGBHV mode, by five.

1.4 VIDEO SECTION

The video section in an area with cards including the input and outputs plugs, the buffers, the switchers, the outputs 75 Ohms amplifiers, and the controllers. The input cards (called BME), and the

output cards (called BMS), own a 41612 DIN connector to get the power supply and the service signals by the internal rail.

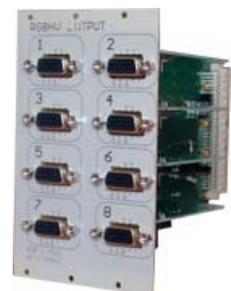
Each card has 8 BNC connectors for in or out.



1.5 RGBHV SECTION

RGBHV architecture is the same as the video section: Each card can support the R, G, B, H or V, and is simultaneously controlled.

The input and output impedances is a 75 Ohms on BNC or HD15, and the bandwidth is 325 MHz minimum.



1.6 AUDIO SECTION

The architecture of the audio path is different. There is no module as for the video, but traditional cards, directly connected on the internal bus. On



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this bus transit the stereo audio signals, and also the power distribution and the service signals.

The cards are normalized at Euro 100x220 mm, and can be extracted by the rear panel. Each card own up to eight stereo plugs. There is two types of audio cards :

- Input audio cards.

Called WME, these cards are identicals between themselves. The only differences are the serigraphy of the panel and its position in the slots.

When viewing from the rear panel, these cards are immediately slotted on the right of the WMZ card (RS232 receipt). Their eight audio plugs can be set up in factory, as balanced or unbalanced, or mixed.

Balanced mode has a +4dB level under 6 Kohms impedance., and the unbalanced mode, -6dB under 10 Kohms. Dynamic is 12 dB. The inputs are directly introduced into the integrated circuits, and have no galvanic isolation.

- Output audio cards.

Called WMS, these cards are physically identical between themselves, but have to be programmed for identification. Their position is immediately on the right of the input cards. Their eight audio plugs have no galvanic isolation. The output impedance is 50 Ohms. We can use the output in balanced mode, as in unbalanced only without connecting the inverted pin. (Do not connect this pin to the ground).

Up to 8 VCA (Voltage Control Amplificators) can be wired in factory. So the audio level can be adjusted with a special RS 232 command.



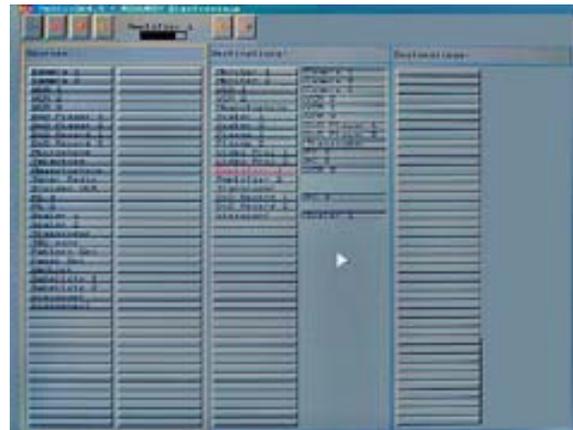
1.7 OTHERS SECTIONS

YC (S-vidéo), component YUV, and RGsB can be realized with the analog vidéo cards, with the same principle as RGBhv section.

1.8 RS232 RECEPTION

The card called GMOsd is the heart of the KRAMER matrix routing switcher. This card own a clock generator, a microcontroller, and provides the service signal to the others cards of the machine. The reception and the treatment of the RS232 and RS422 is made inside and the datas are then transferred to the concerned switchers.

As there is no keyboard on the front panel of the matrix, the GMOsd card take on the dialog with the external keyboard by the RS422 link.



1.9 INTERVAL SWITCHING

Switching during the black interval is basic to get a clean change of picture, without break of the synchronization, and cut in the middle of the screens.

The RS232/RS422 BOARD can be provided with a BNC connector intended to receive a video composite signal that will act as a reference frame for the switching of the set of video matrices.

When the reference signal is present (blackburst), the switching takes place in the beginning of the video frame, that is to say in the middle of the line N°2 or 314 in PAL/SECAM (N°2 or 264 in NTSC). The maximum waiting time is of 20 mS in PAL and 16,7 mS in NTSC. This operation can be effective only when the sources are synchronized with the blackburst. If this condition is not perform, then the switch is made normally out of the interval time.



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2 COMMUNICATION PROTOCOL “MX06”

INCLUDING OPTIONS (02/09/2005 VER-5.06)

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.

MSB

LSB

1 st byte	DEST	INSTRUCTION					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

2 nd byte	INPUT / DATA						
1	D6	D5	D4	D3	D2	D1	D0
7	6	5	4	3	2	1	0

3 rd byte	OUTPUT / ADDRESS						
1	A6	A5	A4	A3	A2	A1	A0
7	6	5	4	3	2	1	0

4 th byte	LAYER NUMBER						
1	Bit 7 MSB output	Bit 7 MSB input	L4	L3	L2	L1	L0
7	6	5	4	3	2	1	0

1st BYTE: Bit 7 – Defined as 0.
 D – “DEST”: 0 - for sending to the switcher (from the PC or keyboard).
 1 - for sending to the PC or keyboard (from the switcher).
 N5...N0 – “INSTRUCTION”

The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5...N0).



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2nd BYTE: Bit 7 – Defined as 1.
D6...D0 – “INPUT or DATA”.

When switching (ie. instruction codes 1 and 2), the INPUT (MSB + 7 bits) is set as the input number which is to be switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
A6...A0 – “OUTPUT or ADDRESS”.

When switching (ie. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 6 – Most Significant Bit (Bit A7) of the output byte.
Bit 5 – Most Significant Bit (Bit D7) of the input byte.
L4...L0 – LAYER NUMBER.

Used to address layers in a system via their layer numbers. When several layers (video, audio, YC, YUV, RGBHV) are controlled from a single serial port in a same machine, they are usually configured separately having an individual layer number.

TABLE OF INSTRUCTION CODES FOR PROTOCOL “MX06”

Notes: All values in the table are decimal, unless otherwise stated as Hexadecimal (xxh).

2.1.1.1 INSTRUCTION				DEFINITION FOR SPECIFIC INSTRUCTION		Layer	Note		
SEND		REPLY		DESCRIPTION	INPUT	OUTPUT	Hex		
Hex	Dec	Hex	Dec						
01h	1	41h	65	SWITCH	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)	01h	1	
01h	1	41h	65				VIDEO	02h	1
01h	1	41h	65				Y / C	03h	1
01h	1	41h	65				YUV	05h	1
02h	2	42h	66				RGBHV	01h	1
				AUDIO					
03h	3	43h	67	STORE STATUS	Set as SETUP#(0-7)	0 - To store 1 - To delete	01h		
04h	4	44h	68	RECALL STATUS	Set as SETUP#(0-7)	0	01h		
05h	5	45h	69	REQUEST STATUS OF AN OUTPUT	0	Equal to output number whose status is requested	01h	2	
05h	5	45h	69				VIDEO	02h	1
05h	5	45h	69				Y / C	03h	1
05h	5	45h	69				YUV	05h	1
06h	6	46h	70				RGBHV	01h	2
				AUDIO					
10h	16	50h	80	ERROR / BUSY	0	0 - Error 1 - Invalid Instruction 2 - Out of range 3 - Machine busy 4 - No card 5 - Adress out of range 6 - Data out of range 7 - Machine busy	01h	3	
11h	17	51h	81	RESERVED	----	----	01h		



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13h	19	53h	83	STORE STATUS	Set as SETUP#(0-7)	0 - To store 1 - To delete	01h	
14h	20	55h	84	RECALL STATUS	Set as SETUP#(0-7)	0	01h	
15h	21	55h	85	SET AUDIO Output VCA	Equal to output number whose VCA is to be set (0 = all)	Set as VCA value : Dec : 0 to 31 Hexa : 0 to 1Fh	01h	1,4
16h	22	56h	86	SET AUDIO GAIN and Balanced or Unbalanced mode for audio input	Equal to input number whose gain or bal/unbal mode is to be set (0 = all)	- Gain value: "100ggggg" (ggggg = 00000 to 11111) - Bal mode: "10100000" - Unbal mode: "11100000"	01h	1,5
19h	25	55h	85	REQUEST Audio output VCA	Equal to output number whose gain is requested	0	01h	2,6
19h	25	56h	86	REQUEST Audio input GAIN / Unbal/Bal	Equal to input or output number whose gain is requested	1	01h	2,6
20h	32	60h	96	SET ADR TEXT (wp=1)	High Byte	Low Byte	10h	
20h	32	60h	96	SET DISPLAY TEXT	0	Text ASCII	11h	
20h	32	60h	96	CLOSE TEXT (wp=0)	High Byte	Low Byte	12h	
21h	33	61h	97	LINE	0	0 - OFF LINE 1 - ON LINE	01h	9
22h	34	62h	98	Keyboard touches	Touch number	TDC current dest touch	01h	
22h	34	62h	98	Keyboard lights	LED number (0=all lights off)	TDC current dest touch	02h	
22h	34	62h	98	Keyboard lights Dest	LED number for DEST	TDC current dest touch	03h	
22h	34	62h	98	Keyboard lights Blink	Blinked LED number	TDC current dest touch	04h	
23h	35	63h	99	SET Serial Number	High Byte	Low Byte	01h	
23h	35	63h	99	SET License	0- no license 1- license active	0- no license 1- license active	03h	
39h	57	79h	121	RESERVED	----	----	01h	
39h	57	79h	121	Refresh OSD screen	0	0	02h	11
39h	57	79h	121	SET Power On Reset	0	VCA + Slope	03h	10
3Ah	58	7Ah	122	RESERVED	----	----		7
3Bh	59	7Bh	123	RESERVED	----	----		7
3Ch	60	7Ch	124	RESERVED	----	----		7
3Dh	61	7Dh	125	IDENTIFY MACHINE	0 – Internal Statements reading	0 - Serial Number 1 - Power On Reset	01h	8

NOTES on the above table:

NOTE 1 - 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

01h 85h 88h 83h

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:

41h 81h 87h 83h

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 2 - 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



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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

0Bh 80h 80h 85h
would be
4Bh 80h 81h 85h

NOTE 3 - 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 switch a 16x16 matrix with an input or output greater than 16, 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 4 – The output VCAs are 32 logarithmic steps. Values are 0 to 31 (decimal).

NOTE 5 – The input levels are 32 logarithmic steps. Values are 0 to 31 (decimal) and coded in the 5 lowest bits of the output byte.

When bit 5 = 0, the gain value is taken.

When bit 5 = 1, the Balanced/Unbalanced mode is taken : bit 6 = 0 for Balanced mode, bit 6 = 1 for Unbalanced mode.

The reply always contains the Balanced/Unbalanced mode and the Gain value under the binary form :

1	bal/unbal	1	G4	G3	G2	G1	G0
---	-----------	---	----	----	----	----	----

Where bal=0 and unbal=1

the reply to the HEX code

16h 02h 85h 81h
would be (for a balanced mode)
56h 02h A1h 81h

NOTE 6 – The Output VCAs are 32 logarithmic steps. Values (0 to 31 decimal) are replied in the output byte.

The input levels are 32 logarithmic steps. Values are 0 to 31 (decimal) and coded in the 5 lowest bits of the output byte.

The reply always contains the Balanced/Unbalanced mode and the gain value under the binary form :

1	bal/unbal	1	G4	G3	G2	G1	G0
---	-----------	---	----	----	----	----	----

Where bal=0 and unbal=1

the reply to the HEX code

19h 02h 00h 81h
would be (for a maximum VCA)
55h 02h 1Fh 81h

NOTE 7 – This code is reserved for internal use.

NOTE 8 - The serial number is replied as BCD code, with Most Significant Byte in the input byte and Less Significant Byte in the output byte.

NOTE 9 – When OFF LINE mode, sending a switch instruction will store the data in the volatile matrix memory, without effective switch. Switch will be done when ON LINE instruction. When ON LINE mode, sending a switch instruction will execute normal switch.



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NOTE 10 – POWER ON RESET. The output register has a value under the binar form :

1	0	POR1	POR0	P3	P2	P1	P0
---	---	------	------	----	----	----	----

P3...P0 : vca slope from 0 to 9 seconds

POR1 = 0 :

POR0 = 0 : vca max when power on.

POR0 = 1 : vca min when power on.

POR1 = 1 : recall vca when power on.

NOTE 11 – REFRESH the ON SCEEN DISPLAY. The GMOSD card will be restarted to be refreshed.

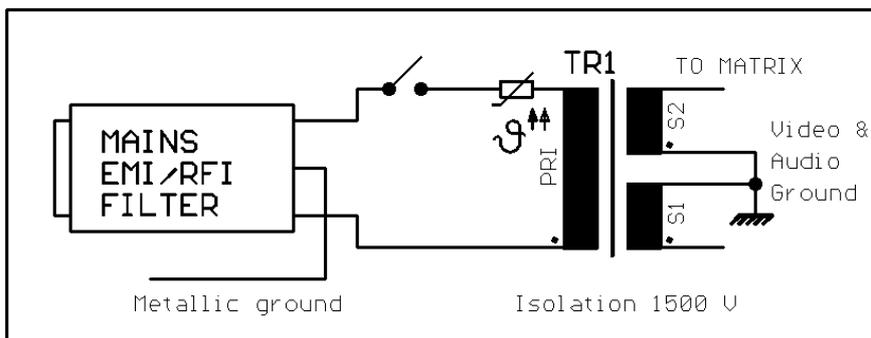


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3 MATRIX HOOK-UP

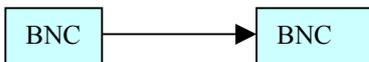
3.1 MAINS AND GROUND ISOLATION

The electric ground of all the plugs are the same, but isolated from the rack.
The rack is directly grounded by the mains cable.

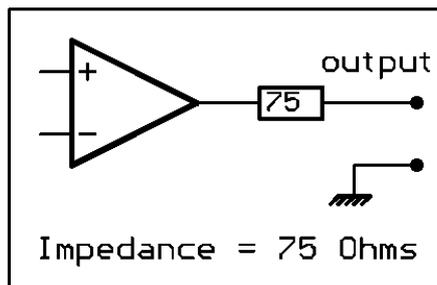
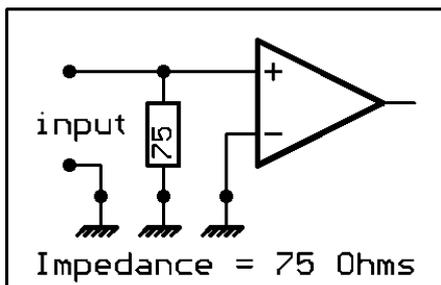


3.2 VIDEO

Video inputs and outputs are standards plugs BNC 75 Ohms.

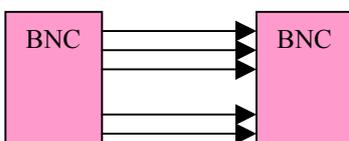


Electric equivalent plan :



3.3 RGBhv

RGBHV inputs and outputs are standard plugs : BNC.
R,G, and B signals are analogs under 75 Ohms. Level = 1V
H and V are logicals under 1 Kohms. Level = 2V to 5V



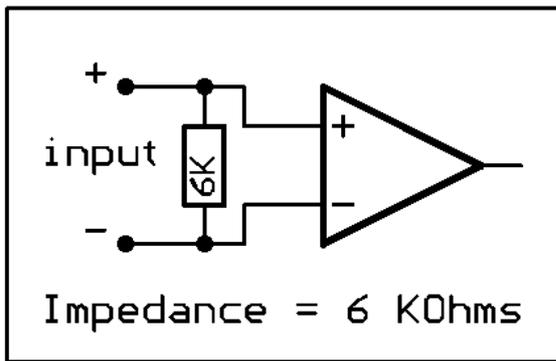
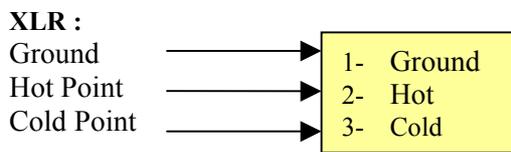


MATRIX ROUTING SWITCHER

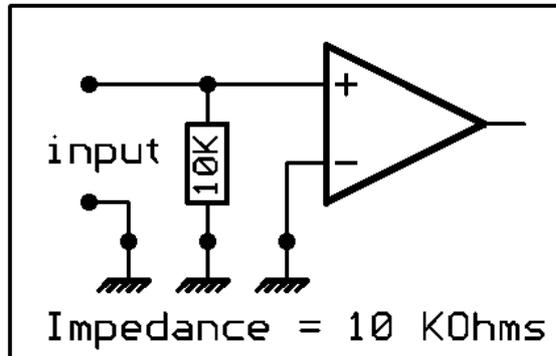
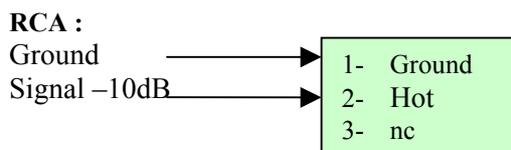
3.4 AUDIO

Audio inputs and outputs are terminal blocks 3 points detachable:

3.4.1 BALANCED INPUTS

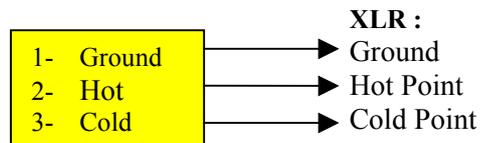


3.4.2 UNBALANCED INPUTS

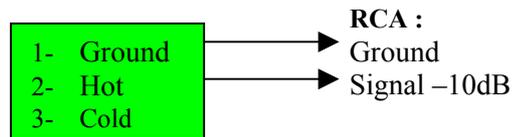


Note :
 skewer 3 no connected. Do not connect to the ground.

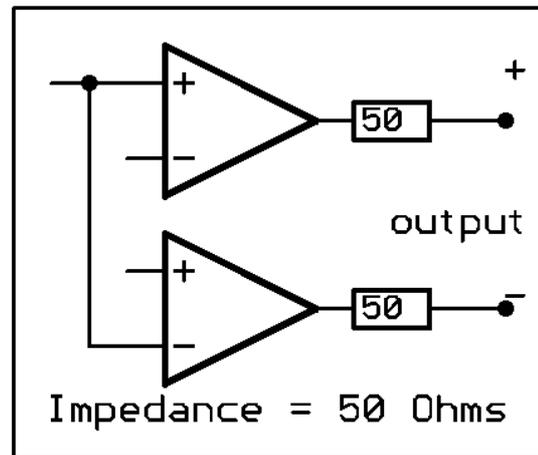
3.4.3 BALANCED OUTPUTS



3.4.4 UNBALANCED OUTPUTS



Importante Note:
 DO NOT CONNECT SKEWER 3 TO THE GROUND
 (audio signal always présent on this line).





4 GENERAL FEATURES

4.1 VIDEO SECTION

- Bandwidth @ -3dB: 325 Mhz
- Crosstalk @ 4,43 Mhzes:
 - 60 dB between two adjacent lines.
 - 75 dB between two extreme lines.
- Differential gain: < 0,5% max.
- Differential phase < 0,5° max.
- Signal/Noise Ratio > 70 dB
- Delay signal input/output matrix: 35 nS
- Chrominance/luminance delay < 10 nS
- Clamp on bottom of synchronization: -0,5V
- BNC connectors 75 Ohms
- Switching Point Assignment down by PROM programming

4.2 AUDIO SECTION

- Bandwidth @ -3 dB: 24 KHz
- Diaphony @ 20 KHz:
 - 85 dB between two adjacent lines.
- Harmonic distortion < 0,05%
- Signal/Noise Ratio > 90 dB
- Terminal blocks 3 points detachable:
 - skewer 1: shield, mass, earth
 - skewer 2: hot point or asymmetric signal
 - skewer 3: cold in balanced, or non connected point in unbalanced

4.3 AUDIO NUMERIC AES/EBU

Standard AES 3-1992

- Bandwidth @ -3dB: 50 Mhz
- Numeric Rise Time gap: 30 nS
- Diaphony @ 5,12 Mhz: -50 dB
- Terminal Blocks 3 points detachable:
 - skewer 1: shield, mass, earth
 - skewer 2: signal
 - skewer 3: reversed signal
- Impedance: 110 Ohms balanced
- Input Level: 2V to 7V

- Output Level: 4V
- Jitter max: 20nS

4.4 COMMUNICATION SECTION

- Rate: 9600 Bauds, 8 bits, without parity, 1 start bit, 1,5 stop bit
- Sub-D9 RS232S connector (measures in relation to the mass 0V) :
 - levels: max: +/-12V min: +/-4V
 - tension of rest: - 10V
 - tension work (start bit): +10V
 - Start 1 bit time: 104 µS
- Sub-D9 RS422S connector (measures in relation to the mass 0V) :
 - level in rest Txd+ : +4,5V
 - level in rest Txd- : 0,5V
 - level in rest Rxd+ : +4,5V
 - level in rest Txd- : 0,5V

4.5 MAINTENANCE

DISASSEMBLY OF THE VIDEO AND AUDIO CARDS.

For the removal of the RS232 cards and Power Supplies, undo the tightening screws on the edge of the panel and pull on the card.

For removal of the Power Supply block, withdraw the adjacent panel to facilitate access.

Then disconnect the power cord and exchange the Power Supply block.

For the extraction of the audio/video blocks (see diagram of implantation of the matrix in beginning of this manual), it is necessary to withdraw all tightening screws of the input cards and the output cards, because they are fitted to the same block.

The cards and blocks must be returned to the factory for testing purposes. A visual examination can be made by the user for the audio and video connectors.



MATRIX ROUTING SWITCHER

5 TOUCH KEYBOARD : LUMINOUS RE-LABELABLE

5.1 PRESENTATION

The keyboard permits the remote control of the switching matrix, without the use of a PC station. It is housed in 19" 1'U' cabinet, with 8, 16, 24 or 32 selection, or in a built-in box. The selected key is illuminated. Each of the keys can be re-labelled, by writing in the name of the source or the destination. This keyboard is auto - powered by the matrix, via the RS422 connector. Several keyboards can connect in parallel on the RS422 line.



5.2 HOOK-UP

Connect the keyboard to the switching matrix by a straight flat cable and complete with Male/Female Sub-D 9 connector, in the RS422/keyboard connector of the matrix, and the RS422/matrix connector of the keyboard. The set of the keys blink when power is on.

5.3 EDITING PARAMETERS

Each key can get an individual fonction :

- Source call
- Destination call
- Configuration pages call

- level audio +/-

Parameters are given in the MatrixOp software (see page 18 EDITING THE MENUS)

5.4 WORKING

First select an output (destination) using the keys of the right part of the keyboard. The key illuminates, as does the key that corresponds to the activated input of the matrix. This operation does not activate any switching, but allows you to show the status of the matrix.

Choose an input (source) on the left part of the keyboard. The key of the input illuminates if the switching is OK.

The matrix also acknowledges receipt of the switching by writing on the LCD display in the front panel: « Comm/destination/source».

5.5 SCHEMATIC

This schematic is representative of the affectation of the keys. Each key can get a special function which can be input or output, and video and/or RGB and/or audio.

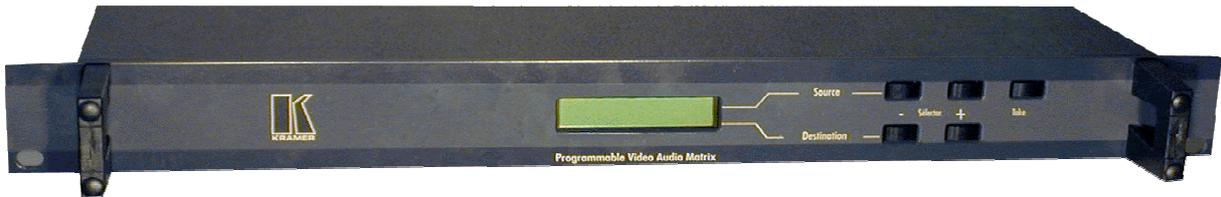
The affectations are installed in the procedure « MENU EDITOR » of the Matrix_Op software (see page 18 EDITING THE MENUS), and down loaded to the EEPROM memory of the switcher.

1	2	3	4		5	6	7	8		9	10	11	12		13	14	15	16
17	18	19	20		21	22	23	24		25	26	27	28		29	30	31	32



MATRIX ROUTING SWITCHER

6 INCREMENTAL TOUCH KEYBOARD AND LCD DISPLAY



6.1 PRESENTATION

This keyboard permits the remote control of the switching matrix, without the use of a PC station.

It is housed in a 19 inch 1U cabinet, with 2 keys for selection of the inputs, 2 keys of selection for the outputs, and a validation key. The configuration status of the switch actions selected is shown on the LCD display.

This keyboard is powered from the matrix, via the RS422 connector.

Several keyboards can connect in parallel on the RS422 line, and are interactive.

6.2 HOOKUP

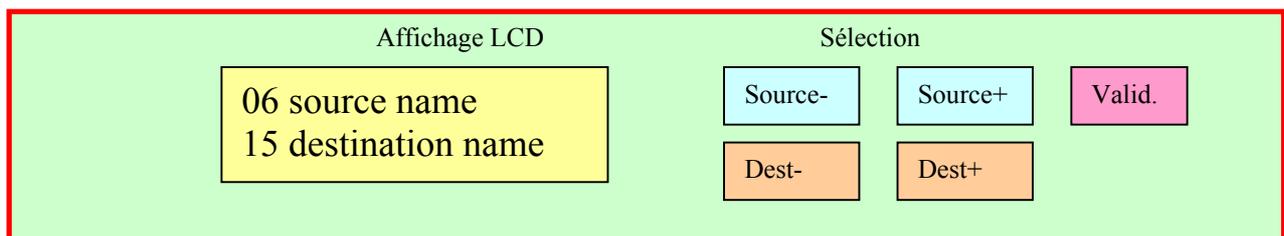
Connect the keyboard to the MATRIX by a straight flat cable and complete with Male/Female Sub-D 9 connector, in the RS422/keyboard connector of the matrix, and the RS422/matrix connector to the keyboard.

6.3 EDITING PARAMETERS

Parameters are given in the MatrixOp software (see page 18 EDITING THE MENUS)

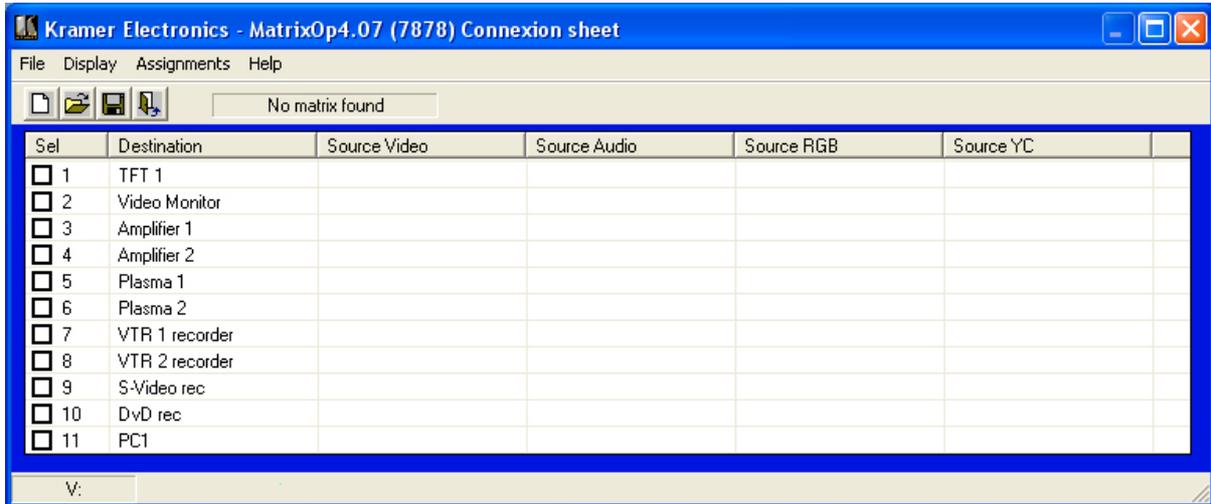
6.5 SCHEMATIC

This schematic shows the front panel of the touch keyboard and LCD display.





7 MATRIX_OP4 SOFTWARE



7.1 INTRODUCTION

The principle of the routing switcher is to connect each of its outputs to any or all of the inputs. Therefore the possible points of switching is a multiple of the number of inputs and the number of outputs.

This principle is best described in the listview form. This grid is composed of switching points, and of distributors. (For instance Input 1 can be selected to go to Outputs 6,7 and 8.)

The management of these switching points can be activated by using a touch keyboard, but this solution can quickly become complex as the matrix becomes larger. Thus the use of a computer to manage the system is preferable.

The MATRIX_OP4 software does not physically represent the routing switcher, but rather the environment in which the various devices exist. Therefore you will have to display these devices in a diagram, without taking into account their state of readiness, or receiver, video or audio (mono or stereo), nor of their hookup to the grid.

A simple control allows you know quickly the actual setup of the matrix.

7.2 Glossary :

Assignment

An audiovisual device which is connected on the switcher may be assigned : Matrix_Op4 has to know its parameters : names and numbers of the connectors.

Destination

Objet connected on an output of the switcher.

On Line / Off Line

When the router is « OFF LINE », all information is received and stored, but not executed. Recall and execution are made when « ON LINE ».

Objet

The devices connected on the matrix routing switcher are called in this documentation « objets », and have to be parametered with the assignment editor (see page 18 *assignments*). this édition have to be realized only in the first installation or when changing some equipment.

Page or Sheet

The status of the router, the VCA levels, and the general informations about the connections, are called « page », are saved in files with extension « .cnx ».

Layer



MATRIX ROUTING SWITCHER

A matrix routing switcher can contain many different layers, according to the kind of electric signals :

- Composite Video layer
- Analog Audio (mono or stéréo) layer
- S-Video (or YC) layer
- YUV layer
- RGB or RGBS or RGBHV layer
- AES-EBU (Digital Audio) layer
- SDI (Digital Vidéo) layer

Source

Objet connected on an input of the switcher.

Unconnexion

An object is unconnected when there is no link to any source. This status is symbolized by a fictive connexion on the first source called « unconnected ».

7.3 STARTING

7.3.1 Power On

The software MatrixOp4 should be installed on hard disk.

Switch Power on of the routing switcher, the PC and the screen.

Start the system by clicking « matrixop4.exe », then the switching program takes over and runs automatically.

After an auto-test, the program is ready, and positions itself on the page that has been previously automatically protected.

It establishes the links, and transmits them to the matrix.

The auto-test was designed to check the correct functioning of the matrix.

7.3.1.1 SET-UP

When just installed, the software may be initialized. The matrix may be linked. SetUp request automatically the size of the matrix.

If fault arises :

- 1) Check that the routing switcher is « power on »
- 2) Select another port
- 3) Check the link between PC and Matrix unit with the RS-232 cable
- 4) The LED display of the routing switcher must lit a switching to every transmission.

- 5) Check if there is evidence of connection between the devices declared in the menus and the real configurations of the matrix. Check that there is not more numbers than the physical capacity of the matrix (see page 18 *assignments*).

Verify the whole matrix/UC and restart the program.

7.3.2 STOPPING THE SYSTEM

Turn off of the power.

The switching off of power to the central unit (PC) and its screen doesn't alter the connection of the matrix (as long as the matrix is powered).

Switching off power to the routing switcher will cease all switching actions. When switching on the matrix, it will keep its previous configuration. MATRIX_OP can reset the matrix however with the "initialization" command.

7.4 ASSIGNMENTS EDITOR

7.4.1 COMMAND : Assignments

Nr	Name	Video	Audio	RGB	YC	Key
1	TFT 1	1	1	1		1
2	Video Monitor	5				2
3	Amplifier 1		3			
4	Amplifier 2		6			
5	Plasma 1	2		3	1	3
6	Plasma 2	3		4	2	4
7	VTR 1 recorder	4	5			5
8	VTR 2 recorder	6	4			
9	S-Video rec		2		3	6
10	DvD rec	8	8			7
11	PCI		9	2		9
12	RF 12 1	0	0	0	0	0
13	RF 13 1	0	0	0	0	0

To run this subroutine, click the *assignment* command. This program establishes the name and the state of the peripherals.

It is the only moment where the numbering of the audio and video connectors is shown.

When opening of this program, a window appears, as well as a schematic representation of the routing switcher and of the peripheral objects. This very simplified schematic is as a real wiring map sheet.



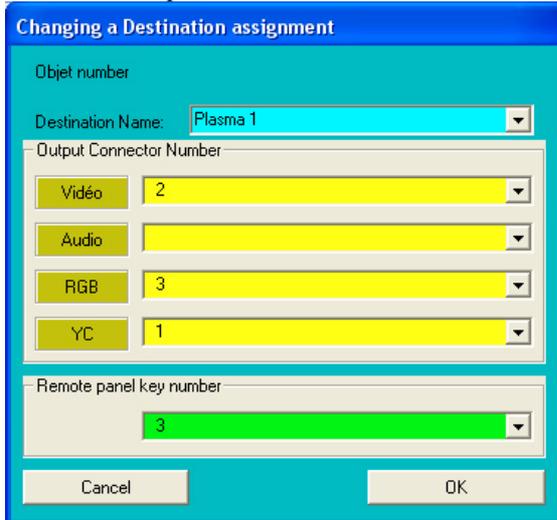
MATRIX ROUTING SWITCHER

Four layers can work simultaneously, and each one can have a different size.

7.4.1.1 Names and Connectors capture.

Click on the box of a source or destination object.

This window opens :



Enter the name of the object, or select it in the list. Each new name will be automatically added in the list. This is easy to get it again for other object with the same name in another column or layer.

If an object with the same name exist in the current column, Matrix_Op4 will ask you if you want to remove the existing one.

Choose the number of the connector of your object in each layer. This will be useful the find easily your objects on the connexion board.

7.4.1.2 Remote Control Panels programmation.

In the combobox "Remote panel key number" :

Indicate the number of the touch you want to assign.

7.4.1.3 Assignments Upload.

When the assignments are defined, you can upload the datas to the EEPROM of the matrix for the remote control panel to get autonomy and be independent of the computer. Select the menu "Matrix / Upload EEPROM".

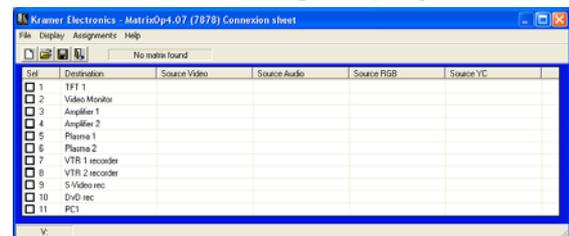
7.5 MATRIX CONTROLLER

7.5.1 General Informations

The mains routine of the software Matrix_Op4 consist to create some crosspoints between various sources and destinations.

Matrix_Op4 don't use the numbers of the connectors to the devices, but only the names of these devices. The connections are directly made between the sources and the destinations. Matrix_Op4 calculates each crosspoint, and returns the the router, the code containing the layers and the connectors numbers. As a matter of fact, several connections can be done with only one operation. The video, RGB, audio and YC layers can be following, or separated.

7.5.2 The Switching Display



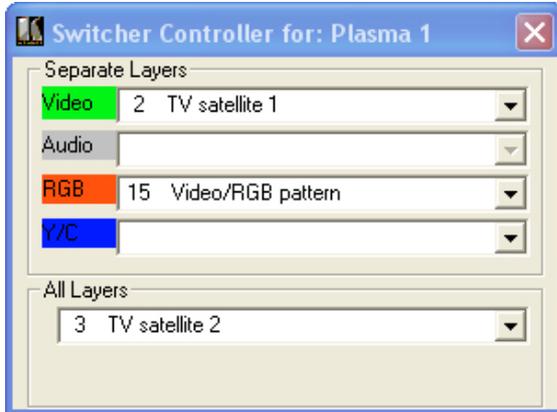
This mode of display is characterized by several personal lines corresponding each one at a destination, which is identified on the left side. On the right side, the four sources that are connected are shown, and can be changed.

7.5.2.1 Selecting and Switching

First, choose a destination by clicking on the line. Then, a new window opens, with the list of available sources in each layer :



MATRIX ROUTING SWITCHER



In this window, choose in the layers that you want use, or in the all list, the sources you want. The switching will be automatically installed featuring the disponibilities.

7.6 COPY BACK-UP

When the edition of the menu is finished, it is important to make a copy on a diskette. Insert your back-up diskette in the floppy drive A and save the file:

C:\Program Files\Matrixop4*.agn

Warning: the MATRIX_OP4 licence that you possess works only with the delivered matrix. A copy of it cannot work on an other matrix. The normal working of the software MATRIX_OP4 may be reduced to a minimal size and interrupted automatically after several days of use. An intermittent message box may open for indication. In this case, the raising of this procedure won't be provided to the holder of the invoice of purchase of the matrices and the software that after operation of the total transfer of property, in application of the reserve of property stipulating the complete payment of the price. In case of contestations, the Courthouse of Trade of Jerusalem will be alone competent. To consult us for the adaptation and the authorization.

7.6.1 Remark

Your PC must be equipped with a mouse as well as the software DOS/WINDOWS 95/98/NT/XP @.

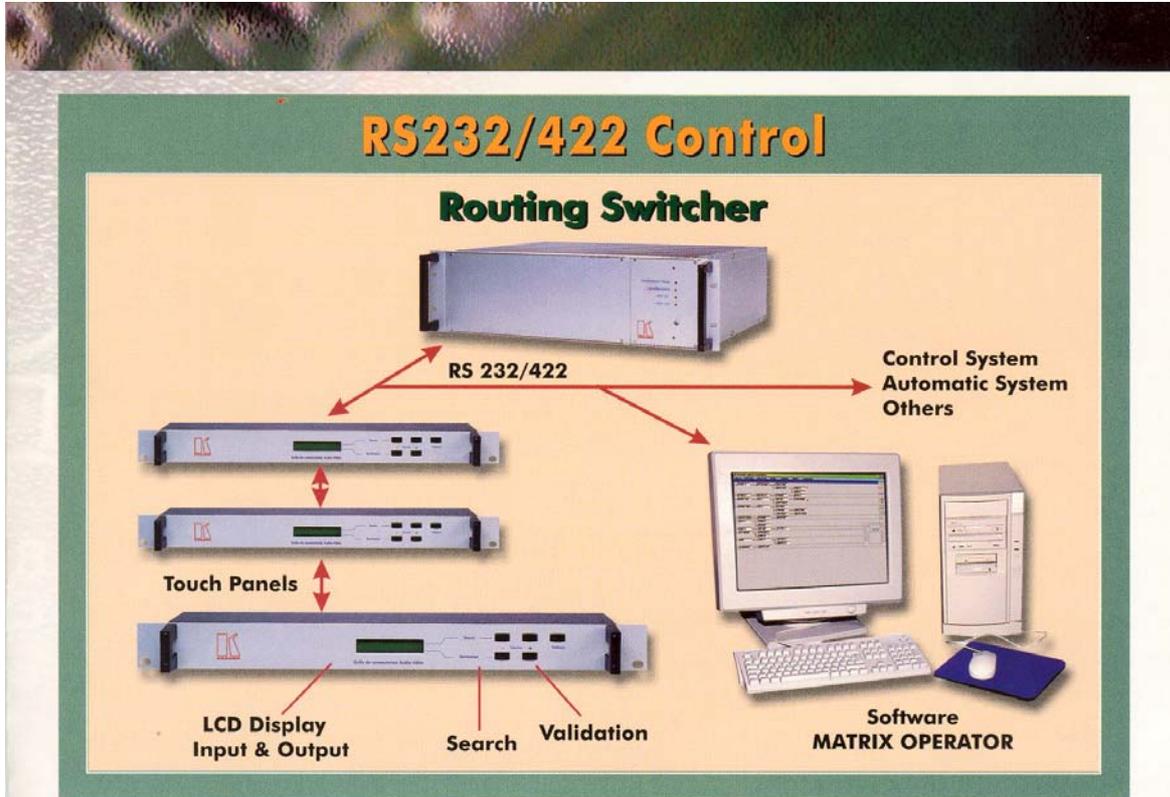
The computer should have a 256MO RAM, and a SXGA video card.

If the mouse is connected on the COM 1, you cannot use the link RS 232 on COM1 for the matrix. Use another COM port (See page 18 setup).



KRAMER *Electronics*

MATRIX ROUTING SWITCHER



Kramer routing switchers are controlled via RS232/422 connection based on the Kramer protocol, which is compatible with standard control systems. A visual indicator on the front panel displays the transmission. This connection enables multi interactive self powered touch panels and/or one or more external control systems (PC software, automatic systems..)

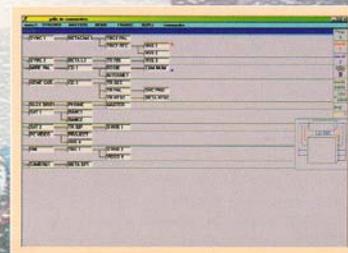
Touch Panel



The touch panel is housed in a 19" 1U unit, with an epoxy coated aluminum front panel. It connects to the switcher RS-422 port. The front panel has four search buttons, 1 validation "take" button and an LCD display.

Matrix Operator Software

Kramer offers a simple and user-friendly software program which has individual window indicators for audio, video and VCA cross-points.



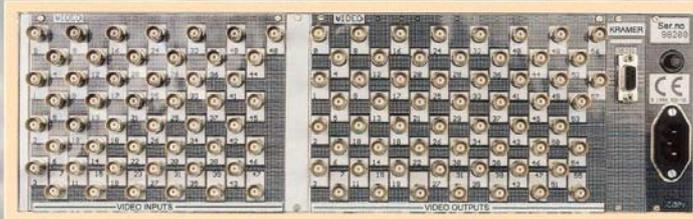


KRAMER Electronics

MATRIX ROUTING SWITCHER

Technical Specifications

Example:
Video
Matrix
49x58



Example:
Video
Matrix 22x35

plus

Bal Audio
19x29
with VCA

Video

BANDWIDTH: 200MHz -3dB (typical).
IN-OUT DELAY: 35ns.
DIFF. PHASE: <0.5 Deg.
DIFF GAIN: <0.5%.
LUMA S/N: >70 dB.
VIDEO CROSSTALK: -60dB adjacent channels,
-75 dB remote channels (at 4.43 Mhz).

Audio

BANDWIDTH: 24 kHz, -3 dB.
THD+NOISE: 0.05%.
CROSSTALK: -85 dB@20 kHz.
S/N RATIO: >90 dB.

General

DIMENSIONS: 19-inch (W), 14-inch (D), 3,6,9 or 12U (H) rack mountable.
POWER SOURCE: 230 VAC, 50/60 Hz, (115VAC U.S.A.)
ACCESSORIES: Detachable A/C cord.



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