Appendix A
Installation/Upgrade

Removing the MAV 84/128 Cover

Use this procedure to prepare the MAV 84/128 for making any hardware changes that require access to the inside of the unit.

1. Disconnect the power cord to remove AC power from the MAV 84/128.
2. If the MAV 84/128 is rack-mounted, remove it and place it on a clean work-space.
3. Remove the eight (8) screws that secure the MAV 84/128 top cover, three on two sides and two on the top. If you are “Installing A Software Update” remove two bottom cover screws as indicated in Figure A-1.A note.

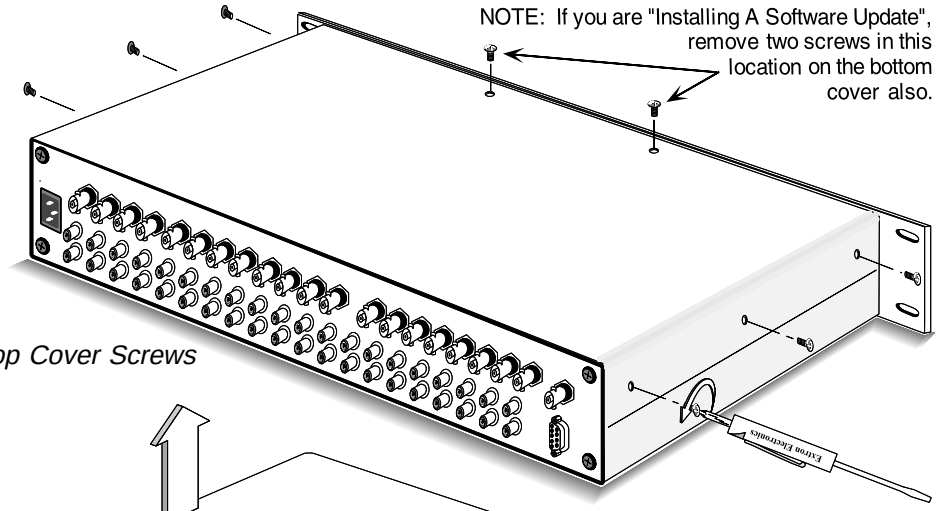


Figure A-1.A Top Cover Screws

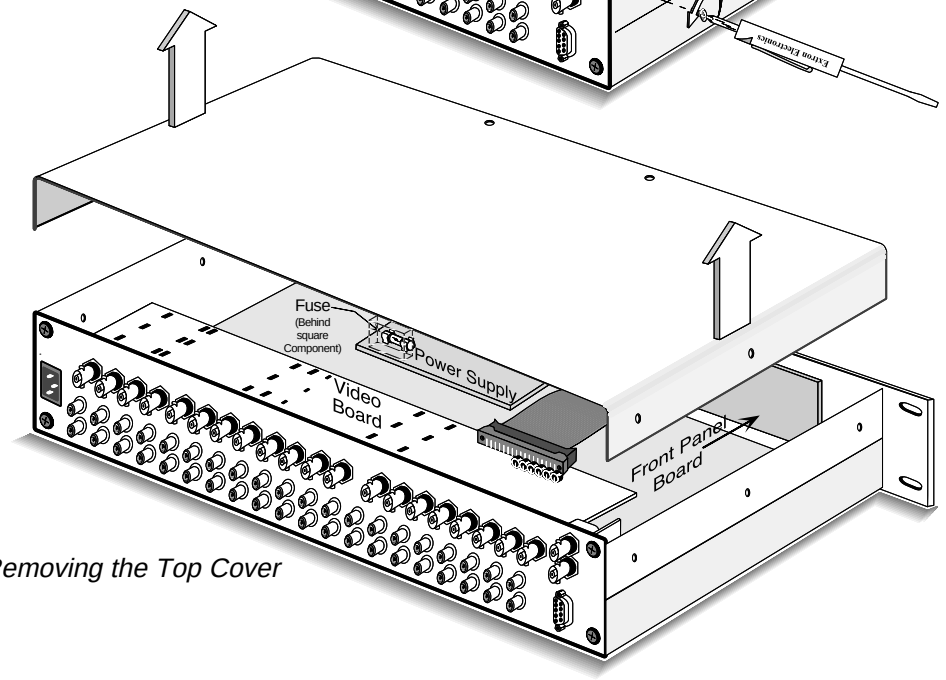


Figure A-1.B Removing the Top Cover

4. Lift the MAV 84/128 cover straight up to expose the internal components as shown in Figure A-1.B.

The cover has grooves that engage the edge of the rear panel. This is a snug fit, therefore you must lift the cover evenly.

5. Go to Page A-2 If you are “Swapping Serial Ports (RS-232/RS-422)” or “Changing the AC Fuse”. Go to Page A-3 if you are “Installing a Software Update”.
6. Return to this procedure and use it in reverse order as a guide for putting the MAV 84/128 cover back on.
7. After the MAV 84/128 cover is back in place, use Chapter 2 as a guide to connecting your video and audio equipment.

*The Power button on the front panel **only** disables the switcher – AC remains ON inside the cabinet. Before working inside, unplug the power cord.*

Ribbon Cable Connectors

The ribbon cables in the MAV 84/128 use a self-latching style Receptacle. Figure A-2.A shows how it operates.

1. Press each of the two tabs outward, this unlocks the receptacle and ejects the ribbon cable connector part way. Pull evenly on the ribbon cable connector to remove it.
2. When reconnecting the cable, first align the pins in the receptacle with the holes in the connector and press evenly into the receptacle until the receptacle tabs lock the connector in place.

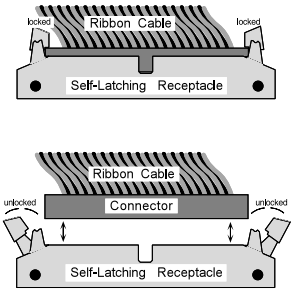


Figure A-2.A. Ribbon Cable Self-Latching Receptacle

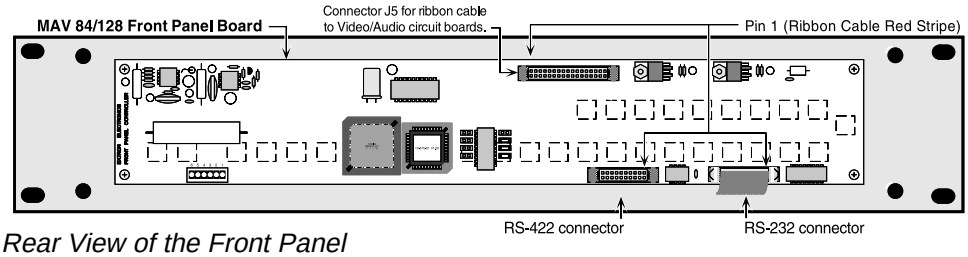


Figure A-2.B Rear View of the Front Panel

Swapping Serial Ports (RS-232/RS-422)

The MAV 84/128 is normally connected for RS-232 use. If your application requires RS-422, follow this procedure (and Figure A-2.B) to change the configuration. The procedure for removing and installing the ribbon cables is described above in “Ribbon Cable Connectors”.

1. With the top cover removed (previous page), locate the Front Panel board.
2. Looking from the rear, locate two ribbon cable receptacles (Figure A-2.B) One is empty and the other has a ribbon cable which goes to the Rear Panel. To the right is the RS-232 receptacle and to the left is the RS-422 receptacle. If the connection is not correct for your application, disconnect the cable and move it to the other receptacle.
3. Put the top cover back on by using the cover-removal procedure (Page A-1) in reverse order as a guide.

Changing the AC Fuse

1. Remove the MAV 84/128 cover (Page A-1), locate the fuse (behind another component) on the Power Supply board. (see Figure A-2.C.)
2. Remove and check the fuse (if test equipment is available).
3. Replace it **only** with a 2A/250V Fast-blow fuse.

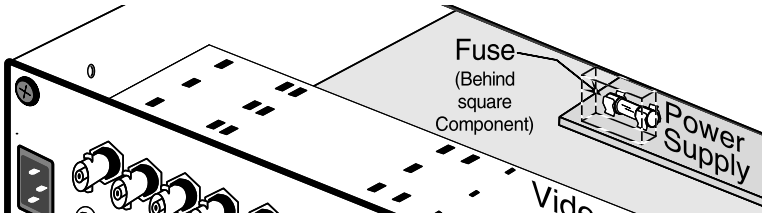


Figure A-2.C Power Supply Fuse Location

If you choose to check for power before putting the cover back on, be sure tools and hands are outside the MAV 84/128, and then connect the power cord to an AC source. The MAV 84/128 should power up without pressing the Power button. Unplug the AC power cord when finished.

Installing A Software Update

1. Go to page A-1 and remove the MAV 84/128 top cover. Also remove two (2) bottom cover screws mentioned in Figure A-1.A note. Remove four (4) front panel screws/washers. The front panel is now connected by two ribbon cables and the power cable. Make note of the location of the bottom ribbon cable, there are two front panel board connectors that it will fit in. Unplug the two ribbon cables at the front panel board (see "Ribbon Cable Connectors" on Page A-2). Unplug the power cable at the front panel board. The front panel should be completely disconnected now.

Do NOT touch IC chips without being electrically grounded. Electro-Static Discharge (ESD) can damage IC chips, even when it is not enough to be humanly detected (felt, heard or seen).

2. Place the front panel (buttons down) on a suitable work-space. Locate the Software IC using Figure A-3.A as a guide.

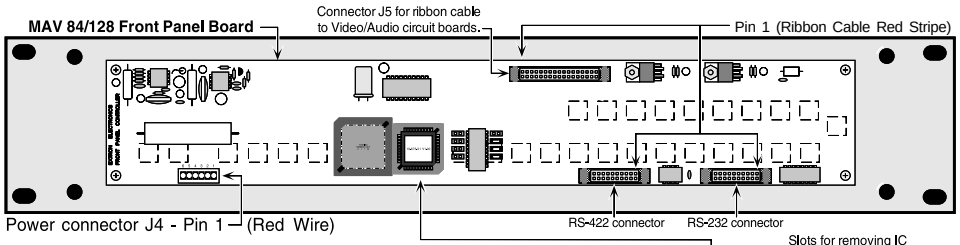


Figure A-3.A Locating the Software IC Chip

3. (Be sure you are electrically grounded.) Use the PLCC IC puller (Figure A-3.B) to remove the existing Software chip. Squeeze the tool to align the hooks with the slots provided in opposite corners of chip socket U8. Insert the hooks, squeeze gently and pull the IC straight out of the socket. Set the chip aside.
4. Note the key (angled corner) of the new Software chip. Orient this to match the key of the socket and carefully press it in place.
5. Reinstall the front panel and top cover and put the MAV 84/128 back in place. If necessary, use step 1 of this procedure and Page A-1 as a guide when reassembling the MAV 84/128.

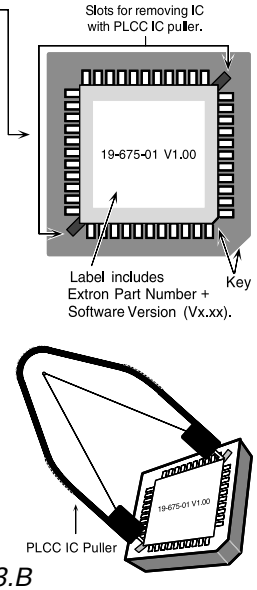


Figure A-3.B Removing the Software IC Chip

MAV 84/128 Switcher Power Up Sequence

When power is applied to the MAV 84/128 through the AC connector, the following self-test takes place.

1. Test processor and RAM. If no error, skip to step #3 below.
2. If an error is detected by the test, go no further but blink the error code with the Power LED. The error codes are:
   1 blink, pause, 1 blink, etc. = Error in primary RAM.
   2 blinks, pause, etc. = Error in secondary RAM.
   3 blinks, pause, etc. = Error in PROM.
   4 blinks, pause, etc. = Configuration Problem.
3. LED Test – Blink all LEDs.
4. Blink the LEDs for all available inputs and outputs, together with the Video and Audio LEDs.
5. The Power, Video and Audio LEDs go ON. The MAV 84/128 switcher is now ready to operate.

B

Appendix B
Reference Information

MAV 84/128 Part Numbers

Extron Part	Part #
MAV 84 RCA Switcher	60-238-02
MAV 128 RCA Switcher	60-238-01

Related Part Numbers

Extron Part	Part #
RCA (female) BNC (male) Adapter	10-264-01
GLI 250 (Ground Loop Isolator, 250 MHz RGBHV)	60-123-01
MAV 84/128 User's Manual (this manual)	68-346-01
MAV 84/128/CrossPoint Software Control Program	29-015-02

BNC Cables (Super High Resolution (SHR) BNC Cables)

Extron SHR BNC cables are Super High Resolution BNC cables. Extron recommends that when using signals with a scanning frequency of 15-125 kHz and running distances of 100 feet or more, high resolution BNC cables should be used to achieve maximum performance.

Extron Part	Part #
Bulk SHR-1, 500’	22-098-02
Bulk SHR-1, 1000’	22-098-03
BNC SHR crimp connectors, qty. 50	100-075-51

Bulk cable in lengths up to 5000' rolls is available with or without connectors.

Binary/hex/decimal Conversion Table

The table below shows how to convert data bytes from one numbering system to another. In MAV 84/128 communications, all data bytes are identified by having bit 7 = 1, therefore it is not included in the computations.

Bit #s in byte: 7		**6**	**5**	**4**	**3**	**2**	**1**	**0**
Decimal value	n/a	64	32	16	8	4	2	1
Dec. Hex	Add the decimal values above for equivalents.							
0 80/00h	n/a	0	0	0	0	0	0	0
1 81/01h	n/a	0	0	0	0	0	0	1
2 82/02h	n/a	0	0	0	0	0	1	0
3 83/03h	n/a	0	0	0	0	0	1	1
4 84/04h	n/a	0	0	0	0	1	0	0
5 85/05h	n/a	0	0	0	0	1	0	1
6 86/06h	n/a	0	0	0	0	1	1	0
7 87/07h	n/a	0	0	0	0	1	1	1
8 88/08h	n/a	0	0	0	1	0	0	0
9 89/09h	n/a	0	0	0	1	0	0	1
10 8A/0Ah	n/a	0	0	0	1	0	1	0
11 8B/0Bh	n/a	0	0	0	1	0	1	1
12 8C/0Ch	n/a	0	0	0	1	1	0	0
13 8D/0Dh	n/a	0	0	0	1	1	0	1
14 8E/0Eh	n/a	0	0	0	1	1	1	0
15 8F/0Fh	n/a	0	0	0	1	1	1	1
16 90/10h	n/a	0	0	1	0	0	0	0
etc.								
32 A0/20h	n/a	0	1	0	0	0	0	0
etc.								
64 C0/40h	n/a	1	0	0	0	0	0	0
etc.								
99 E3/63h	n/a	1	1	0	0	0	1	1
100 E4/64h	n/a	1	1	0	0	1	0	0
etc.								
127 FF/7F	n/a	1	1	1	1	1	1	

Glossary of terms

Following is a list of terms taken from Extron's Glossary.

AC – **Alternating Current** – Flow of electrons that changes direction alternately.

ADA – Extron's product designation for Analog Distribution Amplifier.

AMPS – **Amperes** – A unit of measurement for current.

Analog – **Analogue** – A continuous signal that takes time to make a transition from one level to another. Standard audio and video signals are analog. This signal has an infinite number of levels between its highest and lowest value. (Not represented by bits, such as with digital.)

ANSI – American National Standards Institute

ASCII – American Standard Code for Information Interchange – The standard code consisting of 7-bit coded characters (8 bits including parity check), utilized to exchange information between data processing systems, data communication systems, and associated equipment. The ASCII set contains control characters and graphic characters.

Attenuation – The decrease in magnitude of a signal.

Audio Follow – A term used when audio is tied to other signals, such as video, and they are switched together. (The opposite of Break-away)

Balanced Audio – A method that uses three conductors for one audio signal. They are plus (+), minus (-) and ground. The ground conductor is strictly for shielding, and does not carry any signal. Also Differential Audio.

Bandwidth – A frequency range, or "band" of frequencies, within which a device operates. In audio and video, it is the band of frequencies that can pass through a device without significant loss or distortion. The higher the bandwidth, the sharper the picture; low bandwidth can cause a "fuzzy" picture.

Barrel – Outward curved edges on a display image. Also see "pincushion".

Blanking – The turning off of the electron beam that scans the image onto the screen. When the beam completes a scan line it must return (retrace) back to the left. During this time, the beam must be turned off (horizontal blanking). Similarly, when the last line has been scanned at the bottom of the screen, the beam must return to the upper left. This requires vertical blanking.

Blooming – Most noticeable at the edges of images on a CRT, "blooming" is when the light (color) is so intense that it seems to exceed the boundary of the object. Thin lines and sharp edges could look thick and fuzzy. This may be caused by the brightness being set to high, or by a high voltage problem.

BNC – It is a cylindrical Bayonet Connector which operates with a twist-locking motion. Two curved grooves in the collar of the male connector are aligned with two projections on the outside of the female collar. This allows the connector to be locked in place without the need of tools.

Break-away – The ability to separate signals for the purpose of switching them independently. For example: an audio and video signal from the same source may be "broken away" and switched to different destinations. This is the opposite of the term "follow".

Buffer – Generally referred to as a unity gain amplifier used to isolate the signal source from the load. This is for both digital and analog signals.

Cable Equalization – The method of altering the frequency response of a video amplifier to compensate for high frequency losses in cables that it feeds. (See Peaking.)

Capacitance – The storing of an electrical charge. At high frequencies, capacitance that exists in cables also represents a form of impedance.

Cathode Ray Tube – See CRT.

Chroma – The characteristics of color information, independent of luminance intensity. Hue and saturation are qualities of chroma. Black, gray, and white objects do not have chroma characteristics.

Chrominance Signal – Part of a television signal containing the color information. Abbreviated by "C".

Coaxial Cable – A two-conductor wire in which one conductor completely wraps the cable.

Component Video – Our color television system starts with three channels of information; Red, Green, & Blue (RGB). In the process of translating these channels to a single composite video signal they are often first converted to Y, R-Y, and B-Y. Both 3-channel systems, RGB and Y, R -Y, B -Y are component video signals. They are the components that eventually make up the composite video signal. Much higher program production quality is possible if the elements are assembled in the component domain.

Composite Sync – A signal consisting of horizontal sync pulses, vertical sync pulses, and equalizing pulses only, with no signal reference level.

Composite Video – A mixed signal comprised of the luminance black and white, chrominance (color), blanking pulses, sync pulses and color burst.

Contrast – The range of light and dark values in a picture or the ratio between the maximum and the minimum brightness values. Low contrast is shown mainly as shades of gray, white high contrast is shown as blacks and whites with very little gray. It is also a TV monitor adjustment which increases or decreases the level of contrast of a televised picture.

Crosstalk – Interference from an adjacent channel which adds an undesirable signal to the desired signal.

Crosstalk Isolation – Attenuation of an undesired signal introduced by crosstalk from an adjacent channel.

CRT – **Cathode Ray Tube** – A vacuum tube that produces light when energized by the electron beam generated inside the tube. A CRT has a heater element, cathode, and grids in the neck of the tube, making up the “gun”. An electron beam is produced by the gun and is accelerated toward the front display, or screen surface of the tube. The display surface contains phosphors that light up when hit by the electron beam. The CRT is more commonly known as picture tube.

dB – **Decibel** – The standard unit used to express gain or loss of power. It indicates the logarithmic ratio of output power divided by input power. A power loss of 3 dB is an attenuation of half of the original value. The term “3dB down” is used to describe the “half power point”.

DC – **Direct Current** – The flow of electrons in one direction.

D Connector – A connector with rounded corners and angled ends, taking on the shape of the letter “D”. Commonly used in computers and video.

Decibel – See dB.

Decoder – A device used to separate the RGBS (Red, Green, Blue and Sync) signals from a composite video signal.

Differential Audio – See Balanced Audio.

Distribution Amplifier (DA) – A device that allows connection of one input source to multiple output sources such as monitors or projectors.

FCC – Federal Communications Commission – A unit of the U.S. Government that monitors and regulates communications.

Field – In interlaced video, it takes two scans on a screen to make a complete picture, or a “Frame”. Each scan is called a “Field”. Sometimes these are referred to as “field 1 and field 2”.

Flicker – Flicker occurs when the electron gun paints the screen too slowly, giving the phosphors on the screen time to fade.

Frame – In interlaced video, a Frame is one complete picture. A Frame is made up of two fields, or two sets of interlaced lines.

Frequency Range – Refers to the low-to-high limits of a device, such as a computer, projector or monitor. Also “bandwidth”.

Gain – A general term used to denote an increase in signal power or voltage produced by an amplifier in transmitting a signal from one point to another. The amount of gain is usually expressed in decibels above a reference level. Opposite of Attenuation.

Genlock – A method of synchronizing video equipment by using a common, external “Genlock” signal.

Hertz – **Hz** – A measure of frequency in cycles per second.

High Impedance – **Hi Z or High Z** – In video, when the signal is not terminated locally and is going to another destination, where it will be terminated. In video, Hi Z is typically 10k ohms or greater.

Horizontal Rate – **Horizontal Frequency** – The number of complete horizontal lines, including trace and retrace, scanned per second. Typically shown as a measure of kHz.

Horizontal Resolution – Smallest increment of a television picture that can be discerned in the horizontal plane. This increment is dependent upon the video bandwidth and is measured in frequency. Determines the number of lines it takes to scan an image on the screen.

Hue – **Tint Control** – Red, yellow, blue, etc. are hues of color or types of color. Hue is the parameter of color that allows us to distinguish between colors.

Hz – **Hertz** – Frequency in cycles per second.

Impedance – **Z** – The opposition or "load" to a signal. Circuits that generate audio or video signals, are designed to work with a certain "load", or impedance. Typical video impedances: 75 ohm or High Z. Also see High Impedance and Low Impedance.

Interlaced – The process of scanning whereby the alternate lines of both scanned fields fall evenly between each other.

IRE Scale – An oscilloscope scale that applies to composite video levels. Typically there are 140 IRE units in one volt (1 IRE = 7.14 mV).

K – An abbreviation for kilobyte. A kilobyte is 1,000 bytes. In computer memory sizes, the numbers are rounded down. e.g. 1k byte = 1024 bytes.

Kilohertz – **kHz** – Thousands of Hertz, or a frequency rate in units of thousands of cycles per second. For example, CGA's horizontal scan rate is 15.75 kHz or 15,750 hertz (Hz).

LED – Light-Emitting Diode

Level Control – The Level Control on selected Extron interface products is similar to the Contrast Control on a data monitor. It can either increase or decrease the output voltage level of the interface to the connected data monitor or projector. This results in greater or less contrast in the picture.

Low Impedance – The condition where the source or load is at a lower impedance than the characteristic impedance of the cable. Low source impedances are common; low load impedances are usually fault conditions.

Luminance – This is the signal that represents brightness in a video picture. Luminance is any value between black and white. In mathematical equations, luminance is abbreviated as "Y".

M – **Mega** – An abbreviation for megabyte. A megabyte is 1024K, or roughly a million bytes (1,048,076 to be exact [1024 x 1024]).

Matrix – In A/V, an electronic device used to collect and distribute video (and sometimes audio) signals. See matrix switcher.

Matrix switcher – In audio/video, a means of selecting an input source and connecting it to one or more outputs. A Matrix switcher would normally have multiple inputs and multiple outputs.

MHz (as in 8 MHz) – An abbreviation for megahertz. This is a unit of measurement and refers to a million cycles per second. Bandwidth is measured in megahertz.

Milli – **m** – Abbreviation for one thousandths. Example: 1 ms = 1/1000 second.

Monitor – (A) A TV that may receive its signal directly from a VCR, camera or separate TV tuner for high quality picture reproduction. It may not contain a channel selector. (B) A video display designed for use with closed circuit TV equipment. (C) Device used to display computer text and graphics.

Non-Interlaced – Also called progressive scan – a method by which all the video scan lines are presented on the screen in one sweep instead of two (also see interlaced).

NonVolatile memory – Memory that retains data when power is turned off.

NTSC – **National Television Standards Committee** – Television standard for North America and certain countries in South America. 525 lines/60 Hz (60 Hz Refresh).

Output – The product of an operation by a device going to some external destination, such as another device, a video screen, image or hard copy.

PAL – **Phase Alternate Line** – The phase of the color carrier is alternated from line to line. It takes four full pictures for the color to horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors, the reason the hue control is not needed on PAL TV sets. PAL, in its many forms is used extensively in Western Europe.

PCB – **Printed Circuit Board**

Peak-to-Peak – abbreviated **p-p** – The amplitude (voltage) difference (as displayed on an oscilloscope) between the most positive and the most negative excursions (peaks) of an electrical signal.

Peaking – A means of compensating for mid and high frequency RGB Video Bandwidth response in data monitors and projectors and for signal losses due to cable capacitance. When using the Peak enhancements, use the following guidelines for proper output settings: Use 50% with all computer frequencies between 15-125 kHz at any cable length. Use 100% with high frequency computers of 36 kHz or higher with cable lengths 75 feet or greater.

Pincushion – The inward or outward (curved) appearance of the edges of a display.

Pin-out – An illustration or table that names signals, voltages, etc. that are on each pin of a connector or cable.

Plenum Cable – Cable having a covering that meets the UL specifications for resistance to fire.

PLUGE – **Picture Line Up Generation Equipment** – This is a name of a test pattern that assists in properly setting picture black level. PLUGE can be part of many test patterns. The phrase and origination of the test signal are both credited to the BBC.

Power – **Electrical** – The dissipation of heat by passing a current through a resistance. Measured in Watts (W), it is expressed by Ohm's law from the two variables: Voltage (E) and Current (I). i.e. $P = I^2xR$, or, $P = E^2/R$ or $P = ExI$

Resolution – The density of lines or dots that make up an image. Resolution determines the detail and quality in the image.
A) A measure of the ability of a camera or television system to reproduce detail.
B) In video, generally called horizontal resolution. It can be evaluated by establishing the limit to which lines can be distinguished on a test pattern. A larger resolution value means a broader frequency band of the video signal.
C) A measure of the greatest amount of detail that can be seen in an image. Often incorrectly expressed as a number of pixels in a given line; more correctly it is the bandwidth.

RGB – **Red, Green, Blue** – The basic components of the color television system. They are also the primary colors of light, not to be confused with Cyan, Magenta, and Yellow, the primary pigments. Also called the "Additive Color Process".

RGB Video – A form of color video signal (red, green, blue) distinctly different from the composite color video used in standard television sets. RGB can be displayed only on a color monitor that has a separate electron gun for each of these primary colors. Some color television sets use only one gun. RGB monitors are noted for their crisp, bright colors and high resolution.

RS-170A – EIA technical standard NTSC color TV.

RS-232 – An Electronic Industries Association (EIA) serial digital interface standard specifying the electrical and mechanical characteristics of the communication path between two devices using D-type connectors. This standard is used for relatively short range communications and does not specify balanced control lines.

RS-422 – An EIA serial digital interface standard which specifies the electrical characteristics of balanced voltage digital interface circuits. This standard is usable over longer distances than RS-232 Although originally designed for use with 9-pin and 37-pin, D-type connectors, it is often used with others, including 25-pin D-types. It is also used as the serial port standard for Macintosh computers. This signal governs the asynchronous transmission of computer data at speeds of up to 920,000 bits per second.

SECAM – **Sequential Couleur Avec Memoiré** – Translated as “Sequential Color with Memory”. A composite color transmission system that potentially eliminates a need for both a color and hue control on the monitor. One of the color difference signals is transmitted on one line and the second is transmitted on the second line. Memory is required to obtain both color difference signals for color decoding. This system is used in France, Africa, Asia and many Eastern European countries.

Serial Port – An output on the computer that allows it to communicate with other devices in a serial fashion – data bits flowing on a single pair of wires. The serial port is most often used with RS-232 protocol.

SMPTE – **Society of Motion Picture and Television Engineers** – A global organization, based in the United States, that sets standards for base-band visual communications. This includes film as well as video standards.

SMPTE Pattern – The video test pattern made up of color, black and white bands used by television stations.

Software – The programs used to instruct a processor and its peripheral equipment.

Switcher – Term often used to describe a special effects generator; a unit which allows the operator to switch between video camera signals. Switchers are often used in industrial applications to switch between video camera monitoring certain areas for display on a monitor, or system of display devices. These kinds of switchers do not have sync generators.

Sync – In video, a means of synchronizing signals with timing pulses to insure that each step in a process occurs at exactly the right time. For example: Horizontal Sync determines exactly when to begin each horizontal line (sweep) of the electron beam. Vertical Sync determines when to bring the electron beam to the top-left of the screen to start a new field. There are many other types of sync in a video system. (Also called Sync Signal or Sync Pulse.)

S-VHS – A high band video recording process for VHS that increases the picture quality and resolution capability. See S-Video.

S-Video – The composite video signal is separated into the Luminance (Y) and the Chrominance (C).

Terminal – A device typically having a keyboard and display that is capable of sending text to and receiving text from another device, a network, etc.

Termination – A load, or impedance at the end of a cable or signal line used to match the impedance of the equipment that generated the signal. The impedance absorbs signal energy to prevent signal reflections from going back toward the source. In the video industry, termination impedance is typically 75 ohms.

Vertical Interval – The synchronizing information which is presented between fields, and then signals the picture monitor to return to the top of the screen to start another vertical scan.

Y – In video, “Y” is an abbreviation for Luminance.

Z – A symbol for impedance.

Written and Printed in the U.S.A.
MAV 84/128 User's Manual
68-346-01 Rev A
79-11

The following icons may be used in this manual:

 _____ *Important information – for example, an action or a step that must be done before proceeding.*

 _____ *A Warning – possible dangerous voltage present.*

 _____ *A Warning – possible damage could occur.*

 _____ *A Note, a Hint, or a Tip that may be helpful.*

 _____ *Possible Electrostatic Discharge (ESD) damage could result from touching electronic components.*

 _____ *Indicates word definitions. Additional information may be referenced in another section, or in another document.*

MAV 84/128 Switchers
User's Manual

Chapter One
Introduction to the MAV 84/128

What is a MAV 84/128 Switcher?

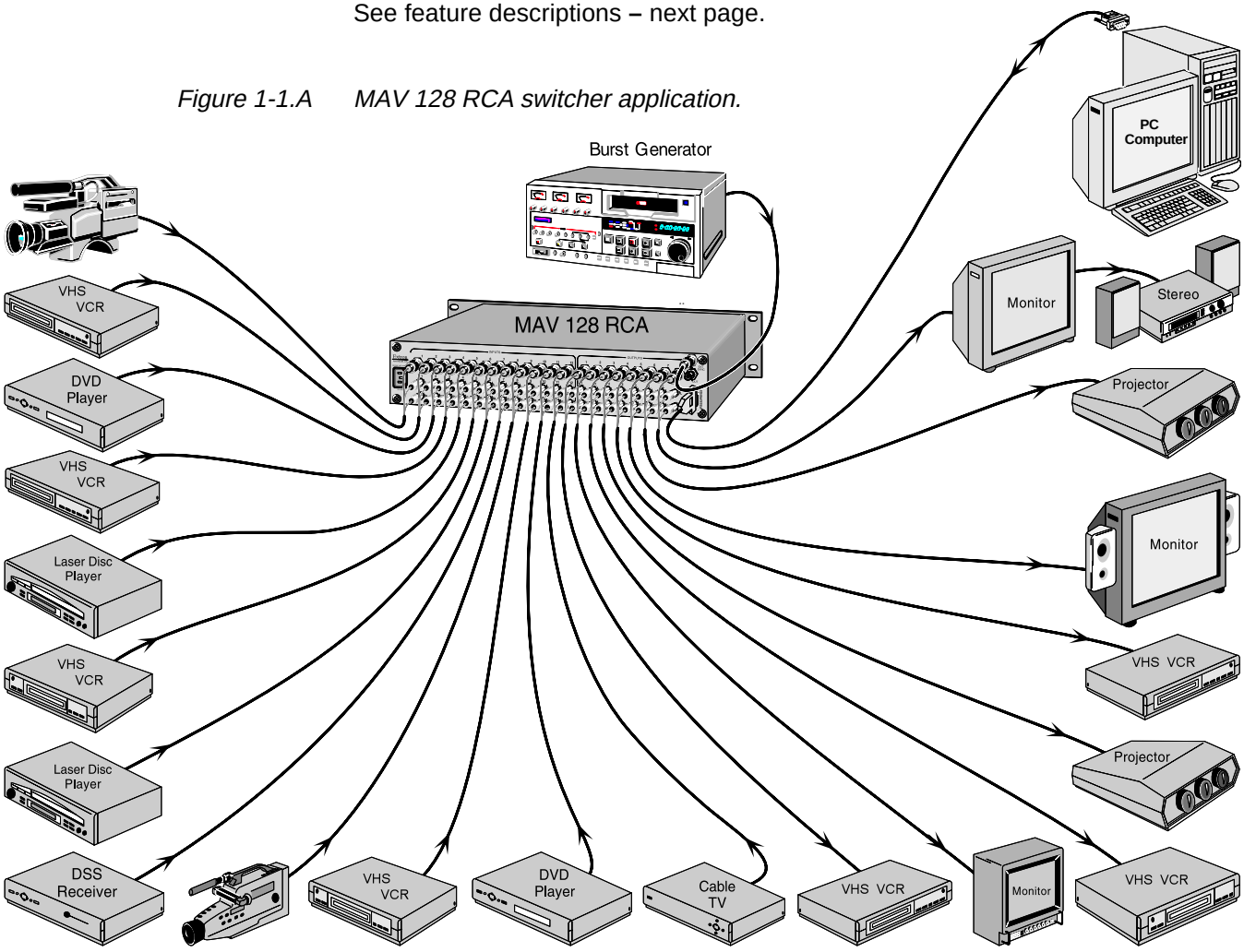
The MAV 84 RCA and MAV 128 RCA (MAV 84/128) switchers provide matrix switching for composite video and unbalanced stereo audio configurations. Any one of the inputs can be switched to any one or all of the outputs and audio follow/break-away is supported.

Standard Features

- *Independent matrix switching outputs*
- *Microprocessor control, with memory*
- *12 Memories for storing preset configurations*
- *RS-232/RS-422 (serial port) control*
- *NTSC, PAL and SECAM Composite Video compatible*
- *Audio/Video break-away supported*
- *External Sync for Vertical Interval Switching*
- *80 MHz (-3dB) Video Bandwidth*
- *100 kHz Audio Bandwidth*
- *75 ohms video input impedance*
- *25k ohms audio input impedance*
- *QuickSwitch™ Front Panel*
- *Left and right (stereo) Audio*
- *Audio Gain/Attenuation adjustable for each Input*
- *Rack Mountable Metal Enclosure*
- *Internal 110-240 volts, 50/60 Hz switch mode power supply*

See feature descriptions – next page.

Figure 1-1.A MAV 128 RCA switcher application.



Microprocessor Control – A Front Panel Microprocessor enables the MAV 84/128 to be programmed from a host system, or from the front panel. It uses memory to store up to twelve preset configurations. Nonvolatile memory prevents loss of configuration information when power is off.

Memory – The current I/O configuration, audio level settings and configuration presets are stored in nonvolatile memory. As new configurations are developed, they may be stored as presets (up to a total of twelve) in the configuration memory. Any preset may later be recalled - instantly configuring the switcher to the desired configuration. Memory contents remain valid after power is removed normally or due to a power failure.

RS-232/RS-422 – The MAV 84/128 can be controlled by any remote control system or computer with serial communications capability (i.e. AMX, Crestron, Dataton).

Audio Break-away – The Audio Break-away feature enables the user to program video and audio from the same input source to be switched independently. This allows the MAV 84/128 to add audio from one input source to video from a different input source. This can be done from the front panel or remotely through the RS-232/RS-422 port.

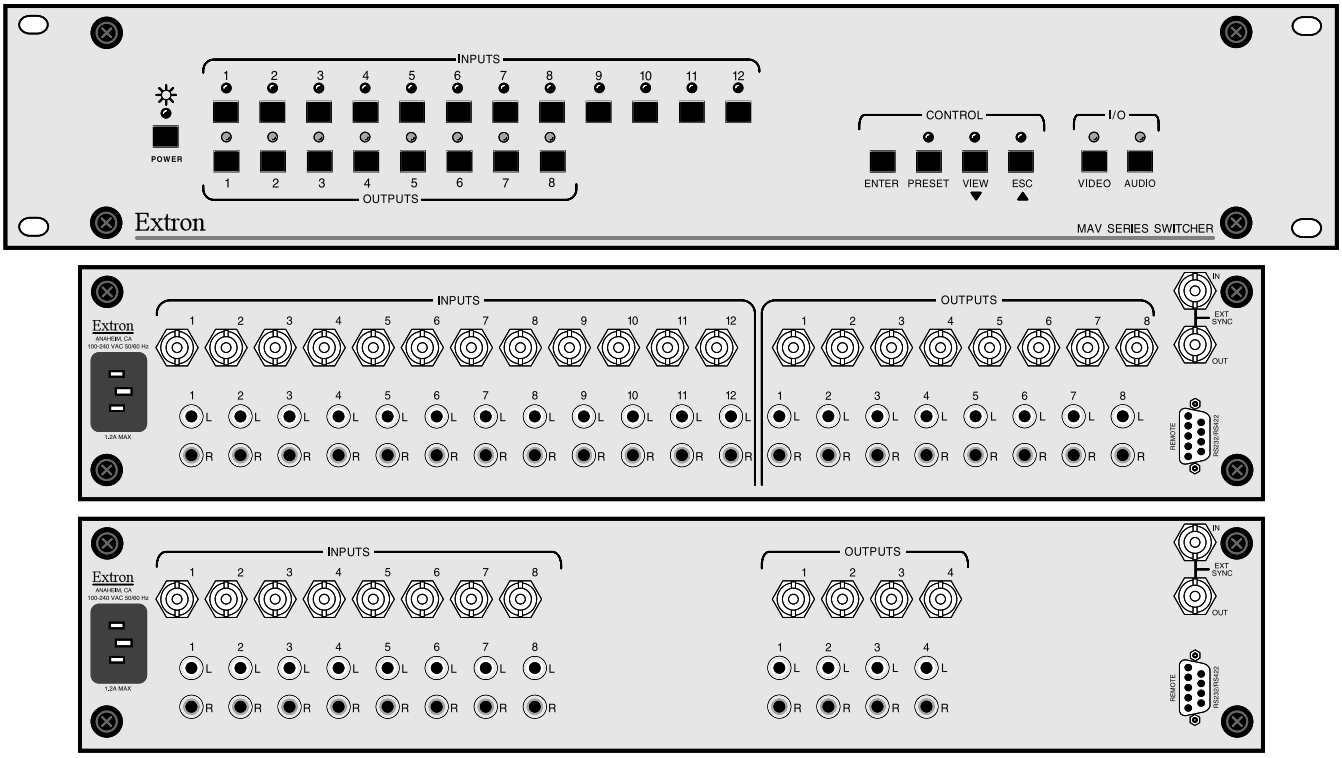
Vertical Interval Switching – The MAV 84/128 Series Switchers include broadcast quality NTSC/PAL/SECAM video circuits (with External Sync In/Out connectors). The video signal is switched during the vertical interval using an external reference timing source to provide clean, seamless switching between inputs.

Audio Level Control – Audio gain or attenuation can be set input by input, with a range of **–**15 dBu to +9 dBu, using MAV 84/128 front panel buttons or from an external RS-232/RS-422 control device.

Rack Mount Kit – The MAV 84/128 Series Switchers are housed in metal enclosures which are rack mountable in any conventional 19" wide, 2U high rack.

QuickSwitch™ Front Panel Controller (QS-FPC) – The QuickSwitch FPC is a standard feature of the MAV 84/128 and enables push-button input and output selection, as well as saving and recalling "preset" configurations. The front panels of the MAV 84 RCA and the MAV 128 RCA are identical. (See Front Panel in Figure 1-2.A below.)

Figure 1-2.A MAV 84/128 front panel is shown below (top) with the rear panels below (MAV 128 above the MAV 84).



MAV 84/128 Switcher Specifications

Power	*100 - 240 VAC, 50/60 Hz, 30 Watts*
Dimensions	*17" W, x 9.5" D, x 3.5" H (excluding connectors)*
	43.2 cm x 24.1 cm x 8.9 cm
Shipping Weight	*17 lbs (7.7 kg)*
Operating Temperature	*0° C - 40° C*
Warranty	*2 years parts and labor*
	(see warranty details, inside back cover)

Video

Video input:

connectors	*BNC type*
nominal signal level	*1 V p-p*
maximum level	*2 V p-p*
impedance	*75 ohms*
return loss	*-30 dB at 5 MHz*
superimposed DC	*1.5 V*
external sync	*3-4 V p-p (vertical interval switching)*

Video throughput:

gain	*unity*
bandwidth	*80 MHz, -3dB*
frequency response	*less than ± .1 dB to 30 MHz*
differential phase error	*0.01º , 0 to 10 MHz*
differential gain error	*0.01%, 0 to 10 MHz*
crosstalk isolation	*-50 dB at 5MHz*

Video output:

connectors	*BNC type*
nominal signal level	*1 V p-p*
maximum level	*2 V p-p*
impedance	*75 ohms*
return loss	*-30 dB at 5 MHz*
DC offset	*± 5mV maximum*

Audio

Audio input:

connectors	*RCA*
nominal input level	*+8 dBu, unbalanced*
maximum input level	*+15 dBu, unbalanced*
input impedance	*25k ohms, unbalanced*
common mode rejection	*no less than 80 dB, 20 Hz - 20 kHz*

Audio throughput:

gain	*-15 dBu to +9 dBu unbalanced*
frequency response	*± 0.05 dB, 20 Hz - 20 kHz*
bandwidth	*100 kHz at -3 dB*
signal-to-noise ratio	*no less than 80 dB, 20 Hz - 20 kHz*
crosstalk isolation	*no less than 80 dB, 20 Hz - 20 kHz*
total harmonic distortion	*0.015%, worse case, 20 Hz - 20 kHz*

Audio output:

connectors	*RCA*
nominal output level	*+8 dBu, unbalanced*
maximum output level	*+15 dBu, unbalanced*
output impedance	*50k ohms, capable of driving 600 ohms*

Control System Specifications

serial control port	*RS-232 or RS-422*
connector	*9-pin female D connector*
baud rate	*9600*
protocol	*8-bit, 1 stop bit, no parity*

Chapter Two
Rear Panel Connections

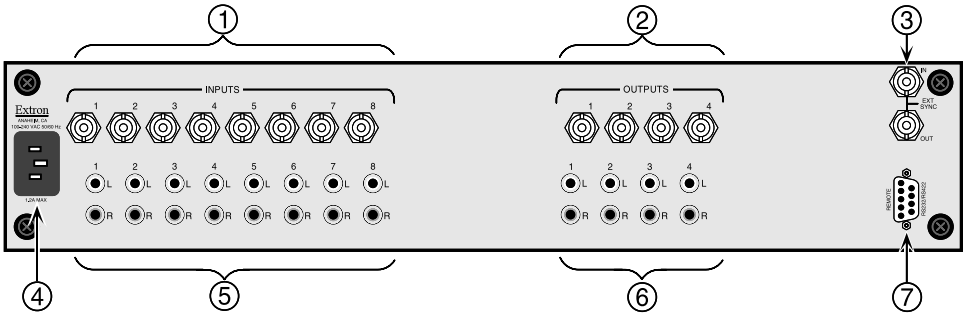
MAV 84/128 Cable Connections

The Mav 84/128 switchers use BNC type connectors for input and output composite video connections and for the external sync (EXT SYNC) input and output. RCA type connectors, two per input/output, are used for audio inputs and outputs.

MAV 84 RCA Switcher

The MAV 84 RCA switcher can have up to 8 inputs and up to 4 outputs, video and/or audio. It can also have an external sync timing input, the sync timing output connector may be used to pass the sync signal on to another device. An RS-232/RS-422 connection to a host device such as a PC enables software control of the switcher. A MAV 84 RCA rear panel is shown in Figure 2-1.A.

Figure 2-1.A MAV 84 RCA switcher rear panel



1. 8 Video input BNC connectors
2. 4 Video output BNC connectors
3. 2 external sync BNC connectors (1 = input sync, 1 = output sync)
4. Standard IEC AC power connector
5. 8 pairs - input audio RCA connectors
6. 4 pairs - output audio RCA connectors
7. RS-232/RS-422 9-pin female D connector

A MAV 84 RCA switcher is shown with typical input and output devices in Figure 2-1.B. A PC computer (Host) is used to control the switcher through the RS-232/RS-422 port. The Burst Generator outputs a reference signal which is used by the MAV 84 to synchronize input switching during the vertical interval. This allows for seamless switching transitions between inputs, eliminating the rolling or glitches which would otherwise be seen.

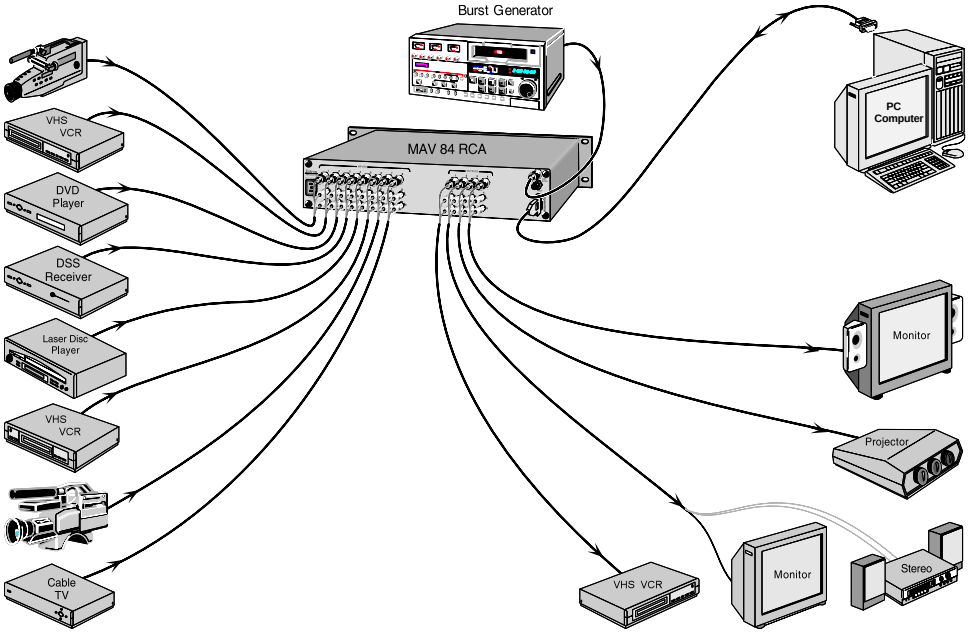
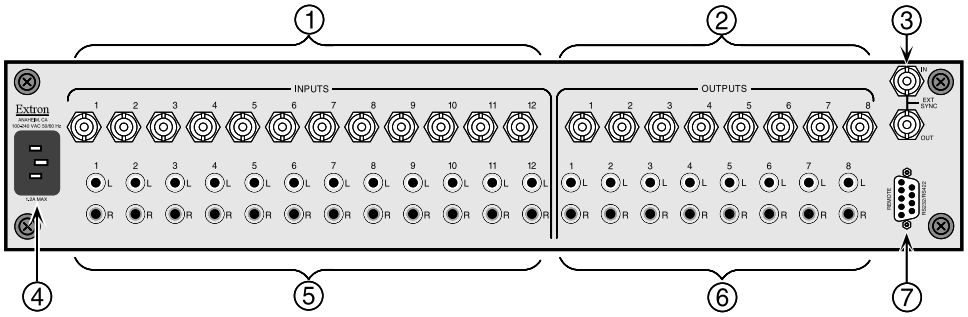


Figure 2-1.B MAV 84 configuration diagram

MAV 128 RCA Switcher

The MAV 128 RCA switcher can have up to 12 inputs and up to 8 outputs, video and/or audio. It can also have an external sync timing input, the sync timing output connector may be used to pass the sync signal on to another device. An RS-232/RS-422 connection to a host device such as a PC enables software control of the switcher. A MAV 128 RCA rear panel is shown in Figure 2-2.A.

Figure 2-2.A MAV 128 RCA switcher rear panel



1. 12 Video input BNC connectors
2. 8 Video output BNC connectors
3. 2 external sync BNC connectors (1 = input sync, 1 = output sync)
4. Standard IEC AC power connector
5. 12 pairs - input audio RCA connectors
6. 8 pairs - output audio RCA connectors
7. RS-232/RS-422 9-pin female D connector

A MAV 128 RCA switcher is shown with typical input and output devices in Figure 2-2.B. A PC computer (Host) is used to control the switcher through the RS-232/RS-422 port. The Burst Generator outputs a reference signal which is used by the MAV 128 to synchronize input switching during the vertical interval. This allows for seamless switching transitions between inputs, eliminating the rolling or glitches which would otherwise be seen.

The only difference between the MAV 128 RCA and the MAV 84 RCA is the number of inputs and outputs supported.

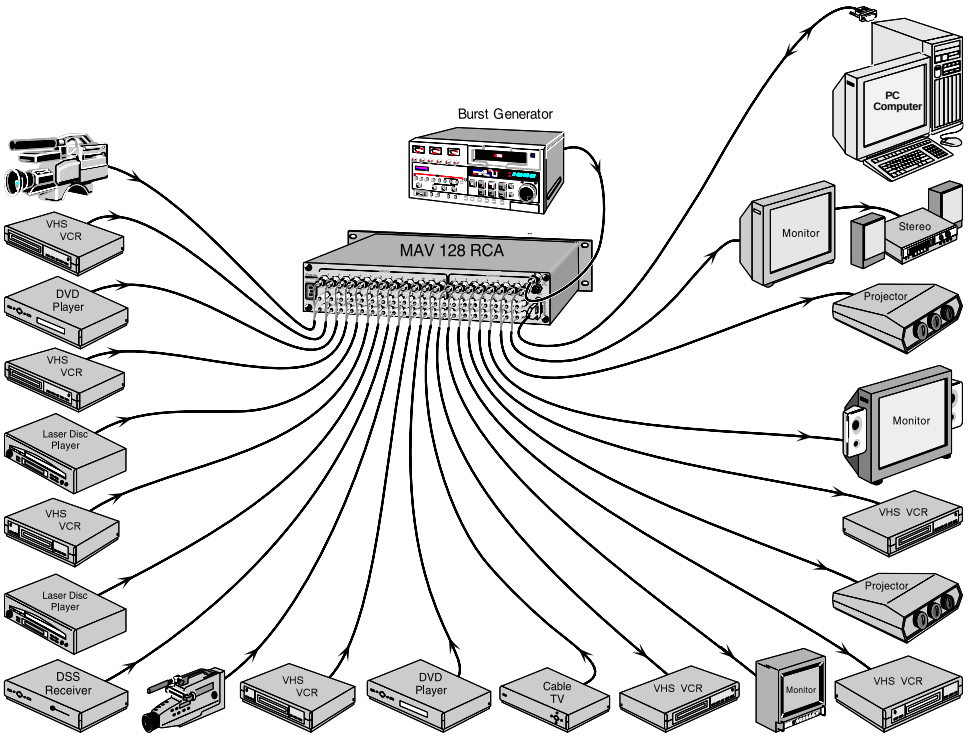


Figure 2-2.B MAV 128 configuration diagram

RCA and BNC Connectors

Installing or removing an RCA connector requires that you first determine whether you have a standard or locking type.

⚠ *Pulling hard on an installed, locked RCA plug will damage both the plug and the receptacle.*

To install a standard (non-locking) RCA plug, align the plug with the receptacle and push in. To remove a standard RCA plug, pull it out.

The locking style RCA plug "locks" onto the female RCA connector. When installed properly, they will not come off accidently.

To install a locking style RCA plug do the following:

1. Loosen the barrel by unscrewing it from the base to the point where the barrel end is even with the end of the gold collar. (see Figure 2-3.A)
2. Push the connector into the female connector on the MAV 84/128 rear panel. (The barrel end should be flush with the panel surface, as shown in Figure 2.3.A)
3. Holding the connector in place (the end of the barrel against the panel surface), screw the barrel onto the base until it is tight. (It will not screw on as far as it did before it was plugged onto the female.)
4. The locking connector should be securely attached to the female connector, if not, repeat the above steps.
5. When removing the RCA plug from the rear panel, simply unscrew the barrel. This reverses the "locking action of the plug and at the same time pushes the plug away from the female connector.

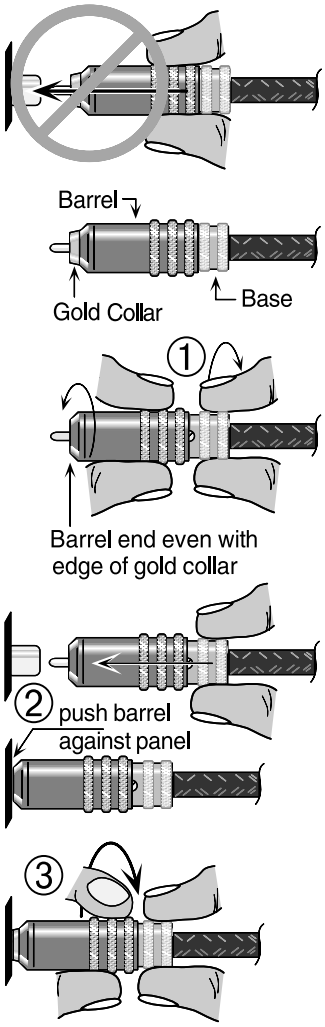


Figure 2-3.A
Locking RCA Plug

⚠ *Pulling on the cable will damage it. Always grasp the plug when connecting or disconnecting a cable.*

An RCA to BNC adapter enables cables with RCA style connectors to be connected to the MAV 84/128 BNC connectors (see Figure 2-3.B). The Extron part number for the RCA-BNC adapter is 10-264-01.

Figure 2-3.B
RCA-BNC Adapter

External Sync Connections

The MAV 84/128 can use an external signal to synchronize switching during the Vertical Interval.

Figure 2-4.A shows one way to connect an external sync timing source to one or more MAV 84/128 switchers. The EXT SYNC IN connector receives a timing signal. The OUT connector allows the signal to be passed on to another video device; it does not have to be connected for MAV 84/128 operation.

Figure 2-4.B is an example of another configuration for an external sync timing source connection to the MAV 84/128. In this example the timing source passes through three video cameras before connecting to the MAV 128 RCA. This type of video camera is capable of synchronizing with the external timing source for video editing applications.

If no external sync timing source is connected to the MAV 84/128, switching will occur immediately.

When switching between the inputs, we want the resultant change in image to be seamless, or clean. Without this locking feature, when switching between inputs, the result could be a brief rolling (sync loss) or a brief change in the picture size.

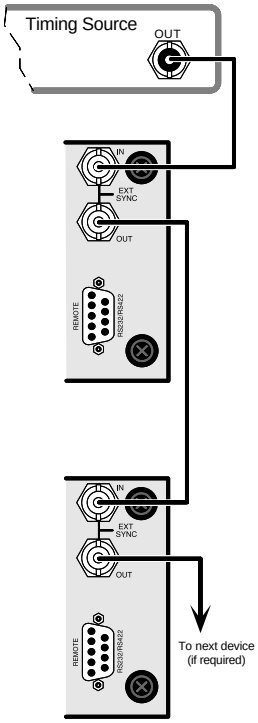


Figure 2-4.A MAV 84/128 External Sync Connections

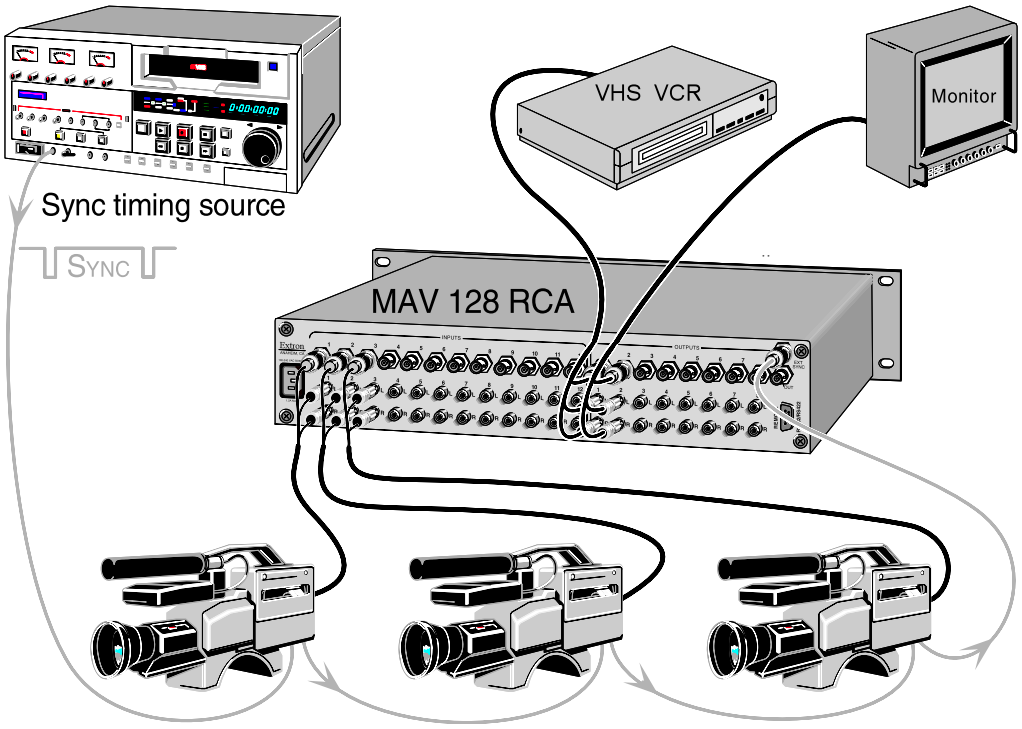


Figure 2-4.B MAV 128 External Sync Configuration

RS-232/RS-422 Connection

The normal configuration for the MAV 84/128 is for RS-232 control. If it is to be used with an RS-422 device, an internal cable must be moved. Pages A-1 and A-2 explain how this is done.

Figure 2-5.A shows a computer connected to a MAV 128 RS-232/RS-422 connector. The pinouts for the RS-232/RS-422 male and female connectors is shown.

See Chapter 4 for programming information and Chapter 5 for Windows Control software information.

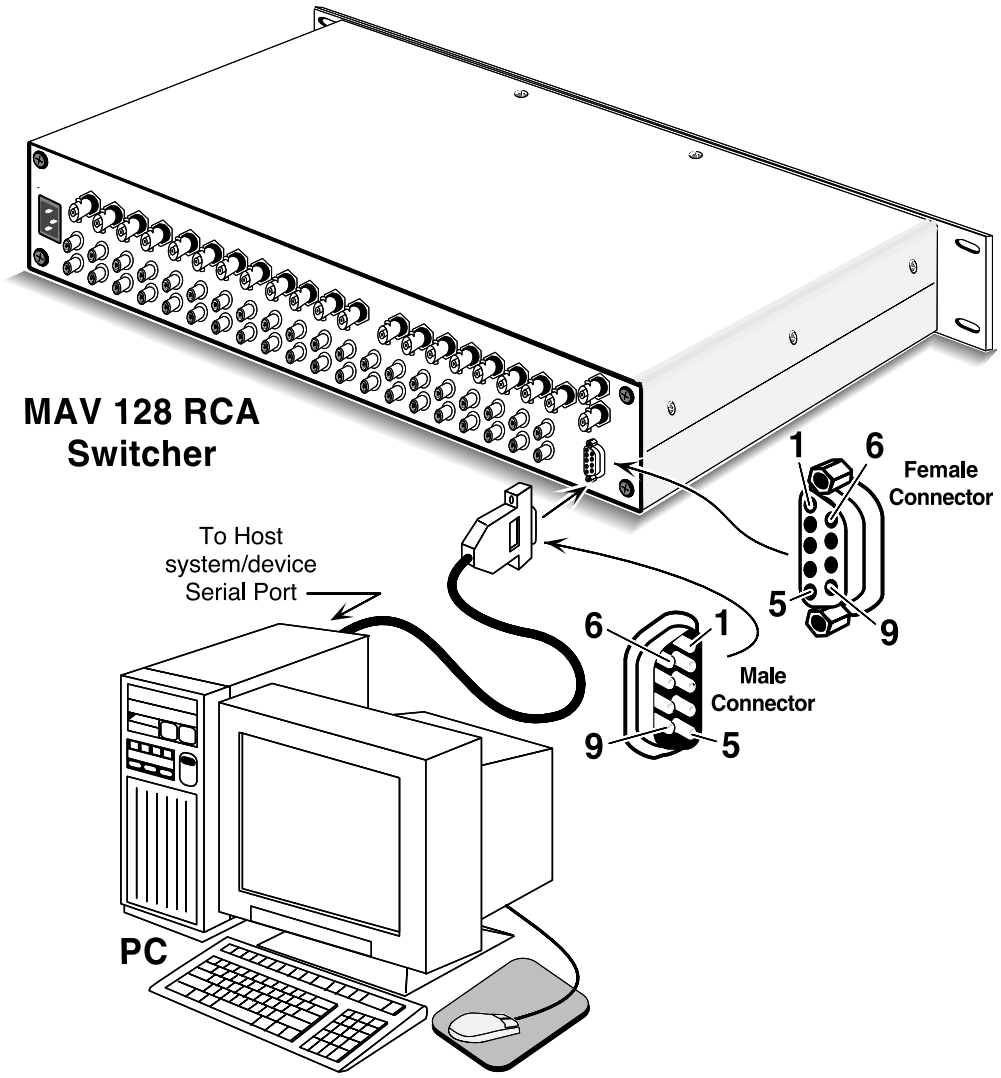


Figure 2-5.A MAV 128 RS-232/RS-422 connection to a PC computer

3

Chapter Three
Using the Front Panel

Front Panel Buttons and LEDs

The Front Panel Controls (Figure 3-1.A) are arranged with the POWER button, INPUT buttons, OUTPUT buttons and their LED indicators on the left side. The CONTROL buttons and LEDs, and the I/O AUDIO/VIDEO select buttons and LEDs are on the right side.

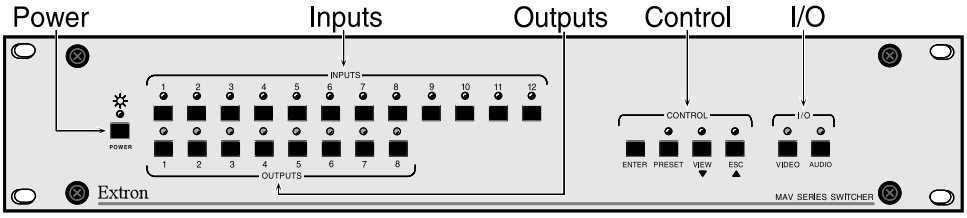


Figure 3-1.A MAV 84/128 Front Panel

The following descriptions may be used along with Figure 3-1.A to locate and understand the function of the Front Panel buttons and LEDs.

POWER Button and LED

The POWER button is used to turn the MAV 84/128 (and POWER LED) off and on. Turning power off with the POWER switch disables the switching circuits, however, internal voltages remain active even though the Power LED is in the "OFF" state (unlit).

When AC power is initially applied, the MAV 84/128 will power on automatically, the Power LED will indicate an "ON" state (lit) after a brief self-test. Each occurrence of AC power being connected/restored to the MAV 84/128 results in the execution of a self-test. If the self test is successful, the Power LED will be ON continuously, if the self test fails, the Power LED will blink a code, followed by a pause, and then repeat the code, etc. (see Page A-3 for additional details). In the unlikely event that a problem is indicated, call Extron Technical Support.

NOTES:

1. The Power switch does NOT turn AC OFF. Internal voltages are active when the power cord is connected to an AC source even though the Power LED is in the "OFF" state (unlit), however, the switching circuits are operational only when the Power LED is in the "ON" state (lit).

2. The current I/O configuration, audio level settings and configuration presets are stored in nonvolatile memory. The contents of this memory remain valid after power is removed normally or due to a power failure.

INPUT Buttons and LEDs

The twelve front panel buttons and LEDs bracketed and labeled INPUTS have two independent functions – to select/identify an input or to select one of twelve possible Presets. Preset selection, loading and activation will be discussed later.

The Front Panel is identical for both the MAV 84 and MAV 128 switchers. The MAV 128 has twelve input connectors, so any one of the twelve Input buttons may be selected. However, the MAV 84 only has eight input connectors, so Input buttons 1 – 8 would be the only valid Input selections. MAV 84 Input buttons 9 – 12 are used for Preset selection only.

Each input button and LED has a dual purpose: one is to select/identify an Input and the other is to select/identify a location within the Preset memory.

OUTPUT Buttons and LEDs

The eight front panel buttons and LEDs bracketed and labeled OUTPUTS are used to select outputs (one or more outputs may be selected). The output LEDs are also used to display the Audio Level of the selected input in Display Audio Gain Levels mode which will be discussed later.

The MAV 84 has four output connectors, so output buttons 1 – 4 are the only valid output selections, output buttons 5 – 8 are unused. Output LEDs 1 – 5 are also used for Audio Gain Levels, LEDs 6 – 8 are unused (MAV 84 only).

CONTROL Buttons and LEDs

ENTER – This button is used to save changes when setting up a configuration. To set up a configuration, press the desired Input button, press the desired Output button(s), and then press Enter. A configuration could consist of several input to output(s) connections. (Examples are shown on following pages.)

PRESET – Use the Preset button to save or retrieve a configuration. To save any current (active) configuration in the MAV 84/128 as a Preset (up to a total of twelve Presets), press and hold the button until the Preset LED begins to blink, indicating a tentative condition. While the preset LED is blinking, press the Input button for the desired Preset storage location. (For example, press Input button #5 to store the current configuration as Preset #5.) The LED for that Input will go ON briefly, and then both the Input LED and the Preset LED will go OFF. (LEDs for Outputs remain OFF.) The Preset has now been stored. There can be one preset assigned to each Input button, for a total of twelve – regardless of the number of available inputs or outputs.

VIEW – Press the VIEW button to enter a "view-only" mode as indicated by the VIEW LED turning ON. (The status of the I/O Video/Audio LEDs, which will be discussed later, determines what will be displayed in View mode.) When in the "view-only" mode, pressing any input button will turn ON the LED for that input along with the LEDs for all outputs that are connected to that input. Pressing any output button will cause the LED(s) for that output and the connected input (plus other outputs connected to that input) to go ON. View all input to output connections by pressing the output buttons one at a time.

When a button for an unassigned input is pressed, no output LEDs will turn ON. Pressing an unassigned output button will cause all unassigned outputs to be displayed (no inputs indicated = unassigned outputs).

A secondary function of the View button is to decrement the audio level value in the Audio Level view/adjust mode (covered later). The View LED doubles as an indicator of a negative (**–**) value in Audio Level view/adjust mode.

ESC – The Escape button is used to abort an operation and reset front panel LEDs for Inputs, Outputs and Controls (I/O Video/Audio LEDs are unchanged). The current active configuration, Preset memory and Audio Level settings are NOT reset by this button. The ESC LED goes ON for a brief period after the button is pressed.

A secondary function of the ESC button is to increment the audio level value in the Audio Level view/adjust mode (covered later). The ESC LED doubles as an indicator of a positive (**+**) value in Audio Level view/adjust mode.

I/O Select Buttons and LEDs

To configure the MAV 84/128, it is necessary to specify Video only, Audio only or Video and Audio before making a selection. When an I/O button (Video or Audio) is pressed, the LED above that button will toggle – if it was OFF, it will go ON – if it was ON, it will go OFF.

Audio Level Display/Adjust – If the Audio button is pressed/held until it begins to blink, audio level display/adjust mode is entered. If the Video LED was ON, it will go OFF. The current audio level setting for any input selected will be displayed by Output LEDs 1 – 5. Audio level display/adjust mode is covered later.

I/O Video/Audio LED Status – The following table summarizes the possible states of the Video and Audio LEDs and what each condition means. Button = button action required: PR = Press & Release, PHA = Press & Hold Audio button

Video	Audio	Button	Description
ON	OFF	PR	Ready to set or view video ties (connections).
OFF	ON	PR	Ready to set or view audio ties (connections).
ON	ON	PR	Ready to set or view video & audio ties.
ON	blinking	PR	Ready to set or view video ties (audio Break-away).
OFF	blinking	PHA	Ready to set or view audio gain.

Configuration Term Definitions

The following definitions will be important to understanding the internal configuring of MAV 84/128 switchers.

Tie – An input to output connection.

Set of Ties – An input connected to two or more outputs.

Configuration – May consist of one Tie, a set of Ties or Sets of Ties.

Active Configuration – The configuration that is currently being used (also called Configuration #0).

Preset – A configuration that has been stored. Up to twelve presets may be stored in memory. Input buttons 1 **–** 12 are used to select the desired Preset memory location to load or retrieve a Preset. When a Preset is retrieved from memory, it becomes the Active Configuration. There can be one preset assigned to each Input button, for a total of twelve – regardless of the number of available inputs or outputs.

All of the above defined operations can be accomplished through the Front Panel buttons or via the MAV 84/128 RS-232/RS-422 communications port.

Using the Front Panel Buttons and LED Indicators (Refer to Figure 3-4.A)

View a Tie. To view a tie, press and release the View button, then press and release the desired Input (or Output) button. See "Tie Displays/Video-Audio LED Status" below.

Using the View mode prevents changing configurations by accident.

When an Input or Output is selected, the results will depend on the Control and I/O LEDs. See "Tie Displays/Video-Audio LED Status" below.

Tie Displays/Video-Audio LED Status

- If the I/O Video/Audio LEDs are both OFF when an Input or Output is selected, NO LEDs go ON because the display is not set to show video or audio ties.
- If the Video and Audio LEDs are ON, the selected Input LED will go ON along with any Output LED(s) that are currently tied (Video & Audio) to that Input. If the Audio is not connected or is connected to different Output(s), the I/O Audio LED will blink to indicate Break-away Audio. To see the Break-away Audio Tie, Toggle the I/O Video LED to the OFF state and select the Input again.
- If only the Video LED is ON, the selected Input LED will go ON along with any Output LED(s) that are currently tied (Video & Audio or Video only) to that Input.
- If only the Audio LED is ON, the selected Input LED will go ON along with any Output LED(s) that are currently tied (Video & Audio or Audio only) to that Input.

To see all active configuration Ties, view each input or each output, one at a time, with the Audio and Video LEDs ON.

Configuring/Changing a Tie.

1. Press the ESC button to clear Input, Output or Control LEDs that may be ON.
2. Select desired I/O operation **–** Video, Audio or Video and Audio.
3. Select desired Input (or Output)
   - If a Tie or set of ties already exists, the LEDs for the connected Input and Output(s) will go ON.
   - If the Audio LED blinks and the Video LED is ON, it means that the Audio Ties are not the same as the Video Ties.
   - If no Tie exists, and an Input was selected, only the input's LED will go ON.
   - If an Output with no Tie was selected, only the output's LED will blink.
   - If an Input was selected, one or more Outputs may be selected. As each output is selected the LED for that Output will blink, indicating a tentative connection. LEDs for Output(s) which were already tied to the Input will be ON solid, they can be left ON along with any new blinking selections or toggled OFF.

Saving a Configuration in Preset Memory

The current active configuration may be saved as a Preset in any one of twelve Preset memory addresses. The configuration may consist of multiple ties. A Preset can be saved using the Front Panel controls or through the RS-232 port. RS-232 operations are covered in a later chapter.

To save a Preset using the Front Panel controls, press and hold the Preset button until the Preset LED begins to blink (it will go on and remain on for a couple of seconds before it begins to blink). Press the Input button that corresponds to the number (Preset memory location) that you want the preset to be saved in (each input number, 1 – 12, can be used as a Preset memory address). The LED for the selected Input number (Preset address) will go ON briefly, and then both the Input LED and the Preset LED will go OFF. The current active configuration is saved in the selected Preset memory address (Input number). The current configuration remains active until changed or until a different configuration is setup by recalling a different Preset.

Recalling a Preset

To Recall or activate a Preset that has been stored, press the Preset button once (briefly). The Preset LED turns ON. Press the Input button for the desired Preset address. That LED will turn ON briefly, and then both it and the Preset LED will go OFF. The Preset is recalled and the stored preset configuration becomes the current active configuration.

With Presets stored, the MAV 84/128 can be configured again without affecting the stored Presets. This means that there can be twelve matrix configurations stored as Presets, and a thirteenth one active. However, when a Preset is activated (recalled), it replaces the active configuration.

When a Preset is recalled, it becomes the active configuration (the replaced configuration is lost unless it was also a Preset).

Audio Level Display/Adjust Procedure

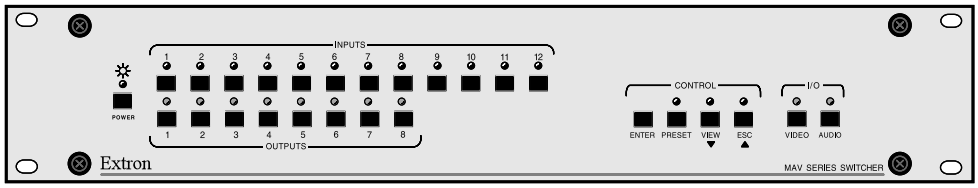
The Audio level for each input can be displayed and adjusted (range = –15 dB to +9 dB) from the MAV 84/128 front panel. To select Audio Level Display mode, press and hold the I/O Audio button until the Audio LED begins to blink, then release the button. While in this mode, some of the buttons and LEDs serve another function as follows.

- Output LEDs 1 – 5 display the audio level value.
- The ESC button is used to increase (▲) the audio level value.
- The ESC LED if blinking indicates a positive (+) audio level value.
- The VIEW button is used to decrease (▼) the audio level value.
- The VIEW LED if blinking indicates a negative (–) audio level value.

Output LEDs 1 – 5 each represent a portion (0 - 3) of the total Audio Level value as follows: Off = 0, blinking slow = 1, blinking fast = 2, ON solid = 3. The sum of the values represented by Output LEDs 1 – 5 is the Audio Level value, the ESC and VIEW LED status indicates the polarity. To adjust the Audio Levels while in Audio Display mode, select an input and use the ESC/VIEW buttons to change the level, repeat for other inputs if necessary. The Audio Level in memory is updated as changes are made. Press and release the Audio button to exit Audio Display/Adjust mode. The input Audio Level values remain valid for all configurations, they are not changed by recalled presets.

Examples of the previous descriptions follow on the next several pages.

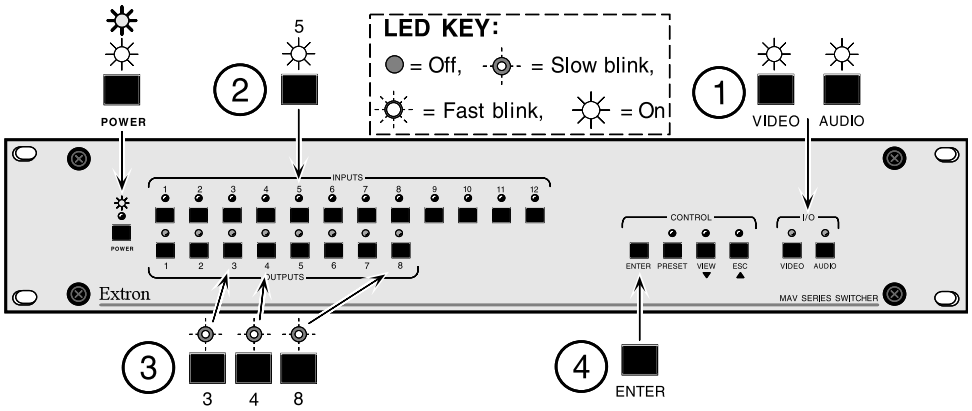
Figure 3-4.A MAV 84/128 Front Panel



For the following examples, if necessary, use the ESC button to clear Input, Output and Control LEDs. Press and release the button, the ESC LED will go ON for approximately 2 seconds and then go OFF.

Example #1: Configure the Ties for Input #5

1. Select I/O (Video, Audio or both). (Example shows both Video and Audio.)
2. Select the Input number. (Example shows Input #5.)
3. Select the Output(s) to be tied to the chosen Input. The Output LEDs will blink to indicate the tentative changes, or steady on to indicate a preexisting condition. (Example shows Outputs #3, 4 and 8.)
4. Press Enter to complete the operation. This configuration is now active.



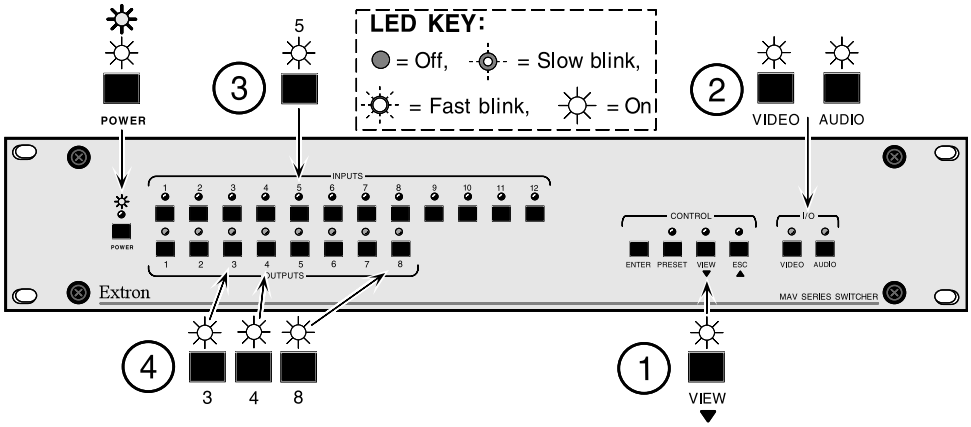
5. Repeat the above steps to tie other inputs to selected output(s). For example, you could tie Input #2 to Outputs #1 and #6; Input #9 to Output #2, 5 and 7.
6. Keep repeating this until the system configuration is complete. This configuration can be stored as a Preset (see Example #2).

If a selected output had been tied to another input, that tie will be broken in favor of the new one.

Example #2: View the Ties for Input 5

1. Select the View Mode. This prevents making accidental changes.
2. For this example, observe that both the Video and Audio LEDs will be ON.
3. Select the Input number (example shows Input 5). The LED(s) for Outputs 3, 4 and 8 will go ON to show that they are connected to Input 5. Likewise, pressing Output buttons 3, 4, or 8 will cause the LEDs to go ON for this set.

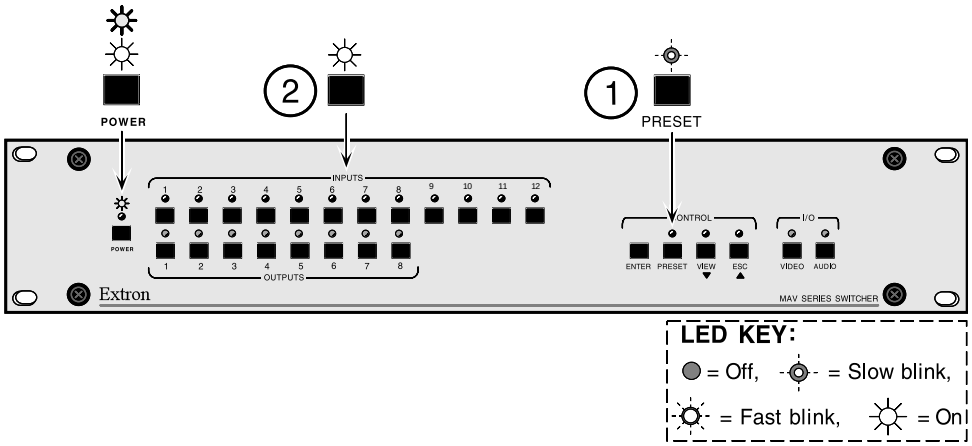
To see all connections (Ties) for the active configuration, View each input or each output, one at a time, with the Audio and Video LEDs ON.



If the Audio LED blinks and Video LED is on when displaying ties, it means that the Audio ties are not the same as the Video ties. (Break-away audio)

Example #3: Saving a Preset

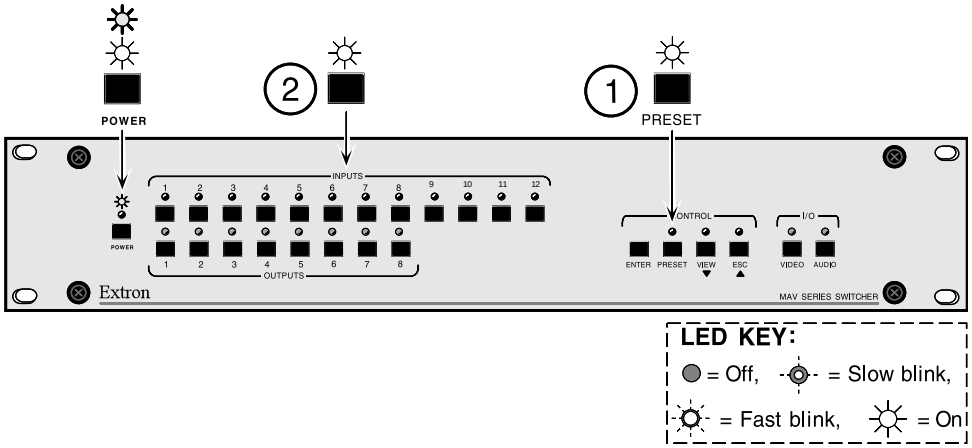
1. The current active configuration may be saved as a preset. To save a Preset, press and hold the Preset button (1), the Preset LED will go ON solid for approximately 2 seconds and then begin blinking to indicate that it is ready for the Preset memory address, release the Preset button.



2. Press and release the Input button that corresponds to the desired Preset Memory address. That Input LED will go ON briefly, and then both the Input and Preset LEDs will go OFF. The preset has been saved.

Example #4: Recalling (loading) a Preset

1. Any Preset can be recalled at any time. To recall a Preset, press and release the Preset button. The Preset LED will go ON.
2. Press and release the Input button that corresponds to the Preset memory address to be recalled. That Input LED will go ON briefly, and then both it and the Preset LED will go OFF. The preset has been loaded.
3. To view any of the ties for this Preset, go to Example #2.



NOTES:

1. When a Preset is recalled, it becomes the active configuration (the replaced configuration is lost unless it was also a Preset).

2. To abort Preset mode without saving or loading a Preset, press and hold the ESC button until the ESC LED goes ON briefly then goes OFF.

*3. A complete Preset cannot be displayed from the Front Panel. It must be recalled (activated), and then each output tie can be displayed separately. However, a complete Preset **can** be displayed through RS-232/422 control.*

Ties, Configurations and Presets

Given a MAV 84/128 with the input and output devices attached, as shown in the Work-sheet below, Ties can be made from an Input Source to one or more Output Destination(s) for a specific application. The resultant configuration, or "Set of Ties" can then be stored in memory to be used again. This is called a "Preset". The Input buttons, together with their LEDs are used to store, display, or activate the Presets.

NOTES:
1. The current I/O configuration, audio level settings and configuration presets are stored in nonvolatile memory. The contents of this memory remain valid after power is removed normally or due to a power failure.
2. The MAV 84/128 memory can store up to 12 Presets. In addition to the 12 Presets, a 13th configuration can be active. This is referred to as "configuration #0". Only video and audio ties are stored as presets; audio gain settings remain active, with configuration #0.

Only one configuration may be active at one time, and only one Tie (or set of Ties) may be viewed at one time. Therefore, the only way to view each of the stored Presets is to load (activate) each preset and then view each set of Ties in that configuration (as shown in Example #2).

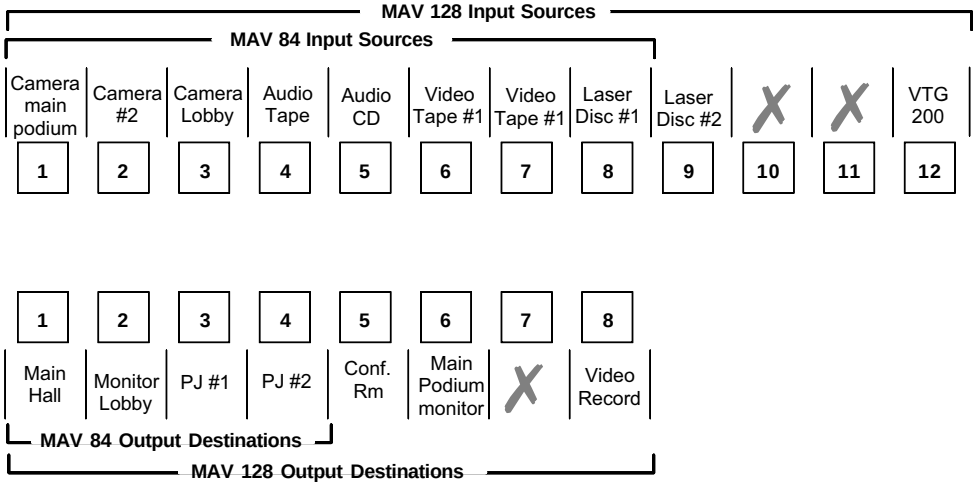
Unlike the Front Panel display, the Windows® PC software displays all the ties in a preset together. See Chapter 5 for details on the PC software.

Using Work-sheets to Define MAV 84/128 Configurations

Rather than try to remember the configuration for each preset, use Work-sheets to record this information. Make copies of the blank Work-sheets provided on Page 3-9 and use one for each Preset configuration. The forms are made to accommodate the MAV 84 or the MAV 128. Cross out all inactive inputs and outputs. Use different colors for Video and Audio.

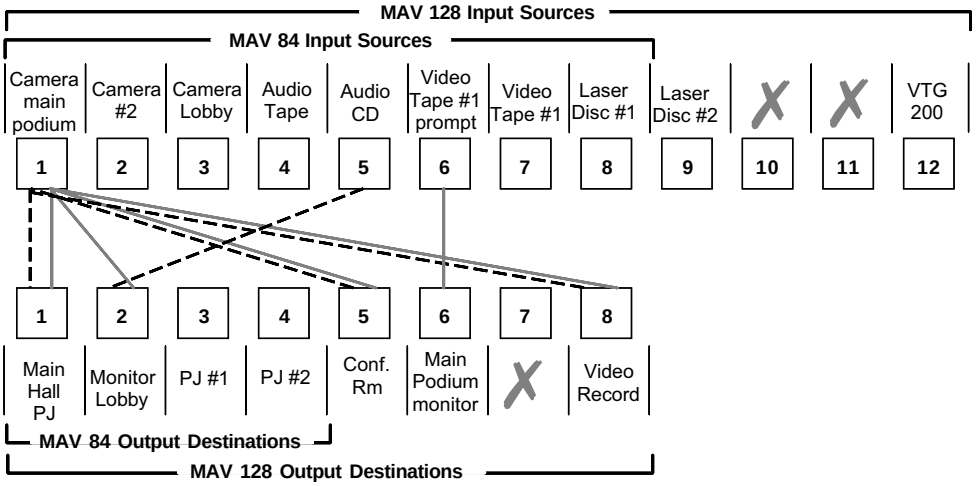
Configuration Work-sheet Example #5: Entering System Equipment

The illustration below shows a Work-sheet with the system hardware written in. Inputs 10 and 11, and Output 7 have nothing connected for this example, so they have been crossed out on the Work-sheet.



Configuration Work-sheet Example #6

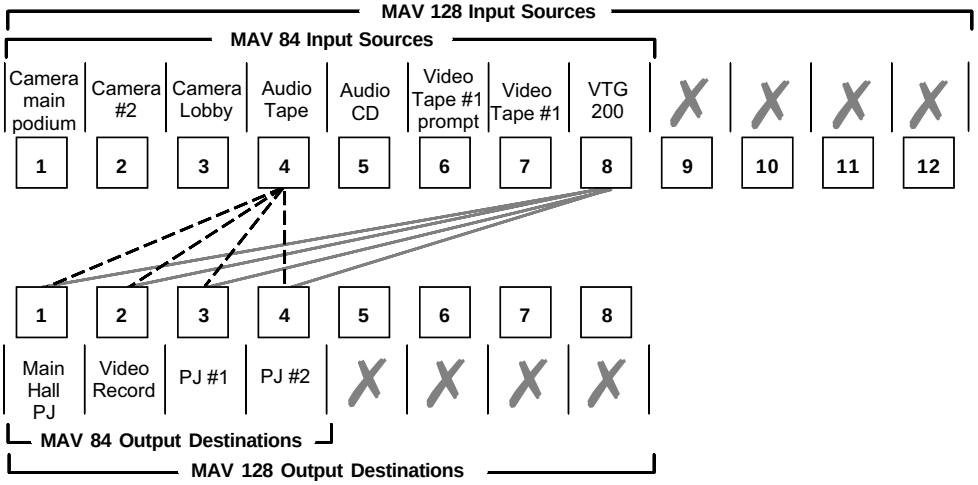
The system configuration form below shows a MAV 128 RCA with ties to five Outputs. Video and Audio are shown as separate lines. This configuration has been given a Preset number (#3) and a title to indicate its use.



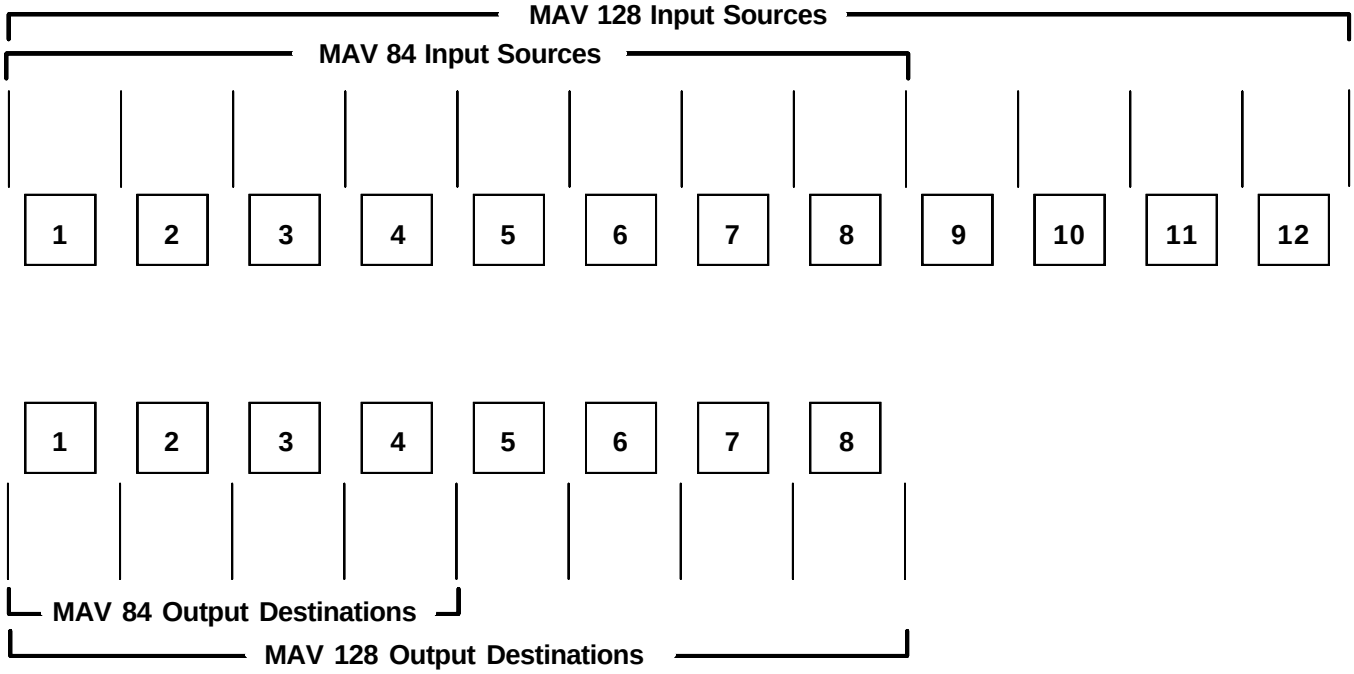
MAV 128 Configuration Worksheet
Preset # 3 Title: Tuesday a.m. config. Video: ——— Audio: – – –
Fill in the preset number and use colors, or dashes, etc. to make connecting lines.
Indicate if the configuration is for Video, Audio, or both.

Configuration Work-sheet Example #7

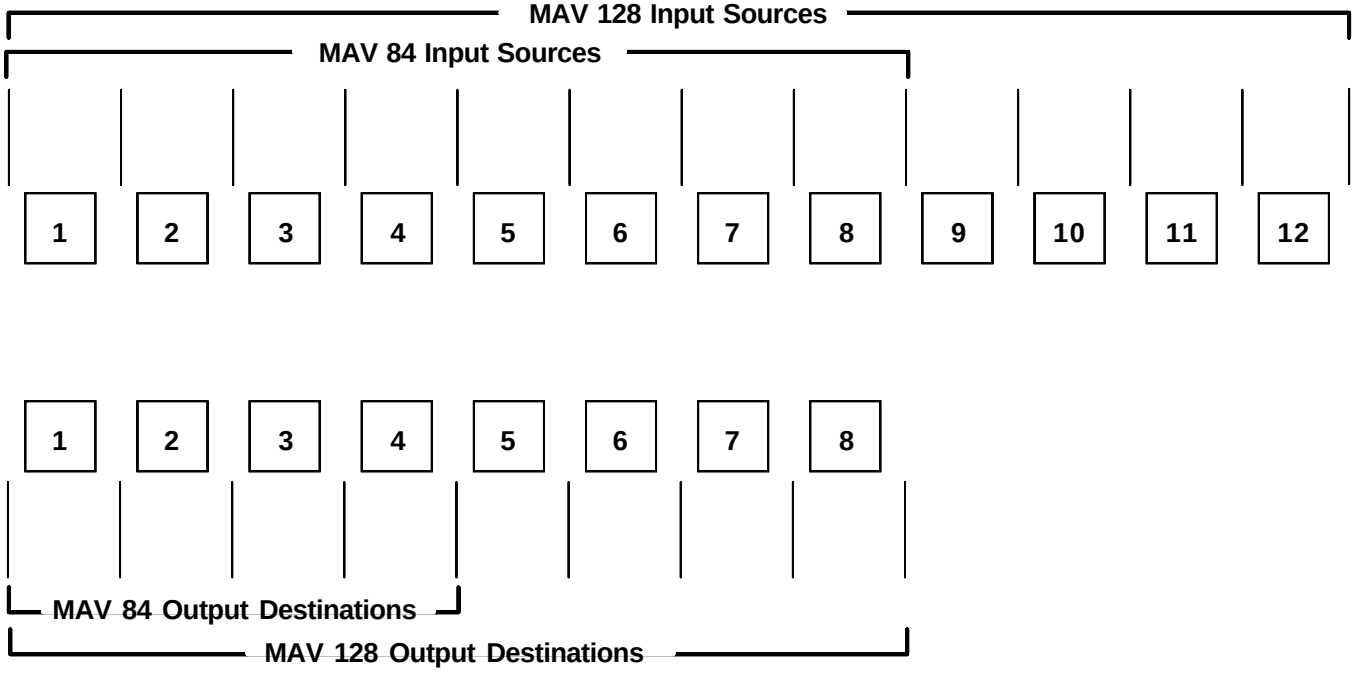
This example shows a MAV 84 RCA with an Extron VTG 200 video test pattern going to all four outputs. Audio, shown as dashed lines, comes from a tape deck and also goes to all four outputs. It has been given a Preset number of 6 and a title of “Test #1” to indicate its use.



MAV 84 Configuration Worksheet
Preset # 6 Title: Test #1 Video: ——— Audio: – – –
Fill in the preset number and use colors, or dashes, etc. to make connecting lines.
Indicate if the configuration is for Video, Audio, or both.



MAV_____ Configuration Worksheet
Preset # _____ Title: _____ Video: _____ Audio: _____
Fill in the preset number and use colors, or dashes, etc. to make connecting lines.
Indicate if the configuration is for Video, Audio, or both.

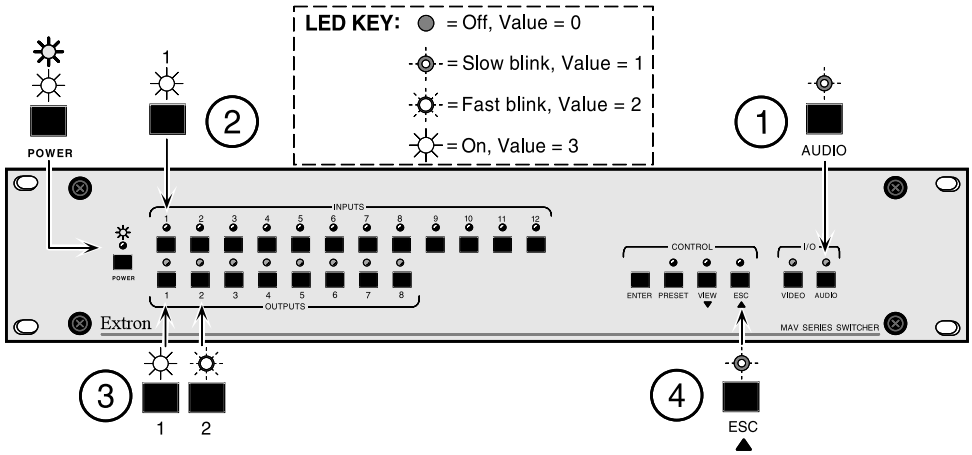


MAV_____ Configuration Worksheet
Preset # _____ Title: _____ Video: _____ Audio: _____
Fill in the preset number and use colors, or dashes, etc. to make connecting lines.
Indicate if the configuration is for Video, Audio, or both.

Example #8: Display Audio Input Levels

The Audio level for each input can be displayed and adjusted (range = –15 dB to + 9 dB) from the MAV 84/128 Front Panel. For this, some of the buttons and indicators serve another function. Use the procedure below to display any Audio Input Level.

1. To select Audio Level Display mode, press and hold the I/O Audio button until the Audio LED begins to blink then release the button.
2. Select the Input number, the LED above the selected Input goes ON. This example uses Input #1.
3 Output #1 LED is ON indicating a value of 3. Output LED #2 is blinking fast indicating a value of 2. The sum of the two values is 5.
4. The ESC LED is blinking slow indicating a positive value. The Audio level for Input #1 is +5. Press and release the I/O Audio button to exit Audio Level Display mode.



NOTES:

1. A secondary function of the View button is to decrement the audio level value in the Audio Level Display/Adjust mode. In this mode the View LED functions as an indicator of a negative (–) value.

2. A secondary function of the ESC button is to increment the audio level value in the Audio Level Display/Adjust mode. In this mode the ESC LED functions as an indicator of a positive (+) value.

3. To exit Audio Level Display/Adjust mode, press and release the I/O Audio button. All LEDs (except Power) go OFF.

4. There is only one Audio Level setting per Input (left & right audio channels for that input share the one setting).

5. The current I/O configuration, audio level settings and configuration presets are stored in nonvolatile memory. The contents of this memory remain valid after power is removed normally or due to a power failure.

An example of adjusting the audio level is shown on the next page.

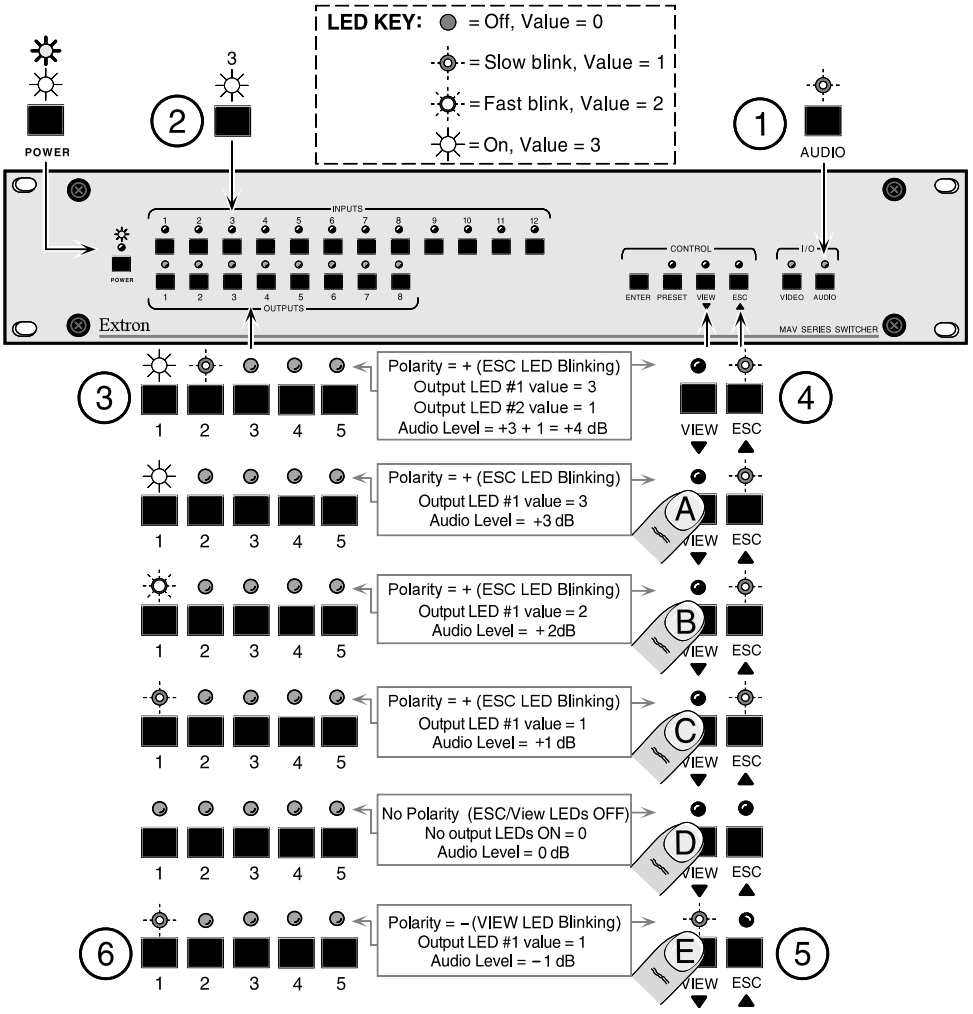
Example #9: Set Audio Input Levels

The Audio Level for each input can be adjusted from the MAV 84/128 Front Panel. Use this procedure to adjust the levels.

1. Press and hold the I/O Audio button until its LED begins to blink, release the button.
2. Select the desired Input number. This example uses Input 3.
3. The current audio level is displayed by Output LEDs 1 - 5.

   Output LED #1 ON = 3
   Output LED #2 Blinking slow = 1
   Output LEDs #3 - #5 OFF = 0
   Total value = 3 + 1 = 4
4. The polarity is displayed by the View LED **(–)** and the ESC LED **(+)**. For this example, the ESC LED is Blinking indicating a positive value (+4 dB).
5. To adjust the audio level to –1, press and release the View button five times as illustrated below (steps A - E). Note the Output, View and ESC LED changes that occur each time the View button is pressed and released.
6. The Output LEDs now indicate a value of –1 dB. The Audio Level setting in memory was updated as the changes were made. To exit Audio Level Display/Adjust mode, press and release the I/O Audio button. All LEDs (except Power) will then go OFF.

Audio Level settings are not stored with presets, but remain with the configuration that is currently active.



Chapter Four

Programming Guide

Serial Communications Port

The RS-232/RS-422 connector is used to connect a MAV 84/128 to a host, or external controlling device, such as a computer or control panel that can generate the proper command codes and recognize the responses. Figure 4-1.A shows a PC (host) connected to the RS-232/RS-422 connector of a MAV 128 RCA with connector Pinouts.

The normal configuration for the MAV *84/128 is for RS-232 control. If it is to be used with an RS-422 device, an internal cable must be moved. Page A-2 explains how this is done.*

The RS-232/422 connector on the MAV 84/128 is a 9-pin D female with the following pin designations:

Pin	RS-232	Description	RS-422	Description
1	–	not used	Tx(-)	Transmit Data (-)
2	Tx	Transmit Data	Tx(+)	Transmit Data (+)
3	Rx	Receive Data	Rx(+)	Receive Data (+)
4	–	not used	Rx(-)	Receive Data (-)
5	Gnd	Signal Ground	Gnd	Ground
6	–	not used	–	not used
7	–	not used	–	not used
8	–	not used	–	not used
9	–	not used	–	not used

The protocol is 9600 baud, 8-bit, 1 stop bit and no parity.

Details for programming the MAV 84/128 from a Host system connected to the RS-232/RS-422 port are covered in this chapter.

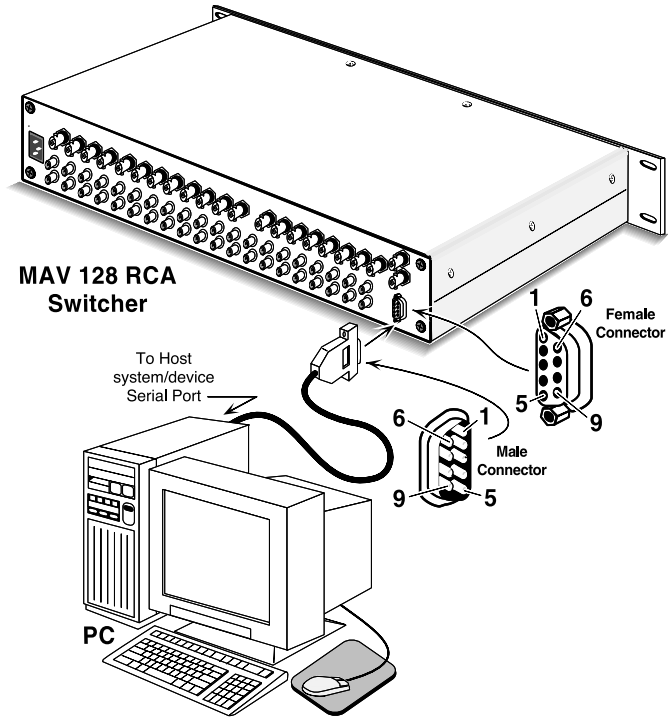


Figure 4-1.A PC computer connected to a MAV 128 RCA RS-232/RS-422 port.

Host-to-MAV 84/128 Instructions

The MAV 84/128 will recognize certain ASCII characters as instructions. The MAV 84/128 responds to those characters with appropriate information. Unrecognizable codes will get an error code response.

Error Codes

The error code response has the format "Exx". Following is a list of possible error code responses that could result from a Host sending a command to a MAV 84/128.

Code	Description
EØ1↵	Invalid input channel number (not there)
EØ5↵	MAV is OFF, can't execute the command.
E1Ø↵	Invalid command
E11↵	Invalid preset number
E12↵	Invalid output number
E13↵	Value too large (invalid parameter value)
E14↵	Illegal command for this configuration

MAV-Initiated Messages

When a local event takes place, such as a Front Panel operation, the MAV 84/128 responds by sending a message to the Host. These MAV 84/128 initiated messages are listed below.

Message	Description
(C) COPYRIGHT 1997, EXTRON ELECTRONICS MAV 84/128, Vx.xx ↵	The AC power has been applied. (x.xx is the software version number.)
RECONFIG↵	Enter button has been pressed, meaning a Front Panel operation has occurred. An Audio Gain adjustment has been completed, or a preset has been recalled.
SYS1↵	The Front Panel button has turned the MAV 84/128 On.
SYSØ↵	The Front Panel button has turned the MAV 84/128 Off.

No response is expected from the host, but, for example, the host program may want to request new status.

The MAV 84/128 Command/Response table is shown on Page 4-3.

The following symbols are used in the table on the following page.
Ø = Symbol for zero, so as not to be confused with "o" or "O".
· = Symbol for a single space (·), this may not show on your display.
↵ = Symbol for carriage return/line feed (does not appear on display)
X0 = Ø or 1, Ø = OFF, 1 = ON (Defines ON/OFF status of MAV 84/128)
X1 = Input Number (1 thru 8 or 12) (Used as input # and Max # of inputs)
X2 = Output Number (1 thru 4 or 8) (Used as output # and Max # of outputs)
X3 = Ø thru maximum number of inputs (Ø = muted)
X4 = Ø thru 9 (1Ø steps of audio gain - 1 db/step)
X5 = 1 thru 15 (15 steps of audio attenuation - 1 db/step)
X6 = Numeric value (-15 thru +9) (dB)
X7 = Preset number Ø - 12, where Ø = current configuration.
X8 = Preset number 1 - 12
X9 = Controller software version number to 2nd decimal place

Command/Response Table

Definitions and Abbreviations:
↵ = Carriage return/line feed
· = Symbol for a space
Ø = Symbol for zero

[X0] = Ø or 1, Ø = OFF, 1 = ON
[X1] = Input Number (1 thru 8 or 12)
[X2] = Output Number (1 thru 4 or 8)
[X3] = Ø thru maximum number of inputs (Ø = muted)
[X4] = Ø thru 9 (1Ø steps of audio gain)
[X5] = 1 thru 15 (15 steps of audio attenuation)
[X6] = Numeric value (-15 thru +9)
[X7] = Preset number Ø - 12, where Ø = current configuration.
[X8] = Preset number 1 - 12
[X9] = Controller software version number to 2nd decimal place

Command Description	Host Code	Hex	MAV to Host Response
Tie Input ([X3]) to Output ([X2]), Audio & Video	[X3]*****[X2]!	[X3] 2A[X2]21	OUT[X2]·IN[X3]·ALL↵
Example:	1*****3!	31 2A 33 21	OUT3·IN1·ALL↵
Result:	Output #3 tied to Input #1, both audio & video.		
Tie Input ([X3]) to Output ([X2]), Audio only	[X3]*****[X2]$	[X3]2A[X2]24	OUT[X2]IN[X3]·AUD↵
Example:	12*8$	31 32 2A 38 24	OUT8·IN12·AUD↵
Result:	Output #8 tied to Input #12, audio only.		
Tie Input ([X3]) to Output ([X2]), Video only	[X3]*****[X2]**%**	[X3]2A[X2]25	OUT[X2]·IN[X3]·VID↵
Example:	7*****4%	37 2A 34 25	OUT4·IN7·VID↵
Result:	Output #4 tied to Input #7, video only.		
Set Gain for Audio Input ([X1]) to +dB value ([X4])	[X1]*****[X4]G	[X1]2A[X4]47	IN[X1]·AUD=[X6]↵
Example:	1*****2G	31 2A 32 47	IN1·AUD=+2↵
Result:	Set input #1 gain to +2 dB.		
Set Attenuation for Audio Input to -dB value	[X1]*****[X5]g	[X1]2A[X5]67	IN[X1]·AUD=[X6]↵
Example:	7*****1Øg	37 2A 31 3Ø 67	IN7·AUD=-10↵
Result:	Set input #7 gain to -10 dB.		
Turn MAV 84/128 ON	**<**	3C	SYS1↵
Turn MAV 84/128 OFF	**>**	3E	SYSØ↵
Save current configuration as Preset	[X8]**,**	[X8]2C	SPRE[X8]↵
Example: (Command character is the comma.)	9**,**	39 2C	SPRE9↵
Result:	Current ties are saved as Preset #9 (specified by [X8]).		
Recall a Preset (period character)	[X8]**.**	[X8]2E	RPRE[X8]↵
Example: (Command character is the period.)	5**.**	35 2E	RPRE5↵
Result:	Preset #5 (specified by [X8]) becomes active.		
Information request	I/i	49/69	V[X1]X[X2]·A[X1]X[X2]·SYS[X0]↵
Example:	i	69	V12X8·A12X8·SYS1↵
Result: V[X1]X[X2]= Video size, A[X1]X[X2] = Audio size, SYS[X0] = On/Off: MAV has 12 V & A inputs and 8 V & A outputs and is ON.			
Request part number	N/n	4E/6E	Nxx-xxx-xx↵
Example:	N	4E	N6Ø-238-Ø1↵
Result:	MAV 128 response is N6Ø-238-Ø1, MAV 84 response is N6Ø-238-Ø2.		
Query software version	Q/q	51/71	QVER[X9]↵
Example:	Q	51	QVER1.Ø2↵
Result:	The software version is 1.02.		
View Video output tie	V/v[X2]%	56/76[X2]25	OUT[X2]·IN[X3]·VID↵
Example:	v7%	76 37 25	OUT7·IN2·VID↵
Result:	Output 7 video is tied to Input 2 video.		
View Audio output tie	V/v[X2]$	56/76[X2] 24	OUT[X2]·IN[X3]·AUD↵
Example:	V3$	56 33 24	OUT3·IN6·AUD↵
Result:	Output 3 audio is tied to Input 6 audio.		
View Gain for Input	V/v[X1]G	56/76[X1]47	IN[X1]·AUD=[X6]↵
Example:	v4G	76 34 47	IN4·AUD=-2↵
Result:	Gain for Input #4 is -2 dB.		
View Preset configuration	V/v[X7]**.**	56/76 [X7] 2E	(Preset #Ø is the current configuration.)
Format: each position is an output, left = #1; right = #8	[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·VID·[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·[X3]·AUD↵		
Example:	V Ø**.**	56 3Ø 2E	2·2·9·12·12·12·1·1·VID·2·2·Ø·Ø·Ø·1·1·AUD↵
Result: The number of positions in the response will match the hardware configuration. (MAV 84 video = [X3]·[X3]·[X3]·[X3]·VID, etc.) Video = Input #2 is tied to Outputs #1 & 2; Input #9 to Output #3; Input #12 to Outputs #4, 5 & 6; Input #1 to Outputs #7 & 8. Audio = The same as Video ties except that Outputs #4, 5 & 6 have no connection (Ø).			

Code Reference List

Below is a list of codes used in commands and responses listed in numeric order, together with a general description. The "Cmd/Rsp" column indicates how the character is used:

Cmd - is a host command (or part of a command) to the matrix.

Rsp - is a matrix switcher response to the host.

Character	Cmd/Rsp	Dec	Hex	Function
!	Cmd	33	21	Delimiter to specify video and audio selection
$	Cmd	36	24	Delimiter to specify audio selection only
%	Cmd	37	25	Delimiter to specify video selection only
*	Cmd	42	2A	Separator for setting ties or gain.
,	Cmd	44	2C	Save current configuration as Preset.
.	Cmd	46	2E	Recall (activate) Preset.
Ø	Cmd/Rsp	48	3Ø	Numeric value of Ø
1	Cmd/Rsp	49	31	Numeric value of 1
2	Cmd/Rsp	5Ø	32	Numeric value of 2
3	Cmd/Rsp	51	33	Numeric value of 3
4	Cmd/Rsp	52	34	Numeric value of 4
5	Cmd/Rsp	53	35	Numeric value of 5
6	Cmd/Rsp	54	36	Numeric value of 6
7	Cmd/Rsp	55	37	Numeric value of 7
8	Cmd/Rsp	56	38	Numeric value of 8
9	Cmd/Rsp	57	39	Numeric value of 9
<	Cmd	6Ø	3C	Turn Switcher On (discrete)
>	Cmd	62	3E	Turn Switcher Off (discrete) (warning: Although the switcher is turned Off, power to the unit could be On.)
E	Rsp	69	45	An error code number follows
G	Cmd/Rsp	71	47	(view/set) audio Gain
I	Cmd	73	49	Request for Information
N	Cmd	78	4E	Request part number
Q	Cmd	81	51	Query Software version
V	Cmd	86	56	View audio/video ties and gain
V	Rsp	86	56	Video channel information follows
g	Cmd/Rsp	1Ø3	67	View/set negative gain (attenuation)
i	Cmd	1Ø5	69	Request for Information (Same as I.)
n	Cmd	11Ø	6E	Request part number. (Same as N.)
q	Cmd	113	71	Query Software version) (Same as Q.)
v	Cmd/Rsp	118	76	View ties/gain (Same as V.)

Notes

Chapter Five

Windows® Software Control

Extron MAV 84/128 Control Software

This chapter is dedicated to using Extron's Windows Control Program to control the MAV 84/128 via the RS-232/RS-422 port. The Extron supplied software "Matrix Switcher Control Program" runs in the Windows® operating system, version 3.1 or later. It works with the MAV 84/128 and other matrix switchers. Communication between the computer software and the MAV 84/128 requires connecting a PC computer COMM port to the RS-232/RS-422 Port on the rear panel of the MAV 84/128.

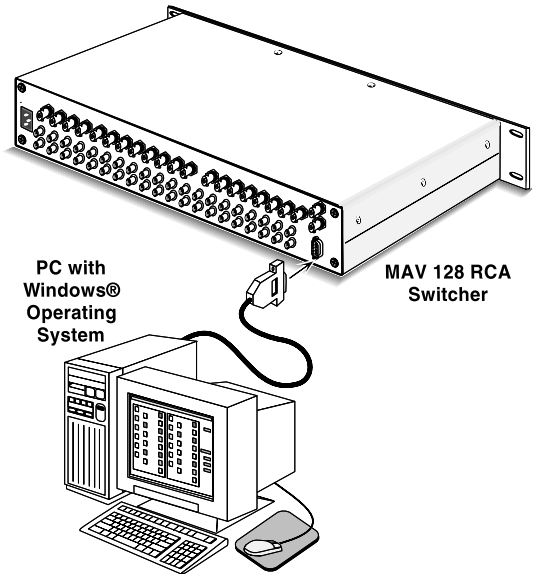
If your MAV 84/128 was previously setup for RS-422, and your PC Comm port uses RS-232, the MAV 84/128 must be changed to match the PC interface. To make this change, see page A-2.

1. Connect the PC's Comm port to the RS-232/RS-422 connector on the back of the MAV 84/128.
2. Power up the matrix and the PC and load Windows.

The floppy disk has instructions printed on the label. The software can be run from the floppy drive, or loaded onto the hard drive.

3. Installing the software from the 3.5" floppy disk onto the hard disk is like most other Windows programs. (Run Setup.exe from the floppy disk.)
4. This software was designed to control any MAV 84/128 and most other Extron matrix switchers, but its operation will be restricted to the features and configuration of your MAV 84/128.
5. Installation of the software creates a Program Group (Windows 3.1) or a Folder (if Windows 95®) called "Extron Electronics". Icons for the Control Program and the Help Program are installed in that group, or folder (Figure 5-1.B). This example is from Windows 3.1 and it includes Extron's VTG 200 Control Program; your system may not have the VTG 200 Software. (VTG = Video Test Generator)
6. Double-click on the "MATRIX Switcher Control Program" icon to start the program. You will be asked to select the Comm Port, or choose "Emulate" mode. After selecting the COMM port, the software looks for the matrix switcher, "reads" its configuration, and then displays it in a window called "Extron's MATRIX SWITCHERS Control program".

Figure 5-1.A. PC connected to MAV 128 RCA RS-232/RS-422 port.



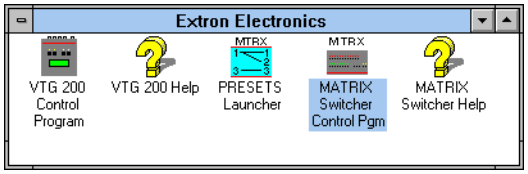


Figure 5-1.B. Extron's Program Group

Emulate mode allows you to exercise the software without having a switcher connected to the PC. It may also be used as a learning tool.

The number of inputs and outputs displayed match that of the MAV 84/128. At the bottom of the window there is a small box called "Group". If the box is selected, (X) the audio and video will have the same tie configuration (Audio Follow). If the Group box is not selected, the condition is called "Break-away".

7. Dragging an Input box to an Output box makes a tie; dragging that same Output back to the tied input removes the tie.

Help is available any time by opening the Help menu (page 5-4) or pressing F1.

To document the system configuration and make the control program easier to operate, you may click on an Input or Output box, which brings up a dialog box with appropriate icons. Selecting on an icon places it into the input/output box which you have selected. At the bottom is a text entry box called "Caption". Select it and type in a name for that input or output. (For example, the icon could be a video camera and the caption could be "North Hall".)

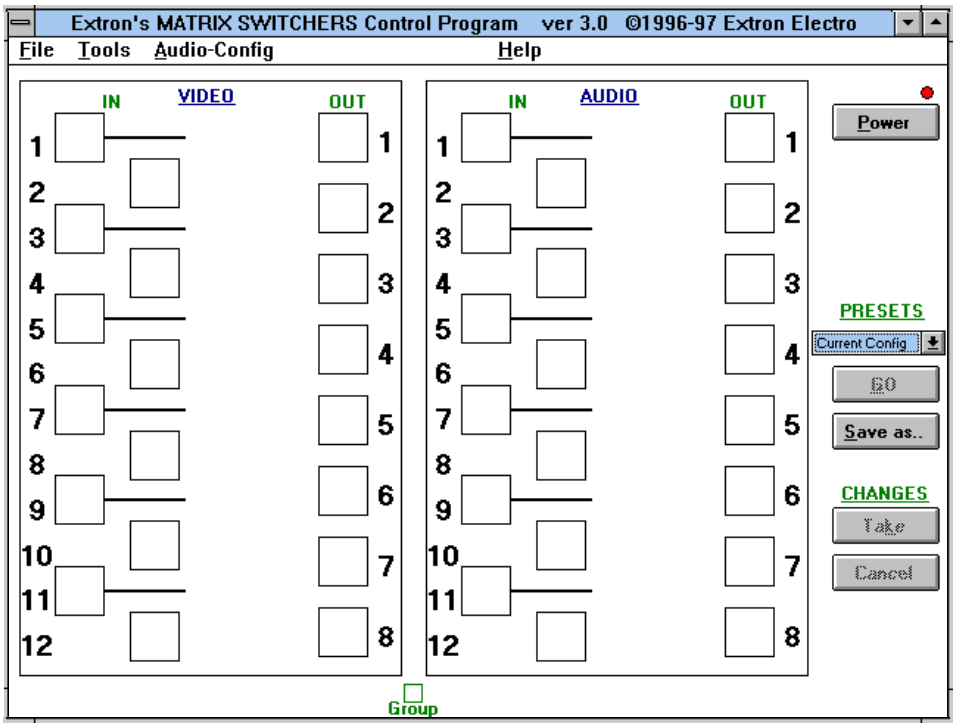


Figure 5-2.A. Example of a Blank Control Program Window

Window Buttons

Other functions of Extron's Windows® software include buttons on the right:

Power – in the upper-right corner. This is the same as the Power button on the matrix front panel. It turns the switching (ties) off or on. (When in the off position, power is present inside the matrix enclosure.)

Presets Menu – This displays a list of the twelve presets. A preset may be selected from this list and displayed in the window.

Go – Make this preset the current configuration. (Activate it.)

Save as.. – This button allows the current set of ties (on the screen) to be saved as a preset. (A dialog box appears, asking for the preset number.)

Changes - Take – If any change has been made to the displayed configuration, this button may be selected to save them.

Changes - Cancel – If any change has been made to the configuration, this button may be selected to cancel them. (Go back to the previous screen.)

Window Menus

File Menu – A complete set of twelve presets, plus the last active setting (preset #0) may be saved by the PC as a file. In fact, any number of such configurations may be saved as files. In turn, any of these files may be restored to the matrix (loaded and activated). A saved configuration file also includes: audio gain settings (if applicable), assigned icons and captions.

The File menu offers the above functions. The software prompts for file name and location.

The File menu also has “Print Tie Map”. This allows the set of ties on the screen to be printed.

Tools – This menu includes:

Assign Device Icons – The complete set of input and output device icons is displayed, allowing any to be dragged to the screen.

Show RS-232 Strings – displays the ASCII tie commands that make up the current configuration. (Useful only for RS-232 programming.)

Initialize – Allows for initialization and clearing any or all ties, icons, etc.

Immediate Changes or Hold/Verify Changes – These two choices determine whether to take the changes as they are made, or wait until later to decide to confirm the settings and save (Take), or abandon (Cancel) them.

Audio-Config – This displays a dialog box with the audio gain level settings. It also allows changes to be made, use of defaults, etc.

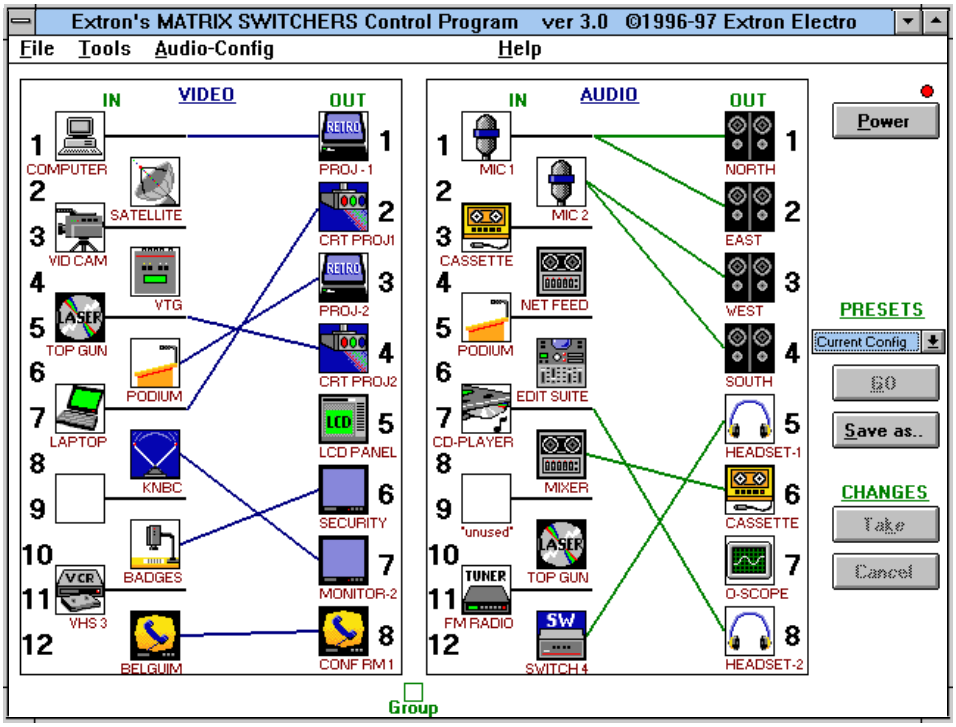


Figure 5-3.A An example of a MAV 128 Video and Audio configuration

MAV 84/128 Help

Double-click on the Help Icon (or press F1 at any time) to open the Help Window. Below is an example of what this might look like.

As with all Windows® Help files, clicking on the underlined words will give more detailed help.

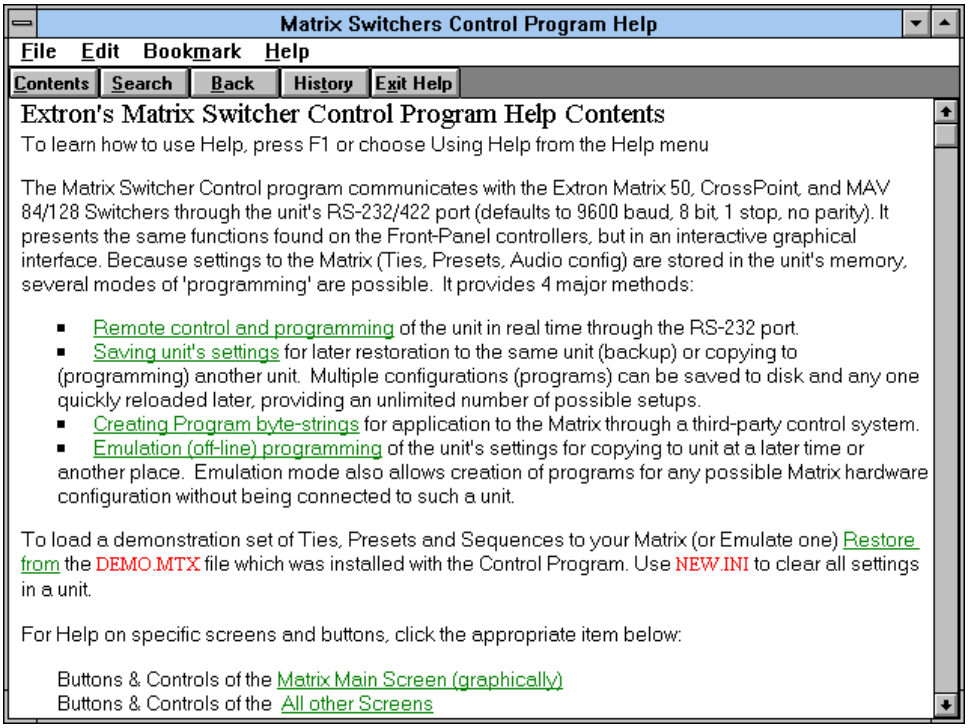


Figure 5-4.A Example of the MAV 84/128 Help Screen

Notes

Appendix A
Installation/Upgrade

Removing the MAV 84/128 Cover

Use this procedure to prepare the MAV 84/128 for making any hardware changes that require access to the inside of the unit.

1. Disconnect the power cord to remove AC power from the MAV 84/128.
2. If the MAV 84/128 is rack-mounted, remove it and place it on a clean work-space.
3. Remove the eight (8) screws that secure the MAV 84/128 top cover, three on two sides and two on the top. If you are “Installing A Software Update” remove two bottom cover screws as indicated in Figure A-1.A note.

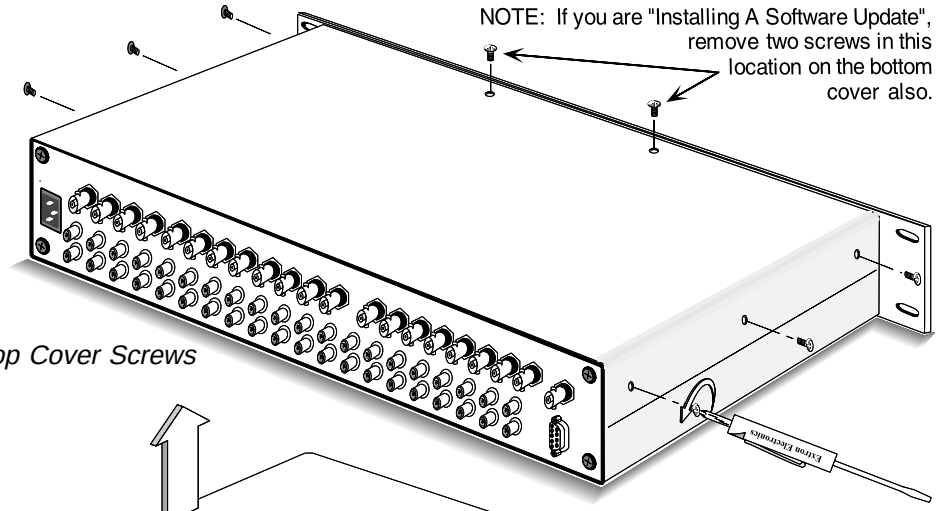


Figure A-1.A Top Cover Screws

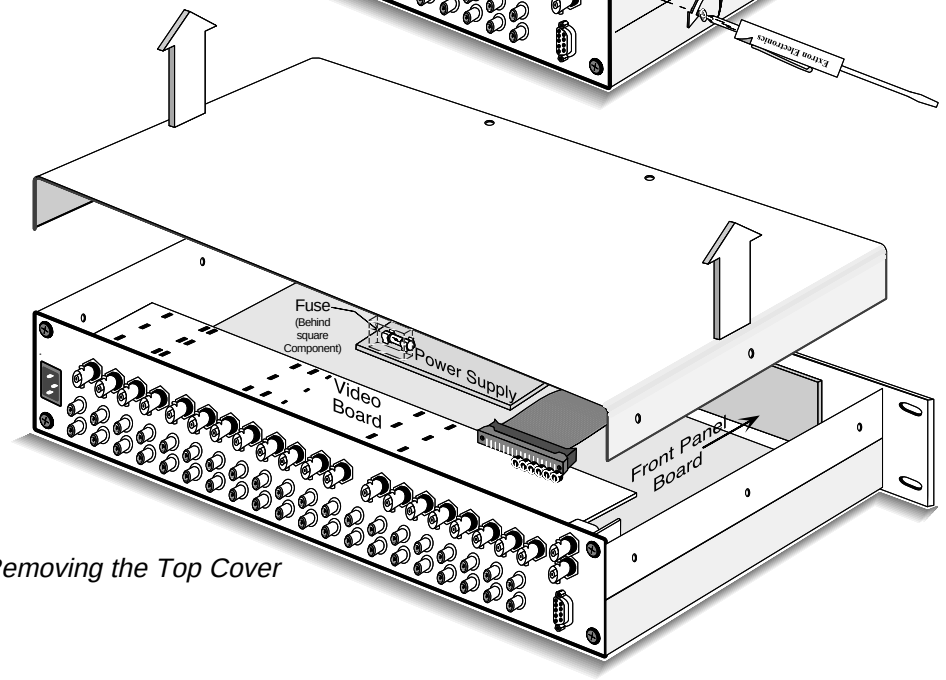


Figure A-1.B Removing the Top Cover

4. Lift the MAV 84/128 cover straight up to expose the internal components as shown in Figure A-1.B.

The cover has grooves that engage the edge of the rear panel. This is a snug fit, therefore you must lift the cover evenly.

5. Go to Page A-2 If you are “Swapping Serial Ports (RS-232/RS-422)” or “Changing the AC Fuse”. Go to Page A-3 if you are “Installing a Software Update”.
6. Return to this procedure and use it in reverse order as a guide for putting the MAV 84/128 cover back on.
7. After the MAV 84/128 cover is back in place, use Chapter 2 as a guide to connecting your video and audio equipment.

*The Power button on the front panel **only** disables the switcher – AC remains ON inside the cabinet. Before working inside, unplug the power cord.*

Ribbon Cable Connectors

The ribbon cables in the MAV 84/128 use a self-latching style Receptacle. Figure A-2.A shows how it operates.

1. Press each of the two tabs outward, this unlocks the receptacle and ejects the ribbon cable connector part way. Pull evenly on the ribbon cable connector to remove it.
2. When reconnecting the cable, first align the pins in the receptacle with the holes in the connector and press evenly into the receptacle until the receptacle tabs lock the connector in place.

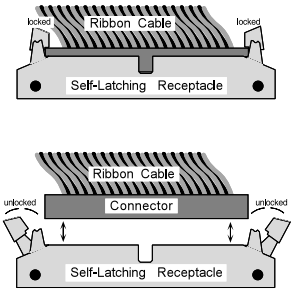


Figure A-2.A. Ribbon Cable Self-Latching Receptacle

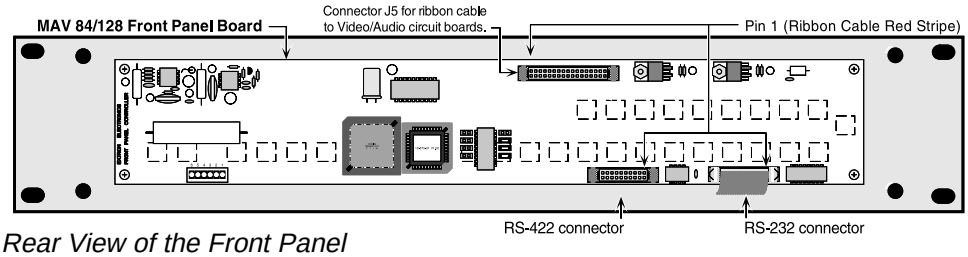


Figure A-2.B Rear View of the Front Panel

Swapping Serial Ports (RS-232/RS-422)

The MAV 84/128 is normally connected for RS-232 use. If your application requires RS-422, follow this procedure (and Figure A-2.B) to change the configuration. The procedure for removing and installing the ribbon cables is described above in “Ribbon Cable Connectors”.

1. With the top cover removed (previous page), locate the Front Panel board.
2. Looking from the rear, locate two ribbon cable receptacles (Figure A-2.B) One is empty and the other has a ribbon cable which goes to the Rear Panel. To the right is the RS-232 receptacle and to the left is the RS-422 receptacle. If the connection is not correct for your application, disconnect the cable and move it to the other receptacle.
3. Put the top cover back on by using the cover-removal procedure (Page A-1) in reverse order as a guide.

Changing the AC Fuse

1. Remove the MAV 84/128 cover (Page A-1), locate the fuse (behind another component) on the Power Supply board. (see Figure A-2.C.)
2. Remove and check the fuse (if test equipment is available).
3. Replace it **only** with a 2A/250V Fast-blow fuse.

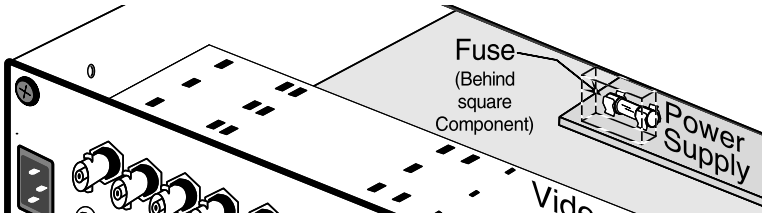


Figure A-2.C Power Supply Fuse Location

If you choose to check for power before putting the cover back on, be sure tools and hands are outside the MAV 84/128, and then connect the power cord to an AC source. The MAV 84/128 should power up without pressing the Power button. Unplug the AC power cord when finished.

Installing A Software Update

1. Go to page A-1 and remove the MAV 84/128 top cover. Also remove two (2) bottom cover screws mentioned in Figure A-1.A note. Remove four (4) front panel screws/washers. The front panel is now connected by two ribbon cables and the power cable. Make note of the location of the bottom ribbon cable, there are two front panel board connectors that it will fit in. Unplug the two ribbon cables at the front panel board (see "Ribbon Cable Connectors" on Page A-2). Unplug the power cable at the front panel board. The front panel should be completely disconnected now.

Do NOT touch IC chips without being electrically grounded. Electro-Static Discharge (ESD) can damage IC chips, even when it is not enough to be humanly detected (felt, heard or seen).

2. Place the front panel (buttons down) on a suitable work-space. Locate the Software IC using Figure A-3.A as a guide.

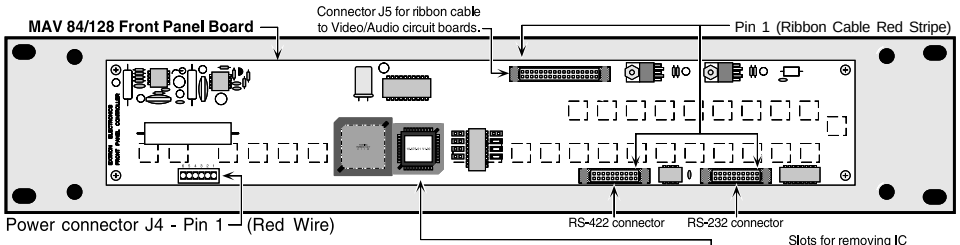


Figure A-3.A Locating the Software IC Chip

3. (Be sure you are electrically grounded.) Use the PLCC IC puller (Figure A-3.B) to remove the existing Software chip. Squeeze the tool to align the hooks with the slots provided in opposite corners of chip socket U8. Insert the hooks, squeeze gently and pull the IC straight out of the socket. Set the chip aside.
4. Note the key (angled corner) of the new Software chip. Orient this to match the key of the socket and carefully press it in place.
5. Reinstall the front panel and top cover and put the MAV 84/128 back in place. If necessary, use step 1 of this procedure and Page A-1 as a guide when reassembling the MAV 84/128.

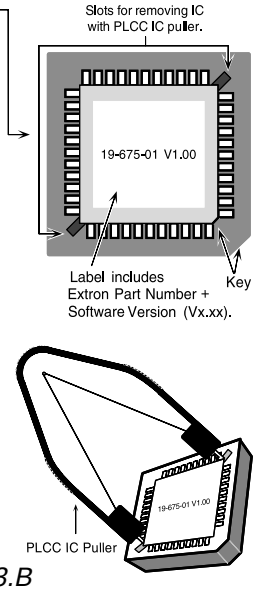


Figure A-3.B Removing the Software IC Chip

MAV 84/128 Switcher Power Up Sequence

When power is applied to the MAV 84/128 through the AC connector, the following self-test takes place.

1. Test processor and RAM. If no error, skip to step #3 below.
2. If an error is detected by the test, go no further but blink the error code with the Power LED. The error codes are:
   1 blink, pause, 1 blink, etc. = Error in primary RAM.
   2 blinks, pause, etc. = Error in secondary RAM.
   3 blinks, pause, etc. = Error in PROM.
   4 blinks, pause, etc. = Configuration Problem.
3. LED Test – Blink all LEDs.
4. Blink the LEDs for all available inputs and outputs, together with the Video and Audio LEDs.
5. The Power, Video and Audio LEDs go ON. The MAV 84/128 switcher is now ready to operate.

B

Appendix B
Reference Information

MAV 84/128 Part Numbers

Extron Part	Part #
MAV 84 RCA Switcher	60-238-02
MAV 128 RCA Switcher	60-238-01

Related Part Numbers

Extron Part	Part #
RCA (female) BNC (male) Adapter	10-264-01
GLI 250 (Ground Loop Isolator, 250 MHz RGBHV)	60-123-01
MAV 84/128 User's Manual (this manual)	68-346-01
MAV 84/128/CrossPoint Software Control Program	29-015-02

BNC Cables (Super High Resolution (SHR) BNC Cables)

Extron SHR BNC cables are Super High Resolution BNC cables. Extron recommends that when using signals with a scanning frequency of 15-125 kHz and running distances of 100 feet or more, high resolution BNC cables should be used to achieve maximum performance.

Extron Part	Part #
Bulk SHR-1, 500’	22-098-02
Bulk SHR-1, 1000’	22-098-03
BNC SHR crimp connectors, qty. 50	100-075-51

Bulk cable in lengths up to 5000' rolls is available with or without connectors.

Binary/hex/decimal Conversion Table

The table below shows how to convert data bytes from one numbering system to another. In MAV 84/128 communications, all data bytes are identified by having bit 7 = 1, therefore it is not included in the computations.

Bit #s in byte: 7		**6**	**5**	**4**	**3**	**2**	**1**	**0**
Decimal value	n/a	64	32	16	8	4	2	1
Dec. Hex	Add the decimal values above for equivalents.							
0 80/00h	n/a	0	0	0	0	0	0	0
1 81/01h	n/a	0	0	0	0	0	0	1
2 82/02h	n/a	0	0	0	0	0	1	0
3 83/03h	n/a	0	0	0	0	0	1	1
4 84/04h	n/a	0	0	0	0	1	0	0
5 85/05h	n/a	0	0	0	0	1	0	1
6 86/06h	n/a	0	0	0	0	1	1	0
7 87/07h	n/a	0	0	0	0	1	1	1
8 88/08h	n/a	0	0	0	1	0	0	0
9 89/09h	n/a	0	0	0	1	0	0	1
10 8A/0Ah	n/a	0	0	0	1	0	1	0
11 8B/0Bh	n/a	0	0	0	1	0	1	1
12 8C/0Ch	n/a	0	0	0	1	1	0	0
13 8D/0Dh	n/a	0	0	0	1	1	0	1
14 8E/0Eh	n/a	0	0	0	1	1	1	0
15 8F/0Fh	n/a	0	0	0	1	1	1	1
16 90/10h	n/a	0	0	1	0	0	0	0
etc.								
32 A0/20h	n/a	0	1	0	0	0	0	0
etc.								
64 C0/40h	n/a	1	0	0	0	0	0	0
etc.								
99 E3/63h	n/a	1	1	0	0	0	1	1
100 E4/64h	n/a	1	1	0	0	1	0	0
etc.								
127 FF/7F	n/a	1	1	1	1	1	1	

Glossary of terms

Following is a list of terms taken from Extron's Glossary.

AC – **Alternating Current** – Flow of electrons that changes direction alternately.

ADA – Extron's product designation for Analog Distribution Amplifier.

AMPS – **Amperes** – A unit of measurement for current.

Analog – **Analogue** – A continuous signal that takes time to make a transition from one level to another. Standard audio and video signals are analog. This signal has an infinite number of levels between its highest and lowest value. (Not represented by bits, such as with digital.)

ANSI – American National Standards Institute

ASCII – American Standard Code for Information Interchange – The standard code consisting of 7-bit coded characters (8 bits including parity check), utilized to exchange information between data processing systems, data communication systems, and associated equipment. The ASCII set contains control characters and graphic characters.

Attenuation – The decrease in magnitude of a signal.

Audio Follow – A term used when audio is tied to other signals, such as video, and they are switched together. (The opposite of Break-away)

Balanced Audio – A method that uses three conductors for one audio signal. They are plus (+), minus (-) and ground. The ground conductor is strictly for shielding, and does not carry any signal. Also Differential Audio.

Bandwidth – A frequency range, or "band" of frequencies, within which a device operates. In audio and video, it is the band of frequencies that can pass through a device without significant loss or distortion. The higher the bandwidth, the sharper the picture; low bandwidth can cause a "fuzzy" picture.

Barrel – Outward curved edges on a display image. Also see "pincushion".

Blanking – The turning off of the electron beam that scans the image onto the screen. When the beam completes a scan line it must return (retrace) back to the left. During this time, the beam must be turned off (horizontal blanking). Similarly, when the last line has been scanned at the bottom of the screen, the beam must return to the upper left. This requires vertical blanking.

Blooming – Most noticeable at the edges of images on a CRT, "blooming" is when the light (color) is so intense that it seems to exceed the boundary of the object. Thin lines and sharp edges could look thick and fuzzy. This may be caused by the brightness being set to high, or by a high voltage problem.

BNC – It is a cylindrical Bayonet Connector which operates with a twist-locking motion. Two curved grooves in the collar of the male connector are aligned with two projections on the outside of the female collar. This allows the connector to be locked in place without the need of tools.

Break-away – The ability to separate signals for the purpose of switching them independently. For example: an audio and video signal from the same source may be "broken away" and switched to different destinations. This is the opposite of the term "follow".

Buffer – Generally referred to as a unity gain amplifier used to isolate the signal source from the load. This is for both digital and analog signals.

Cable Equalization – The method of altering the frequency response of a video amplifier to compensate for high frequency losses in cables that it feeds. (See Peaking.)

Capacitance – The storing of an electrical charge. At high frequencies, capacitance that exists in cables also represents a form of impedance.

Cathode Ray Tube – See CRT.

Chroma – The characteristics of color information, independent of luminance intensity. Hue and saturation are qualities of chroma. Black, gray, and white objects do not have chroma characteristics.

Chrominance Signal – Part of a television signal containing the color information. Abbreviated by "C".

Coaxial Cable – A two-conductor wire in which one conductor completely wraps the cable.

Component Video – Our color television system starts with three channels of information; Red, Green, & Blue (RGB). In the process of translating these channels to a single composite video signal they are often first converted to Y, R-Y, and B-Y. Both 3-channel systems, RGB and Y, R -Y, B -Y are component video signals. They are the components that eventually make up the composite video signal. Much higher program production quality is possible if the elements are assembled in the component domain.

Composite Sync – A signal consisting of horizontal sync pulses, vertical sync pulses, and equalizing pulses only, with no signal reference level.

Composite Video – A mixed signal comprised of the luminance black and white, chrominance (color), blanking pulses, sync pulses and color burst.

Contrast – The range of light and dark values in a picture or the ratio between the maximum and the minimum brightness values. Low contrast is shown mainly as shades of gray, white high contrast is shown as blacks and whites with very little gray. It is also a TV monitor adjustment which increases or decreases the level of contrast of a televised picture.

Crosstalk – Interference from an adjacent channel which adds an undesirable signal to the desired signal.

Crosstalk Isolation – Attenuation of an undesired signal introduced by crosstalk from an adjacent channel.

CRT – **Cathode Ray Tube** – A vacuum tube that produces light when energized by the electron beam generated inside the tube. A CRT has a heater element, cathode, and grids in the neck of the tube, making up the “gun”. An electron beam is produced by the gun and is accelerated toward the front display, or screen surface of the tube. The display surface contains phosphors that light up when hit by the electron beam. The CRT is more commonly known as picture tube.

dB – **Decibel** – The standard unit used to express gain or loss of power. It indicates the logarithmic ratio of output power divided by input power. A power loss of 3 dB is an attenuation of half of the original value. The term “3dB down” is used to describe the “half power point”.

DC – **Direct Current** – The flow of electrons in one direction.

D Connector – A connector with rounded corners and angled ends, taking on the shape of the letter “D”. Commonly used in computers and video.

Decibel – See dB.

Decoder – A device used to separate the RGBS (Red, Green, Blue and Sync) signals from a composite video signal.

Differential Audio – See Balanced Audio.

Distribution Amplifier (DA) – A device that allows connection of one input source to multiple output sources such as monitors or projectors.

FCC – Federal Communications Commission – A unit of the U.S. Government that monitors and regulates communications.

Field – In interlaced video, it takes two scans on a screen to make a complete picture, or a “Frame”. Each scan is called a “Field”. Sometimes these are referred to as “field 1 and field 2”.

Flicker – Flicker occurs when the electron gun paints the screen too slowly, giving the phosphors on the screen time to fade.

Frame – In interlaced video, a Frame is one complete picture. A Frame is made up of two fields, or two sets of interlaced lines.

Frequency Range – Refers to the low-to-high limits of a device, such as a computer, projector or monitor. Also “bandwidth”.

Gain – A general term used to denote an increase in signal power or voltage produced by an amplifier in transmitting a signal from one point to another. The amount of gain is usually expressed in decibels above a reference level. Opposite of Attenuation.

Genlock – A method of synchronizing video equipment by using a common, external “Genlock” signal.

Hertz – **Hz** – A measure of frequency in cycles per second.

High Impedance – **Hi Z or High Z** – In video, when the signal is not terminated locally and is going to another destination, where it will be terminated. In video, Hi Z is typically 10k ohms or greater.

Horizontal Rate – **Horizontal Frequency** – The number of complete horizontal lines, including trace and retrace, scanned per second. Typically shown as a measure of kHz.

Horizontal Resolution – Smallest increment of a television picture that can be discerned in the horizontal plane. This increment is dependent upon the video bandwidth and is measured in frequency. Determines the number of lines it takes to scan an image on the screen.

Hue – **Tint Control** – Red, yellow, blue, etc. are hues of color or types of color. Hue is the parameter of color that allows us to distinguish between colors.

Hz – **Hertz** – Frequency in cycles per second.

Impedance – **Z** – The opposition or "load" to a signal. Circuits that generate audio or video signals, are designed to work with a certain "load", or impedance. Typical video impedances: 75 ohm or High Z. Also see High Impedance and Low Impedance.

Interlaced – The process of scanning whereby the alternate lines of both scanned fields fall evenly between each other.

IRE Scale – An oscilloscope scale that applies to composite video levels. Typically there are 140 IRE units in one volt (1 IRE = 7.14 mV).

K – An abbreviation for kilobyte. A kilobyte is 1,000 bytes. In computer memory sizes, the numbers are rounded down. e.g. 1k byte = 1024 bytes.

Kilohertz – **kHz** – Thousands of Hertz, or a frequency rate in units of thousands of cycles per second. For example, CGA's horizontal scan rate is 15.75 kHz or 15,750 hertz (Hz).

LED – Light-Emitting Diode

Level Control – The Level Control on selected Extron interface products is similar to the Contrast Control on a data monitor. It can either increase or decrease the output voltage level of the interface to the connected data monitor or projector. This results in greater or less contrast in the picture.

Low Impedance – The condition where the source or load is at a lower impedance than the characteristic impedance of the cable. Low source impedances are common; low load impedances are usually fault conditions.

Luminance – This is the signal that represents brightness in a video picture. Luminance is any value between black and white. In mathematical equations, luminance is abbreviated as "Y".

M – **Mega** – An abbreviation for megabyte. A megabyte is 1024K, or roughly a million bytes (1,048,076 to be exact [1024 x 1024]).

Matrix – In A/V, an electronic device used to collect and distribute video (and sometimes audio) signals. See matrix switcher.

Matrix switcher – In audio/video, a means of selecting an input source and connecting it to one or more outputs. A Matrix switcher would normally have multiple inputs and multiple outputs.

MHz (as in 8 MHz) – An abbreviation for megahertz. This is a unit of measurement and refers to a million cycles per second. Bandwidth is measured in megahertz.

Milli – **m** – Abbreviation for one thousandths. Example: 1 ms = 1/1000 second.

Monitor – (A) A TV that may receive its signal directly from a VCR, camera or separate TV tuner for high quality picture reproduction. It may not contain a channel selector. (B) A video display designed for use with closed circuit TV equipment. (C) Device used to display computer text and graphics.

Non-Interlaced – Also called progressive scan – a method by which all the video scan lines are presented on the screen in one sweep instead of two (also see interlaced).

NonVolatile memory – Memory that retains data when power is turned off.

NTSC – **National Television Standards Committee** – Television standard for North America and certain countries in South America. 525 lines/60 Hz (60 Hz Refresh).

Output – The product of an operation by a device going to some external destination, such as another device, a video screen, image or hard copy.

PAL – **Phase Alternate Line** – The phase of the color carrier is alternated from line to line. It takes four full pictures for the color to horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors, the reason the hue control is not needed on PAL TV sets. PAL, in its many forms is used extensively in Western Europe.

PCB – **Printed Circuit Board**

Peak-to-Peak – abbreviated **p-p** – The amplitude (voltage) difference (as displayed on an oscilloscope) between the most positive and the most negative excursions (peaks) of an electrical signal.

Peaking – A means of compensating for mid and high frequency RGB Video Bandwidth response in data monitors and projectors and for signal losses due to cable capacitance. When using the Peak enhancements, use the following guidelines for proper output settings: Use 50% with all computer frequencies between 15-125 kHz at any cable length. Use 100% with high frequency computers of 36 kHz or higher with cable lengths 75 feet or greater.

Pincushion – The inward or outward (curved) appearance of the edges of a display.

Pin-out – An illustration or table that names signals, voltages, etc. that are on each pin of a connector or cable.

Plenum Cable – Cable having a covering that meets the UL specifications for resistance to fire.

PLUGE – **Picture Line Up Generation Equipment** – This is a name of a test pattern that assists in properly setting picture black level. PLUGE can be part of many test patterns. The phrase and origination of the test signal are both credited to the BBC.

Power – **Electrical** – The dissipation of heat by passing a current through a resistance. Measured in Watts (W), it is expressed by Ohm's law from the two variables: Voltage (E) and Current (I). i.e. $P = I^2xR$, or, $P = E^2/R$ or $P = ExI$

Resolution – The density of lines or dots that make up an image. Resolution determines the detail and quality in the image.
A) A measure of the ability of a camera or television system to reproduce detail.
B) In video, generally called horizontal resolution. It can be evaluated by establishing the limit to which lines can be distinguished on a test pattern. A larger resolution value means a broader frequency band of the video signal.
C) A measure of the greatest amount of detail that can be seen in an image. Often incorrectly expressed as a number of pixels in a given line; more correctly it is the bandwidth.

RGB – **Red, Green, Blue** – The basic components of the color television system. They are also the primary colors of light, not to be confused with Cyan, Magenta, and Yellow, the primary pigments. Also called the "Additive Color Process".

RGB Video – A form of color video signal (red, green, blue) distinctly different from the composite color video used in standard television sets. RGB can be displayed only on a color monitor that has a separate electron gun for each of these primary colors. Some color television sets use only one gun. RGB monitors are noted for their crisp, bright colors and high resolution.

RS-170A – EIA technical standard NTSC color TV.

RS-232 – An Electronic Industries Association (EIA) serial digital interface standard specifying the electrical and mechanical characteristics of the communication path between two devices using D-type connectors. This standard is used for relatively short range communications and does not specify balanced control lines.

RS-422 – An EIA serial digital interface standard which specifies the electrical characteristics of balanced voltage digital interface circuits. This standard is usable over longer distances than RS-232 Although originally designed for use with 9-pin and 37-pin, D-type connectors, it is often used with others, including 25-pin D-types. It is also used as the serial port standard for Macintosh computers. This signal governs the asynchronous transmission of computer data at speeds of up to 920,000 bits per second.

SECAM – **Sequential Couleur Avec Memoiré** – Translated as “Sequential Color with Memory”. A composite color transmission system that potentially eliminates a need for both a color and hue control on the monitor. One of the color difference signals is transmitted on one line and the second is transmitted on the second line. Memory is required to obtain both color difference signals for color decoding. This system is used in France, Africa, Asia and many Eastern European countries.

Serial Port – An output on the computer that allows it to communicate with other devices in a serial fashion – data bits flowing on a single pair of wires. The serial port is most often used with RS-232 protocol.

SMPTE – **Society of Motion Picture and Television Engineers** – A global organization, based in the United States, that sets standards for base-band visual communications. This includes film as well as video standards.

SMPTE Pattern – The video test pattern made up of color, black and white bands used by television stations.

Software – The programs used to instruct a processor and its peripheral equipment.

Switcher – Term often used to describe a special effects generator; a unit which allows the operator to switch between video camera signals. Switchers are often used in industrial applications to switch between video camera monitoring certain areas for display on a monitor, or system of display devices. These kinds of switchers do not have sync generators.

Sync – In video, a means of synchronizing signals with timing pulses to insure that each step in a process occurs at exactly the right time. For example: Horizontal Sync determines exactly when to begin each horizontal line (sweep) of the electron beam. Vertical Sync determines when to bring the electron beam to the top-left of the screen to start a new field. There are many other types of sync in a video system. (Also called Sync Signal or Sync Pulse.)

S-VHS – A high band video recording process for VHS that increases the picture quality and resolution capability. See S-Video.

S-Video – The composite video signal is separated into the Luminance (Y) and the Chrominance (C).

Terminal – A device typically having a keyboard and display that is capable of sending text to and receiving text from another device, a network, etc.

Termination – A load, or impedance at the end of a cable or signal line used to match the impedance of the equipment that generated the signal. The impedance absorbs signal energy to prevent signal reflections from going back toward the source. In the video industry, termination impedance is typically 75 ohms.

Vertical Interval – The synchronizing information which is presented between fields, and then signals the picture monitor to return to the top of the screen to start another vertical scan.

Y – In video, “Y” is an abbreviation for Luminance.

Z – A symbol for impedance.