BIAMP®

VRAM
Variable Resource Automixer

Operation Manual

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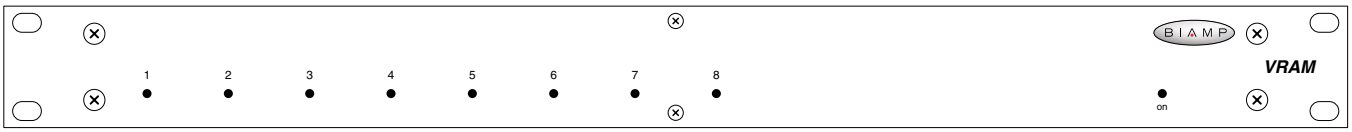
INTRODUCTION

The **VRAM** Variable Resource Automixer is a 10-in / 2-out programmable automatic mixer, which is completely user tamper proof, providing no external controls. All mixer parameters are under microprocessor control, and are easily programmed via Windows® software. The VRAM is extremely versatile, with an extensive set of features, and is designed to adapt to a variety of applications. A second model, **VRAMeq**, includes 3-band channel equalization, with variable mid-frequency. The VRAM is covered by a five-year warranty.

VRAM features include:

- 8 balanced mic/line inputs on plug-in barrier strip connectors
- 2 balanced auxiliary line inputs on plug-in barrier connectors
- balanced main & aux outputs on plug-in barrier connectors
- phantom power, trim, HPF, level, & gating on channels 1~8
- model **VRAMeq** includes 3-band, variable-mid, channel EQ
- aux line inputs include mix-minus & teleconferencing mode
- independent mixing to main & aux outputs (pre/post gate)
- direct outputs from channels (programmable pre/post gate)
- eight logic outputs (programmable timing & pre/post gate)
- eight logic inputs (programmable for remote switch control)
- sixteen non-volatile memory presets store all mixer settings
- NOM attenuation, last mic, default mic, & hold time selectable
- selectable channel-off gating attenuation (-10dB to -80dB)
- expansion in & out for linking of units for more mixer inputs
- controls & indicators provided by software graphic interface
- software peak & level meters - front panel active indicators
- Windows® 95/98/NT/2000/XP software & cable included
- remote control via RS-232 & programmable logic inputs
- incorporates **AES** recommended grounding practices
- CE marked and **UL** / **C-UL** listed power source
- covered by Biamp Systems' five-year warranty

FRONT & REAR PANEL FEATURES



FRONT PANEL FEATURES

Channel Gate Indicators: These red LEDs normally indicate when Channels 1~8 are active to Main Out ('on' or 'auto' gating). ***NOTE:*** *When a channel is assigned as 'off' to Main Out, but is assigned as 'auto' to Aux Out, this indicator will light when the channel is active (gated on) to Aux Out (see Setup on pg. 5).*

On Indicator: When AC power is applied to the VRAM, this red LED will light indicating power to the mixer is On. When power is removed, all 'current mix' settings (levels, assignments, etc.) will be stored in non-volatile memory and recalled when power is restored. ***NOTE:*** *During setup the VRAM may instead be set to recall a special preset whenever power is turned on (see Setup on pg. 9).*

REAR PANEL FEATURES

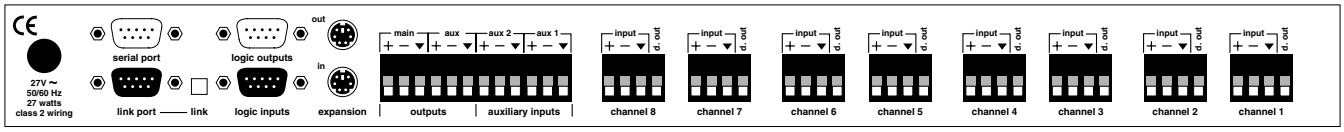
AC Power Cord: The power transformer provides 27 Volts AC to the VRAM, and is detachable via a 5-pin DIN connector. The VRAM has two internal 'self-resetting' fuses (there are no user serviceable parts inside the unit). If the internal fuses blow, they will attempt to re-set after a short period. However, this may be an indication that the VRAM requires service.

Serial Port: This 9-pin Sub-D (male) connector provides an RS-232 Serial Port for remote control via computer or third-party controllers (see RS-232 Control on pg. 14). The Serial Port has the following pin assignments (left-to-right & top-to-bottom): **Pin 1)** not used; **Pin 2)** Receive Data (RxD) input; **Pin 3)** Transmit Data (TxD) output; **Pin 4)** Data Terminal Ready (DTR) output; **Pin 5)** Ground; **Pin 6)** not used; **Pin 7)** Request To Send (RTS) output; **Pin 8)** not used; **Pin 9)** not used. BiampWin software and a null-modem cable are provided for programming (see Setup on pg. 4). ***NOTE:*** *The Serial Port can also transmit commands received via the Logic Inputs (see Setup on pg. 8).*

Link Port: This 9-pin Sub-D (female) connector provides a Link Port for RS-232 control of multiple BIAMP products (see RS-232 Control on pg. 14). The Link Port of one device simply connects to the Serial Port of the next device (and so forth). Link cables are available as an option (Biamp #909-0057-00). ***NOTE:*** *All but the final device in a system should have the Link Switch pressed in (see below).* The Link Port has the following pin assignments (right-to-left & top-to-bottom): **Pin 1)** not used; **Pin 2)** Transmit Data (TxD) output; **Pin 3)** Receive Data (RxD) input; **Pin 4)** not used; **Pin 5)** Ground; **Pin 6)** not used; **Pin 7)** not used; **Pin 8)** not used; **Pin 9)** not used. ***NOTE:*** *The Link Port will also transmit commands received via the Logic Inputs (see Setup on pg. 8).*

Link Switch: The Link Switch is used when connecting multiple devices in a 'Link Port to Serial Port' configuration (see Link Port above). From the factory, the Link Switch is released (out). When connecting multiple devices, the Link Switch must be depressed (in) on all devices except the final device in the system (the device with no Link Port connection).

FRONT & REAR PANEL FEATURES



Logic Outputs: This 9-pin Sub-D connector provides Logic Outputs from Channels 1~8 (see Logic Outputs on pg. 12). If a channel is assigned as 'auto' to either Main Out or Aux Out, the corresponding Logic Output will turn on whenever the channel is gated on. Logic Outputs may be used to control external switching circuits, such as relays or other BIAMP products. These outputs are typically used to turn off speakers or select cameras when certain microphones are active. ***NOTE:*** *Individual Logic Outputs may be turned on/off via software or remote control. However, this temporarily defeats their ability to follow the active channel, until again assigned to 'follow gate' (see Setup on pg. 5).*

Logic Inputs: This 9-pin Sub-D (female) connector provides eight logic inputs for controlling the VRAM via contact-closures (see Logic Inputs on pg. 10). Logic Inputs are programmed using the BiampWin software and serial cable provided with the VRAM (see Setup on pg. 8). ***NOTE:*** *From the factory, Logic Inputs 1~8 have no pre-programmed function.*

Expansion In & Out: These 6-pin mini-DIN connectors are for linking multiple mixers, to increase the number of input channels. A 6-pin mini-DIN cable is provided with each mixer. To link mixers, simply connect the cable from the Expansion Out jack of one mixer to the Expansion In jack of the next mixer (and so forth). The final mixer in the system (with no Expansion Out jack connection) becomes the 'master'. The 'master' collects audio signals & control data from the other mixers, which become 'slaves'. Main Out & Aux Out signals, plus NOM attenuation, for the combined system are provided by the 'master'. The outputs from 'slave' mixers provide only signals from their own inputs, plus those of any 'slave' mixers connected to them via Expansion In.

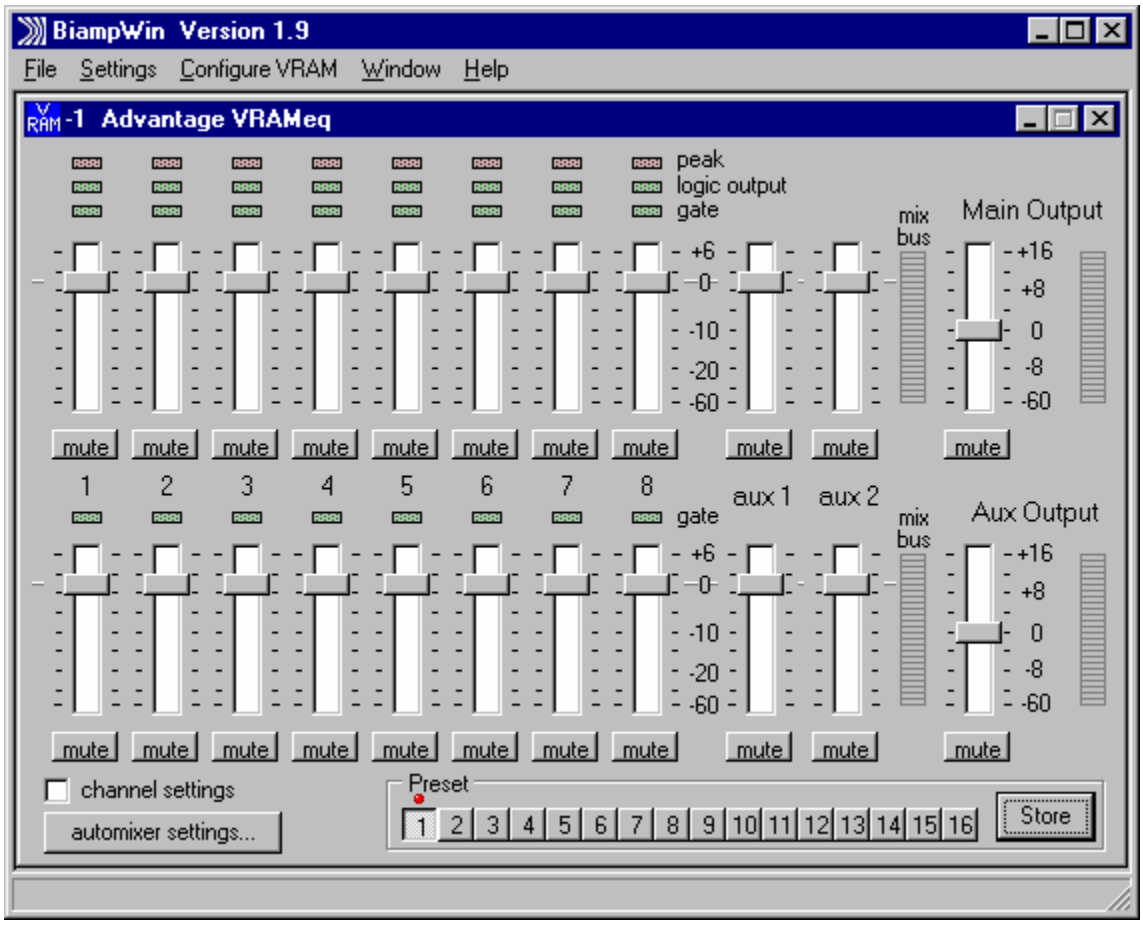
Main Out: This plug-in barrier strip provides the balanced Main Out from the VRAM. For balanced output, wire high to (+), low to (-), and ground to (▼). For unbalanced output, wire high to (+) and ground to (▼), leaving (-) unconnected. Signal level will be reduced by 6dB when outputs are unbalanced.

Aux Out: This plug-in barrier strip provides the balanced Aux Out from the VRAM. For balanced output, wire high to (+), low to (-), and ground to (▼). For unbalanced output, wire high to (+) and ground to (▼), leaving (-) unconnected. Signal level will be reduced by 6dB when outputs are unbalanced.

Aux 1 & Aux 2 Inputs: These plug-in barrier strips provide the balanced auxiliary line inputs to the VRAM. For balanced input, wire high to (+), low to (-), and ground to (▼). For unbalanced input, wire high to (+) and ground to both (-) & (▼).

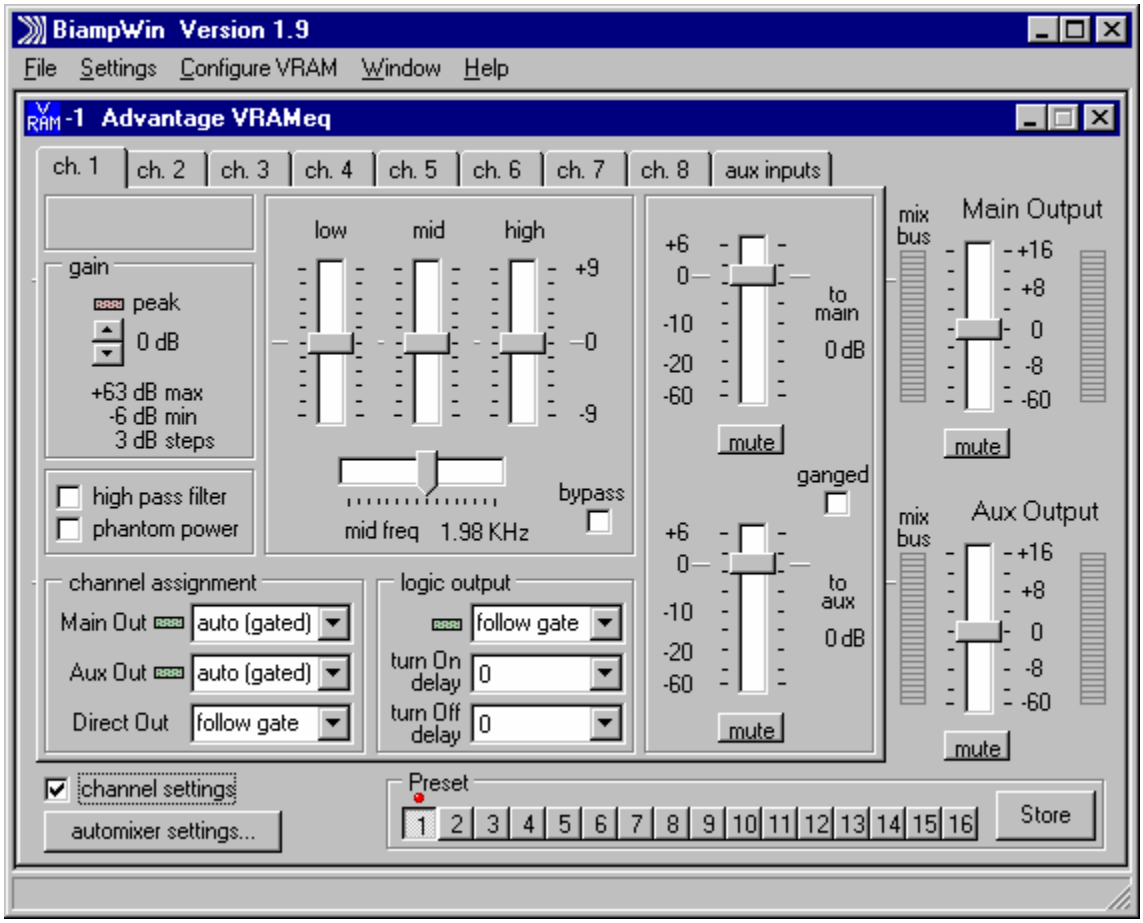
Channel Input & Direct Output: These plug-in barrier strips provide the balanced mic/line input to the respective channels. For balanced input, wire high to (+), low to (-), and ground to (▼). For unbalanced input, wire high to (+) and ground to both (-) & (▼). Unbalanced Direct Outputs are also available from the channels using (d out) & (▼). ***NOTE:*** *Inputs & Direct Outputs can be assigned for 'auto' (gated) or on/off operation (see Setup on pg. 5).*

VRAM & VRAMeq parameters are all adjustable using the 'BiampWin' software and null-modem cable provided with the unit. BiampWin software provides programs for various BIAMP products, including the VRAM(eq). The VRAM program includes seven control screens, which are described on the following pages. Once the software is started (and Comm Port Configuration is set), the control screens are accessed via the drop-down menus at the top of the opening screen. The Mix screen appears whenever a VRAM file is opened. Channel Settings, Automixer Settings, Button Definitions, Logic Input Definitions, Logic Output Polarity, & Configuration Options screens are then available from the Configure VRAM menu. The File menu provides functions such as save, open, download, etc. The Settings menu recalls the Comm Port Configuration screen. The Window menu arranges the active product screens. The Help menu explains the available adjustments. To install BiampWin software: Select 'Run' from 'Start' menu, and browse to 'BiampWin' on appropriate drive. System Requirements: Windows® 95/98/NT/2000/XP with 8MB of available hard disk space (serial port required for 'on-line' operation).



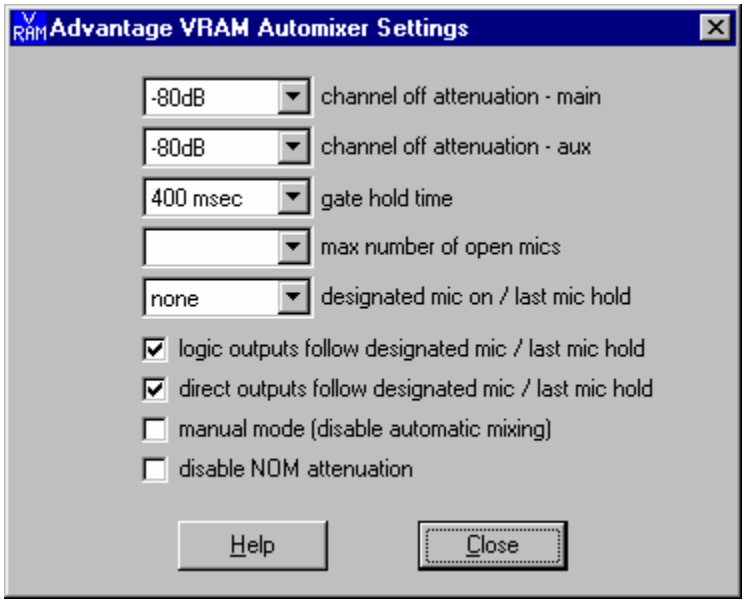
MIX SCREEN

The Mix Screen is used to adjust VRAM input/output levels, as well as to store/recall sixteen memory presets. All VRAM inputs may be adjusted to each output independently. Each output is also independently adjusted. Adjustments are made with the computer mouse (or keyboard). Input & output levels are adjusted by dragging the corresponding 'faders' up or down. Mute buttons turn off the respective input/output signals, without changing the channel assignments (see next page). Mix Bus meters display 'pre-fader' signal levels for the respective outputs. Main Output & Aux Output meters display 'post-fader' signal levels for the respective outputs. ***NOTE:*** *For best performance, adjust faders so the meters show occasional peaks in the yellow area, but never to the top (red).* Peak indicators should flash only on occasional peaks in signal level, as determined by input gain adjustments (see pg. 5). Logic Outputs indicators will light whenever the respective Logic Outputs are on (see pg. 5). Gate indicators will light whenever channels are active to the corresponding outputs (see pg. 5). Channel Settings selects a screen for adjusting individual input parameters (see pg. 5). Automixer Settings selects a screen for adjusting automatic mixing functions, which affect the entire mixer (see pg. 6). Preset buttons recall the corresponding presets from non-volatile memory. Presets must first be created & stored by the user (no factory presets). The Store button opens a menu for storing current settings in any of the Presets 1~16. Each preset includes settings from the Mix screen, as well as from the Channel Settings & Automixer Settings screens (see pgs. 5 & 6). The title bar across the top of the Main screen will indicate the Device #, the custom Device Name, and the model of product being controlled. BiampWin software can operate 'off-line' (with no product connected) by opening a 'new' file for the desired product. The Device # for 'off-line' files is assigned sequentially as a negative number.



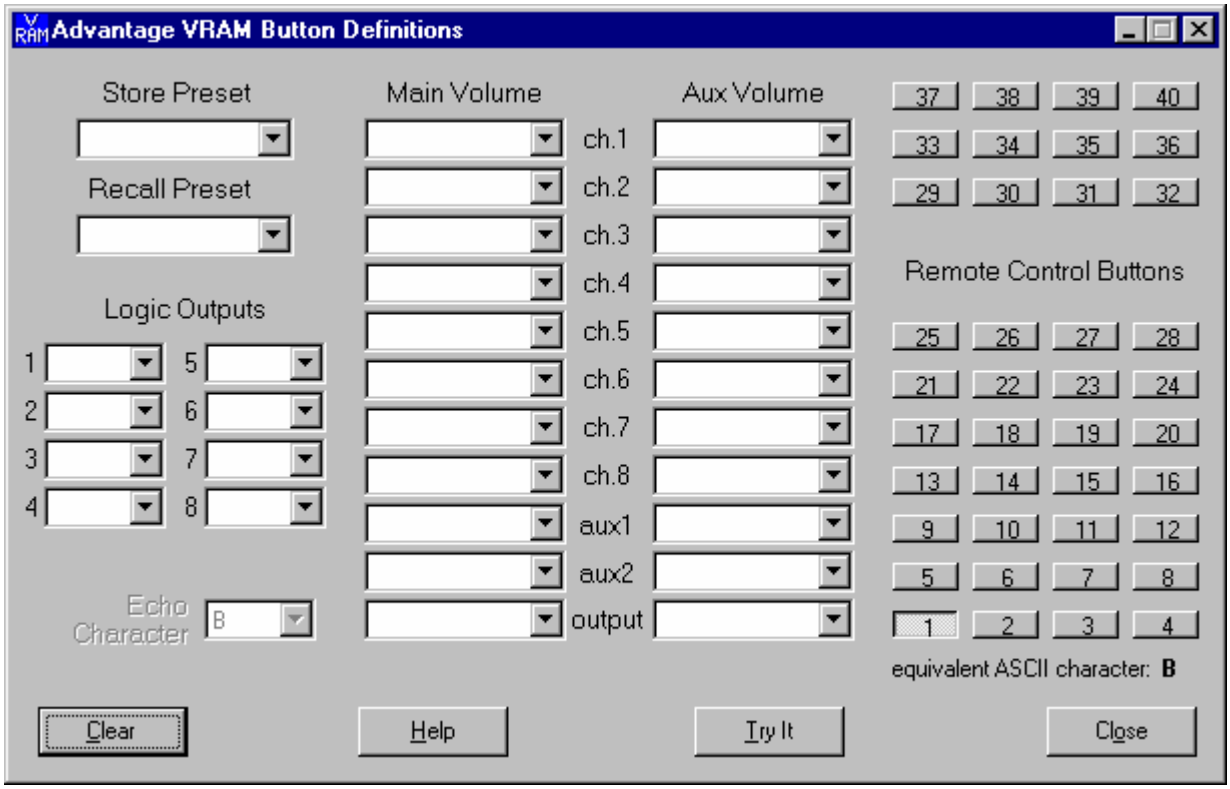
CHANNEL SETTINGS SCREEN

The Channel Settings screen appears as an overlay of the Mix screen, and is used to adjust individual input parameters. It is accessed via the Configure VRAM menu, or from the Mix screen. Individual tabs are provided for Channels 1~8 and the Aux Inputs. Right-clicking the blank area at the upper-left of a tab allows that input to be given a custom name. Gain adjusts the input to compensate for different signal levels. Set Gain so the Peak indicator flashes only on occasional peaks in signal level. High Pass Filter reduces low frequencies signals 6dB/octave @ 110Hz. Phantom Power turns on +36V power for condenser mics. Low, Mid, & High *(model VRAMeq only)* provide 3-band input equalization, with variable mid frequency & bypass. Faders & Mute provide the same functions as on the Mix screen, except that Main & Aux faders may be Ganged for combined control. Channel Assignment allows the input to be assigned as 'on', 'off', or 'auto' to Main Out & Aux Out independently. ***NOTE:*** *'Auto' means automatic gating (signal activated). 'On' means not gated (always active). 'Off' means unassigned (never active).* Direct Out provides 'on', 'off', or 'follow gate' assignment. ***NOTE:*** *'Follow gate' means to turn on & off simultaneously with any channel gating (to Main Out or Aux Out).* Logic Output provides the same 'on', 'off', or 'follow gate' assignment. Turn On Delay selects the timing between when a channel becomes active (gate on) and when the corresponding Logic Output turns on. Turn Off Delay selects the timing between when a channel becomes inactive (gate off) and when the corresponding Logic Output turns off. ***NOTE:*** *Logic Output delay times are typically used for proper timing in applications where camera switching circuits are being controlled.* The Aux Inputs tab provides two Gain settings (+6dB & -6dB), and faders for Main Out & Aux Out. Each of the Aux Inputs may be given a custom name. Aux 1 includes a Teleconference Mode, which defeats the Aux Out fader (mix-minus), and enables a Threshold fader (Adaptive Threshold Sensing). In this mode Aux 1 provides the teleconference input, and Aux Out provides the teleconference output. ***NOTE:*** *Automixer Settings, Presets, & output faders (on the Mix screen) are still available while using the Channel Settings screen.*



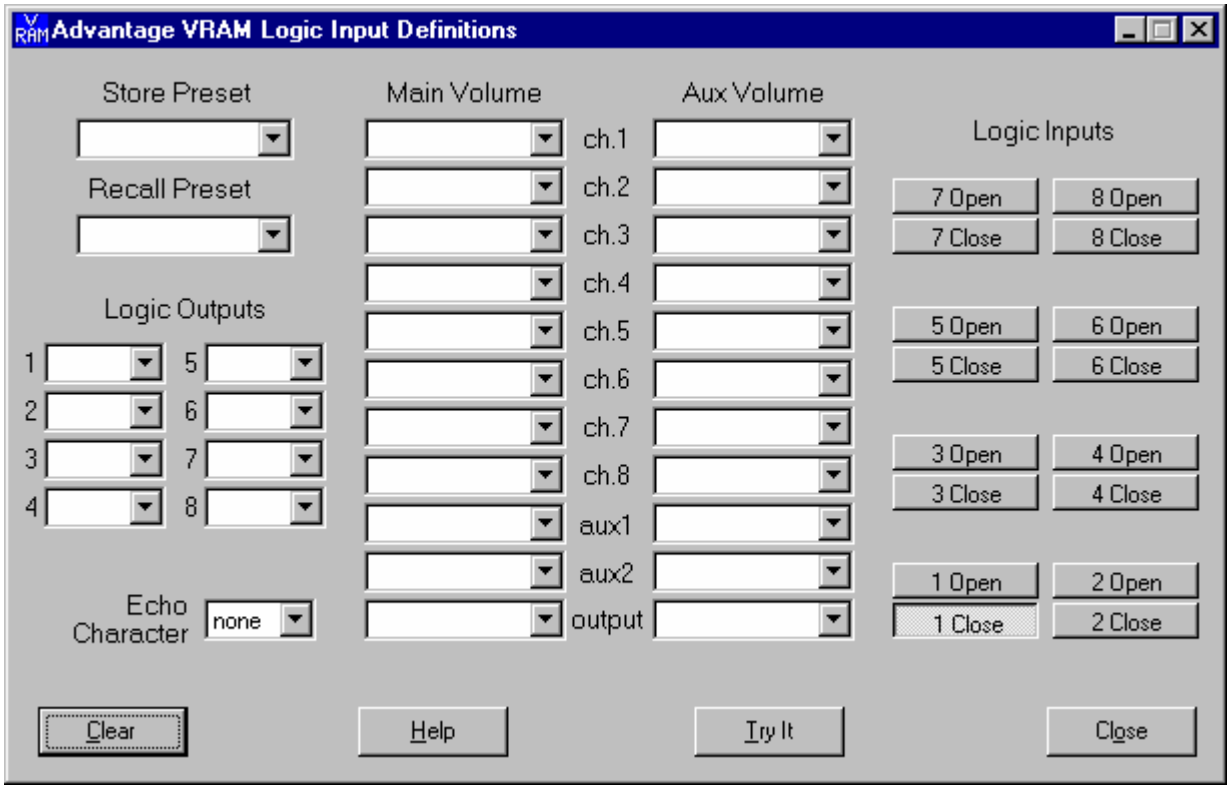
AUTOMIXER SETTINGS SCREEN

The Automixer Settings screen is used to adjust automatic mixing functions, which affect the entire mixer. It is accessed via the Configure VRAM menu, or from the Mix screen. Channel Off Attenuation selects the amount of attenuation applied to 'auto' channels when they are inactive (gated off). ***NOTE:*** *Channel Off Attenuation is set separately for Main Out & Aux Out.* Gate Hold Time selects the length of time that 'auto' channels will remain active (gated on) once signal is no longer present. Max Number of Open Mics limits the quantity of 'auto' channels which can be active (gated on) to Main Out at the same time. Designated Mic On / Last Mic Hold selects the most recently active 'auto' channel to remain active (gated on), or a specified channel to become active (gated on), whenever signals are no longer present. Logic Outputs Follow Designated Mic / Last Mic Hold causes logic outputs to turn on when corresponding channels are activated (gated on) due to their assignment as Designated Mic On or Last Mic On. Direct Outputs Follow Designated Mic / Last Mic Hold causes direct outputs to turn on when corresponding channels are activated (gated on) due to their assignment as Designated Mic On or Last Mic On. ***NOTE:*** *If Logic Outputs or Direct Outputs are not assigned to follow Designated Mic / Last Mic Hold, they will still follow normal gating activity of the channels, but will not hold without signal (as Last Mic Hold) and will not turn on without signal (as Designated Mic On).* Manual Mode defeats the channel gating functions, turning all channels on to Main Out & Aux Out (except for channels specifically assigned as 'off'). Disable NOM Attenuation defeats the typical attenuation (3dB for each doubling of active 'auto' channels) which occurs at Main Out. Help provides additional instruction. Close will close the Automixer Settings screen.



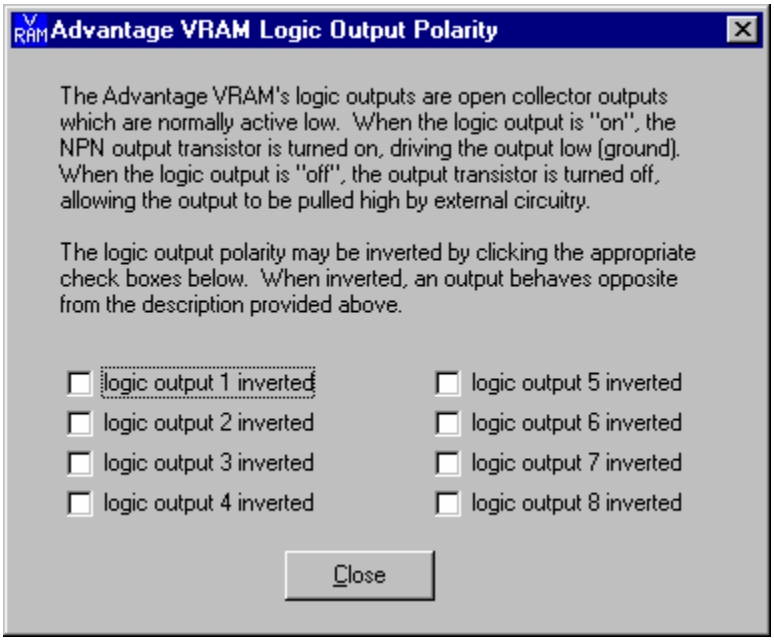
BUTTON DEFINITIONS SCREEN

The Button Definitions screen is used to assign specific 'actions' to remote control buttons. Although the VRAM does not accept commands from push-button remote controls directly, it can receive individual ASCII characters (via RS-232) from other BIAMP products and/or third-party control systems. From the factory, Remote Control Buttons have equivalent ASCII characters permanently assigned to them (see RS-232 Control on pg. 14). Therefore, a Remote Control Button can be assigned specific 'actions', which the VRAM will then perform whenever the equivalent ASCII character for that button is received. From the factory, Remote Control Buttons have no pre-programmed functions. However, using the Button Definitions screen, each Remote Control Button may be assigned various 'actions'. Remote Control Buttons select which button is to be defined. Equivalent ASCII Character displays the permanent ASCII character for the selected button. Store Preset allows store actions for Presets 1~16 to be assigned to the selected button. Recall Preset allows recall actions for Presets 1~16 to be assigned to the selected button. Logic Outputs allows 'on', 'off', & 'toggle' actions for Logic Outputs 1~8 to be assigned to the selected button. ***NOTE:*** *Turning a Logic Output on/off will temporarily defeat its ability to follow channel gating activity, until again assigned to 'follow gate' (see pg. 5).* Echo Character displays the 'echo' character for the selected button. ***NOTE:*** *Echo Characters are permanent for Remote Control Buttons, and can only be changed for Logic Input control (see next page).* Main Volume & Aux Volume allow specific volume & muting actions for Channels 1~8, Aux 1 & 2, Main Out, & Aux Out to be assigned to the selected button. Clear allows all actions assigned to the selected button (or all buttons) to be cleared. Try It causes the actions currently assigned to the selected button to be performed by the VRAM. Help provides additional instruction. Close will close the Button Definitions screen.



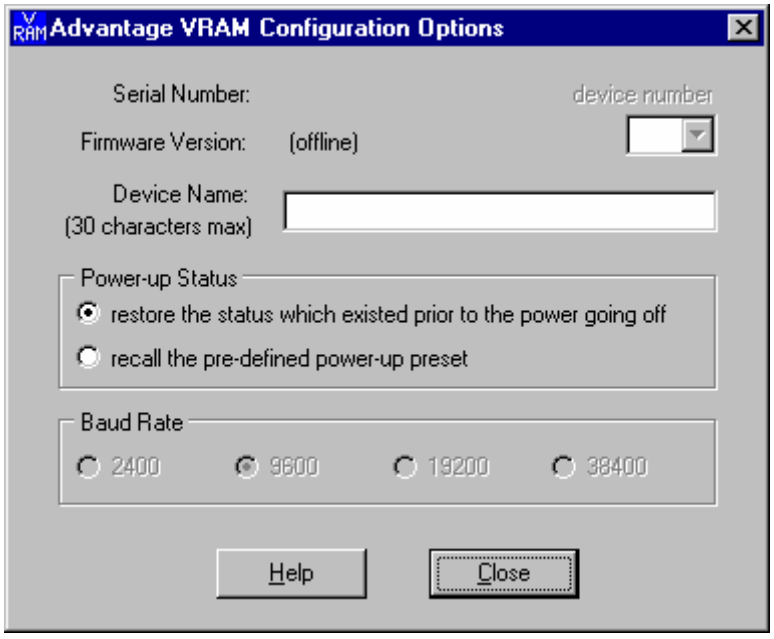
LOGIC INPUT DEFINITIONS SCREEN

The Logic Input Definitions screen is used to assign specific 'actions' to the Logic Inputs (and remote control buttons). Logic Inputs allow remote control of the VRAM via external circuits, such as switches, contact-closures, active driver circuits, and/or 'open-collector' logic outputs (see Logic Inputs on pg. 10). From the factory, Logic Inputs 1~8 have no pre-programmed functions. However, using the Logic Input Definitions screen, each Logic Input may be assigned various 'actions'. Logic Inputs select which Logic Input is to be defined. ***NOTE:*** *Since Logic Inputs are controlled by switches, contact-closures, etc., each Logic Input may be assigned certain actions to perform when the switch is 'opened', and different actions to perform when that same switch is 'closed'.* Store Preset allows store actions for Presets 1~16 to be assigned to the selected Logic Input. Recall Preset allows recall actions for Presets 1~16 to be assigned to the selected Logic Input. Logic Outputs allows 'on', 'off', & 'toggle' actions for Logic Outputs 1~8 to be assigned to the selected Logic Input. ***NOTE:*** *Turning a Logic Output on/off will temporarily defeat its ability to follow channel gating activity, until again assigned to 'follow gate' (see pg. 5).* Echo Character allows the 'echo' character for the selected Logic Input to be changed. ***NOTE****: This is the RS-232 ASCII character which will be transmitted via the Serial Port whenever that Logic Input is switched. From the factory, no echo characters are assigned to Logic Inputs 1~8. Changing the Echo Character is used primarily for customizing remote control commands amongst various RS-232 controlled products within a system (see RS-232 Control on pg. 14).* Main Volume & Aux Volume allow specific volume & muting actions for Channels 1~8, Aux 1 & 2, Main Out, & Aux Out to be assigned to the selected Logic Input. ***NOTE:*** *Although Logic Inputs volume actions include a 'repeating' (volume ramp) function, they will not continuously repeat the echo character via RS-232.* Clear allows all actions assigned to the selected Logic Input (or all Logic Inputs) to be cleared. Try It causes the actions currently assigned to the selected Logic Input to be performed by the VRAM. Help provides additional instruction. Close will close the Button Definitions screen.



LOGIC OUTPUT POLARITY SCREEN

Normally, when a Logic Output turns 'on' it provides a DC path to ground, which is then used to control 'active-low' type circuits. The Logic Outputs Polarity screen simply allows this operation of the individual Logic Outputs to be reversed, for driving 'active-high' type circuits.



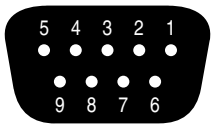
CONFIGURATION OPTIONS SCREEN

The Configuration Options screen is used to select options which customize the operation of the VRAM. At the top of the Configuration Options screen, the Serial Number and Firmware Version of the VRAM will be displayed. BiampWin software can operate 'off-line' (with no product connected) by opening a 'new' file for the desired product. The Serial Number and Firmware Version are not displayed for 'new' ('off-line') files. Device Number allows a device number (0~63) to be assigned to the currently active VRAM. This allows multiple VRAM (or other BIAMP programmable products) to be individually controlled when linked together. Unique device numbers must be assigned to each device before the devices are linked together. Device Name allows a custom name to be given to the particular VRAM, by entering up to 30 characters of text. The Device Name will be stored in the VRAM memory, and will be displayed on the title bar of the Main screen whenever that VRAM is accessed with the software. Power-up Status provides a choice of settings to be recalled from non-volatile memory each time the VRAM is powered up When 'pre-defined power-up preset' is selected, the associated store & recall preset options are then made available on the Mix screen, via the Store button menu. Baud Rate determines the speed of data transfer for the software, as well as for any products currently connected which support this function. Help provides additional instruction. Close will close the Configuration Options screen.

LOGIC INPUTS

Eight Logic Inputs are available on a rear panel 9-pin Sub-D (female) connector. Logic Inputs allow remote control of the VRAM via external circuits, such as switches, contact-closures, active driver circuits, and/or 'open-collector' logic outputs. From the factory, Logic Inputs 1~8 have no pre-programmed function. However, each Logic Input may be assigned different 'actions' using the BiampWin software and null-modem cable provided with the VRAM (see Setup on pg. 8). Since Logic Inputs are controlled by switches, contact-closures, etc., each Logic Input may be assigned two functions (one for switch 'closed' and one for switch 'open').

Logic Inputs have the following pin assignments (right-to-left & top-to-bottom**): Pins 1~8)** Logic Inputs 1~8; **Pin 9)** Ground.



logic inputs

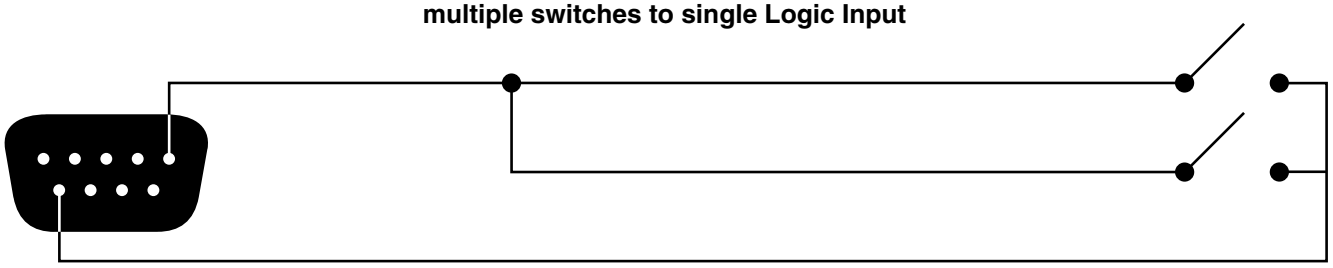
pin #1 = Logic Input 1
pin #2 = Logic Input 2
pin #3 = Logic Input 3
pin #4 = Logic Input 4
pin #5 = Logic Input 5
pin #6 = Logic Input 6
pin #7 = Logic Input 7
pin #8 = Logic Input 8
pin #9 = ground

When nothing is connected to a Logic Input, an internal pull-up resistor keeps it at a 'high' idle state (+5.0 VDC). The Logic Input is activated when its input goes 'low' (less than +0.8 VDC), and is de-activated when its input goes 'high' (greater than +2.4 VDC). A Logic Input is controlled in one of three ways: 1) Use an NPN style 'open-collector' logic output from an external device (such as another BIAMP product) to short the Logic Input to ground. 2) Use a switch, relay, or other contact-closure (such as from a third-party controller) to short the Logic Input to ground. 3) Use an active TTL output driver circuit (such as from a third-party controller) to actively drive the Logic Input to a 'high' or 'low' state.

LOGIC INPUTS

Multiple contact-closures or 'open-collector' logic outputs may be wired in parallel to a single Logic Input (see diagram below). Logic Outputs and contact-closures should be rated for at least 5 Volts / 1mA operation. Low-current / dry-contact closures are recommended for reliability. Active output driver circuits should not exceed a signal range of 0~5 Volts DC, and should have a minimum pulse width of 100 milli-seconds. Logic Input impedances are approximately 10k ohms.

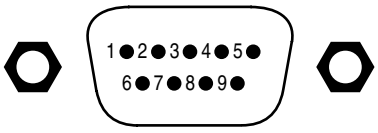
multiple switches to single Logic Input



LOGIC OUTPUTS

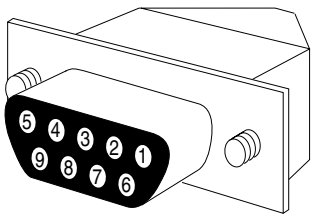
The VRAM provides eight logic outputs on a rear panel 9-pin Subminiature D (male) connector. Logic Outputs can be used to control external switching circuits (such as relays) for speakers, cameras, indicators, etc. The VRAM Logic Outputs are most often used, in conjunction with external relays, to turn off specific speakers when nearby microphones are active (reducing feedback problems). For example, if a speaker is located directly above microphone #1, the Logic Output for Channel 1 of the VRAM can be used to turn off that speaker relay when microphone #1 is active (see diagram on next page). The Logic Outputs can also be combined (wired in parallel) to control a single circuit. For example, a speaker relay could be turned off when either microphone #1 or microphone #2 is active. In addition to speaker relays, the VRAM Logic Outputs may be used to control external indicator lights (see diagram on next page). Another common application for Logic Outputs is to control video cameras. Different cameras could be activated depending upon which microphone (or group of microphones) is currently active. Cameras can be selected (using a video switcher such as a VSX41) and/or camera presets may be triggered (using a 'pan/tilt/zoom' camera system). The VRAM Logic Outputs may also be used in conjunction with the VRAM Logic Inputs to perform such functions as 'automatic priority', which allows a microphone (or group of microphones) to be muted whenever specific 'priority' microphones are active (see diagram on next page). The Logic Output for the 'priority' microphone is wired to a Logic Input which is defined to mute the other microphones (see Setup on pg. 8). A similar approach is useful for 'page-over-music' applications. However, in this case the Logic Outputs from multiple 'paging' microphones are wired to a Logic Input which is defined to mute the music channel. Multi-level priority schemes are also possible, but require the use of multiple Logic Inputs and a diode matrix. These 'priority' applications require that Logic Inputs do not follow Designated Mic On / Last Mic Hold (see Setup on pg. 6). Of course, manual muting of microphones via external switches is also possible (see Logic Inputs on pg. 10).

The VRAM Logic Outputs are 'open collector' outputs. Each Logic Output is an NPN transistor with the collector being the output and the emitter being ground (see diagram on next page). When a Logic Output is turned on, the transistor provides a path for DC current to flow. The Logic Outputs do not provide any voltage or current. They act only as switches (with a common ground return). To activate external relays, an external power supply must be used (see diagram on next page). The Logic Output transistors are rated up to a maximum of 24 VDC and 50 mA per output (24 volt relay coils maximum). However, +12 Volts DC is sufficient power for most applications. When using the Logic Outputs to control relays, protection diodes must be used to suppress high voltage transients that are generated when the relays turn off (see diagram on next page). Any of the 1N4004 family of diodes (1N4001, 1N4002, 1N4003, 1N4004, 1N4005, 1N4006, 1N4007, or equivalent) will provide proper protection. When a Logic Output goes on, the associated relay may be wired to perform on, off, or 'A/B' switching functions. To use logic 'on' to turn on (or activate) a device, wire across the 'normally open' relay contacts, in series with the device (or control voltage source). To use logic 'on' to select between 'A' or 'B' signals (inputs or outputs), wire one signal to the 'normally closed' relay terminal and the other signal to the 'normally open' relay terminal, with the common relay terminal providing the feed (input or output).



logic outputs

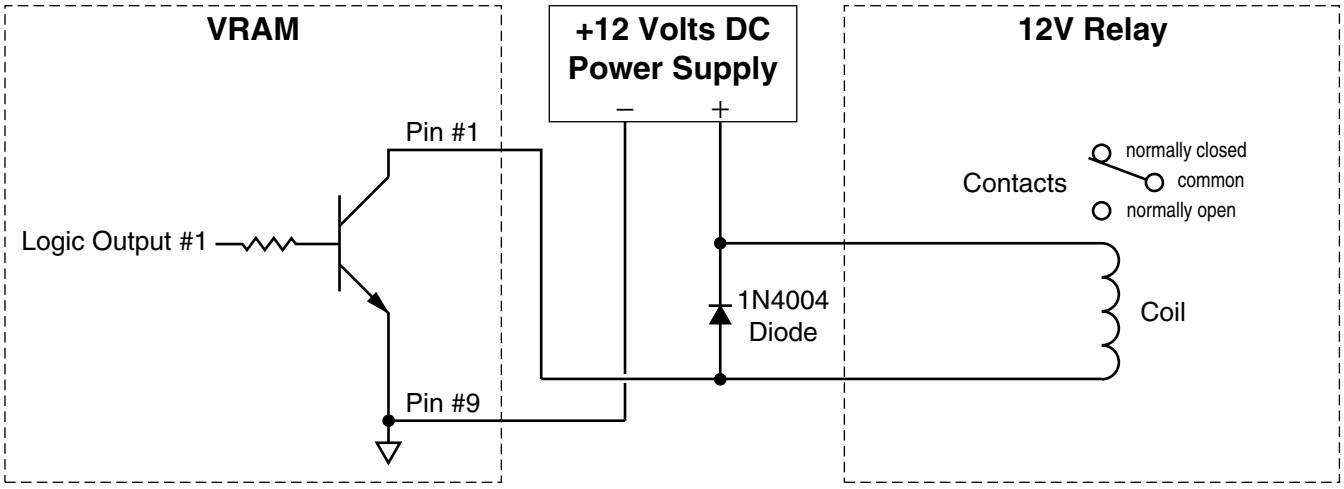
logic out	pin number
channel 1	pin #1
channel 2	pin #2
channel 3	pin #3
channel 4	pin #4
channel 5	pin #5
channel 6	pin #6
channel 7	pin #7
channel 8	pin #8
ground	pin #9



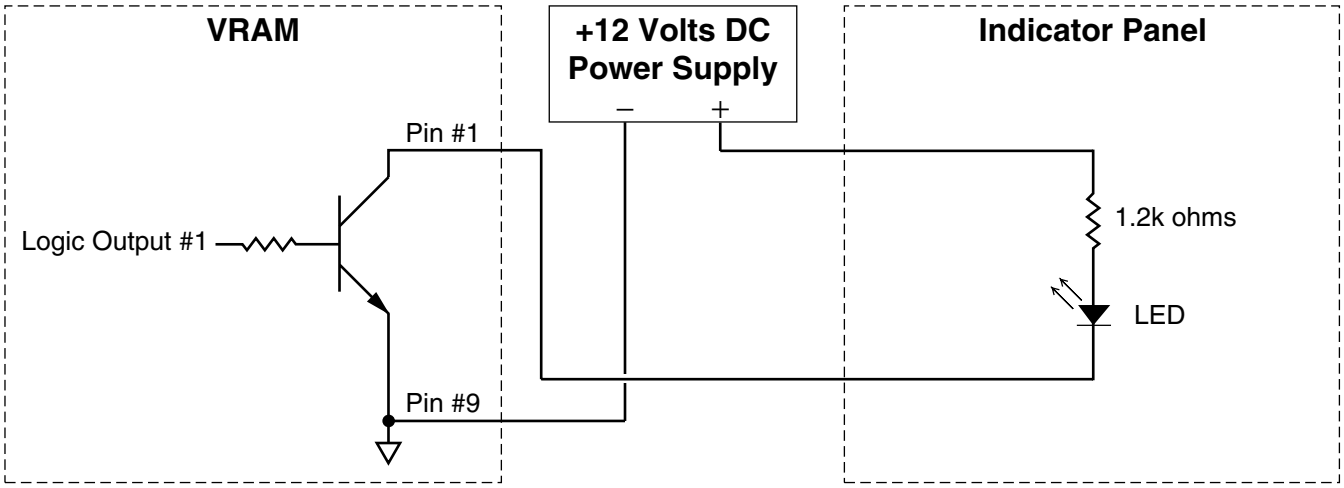
9-pin cable-end

LOGIC OUTPUTS

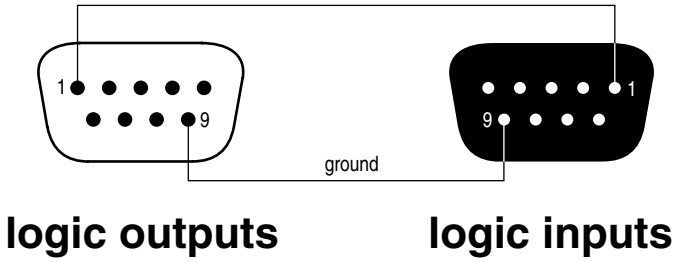
Logic/Relay circuit



Logic Outputs controlling indicators



Channel 1 'automatic priority' over Channels 2~8



RS-232 CONTROL

The VRAM has an RS-232 Serial Port, which allows it to be controlled by a computer (see Front & Rear Panel Features on pg. 2). In addition to the BiampWin software, the VRAM offers two other methods of computer control.

Control Button Emulation: This method allows the computer to imitate the operation of an infrared transmitter or wall-mount control panel. Although the VRAM does not accept infrared or wall-mount remote controls itself, it can still receive ASCII characters (via RS-232) which emulate the buttons on these types of remote controls. From the factory, remote control buttons have equivalent ASCII characters permanently assigned to them (see table below). Therefore, actions can be assigned to remote control buttons in the same way they are assigned to Logic Inputs. Then, using this method, the computer can output ASCII characters which are equivalent to the commands generated by those standard remote control buttons. Control Button Emulation allows the computer to utilize up to forty button definitions (unlike standard remote controls, which have only twenty-eight buttons). When using up to four devices in a system, Control Button Emulation also allows the computer to designate which device or devices should react to each control button command.

Advanced Computer Control: This method provides advanced commands, which allow the computer to retrieve or edit various VRAM settings. The computer may also emulate control buttons. Using this method, the computer may designate up to sixty-four devices, and may also provide 'real-time' display of various settings.

This manual only describes the Control Button Emulation method of computer control. For complete details about using the VRAM with a computer, including Advanced Computer Control, contact Biamp Systems for the manual "Computer Control of the VRAM".

Each control button on an infrared transmitter or wall-mount control panel corresponds to one character in the standard ASCII character set. The character equivalents are summarized in the following table. This table includes all forty possible buttons, their button numbers, their ASCII code equivalents, and their factory default button definitions (no operation assigned).

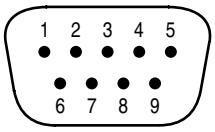
button 01	B	no operation assigned	button 15	P	no operation assigned	button 29	^	no operation assigned
button 02	C	no operation assigned	button 16	Q	no operation assigned	button 30	_	no operation assigned
button 03	D	no operation assigned	button 17	R	no operation assigned	button 31	'	no operation assigned
button 04	E	no operation assigned	button 18	S	no operation assigned	button 32	b	no operation assigned
button 05	F	no operation assigned	button 19	T	no operation assigned	button 33	c	no operation assigned
button 06	G	no operation assigned	button 20	U	no operation assigned	button 34	d	no operation assigned
button 07	H	no operation assigned	button 21	V	no operation assigned	button 35	e	no operation assigned
button 08	I	no operation assigned	button 22	W	no operation assigned	button 36	f	no operation assigned
button 09	J	no operation assigned	button 23	X	no operation assigned	button 37	g	no operation assigned
button 10	K	no operation assigned	button 24	Y	no operation assigned	button 38	h	no operation assigned
button 11	L	no operation assigned	button 25	Z	no operation assigned	button 39	i	no operation assigned
button 12	M	no operation assigned	button 26	[	no operation assigned	button 40	j	no operation assigned
button 13	N	no operation assigned	button 27	\	no operation assigned			
button 14	O	no operation assigned	button 28	]	no operation assigned			

The computer can initiate any functions or actions that a standard control can, by simply transmitting the equivalent control button ASCII character. When interfacing the VRAM to a computer, the computer must be aware that the VRAM will 'echo' all characters it receives (both from computer and Logic Inputs) via the Serial Port Transmit Data (TXD) output signal. However, from the factory, the VRAM Logic inputs are programmed with no 'echo character' assigned to them.

When using Control Button Emulation, up to four BIAMP products may be connected together and addressed individually. When multiple units are used, each unit is assigned a unique "Device #" (see Setup on pg. 9). Normally, all units would react to control button commands. However, a computer can send commands to specific units, by preceding each command with a "device select prefix" character (see table below). Only those units whose Device #s are specified will respond to the command which follows. If a command is not preceded by a device select prefix character, then all units in the system will react to that command.

Select Device 1	l	Select Devices 2 & 3	q	Select Devices 1 & 2 & 4	v
Select Device 2	m	Select Devices 1 & 2 & 3	r	Select Devices 3 & 4	w
Select Devices 1 & 2	n	Select Device 4	s	Select Devices 1 & 3 & 4	x
Select Device 3	o	Select Devices 1 & 4	t	Select Devices 2 & 3 & 4	y
Select Devices 1 & 3	p	Select Devices 2 & 4	u	Select Devices 1 & 2 & 3 & 4	z

Serial Port: The 9-pin Sub-D (male) connector on the VRAM rear panel provides the RS-232 compatible serial interface signals used for computer control. The VRAM Serial Port transmits serial data on pin 3 (TxD), receives serial data on pin 2 (RxD), and provides a ground on Pin 5. The Data Terminal Ready (DTR) & Request To Send (RTS) output signals are connected to the +12 Volt power supply (through a resistor) and are always asserted when the VRAM power is on. ***NOTE:*** *The Serial Port may also transmit commands which are received via the Logic Inputs, depending upon the echo character assignments (see Setup on pg. 8).*



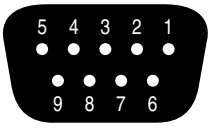
pin #1 = not used
pin #2 = Receive Data (RxD) input
pin #3 = Transmit Data (TxD) output
pin #4 = Data Terminal Ready (DTR) output
pin #5 = ground
pin #6 = not used
pin #7 = Request To Send (RTS) output
pin #8 = not used
pin #9 = not used

serial port

The VRAM only requires receive data (pin 2), transmit data (pin 3), and signal ground (pin 5) to be connected for successful data communications (see cable diagram below). However, the PC may require that signals be present on the data set ready, clear to send, or carrier detect inputs, as well as the receive data, transmit data, and signal ground pins. Success or failure depends entirely on the actual computer hardware and software being used. When trying to solve an interfacing problem, the most important thing to remember is that an output of one device should connect to one or more inputs of the other device, and that two outputs should never be connected together. Also, keep in mind that the RS-232 specification calls for the cable length to be no greater than 50 feet (although it is not unusual to be able to operate over distances of 150 to 250 feet), and the connectors must be of the appropriate gender (male or female) to mate properly. For best results, a shielded cable should be used, with the shield connected to chassis ground. Since the VRAM serial interface ground is also tied (indirectly) to the analog signal ground, undesirable ground loops may occur when the VRAM is connected to a PC (if the system grounding is not carefully designed). For best performance, the PC ground and the chassis ground of the VRAM should be at the same potential, and the PC should get AC power from the same source as the VRAM (and any other audio equipment which is connected to the VRAM). Since most lap-top computers are isolated from earth ground, this should rarely pose a problem.

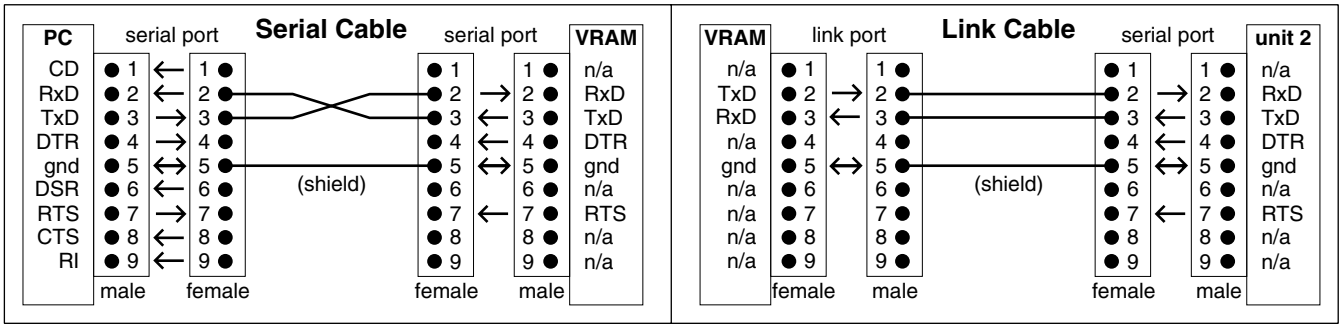
Serial Port Data Communications Parameters: The VRAM communicates through the Serial Port at the factory selected rate of 38400 bits per second, with 8 data bits, 1 stop bit, and no parity. The VRAM utilizes a subset of the standard 7-bit ASCII character set. The eighth data bit of each character (the most significant bit) should always be 0. The computer should not echo the characters it receives. The computer should not be set for either hardware (DTR) or software (XON/XOFF) flow control. The baud rate may be changed to either 2400, 9600, or 19200 bits per second by means of the software (see Setup on pg. 9). ***NOTE:*** *Baud rate may need to be changed when the VRAM is being used in RS-232 systems with other products having a lower maximum baud rate.*

Link Port Connections: The 9-pin Sub-D (female) connector on the VRAM rear panel provides the RS-232 compatible serial interface signals used for linking multiple BIAMP products within a system. The Link Port of one device simply connects to the Serial Port of the next device, and so forth (see diagram below). Link cables are available as an option (Biamp #909-0057-00). ***NOTE:*** *All but the final device in a system should have its '<u>Link</u>' switch pressed in (see Front & Rear Panel Features on pg. 2). The Link Port may also transmit commands which are received via the Logic Inputs, depending upon the echo character assignments (see Setup on pg. 8).*



pin #1 = not used
pin #2 = Transmit Data (TxD) output
pin #3 = Receive Data (RxD) input
pin #4 = not used
pin #5 = ground
pin #6 = not used
pin #7 = not used
pin #8 = not used
pin #9 = not used

link port

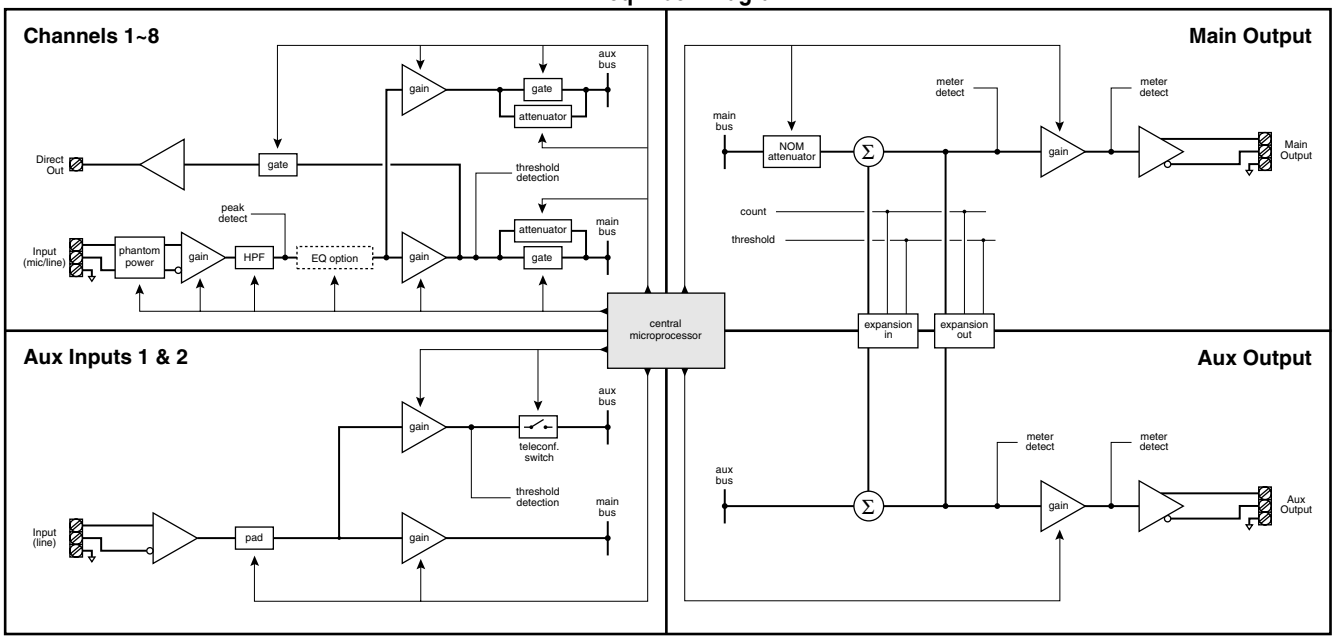


SPECIFICATIONS & BLOCK DIAGRAM

Frequency Response (20Hz~20kHz @ +4dBu)**:**	+0/-0.3dB
THD + Noise (20Hz~20kHz @ +4dBu)**:**	< 0.03%
Equivalent Input Noise (20Hz~20kHz, 60dB gain, 150 ohm)**:**	-126dBu
Output Noise (20Hz~20kHz, main & 1 channel @ nominal)**:**	< -83dBu
Maximum Gain:	
mic/line inputs to main & aux outputs	85dB
aux line inputs to main & aux outputs	28dB
Crosstalk (channel-to-channel @ 1kHz)**:**	< -95dB
Output Impedance:	
main & aux outputs (balanced)	200 ohms
channel direct outputs (unbalanced)	560 ohms
Input Impedance	
mic/line inputs (balanced)	6.6k ohms
aux line inputs (balanced)	20k ohms
Maximum Output:	
main & aux outputs (balanced)	+24dBu
Maximum Input:	
mic/line & aux line inputs	+24dBu

Phantom Power:	+36VDC (7mA/channel)
Input Gain Range:	
mic/line inputs (variable trim)	-6dB to +63dB
aux line inputs (selectable pad)	-6dB or +6dB
Channel Equalization (model VRAMeq)**:**	
low-frequency (shelving)	±9dB @ 100Hz
mid-frequency (variable peaking)	±9dB @ 220Hz~3.6kHz
high-frequency (shelving)	±9dB @ 3.3kHz
High-Pass Filter:	6dB/octave @ 110Hz
Automixing:	
gate attack time (signal dependent)	4mSec min.
release time (variable)	200mSec to 2Sec
channel-off attenuation (variable)	-10dB to -80dB
NOM attenuation (doubling of active inputs)	-3dB
Feedback/Noise Improvement (8 channels)	9dB
Power Consumption (115/230VAC 50/60Hz)**:**	< 27 watts
Dimensions (HxWxD)**:**	1.75"x19"x11" (44x483x279mm)
Weight:	< 10 lbs. (4.55kg)

VRAMeq Block Diagram



WARRANTY

BIAMP SYSTEMS IS PLEASED TO EXTEND THE FOLLOWING 5-YEAR LIMITED WARRANTY TO THE ORIGINAL PURCHASER OF THE PROFESSIONAL SOUND EQUIPMENT DESCRIBED IN THIS MANUAL

1. BIAMP Systems warrants to the original purchaser of new products that the product will be free from defects in material and workmanship for a period of 5 YEARS from the date of purchase from an authorized BIAMP Systems dealer, subject to the terms and conditions set forth below.

2. If you notify BIAMP during the warranty period that a BIAMP Systems product fails to comply with the warranty, BIAMP Systems will repair or replace, at BIAMP Systems' option, the nonconforming product. As a condition to receiving the benefits of this warranty, you must provide BIAMP Systems with documentation that establishes that you were the original purchaser of the products. Such evidence may consist of your sales receipt from an authorized BIAMP Systems dealer. Transportation and insurance charges to and from the BIAMP Systems factory for warranty service shall be your responsibility.

3. This warranty will be VOID if the serial number has been removed or defaced; or if the product has been altered, subjected to damage, abuse or rental usage, repaired by any person not authorized by BIAMP Systems to make repairs; or installed in any manner that does not comply with BIAMP Systems' recommendations.

4. Electro-mechanical fans, electrolytic capacitors, and normal wear and tear of items such as paint, knobs, handles, and covers are not covered under this warranty.

5. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. BIAMP SYSTEMS DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

6. The remedies set forth herein shall be the purchaser's sole and exclusive remedies with respect to any defective product.

7. No agent, employee, distributor or dealer of Biamp Systems is authorized to modify this warranty or to make additional warranties on behalf of Biamp Systems. statements, representations or warranties made by any dealer do not constitute warranties by Biamp Systems. Biamp Systems shall not be responsible or liable for any statement, representation or warranty made by any dealer or other person.

8. No action for breach of this warranty may be commenced more than one year after the expiration of this warranty.

9. BIAMP SYSTEMS SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS OR LOSS OF USE ARISING OUT OF THE PURCHASE, SALE, OR USE OF THE PRODUCTS, EVEN IF BIAMP SYSTEMS WAS ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Biamp Systems
10074 S.W. Arctic Drive
Beaverton, Oregon 97005
(503) 641-7287

Declaration of Conformity

BIAMP SYSTEMS
10074 SW Arctic Drive
Beaverton, OR USA 97005

as the manufacturer, hereby declares that the following described product, in our delivered version, complies with the provisions of the DIRECTIVES as noted herein. In case of alteration of the product, not agreed upon or directed by us, this declaration is no longer valid.

Product: Model: ADVANTAGE® VRAM
Description: Variable Resource Automixer

Applicable EC Directives: EMC Directive (89/336/EEC) LVD Directive (73/23/EEC)

Applicable Harmonized Standards: EN55103-1 emissionsEN55103-2 immunity
EN60065 safety

Special Considerations for Product Environment or Compliance:

Shielded cabling must be used for system connections. The apparatus is deemed incapable of producing harmonic emissions or flicker levels sufficient enough to interfere with other apparatus as noted in EN61000-3-2 and EN61000-3-3.

This apparatus operates from a removeable external power source at voltages below the levels encompassed by the LVD. The external power source complies with the applicable requirements of EN60065. The apparatus itself is outside of the scope of the LVD and presents no hazardous voltages, as defined in the LVD. For compliance, the apparatus shall be powered only from the separate CE marked BIAMP SYSTEMS power source.

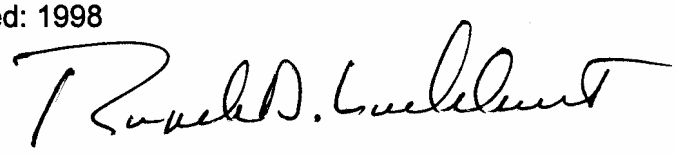
RF interference conducted through interconnect cabling may cause varying degrees of random signal degradation. The effect of increased noise or distortion due to this interference is typically masked by the desired signal. In no instance is operation inhibited.

The Technical Report/File is maintained at:

Biamp Systems
10074 S.W. Arctic Drive
Beaverton, OR USA 97005
phone: (503) 641-7287 fax: (503) 626-0281
e-mail: biamp@biamp.com

Authorized Representative: Ralph Lockhart, President

Authorized Representative Signature:
Issued: 1998



SAFETY INFORMATION

The words WARNING and CAUTION throughout the manual, and on the device, call attention to important safety information. These words have the following meanings.

WARNING: The related information alerts you to conditions that could result in serious injury or damage to property if the instructions are not followed properly.

CAUTION: The related information instructs you on how to prevent damage to the equipment or how to avoid conditions that could result in minor injury if proper steps are not followed.

Product labelling and the operation manual may use the internationally recognized symbols defined below to note safety messages.

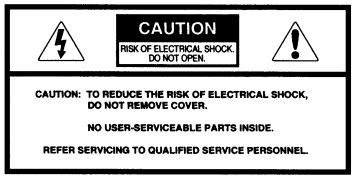
The lightning flash with arrowhead symbol, enclosed within a triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the apparatus's enclosure or at connection terminals that may be of sufficient magnitude to constitute a risk of electrical shock.

The exclamation point, enclosed within a triangle, is intended to alert the user to important installation, operation, and maintenance (servicing) instructions in the literature accompanying the apparatus.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

CAUTION: Installation of this apparatus should be made by a qualified installation person and should conform to all applicable local codes.

Modification and optional equipment information referenced in this manual is for use by qualified installation and service personnel only.



"INFORMACIÓN DE SEGURIDAD"

Las palabras **PELIGRO** (WARNING) y **PRECAUCIÓN** (CAUTION) a lo largo del manual y en el dispositivo (sistema), llaman la atención acerca de una importante información de seguridad. Estas palabras tienen los siguientes significados :

PELIGRO (WARNING) : la información relata las condiciones en que podría ser dañada seriamente la propiedad si no se siguen adecuadamente las instrucciones.

PRECAUCIÓN (CAUTION) : la información que se relata te instruye en cómo prevenir daños al equipo o como evitar condiciones que podrían resultar en perjuicio menor si los pasos adecuados no son seguidos correctamente.

El etiquetado del producto y el manual de operación pueden hacer uso de los símbolos reconocidos internacionalmente y cuyos mensajes estan definidos a continuación para modificar mensajes de seguridad:

El símbolo del rayo encerrado en un triángulo pretende alertar al usuario de la presencia de un peligroso voltaje no aislado ,dentro de la caja del aparato o a un terminal de conexión y que podría ser de suficiente magnitud como para constituir un grave riesgo de descarga eléctrica.

El punto de exclamación dentro de un triángulo pretende alertar al usuario de la importancia de las instrucciones de instalación, operación y mantenimiento (servicio) que acompañan al aparato.

PELIGRO (WARNING) : para reducir el riesgo de fuego o una descarga electrica, no exponer este aparato a la lluvia o la humedad.

PRECAUCIÓN (CAUTION) : la instalación de este aparato debería hacerse por una persona cualificada en la instalación, y debería conformar todos los códigos locales aplicables.

La modificación y la información opcional del equipo referenciada en este manual es para ser utilizada únicamente por personal cualificado en instalación y servicio.

INFORMATION CONCERNANT VOTRE SECURITE

Les mots **WARNING** et **CAUTION** dans le manuel d'utilisation et sur les appareils attirent votre attention sur les plus importantes informations concernant votre sécurité. Ces mots ont la signification suivante:

WARNING: Ce mot vous indique les circonstances dans lesquelles vous pourriez être blessé ou endommager votre équipement si les instructions ne sont pas suivies correctement.

CAUTION: Ce mot vous indique comment éviter d'endommager votre matériel et comment éviter de vous blesser si vous ne suivez pas les instructions.

Vous trouverez peut-être les symboles suivants sur votre appareil ou dans le manuel d'utilisation.

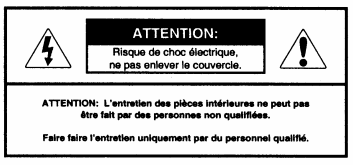
L'éclair se terminant en flèche dans un triangle permet de prévenir l'utilisateur d'un voltage dangereux non isolé dans l'appareil ou d'une connexion d'une amplitude suffisante pour constituer un risque de choc électrique.

Le point d'exclamation dans un triangle permet de prévenir l'utilisateur des points importants concernant l'installation, le fonctionnement et l'entretien de l'appareil figurant dans le manuel d'utulisation.

WARNING: POUR REDUIRE LES RISQUES DE FEU OU DE CHOC ELECTRIQUE, NE PAS METTRE L'APPAREIL SOUS LA PLUIE OU DANS L'HUMIDITE.

CAUTION: L'installation de cet appareil doit être faite par un installateur qualifié et doit être en conformité avec toutes les lois locales en application.

Les informations concernant une modification ou un équipement en option dans le manuel doivent être effectué par du personnel qualifié.



INFORMAZIONI PER LA SICUREZZA

Le parole **AVVERTENZA** (WARNING) e **PRUDENZA** (CAUTION) poste sul manuale d'uso e sul apparato richiamano la vostra attenzione su delle importanti informazioni per la vostra sicurezza. Queste parole hanno il seguente significato.

AVVERTENZA: (WARNING) La suddetta indicazione vi avvisa sul rischio di incorrere in danni a cose o a persone ,se le procedure d'uso e installazione non saranno seguite propriamente.

PRUDENZA: (CAUTION) La suddetta indicazione vi instruisce su come prevenire e ridurre al minimo, il rischio di danni agli apparati e alle persone se le instruzioni saranno seguite propriamente.

Le apparecchiature e i manuali di instruzioni riporteranno la simbologia standard raffigurata qui sotto ,accompagnate dalle relative informazioni per la sicurezza.

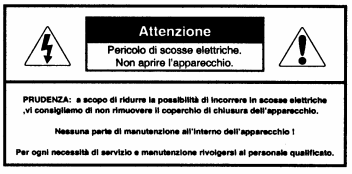
La simbologia con il fulmine all'interno di un triangolo, intende avvisare l'utente della presenza di alto volaggio all'interno del apparecchio in questione, e che il suddetto apparecchio si alimenta attraverso una tensione di rete ad alto voltaggio e che dunque si potrebbe incorrere sul rischio di una possibile scossa elettrica.

La simbologia con il punto esclamativo all'interno di un triangolo, intende avvisare l'utente di una serie di instruzioni contenute nel manuale d'uso riguardanti : operato,manutenzione e assistenza. Il suddetto manuale sarà a corredo dell'apparecchio.

AVVERTENZA: (WARNING) PER RIDURRE IL RISCHIO DI POSSIBILI INCENDI O SCOSSE ELECTTRICHE ,SCONSIGLIAMO DI ESPORRE L'APPARECCHIO ALLA PIOGGIA O ALL'UMIDITA'.

PRUDENZA: (CAUTION) l'Installazione di questo apparato dovrà essere effettuata solo da personale qualificato e il tipo di installazione dovrà essere in regola con le norme vigenti locali..

Modifiche e ulteriori informazioni specificate in questo manuale sono solamente riservate al personale qualificato all'installazione.



Sicherheitshinweise

Die Bergriffe **WARNUNG** (engl. WARNING) und **ACHTUNG** (engl. CAUTION) in der Bedienungsanleitung und auf den Geräten machen auf wichtige Sicherheitsinformationen aufmerksam. Diese Begriffe haben die folgende Bedeutung:

WARNUNG: (WARNING) Der folgende Text warnt Sie vor ernsthaften Verletzungen oder Beschädigungen, die aus einer fehlerhaften Bedienung bzw. Handhabung des Gerätes resultieren können.

ACHTUNG: (CAUTION) Der folgende Text informiert Sie über Bedienungshinweise zum Schutz Ihres Gerätes oder weist auf mögliche Schäden hin, wenn die Bedienungshinweise nicht beachtet werden.

Die Beschriftung der Geräte und die Bedienungsanleitungen weisen unter Umständen international bekannte Symbole auf, die die folgende Bedeutung haben:

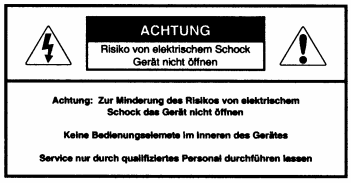
Das Blitzsymbol im Dreieck warnt vor anliegender, nicht isolierter „gefährlicher Spannung" im Inneren oder an den Anschlüssen des Gerätes. Die Berührung der unter Spannung stehenden Teile kann zu einem elektrischen Schock führen.

Das Rufzeichen im Dreieck macht auf wichtige Installations-, Bedienungs- und Servicehinweise in der zugehörigen Bedienungsanleitung aufmerksam.

WARNUNG: (WARNING) Zur Minderung des Risikos von Feuer und elektrischem Schock schützen Sie das Gerät vor Regen und Feuchtigkeit.

ACHTUNG: (CAUTION) Die Installation des Gerätes sollte nur durch qualifiziertes Personal durchgeführt werden und muß den jeweiligen Bestimmungen entsprechen.

Die Modifikationen und die Informationen zu den optionalen Erweiterungen in der Bedienungsanleitung sind nur für qualifiziertes Personal bestimmt.



Sikkerhedsinformation

Ordene ***ADVARSEL*** (WARNING) og ***FORSIGTIG*** (CAUTION), brugt i henholdsvis brugervejledning og på selve produktet, indikerer, at vigtig information omkring sikkerhed følger. Ordene betyder følgende:

ADVARSEL: (WARNING) Den efterfølgende information advarer Dem om forhold, der kan føre til alvorlige ulykker og ejendomsskader, hvis ikke vejledningen følges.

FORSIGTIG: (CAUTION) Den efterfølgende information vejleder Dem i, hvordan De undgår skade på produktet, samt undgår forhold der kan føre til mindre ulykker og ejendomsskader, hvis ikke vejledningen følges.

Produktetiketter og brugervejledning kan indeholde de internationalt anerkendte symboler der er vist nedenfor:

Trekanten med et lyn i midten har til hensigt at advare brugeren om, at produktet indeholder "farlig spænding", og at det derfor er forbundet med fare for elektrisk stød at åbne produktet.

Trekanten med udråbstegn har til hensigt at advare brugeren om, at vigtig information omkring installation, brug, service og vedligeholdelse af produktet er indeholdt i den medfølgende brugervejledning.

ADVARSEL: (WARNING) Med henblik på at reducere risikoen for brand eller elektrisk stød, må produktet ikke udsættes for regn eller fugt.

FORSIGTIG: (CAUTION) Installation af dette produkt skal foretages af en autoriseret installatør og skal være i overensstemmelse med alle anvendelige lokale retningsliner.

Modifikationer samt alternativt udstyr beskrevet i denne brugervejledning er kun henvendt til kvalificerede installatører og servicepersonale.

VEILIGHEIDSINFORMATIE

De woorden **WAARSCHUWING** (WARNING) en **VOORZICHTIG** (CAUTION) welke in de handleiding en op het apparaat voorkomen, waarschuwen U voor belangrijke veiligheidsinformatie. Zij hebben de volgende betekenis:

WAARSCHUWING: (WARNING) De betreffende informatie waarschuwt U voor omstandigheden die kunnen leiden tot defecten of beschadigingen aan apparaten als de instructies niet volledig worden opgevolgd.

VOORZICHTIG: (CAUTION) De betreffende informatie instrueert U hoe U defecten aan apparatuur kunt voorkomen of hoe U omstandigheden kunt vermijden die kunnen resulteren in schade als de juiste stappen niet worden opgevolgd.

Produkt informatie en handleiding hanteren onderstaande internationaal erkende symbolen om veiligheidsinstructies aan te geven.

De bliksemschicht in een driehoek wordt gebruikt om de gebruiker te attenderen op ongeïsoleerde "gevaarlijke spanning" in het apparaat of bij de aansluitklemmen, die het risico van een electrische schok kunnen geven.

Het uitroepteken in een driehoek wordt gebruikt om de gebruiker te attenderen op belangrijke installatie, gebruiks- en onderhoudsinstructies in de beschrijving die bij het apparaat hoort.

WAARSCHUWING: (WARNING) OM HET RISICO VAN BRAND OF EEN ELECTRISCHE SCHOK TE VERMIJDEN DIENT U HET APPARAAT NIET AAN VOCHT BLOOT TE STELLEN.

VOORZICHTIG: (CAUTION) Installatie van dit apparaat dient te geschieden door gekwalificeerd personeel en dient te geschieden conform de plaatselijke voorschriften.

Modificaties en aanvullende informatie waar in de handleiding naar wordt verwezen, dient alleen voor gebruik door gekwalificeerd personeel.

TURVALLISUUSTIEDOTE

Sanat **VAROITUS** (WARNING) ja **HUOMIO** (CAUTION), jotka esiintyvät manuaalissa ja itse laitteessa, ilmoittavat tärkeästä turvallisuusinformaatiosta. Näillä sanoilla on seuraava merkitys:

VAROITUS: (WARNING) Yhteydessä oleva informaatio varoittaa olosuhteista, jotka saattavat johtaa vakaviin vammoihin tai laitteen vaurioitumiseen, mikäli ohjeita ei täysin noudateta.

HUOMIO: (CAUTION) Yhteydessä oleva informaatio neuvoo, miten laitteen vaurioituminen voidaan ehkäistä tai miten voidaan välttää olosuhteet, jotka voivat johtaa lieviin vammoihin, mikäli ohjeita ei noudateta.

Tuotteessa tai käyttöohjeessa voidaan käyttää seuraavia alla määriteltyjä kansainvälisiä symboleja, jotka viittaavat turvallisuusinformaatioon.

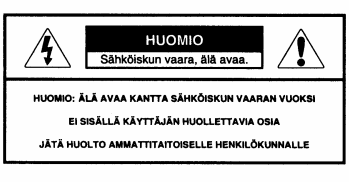
Kolmion sisällä olevan nuolipäinen salama varoittaa käyttäjää laitteen sisällä tai liitännöissä olevasta eristämättömästä vaarallisesta jännitteestä, joka saattaa olla tarpeeksi suuri aiheuttaakseen sähköiskun vaaran.

Kolmion sisällä oleva huutomerkin tarkoituksena on ilmoittaa käyttäjälle tärkeistä asennusta, käyttöä tai huoltoa koskevista ohjeista laitteen mukana seuraavassa kirjallisuudessa.

VAROITUS: (WARNING) ÄLÄ ALTISTA LAITETTA SATEELLE TAI KOSTEUDELLE TULIPALON JA SÄHKÖISKUN VAARAN VUOKSI.

HUOMIO: (CAUTION) Laitteen asentaminen tulisi jättää ammattitaitoisen henkilön suoritettavaksi ja asennuksessa tulee noudattaa kaikkia paikallisia säännöksiä.

Tässä manuaalissa oleva informaatio, joka koskee muutostöitä ja lisälaitteita, on tarkoitettu vain ammattitaitoisten asennus- ja huoltohenkilöiden käyttöön.



SIKKERHETS INFORMASJON

Når ordene **ADVARSEL** (WARNING) og **VIKTIG** (CAUTION) blir brukt i manualen og på produktet, gjelder det informasjon som har med brukerens sikkerhet å gjøre. Ordene har følgende mening:

ADVARSEL: (WARNING) Tilhørende informasjon viser til forhold som kan resultere i alvorlige skader eller ødeleggelser hvis anvisningene ikke følges nøye.

VIKTIG: (CAUTION) Tilhørende informasjon forteller deg hvordan du skal unngå feil på utstyret, eller unngå situasjoner som kan resultere i mindre skader.

Produkt merkingen og bruksanvisningen bruker internasjonale symboler for å merke punkter som er viktige for brukerens sikkerhet.

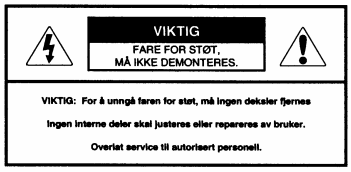
Lynet i en triangel advarer brukeren om uisolert "farlig spenning" inne i apparatet, eller tilkoblings terminaler som kan gi støt.

Etter utropstegnet i en triangel følger informasjon som er viktig når det gjelder installasjon, bruk og vedlikehold (service) av apparatet.

ADVARSEL: (WARNING) FOR Å REDUSERE FAREN FOR BRANN ELLER STØT MÅ APPARATET IKKE UTSETTES FOR VANN ELLER FUKTIGHET.

VIKTIG: (CAUTION) Installasjon av apparatet skal foretas av autorisert installatør etter gjeldende forskrifter.

Modifikasjoner og tilleggs informasjon som følger er kun for kvalifiserte installatører eller service personell.



SÄKERHETS INFORMATION

Orden **VARNING** (WARNING) och **OBSERVERA** (CAUTION) vilka används i denna manual och på apparaten, är menade att uppmärksamma viktig säkerhets information. Dessa ord har följande betydelse.

VARNING: (WARNING) Information som uppmärksammar på omständigheter som kan resultera i allvarlig personskada eller skada på egendom om instruktionerna ej följs.

OBSERVERA: (CAUTION) Information som uppmärksammar på instruktioner om hur skada på utrustning eller hur situationer där lättare personskador kan uppstå undvikes.

Följande internationellt använda ord och symboler används i handboken och på märkningar på produkten för att uppmärksamma användare på viktiga säkerhets instruktioner.

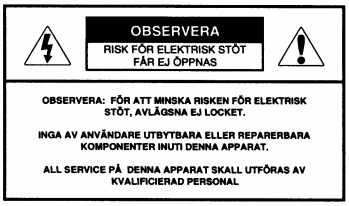
En blixt med pil, innesluten i en triangel, menad att uppmärksamma användare på närvaron av oisolerade "farliga spänningar" i apparaten eller på anslutnings kontakter vilka har tillräcklig styrka för att medföra risk för elektrisk söt.

Ett utropstecken, innesluten i en triangel, menad att uppmärksamma användare på viktiga installations, handhavande eller underhålls-instruktioner i medföljande dokumentation.

VARNING: (WARNING) FÖR ATT MINSKA RISKEN FÖR BRAND ELLER ELEKTRISK STÖT, UTSÄTT EJ APPARATEN FÖR FUKT ELLER VÄTSKA.

OBSERVERA: (CAUTION) Installation av denna apparat skall utföras av kvalificerad installatör samt enligt alla gällande lokala bestämmelser.

Eventuella modifierings instruktioner och annan information av teknisk art i denna manual är endast avsedd att användas av kvalificierad installations och service personal.



ΠΛΗΡΟΦΟΡΙΕΣ ΑΣΦΑΛΕΙΑΣ

Οι λέξεις **ΚΙΝΔΥΝΟΣ** (WARNING) και **ΠΡΟΣΟΧΗ** (CAUTION) που αναφέρονται μέσα στο εγχειρίδιο και στη συσκευή, επικεντρώνουν την προσοχή σε σημαντικές πληροφορίες ασφαλείας. Οι λέξεις αυτές έχουν την παρακάτω σημασία.

ΚΙΝΔΥΝΟΣ : (WARNING) Η αναγραφόμενη πληροφορία επιστά την προσοχή σας σε καταστάσεις που θα μπορούσαν να έχουν σαν αποτέλεσμα σοβαρό τραυματισμό ή καταστροφή της ιδιοκτησίας αν οι οδηγίες δεν ακολουθηθούν κατάλληλα.

ΠΡΟΣΟΧΗ : (CAUTION) Η αναγραφόμενη πληροφορία σας καθοδηγεί πώς να προλάβετε καταστροφή του εξοπλισμού ή πώς να αποφύγετε καταστάσεις που θα μπορούσαν να έχουν ως αποτέλεσμα μικροτραυματισμούς αν δεν ακολουθηθούν τα σωστά βήματα.

Στις επιγραφές των προτόντων και στο εγχειρίδιο λειτουργίας, χρησιμοποιούνται τα σιεθνώς αναγνωρισμένα σύμβολα, των οποίων ο ορισμός δίνεται παρακάτω έτσι ώστε να υπογραμμιστούν τα μηνύματα ασφαλείας.

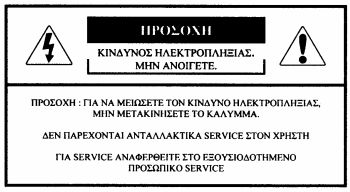
Η φωτεινή αναλαμπή με σύμβολο το βέλος, μέσα στο τρίγωνο, έχει σκοπό να επιστήσει την προσοχή του χρήστη, στην ύπαρξη μη- μονωμένης « επικίνδυνης ισχύος ρεύματος » στο εσωτερικό της συσκευής ή στις άκρες σύνδεσης οι οποίες μπορεί να έχουν αρκετό μέγεθος ώστε να περιέχουν κίνδυνο ηλεκτροπληξίας.

Το επεξηγηματικό σημείο, μέσα στο τρίγωνο, έχει σκοπό να επιστήσει την προσοχή του χρήστη στις σημαντικές οδηγίες εγκατάστασης, λειτουργιας και συντήρησης (service) που περιέχονται στα φυλλάδια που συνοδεύουν την συσκευή.

ΚΙΝΔΥΝΟΣ : (WARNING) Για να αποφύγετε τον κίνδυνο φωτιάς ή ηλεκτροπληξίας, μην εκθέτετε αυτή τη αυσκευή σε βροχή ή σε υγρασία.

ΠΡΟΣΟΧΗ : (CAUTION) Η εγκατάσταση αυτής της συσκευής θα πρέπει να γίνει από εξειδικευμένο άτομο και θα πρέπει να προσαρμόζεται σε όλους τους εφαρμόσιμους τοπικούς κώδικες.

Οι τροποποιήσεις και οι προϋποθετικές πληροφορίες για τον εξοπλισμό, που αναφέρονται σε αυτό το εγχειρίδιο, προορίζονται για χρήση μόνο από εξειδικευμένα στην εγκατάσταση και στο service, άτομα.



INFORMAÇÃO SOBRE SEGURANÇA

As palavras ADVERTÊNCIA (WARNING) e PRECAUÇÃO (CAUTION) neste manual, e no dispositivo, alertam para importantes informações sobre segurança. Estas palavras significam o seguinte:

ADVERTÊNCIA : (WARNING) Informação relacionada que alerta sobre condições que poderão resultar em lesões sérias ou prejuízo, se as instruções não forem seguidas adequadamente.

PRECAUÇÃO : (CAUTION) Informação relacionada que instrúi como prevenir danos no equipamento ou como evitar condições que poderão resultar em lesões leves, se os passos não forem seguidos adequadamente.

As etiquetas do produto e do manual de operações podem usar os símbolos internacionalmente reconhecidos definidos abaixo para advertir mensagens de segurança.

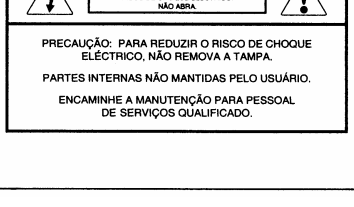
símbolo do relâmpago com uma seta, dentro de um triângulo, tem o fim de alertar o usuário a presença de "voltagem perigosa" sem isolação dentro da caixa isolamento do aparelho ou nos terminais de ligação que podem ter a magnitude suficiente que constitui um risco de choque eléctrico.

ponto de exclamação, dentro de um triângulo, tem o fim de alertar o usuário sobre instruções importantes de instalação, operação e manutenção (serviços) na literatura que acompanha o aparelho.

ADVERTÊNCIA : (WARNING) PARA REDUZIR O RISCO DE INCÊNDIO OU CHOQUE ELÉCTRICO, NÃO EXPONHA ESTE APARELHO A CHUVA OU HUMIDADE.

PRECAUÇÃO : (CAUTION) A instalação deste aparelho deve ser feita por um profissional qualificado e deve obedecer a todos os códigos locais aplicáveis.

Modificação e informação sobre equipamento adicional citados neste manual são para o uso exclusivo do pessoal qualificado de instalação e manutenção.

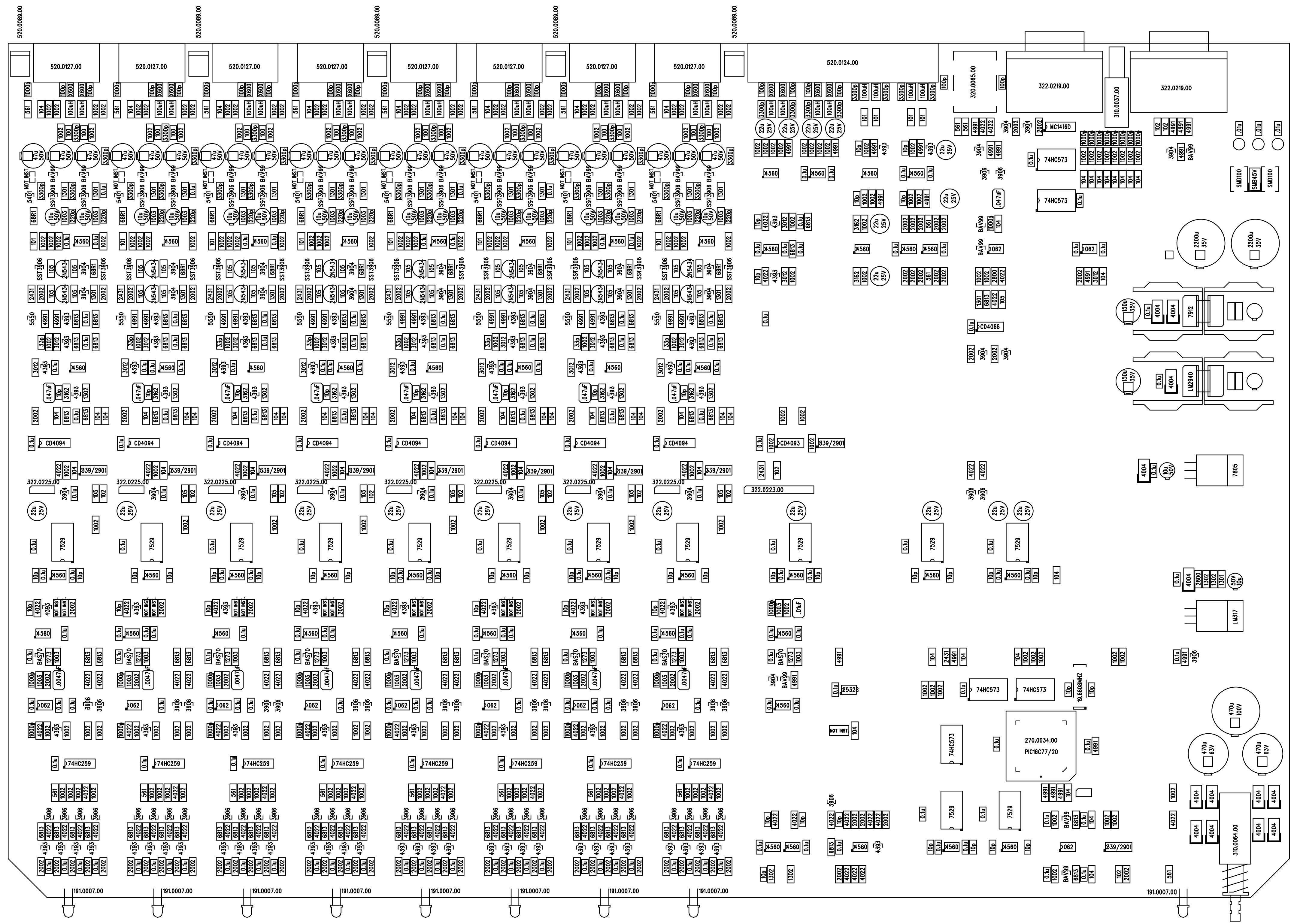


BIAMP™

VRAM & VRAMeq
Variable Resource Automixer

Schematic

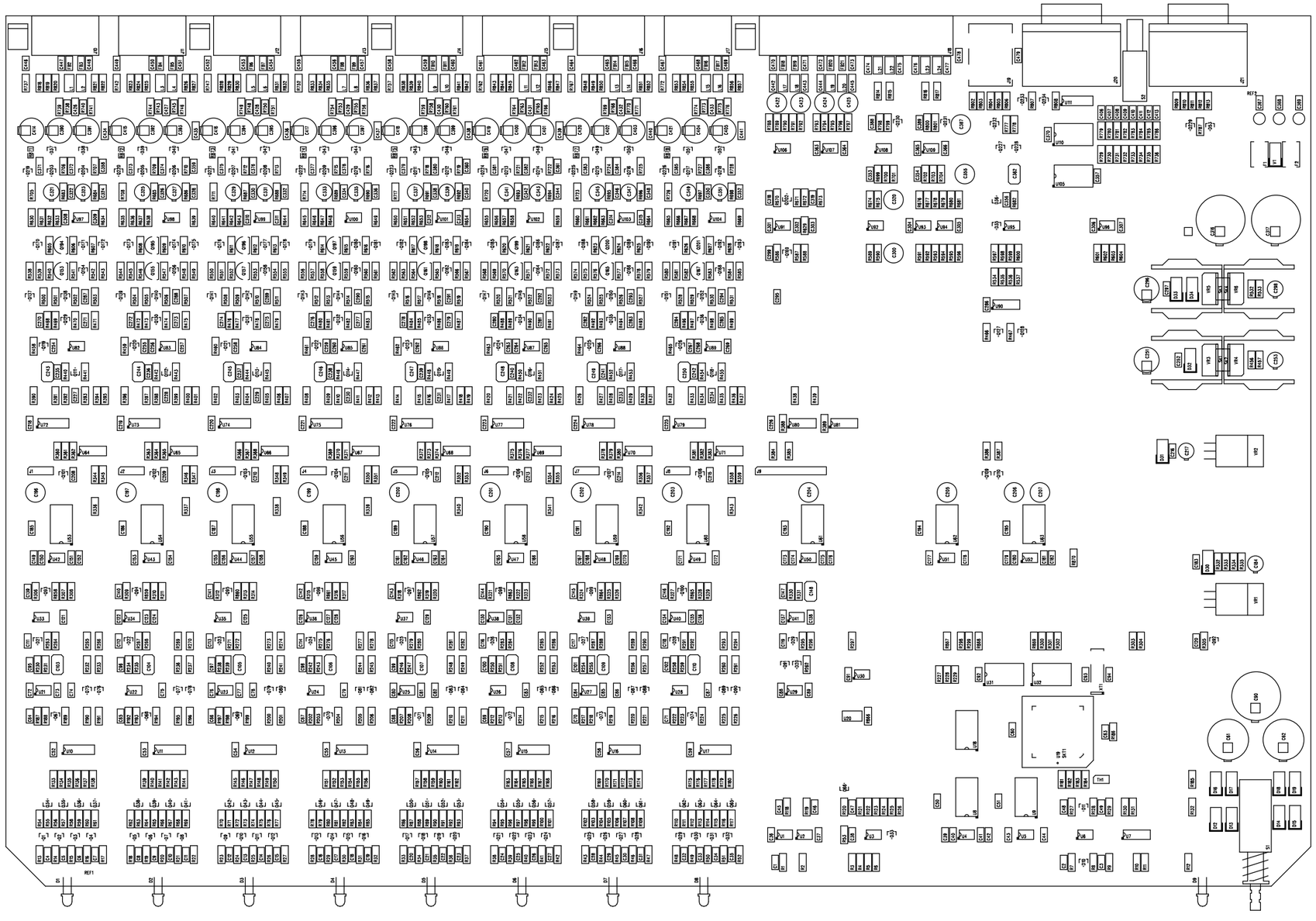
Released June 25,



BIAMP SYSTEMS
10074 S.W. Arctic Drive
Beaverton, Oregon 97005
(503) 641-7287

380-0478-00 REV D

DRAWN		BIAMP SYSTEMS, INC 10074 SW Arctic Drive, Beaverton OR 97005
CHECKED		VRAM Automixer Main PCB Component Assembly Diagram
DESIGN 11/09/99	JED	
APPROVED		DWG. NO. 701-0478-00 REV. D SHEET 1 OF 2



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380-0478-00 REV D

DRAWN		BIAMP SYSTEMS, INC 10074 SW Arctic Drive, Beaverton OR 97005
CHECKED		VRAM Automixer Main PCB Component Reference Designators
DESIGN 11/09/99 JED		
APPROVED		DWG. NO. 701-0478-00 REV. D SHEET 2 OF 2

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C270, C322, C324	9/22/98	LRS
A		INPUT (RF, GND), ADD R858	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D21 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C103, R231 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.POWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT 1

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

REF1 MH1 NO 6 MH4 NO 6

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99		
APPROVED:	ON:		
COPY DATE STAMP:	SIZE: D	DRAWING NO: 700–0478–00	REV: D
SCALE:		SHEET: 1 OF 10	

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C272, C326, C328	9/22/98	LRS
A		INPUT (RF, GND), ADD R859	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D22 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C104, R235 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.POWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT 2

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:	COPY DATE STAMP:	SIZE: D	DRAWING NO: 700–0478–00 REV: D
DRAWN: JED ON: 11/09/99			
APPROVED: ON:	SCALE:		SHEET: 2 OF 10

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
-1	79-98	CHANGED C274, C330, C332	9/22/98	LRS
A		INPUT (RF, GND), ADD R860	11/98	LRS
B	100-98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D23 SHOTTKY	1/18/99	JED
C	044-99	MOVED THRESH SENSE TO PRE-FADER CHANGED C105, R239 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS-03(CTG) MODIF.	06/21/01	VK

MIC INPUT

* INSTALLED ONLY FOR FS-03 VRAM

** NOT INSTALLED FOR FS-03 VRAM

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99	COPY DATE STAMP:	SIZE: D
APPROVED:	ON:	SCALE:	DRAWING NO: 700-0478-00 REV: D
			SHEET: 3 OF 10

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C276, C334, C336	9/22/98	LRS
A		INPUT (RF, GND) ADD R861	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D24 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C106, R243 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99		
APPROVED:	ON:		
COPY DATE STAMP:	SIZE: D	DRAWING NO: 700–0478–00	REV: D
SCALE:		SHEET: 4 OF 10	

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C278, C338, C340	9/22/98	LRS
A		INPUT (RF, GND), ADD R862	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D25 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C107, R247 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

MH2 NO 6 MH5 NO 6

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99		
APPROVED:	ON:	SCALE:	SHEET: 5 OF 10
COPY DATE STAMP:	SIZE:	DRAWING NO: 700–0478–00	REV: D

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C280, C342, C344	9/22/98	LRS
A		INPUT (RF, GND), ADD R863	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D26 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE-FADER CHANGED C108, R251 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99	COPY DATE STAMP:	SIZE:
APPROVED:	ON:	SCALE:	DRAWING NO: 700–0478–00 REV: D
			SHEET: 6 OF 10

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C282, C346, C348	9/22/98	LRS
A		INPUT (RF, GND), ADD R864	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D27 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C109, R255 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS–03(CTG) MODIF.	06/21/01	VK

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99		
APPROVED:	ON:	SCALE:	SHEET: 7 OF 10
COPY DATE STAMP:	SIZE:	DRAWING NO: 700–0478–00	REV: D

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
–1	79–98	CHANGED C284, C350, C352	9/22/98	LRS
A		INPUT (RF, GND, ADD R865	11/98	LRS
B	100–98	FIXED INPUT STAGE MODS	11/20/98	LRS
		D28 SHOTTKY	1/18/99	JED
C	044–99	MOVED THRESH SENSE TO PRE–FADER CHANGED C110, R259 VALUES	6/30/99 11/09/99	JED
D		ADD 0 OHM RES. FOR +12V PH.OOWER FS–03(CTG) MODIF.	06/21/01	VK

MIC INPUT

* INSTALLED ONLY FOR FS–03 VRAM

** NOT INSTALLED FOR FS–03 VRAM

BIAMP SYSTEMS, INC.	10074 SW ARCTIC DRIVE BEAVERTON, OR 97005		
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99	COPY DATE STAMP:	SIZE:
APPROVED:	ON:	DRAWING NO: 700–0478–00	REV: D
		SCALE:	SHEET: 8 OF 10

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
-1	79-98	NO CHANGES THIS SHEET	9/22/98	LRS
A		INPUT/OUTPUT (RF)	11/98	LRS
B	100-98	D29 SHOTTKY	1/18/99	JED
C	044-99	NO CHANGES THIS SHEET	6/30/99	JED

MAIN OUTPUT

AUX OUTPUT

AUX INPUT 1

AUX INPUT 2

BIAMP SYSTEMS, INC.	10074 SW ARCTIC DRIVE BEAVERTON, OR 97005
TITLE:	VRAM VARIABLE RESOURCE AUTOMIXER
USED ON:	
DRAWN: JED	ON: 11/09/99
APPROVED:	ON:
COPY DATE STAMP:	SIZE:
DRAWING NO:	700-0478-00
REV:	D
SCALE:	SHEET: 9 OF 10

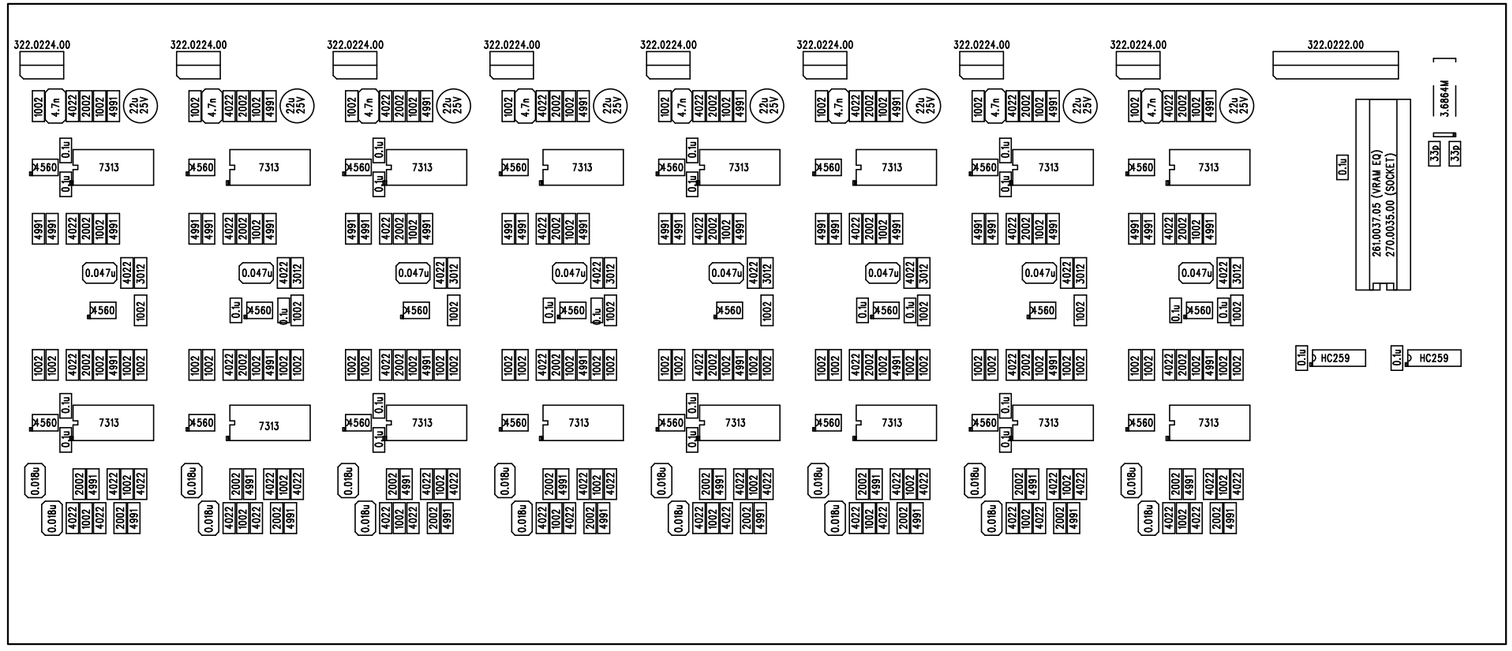
REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:
–		INITIAL RELEASE		
-1	79-98	NO CHANGES THIS SHEET	9/22/98	LRS
A		RESET TERMINATIONS, ADD V1	11/98	LRS
B	100-98	NO CHANGES THIS SHEET	11/20/98	LRS
C	044-99	NO CHANGES THIS SHEET	6/30/99	JED

EXPANSION INPUT

EXPANSION OUTPUT

** NOT INSTALLED FOR FS-03 VRAM

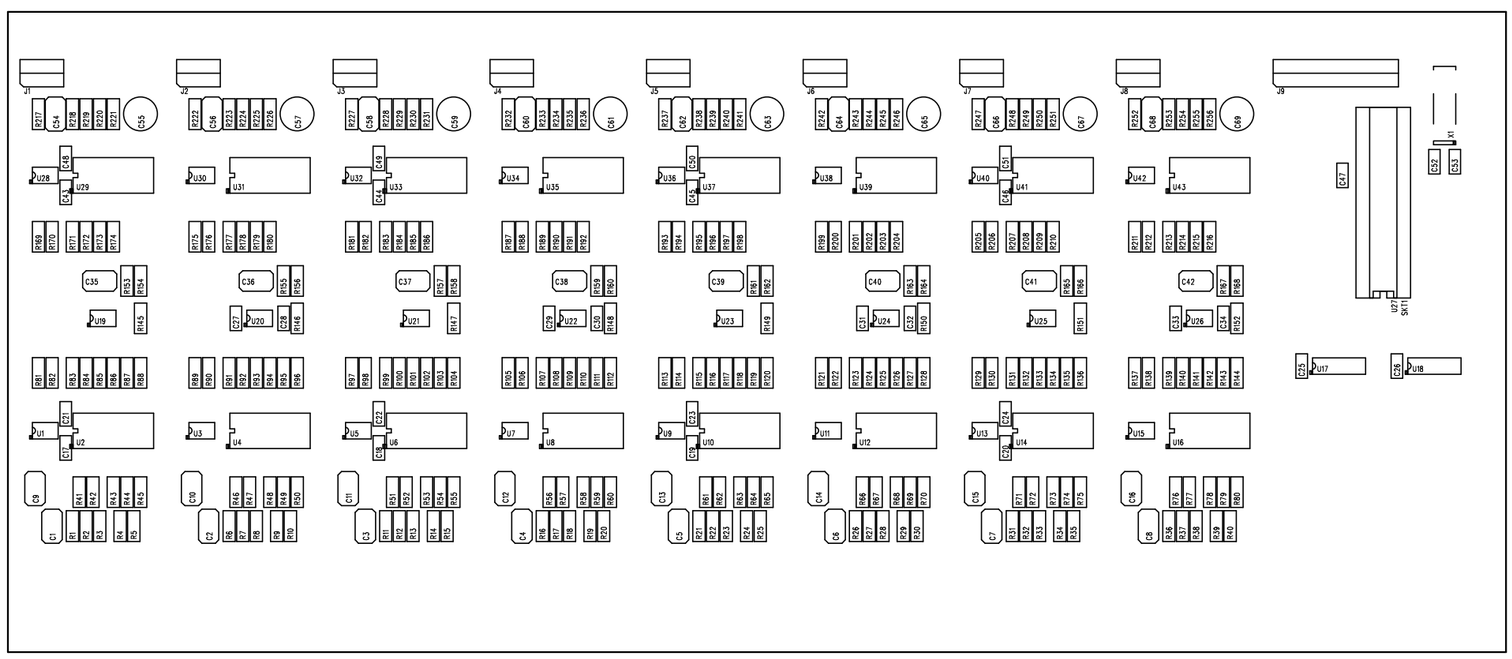
BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005			
TITLE: VRAM VARIABLE RESOURCE AUTOMIXER			
USED ON:			
DRAWN: JED	ON: 11/09/99		
APPROVED:	ON:		
COPY DATE STAMP:	SIZE:	DRAWING NO: 700-0478-00	REV: D
SCALE:		SHEET: 10 OF 10	



BIAMP SYSTEMS, INC
10074 SW Arctic Drive
Beaverton, Oregon 97005
(503) 641-7287

380-0479-00 REV -

DRAWN		BIAMP SYSTEMS, INC 10074 SW Arctic Drive, Beaverton OR 97005	
CHECKED		VRAM EQ Aux PCB	
DESIGN 9/28/98	LRS	COMPONENT ASSEMBLY DRAWING	
APPROVED		DWG. NO. 701-0479-00	REV. - SHEET 1 OF 2

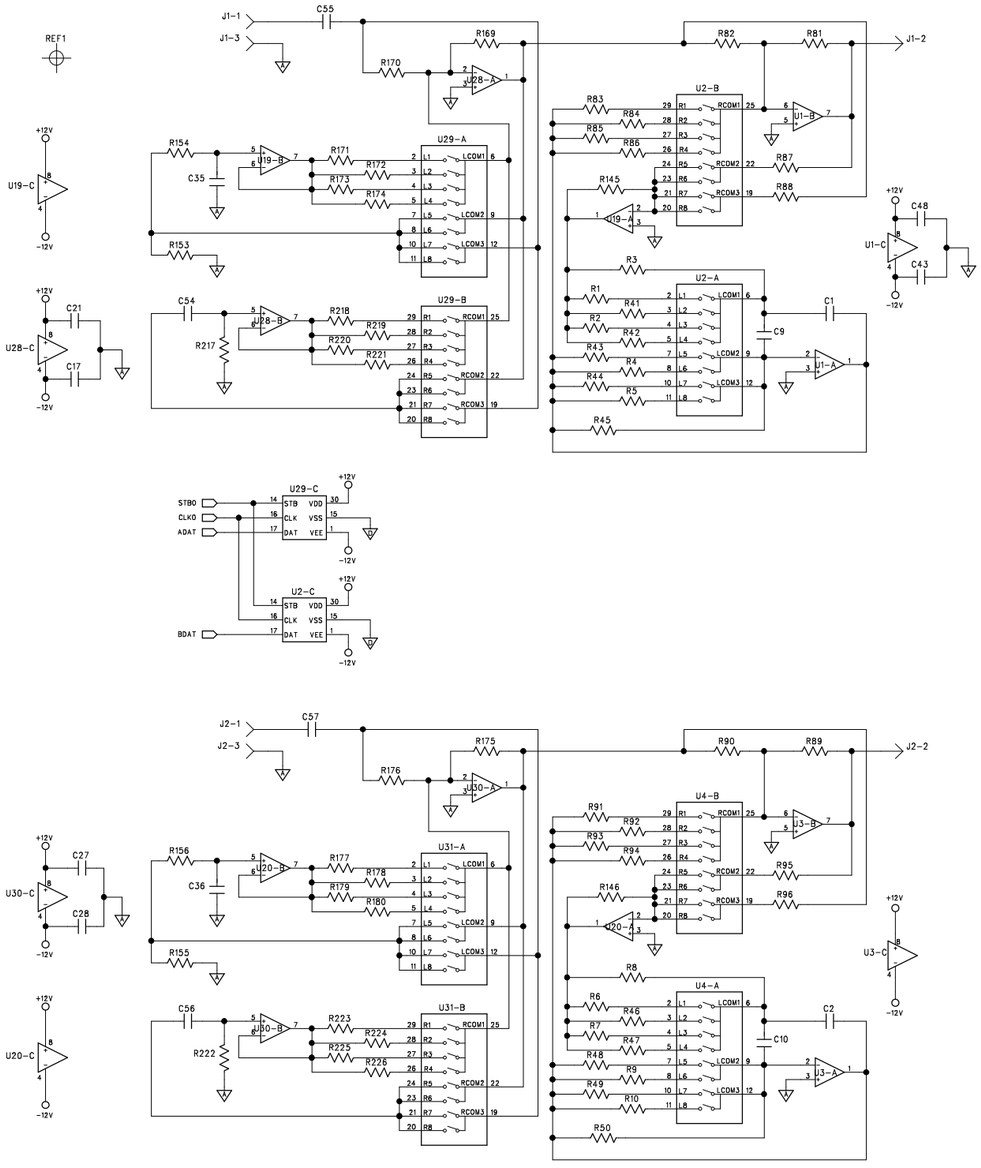


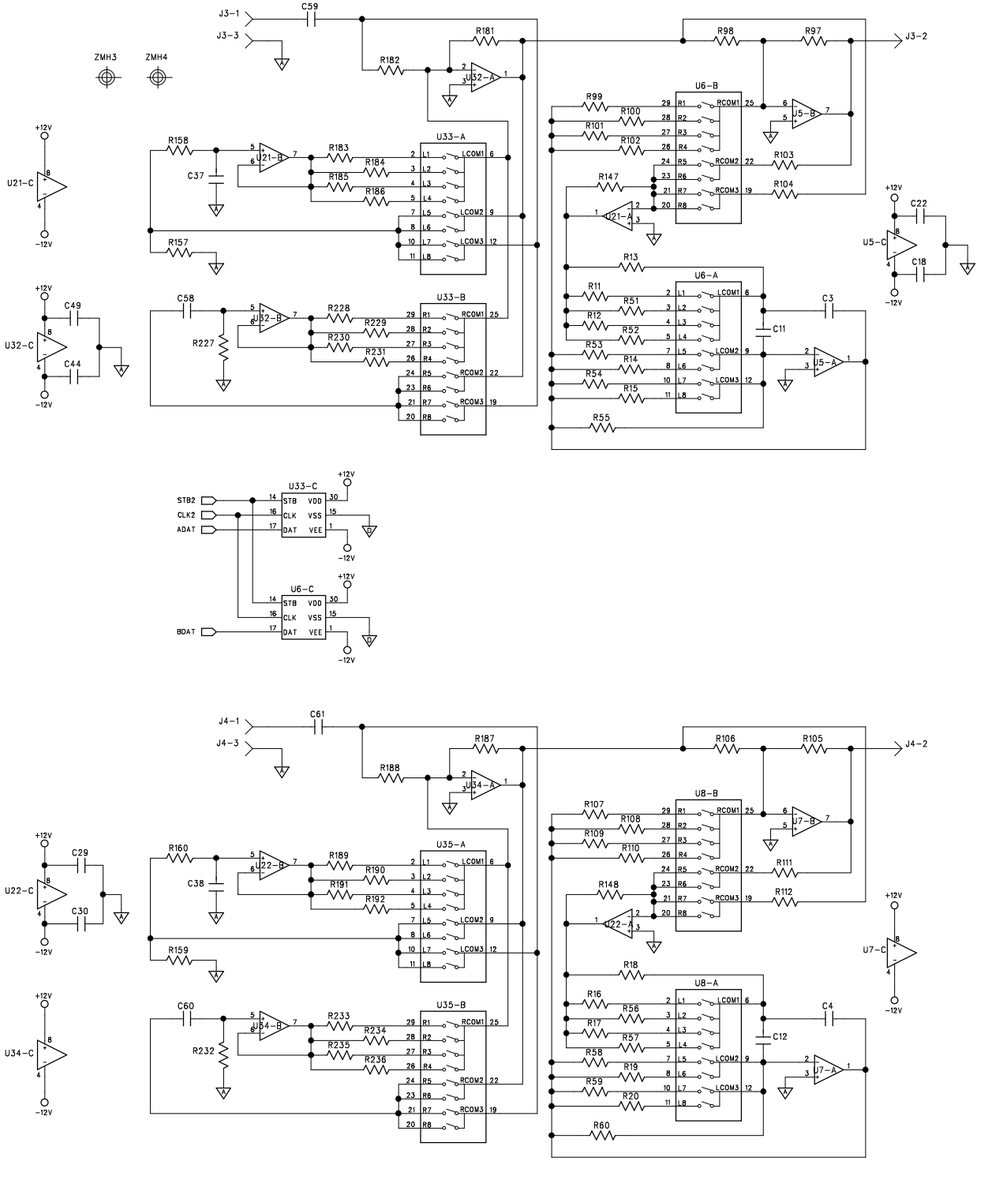
BIAMP SYSTEMS, INC
10074 SW Arctic Drive
Beaverton, Oregon 97005
(503) 641-7287

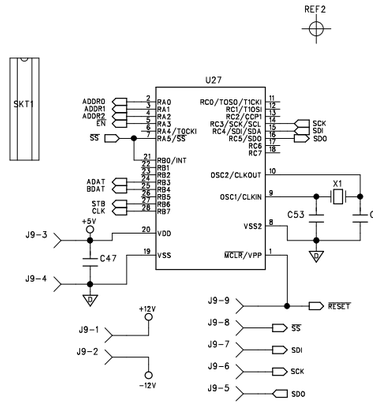
380-0479-00 REV -

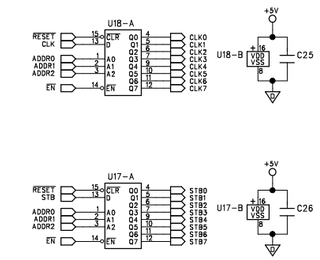
DRAWN		BIAMP SYSTEMS, INC 10074 SW Arctic Drive, Beaverton OR 97005	
CHECKED		VRAM EQ Aux PCB	
DESIGN 9/28/98	LRS	COMPONENT REFERENCE DESIGNATORS	
APPROVED		DWG. NO. 701-0479-00	REV. - SHEET 2 OF 2

REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:



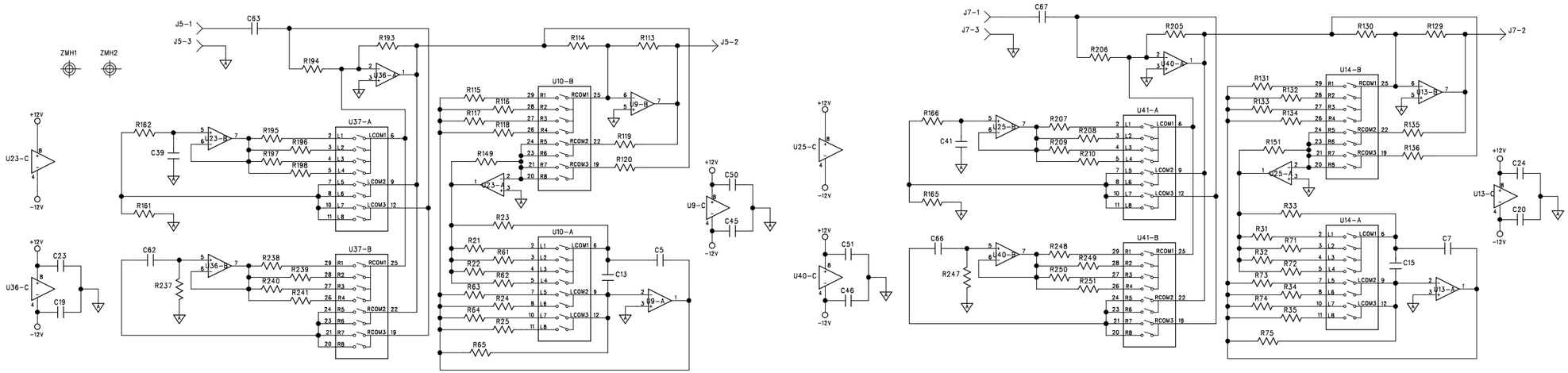






USED ON:		BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005		
		TITLE: VRAM EQ AUX PCB		
DRAWN: L SLAMKA	ON: 4/24/98	COPY DATE STAMP:	SIZE:	DRAWING NO: 700-0479-00 REV: –
APPROVED:	ON:	SCALE:		SHEET: 1 OF 2

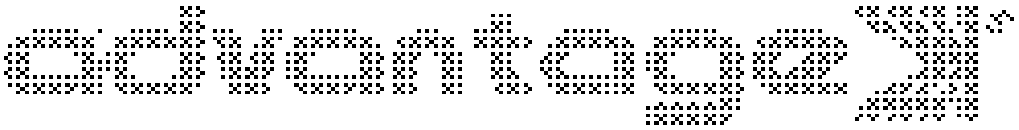
REVISION RECORD				
REV	ECO #	DESCRIPTION:	DATE:	BY:



USED ON:		BIAMP SYSTEMS, INC. 10074 SW ARCTIC DRIVE BEAVERTON, OR 97005	
DRAWN: L SLAMKA	ON: 4/24/98	TITLE: VRAM EQ AUX PCB	
APPROVED:	ON:	COPY DATE STAMP: / SIZE: / DRAWING NO: 700-0479-00 / REV: –	
		SCALE:	SHEET: 2 OF 2

ADVANTAGE® VRAM
Variable Resource
Automixer

RS-232 Control Manual (Basic Commands)



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An affiliate of Rauland-Borg Corporation

Introduction

The purpose of this manual is to assist third-party programmers in successfully writing code to control day-to-day operations of the Advantage VRAM and VRAMeq. If you do not find a command that you are looking for, please contact Biamp Systems at 1-800-826-1457 and ask for Technical Support.

Using this manual

To use this manual, simply select the type of command you are looking for, located in the tables that make up the following pages, then look at the corresponding command string. In each case you will need to insert the proper characters in the string to complete the Command String. Example: in the string ‘ 1?01**aa**80**dd**) ‘[which is an increase fader string] you will need to provide psuedohex character for the **aa** and **dd** parameters. The following table explains the characters you will need to define:

Characters	Definition
aa	Address for Main and Aux Faders
pp	Preset Number
ee	Button Number
ss	Volume Level
dd	Device Number

Command	Command String	Response	Comments
Volume Up	1?01**aa**80**dd**)	None	**Define aa and dd parameters**
Volume Down	0000**aa**80**dd**)	None	**Define aa and dd parameters**
Mute	008000**aa**80**dd**(	None	**Define aa and dd parameters**
Unmute	800000**aa**80**dd**(	None	**Define aa and dd parameters**
Recall Preset	**pp**80**dd**"	None	**Define pp and dd parameters**
Button Action	**ee**80**dd**&	None	**Define ee and dd parameters**
Set Volume to specific value	1?**ss**00**aa**80**dd**(	None	**Define ss, aa and dd parameters**

aa = Address for Main and Aux Faders

Fader	Value
Channel 1 Main Feed	28
Channel 1 Aux Feed	29
Channel 2 Main Feed	2:
Channel 2 Aux Feed	2;
Channel 3 Main Feed	2<
Channel 3 Aux feed	2=
Channel 4 Main Feed	2>
Channel 4 Aux feed	2?
Channel 5 Main Feed	30
Channel 5 Aux Feed	31
Channel 6 Main Feed	32

Fader	Value
Channel 6 Aux feed	33
Channel 7 Main Feed	34
Channel 7 Aux Feed	35
Channel 8 Main Feed	36
Channel 8 Aux feed	37
Aux 1 Level Main Feed	38
Aux 1 Level Aux Feed	39
Aux 2 level Main Feed	3:
Aux 2 Level Aux feed	3;
Main Out Level (Master)	3<
Aux Out Level (Master)	3=

Table of Main and Aux Faders for aa parameter

pp = Preset Number

Preset	Value
Preset #1	01
Preset #2	02
Preset #3	03
Preset #4	04
Preset #5	05
Preset #6	06
Preset #7	07
Preset #8	08

Preset	Value
Preset #9	09
Preset #10	0:
Preset #11	0;
Preset #12	0<
Preset #13	0=
Preset #14	0>
Preset #15	0?
Preset #16	10

Table of presets for pp parameter

ee = Button Number

Button #	Value
Button#1	01
Button #2	02
Button #3	03
Button #4	04
Button #5	05
Button #6	06
Button #7	07
Button #8	08
Button #9	09
Button #10	0:
Button #11	0;
Button #12	0>
Button #13	0=
Button #14	0<
Button #15	0?
Button #16	10
Button #17	11
Button #18	12
Button #19	13
Button #20	14

Button #	Value
Button # 21	15
Button #22	16
Button #23	17
Button #24	18
Button #25	19
Button #26	1:
Button #27	1;
Button #28	1<
Button #29	1=
Button #30	1>
Button #31	1?
Button #32	20
Button #33	21
Button #34	22
Button #35	23
Button #36	24
Button #37	25
Button #38	26
Button #39	27
Button #40	28

Table of Button Numbers for ee parameter

ss = Volume Level

Fader level	Value
+6db	1?
+5dB	1>
+4dB	1=
+3dB	1<
+2dB	1;
+1dB	1:
0dB	19
-1dB	18
-2dB	17
-3dB	16
-4dB	15
-5dB	14
-6dB	13
-7dB	12
-8dB	11
-9dB	10

Fader Level	Value
-10dB	0?
-11dB	0>
-12dB	0=
-13dB	0<
-14dB	0;
-15dB	0:
-16dB	09
-17dB	08
-18dB	07
-20dB	06
-22dB	05
-24dB	04
-30dB	03
-36dB	02
-42dB	01
-60dB	00

Table of Fader Levels for ss perameter

dd = Device Number

Device	Value
Device #0	00
Device #1	01
Device #2	02
Device #3	03
Device #4	04
Device #5	05
Device #6	06
Device #7	07
Device #8	08
Device #9	09
Device #10	0:
Device #11	0;
Device #12	0<
Device #13	0=
Device #14	0>
Device #15	0?

Device	Value
Device #16	10
Device #17	11
Device #18	12
Device #19	13
Device #20	14
Device #21	15
Device #22	16
Device #23	17
Device #24	18
Device #25	19
Device #26	1:
Device #27	1;
Device #28	1<
Device #29	1=
Device #30	1>
Device #31	1?

Device	Value
Device #32	20
Device #33	21
Device #34	22
Device #35	23
Device #36	24
Device #37	25
Device #38	26
Device #39	27
Device #40	28
Device #41	29
Device #42	2:
Device #43	2;
Device #44	2<
Device #45	2=
Device #46	2>
Device #47	2?

Device	Value
Device #48	30
Device #49	31
Device #50	32
Device #51	33
Device #52	34
Device #53	35
Device #54	36
Device #55	37
Device #56	38
Device #57	39
Device #58	3:
Device #59	3;
Device #60	3<
Device #61	3=
Device #62	3>
Device #63	3?

Table of device numbers for dd perameter

Serial Control
of the
Advantage VRAM

Biamp Systems, 10074 S.W. Arctic Drive, Beaverton, Oregon 97005 U.S.A. (503) 641-7287
an affiliate of Rauland-Borg Corp.

Introduction

This document contains information for the serial control of the Advantage VRAM (Variable Resource Auto Mixer) and the Advantage VRAMeq, (Variable Resource Auto Mixer with equalizer). Specifically, this document tries to inform those looking to write their own software controls for the Advantage VRAM. It is assumed that the reader has some familiarity with standard programming practices, binary and hexadecimal numbers, the ASCII character set, asynchronous serial data connections, and RS-232 interfaces.

Decimal, Binary, and "Pseudo-hex" Numbers

This document uses three different numerical notations. The first, the most common, is the decimal notation. Whenever it is used, a "d" will appear after the number..

8 Bit binary numbers are the second format used in this paper. These numbers will be followed by "b" after their usage. If a specific bit is being referred to, the numbers will be preceded by the word "bit."

To transmit an 8 bit binary number to the Advantage VRAM, hexadecimal notation is used. Hexadecimal numbers are arrived at by splitting the number into two halves. One half consists of the first four binary digits (most significant nibble) while the other consists of the last four binary digits (least significant nibble). 2 nibbles form a byte, which takes on a decimal value of 0 to 255. Each half is then assigned a hexadecimal value. Since the binary values range from 0 to 15, usually values from 10 to 15 are given the alphabetic letters from A to F.

However, the Advantage VRAM does not utilize standard hex format. Instead, the Advantage VRAM uses what is known as "pseudo-hex." Simply put, instead of using the letters A, B, C, D, E and F the Advantage VRAM uses : ; < = > and ?, respectively. All it takes to arrive at the new notation for hex values 10 to 15d is to add 30 to the old ASCII values. In this paper, [pseudo-hex] will appear after the use of a pseudo-hex character. The changes are traditional hex are summed up below:

	Nibble Conversion		
Decimal	Hex	Pseudo-hex	Binary
0	0	0	0000
1	1	1	0001
2	2	2	0010
3	3	3	0011
4	4	4	0100
5	5	5	0101
6	6	6	0110
7	7	7	0111
8	8	8	1000
9	9	9	1001
10	A	:	1010
11	B	;	1011
12	C	<	1100
13	D	=	1101
14	E	>	1110
15	F	?	1111

Serial Interface - Data Communications Parameters

The Advantage VRAM communicates through its serial port at four different baud rates: 2400, 9600, 19200, and 38400. The factory default setting is 9600 baud. Changing this rate is accomplished in the advanced mode (see page 18, not a recommended procedure) or through BiampWin. The Advantage VRAM communicates with 8 data bits, no parity, and 1 stop bit. The Advantage VRAM utilizes a subset of the standard 7-bit ASCII character set.

Control

The Advantage VRAM has an RS-232-compatible serial port which allows it to be controlled by a computer or by a third party system controller (such as those provided by AMX or Crestron). The Advantage VRAM offers the following two methods of serial control:

- Control Button Emulation. This method of control emulates Biamp's standard infrared remote control transmitter or wall-mount remote control panel. Using this method, single ASCII characters sent to the device's serial port cause the device to behave as if a biamp remote controller were attached. While Control Button Emulation is simple to perform, it only provides basic and "one-way" control of the Advantage VRAM - it allows the user to send simple commands *to* the Advantage VRAM, but it does not provide any mechanism for requesting status information *from* the Advantage VRAM.

- Advanced Control. Advanced control provides a command set which allow "two-way" control of the Advantage VRAM. Using Advanced Control commands, a system may request status information *from* the device as well as send commands *to* the device. Communication occurs with the Advantage VRAM using the Advantage VRAM's serial port.

Control Button Emulation

Control Button Emulation is the simplest form of serial control of the Advantage VRAM. This method of operation allows the user to emulate the operation of a standard Biamp remote control transmitter.

For each button on a standard Biamp remote control, there is a corresponding ASCII character. In order to emulate a remote control button, the transmitting system simply transmits the corresponding ASCII character to the Advantage VRAM's serial port. Each character received by the Advantage VRAM will be echoed back out the serial port.

The standard Biamp remote control devices never exceed a transmission rate of 9 characters per second. If the controlling system wishes to perform Control Button Emulation at a rate of greater than 20 characters per second (50 msec per character), flow

control should be implemented by waiting for the echo of each character before transmitting the next character. At slower speeds, flow control should not be necessary.

The following table summarizes the ASCII character codes for Control Button Emulation corresponding to each of the 40 remote control buttons supported by the Advantage VRAM. These button codes are also summarized on the ASCII code chart provided at the end of this manual. The remote control buttons on the standard Biamp transmitter are numbered from left to right going from bottom to top with the lower left-hand button being button number 1.

Using BiampWin, it is possible to program the VRAM to respond to these commands.

button 1	'B'	(0x42)		button 21	'V'	(0x56)
button 2	'C'	(0x43)		button 22	'W'	(0x57)
button 3	'D'	(0x44)		button 23	'X'	(0x58)
button 4	'E'	(0x45)		button 24	'Y'	(0x59)
button 5	'F'	(0x46)		button 25	'Z'	(0x5A)
button 6	'G'	(0x47)		button 26	'['	(0x5B)
button 7	'H'	(0x48)		button 27	'\'	(0x5C)
button 8	'I'	(0x49)		button 28	']'	(0x5D)
button 9	'J'	(0x4A)		button 29	'^'	(0x5E)
button 10	'K'	(0x4B)		button 30	'_'	(0x5F)
button 11	'L'	(0x4C)		button 31	'`'	(0x60)
button 12	'M'	(0x4D)		button 32	'b'	(0x62)
button 13	'N'	(0x4E)		button 33	'c'	(0x63)
button 14	'O'	(0x4F)		button 34	'd'	(0x64)
button 15	'P'	(0x50)		button 35	'e'	(0x65)
button 16	'Q'	(0x51)		button 36	'f'	(0x66)
button 17	'R'	(0x52)		button 37	'g'	(0x67)
button 18	'S'	(0x53)		button 38	'h'	(0x68)
button 19	'T'	(0x54)		button 39	'i'	(0x69)
button 20	'U'	(0x55)		button 40	'j'	(0x6A)

Simple vs Addressable

The simple method of control button emulation is to send any one of the control button characters through the serial port to the VRAM. The disadvantage to this method is that every device hooked into the VRAM will also hear the command. If any of the other devices have been programmed with this particular character, they will also respond.

To avoid this problem, the VRAM allows addressable control button emulation. By using the control-button-emulation command, on page 12, control button commands are sent directly to a specific device.

Advanced Control

The Advanced Control command set includes more powerful commands to allow more flexible control of the Advantage VRAM. Unlike Control Button Emulation (which is basically a one-way control mechanism) advanced control commands allow the VRAM to return information through the serial port,. The following list summarizes the commands available using Advanced Control, including the ASCII command character associated with each command:

!	store-as-preset *(save settings as preset)*
"	retrieve-preset *(put Advantage VRAM into preset mode)*
#	read-device-settings *(read current settings from device memory*)
$	write-settings *(write to device memory)*
&	addressable-control-button-emulation *(execute control buttons)*
(	bitwise-operator *(perform bitwise operations on memory locations)*
)	increment-decrement-memory *(change memory location value by plus or minus one)*
*	polling-status *(request status update of various functions)*
+	sleep-for-10-seconds *(sleep for 10 seconds, ignoring all communication)*
,	read-eeprom-locations *(read from non-volatile memory)*
-	write-eeprom-locations[1] *(write to non-volatile memory)*
.	set-baud[1] *(set communications speed)*
/	get-version *(retrieve the model information and firmware version date)*

Each Advanced Control command requires at least two parameter bytes (four pseudo-hex characters) to be sent prior to the command character. Each command will be explained in detail on the following pages.

Some of the commands cause the Advantage VRAM to return information through the serial port. For each string of information returned to the serial port, the Advantage VRAM terminates the string by transmitting the ASCII carriage return character (0x0D - represented in this document as ↵).

[1] Not recommended, but available for use

As mentioned earlier, the Advantage VRAM will echo all characters it receives, regardless of whether or not the characters are valid commands or parameters. Characters greater than 0x7F are reserved and should not be transmitted to the serial port. The Advantage VRAM utilizes a subset of the standard ASCII character set. The following characters have meaning to the Advantage VRAM:

character	hexadecimal	operation
ASCII control characters	(0x00 - 0x1F)	no operation
ASCII **SPACE** character	(0x20)	no operation
! thru **/**	(0x21 - 0x2F)	Advanced Control commands
0 thru **?**	(0x30 - 0x3F)	pseudo-hex parameters for Advanced Control commands
@	(0x40)	Control Button Emulation Repeat Code
A	(0x41)	no operation
B thru **`**	(0x42 - 0x60)	Control Button Emulation commands (buttons 01 - 31)
a	(0x61)	no operation
b thru **j**	(0x62 - 0x6A)	Control Button Emulation commands (buttons 32 - 40)
k thru **z**	(0x6B - 0x7A)	Control Button Emulation Device Select Prefix commands
{ thru **DEL**	(0x7B - 0x7F)	no operation
0x80 thru 0xFF	(0x80 - 0xFF)	RESERVED

Device Type Bitmask, Device Number Bitmask, and Device Model Bitmask

In a system which has more than one Advantage product connected together, the Device Type Bitmask and Device Number Bitmask command parameters provide a mechanism to individually address a particular device (or a combination of devices). Every command in the Advanced Control command set requires that a Device Type Bitmask and a Device Number Bitmask be transmitted as the last two parameter bytes before transmitting the command character itself. These two bitmask parameters bytes provide a device addressing capability to specify which of the devices in the system should execute the command. All devices which are not specifically addressed by these two bitmask values will ignore the command.

The Device Type Bitmask parameter byte supports up to eight distinct device types - one bit per device type. The eight device types are:

0x01 [hex] (bit 0) Biamp Advantage DRC 4+4 digital remote control
0x02 [hex] (bit 1) Biamp Advantage EQ28X digitally-controlled graphicEQ
0x04 [hex] (bit 2) Biamp Advantage SPM522D stereo preamp/mixer
0x08 [hex] (bit 3) Biamp Advantage PMX84 programmable matrix switch
0x10 [hex] (bit 4) (reserved for future product)
0x20 [hex] (bit 5) (reserved for future product)
0x40 [hex] (bit 6) (reserved for future product)
0x80 [hex] (bit 7) Advanced Products, such as the Biamp Advantage VRAM

The Advantage VRAM will only respond to Advanced Control commands if bit 7 of the Device Type Bitmask parameter byte is a '1'. A command may be directed to more than one device type in the system by setting all of the corresponding bits in the Device Type Bitmask to '1's. If only advanced equipment is being addressed (EQ2828/8 DRI, MSP, and DDL12) 80 is the only bitmask required to use.

The Device Number Bitmask parameter byte supports up to sixty-four distinct device numbers:

0x00 [hex]	Select Device Number 0
0x01 [hex]	Select Device Number 1
0x02 [hex]	Select Device Number 2
0xFF [hex]	Select Device Number 63

A particular Advantage VRAM will only respond to Advanced Control commands if the Device Number Bitmask parameter byte corresponds to its own device number.

For instance, the bitmask 8007 serves to talk only to advanced product (**80**) number 7 (**07**).

! store-as-preset

Description:

The Advantage VRAM and Advantage VRAMeq each allow up to 17 different presets. Using the store-as-preset command, the user is allowed to store the current settings (device configurations) under a specified preset.

Syntax of Command:

*pp*80*dd*!

where

pp	=	Preset number (0 to 16d; **00** to **10** [pseudo-hex])
80	=	Device type bitmask for Advantage Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
!	=	store-as-preset command character

Syntax of response:

no response

Example:

command:	response:
0?8002!	***(none)***

This example causes the Advantage VRAM , device number 2, to store the current settings under preset number 15d (**0?** [pseudo-hex]).

Comments:

While there are 16 designated presets on the main control screen in BiampWin, it is also possible to access and write to the power-up preset, **00**. This preset is used by the VRAM at power-up to load its startup configuration.

However, the current settings at power-down are normally saved to this preset. Consult the user's manual (regarding BiampWin) if you wish to disable saving of current settings at power-down.

" retrieve-preset

Description:

The retrieve-preset command configures the Advantage VRAM and Advantage VRAMeq according to a preset definition in non-volatile memory. The user can retrieve any of the 17 available presets.

Syntax of Command:

*pp*80*dd*"

where

pp	=	Preset number (1 to 16d; **00** to **10** [pseudo-hex])
80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; to **3?** [pseudo-hex])
"	=	retrieve-preset command character

Syntax of response:

no response

Example:

command:	response:
108003!	***(none)***

This example configures the Advantage VRAM , device number 3, according to the settings stored in preset number 16d (**10** [psuedo-hex].

Comments:

Depending on how the VRAM is configured from BiampWin, recalling preset 0 will either recall the default power-up configuration or recall the state of the VRAM at the last power-down. Please consult the BiampWin user's manual for more information

read-current-device-settings

Description:

The Advantage VRAM stores the settings of its pre-amp, volume, logic outputs and other miscellaneous configuration data in 96 bytes of data. The Advantage VRAMeq also stores equalizer data in this area of memory. The read-device-settings command can be used to retrieve the contents of these memory locations.

Syntax of Command:

*nnaa*80*dd*#

nn	=	Number of bytes to read (limited by starting address; 1 to 96d; **01** to **60** [pseudo-hex])
aa	=	Starting memory address (0 to 95d; **00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
#	=	read-device-setting command character

Syntax of response:

xx…(up to 96 data values)…↵

where

xx	=	Data value

Example:

command:	response:
10008002#	**642800001000001000??00??03?<03?<**

In this example, a Advantage VRAM (device number 2) is queried for the contents of the first 16d (**10** [pseudo-hex]) memory locations.

Comments:

From the beginning of the data structure (byte **00**), bytes 0-15d are miscellaneous settings. Bytes 16-31d are logic output settings, and bytes 32-95d are pre-amp settings, volume, and equalizer settings. See the memory map for exact details of memory mapping of device functions.

$ write-current-device-settings

Description:

When used in conjunction with the read-device-settings command, the write-device-settings command allows the user to manually adjust any aspect of the Advantage VRAM or Advantage VRAMeq settings.

Syntax of Command:

*xx…(up to 16 data values)…nnaa*80*dd*$

where

xx	=	Up to 16 data values, sent in reverse order, highest memory address first
nn	=	Number of bytes to write (limited by starting address; 1 to 96d; **01** to **60** [pseudo-hex])
aa	=	Starting memory address (0 to 95d; **00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
$	=	write-device-setting command character

Syntax of response:

no response

Example:

command:	response:
919191032880 02$	***(none)***

This command causes a Advantage VRAM (device number 2) to write **03** bytes, **919191** [pseudo-hex], to setting location 40d (**28** [pseudo-hex]).

Comments:

The increment-decrement-memory command “)” can provide a simpler way of modifying a device setting by a single step, especially for settings that require the increasing or decreasing of a value

& addressable-control-button-emulation

Description:

The Advantage VRAM and Advantage VRAMeq can be controlled by a 40 button standard IR remote control that sends single ASCII characters. These characters are then echoed to all linked devices with control ports. Using addressable-control-button emulation allows the user to send control button emulation commands to a specific device.

Sending buttons 41- 48 and 49-56 simulates a logic input instead of a control button. Note that these buttons are not available on the remote control.

Syntax of Command:

*ee*80*dd*&

where

ee	=	Button to emulate (1 to 40d; **01** to **28** [pseudo-hex])
80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
&	=	control-button-emulation command character

Syntax of response:

no response

Example:

command:	response:
018001&	***(none)***

This command tells the Advantage VRAM (device number 1) to emulate remote control button number 1.

Comments:

BiampWin provides the easiest method of entering button and logic input definitions.

(**bitwise-operator (firmware dates 7/23/98 and later)**

Description:

Many of the settings available on the Advantage VRAM are controlled by the status of individual bits in the device settings. To adjust one of these bits (for instance to mute or un-mute a channel) , use the bitwise-operator command.

Syntax of Command:

*vvssttaa*80*dd*)

where

vv	=	Bits to clear (**00** to **??** [pseudo-hex]; 00 indicates nothing to clear)
ss	=	Bits to set (**00** to **??** [pseudo-hex]; 00 indicates nothing to set)
tt	=	Bits to toggle (**00** to **??** [pseudo-hex]; 00 indicates nothing to toggle)
aa	=	Memory address (0 to 95d**; 00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
(	=	bitwise-operator command character

Syntax of response:

no response

Example:

command:	response:
0000803<8007(	***(none)***

Here the mute bit of the main volume control (memory location **3<** [pseudo-hex]) is toggled.

command	response
0040003<8007(	***(none)***

This example sets the phantom power on for channel 1.

Comments:

It is easiest to think of the settings in binary, using the data from the memory map notes, and then convert the setting to pseudo-hex.

) increment-decrement-memory (firmware dates 7/23/98 and later)

Description:

Sometimes it is desired to adjust a value in device memory by increasing or decreasing it one step. A common application of this would be to adjust the main or auxiliary volume.

Syntax of Command:

*ooffaa*80*dd*)

where

oo	=	Upper or lower limit, depending on direction of change (limited by setting to be incremented, 0 to 23d for preamp 0 to 31d for fader 0 to 30d for eq tone 0 to 15d for eq frequency)
ff	=	Increment or decrement (**00** or **01**; 00 is decrement, 01 increment)
aa	=	Memory address (32 to 96d; **20** to **60** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
)	=	increment-decrement-memory command character

Syntax of response:

no response

Example:

command:	response:
02003<8007)	***(none)***

This example sets the lower bound as 02, and then decreases memory location **3<** [pseudo-hex] by one. This location happens to be the main volume level. Repeated use of this command will force the fader to its lower limit of 2d steps from the bottom.

Comments:

The increment / decrement command is limited to preamp gains, volume, and equalizer faders only.

* polling-status

Description:

In order to give the user a glimpse into the current status of the Advantage VRAM and Advantage VRAMeq, the polling-status command can be used. When directed, this command will return information regarding the mix status of the device, it's auxiliary and main analog to digital levels, as well as the presence of clipping, activity of the logic output, auxiliary and main outputs.

Syntax of Command:

80*dd**

where

80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
*	=	polling-status command character

Syntax of response:

ppyyzzcclluumm↵

where

pp	=	Last preset and communication bit used with BiampWin (first nibble is for Biamp use only, second nibble indicates current preset, **0** to **?** [pseudo-hex])
yy	=	Auxiliary analog to digital converter level (level ranges from **00** to **??** [pseudo-hex])
zz	=	Main analog to digital converter level (level ranges from **00** to **??** [pseudo-hex])
cc	=	Clipping presence (high bit indicates presence, **00** or **01**)
ll	=	Logic output status (binary high bit indicates active, **00** to **??** [pseudo-hex])
uu	=	Auxiliary output status (binary high output indicates channel active, **00** to **??** [pseudo-hex])
mm	=	Main output status (binary high output indicates channel active, **00** to **??** [pseudo-hex]

Example:

command:	response:
8002*	**292:2;00000303**

In this example, a Advantage VRAM (device number 2) reports that it's last preset was 9. The 2 appearing before the 9 is used by BiampWin for communication purposes. The auxiliary and main a/d converter levels are 42 and 43d, or about 16% of max. There is no clipping, nor any output to the logic out. Finally, both the auxiliary and main outputs are being fed by channels 1 and 2 (**03** translates to 00000011b, indicating that the first two channels are on).

Comments:

Preset:
If the last preset selected was 16d, (the startup preset) and a communication bit is set, there can be some confusion. Preset 16d, without a communication bit has a pseudo-hex value of **10**, or 00010000b. However, when a communication bit is set, say, bit 8, the resultant binary is 10010000, or **90** [pseudo-hex]. In all cases other than preset 16d the communication bits always remain in the most significant nibble and the preset remains in the least significant nibble.

Logic outputs:
As there are 8 logic outputs, each bit in the pseudo-hex value represents a specific output. The outputs are ordered from most significant bit to least significant bit. For instance, an output of **?;** [pseudo-hex] would coincide with an binary value of 11111011b. Going from msb to lsb, this indicates that pins 8, 7, 6, 4, 2, and 1 are active.

Main and auxiliary outputs:
These work in a similar manner to the logic outputs. Each of the 8 outputs are represented by a bit in the pseudo-hex value. Each channel is ordered from lowest to highest, lsb to msb.

+ sleep-for-10-seconds

Description:

The sleep-for-10-seconds command allows the Advantage VRAM and Advantage VRAMeq to fall "asleep" for 10 seconds, ignoring all communication. During this 10 seconds of sleep, the Advantage VRAM will not respond to nor echo any commands that it receives.

Syntax of Command:

80*dd*+

where

80	=	Device type bitmask for the Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
+	=	sleep-for-10-seconds command character

Syntax of response:

no response

Example:

command:	response:
800;+	***(none)***

This example causes the Advantage VRAM (device number 11d) to sleep for 10 seconds.

Comments:

, read-eeprom-locations

Description:

Specifying the read-eeprom-locations command causes the Advantage VRAM and Advantage VRAMeq models to read a specified number of bytes starting at any valid memory location in any memory bank. This information is then passed to the serial port, from the last byte of sequence to the first byte specified. The Advantage VRAM has 16 banks with 256 bytes each

Syntax of Command:

*bbaann*80*dd*,

where

bb	=	Bank select (0 to 15d; **00** to **0?** [pseudo-hex])
aa	=	Starting memory address (0 to 255d; **00** to **??** [pseudo-hex])
nn	=	Number of bytes to read minus one (limited by starting address)
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d*;* **00** to **3?** [pseudo-hex])
,	=	read-eeprom-locations command character

Syntax of response:

xx…(up to 256 data values)…↵

where

xx	=	Data value

Example:

command:	response:
0>74068001,	**010?0?0?0?0?0?**

This command causes the Advantage VRAM (device number 1) to go to bank 14d (**0>** [pseudo-hex]) and dump to the user the 7 bytes (since 7 - 1 is **06**) from byte 116d (**74** [pseudo-hex]) on. The output indicates that byte 122d contains **01**, while bytes 116 to 121d all contain **0?** [pseudo-hex].

Comments:

- write-eeprom-locations

Description:

The write-eeprom-locations command allows the user to write directly to the eeprom, placing specific characters in designated memory locations. The Advantage VRAM and Advantage VRAMeq each allow the user to program all of the eeprom's 16 banks of 256 bytes. While this provides a powerful method of setting or changing configuration parameter, it also provides an easy way to screw things up.

Syntax of Command:

*xx…(up to 16 data values)…bbaanncc*80*dd-*

where

xx	=	Up to 16 data values, sent in reverse order, highest memory address first.
bb	=	Bank select (0 to 15d; **00** to **0?** [pseudo-hex];)
aa	=	Starting memory address (0 to 255d; **00** to **??** [pseudo-hex];)
nn	=	Number of bytes to write minus one (limited by starting address)
cc	=	Checksum which consists of the 1's compliment of the eight bit sum of *nn* + *aa* + *bb* + *xx* + ...
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
-	=	write-eeprom-locations command character

Syntax of response:

no response

Example:

command:	response:
0=07=>000>8006-	***(none)***

This example commands an Advantage VRAM (device number 6) to access bank 7d of the non-volatile memory. In this bank, it writes 1 byte (recall that 1 - 1 is **00**), **0=**, to memory location 222d (=> pseudo-hex). Finally, as a checksum, the command provides **0>** (00001110b), the one's compliment of the sum of **0=**, **07**, **=>**, and **00** [pseudo-hex]. If the command had specified more than one byte, then the Advantage VRAM would have entered the data from the highest memory location to the lowest.

. set-baud

Description:

The set-baud rate command allows the user to specify the baud rate at which the Advantage VRAM and Advantage VRAMeq operate. The units operate at 2400, 9600, 19200, and 38400 baud. In order to specify which of these baud rates to use, the Advantage VRAM refers tothem by the numbers 0,1,2 and 3; respectively.

Syntax of Command:

*rrii*80*dd*.

where

rr	=	Baud rate (**00** to **03**)
ii	=	Compliment of selected baud rate (**0<** to **0?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
.	=	set-baud command character

Syntax of response:

no response

Example:

command:	response:
00??8002.	***(none)***

This command changes the baud of the Advantage VRAM (device number 2) to 2400 (mode **00** [pseudo-hex]).

Comments:

Changing the baud value will immediately disconnect the user from the Advantage VRAM until the user has changed the baud of the device connected to serial port also. Therefore, this command can be dangerous and is not recommended.

/ get-version

Description:

The get-version command causes the Advantage VRAM and Advantage VRAMeq to return the model identification code and firmware version to the user. The firmware version is the release date, in the American format *mmddyy*. It is important to note that the Advantage VRAM will return this date in decimal format, **not** pseudo-hex.

Syntax of Command:

80*dd*/

where

80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
/	=	get-version command character

Syntax of response:

12*mmddyy*↵

where

12	=	Model i.d. for Advantage VRAM
mm	=	2 digit decimal month character
dd	=	2 digit decimal day character
yy	=	2 digit decimal year character

Example:

command:	response:
800=/	**12060598**

This command asks a Advantage VRAM, number 13d, (**0=** [pseudo-hex]) to return its model i.d. and firmware date. In this case, the model i.d. is **12** [pseudo-hex] and firmware date is 6/5/98.

Comments:

Using the ? character will act as a wild card for any of the parameters.

ASCII Code Chart

with Decimal & Hexadecimal Equivalents and Advantage DRI Commands

000. 0x00 **NUL**	016. 0x10 **DLE**	032. 0x20 **(space)**	048. 0x30 **0** nibble 0x0	064. 0x40 **@** repeat code	080. 0x50 **P** button 15	096. 0x60 **`** button 31	112. 0x70 **p** select 1,3
001. 0x01 **SOH**	017. 0x11 **DC1**	033. 0x21 **!** vol limits	049. 0x31 **1** nibble 0x1	065. 0x41 **A**	081. 0x51 **Q** button 16	097. 0x61 **a**	113. 0x71 **q** select 2,3
002. 0x02 **STX**	018. 0x12 **DC2**	034. 0x22 **"** do-button	050. 0x32 **2** nibble 0x2	066. 0x42 **B** button 01	082. 0x52 **R** button 17	098. 0x62 **b** button 32	114. 0x72 **r** select 1,2,3
003. 0x03 **ETX**	019. 0x13 **DC3**	035. 0x23 **#** do-volume	051. 0x33 **3** nibble 0x3	067. 0x43 **C** button 02	083. 0x53 **S** button 18	099. 0x63 **c** button 33	115. 0x73 **s** select 4
004. 0x04 **EOT**	020. 0x14 **DC4**	036. 0x24 **$** define-preset	052. 0x34 **4** nibble 0x4	068. 0x44 **D** button 03	084. 0x54 **T** button 19	100. 0x64 **d** button 34	116. 0x74 **t** select 1,4
005. 0x05 **ENQ**	021. 0x15 **NAK**	037. 0x25 **%** get-preset	053. 0x35 **5** nibble 0x5	069. 0x45 **E** button 04	085. 0x55 **U** button 20	101. 0x65 **e** button 35	117. 0x75 **u** select 2,4
006. 0x06 **ACK**	022. 0x16 **SYN**	038. 0x26 **&** get/set-volume	054. 0x36 **6** nibble 0x6	070. 0x46 **F** button 05	086. 0x56 **V** button 21	102. 0x66 **f** button 36	118. 0x76 **v** select 1,2,4
007. 0x07 **BEL**	023. 0x17 **ETB**	039. 0x27 **'**	055. 0x37 **7** nibble 0x7	071. 0x47 **G** button 06	087. 0x57 **W** button 22	103. 0x67 **g** button 37	119. 0x77 **w** select 3,4
008. 0x08 **BS**	024. 0x18 **CAN**	040. 0x28 **(** do-logic	056. 0x38 **8** nibble 0x8	072. 0x48 **H** button 07	088. 0x58 **X** button 23	104. 0x68 **h** button 38	120. 0x78 **x** select 1,3,4
009. 0x09 **HT**	025. 0x19 **EM**	041. 0x29 **)** do-preset	057. 0x39 **9** nibble 0x9	073. 0x49 **I** button 08	089. 0x59 **Y** button 24	105. 0x69 **i** button 39	121. 0x79 **y** select 2,3,4
010. 0x0A **LF**	026. 0x1A **SUB**	042. 0x2A ***** get-status	058. 0x3A **:** nibble 0xA	074. 0x4A **J** button 09	090. 0x5A **Z** button 25	106. 0x6A **j** button 40	122. 0x7A **z** select 1,2,3,4
011. 0x0B **VT**	027. 0x1B **ESC**	043. 0x2B **+** sleep 10 sec.	059. 0x3B **;** nibble 0xB	075. 0x4B **K** button 10	091. 0x5B **[** button 26	107. 0x6B **k** select none	123. 0x7B **{**
012. 0x0C **FF**	028. 0x1C **FS**	044. 0x2C **,** read memory	060. 0x3C **<** nibble 0xC	076. 0x4C **L** button 11	092. 0x5C **** button 27	108. 0x6C **l** select 1	124. 0x7C **¦**
013. 0x0D **CR**	029. 0x1D **GS**	045. 0x2D **-** write memory	061. 0x3D **=** nibble 0xD	077. 0x4D **M** button 12	093. 0x5D **]** button 28	109. 0x6D **m** select 2	125. 0x7D **}**
014. 0x0E **SO**	030. 0x1E **RS**	046. 0x2E **.** set defaults	062. 0x3E **>** nibble 0xE	078. 0x4E **N** button 13	094. 0x5E **^** button 29	110. 0x6E **n** select 1,2	126. 0x7E **~**
015. 0x0F **SI**	031. 0x1F **US**	047. 0x2F **/** get version	063. 0x3F **?** nibble 0xF	079. 0x4F **O** button 14	095. 0x5F **_** button 30	111. 0x6F **o** select 3	127. 0x7F **DEL**

Address		Used for storage of	Byte Controls	Value Ranges	Corresponds to
0 0	0	Auto (gated) to main status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not auto (gated), 1 auto (gated)
0 1	1	Main out channel on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 2 is value 0	0 off, 1 on
0 2	2	Auto (gated) to aux status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not auto (gated), 1 auto (gated)
0 3	3	Aux out channel on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 2 is value 0	0 off, 1 on
0 4	4	Direct out follow gate status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not follow gated, 1 follow gated
0 5	5	Direct out on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 4 is value 0	0 off, 1 on
0 6	6	Logic output follow gate status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not follow gated, 1 follow gated
0 7	7	Logic output on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 6 is value 0	0 off, 1 on
0 8	8	Config bits	See note 1	See note 1	See note 1
0 9	9	MaxNOM presence	Maximum number of open mic	0 to 7	number of open mics
0 :	10	Main and aux attenuation	attenuation	0 to 15	see table
0 ;	11	Channel on time	reload the channel on	0 to 255	value*.025 seconds
0 <	12	Designated mic	designated mic	See note 2	See note 2
0 =	13	reserved			
0 >	14	reserved			
0 ?	15	reserved			
1 0	16	Turn on delay	Ch.1 delay	0 to 255	.025*value seconds
1 1	17	Turn on delay	Ch.2 delay	0 to 255	.025*value seconds
1 2	18	Turn on delay	Ch.3 delay	0 to 255	.025*value seconds
1 3	19	Turn on delay	Ch.4 delay	0 to 255	.025*value seconds
1 4	20	Turn on delay	Ch.5 delay	0 to 255	.025*value seconds
1 5	21	Turn on delay	Ch.6 delay	0 to 255	.025*value seconds
1 6	22	Turn on delay	Ch.7 delay	0 to 255	.025*value seconds
1 7	23	Turn on delay	Ch.8 delay	0 to 255	.025*value seconds
1 8	24	Logic output turnoff delay	Ch.1 delay	0 to 255	.025*value seconds
1 9	25	Logic output turnoff delay	Ch.2 delay	0 to 255	.025*value seconds
1 :	26	Logic output turnoff delay	Ch.3 delay	0 to 255	.025*value seconds
1 ;	27	Logic output turnoff delay	Ch.4 delay	0 to 255	.025*value seconds
1 <	28	Logic output turnoff delay	Ch.5 delay	0 to 255	.025*value seconds
1 =	29	Logic output turnoff delay	Ch.6 delay	0 to 255	.025*value seconds
1 >	30	Logic output turnoff delay	Ch.7 delay	0 to 255	.025*value seconds
1 ?	31	Logic output turnoff delay	Ch.8 delay	0 to 255	.025*value seconds
2 0	32	gain, phantom, hpf	Ch.1	See note 3	See note 3
2 1	33	gain, phantom, hpf	Ch.2	See note 3	See note 3

2 2	34	gain, phantom, hpf	Ch.3	See note 3	See note 3
2 3	35	gain, phantom, hpf	Ch.4	See note 3	See note 3
2 4	36	gain, phantom, hpf	Ch.5	See note 3	See note 3
2 5	37	gain, phantom, hpf	Ch.6	See note 3	See note 3
2 6	38	gain, phantom, hpf	Ch.7	See note 3	See note 3
2 7	39	gain, phantom, hpf	Ch.8	See note 3	See note 3
2 8	40	Main Feed	Ch. 1 level	See note 4	See note 4
2 9	41	Aux Feed	Ch. 1 level	See note 4	See note 4
2 :	42	Main Feed	Ch. 2 level	See note 4	See note 4
2 ;	43	Aux Feed	Ch. 2 level	See note 4	See note 4
2 <	44	Main Feed	Ch. 3 level	See note 4	See note 4
2 =	45	Aux Feed	Ch. 3 level	See note 4	See note 4
2 >	46	Main Feed	Ch. 4 level	See note 4	See note 4
2 ?	47	Aux Feed	Ch. 4 level	See note 4	See note 4
3 0	48	Main Feed	Ch. 5 level	See note 4	See note 4
3 1	49	Aux Feed	Ch. 5 level	See note 4	See note 4
3 2	50	Main Feed	Ch. 6 level	See note 4	See note 4
3 3	51	Aux Feed	Ch. 6 level	See note 4	See note 4
3 4	52	Main Feed	Ch. 7 level	See note 4	See note 4
3 5	53	Aux Feed	Ch. 7 level	See note 4	See note 4
3 6	54	Main Feed	Ch. 8 level	See note 4	See note 4
3 7	55	Aux Feed	Ch. 8 level	See note 4	See note 4
3 8	56	Main Feed	Aux 1 level	See note 4	See note 4
3 9	57	Aux Feed	Aux 1 level	See note 4	See note 4
3 :	58	Main Feed	Aux 2 level	See note 4	See note 4
3 ;	59	Aux Feed	Aux 2 level	See note 4	See note 4
3 <	60	Main Output	Main out level	See note 4	See note 4
3 =	61	Aux Output	Aux out level	See note 4	See note 4
3 >	62	Last recalled preset	Preset number	0 to 16	Preset number
3 ?	63	reserved			
4 0	64	Bass	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 1	65	Mid	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 2	66	Mid Freq	Ch. 1	0 to 15	(value+1)*220 Hz
4 3	67	High	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 4	68	Bass	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 5	69	Mid	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 6	70	Mid Freq	Ch. 2	0 to 15	(value+1)*220 Hz
4 7	71	High	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 8	72	Bass	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 9	73	Mid	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 :	74	Mid Freq	Ch. 3	0 to 15	(value+1)*220 Hz

4 ;	75	High	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 <	76	Bass	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
4 =	77	Mid	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
4 >	78	Mid Freq	Ch. 4	0 to 15	(value+1)*220 Hz
4 ?	79	High	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
5 0	80	Bass	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 1	81	Mid	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 2	82	Mid Freq	Ch. 5	0 to 15	(value+1)*220 Hz
5 3	83	High	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 4	84	Bass	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 5	85	Mid	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 6	86	Mid Freq	Ch. 6	0 to 15	(value+1)*220 Hz
5 7	87	High	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 8	88	Bass	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 9	89	Mid	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 :	90	Mid Freq	Ch. 7	0 to 15	(value+1)*220 Hz
5 ;	91	High	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 <	92	Bass	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15
5 =	93	Mid	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15
5 >	94	Mid Freq	Ch. 8	0 to 15	(value+1)*220 Hz
5 ?	95	High	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15

Attenuation Table

value	dB
0	-80
1	-40
2	-35
3	-30
4	-25
5	-20
6	-19
7	-18
8	-17
9	-16
10	-15
11	-14
12	-13
13	-12
14	-11
15	-10

Note 1 [Config bits]) High bit indicates the presence of the following (from lsb to msb)

bit 1- last mic hold
bit 2- force into manual
bit 3- teleconference mode
bit 4- aux 1 +/-6dB gain
bit 5- aux 2 +/-6 dB gain
bit 6- disable NOM attenuation
bit 7- logic out don't track last mic channel
bit 8- direct out don't track last mic channel.

Example: 01101010 has

bit 2- manual mode engaged
bit 4- aux 1 at +6dB gain
bit 6- NOM attenuation disabled
bit 7- the logic out is not tracking the last mic channel

Note 2 [Mic]: The bit that is high represents the designated mic on. If no bit is high, the system is either on last mic hold or has no designated mic.

Example: 01000000 has

7- mic 7 as designated mic

Note 3 [Gain]: Multi-purpose byte. 5 least significant bits represent gain and range in value from 0 to 23.

Gain = (value-2)*3dB.

Add binary 100000 for phantom power, binary 1000000 for high pass filter

Example: 01100111 has

bits (1, 2, 3)- a gain of (7-2)*3=15dB
bit 6- phantom power on
bit 7- high pass filter on

Note 4 [Feeds]: Multi-purpose byte. 5 least significant bits represent feed levels and values range from 0 to 31. 0 dB occurs at 25 value. Setting the msb, 128, (adding 10000000 binary) to high indicates muting. Another way of thinking of this is that the un-muted levels range from 0 to 31, while the muted levels range from 128 to 159.

Example: 10000011 has

bits (1, 2)- volume level of 3 (out of 31)
bit 8- muting on

Serial Control
of the
Advantage VRAM

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Introduction

This document contains information for the serial control of the Advantage VRAM (Variable Resource Auto Mixer) and the Advantage VRAMeq, (Variable Resource Auto Mixer with equalizer). Specifically, this document tries to inform those looking to write their own software controls for the Advantage VRAM. It is assumed that the reader has some familiarity with standard programming practices, binary and hexadecimal numbers, the ASCII character set, asynchronous serial data connections, and RS-232 interfaces.

Decimal, Binary, and "Pseudo-hex" Numbers

This document uses three different numerical notations. The first, the most common, is the decimal notation. Whenever it is used, a "d" will appear after the number..

8 Bit binary numbers are the second format used in this paper. These numbers will be followed by "b" after their usage. If a specific bit is being referred to, the numbers will be preceded by the word "bit."

To transmit an 8 bit binary number to the Advantage VRAM, hexadecimal notation is used. Hexadecimal numbers are arrived at by splitting the number into two halves. One half consists of the first four binary digits (most significant nibble) while the other consists of the last four binary digits (least significant nibble). 2 nibbles form a byte, which takes on a decimal value of 0 to 255. Each half is then assigned a hexadecimal value. Since the binary values range from 0 to 15, usually values from 10 to 15 are given the alphabetic letters from A to F.

However, the Advantage VRAM does not utilize standard hex format. Instead, the Advantage VRAM uses what is known as "pseudo-hex." Simply put, instead of using the letters A, B, C, D, E and F the Advantage VRAM uses : ; < = > and ?, respectively. All it takes to arrive at the new notation for hex values 10 to 15d is to add 30 to the old ASCII values. In this paper, [pseudo-hex] will appear after the use of a pseudo-hex character. The changes are traditional hex are summed up below:

	Nibble Conversion		
Decimal	Hex	Pseudo-hex	Binary
0	0	0	0000
1	1	1	0001
2	2	2	0010
3	3	3	0011
4	4	4	0100
5	5	5	0101
6	6	6	0110
7	7	7	0111
8	8	8	1000
9	9	9	1001
10	A	:	1010
11	B	;	1011
12	C	<	1100
13	D	=	1101
14	E	>	1110
15	F	?	1111

Serial Interface - Data Communications Parameters

The Advantage VRAM communicates through its serial port at four different baud rates: 2400, 9600, 19200, and 38400. The factory default setting is 9600 baud. Changing this rate is accomplished in the advanced mode (see page 18, not a recommended procedure) or through BiampWin. The Advantage VRAM communicates with 8 data bits, no parity, and 1 stop bit. The Advantage VRAM utilizes a subset of the standard 7-bit ASCII character set.

Control

The Advantage VRAM has an RS-232-compatible serial port which allows it to be controlled by a computer or by a third party system controller (such as those provided by AMX or Crestron). The Advantage VRAM offers the following two methods of serial control:

- Control Button Emulation. This method of control emulates Biamp's standard infrared remote control transmitter or wall-mount remote control panel. Using this method, single ASCII characters sent to the device's serial port cause the device to behave as if a biamp remote controller were attached. While Control Button Emulation is simple to perform, it only provides basic and "one-way" control of the Advantage VRAM - it allows the user to send simple commands *to* the Advantage VRAM, but it does not provide any mechanism for requesting status information *from* the Advantage VRAM.

- Advanced Control. Advanced control provides a command set which allow "two-way" control of the Advantage VRAM. Using Advanced Control commands, a system may request status information *from* the device as well as send commands *to* the device. Communication occurs with the Advantage VRAM using the Advantage VRAM's serial port.

Control Button Emulation

Control Button Emulation is the simplest form of serial control of the Advantage VRAM. This method of operation allows the user to emulate the operation of a standard Biamp remote control transmitter.

For each button on a standard Biamp remote control, there is a corresponding ASCII character. In order to emulate a remote control button, the transmitting system simply transmits the corresponding ASCII character to the Advantage VRAM's serial port. Each character received by the Advantage VRAM will be echoed back out the serial port.

The standard Biamp remote control devices never exceed a transmission rate of 9 characters per second. If the controlling system wishes to perform Control Button Emulation at a rate of greater than 20 characters per second (50 msec per character), flow

control should be implemented by waiting for the echo of each character before transmitting the next character. At slower speeds, flow control should not be necessary.

The following table summarizes the ASCII character codes for Control Button Emulation corresponding to each of the 40 remote control buttons supported by the Advantage VRAM. These button codes are also summarized on the ASCII code chart provided at the end of this manual. The remote control buttons on the standard Biamp transmitter are numbered from left to right going from bottom to top with the lower left-hand button being button number 1.

Using BiampWin, it is possible to program the VRAM to respond to these commands.

button 1	'B'	(0x42)		button 21	'V'	(0x56)
button 2	'C'	(0x43)		button 22	'W'	(0x57)
button 3	'D'	(0x44)		button 23	'X'	(0x58)
button 4	'E'	(0x45)		button 24	'Y'	(0x59)
button 5	'F'	(0x46)		button 25	'Z'	(0x5A)
button 6	'G'	(0x47)		button 26	'['	(0x5B)
button 7	'H'	(0x48)		button 27	'\'	(0x5C)
button 8	'I'	(0x49)		button 28	']'	(0x5D)
button 9	'J'	(0x4A)		button 29	'^'	(0x5E)
button 10	'K'	(0x4B)		button 30	'_'	(0x5F)
button 11	'L'	(0x4C)		button 31	'`'	(0x60)
button 12	'M'	(0x4D)		button 32	'b'	(0x62)
button 13	'N'	(0x4E)		button 33	'c'	(0x63)
button 14	'O'	(0x4F)		button 34	'd'	(0x64)
button 15	'P'	(0x50)		button 35	'e'	(0x65)
button 16	'Q'	(0x51)		button 36	'f'	(0x66)
button 17	'R'	(0x52)		button 37	'g'	(0x67)
button 18	'S'	(0x53)		button 38	'h'	(0x68)
button 19	'T'	(0x54)		button 39	'i'	(0x69)
button 20	'U'	(0x55)		button 40	'j'	(0x6A)

Simple vs Addressable

The simple method of control button emulation is to send any one of the control button characters through the serial port to the VRAM. The disadvantage to this method is that every device hooked into the VRAM will also hear the command. If any of the other devices have been programmed with this particular character, they will also respond.

To avoid this problem, the VRAM allows addressable control button emulation. By using the control-button-emulation command, on page 12, control button commands are sent directly to a specific device.

Advanced Control

The Advanced Control command set includes more powerful commands to allow more flexible control of the Advantage VRAM. Unlike Control Button Emulation (which is basically a one-way control mechanism) advanced control commands allow the VRAM to return information through the serial port,. The following list summarizes the commands available using Advanced Control, including the ASCII command character associated with each command:

!	store-as-preset *(save settings as preset)*
"	retrieve-preset *(put Advantage VRAM into preset mode)*
#	read-device-settings *(read current settings from device memory*)
$	write-settings *(write to device memory)*
&	addressable-control-button-emulation *(execute control buttons)*
(	bitwise-operator *(perform bitwise operations on memory locations)*
)	increment-decrement-memory *(change memory location value by plus or minus one)*
*	polling-status *(request status update of various functions)*
+	sleep-for-10-seconds *(sleep for 10 seconds, ignoring all communication)*
,	read-eeprom-locations *(read from non-volatile memory)*
-	write-eeprom-locations[1] *(write to non-volatile memory)*
.	set-baud[1] *(set communications speed)*
/	get-version *(retrieve the model information and firmware version date)*

Each Advanced Control command requires at least two parameter bytes (four pseudo-hex characters) to be sent prior to the command character. Each command will be explained in detail on the following pages.

Some of the commands cause the Advantage VRAM to return information through the serial port. For each string of information returned to the serial port, the Advantage VRAM terminates the string by transmitting the ASCII carriage return character (0x0D - represented in this document as ↵).

[1] Not recommended, but available for use

As mentioned earlier, the Advantage VRAM will echo all characters it receives, regardless of whether or not the characters are valid commands or parameters. Characters greater than 0x7F are reserved and should not be transmitted to the serial port. The Advantage VRAM utilizes a subset of the standard ASCII character set. The following characters have meaning to the Advantage VRAM:

character	hexadecimal	operation
ASCII control characters	(0x00 - 0x1F)	no operation
ASCII **SPACE** character	(0x20)	no operation
! thru **/**	(0x21 - 0x2F)	Advanced Control commands
0 thru **?**	(0x30 - 0x3F)	pseudo-hex parameters for Advanced Control commands
@	(0x40)	Control Button Emulation Repeat Code
A	(0x41)	no operation
B thru **`**	(0x42 - 0x60)	Control Button Emulation commands (buttons 01 - 31)
a	(0x61)	no operation
b thru **j**	(0x62 - 0x6A)	Control Button Emulation commands (buttons 32 - 40)
k thru **z**	(0x6B - 0x7A)	Control Button Emulation Device Select Prefix commands
{ thru **DEL**	(0x7B - 0x7F)	no operation
0x80 thru 0xFF	(0x80 - 0xFF)	RESERVED

Device Type Bitmask, Device Number Bitmask, and Device Model Bitmask

In a system which has more than one Advantage product connected together, the Device Type Bitmask and Device Number Bitmask command parameters provide a mechanism to individually address a particular device (or a combination of devices). Every command in the Advanced Control command set requires that a Device Type Bitmask and a Device Number Bitmask be transmitted as the last two parameter bytes before transmitting the command character itself. These two bitmask parameters bytes provide a device addressing capability to specify which of the devices in the system should execute the command. All devices which are not specifically addressed by these two bitmask values will ignore the command.

The Device Type Bitmask parameter byte supports up to eight distinct device types - one bit per device type. The eight device types are:

0x01 [hex] (bit 0) Biamp Advantage DRC 4+4 digital remote control
0x02 [hex] (bit 1) Biamp Advantage EQ28X digitally-controlled graphicEQ
0x04 [hex] (bit 2) Biamp Advantage SPM522D stereo preamp/mixer
0x08 [hex] (bit 3) Biamp Advantage PMX84 programmable matrix switch
0x10 [hex] (bit 4) (reserved for future product)
0x20 [hex] (bit 5) (reserved for future product)
0x40 [hex] (bit 6) (reserved for future product)
0x80 [hex] (bit 7) Advanced Products, such as the Biamp Advantage VRAM

The Advantage VRAM will only respond to Advanced Control commands if bit 7 of the Device Type Bitmask parameter byte is a '1'. A command may be directed to more than one device type in the system by setting all of the corresponding bits in the Device Type Bitmask to '1's. If only advanced equipment is being addressed (EQ2828/8 DRI, MSP, and DDL12) 80 is the only bitmask required to use.

The Device Number Bitmask parameter byte supports up to sixty-four distinct device numbers:

0x00 [hex]	Select Device Number 0
0x01 [hex]	Select Device Number 1
0x02 [hex]	Select Device Number 2
0xFF [hex]	Select Device Number 63

A particular Advantage VRAM will only respond to Advanced Control commands if the Device Number Bitmask parameter byte corresponds to its own device number.

For instance, the bitmask 8007 serves to talk only to advanced product (**80**) number 7 (**07**).

! store-as-preset

Description:

The Advantage VRAM and Advantage VRAMeq each allow up to 17 different presets. Using the store-as-preset command, the user is allowed to store the current settings (device configurations) under a specified preset.

Syntax of Command:

*pp*80*dd*!

where

pp	=	Preset number (0 to 16d; **00** to **10** [pseudo-hex])
80	=	Device type bitmask for Advantage Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
!	=	store-as-preset command character

Syntax of response:

no response

Example:

command:	response:
0?8002!	***(none)***

This example causes the Advantage VRAM , device number 2, to store the current settings under preset number 15d (**0?** [pseudo-hex]).

Comments:

While there are 16 designated presets on the main control screen in BiampWin, it is also possible to access and write to the power-up preset, **00**. This preset is used by the VRAM at power-up to load its startup configuration.

However, the current settings at power-down are normally saved to this preset. Consult the user's manual (regarding BiampWin) if you wish to disable saving of current settings at power-down.

" retrieve-preset

Description:

The retrieve-preset command configures the Advantage VRAM and Advantage VRAMeq according to a preset definition in non-volatile memory. The user can retrieve any of the 17 available presets.

Syntax of Command:

*pp*80*dd*"

where

pp	=	Preset number (1 to 16d; **00** to **10** [pseudo-hex])
80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; to **3?** [pseudo-hex])
"	=	retrieve-preset command character

Syntax of response:

no response

Example:

command:	response:
108003!	***(none)***

This example configures the Advantage VRAM , device number 3, according to the settings stored in preset number 16d (**10** [psuedo-hex].

Comments:

Depending on how the VRAM is configured from BiampWin, recalling preset 0 will either recall the default power-up configuration or recall the state of the VRAM at the last power-down. Please consult the BiampWin user's manual for more information

read-current-device-settings

Description:

The Advantage VRAM stores the settings of its pre-amp, volume, logic outputs and other miscellaneous configuration data in 96 bytes of data. The Advantage VRAMeq also stores equalizer data in this area of memory. The read-device-settings command can be used to retrieve the contents of these memory locations.

Syntax of Command:

*nnaa*80*dd*#

nn	=	Number of bytes to read (limited by starting address; 1 to 96d; **01** to **60** [pseudo-hex])
aa	=	Starting memory address (0 to 95d; **00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
#	=	read-device-setting command character

Syntax of response:

xx…(up to 96 data values)…↵

where

xx	=	Data value

Example:

command:	response:
10008002#	**642800001000001000??00??03?<03?<**

In this example, a Advantage VRAM (device number 2) is queried for the contents of the first 16d (**10** [pseudo-hex]) memory locations.

Comments:

From the beginning of the data structure (byte **00**), bytes 0-15d are miscellaneous settings. Bytes 16-31d are logic output settings, and bytes 32-95d are pre-amp settings, volume, and equalizer settings. See the memory map for exact details of memory mapping of device functions.

$ write-current-device-settings

Description:

When used in conjunction with the read-device-settings command, the write-device-settings command allows the user to manually adjust any aspect of the Advantage VRAM or Advantage VRAMeq settings.

Syntax of Command:

*xx…(up to 16 data values)…nnaa*80*dd*$

where

xx	=	Up to 16 data values, sent in reverse order, highest memory address first
nn	=	Number of bytes to write (limited by starting address; 1 to 96d; **01** to **60** [pseudo-hex])
aa	=	Starting memory address (0 to 95d; **00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
$	=	write-device-setting command character

Syntax of response:

no response

Example:

command:	response:
919191032880 02$	***(none)***

This command causes a Advantage VRAM (device number 2) to write **03** bytes, **919191** [pseudo-hex], to setting location 40d (**28** [pseudo-hex]).

Comments:

The increment-decrement-memory command “)” can provide a simpler way of modifying a device setting by a single step, especially for settings that require the increasing or decreasing of a value

& addressable-control-button-emulation

Description:

The Advantage VRAM and Advantage VRAMeq can be controlled by a 40 button standard IR remote control that sends single ASCII characters. These characters are then echoed to all linked devices with control ports. Using addressable-control-button emulation allows the user to send control button emulation commands to a specific device.

Sending buttons 41- 48 and 49-56 simulates a logic input instead of a control button. Note that these buttons are not available on the remote control.

Syntax of Command:

*ee*80*dd*&

where

ee	=	Button to emulate (1 to 40d; **01** to **28** [pseudo-hex])
80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
&	=	control-button-emulation command character

Syntax of response:

no response

Example:

command:	response:
018001&	***(none)***

This command tells the Advantage VRAM (device number 1) to emulate remote control button number 1.

Comments:

BiampWin provides the easiest method of entering button and logic input definitions.

(**bitwise-operator (firmware dates 7/23/98 and later)**

Description:

Many of the settings available on the Advantage VRAM are controlled by the status of individual bits in the device settings. To adjust one of these bits (for instance to mute or un-mute a channel) , use the bitwise-operator command.

Syntax of Command:

*vvssttaa*80*dd*)

where

vv	=	Bits to clear (**00** to **??** [pseudo-hex]; 00 indicates nothing to clear)
ss	=	Bits to set (**00** to **??** [pseudo-hex]; 00 indicates nothing to set)
tt	=	Bits to toggle (**00** to **??** [pseudo-hex]; 00 indicates nothing to toggle)
aa	=	Memory address (0 to 95d**; 00** to **5?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
(	=	bitwise-operator command character

Syntax of response:

no response

Example:

command:	response:
0000803<8007(	***(none)***

Here the mute bit of the main volume control (memory location **3<** [pseudo-hex]) is toggled.

command	response
0040003<8007(	***(none)***

This example sets the phantom power on for channel 1.

Comments:

It is easiest to think of the settings in binary, using the data from the memory map notes, and then convert the setting to pseudo-hex.

) increment-decrement-memory (firmware dates 7/23/98 and later)

Description:

Sometimes it is desired to adjust a value in device memory by increasing or decreasing it one step. A common application of this would be to adjust the main or auxiliary volume.

Syntax of Command:

*ooffaa*80*dd*)

where

oo	=	Upper or lower limit, depending on direction of change (limited by setting to be incremented, 0 to 23d for preamp 0 to 31d for fader 0 to 30d for eq tone 0 to 15d for eq frequency)
ff	=	Increment or decrement (**00** or **01**; 00 is decrement, 01 increment)
aa	=	Memory address (32 to 96d; **20** to **60** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
)	=	increment-decrement-memory command character

Syntax of response:

no response

Example:

command:	response:
02003<8007)	***(none)***

This example sets the lower bound as 02, and then decreases memory location **3<** [pseudo-hex] by one. This location happens to be the main volume level. Repeated use of this command will force the fader to its lower limit of 2d steps from the bottom.

Comments:

The increment / decrement command is limited to preamp gains, volume, and equalizer faders only.

* polling-status

Description:

In order to give the user a glimpse into the current status of the Advantage VRAM and Advantage VRAMeq, the polling-status command can be used. When directed, this command will return information regarding the mix status of the device, it's auxiliary and main analog to digital levels, as well as the presence of clipping, activity of the logic output, auxiliary and main outputs.

Syntax of Command:

80*dd**

where

80	=	Device type bitmask
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
*	=	polling-status command character

Syntax of response:

ppyyzzcclluumm↵

where

pp	=	Last preset and communication bit used with BiampWin (first nibble is for Biamp use only, second nibble indicates current preset, **0** to **?** [pseudo-hex])
yy	=	Auxiliary analog to digital converter level (level ranges from **00** to **??** [pseudo-hex])
zz	=	Main analog to digital converter level (level ranges from **00** to **??** [pseudo-hex])
cc	=	Clipping presence (high bit indicates presence, **00** or **01**)
ll	=	Logic output status (binary high bit indicates active, **00** to **??** [pseudo-hex])
uu	=	Auxiliary output status (binary high output indicates channel active, **00** to **??** [pseudo-hex])
mm	=	Main output status (binary high output indicates channel active, **00** to **??** [pseudo-hex]

Example:

command:	response:
8002*	**292:2;00000303**

In this example, a Advantage VRAM (device number 2) reports that it's last preset was 9. The 2 appearing before the 9 is used by BiampWin for communication purposes. The auxiliary and main a/d converter levels are 42 and 43d, or about 16% of max. There is no clipping, nor any output to the logic out. Finally, both the auxiliary and main outputs are being fed by channels 1 and 2 (**03** translates to 00000011b, indicating that the first two channels are on).

Comments:

Preset:
If the last preset selected was 16d, (the startup preset) and a communication bit is set, there can be some confusion. Preset 16d, without a communication bit has a pseudo-hex value of **10**, or 00010000b. However, when a communication bit is set, say, bit 8, the resultant binary is 10010000, or **90** [pseudo-hex]. In all cases other than preset 16d the communication bits always remain in the most significant nibble and the preset remains in the least significant nibble.

Logic outputs:
As there are 8 logic outputs, each bit in the pseudo-hex value represents a specific output. The outputs are ordered from most significant bit to least significant bit. For instance, an output of **?;** [pseudo-hex] would coincide with an binary value of 11111011b. Going from msb to lsb, this indicates that pins 8, 7, 6, 4, 2, and 1 are active.

Main and auxiliary outputs:
These work in a similar manner to the logic outputs. Each of the 8 outputs are represented by a bit in the pseudo-hex value. Each channel is ordered from lowest to highest, lsb to msb.

+ sleep-for-10-seconds

Description:

The sleep-for-10-seconds command allows the Advantage VRAM and Advantage VRAMeq to fall "asleep" for 10 seconds, ignoring all communication. During this 10 seconds of sleep, the Advantage VRAM will not respond to nor echo any commands that it receives.

Syntax of Command:

80*dd*+

where

80	=	Device type bitmask for the Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
+	=	sleep-for-10-seconds command character

Syntax of response:

no response

Example:

command:	response:
800;+	***(none)***

This example causes the Advantage VRAM (device number 11d) to sleep for 10 seconds.

Comments:

, read-eeprom-locations

Description:

Specifying the read-eeprom-locations command causes the Advantage VRAM and Advantage VRAMeq models to read a specified number of bytes starting at any valid memory location in any memory bank. This information is then passed to the serial port, from the last byte of sequence to the first byte specified. The Advantage VRAM has 16 banks with 256 bytes each

Syntax of Command:

*bbaann*80*dd*,

where

bb	=	Bank select (0 to 15d; **00** to **0?** [pseudo-hex])
aa	=	Starting memory address (0 to 255d; **00** to **??** [pseudo-hex])
nn	=	Number of bytes to read minus one (limited by starting address)
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d*;* **00** to **3?** [pseudo-hex])
,	=	read-eeprom-locations command character

Syntax of response:

xx…(up to 256 data values)…↵

where

xx	=	Data value

Example:

command:	response:
0>74068001,	**010?0?0?0?0?0?**

This command causes the Advantage VRAM (device number 1) to go to bank 14d (**0>** [pseudo-hex]) and dump to the user the 7 bytes (since 7 - 1 is **06**) from byte 116d (**74** [pseudo-hex]) on. The output indicates that byte 122d contains **01**, while bytes 116 to 121d all contain **0?** [pseudo-hex].

Comments:

- write-eeprom-locations

Description:

The write-eeprom-locations command allows the user to write directly to the eeprom, placing specific characters in designated memory locations. The Advantage VRAM and Advantage VRAMeq each allow the user to program all of the eeprom's 16 banks of 256 bytes. While this provides a powerful method of setting or changing configuration parameter, it also provides an easy way to screw things up.

Syntax of Command:

*xx…(up to 16 data values)…bbaanncc*80*dd-*

where

xx	=	Up to 16 data values, sent in reverse order, highest memory address first.
bb	=	Bank select (0 to 15d; **00** to **0?** [pseudo-hex];)
aa	=	Starting memory address (0 to 255d; **00** to **??** [pseudo-hex];)
nn	=	Number of bytes to write minus one (limited by starting address)
cc	=	Checksum which consists of the 1's compliment of the eight bit sum of *nn* + *aa* + *bb* + *xx* + ...
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
-	=	write-eeprom-locations command character

Syntax of response:

no response

Example:

command:	response:
0=07=>000>8006-	***(none)***

This example commands an Advantage VRAM (device number 6) to access bank 7d of the non-volatile memory. In this bank, it writes 1 byte (recall that 1 - 1 is **00**), **0=**, to memory location 222d (=> pseudo-hex). Finally, as a checksum, the command provides **0>** (00001110b), the one's compliment of the sum of **0=**, **07**, **=>**, and **00** [pseudo-hex]. If the command had specified more than one byte, then the Advantage VRAM would have entered the data from the highest memory location to the lowest.

. set-baud

Description:

The set-baud rate command allows the user to specify the baud rate at which the Advantage VRAM and Advantage VRAMeq operate. The units operate at 2400, 9600, 19200, and 38400 baud. In order to specify which of these baud rates to use, the Advantage VRAM refers tothem by the numbers 0,1,2 and 3; respectively.

Syntax of Command:

*rrii*80*dd*.

where

rr	=	Baud rate (**00** to **03**)
ii	=	Compliment of selected baud rate (**0<** to **0?** [pseudo-hex])
80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
.	=	set-baud command character

Syntax of response:

no response

Example:

command:	response:
00??8002.	***(none)***

This command changes the baud of the Advantage VRAM (device number 2) to 2400 (mode **00** [pseudo-hex]).

Comments:

Changing the baud value will immediately disconnect the user from the Advantage VRAM until the user has changed the baud of the device connected to serial port also. Therefore, this command can be dangerous and is not recommended.

/ get-version

Description:

The get-version command causes the Advantage VRAM and Advantage VRAMeq to return the model identification code and firmware version to the user. The firmware version is the release date, in the American format *mmddyy*. It is important to note that the Advantage VRAM will return this date in decimal format, **not** pseudo-hex.

Syntax of Command:

80*dd*/

where

80	=	Device type bitmask for Advantage VRAM
dd	=	Device number bitmask (1 to 63d; **00** to **3?** [pseudo-hex])
/	=	get-version command character

Syntax of response:

12*mmddyy*↵

where

12	=	Model i.d. for Advantage VRAM
mm	=	2 digit decimal month character
dd	=	2 digit decimal day character
yy	=	2 digit decimal year character

Example:

command:	response:
800=/	**12060598**

This command asks a Advantage VRAM, number 13d, (**0=** [pseudo-hex]) to return its model i.d. and firmware date. In this case, the model i.d. is **12** [pseudo-hex] and firmware date is 6/5/98.

Comments:

Using the ? character will act as a wild card for any of the parameters.

ASCII Code Chart

with Decimal & Hexadecimal Equivalents and Advantage DRI Commands

000. 0x00 **NUL**	016. 0x10 **DLE**	032. 0x20 **(space)**	048. 0x30 **0** nibble 0x0	064. 0x40 **@** repeat code	080. 0x50 **P** button 15	096. 0x60 **`** button 31	112. 0x70 **p** select 1,3
001. 0x01 **SOH**	017. 0x11 **DC1**	033. 0x21 **!** vol limits	049. 0x31 **1** nibble 0x1	065. 0x41 **A**	081. 0x51 **Q** button 16	097. 0x61 **a**	113. 0x71 **q** select 2,3
002. 0x02 **STX**	018. 0x12 **DC2**	034. 0x22 **"** do-button	050. 0x32 **2** nibble 0x2	066. 0x42 **B** button 01	082. 0x52 **R** button 17	098. 0x62 **b** button 32	114. 0x72 **r** select 1,2,3
003. 0x03 **ETX**	019. 0x13 **DC3**	035. 0x23 **#** do-volume	051. 0x33 **3** nibble 0x3	067. 0x43 **C** button 02	083. 0x53 **S** button 18	099. 0x63 **c** button 33	115. 0x73 **s** select 4
004. 0x04 **EOT**	020. 0x14 **DC4**	036. 0x24 **$** define-preset	052. 0x34 **4** nibble 0x4	068. 0x44 **D** button 03	084. 0x54 **T** button 19	100. 0x64 **d** button 34	116. 0x74 **t** select 1,4
005. 0x05 **ENQ**	021. 0x15 **NAK**	037. 0x25 **%** get-preset	053. 0x35 **5** nibble 0x5	069. 0x45 **E** button 04	085. 0x55 **U** button 20	101. 0x65 **e** button 35	117. 0x75 **u** select 2,4
006. 0x06 **ACK**	022. 0x16 **SYN**	038. 0x26 **&** get/set-volume	054. 0x36 **6** nibble 0x6	070. 0x46 **F** button 05	086. 0x56 **V** button 21	102. 0x66 **f** button 36	118. 0x76 **v** select 1,2,4
007. 0x07 **BEL**	023. 0x17 **ETB**	039. 0x27 **'**	055. 0x37 **7** nibble 0x7	071. 0x47 **G** button 06	087. 0x57 **W** button 22	103. 0x67 **g** button 37	119. 0x77 **w** select 3,4
008. 0x08 **BS**	024. 0x18 **CAN**	040. 0x28 **(** do-logic	056. 0x38 **8** nibble 0x8	072. 0x48 **H** button 07	088. 0x58 **X** button 23	104. 0x68 **h** button 38	120. 0x78 **x** select 1,3,4
009. 0x09 **HT**	025. 0x19 **EM**	041. 0x29 **)** do-preset	057. 0x39 **9** nibble 0x9	073. 0x49 **I** button 08	089. 0x59 **Y** button 24	105. 0x69 **i** button 39	121. 0x79 **y** select 2,3,4
010. 0x0A **LF**	026. 0x1A **SUB**	042. 0x2A ***** get-status	058. 0x3A **:** nibble 0xA	074. 0x4A **J** button 09	090. 0x5A **Z** button 25	106. 0x6A **j** button 40	122. 0x7A **z** select 1,2,3,4
011. 0x0B **VT**	027. 0x1B **ESC**	043. 0x2B **+** sleep 10 sec.	059. 0x3B **;** nibble 0xB	075. 0x4B **K** button 10	091. 0x5B **[** button 26	107. 0x6B **k** select none	123. 0x7B **{**
012. 0x0C **FF**	028. 0x1C **FS**	044. 0x2C **,** read memory	060. 0x3C **<** nibble 0xC	076. 0x4C **L** button 11	092. 0x5C **** button 27	108. 0x6C **l** select 1	124. 0x7C **¦**
013. 0x0D **CR**	029. 0x1D **GS**	045. 0x2D **-** write memory	061. 0x3D **=** nibble 0xD	077. 0x4D **M** button 12	093. 0x5D **]** button 28	109. 0x6D **m** select 2	125. 0x7D **}**
014. 0x0E **SO**	030. 0x1E **RS**	046. 0x2E **.** set defaults	062. 0x3E **>** nibble 0xE	078. 0x4E **N** button 13	094. 0x5E **^** button 29	110. 0x6E **n** select 1,2	126. 0x7E **~**
015. 0x0F **SI**	031. 0x1F **US**	047. 0x2F **/** get version	063. 0x3F **?** nibble 0xF	079. 0x4F **O** button 14	095. 0x5F **_** button 30	111. 0x6F **o** select 3	127. 0x7F **DEL**

Address		Used for storage of	Byte Controls	Value Ranges	Corresponds to
0 0	0	Auto (gated) to main status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not auto (gated), 1 auto (gated)
0 1	1	Main out channel on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 2 is value 0	0 off, 1 on
0 2	2	Auto (gated) to aux status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not auto (gated), 1 auto (gated)
0 3	3	Aux out channel on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 2 is value 0	0 off, 1 on
0 4	4	Direct out follow gate status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not follow gated, 1 follow gated
0 5	5	Direct out on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 4 is value 0	0 off, 1 on
0 6	6	Logic output follow gate status	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1	0 not follow gated, 1 follow gated
0 7	7	Logic output on or off	Ch.1 to 8, from lsb to msb. Each bit controls one channel	0 or 1, bit only active when coinciding bit in byte 6 is value 0	0 off, 1 on
0 8	8	Config bits	See note 1	See note 1	See note 1
0 9	9	MaxNOM presence	Maximum number of open mic	0 to 7	number of open mics
0 :	10	Main and aux attenuation	attenuation	0 to 15	see table
0 ;	11	Channel on time	reload the channel on	0 to 255	value*.025 seconds
0 <	12	Designated mic	designated mic	See note 2	See note 2
0 =	13	reserved			
0 >	14	reserved			
0 ?	15	reserved			
1 0	16	Turn on delay	Ch.1 delay	0 to 255	.025*value seconds
1 1	17	Turn on delay	Ch.2 delay	0 to 255	.025*value seconds
1 2	18	Turn on delay	Ch.3 delay	0 to 255	.025*value seconds
1 3	19	Turn on delay	Ch.4 delay	0 to 255	.025*value seconds
1 4	20	Turn on delay	Ch.5 delay	0 to 255	.025*value seconds
1 5	21	Turn on delay	Ch.6 delay	0 to 255	.025*value seconds
1 6	22	Turn on delay	Ch.7 delay	0 to 255	.025*value seconds
1 7	23	Turn on delay	Ch.8 delay	0 to 255	.025*value seconds
1 8	24	Logic output turnoff delay	Ch.1 delay	0 to 255	.025*value seconds
1 9	25	Logic output turnoff delay	Ch.2 delay	0 to 255	.025*value seconds
1 :	26	Logic output turnoff delay	Ch.3 delay	0 to 255	.025*value seconds
1 ;	27	Logic output turnoff delay	Ch.4 delay	0 to 255	.025*value seconds
1 <	28	Logic output turnoff delay	Ch.5 delay	0 to 255	.025*value seconds
1 =	29	Logic output turnoff delay	Ch.6 delay	0 to 255	.025*value seconds
1 >	30	Logic output turnoff delay	Ch.7 delay	0 to 255	.025*value seconds
1 ?	31	Logic output turnoff delay	Ch.8 delay	0 to 255	.025*value seconds
2 0	32	gain, phantom, hpf	Ch.1	See note 3	See note 3
2 1	33	gain, phantom, hpf	Ch.2	See note 3	See note 3

2 2	34	gain, phantom, hpf	Ch.3	See note 3	See note 3
2 3	35	gain, phantom, hpf	Ch.4	See note 3	See note 3
2 4	36	gain, phantom, hpf	Ch.5	See note 3	See note 3
2 5	37	gain, phantom, hpf	Ch.6	See note 3	See note 3
2 6	38	gain, phantom, hpf	Ch.7	See note 3	See note 3
2 7	39	gain, phantom, hpf	Ch.8	See note 3	See note 3
2 8	40	Main Feed	Ch. 1 level	See note 4	See note 4
2 9	41	Aux Feed	Ch. 1 level	See note 4	See note 4
2 :	42	Main Feed	Ch. 2 level	See note 4	See note 4
2 ;	43	Aux Feed	Ch. 2 level	See note 4	See note 4
2 <	44	Main Feed	Ch. 3 level	See note 4	See note 4
2 =	45	Aux Feed	Ch. 3 level	See note 4	See note 4
2 >	46	Main Feed	Ch. 4 level	See note 4	See note 4
2 ?	47	Aux Feed	Ch. 4 level	See note 4	See note 4
3 0	48	Main Feed	Ch. 5 level	See note 4	See note 4
3 1	49	Aux Feed	Ch. 5 level	See note 4	See note 4
3 2	50	Main Feed	Ch. 6 level	See note 4	See note 4
3 3	51	Aux Feed	Ch. 6 level	See note 4	See note 4
3 4	52	Main Feed	Ch. 7 level	See note 4	See note 4
3 5	53	Aux Feed	Ch. 7 level	See note 4	See note 4
3 6	54	Main Feed	Ch. 8 level	See note 4	See note 4
3 7	55	Aux Feed	Ch. 8 level	See note 4	See note 4
3 8	56	Main Feed	Aux 1 level	See note 4	See note 4
3 9	57	Aux Feed	Aux 1 level	See note 4	See note 4
3 :	58	Main Feed	Aux 2 level	See note 4	See note 4
3 ;	59	Aux Feed	Aux 2 level	See note 4	See note 4
3 <	60	Main Output	Main out level	See note 4	See note 4
3 =	61	Aux Output	Aux out level	See note 4	See note 4
3 >	62	Last recalled preset	Preset number	0 to 16	Preset number
3 ?	63	reserved			
4 0	64	Bass	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 1	65	Mid	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 2	66	Mid Freq	Ch. 1	0 to 15	(value+1)*220 Hz
4 3	67	High	Ch. 1	0 to 30	-9 dB to 9dB with 0 dB at 15
4 4	68	Bass	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 5	69	Mid	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 6	70	Mid Freq	Ch. 2	0 to 15	(value+1)*220 Hz
4 7	71	High	Ch. 2	0 to 30	-9 dB to 9dB with 0 dB at 15
4 8	72	Bass	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 9	73	Mid	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 :	74	Mid Freq	Ch. 3	0 to 15	(value+1)*220 Hz

4 ;	75	High	Ch. 3	0 to 30	-9 dB to 9dB with 0 dB at 15
4 <	76	Bass	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
4 =	77	Mid	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
4 >	78	Mid Freq	Ch. 4	0 to 15	(value+1)*220 Hz
4 ?	79	High	Ch. 4	0 to 30	-9 dB to 9dB with 0 dB at 15
5 0	80	Bass	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 1	81	Mid	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 2	82	Mid Freq	Ch. 5	0 to 15	(value+1)*220 Hz
5 3	83	High	Ch. 5	0 to 30	-9 dB to 9dB with 0 dB at 15
5 4	84	Bass	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 5	85	Mid	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 6	86	Mid Freq	Ch. 6	0 to 15	(value+1)*220 Hz
5 7	87	High	Ch. 6	0 to 30	-9 dB to 9dB with 0 dB at 15
5 8	88	Bass	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 9	89	Mid	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 :	90	Mid Freq	Ch. 7	0 to 15	(value+1)*220 Hz
5 ;	91	High	Ch. 7	0 to 30	-9 dB to 9dB with 0 dB at 15
5 <	92	Bass	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15
5 =	93	Mid	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15
5 >	94	Mid Freq	Ch. 8	0 to 15	(value+1)*220 Hz
5 ?	95	High	Ch. 8	0 to 30	-9 dB to 9dB with 0 dB at 15

Attenuation Table

value	dB
0	-80
1	-40
2	-35
3	-30
4	-25
5	-20
6	-19
7	-18
8	-17
9	-16
10	-15
11	-14
12	-13
13	-12
14	-11
15	-10

Note 1 [Config bits]) High bit indicates the presence of the following (from lsb to msb)

bit 1- last mic hold
bit 2- force into manual
bit 3- teleconference mode
bit 4- aux 1 +/-6dB gain
bit 5- aux 2 +/-6 dB gain
bit 6- disable NOM attenuation
bit 7- logic out don't track last mic channel
bit 8- direct out don't track last mic channel.

Example: 01101010 has

bit 2- manual mode engaged
bit 4- aux 1 at +6dB gain
bit 6- NOM attenuation disabled
bit 7- the logic out is not tracking the last mic channel

Note 2 [Mic]: The bit that is high represents the designated mic on. If no bit is high, the system is either on last mic hold or has no designated mic.

Example: 01000000 has

7- mic 7 as designated mic

Note 3 [Gain]: Multi-purpose byte. 5 least significant bits represent gain and range in value from 0 to 23.

Gain = (value-2)*3dB.

Add binary 100000 for phantom power, binary 1000000 for high pass filter

Example: 01100111 has

bits (1, 2, 3)- a gain of (7-2)*3=15dB
bit 6- phantom power on
bit 7- high pass filter on

Note 4 [Feeds]: Multi-purpose byte. 5 least significant bits represent feed levels and values range from 0 to 31. 0 dB occurs at 25 value. Setting the msb, 128, (adding 10000000 binary) to high indicates muting. Another way of thinking of this is that the un-muted levels range from 0 to 31, while the muted levels range from 128 to 159.

Example: 10000011 has

bits (1, 2)- volume level of 3 (out of 31)
bit 8- muting on

BIAMP®

VRAM
Variable Resource Automixer

The VRAM Variable Resource Automixer is a 10-in / 2-out programmable automatic mixer, which is completely user tamper proof, providing no external controls. All mixer parameters are under microprocessor control, and are easily programmed via Windows® 95/98/NT/2000/XP software. The VRAM is extremely versatile, with an extensive set of features, and is designed to adapt to a variety of applications. A second model, VRAMeq, includes 3-band channel equalization, with variable mid-frequency. The VRAM is covered by a 5-year warranty.

FEATURES

- 8 balanced mic/line inputs on plug-in barrier connectors
- 2 balanced auxiliary line inputs on plug-in barrier connectors
- balanced main & aux outputs on plug-in barrier connectors
- phantom power, trim, HPF, level, & gating on channels 1~8
- model VRAMeq includes 3-band, variable-mid, channel EQ
- aux line inputs include mix-minus & teleconferencing mode
- independent mixing to main & aux outputs (pre/post gate)
- direct outputs from channels (programmable pre/post gate)
- eight logic outputs (prgrammable timing & pre/post gate)
- eight logic inputs (programmable for remote switch control)
- sixteen non-volatile memory presets store all mixer settings
- NOM attenuation, last/default mic, & hold time selectable
- selectable channel-off gating attenuation (-10db to -80dB)
- expansion in & out for linking of units for more mixer inputs
- controls & indicators provided by software graphic interface
- software peak & level meters - front panel active indicators
- software for Windows® 95/98/NT/2000/XP & cable included
- remote control via RS-232 & programmable logic inputs
- incorporates **AES** recommended grounding practices
- **CE** marked and **UL** / **C-UL** listed power source
- covered by Biamp Systems' five-year warranty

ARCHITECTS & ENGINEERS SPECIFICATION

The programmable automatic mixer shall provide 8 balanced mic/line inputs, 2 balanced auxiliary line inputs, a balanced main output, & a balanced auxiliary output, all on plug-in barrier strip connectors. Mic/line inputs shall include 36V phantom power, trim, high-pass filter, level & selectable gating to both outputs. Each mic/line input shall also include a direct output, with selectable gating. A special model shall include 3-band channel equalization, with variable mid frequency. Aux line inputs shall include pad, level, mix-minus, & teleconferencing mode. All inputs shall mix to main & aux outs independently.

Automatic mixing functions, such as NOM attenuation, last mic, default mic, hold time, & channel-off attenuation shall be selectable. Timing & gating of 8 logic outputs shall be selectable, for control of external circuits. Mixer control via 8 logic inputs shall be programmable, for remote contact-closures. Non-volatile memory shall store/recall all mixer settings in as many as 16 presets. Expansion ports shall link multiple units, for increased input capability.

The mixer shall be tamper proof, providing no manual controls. Channel status indicators & a power switch shall be provided on the front panel. Rear panel serial & link ports shall be provided for RS-232 control. Windows® 95/98/NT/2000/XP software & a serial cable shall be provided, for programming all mixer parameters. Mixer controls, options, indicators, & metering shall appear as part of the software graphic interface. Remote control shall be via RS-232 and/or programmable logic inputs.

Frequency response shall be +0/-0.3dB (20Hz~20kHz @ +4dBu). THD+N shall be less than 0.03% (20Hz~20kHz @ +4dBu). Equivalent Input Noise shall be -126dBu (20Hz~20kHz). Power consumption shall be less than 27 Watts. Dimensions shall be 1.75 inches (1 rack space) high, 19 inches wide, and 11 inches deep. Weight shall be 10 lbs. Warranty coverage shall be 5 years. The unit shall be CE marked, include a UL / C-UL listed power source, and incorporate AES recommended grounding practices.

The programmable automatic mixer shall be a BIAMP VRAM.

The channel equalization model shall be a BIAMP VRAMeq.

Biamp Systems, 10074 S.W. Arctic Drive, Beaverton, Oregon 97005 U.S.A. (503) 641-7287 www.biamp.com

an affiliate of Rauland-Borg Corp.

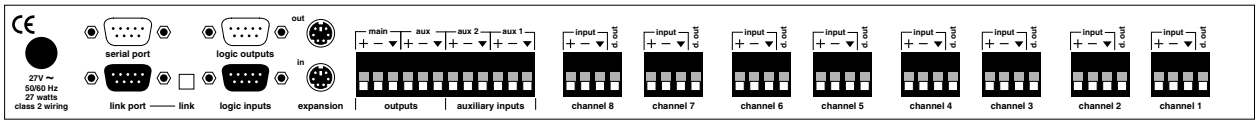
BIAMP®

VRAM SPECIFICATIONS

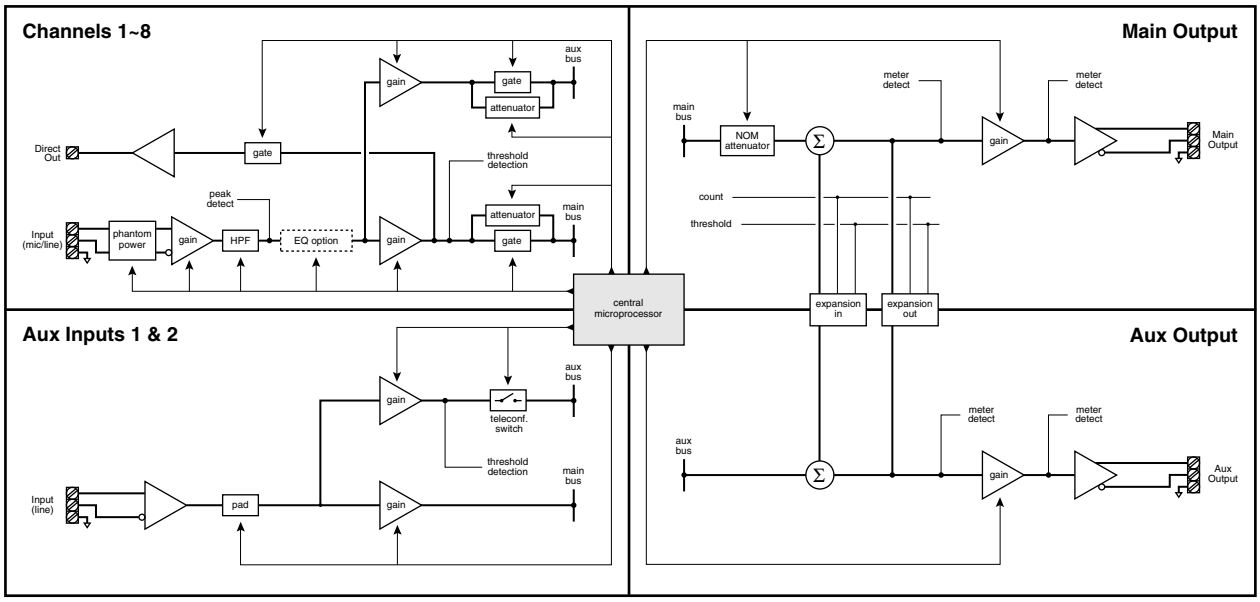
Frequency Response (20Hz~20kHz @ +4dBu):	+0/-0.3dB
THD+N (20Hz~20kHz @ +4dBu):	< 0.03%
Equivalent Input Noise (20Hz~20kHz, 60dB gain, 150 ohm):	-126dBu
Output Noise (20Hz~20kHz, main & 1 channel @ nominal):	< -83dBu
Maximum Gain:	
mic/line inputs to main & aux outputs	85dB
aux line inputs to main & aux outputs	28dB
Crosstalk (channel-to-channel @ 1kHz):	< -95dB
Output Impedance:	
main & aux outputs (balanced)	200 ohms
channel direct outputs (unbalanced)	560 ohms
Input Impedance:	
mic/line inputs (balanced)	6.6k ohms
aux line inputs (balanced)	20k ohms
Maximum Output:	
main & aux outputs (balanced)	+24dBu
Maximum Inputs:	
mic/line & aux line inputs (balanced)	+24dBu

Phantom Power:	+36VDC (7mA/channel)
Input Gain Range:	
mic/line inputs (variable trim)	-6dB ~ +63dB
aux line inputs (selectable pad)	-6dB or +6dB
Channel Equalization (model VRAMeq):	
low-frequency (shelving)	±9dB @ 100Hz
mid-frequency (variable peaking)	±9dB @ 220Hz~3.6kHz
high-frequency (shelving)	±9dB @ 3.3kHz
High-Pass Filter:	6dB/octave @ 110Hz
Automixing:	
gate attack time (signal dependent)	4mS (minimum)
release time (variable)	200mS ~ 2 Seconds
channel-off attenuation (variable)	-10dB ~ -80dB
NOM attenuation (doubling of active inputs)	-3dB
Feedback/Noise Improvement (8 channels)	9dB
Power Consumption (115/230VAC 50/60Hz):	< 27 watts
Dimensions (HxWxD):	1.75"x19"x11" (44x483x279mm)
Weight:	< 10 lbs. (4.55kg)

VRAM REAR PANEL DIAGRAM



VRAM BLOCK DIAGRAM



BIAMP®

VRAM
Variable Resource Automixer

Operation Manual

Biamp Systems, 10074 S.W. Arctic Drive, Beaverton, Oregon 97005 U.S.A. (503) 641-7287 www.biamp.com
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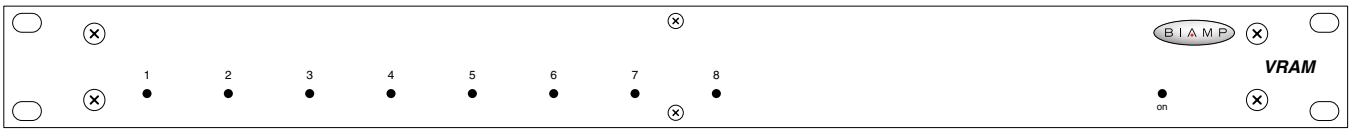
INTRODUCTION

The **VRAM** Variable Resource Automixer is a 10-in / 2-out programmable automatic mixer, which is completely user tamper proof, providing no external controls. All mixer parameters are under microprocessor control, and are easily programmed via Windows® software. The VRAM is extremely versatile, with an extensive set of features, and is designed to adapt to a variety of applications. A second model, **VRAMeq**, includes 3-band channel equalization, with variable mid-frequency. The VRAM is covered by a five-year warranty.

VRAM features include:

- 8 balanced mic/line inputs on plug-in barrier strip connectors
- 2 balanced auxiliary line inputs on plug-in barrier connectors
- balanced main & aux outputs on plug-in barrier connectors
- phantom power, trim, HPF, level, & gating on channels 1~8
- model **VRAMeq** includes 3-band, variable-mid, channel EQ
- aux line inputs include mix-minus & teleconferencing mode
- independent mixing to main & aux outputs (pre/post gate)
- direct outputs from channels (programmable pre/post gate)
- eight logic outputs (programmable timing & pre/post gate)
- eight logic inputs (programmable for remote switch control)
- sixteen non-volatile memory presets store all mixer settings
- NOM attenuation, last mic, default mic, & hold time selectable
- selectable channel-off gating attenuation (-10dB to -80dB)
- expansion in & out for linking of units for more mixer inputs
- controls & indicators provided by software graphic interface
- software peak & level meters - front panel active indicators
- Windows® 95/98/NT/2000/XP software & cable included
- remote control via RS-232 & programmable logic inputs
- incorporates **AES** recommended grounding practices
- CE marked and **UL** / **C-UL** listed power source
- covered by Biamp Systems' five-year warranty

FRONT & REAR PANEL FEATURES



FRONT PANEL FEATURES

Channel Gate Indicators: These red LEDs normally indicate when Channels 1~8 are active to Main Out ('on' or 'auto' gating). ***NOTE:*** *When a channel is assigned as 'off' to Main Out, but is assigned as 'auto' to Aux Out, this indicator will light when the channel is active (gated on) to Aux Out (see Setup on pg. 5).*

On Indicator: When AC power is applied to the VRAM, this red LED will light indicating power to the mixer is On. When power is removed, all 'current mix' settings (levels, assignments, etc.) will be stored in non-volatile memory and recalled when power is restored. ***NOTE:*** *During setup the VRAM may instead be set to recall a special preset whenever power is turned on (see Setup on pg. 9).*

REAR PANEL FEATURES

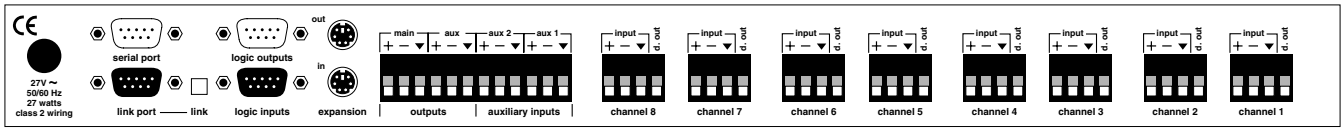
AC Power Cord: The power transformer provides 27 Volts AC to the VRAM, and is detachable via a 5-pin DIN connector. The VRAM has two internal 'self-resetting' fuses (there are no user serviceable parts inside the unit). If the internal fuses blow, they will attempt to re-set after a short period. However, this may be an indication that the VRAM requires service.

Serial Port: This 9-pin Sub-D (male) connector provides an RS-232 Serial Port for remote control via computer or third-party controllers (see RS-232 Control on pg. 14). The Serial Port has the following pin assignments (left-to-right & top-to-bottom): **Pin 1)** not used; **Pin 2)** Receive Data (RxD) input; **Pin 3)** Transmit Data (TxD) output; **Pin 4)** Data Terminal Ready (DTR) output; **Pin 5)** Ground; **Pin 6)** not used; **Pin 7)** Request To Send (RTS) output; **Pin 8)** not used; **Pin 9)** not used. BiampWin software and a null-modem cable are provided for programming (see Setup on pg. 4). ***NOTE:*** *The Serial Port can also transmit commands received via the Logic Inputs (see Setup on pg. 8).*

Link Port: This 9-pin Sub-D (female) connector provides a Link Port for RS-232 control of multiple BIAMP products (see RS-232 Control on pg. 14). The Link Port of one device simply connects to the Serial Port of the next device (and so forth). Link cables are available as an option (Biamp #909-0057-00). ***NOTE:*** *All but the final device in a system should have the Link Switch pressed in (see below).* The Link Port has the following pin assignments (right-to-left & top-to-bottom): **Pin 1)** not used; **Pin 2)** Transmit Data (TxD) output; **Pin 3)** Receive Data (RxD) input; **Pin 4)** not used; **Pin 5)** Ground; **Pin 6)** not used; **Pin 7)** not used; **Pin 8)** not used; **Pin 9)** not used. ***NOTE:*** *The Link Port will also transmit commands received via the Logic Inputs (see Setup on pg. 8).*

Link Switch: The Link Switch is used when connecting multiple devices in a 'Link Port to Serial Port' configuration (see Link Port above). From the factory, the Link Switch is released (out). When connecting multiple devices, the Link Switch must be depressed (in) on all devices except the final device in the system (the device with no Link Port connection).

FRONT & REAR PANEL FEATURES



Logic Outputs: This 9-pin Sub-D connector provides Logic Outputs from Channels 1~8 (see Logic Outputs on pg. 12). If a channel is assigned as 'auto' to either Main Out or Aux Out, the corresponding Logic Output will turn on whenever the channel is gated on. Logic Outputs may be used to control external switching circuits, such as relays or other BIAMP products. These outputs are typically used to turn off speakers or select cameras when certain microphones are active. ***NOTE:*** *Individual Logic Outputs may be turned on/off via software or remote control. However, this temporarily defeats their ability to follow the active channel, until again assigned to 'follow gate' (see Setup on pg. 5).*

Logic Inputs: This 9-pin Sub-D (female) connector provides eight logic inputs for controlling the VRAM via contact-closures (see Logic Inputs on pg. 10). Logic Inputs are programmed using the BiampWin software and serial cable provided with the VRAM (see Setup on pg. 8). ***NOTE:*** *From the factory, Logic Inputs 1~8 have no pre-programmed function.*

Expansion In & Out: These 6-pin mini-DIN connectors are for linking multiple mixers, to increase the number of input channels. A 6-pin mini-DIN cable is provided with each mixer. To link mixers, simply connect the cable from the Expansion Out jack of one mixer to the Expansion In jack of the next mixer (and so forth). The final mixer in the system (with no Expansion Out jack connection) becomes the 'master'. The 'master' collects audio signals & control data from the other mixers, which become 'slaves'. Main Out & Aux Out signals, plus NOM attenuation, for the combined system are provided by the 'master'. The outputs from 'slave' mixers provide only signals from their own inputs, plus those of any 'slave' mixers connected to them via Expansion In.

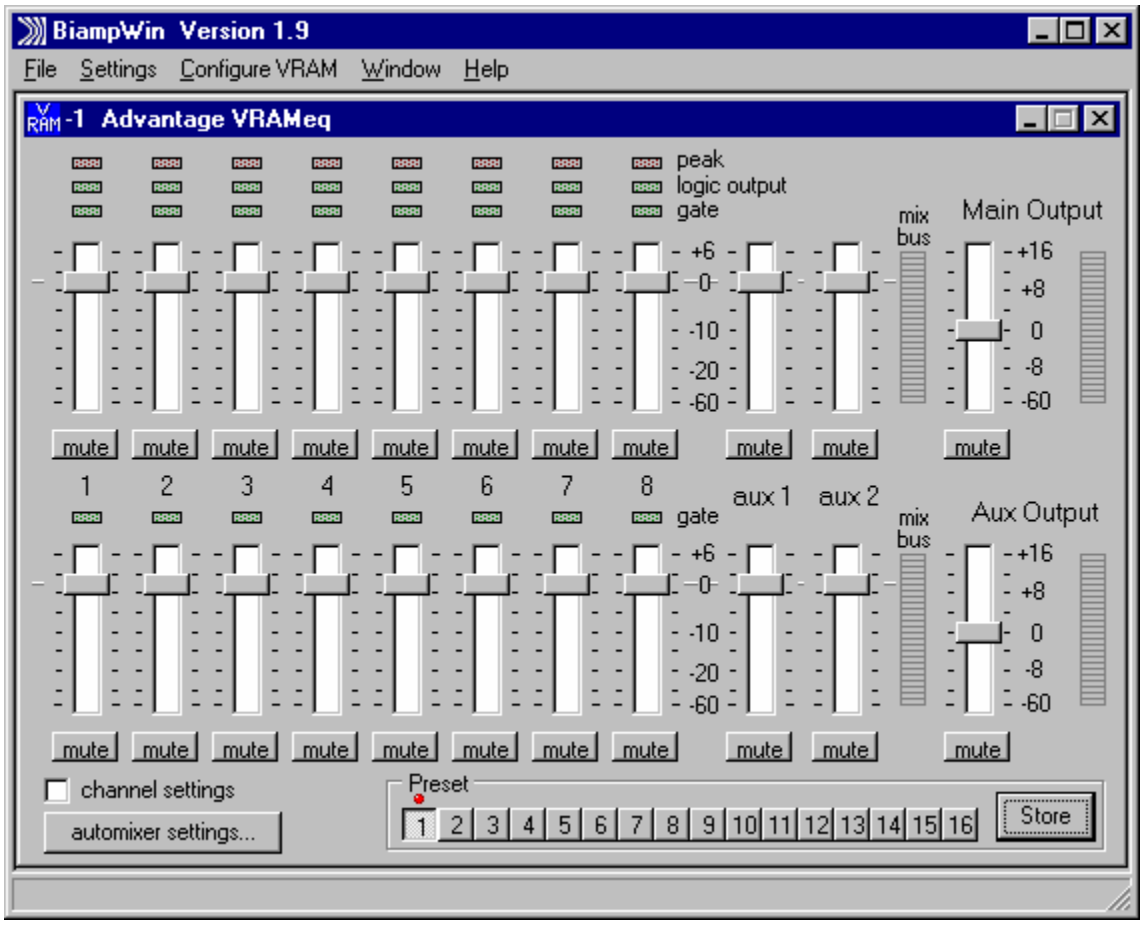
Main Out: This plug-in barrier strip provides the balanced Main Out from the VRAM. For balanced output, wire high to (+), low to (-), and ground to (▼). For unbalanced output, wire high to (+) and ground to (▼), leaving (-) unconnected. Signal level will be reduced by 6dB when outputs are unbalanced.

Aux Out: This plug-in barrier strip provides the balanced Aux Out from the VRAM. For balanced output, wire high to (+), low to (-), and ground to (▼). For unbalanced output, wire high to (+) and ground to (▼), leaving (-) unconnected. Signal level will be reduced by 6dB when outputs are unbalanced.

Aux 1 & Aux 2 Inputs: These plug-in barrier strips provide the balanced auxiliary line inputs to the VRAM. For balanced input, wire high to (+), low to (-), and ground to (▼). For unbalanced input, wire high to (+) and ground to both (-) & (▼).

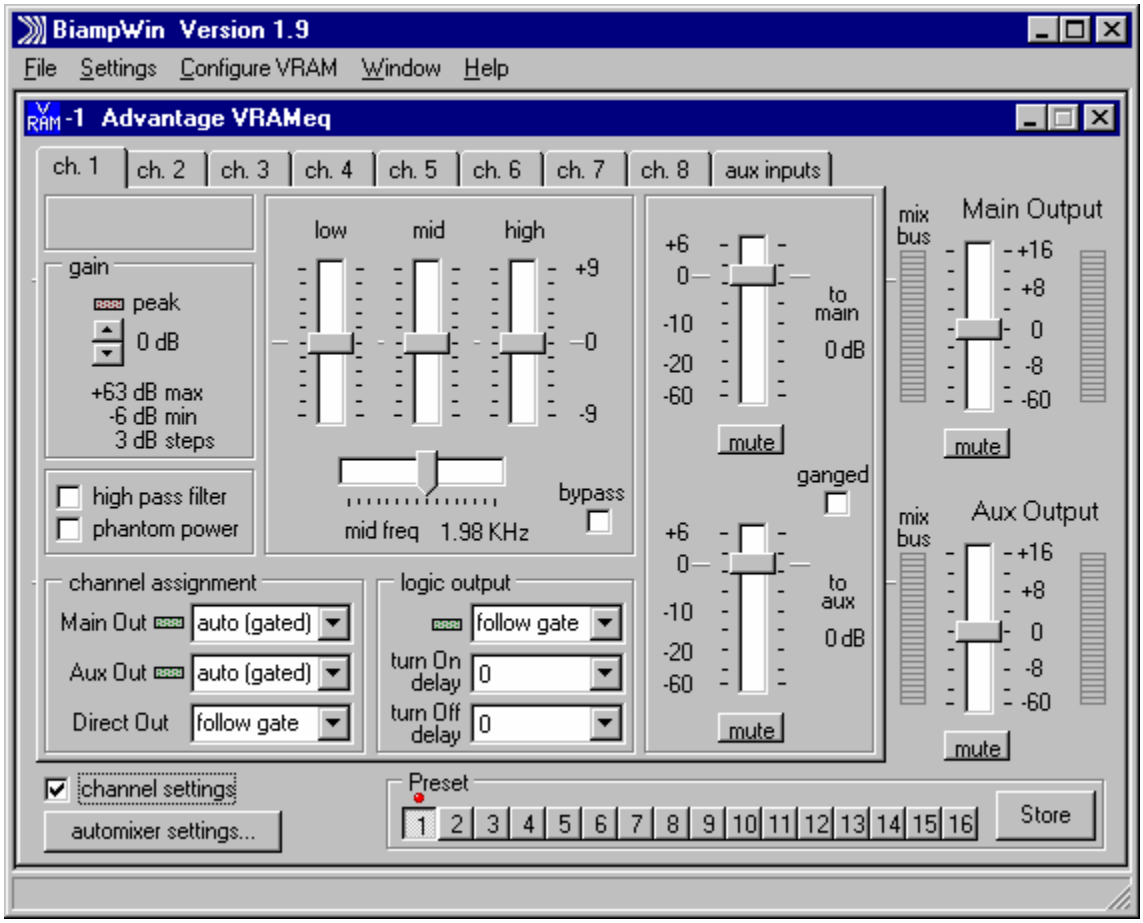
Channel Input & Direct Output: These plug-in barrier strips provide the balanced mic/line input to the respective channels. For balanced input, wire high to (+), low to (-), and ground to (▼). For unbalanced input, wire high to (+) and ground to both (-) & (▼). Unbalanced Direct Outputs are also available from the channels using (d out) & (▼). ***NOTE:*** *Inputs & Direct Outputs can be assigned for 'auto' (gated) or on/off operation (see Setup on pg. 5).*

VRAM & VRAMeq parameters are all adjustable using the 'BiampWin' software and null-modem cable provided with the unit. BiampWin software provides programs for various BIAMP products, including the VRAM(eq). The VRAM program includes seven control screens, which are described on the following pages. Once the software is started (and Comm Port Configuration is set), the control screens are accessed via the drop-down menus at the top of the opening screen. The Mix screen appears whenever a VRAM file is opened. Channel Settings, Automixer Settings, Button Definitions, Logic Input Definitions, Logic Output Polarity, & Configuration Options screens are then available from the Configure VRAM menu. The File menu provides functions such as save, open, download, etc. The Settings menu recalls the Comm Port Configuration screen. The Window menu arranges the active product screens. The Help menu explains the available adjustments. To install BiampWin software: Select 'Run' from 'Start' menu, and browse to 'BiampWin' on appropriate drive. System Requirements: Windows® 95/98/NT/2000/XP with 8MB of available hard disk space (serial port required for 'on-line' operation).



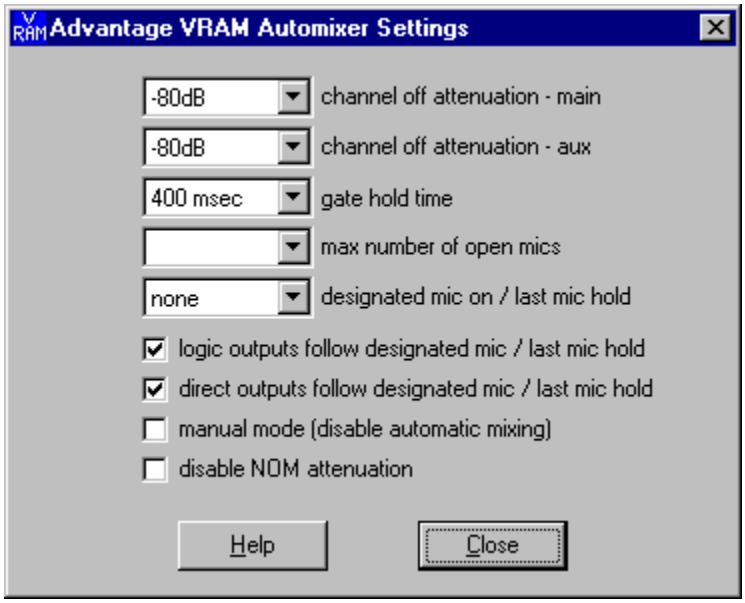
MIX SCREEN

The Mix Screen is used to adjust VRAM input/output levels, as well as to store/recall sixteen memory presets. All VRAM inputs may be adjusted to each output independently. Each output is also independently adjusted. Adjustments are made with the computer mouse (or keyboard). Input & output levels are adjusted by dragging the corresponding 'faders' up or down. Mute buttons turn off the respective input/output signals, without changing the channel assignments (see next page). Mix Bus meters display 'pre-fader' signal levels for the respective outputs. Main Output & Aux Output meters display 'post-fader' signal levels for the respective outputs. ***NOTE:*** *For best performance, adjust faders so the meters show occasional peaks in the yellow area, but never to the top (red).* Peak indicators should flash only on occasional peaks in signal level, as determined by input gain adjustments (see pg. 5). Logic Outputs indicators will light whenever the respective Logic Outputs are on (see pg. 5). Gate indicators will light whenever channels are active to the corresponding outputs (see pg. 5). Channel Settings selects a screen for adjusting individual input parameters (see pg. 5). Automixer Settings selects a screen for adjusting automatic mixing functions, which affect the entire mixer (see pg. 6). Preset buttons recall the corresponding presets from non-volatile memory. Presets must first be created & stored by the user (no factory presets). The Store button opens a menu for storing current settings in any of the Presets 1~16. Each preset includes settings from the Mix screen, as well as from the Channel Settings & Automixer Settings screens (see pgs. 5 & 6). The title bar across the top of the Main screen will indicate the Device #, the custom Device Name, and the model of product being controlled. BiampWin software can operate 'off-line' (with no product connected) by opening a 'new' file for the desired product. The Device # for 'off-line' files is assigned sequentially as a negative number.



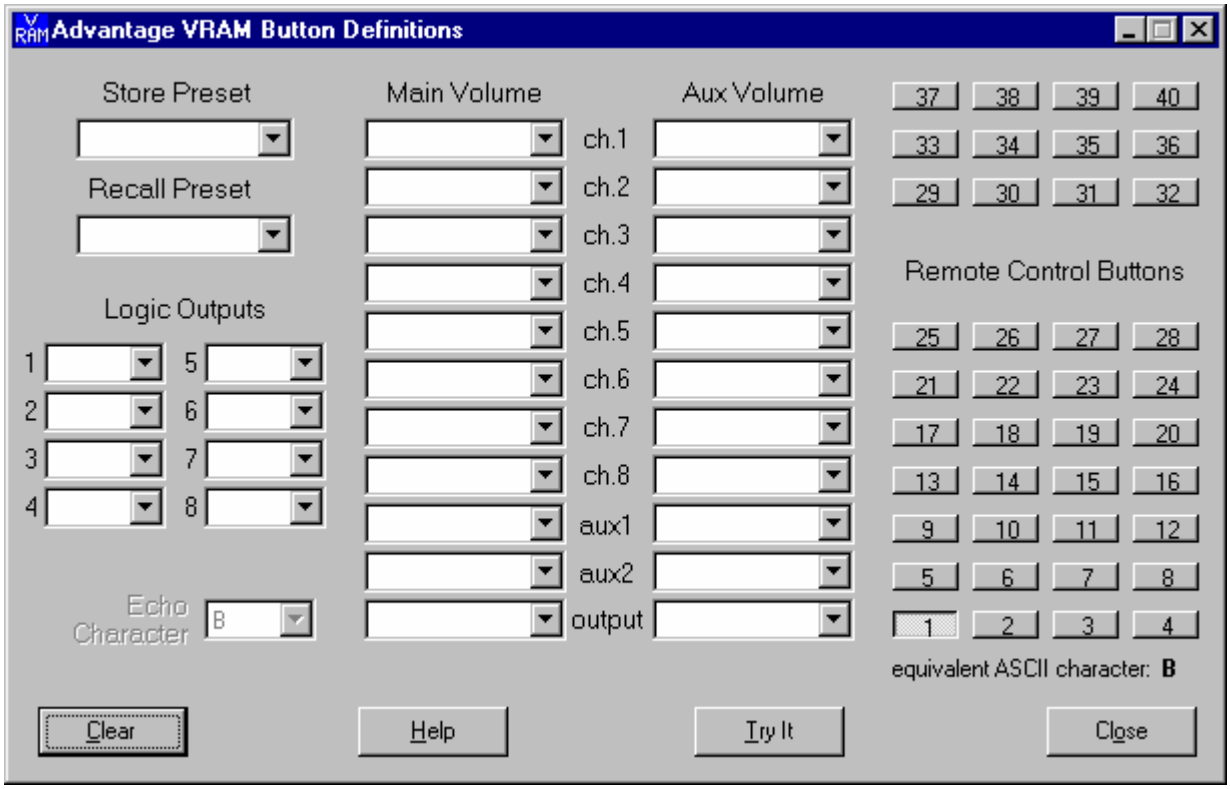
CHANNEL SETTINGS SCREEN

The Channel Settings screen appears as an overlay of the Mix screen, and is used to adjust individual input parameters. It is accessed via the Configure VRAM menu, or from the Mix screen. Individual tabs are provided for Channels 1~8 and the Aux Inputs. Right-clicking the blank area at the upper-left of a tab allows that input to be given a custom name. Gain adjusts the input to compensate for different signal levels. Set Gain so the Peak indicator flashes only on occasional peaks in signal level. High Pass Filter reduces low frequencies signals 6dB/octave @ 110Hz. Phantom Power turns on +36V power for condenser mics. Low, Mid, & High *(model VRAMeq only)* provide 3-band input equalization, with variable mid frequency & bypass. Faders & Mute provide the same functions as on the Mix screen, except that Main & Aux faders may be Ganged for combined control. Channel Assignment allows the input to be assigned as 'on', 'off', or 'auto' to Main Out & Aux Out independently. ***NOTE:*** *'Auto' means automatic gating (signal activated). 'On' means not gated (always active). 'Off' means unassigned (never active).* Direct Out provides 'on', 'off', or 'follow gate' assignment. ***NOTE:*** *'Follow gate' means to turn on & off simultaneously with any channel gating (to Main Out or Aux Out).* Logic Output provides the same 'on', 'off', or 'follow gate' assignment. Turn On Delay selects the timing between when a channel becomes active (gate on) and when the corresponding Logic Output turns on. Turn Off Delay selects the timing between when a channel becomes inactive (gate off) and when the corresponding Logic Output turns off. ***NOTE:*** *Logic Output delay times are typically used for proper timing in applications where camera switching circuits are being controlled.* The Aux Inputs tab provides two Gain settings (+6dB & -6dB), and faders for Main Out & Aux Out. Each of the Aux Inputs may be given a custom name. Aux 1 includes a Teleconference Mode, which defeats the Aux Out fader (mix-minus), and enables a Threshold fader (Adaptive Threshold Sensing). In this mode Aux 1 provides the teleconference input, and Aux Out provides the teleconference output. ***NOTE:*** *Automixer Settings, Presets, & output faders (on the Mix screen) are still available while using the Channel Settings screen.*



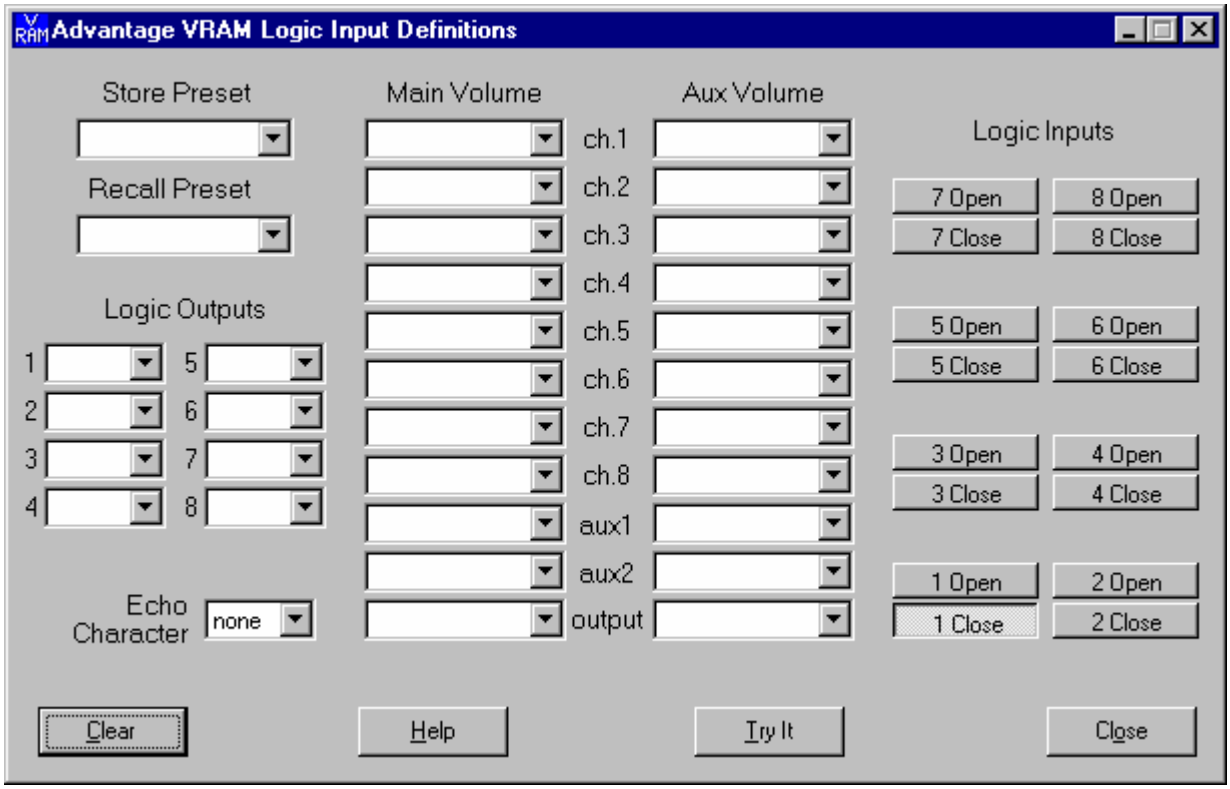
AUTOMIXER SETTINGS SCREEN

The Automixer Settings screen is used to adjust automatic mixing functions, which affect the entire mixer. It is accessed via the Configure VRAM menu, or from the Mix screen. Channel Off Attenuation selects the amount of attenuation applied to 'auto' channels when they are inactive (gated off). ***NOTE:*** *Channel Off Attenuation is set separately for Main Out & Aux Out.* Gate Hold Time selects the length of time that 'auto' channels will remain active (gated on) once signal is no longer present. Max Number of Open Mics limits the quantity of 'auto' channels which can be active (gated on) to Main Out at the same time. Designated Mic On / Last Mic Hold selects the most recently active 'auto' channel to remain active (gated on), or a specified channel to become active (gated on), whenever signals are no longer present. Logic Outputs Follow Designated Mic / Last Mic Hold causes logic outputs to turn on when corresponding channels are activated (gated on) due to their assignment as Designated Mic On or Last Mic On. Direct Outputs Follow Designated Mic / Last Mic Hold causes direct outputs to turn on when corresponding channels are activated (gated on) due to their assignment as Designated Mic On or Last Mic On. ***NOTE:*** *If Logic Outputs or Direct Outputs are not assigned to follow Designated Mic / Last Mic Hold, they will still follow normal gating activity of the channels, but will not hold without signal (as Last Mic Hold) and will not turn on without signal (as Designated Mic On).* Manual Mode defeats the channel gating functions, turning all channels on to Main Out & Aux Out (except for channels specifically assigned as 'off'). Disable NOM Attenuation defeats the typical attenuation (3dB for each doubling of active 'auto' channels) which occurs at Main Out. Help provides additional instruction. Close will close the Automixer Settings screen.



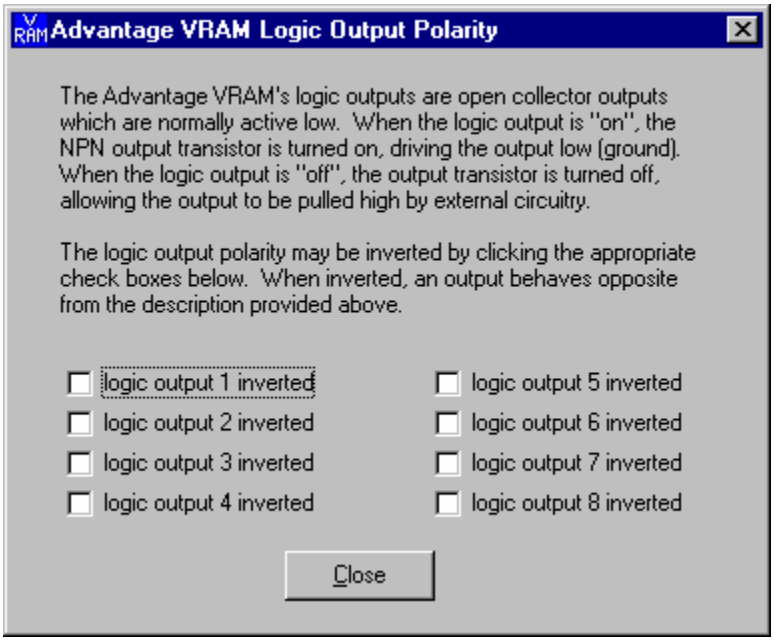
BUTTON DEFINITIONS SCREEN

The Button Definitions screen is used to assign specific 'actions' to remote control buttons. Although the VRAM does not accept commands from push-button remote controls directly, it can receive individual ASCII characters (via RS-232) from other BIAMP products and/or third-party control systems. From the factory, Remote Control Buttons have equivalent ASCII characters permanently assigned to them (see RS-232 Control on pg. 14). Therefore, a Remote Control Button can be assigned specific 'actions', which the VRAM will then perform whenever the equivalent ASCII character for that button is received. From the factory, Remote Control Buttons have no pre-programmed functions. However, using the Button Definitions screen, each Remote Control Button may be assigned various 'actions'. Remote Control Buttons select which button is to be defined. Equivalent ASCII Character displays the permanent ASCII character for the selected button. Store Preset allows store actions for Presets 1~16 to be assigned to the selected button. Recall Preset allows recall actions for Presets 1~16 to be assigned to the selected button. Logic Outputs allows 'on', 'off', & 'toggle' actions for Logic Outputs 1~8 to be assigned to the selected button. ***NOTE:*** *Turning a Logic Output on/off will temporarily defeat its ability to follow channel gating activity, until again assigned to 'follow gate' (see pg. 5).* Echo Character displays the 'echo' character for the selected button. ***NOTE:*** *Echo Characters are permanent for Remote Control Buttons, and can only be changed for Logic Input control (see next page).* Main Volume & Aux Volume allow specific volume & muting actions for Channels 1~8, Aux 1 & 2, Main Out, & Aux Out to be assigned to the selected button. Clear allows all actions assigned to the selected button (or all buttons) to be cleared. Try It causes the actions currently assigned to the selected button to be performed by the VRAM. Help provides additional instruction. Close will close the Button Definitions screen.



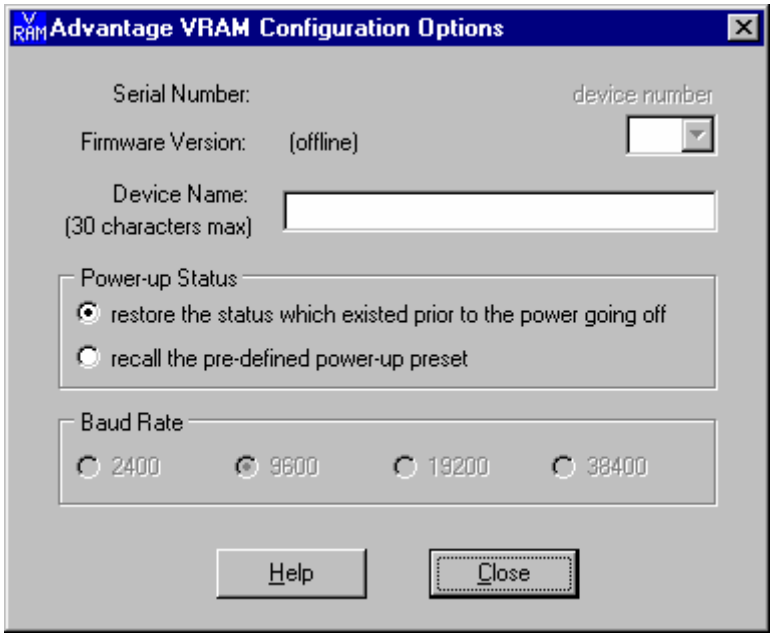
LOGIC INPUT DEFINITIONS SCREEN

The Logic Input Definitions screen is used to assign specific 'actions' to the Logic Inputs (and remote control buttons). Logic Inputs allow remote control of the VRAM via external circuits, such as switches, contact-closures, active driver circuits, and/or 'open-collector' logic outputs (see Logic Inputs on pg. 10). From the factory, Logic Inputs 1~8 have no pre-programmed functions. However, using the Logic Input Definitions screen, each Logic Input may be assigned various 'actions'. Logic Inputs select which Logic Input is to be defined. ***NOTE:*** *Since Logic Inputs are controlled by switches, contact-closures, etc., each Logic Input may be assigned certain actions to perform when the switch is 'opened', and different actions to perform when that same switch is 'closed'.* Store Preset allows store actions for Presets 1~16 to be assigned to the selected Logic Input. Recall Preset allows recall actions for Presets 1~16 to be assigned to the selected Logic Input. Logic Outputs allows 'on', 'off', & 'toggle' actions for Logic Outputs 1~8 to be assigned to the selected Logic Input. ***NOTE:*** *Turning a Logic Output on/off will temporarily defeat its ability to follow channel gating activity, until again assigned to 'follow gate' (see pg. 5).* Echo Character allows the 'echo' character for the selected Logic Input to be changed. ***NOTE****: This is the RS-232 ASCII character which will be transmitted via the Serial Port whenever that Logic Input is switched. From the factory, no echo characters are assigned to Logic Inputs 1~8. Changing the Echo Character is used primarily for customizing remote control commands amongst various RS-232 controlled products within a system (see RS-232 Control on pg. 14).* Main Volume & Aux Volume allow specific volume & muting actions for Channels 1~8, Aux 1 & 2, Main Out, & Aux Out to be assigned to the selected Logic Input. ***NOTE:*** *Although Logic Inputs volume actions include a 'repeating' (volume ramp) function, they will not continuously repeat the echo character via RS-232.* Clear allows all actions assigned to the selected Logic Input (or all Logic Inputs) to be cleared. Try It causes the actions currently assigned to the selected Logic Input to be performed by the VRAM. Help provides additional instruction. Close will close the Button Definitions screen.



LOGIC OUTPUT POLARITY SCREEN

Normally, when a Logic Output turns 'on' it provides a DC path to ground, which is then used to control 'active-low' type circuits. The Logic Outputs Polarity screen simply allows this operation of the individual Logic Outputs to be reversed, for driving 'active-high' type circuits.



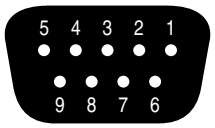
CONFIGURATION OPTIONS SCREEN

The Configuration Options screen is used to select options which customize the operation of the VRAM. At the top of the Configuration Options screen, the Serial Number and Firmware Version of the VRAM will be displayed. BiampWin software can operate 'off-line' (with no product connected) by opening a 'new' file for the desired product. The Serial Number and Firmware Version are not displayed for 'new' ('off-line') files. Device Number allows a device number (0~63) to be assigned to the currently active VRAM. This allows multiple VRAM (or other BIAMP programmable products) to be individually controlled when linked together. Unique device numbers must be assigned to each device before the devices are linked together. Device Name allows a custom name to be given to the particular VRAM, by entering up to 30 characters of text. The Device Name will be stored in the VRAM memory, and will be displayed on the title bar of the Main screen whenever that VRAM is accessed with the software. Power-up Status provides a choice of settings to be recalled from non-volatile memory each time the VRAM is powered up When 'pre-defined power-up preset' is selected, the associated store & recall preset options are then made available on the Mix screen, via the Store button menu. Baud Rate determines the speed of data transfer for the software, as well as for any products currently connected which support this function. Help provides additional instruction. Close will close the Configuration Options screen.

LOGIC INPUTS

Eight Logic Inputs are available on a rear panel 9-pin Sub-D (female) connector. Logic Inputs allow remote control of the VRAM via external circuits, such as switches, contact-closures, active driver circuits, and/or 'open-collector' logic outputs. From the factory, Logic Inputs 1~8 have no pre-programmed function. However, each Logic Input may be assigned different 'actions' using the BiampWin software and null-modem cable provided with the VRAM (see Setup on pg. 8). Since Logic Inputs are controlled by switches, contact-closures, etc., each Logic Input may be assigned two functions (one for switch 'closed' and one for switch 'open').

Logic Inputs have the following pin assignments (right-to-left & top-to-bottom**): Pins 1~8)** Logic Inputs 1~8; **Pin 9)** Ground.



logic inputs

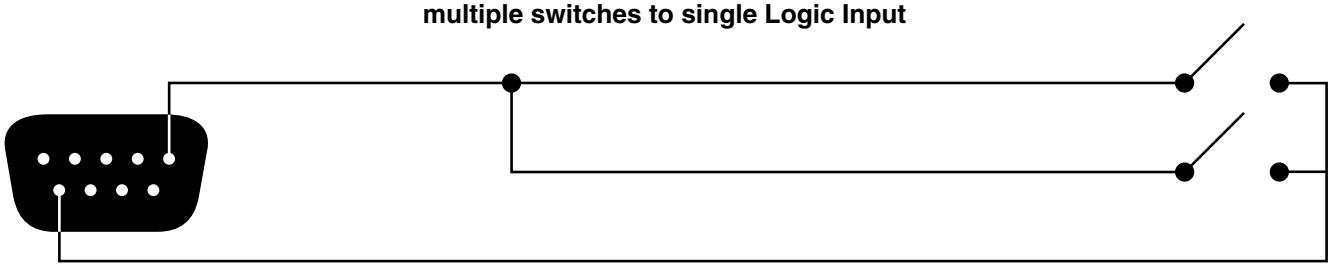
pin #1 = Logic Input 1
pin #2 = Logic Input 2
pin #3 = Logic Input 3
pin #4 = Logic Input 4
pin #5 = Logic Input 5
pin #6 = Logic Input 6
pin #7 = Logic Input 7
pin #8 = Logic Input 8
pin #9 = ground

When nothing is connected to a Logic Input, an internal pull-up resistor keeps it at a 'high' idle state (+5.0 VDC). The Logic Input is activated when its input goes 'low' (less than +0.8 VDC), and is de-activated when its input goes 'high' (greater than +2.4 VDC). A Logic Input is controlled in one of three ways: 1) Use an NPN style 'open-collector' logic output from an external device (such as another BIAMP product) to short the Logic Input to ground. 2) Use a switch, relay, or other contact-closure (such as from a third-party controller) to short the Logic Input to ground. 3) Use an active TTL output driver circuit (such as from a third-party controller) to actively drive the Logic Input to a 'high' or 'low' state.

LOGIC INPUTS

Multiple contact-closures or 'open-collector' logic outputs may be wired in parallel to a single Logic Input (see diagram below). Logic Outputs and contact-closures should be rated for at least 5 Volts / 1mA operation. Low-current / dry-contact closures are recommended for reliability. Active output driver circuits should not exceed a signal range of 0~5 Volts DC, and should have a minimum pulse width of 100 milli-seconds. Logic Input impedances are approximately 10k ohms.

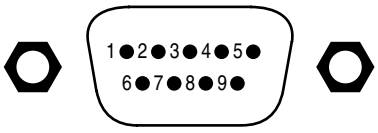
multiple switches to single Logic Input



LOGIC OUTPUTS

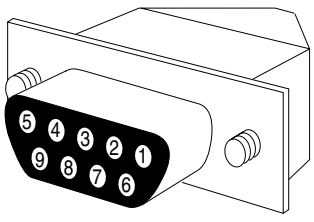
The VRAM provides eight logic outputs on a rear panel 9-pin Subminiature D (male) connector. Logic Outputs can be used to control external switching circuits (such as relays) for speakers, cameras, indicators, etc. The VRAM Logic Outputs are most often used, in conjunction with external relays, to turn off specific speakers when nearby microphones are active (reducing feedback problems). For example, if a speaker is located directly above microphone #1, the Logic Output for Channel 1 of the VRAM can be used to turn off that speaker relay when microphone #1 is active (see diagram on next page). The Logic Outputs can also be combined (wired in parallel) to control a single circuit. For example, a speaker relay could be turned off when either microphone #1 or microphone #2 is active. In addition to speaker relays, the VRAM Logic Outputs may be used to control external indicator lights (see diagram on next page). Another common application for Logic Outputs is to control video cameras. Different cameras could be activated depending upon which microphone (or group of microphones) is currently active. Cameras can be selected (using a video switcher such as a VSX41) and/or camera presets may be triggered (using a 'pan/tilt/zoom' camera system). The VRAM Logic Outputs may also be used in conjunction with the VRAM Logic Inputs to perform such functions as 'automatic priority', which allows a microphone (or group of microphones) to be muted whenever specific 'priority' microphones are active (see diagram on next page). The Logic Output for the 'priority' microphone is wired to a Logic Input which is defined to mute the other microphones (see Setup on pg. 8). A similar approach is useful for 'page-over-music' applications. However, in this case the Logic Outputs from multiple 'paging' microphones are wired to a Logic Input which is defined to mute the music channel. Multi-level priority schemes are also possible, but require the use of multiple Logic Inputs and a diode matrix. These 'priority' applications require that Logic Inputs do not follow Designated Mic On / Last Mic Hold (see Setup on pg. 6). Of course, manual muting of microphones via external switches is also possible (see Logic Inputs on pg. 10).

The VRAM Logic Outputs are 'open collector' outputs. Each Logic Output is an NPN transistor with the collector being the output and the emitter being ground (see diagram on next page). When a Logic Output is turned on, the transistor provides a path for DC current to flow. The Logic Outputs do not provide any voltage or current. They act only as switches (with a common ground return). To activate external relays, an external power supply must be used (see diagram on next page). The Logic Output transistors are rated up to a maximum of 24 VDC and 50 mA per output (24 volt relay coils maximum). However, +12 Volts DC is sufficient power for most applications. When using the Logic Outputs to control relays, protection diodes must be used to suppress high voltage transients that are generated when the relays turn off (see diagram on next page). Any of the 1N4004 family of diodes (1N4001, 1N4002, 1N4003, 1N4004, 1N4005, 1N4006, 1N4007, or equivalent) will provide proper protection. When a Logic Output goes on, the associated relay may be wired to perform on, off, or 'A/B' switching functions. To use logic 'on' to turn on (or activate) a device, wire across the 'normally open' relay contacts, in series with the device (or control voltage source). To use logic 'on' to select between 'A' or 'B' signals (inputs or outputs), wire one signal to the 'normally closed' relay terminal and the other signal to the 'normally open' relay terminal, with the common relay terminal providing the feed (input or output).



logic outputs

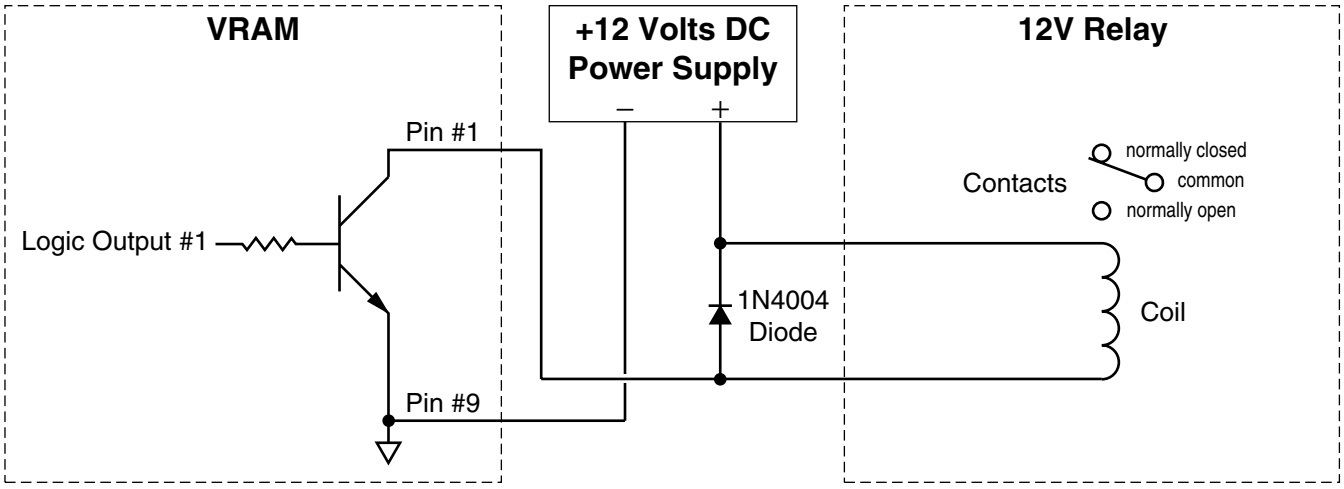
logic out	pin number
channel 1	pin #1
channel 2	pin #2
channel 3	pin #3
channel 4	pin #4
channel 5	pin #5
channel 6	pin #6
channel 7	pin #7
channel 8	pin #8
ground	pin #9



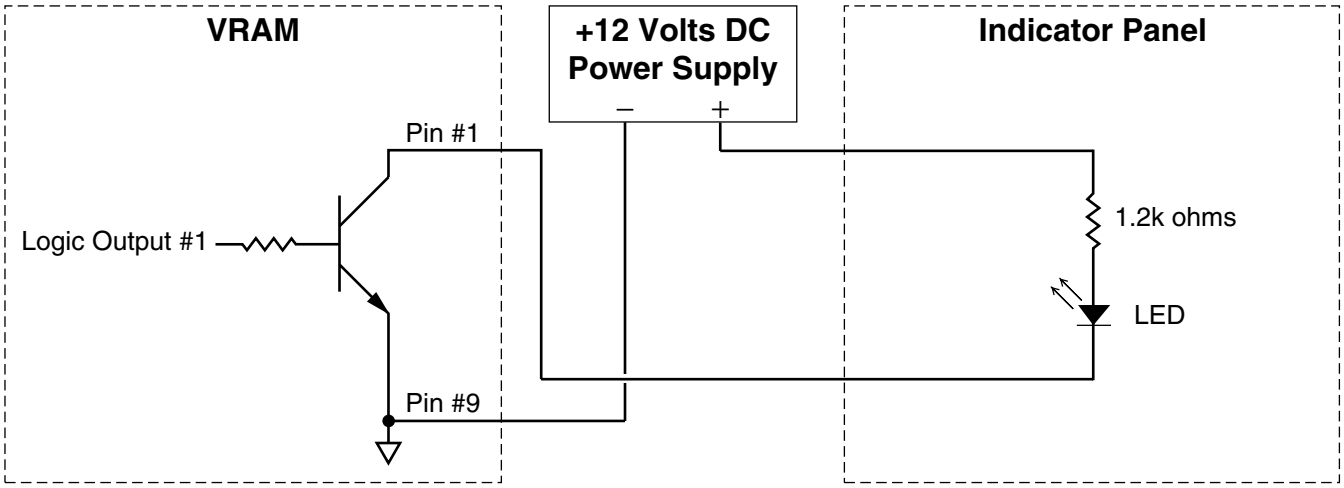
9-pin cable-end

LOGIC OUTPUTS

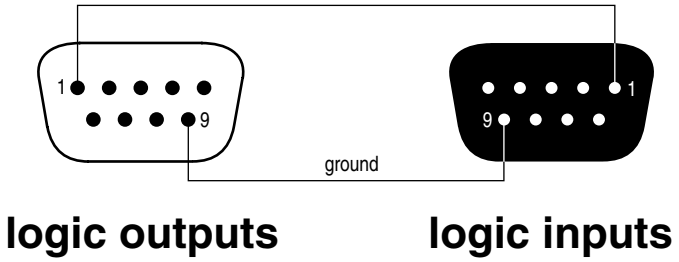
Logic/Relay circuit



Logic Outputs controlling indicators



Channel 1 'automatic priority' over Channels 2~8



RS-232 CONTROL

The VRAM has an RS-232 Serial Port, which allows it to be controlled by a computer (see Front & Rear Panel Features on pg. 2). In addition to the BiampWin software, the VRAM offers two other methods of computer control.

Control Button Emulation: This method allows the computer to imitate the operation of an infrared transmitter or wall-mount control panel. Although the VRAM does not accept infrared or wall-mount remote controls itself, it can still receive ASCII characters (via RS-232) which emulate the buttons on these types of remote controls. From the factory, remote control buttons have equivalent ASCII characters permanently assigned to them (see table below). Therefore, actions can be assigned to remote control buttons in the same way they are assigned to Logic Inputs. Then, using this method, the computer can output ASCII characters which are equivalent to the commands generated by those standard remote control buttons. Control Button Emulation allows the computer to utilize up to forty button definitions (unlike standard remote controls, which have only twenty-eight buttons). When using up to four devices in a system, Control Button Emulation also allows the computer to designate which device or devices should react to each control button command.

Advanced Computer Control: This method provides advanced commands, which allow the computer to retrieve or edit various VRAM settings. The computer may also emulate control buttons. Using this method, the computer may designate up to sixty-four devices, and may also provide 'real-time' display of various settings.

This manual only describes the Control Button Emulation method of computer control. For complete details about using the VRAM with a computer, including Advanced Computer Control, contact Biamp Systems for the manual "Computer Control of the VRAM".

Each control button on an infrared transmitter or wall-mount control panel corresponds to one character in the standard ASCII character set. The character equivalents are summarized in the following table. This table includes all forty possible buttons, their button numbers, their ASCII code equivalents, and their factory default button definitions (no operation assigned).

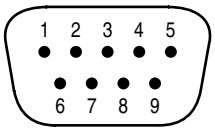
button 01	B	no operation assigned	button 15	P	no operation assigned	button 29	^	no operation assigned
button 02	C	no operation assigned	button 16	Q	no operation assigned	button 30	_	no operation assigned
button 03	D	no operation assigned	button 17	R	no operation assigned	button 31	'	no operation assigned
button 04	E	no operation assigned	button 18	S	no operation assigned	button 32	b	no operation assigned
button 05	F	no operation assigned	button 19	T	no operation assigned	button 33	c	no operation assigned
button 06	G	no operation assigned	button 20	U	no operation assigned	button 34	d	no operation assigned
button 07	H	no operation assigned	button 21	V	no operation assigned	button 35	e	no operation assigned
button 08	I	no operation assigned	button 22	W	no operation assigned	button 36	f	no operation assigned
button 09	J	no operation assigned	button 23	X	no operation assigned	button 37	g	no operation assigned
button 10	K	no operation assigned	button 24	Y	no operation assigned	button 38	h	no operation assigned
button 11	L	no operation assigned	button 25	Z	no operation assigned	button 39	i	no operation assigned
button 12	M	no operation assigned	button 26	[	no operation assigned	button 40	j	no operation assigned
button 13	N	no operation assigned	button 27	\	no operation assigned			
button 14	O	no operation assigned	button 28	]	no operation assigned			

The computer can initiate any functions or actions that a standard control can, by simply transmitting the equivalent control button ASCII character. When interfacing the VRAM to a computer, the computer must be aware that the VRAM will 'echo' all characters it receives (both from computer and Logic Inputs) via the Serial Port Transmit Data (TXD) output signal. However, from the factory, the VRAM Logic inputs are programmed with no 'echo character' assigned to them.

When using Control Button Emulation, up to four BIAMP products may be connected together and addressed individually. When multiple units are used, each unit is assigned a unique "Device #" (see Setup on pg. 9). Normally, all units would react to control button commands. However, a computer can send commands to specific units, by preceding each command with a "device select prefix" character (see table below). Only those units whose Device #s are specified will respond to the command which follows. If a command is not preceded by a device select prefix character, then all units in the system will react to that command.

Select Device 1	l	Select Devices 2 & 3	q	Select Devices 1 & 2 & 4	v
Select Device 2	m	Select Devices 1 & 2 & 3	r	Select Devices 3 & 4	w
Select Devices 1 & 2	n	Select Device 4	s	Select Devices 1 & 3 & 4	x
Select Device 3	o	Select Devices 1 & 4	t	Select Devices 2 & 3 & 4	y
Select Devices 1 & 3	p	Select Devices 2 & 4	u	Select Devices 1 & 2 & 3 & 4	z

Serial Port: The 9-pin Sub-D (male) connector on the VRAM rear panel provides the RS-232 compatible serial interface signals used for computer control. The VRAM Serial Port transmits serial data on pin 3 (TxD), receives serial data on pin 2 (RxD), and provides a ground on Pin 5. The Data Terminal Ready (DTR) & Request To Send (RTS) output signals are connected to the +12 Volt power supply (through a resistor) and are always asserted when the VRAM power is on. ***NOTE:*** *The Serial Port may also transmit commands which are received via the Logic Inputs, depending upon the echo character assignments (see Setup on pg. 8).*



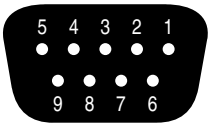
pin #1 = not used
pin #2 = Receive Data (RxD) input
pin #3 = Transmit Data (TxD) output
pin #4 = Data Terminal Ready (DTR) output
pin #5 = ground
pin #6 = not used
pin #7 = Request To Send (RTS) output
pin #8 = not used
pin #9 = not used

serial port

The VRAM only requires receive data (pin 2), transmit data (pin 3), and signal ground (pin 5) to be connected for successful data communications (see cable diagram below). However, the PC may require that signals be present on the data set ready, clear to send, or carrier detect inputs, as well as the receive data, transmit data, and signal ground pins. Success or failure depends entirely on the actual computer hardware and software being used. When trying to solve an interfacing problem, the most important thing to remember is that an output of one device should connect to one or more inputs of the other device, and that two outputs should never be connected together. Also, keep in mind that the RS-232 specification calls for the cable length to be no greater than 50 feet (although it is not unusual to be able to operate over distances of 150 to 250 feet), and the connectors must be of the appropriate gender (male or female) to mate properly. For best results, a shielded cable should be used, with the shield connected to chassis ground. Since the VRAM serial interface ground is also tied (indirectly) to the analog signal ground, undesirable ground loops may occur when the VRAM is connected to a PC (if the system grounding is not carefully designed). For best performance, the PC ground and the chassis ground of the VRAM should be at the same potential, and the PC should get AC power from the same source as the VRAM (and any other audio equipment which is connected to the VRAM). Since most lap-top computers are isolated from earth ground, this should rarely pose a problem.

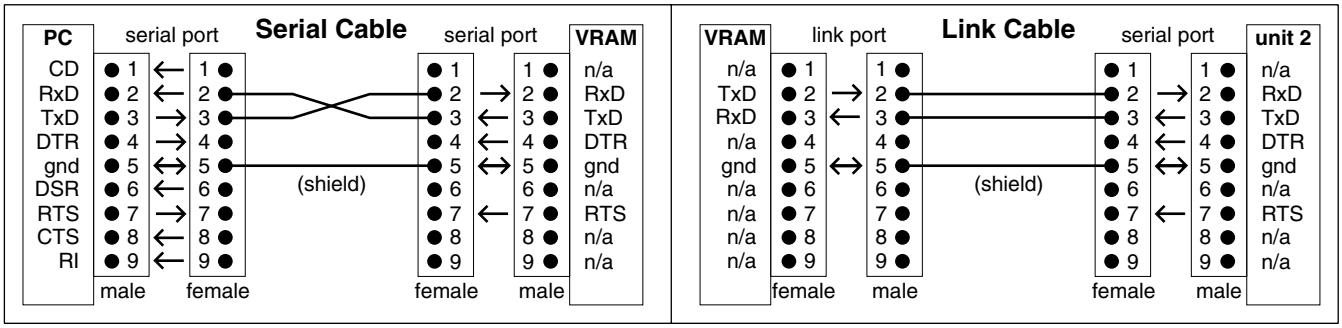
Serial Port Data Communications Parameters: The VRAM communicates through the Serial Port at the factory selected rate of 38400 bits per second, with 8 data bits, 1 stop bit, and no parity. The VRAM utilizes a subset of the standard 7-bit ASCII character set. The eighth data bit of each character (the most significant bit) should always be 0. The computer should not echo the characters it receives. The computer should not be set for either hardware (DTR) or software (XON/XOFF) flow control. The baud rate may be changed to either 2400, 9600, or 19200 bits per second by means of the software (see Setup on pg. 9). ***NOTE:*** *Baud rate may need to be changed when the VRAM is being used in RS-232 systems with other products having a lower maximum baud rate.*

Link Port Connections: The 9-pin Sub-D (female) connector on the VRAM rear panel provides the RS-232 compatible serial interface signals used for linking multiple BIAMP products within a system. The Link Port of one device simply connects to the Serial Port of the next device, and so forth (see diagram below). Link cables are available as an option (Biamp #909-0057-00). ***NOTE:*** *All but the final device in a system should have its '<u>Link</u>' switch pressed in (see Front & Rear Panel Features on pg. 2). The Link Port may also transmit commands which are received via the Logic Inputs, depending upon the echo character assignments (see Setup on pg. 8).*



pin #1 = not used
pin #2 = Transmit Data (TxD) output
pin #3 = Receive Data (RxD) input
pin #4 = not used
pin #5 = ground
pin #6 = not used
pin #7 = not used
pin #8 = not used
pin #9 = not used

link port

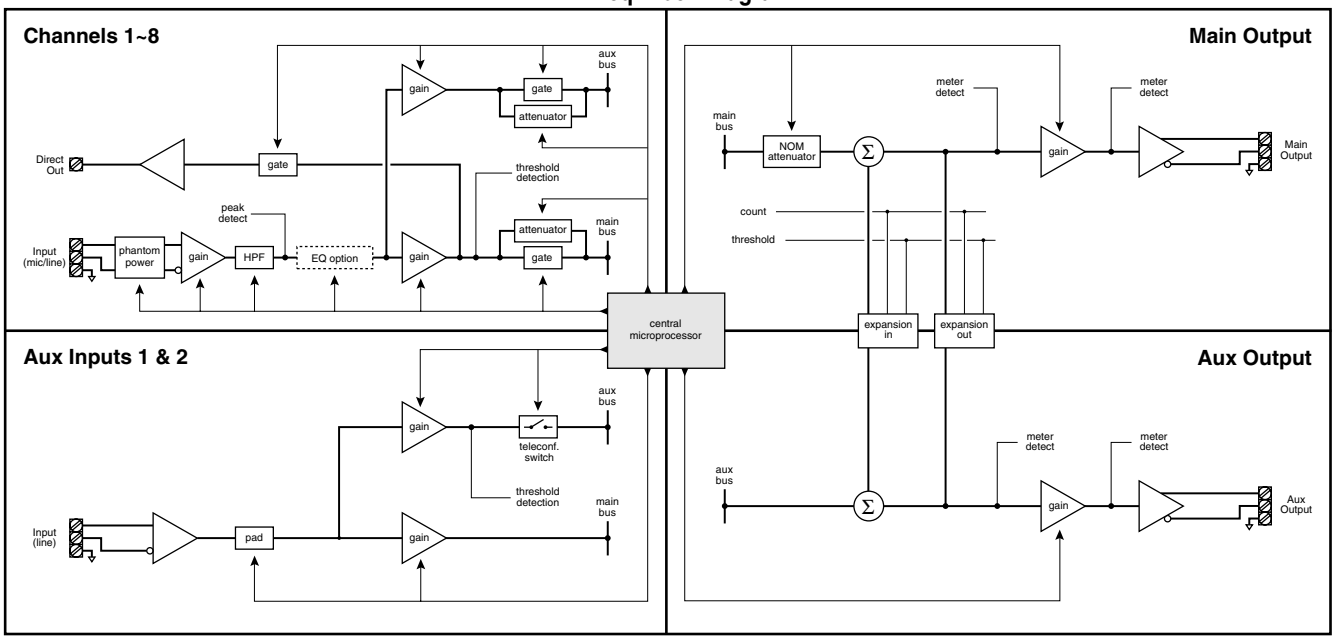


SPECIFICATIONS & BLOCK DIAGRAM

Frequency Response (20Hz~20kHz @ +4dBu)**:**	+0/-0.3dB
THD + Noise (20Hz~20kHz @ +4dBu)**:**	< 0.03%
Equivalent Input Noise (20Hz~20kHz, 60dB gain, 150 ohm)**:**	-126dBu
Output Noise (20Hz~20kHz, main & 1 channel @ nominal)**:**	< -83dBu
Maximum Gain:	
mic/line inputs to main & aux outputs	85dB
aux line inputs to main & aux outputs	28dB
Crosstalk (channel-to-channel @ 1kHz)**:**	< -95dB
Output Impedance:	
main & aux outputs (balanced)	200 ohms
channel direct outputs (unbalanced)	560 ohms
Input Impedance	
mic/line inputs (balanced)	6.6k ohms
aux line inputs (balanced)	20k ohms
Maximum Output:	
main & aux outputs (balanced)	+24dBu
Maximum Input:	
mic/line & aux line inputs	+24dBu

Phantom Power:	+36VDC (7mA/channel)
Input Gain Range:	
mic/line inputs (variable trim)	-6dB to +63dB
aux line inputs (selectable pad)	-6dB or +6dB
Channel Equalization (model VRAMeq)**:**	
low-frequency (shelving)	±9dB @ 100Hz
mid-frequency (variable peaking)	±9dB @ 220Hz~3.6kHz
high-frequency (shelving)	±9dB @ 3.3kHz
High-Pass Filter:	6dB/octave @ 110Hz
Automixing:	
gate attack time (signal dependent)	4mSec min.
release time (variable)	200mSec to 2Sec
channel-off attenuation (variable)	-10dB to -80dB
NOM attenuation (doubling of active inputs)	-3dB
Feedback/Noise Improvement (8 channels)	9dB
Power Consumption (115/230VAC 50/60Hz)**:**	< 27 watts
Dimensions (HxWxD)**:**	1.75"x19"x11" (44x483x279mm)
Weight:	< 10 lbs. (4.55kg)

VRAMeq Block Diagram



WARRANTY

BIAMP SYSTEMS IS PLEASED TO EXTEND THE FOLLOWING 5-YEAR LIMITED WARRANTY TO THE ORIGINAL PURCHASER OF THE PROFESSIONAL SOUND EQUIPMENT DESCRIBED IN THIS MANUAL

1. BIAMP Systems warrants to the original purchaser of new products that the product will be free from defects in material and workmanship for a period of 5 YEARS from the date of purchase from an authorized BIAMP Systems dealer, subject to the terms and conditions set forth below.

2. If you notify BIAMP during the warranty period that a BIAMP Systems product fails to comply with the warranty, BIAMP Systems will repair or replace, at BIAMP Systems' option, the nonconforming product. As a condition to receiving the benefits of this warranty, you must provide BIAMP Systems with documentation that establishes that you were the original purchaser of the products. Such evidence may consist of your sales receipt from an authorized BIAMP Systems dealer. Transportation and insurance charges to and from the BIAMP Systems factory for warranty service shall be your responsibility.

3. This warranty will be VOID if the serial number has been removed or defaced; or if the product has been altered, subjected to damage, abuse or rental usage, repaired by any person not authorized by BIAMP Systems to make repairs; or installed in any manner that does not comply with BIAMP Systems' recommendations.

4. Electro-mechanical fans, electrolytic capacitors, and normal wear and tear of items such as paint, knobs, handles, and covers are not covered under this warranty.

5. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. BIAMP SYSTEMS DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

6. The remedies set forth herein shall be the purchaser's sole and exclusive remedies with respect to any defective product.

7. No agent, employee, distributor or dealer of Biamp Systems is authorized to modify this warranty or to make additional warranties on behalf of Biamp Systems. statements, representations or warranties made by any dealer do not constitute warranties by Biamp Systems. Biamp Systems shall not be responsible or liable for any statement, representation or warranty made by any dealer or other person.

8. No action for breach of this warranty may be commenced more than one year after the expiration of this warranty.

9. BIAMP SYSTEMS SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS OR LOSS OF USE ARISING OUT OF THE PURCHASE, SALE, OR USE OF THE PRODUCTS, EVEN IF BIAMP SYSTEMS WAS ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Biamp Systems
10074 S.W. Arctic Drive
Beaverton, Oregon 97005
(503) 641-7287

Declaration of Conformity

BIAMP SYSTEMS
10074 SW Arctic Drive
Beaverton, OR USA 97005

as the manufacturer, hereby declares that the following described product, in our delivered version, complies with the provisions of the DIRECTIVES as noted herein. In case of alteration of the product, not agreed upon or directed by us, this declaration is no longer valid.

Product: Model: ADVANTAGE® VRAM
Description: Variable Resource Automixer

Applicable EC Directives: EMC Directive (89/336/EEC) LVD Directive (73/23/EEC)

Applicable Harmonized Standards: EN55103-1 emissionsEN55103-2 immunity
EN60065 safety

Special Considerations for Product Environment or Compliance:

Shielded cabling must be used for system connections. The apparatus is deemed incapable of producing harmonic emissions or flicker levels sufficient enough to interfere with other apparatus as noted in EN61000-3-2 and EN61000-3-3.

This apparatus operates from a removeable external power source at voltages below the levels encompassed by the LVD. The external power source complies with the applicable requirements of EN60065. The apparatus itself is outside of the scope of the LVD and presents no hazardous voltages, as defined in the LVD. For compliance, the apparatus shall be powered only from the separate CE marked BIAMP SYSTEMS power source.

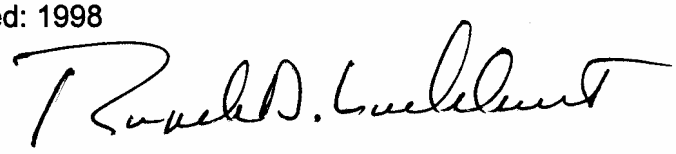
RF interference conducted through interconnect cabling may cause varying degrees of random signal degradation. The effect of increased noise or distortion due to this interference is typically masked by the desired signal. In no instance is operation inhibited.

The Technical Report/File is maintained at:

Biamp Systems
10074 S.W. Arctic Drive
Beaverton, OR USA 97005
phone: (503) 641-7287 fax: (503) 626-0281
e-mail: biamp@biamp.com

Authorized Representative: Ralph Lockhart, President

Authorized Representative Signature:
Issued: 1998



SAFETY INFORMATION

The words WARNING and CAUTION throughout the manual, and on the device, call attention to important safety information. These words have the following meanings.

WARNING: The related information alerts you to conditions that could result in serious injury or damage to property if the instructions are not followed properly.

CAUTION: The related information instructs you on how to prevent damage to the equipment or how to avoid conditions that could result in minor injury if proper steps are not followed.

Product labelling and the operation manual may use the internationally recognized symbols defined below to note safety messages.

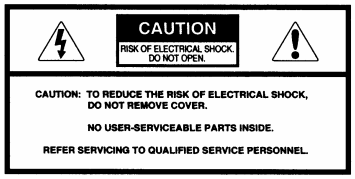
The lightning flash with arrowhead symbol, enclosed within a triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the apparatus's enclosure or at connection terminals that may be of sufficient magnitude to constitute a risk of electrical shock.

The exclamation point, enclosed within a triangle, is intended to alert the user to important installation, operation, and maintenance (servicing) instructions in the literature accompanying the apparatus.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

CAUTION: Installation of this apparatus should be made by a qualified installation person and should conform to all applicable local codes.

Modification and optional equipment information referenced in this manual is for use by qualified installation and service personnel only.



"INFORMACIÓN DE SEGURIDAD"

Las palabras **PELIGRO** (WARNING) y **PRECAUCIÓN** (CAUTION) a lo largo del manual y en el dispositivo (sistema), llaman la atención acerca de una importante información de seguridad. Estas palabras tienen los siguientes significados :

PELIGRO (WARNING) : la información relata las condiciones en que podría ser dañada seriamente la propiedad si no se siguen adecuadamente las instrucciones.

PRECAUCIÓN (CAUTION) : la información que se relata te instruye en cómo prevenir daños al equipo o como evitar condiciones que podrían resultar en perjuicio menor si los pasos adecuados no son seguidos correctamente.

El etiquetado del producto y el manual de operación pueden hacer uso de los símbolos reconocidos internacionalmente y cuyos mensajes estan definidos a continuación para modificar mensajes de seguridad:

El símbolo del rayo encerrado en un triángulo pretende alertar al usuario de la presencia de un peligroso voltaje no aislado ,dentro de la caja del aparato o a un terminal de conexión y que podría ser de suficiente magnitud como para constituir un grave riesgo de descarga eléctrica.

El punto de exclamación dentro de un triángulo pretende alertar al usuario de la importancia de las instrucciones de instalación, operación y mantenimiento (servicio) que acompañan al aparato.

PELIGRO (WARNING) : para reducir el riesgo de fuego o una descarga electrica, no exponer este aparato a la lluvia o la humedad.

PRECAUCIÓN (CAUTION) : la instalación de este aparato debería hacerse por una persona cualificada en la instalación, y debería conformar todos los códigos locales aplicables.

La modificación y la información opcional del equipo referenciada en este manual es para ser utilizada únicamente por personal cualificado en instalación y servicio.

INFORMATION CONCERNANT VOTRE SECURITE

Les mots **WARNING** et **CAUTION** dans le manuel d'utilisation et sur les appareils attirent votre attention sur les plus importantes informations concernant votre sécurité. Ces mots ont la signification suivante:

WARNING: Ce mot vous indique les circonstances dans lesquelles vous pourriez être blessé ou endommager votre équipement si les instructions ne sont pas suivies correctement.

CAUTION: Ce mot vous indique comment éviter d'endommager votre matériel et comment éviter de vous blesser si vous ne suivez pas les instructions.

Vous trouverez peut-être les symboles suivants sur votre appareil ou dans le manuel d'utilisation.

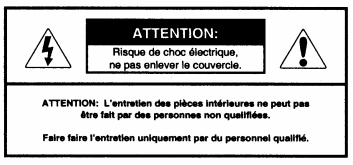
L'éclair se terminant en flèche dans un triangle permet de prévenir l'utilisateur d'un voltage dangereux non isolé dans l'appareil ou d'une connexion d'une amplitude suffisante pour constituer un risque de choc électrique.

Le point d'exclamation dans un triangle permet de prévenir l'utilisateur des points importants concernant l'installation, le fonctionnement et l'entretien de l'appareil figurant dans le manuel d'utulisation.

WARNING: POUR REDUIRE LES RISQUES DE FEU OU DE CHOC ELECTRIQUE, NE PAS METTRE L'APPAREIL SOUS LA PLUIE OU DANS L'HUMIDITE.

CAUTION: L'installation de cet appareil doit être faite par un installateur qualifié et doit être en conformité avec toutes les lois locales en application.

Les informations concernant une modification ou un équipement en option dans le manuel doivent être effectué par du personnel qualifié.



INFORMAZIONI PER LA SICUREZZA

Le parole **AVVERTENZA** (WARNING) e **PRUDENZA** (CAUTION) poste sul manuale d'uso e sul apparato richiamano la vostra attenzione su delle importanti informazioni per la vostra sicurezza. Queste parole hanno il seguente significato.

AVVERTENZA: (WARNING) La suddetta indicazione vi avvisa sul rischio di incorrere in danni a cose o a persone ,se le procedure d'uso e installazione non saranno seguite propriamente.

PRUDENZA: (CAUTION) La suddetta indicazione vi instruisce su come prevenire e ridurre al minimo, il rischio di danni agli apparati e alle persone se le instruzioni saranno seguite propriamente.

Le apparecchiature e i manuali di instruzioni riporteranno la simbologia standard raffigurata qui sotto ,accompagnate dalle relative informazioni per la sicurezza.

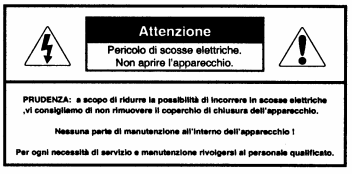
La simbologia con il fulmine all'interno di un triangolo, intende avvisare l'utente della presenza di alto volaggio all'interno del apparecchio in questione, e che il suddetto apparecchio si alimenta attraverso una tensione di rete ad alto voltaggio e che dunque si potrebbe incorrere sul rischio di una possibile scossa elettrica.

La simbologia con il punto esclamativo all'interno di un triangolo, intende avvisare l'utente di una serie di instruzioni contenute nel manuale d'uso riguardanti : operato,manutenzione e assistenza. Il suddetto manuale sarà a corredo dell'apparecchio.

AVVERTENZA: (WARNING) PER RIDURRE IL RISCHIO DI POSSIBILI INCENDI O SCOSSE ELECTTRICHE ,SCONSIGLIAMO DI ESPORRE L'APPARECCHIO ALLA PIOGGIA O ALL'UMIDITA'.

PRUDENZA: (CAUTION) l'Installazione di questo apparato dovrà essere effettuata solo da personale qualificato e il tipo di installazione dovrà essere in regola con le norme vigenti locali..

Modifiche e ulteriori informazioni specificate in questo manuale sono solamente riservate al personale qualificato all'installazione.



Sicherheitshinweise

Die Bergriffe **WARNUNG** (engl. WARNING) und **ACHTUNG** (engl. CAUTION) in der Bedienungsanleitung und auf den Geräten machen auf wichtige Sicherheitsinformationen aufmerksam. Diese Begriffe haben die folgende Bedeutung:

WARNUNG: (WARNING) Der folgende Text warnt Sie vor ernsthaften Verletzungen oder Beschädigungen, die aus einer fehlerhaften Bedienung bzw. Handhabung des Gerätes resultieren können.

ACHTUNG: (CAUTION) Der folgende Text informiert Sie über Bedienungshinweise zum Schutz Ihres Gerätes oder weist auf mögliche Schäden hin, wenn die Bedienungshinweise nicht beachtet werden.

Die Beschriftung der Geräte und die Bedienungsanleitungen weisen unter Umständen international bekannte Symbole auf, die die folgende Bedeutung haben:

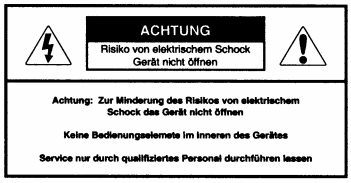
Das Blitzsymbol im Dreieck warnt vor anliegender, nicht isolierter „gefährlicher Spannung" im Inneren oder an den Anschlüssen des Gerätes. Die Berührung der unter Spannung stehenden Teile kann zu einem elektrischen Schock führen.

Das Rufzeichen im Dreieck macht auf wichtige Installations-, Bedienungs- und Servicehinweise in der zugehörigen Bedienungsanleitung aufmerksam.

WARNUNG: (WARNING) Zur Minderung des Risikos von Feuer und elektrischem Schock schützen Sie das Gerät vor Regen und Feuchtigkeit.

ACHTUNG: (CAUTION) Die Installation des Gerätes sollte nur durch qualifiziertes Personal durchgeführt werden und muß den jeweiligen Bestimmungen entsprechen.

Die Modifikationen und die Informationen zu den optionalen Erweiterungen in der Bedienungsanleitung sind nur für qualifiziertes Personal bestimmt.



Sikkerhedsinformation

Ordene ***ADVARSEL*** (WARNING) og ***FORSIGTIG*** (CAUTION), brugt i henholdsvis brugervejledning og på selve produktet, indikerer, at vigtig information omkring sikkerhed følger. Ordene betyder følgende:

ADVARSEL: (WARNING) Den efterfølgende information advarer Dem om forhold, der kan føre til alvorlige ulykker og ejendomsskader, hvis ikke vejledningen følges.

FORSIGTIG: (CAUTION) Den efterfølgende information vejleder Dem i, hvordan De undgår skade på produktet, samt undgår forhold der kan føre til mindre ulykker og ejendomsskader, hvis ikke vejledningen følges.

Produktetiketter og brugervejledning kan indeholde de internationalt anerkendte symboler der er vist nedenfor:

Trekanten med et lyn i midten har til hensigt at advare brugeren om, at produktet indeholder "farlig spænding", og at det derfor er forbundet med fare for elektrisk stød at åbne produktet.

Trekanten med udråbstegn har til hensigt at advare brugeren om, at vigtig information omkring installation, brug, service og vedligeholdelse af produktet er indeholdt i den medfølgende brugervejledning.

ADVARSEL: (WARNING) Med henblik på at reducere risikoen for brand eller elektrisk stød, må produktet ikke udsættes for regn eller fugt.

FORSIGTIG: (CAUTION) Installation af dette produkt skal foretages af en autoriseret installatør og skal være i overensstemmelse med alle anvendelige lokale retningsliner.

Modifikationer samt alternativt udstyr beskrevet i denne brugervejledning er kun henvendt til kvalificerede installatører og servicepersonale.

VEILIGHEIDSINFORMATIE

De woorden **WAARSCHUWING** (WARNING) en **VOORZICHTIG** (CAUTION) welke in de handleiding en op het apparaat voorkomen, waarschuwen U voor belangrijke veiligheidsinformatie. Zij hebben de volgende betekenis:

WAARSCHUWING: (WARNING) De betreffende informatie waarschuwt U voor omstandigheden die kunnen leiden tot defecten of beschadigingen aan apparaten als de instructies niet volledig worden opgevolgd.

VOORZICHTIG: (CAUTION) De betreffende informatie instrueert U hoe U defecten aan apparatuur kunt voorkomen of hoe U omstandigheden kunt vermijden die kunnen resulteren in schade als de juiste stappen niet worden opgevolgd.

Produkt informatie en handleiding hanteren onderstaande internationaal erkende symbolen om veiligheidsinstructies aan te geven.

De bliksemschicht in een driehoek wordt gebruikt om de gebruiker te attenderen op ongeïsoleerde "gevaarlijke spanning" in het apparaat of bij de aansluitklemmen, die het risico van een electrische schok kunnen geven.

Het uitroepteken in een driehoek wordt gebruikt om de gebruiker te attenderen op belangrijke installatie, gebruiks- en onderhoudsinstructies in de beschrijving die bij het apparaat hoort.

WAARSCHUWING: (WARNING) OM HET RISICO VAN BRAND OF EEN ELECTRISCHE SCHOK TE VERMIJDEN DIENT U HET APPARAAT NIET AAN VOCHT BLOOT TE STELLEN.

VOORZICHTIG: (CAUTION) Installatie van dit apparaat dient te geschieden door gekwalificeerd personeel en dient te geschieden conform de plaatselijke voorschriften.

Modificaties en aanvullende informatie waar in de handleiding naar wordt verwezen, dient alleen voor gebruik door gekwalificeerd personeel.

TURVALLISUUSTIEDOTE

Sanat **VAROITUS** (WARNING) ja **HUOMIO** (CAUTION), jotka esiintyvät manuaalissa ja itse laitteessa, ilmoittavat tärkeästä turvallisuusinformaatiosta. Näillä sanoilla on seuraava merkitys:

VAROITUS: (WARNING) Yhteydessä oleva informaatio varoittaa olosuhteista, jotka saattavat johtaa vakaviin vammoihin tai laitteen vaurioitumiseen, mikäli ohjeita ei täysin noudateta.

HUOMIO: (CAUTION) Yhteydessä oleva informaatio neuvoo, miten laitteen vaurioituminen voidaan ehkäistä tai miten voidaan välttää olosuhteet, jotka voivat johtaa lieviin vammoihin, mikäli ohjeita ei noudateta.

Tuotteessa tai käyttöohjeessa voidaan käyttää seuraavia alla määriteltyjä kansainvälisiä symboleja, jotka viittaavat turvallisuusinformaatioon.

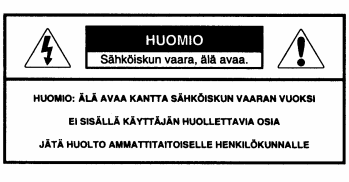
Kolmion sisällä olevan nuolipäinen salama varoittaa käyttäjää laitteen sisällä tai liitännöissä olevasta eristämättömästä vaarallisesta jännitteestä, joka saattaa olla tarpeeksi suuri aiheuttaakseen sähköiskun vaaran.

Kolmion sisällä oleva huutomerkin tarkoituksena on ilmoittaa käyttäjälle tärkeistä asennusta, käyttöä tai huoltoa koskevista ohjeista laitteen mukana seuraavassa kirjallisuudessa.

VAROITUS: (WARNING) ÄLÄ ALTISTA LAITETTA SATEELLE TAI KOSTEUDELLE TULIPALON JA SÄHKÖISKUN VAARAN VUOKSI.

HUOMIO: (CAUTION) Laitteen asentaminen tulisi jättää ammattitaitoisen henkilön suoritettavaksi ja asennuksessa tulee noudattaa kaikkia paikallisia säännöksiä.

Tässä manuaalissa oleva informaatio, joka koskee muutostöitä ja lisälaitteita, on tarkoitettu vain ammattitaitoisten asennus- ja huoltohenkilöiden käyttöön.



SIKKERHETS INFORMASJON

Når ordene **ADVARSEL** (WARNING) og **VIKTIG** (CAUTION) blir brukt i manualen og på produktet, gjelder det informasjon som har med brukerens sikkerhet å gjøre. Ordene har følgende mening:

ADVARSEL: (WARNING) Tilhørende informasjon viser til forhold som kan resultere i alvorlige skader eller ødeleggelser hvis anvisningene ikke følges nøye.

VIKTIG: (CAUTION) Tilhørende informasjon forteller deg hvordan du skal unngå feil på utstyret, eller unngå situasjoner som kan resultere i mindre skader.

Produkt merkingen og bruksanvisningen bruker internasjonale symboler for å merke punkter som er viktige for brukerens sikkerhet.

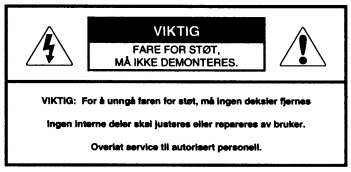
Lynet i en triangel advarer brukeren om uisolert "farlig spenning" inne i apparatet, eller tilkoblings terminaler som kan gi støt.

Etter utropstegnet i en triangel følger informasjon som er viktig når det gjelder installasjon, bruk og vedlikehold (service) av apparatet.

ADVARSEL: (WARNING) FOR Å REDUSERE FAREN FOR BRANN ELLER STØT MÅ APPARATET IKKE UTSETTES FOR VANN ELLER FUKTIGHET.

VIKTIG: (CAUTION) Installasjon av apparatet skal foretas av autorisert installatør etter gjeldende forskrifter.

Modifikasjoner og tilleggs informasjon som følger er kun for kvalifiserte installatører eller service personell.



SÄKERHETS INFORMATION

Orden **VARNING** (WARNING) och **OBSERVERA** (CAUTION) vilka används i denna manual och på apparaten, är menade att uppmärksamma viktig säkerhets information. Dessa ord har följande betydelse.

VARNING: (WARNING) Information som uppmärksammar på omständigheter som kan resultera i allvarlig personskada eller skada på egendom om instruktionerna ej följs.

OBSERVERA: (CAUTION) Information som uppmärksammar på instruktioner om hur skada på utrustning eller hur situationer där lättare personskador kan uppstå undvikes.

Följande internationellt använda ord och symboler används i handboken och på märkningar på produkten för att uppmärksamma användare på viktiga säkerhets instruktioner.

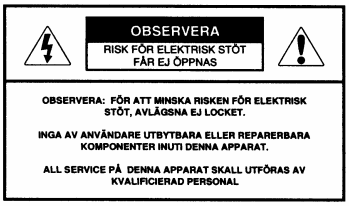
En blixt med pil, innesluten i en triangel, menad att uppmärksamma användare på närvaron av oisolerade "farliga spänningar" i apparaten eller på anslutnings kontakter vilka har tillräcklig styrka för att medföra risk för elektrisk söt.

Ett utropstecken, innesluten i en triangel, menad att uppmärksamma användare på viktiga installations, handhavande eller underhålls-instruktioner i medföljande dokumentation.

VARNING: (WARNING) FÖR ATT MINSKA RISKEN FÖR BRAND ELLER ELEKTRISK STÖT, UTSÄTT EJ APPARATEN FÖR FUKT ELLER VÄTSKA.

OBSERVERA: (CAUTION) Installation av denna apparat skall utföras av kvalificerad installatör samt enligt alla gällande lokala bestämmelser.

Eventuella modifierings instruktioner och annan information av teknisk art i denna manual är endast avsedd att användas av kvalificierad installations och service personal.



ΠΛΗΡΟΦΟΡΙΕΣ ΑΣΦΑΛΕΙΑΣ

Οι λέξεις **ΚΙΝΔΥΝΟΣ** (WARNING) και **ΠΡΟΣΟΧΗ** (CAUTION) που αναφέρονται μέσα στο εγχειρίδιο και στη συσκευή, επικεντρώνουν την προσοχή σε σημαντικές πληροφορίες ασφαλείας. Οι λέξεις αυτές έχουν την παρακάτω σημασία.

ΚΙΝΔΥΝΟΣ : (WARNING) Η αναγραφόμενη πληροφορία επιστά την προσοχή σας σε καταστάσεις που θα μπορούσαν να έχουν σαν αποτέλεσμα σοβαρό τραυματισμό ή καταστροφή της ιδιοκτησίας αν οι οδηγίες δεν ακολουθηθούν κατάλληλα.

ΠΡΟΣΟΧΗ : (CAUTION) Η αναγραφόμενη πληροφορία σας καθοδηγεί πώς να προλάβετε καταστροφή του εξοπλισμού ή πώς να αποφύγετε καταστάσεις που θα μπορούσαν να έχουν ως αποτέλεσμα μικροτραυματισμούς αν δεν ακολουθηθούν τα σωστά βήματα.

Στις επιγραφές των προτόντων και στο εγχειρίδιο λειτουργίας, χρησιμοποιούνται τα σιεθνώς αναγνωρισμένα σύμβολα, των οποίων ο ορισμός δίνεται παρακάτω έτσι ώστε να υπογραμμιστούν τα μηνύματα ασφαλείας.

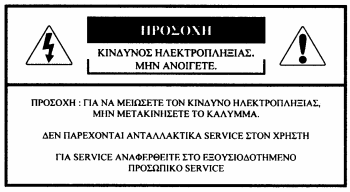
Η φωτεινή αναλαμπή με σύμβολο το βέλος, μέσα στο τρίγωνο, έχει σκοπό να επιστήσει την προσοχή του χρήστη, στην ύπαρξη μη- μονωμένης « επικίνδυνης ισχύος ρεύματος » στο εσωτερικό της συσκευής ή στις άκρες σύνδεσης οι οποίες μπορεί να έχουν αρκετό μέγεθος ώστε να περιέχουν κίνδυνο ηλεκτροπληξίας.

Το επεξηγηματικό σημείο, μέσα στο τρίγωνο, έχει σκοπό να επιστήσει την προσοχή του χρήστη στις σημαντικές οδηγίες εγκατάστασης, λειτουργιας και συντήρησης (service) που περιέχονται στα φυλλάδια που συνοδεύουν την συσκευή.

ΚΙΝΔΥΝΟΣ : (WARNING) Για να αποφύγετε τον κίνδυνο φωτιάς ή ηλεκτροπληξίας, μην εκθέτετε αυτή τη αυσκευή σε βροχή ή σε υγρασία.

ΠΡΟΣΟΧΗ : (CAUTION) Η εγκατάσταση αυτής της συσκευής θα πρέπει να γίνει από εξειδικευμένο άτομο και θα πρέπει να προσαρμόζεται σε όλους τους εφαρμόσιμους τοπικούς κώδικες.

Οι τροποποιήσεις και οι προϋποθετικές πληροφορίες για τον εξοπλισμό, που αναφέρονται σε αυτό το εγχειρίδιο, προορίζονται για χρήση μόνο από εξειδικευμένα στην εγκατάσταση και στο service, άτομα.



INFORMAÇÃO SOBRE SEGURANÇA

As palavras ADVERTÊNCIA (WARNING) e PRECAUÇÃO (CAUTION) neste manual, e no dispositivo, alertam para importantes informações sobre segurança. Estas palavras significam o seguinte:

ADVERTÊNCIA : (WARNING) Informação relacionada que alerta sobre condições que poderão resultar em lesões sérias ou prejuízo, se as instruções não forem seguidas adequadamente.

PRECAUÇÃO : (CAUTION) Informação relacionada que instrúi como prevenir danos no equipamento ou como evitar condições que poderão resultar em lesões leves, se os passos não forem seguidos adequadamente.

As etiquetas do produto e do manual de operações podem usar os símbolos internacionalmente reconhecidos definidos abaixo para advertir mensagens de segurança.

símbolo do relâmpago com uma seta, dentro de um triângulo, tem o fim de alertar o usuário a presença de "voltagem perigosa" sem isolação dentro da caixa isolamento do aparelho ou nos terminais de ligação que podem ter a magnitude suficiente que constitui um risco de choque eléctrico.

ponto de exclamação, dentro de um triângulo, tem o fim de alertar o usuário sobre instruções importantes de instalação, operação e manutenção (serviços) na literatura que acompanha o aparelho.

ADVERTÊNCIA : (WARNING) PARA REDUZIR O RISCO DE INCÊNDIO OU CHOQUE ELÉCTRICO, NÃO EXPONHA ESTE APARELHO A CHUVA OU HUMIDADE.

PRECAUÇÃO : (CAUTION) A instalação deste aparelho deve ser feita por um profissional qualificado e deve obedecer a todos os códigos locais aplicáveis.

Modificação e informação sobre equipamento adicional citados neste manual são para o uso exclusivo do pessoal qualificado de instalação e manutenção.