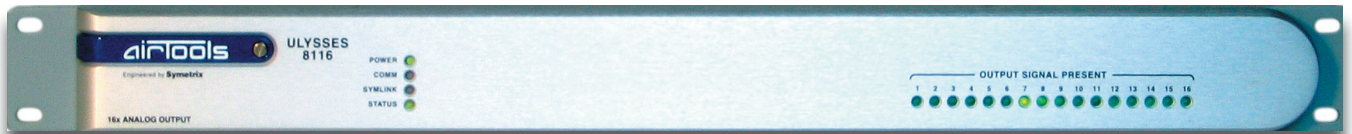


Studio Matrix™



CONTROL PROTOCOL

For Studio Matrix™ Designer version 1.0

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Studio Matrix™
Command Protocol
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Introduction

About this document

The purpose of this document is to provide a technical understanding of the AirTools Studio Matrix™ Command Protocol. It will define and illustrate the protocol used to communicate with the Studio Matrix™ via a serial RS-232 interface.

Studio Matrix™ units can be controlled by RS-232 based controllers such as certain AMX or Crestron models, or any RS-232 equipped device that can be adapted to this protocol. The protocol consists of humanly readable text commands and responses.

Control is achieved by using the existing controller assignment system in Studio Matrix™ Designer for RS-232/485 control over most processing parameters. Right-clicking on most faders and buttons of module views will allow assigning the parameter to an RS-232/485 controller. An appropriate controller number is assigned in the 1-10000 range then the design with the controller assignment is downloaded. At this point, the RS-232 interfaces, referencing the controller number can control the parameter.

Conventions used in this document

A dollar sign (\$) preceding a set of alphanumeric characters denotes a hex value. All other number values should be considered decimal values. **Example:** "\$A0" represents the decimal value of "160".

General Notes

Connections

Each Icarus, Ulysses, Narcissus and Oedipus features an RS-232 port and a 10/100Base-T Ethernet port. The Studio Matrix™ Designer software and RS-232 accessory controllers both connect to the rear panel RS-232 port on the master (address 1) Studio Matrix™ hardware device. This of course means that both can not be connected via RS-232 at the same time. In order to use Studio Matrix™ Designer and an RS-232 accessory controller simultaneously on the same ring, you should interface your PC running Studio Matrix™ Designer via Ethernet. DIP switch number 2 determines the purpose of the rear panel RS-232 port for address number 1 (master) units. (Down = RS-232 for Accessory Controllers; Up = RS-232 for Studio Matrix™ Designer). Regardless of the switch's position, Ethernet communication can be used for Studio Matrix™ Designer. For units with an address other than 1, this switch has no effect. The RS-232 port defaults to 38.4k baud when configured for accessory communications. This can be changed via the **Set Baud** command on page 14. Remember to power cycle the unit after any DIP switch change.

Connect your RS-232 based accessory to the rear panel RS-232 connector. For experimentation purposes, a terminal emulation program such as HyperTerminal included with Windows can be run on a PC instead. Typically this connection requires a "straight through" cable, but a null-modem cable may be required depending on the manufacturer. In general, if the sexes of the two connectors you are trying to connect are the same, a "null modem" cable is required. Set up the controller for baud: 38400, data bits: 8, stop bits: 1, parity: NONE. No handshaking or flow control is used.

The commands on pages 14-15, **Set Baud**, **Set Quiet Mode** and **Set Echo**, will further configure the RS-232 port. The unit's default settings (Baud 38400, Quiet Mode ON, Echo OFF) are typical for RS-232 controller interfacing, so it may be necessary to use these commands to accommodate some controllers. Therefore, they are documented for reference on pages 14-15.

RS-232 Control

The RS-232 protocol is used to simulate the movement of a RS-232/485 controller by referencing the controller number and a new virtual position. As previously mentioned, controller numbers can be 1-10000. Controller positions are a 16-bit unsigned number providing a range of 0-65535.

RS-485 Control

RS-485 control is generally done using one or more of the Symetrix ARC (Adaptive Remote Controller) units. Further discussion of RS-485 and the ARC can be found on the Symetrix web site.

Parameter Notes

Faders

Faders in Studio Matrix™ Designer can be controlled to the limits of their minimum and maximum values shown in the Module View Screens. A controller position of zero (0) will cause the minimum fader position to be realized. A controller position of 65535 will cause the maximum fader position to be realized. Increasing positions will move the fader linearly in dB.

Most volume faders in Studio Matrix™ Designer have a range of -72dB to +12dB. In these cases, the following formula can be used to convert from RS-232/485 controller position to dB:

$$\text{Volume dB} = -72 + 84 * (\text{CONTROLLER POSITION} / 65535)$$

If CONTROLLER POSITION = 0, Volume dB = OFF

Note that some faders have a different range than -72 to +12dB and future versions of Studio Matrix™ Designer may allow further scaling and limiting the range of RS-232/485 controller values. In this case, the formula will depend upon the actual fader range. The more general formula is shown below:

$$\text{Volume dB} = \text{MINIMUM VALUE} + (\text{MAXIMUM VALUE} - \text{MINIMUM VALUE}) * (\text{CONTROLLER POSITION} / 65535)$$

Where MINIMUM VALUE is the fader's lower limit in dB and MAXIMUM VALUE is the fader's upper limit in dB.

Buttons

Buttons in Studio Matrix™ Designer such as a mute or bypass can be controlled similarly with controller positions by sending the minimum value (0) to turn the switch off (button not pushed) and sending the maximum value (65535) to turn the switch on (button pushed).

Input and Output Selectors

Controlling selectors can either be done by assigning a controller to the individual buttons, or to the single selector slider. It is recommended that the selector slider be used because it allows reading back the current state whereas the buttons do not. A value of zero (0) will select the first input or output and a value of (65535) will select the last input or output. Other values are selected by sending evenly spaced (linear) values as shown by the formula below:

$$\text{Controller Value} = (\text{INPUT/OUTPUT NUMBER} - 1) * 65536 / \text{NUMBER OF INPUTS/OUTPUTS}$$

Meters

Meters in the Studio Matrix™ Designer dedicated meter modules can be read via RS-232. The readback value will be linear in dB with 65535 representing 0dBFS and 0 representing -72dBFS (or less). The formula below can be used to calculate a dB reading from a controller value:

$$\text{Level dBFS} = 72 * (\text{CONTROLLER VALUE} / 65535) - 72$$

If CONTROLLER VALUE = 0, Level dBFS <= -72dBFS

Input and output meters in some other modules such as Automixers, Compressors, and AGCs can also be read via RS-232. In this case, the readback value will be linear in dB with 65535 representing the maximum value shown on the meter and 0 representing the minimum value shown on the meter (or less). The formula below can be used to calculate a dB reading from a controller value:

$$\text{Level dBFS} = (\text{MAXIMUM VALUE} - \text{MINIMUM VALUE}) * (\text{CONTROLLER VALUE} / 65535) + \text{MINIMUM VALUE}$$

If CONTROLLER VALUE = 0, Level dBFS <= MINIMUM VALUE

Where MINIMUM VALUE is the meter's lower limit in dB and MAXIMUM VALUE is the meter's upper limit in dB.

Control meters in dedicated control meter modules can also be read via RS-232. In this case, the readback value will be linear with 65535 representing 100% and 0 representing 0%. The formula below can be used to calculate a percentage reading from a controller value:

$$\text{Level \%} = 100 * (\text{CONTROLLER VALUE} / 65535)$$

Note: Meters are a "read-only" parameter. Attempting to change the meter value via RS-232 will have no effect.

Other Parameters

Many other parameters such as compression ratios, delay times, EQ settings and pans can also be controlled externally. In fact, almost any DSP parameter in Studio Matrix™ Designer can be controlled. For other parameter types, as in the above examples, sending a value of zero (0) will set the parameter to its minimum value and sending a value of (65535) will set it to its maximum value. Ratios, frequencies, width/Q, and attack/release/hold times all use a logarithmic scale. Pans and delay times use a linear scale. Quantities expressed in dB such as gains, volumes, thresholds and depths are linear in dB.

Parameters that cannot be controlled externally

The following Studio Matrix™ Designer features cannot be controlled externally. In some cases, workarounds are suggested.

1. Oscilloscope: Trigger and Auto-Range controls
2. Sine Generator: Sweep button and parameters
3. Parametric EQ: Flatten All and Octaves/Q buttons
4. Crossover: Slope and Filter Type (i.e. Butterworth/Bessel) buttons
5. Programmable Filters: Slope and Filter Type (i.e. Butterworth/Bessel) buttons
6. Matrix: Mute All and Disconnect All buttons (use individual mute or disconnect buttons instead)
7. Mixers: Link buttons (assign same controller to all linked faders instead)
8. Stereo Mixer: L and R buttons (use pan slider instead)
9. LCR Mixer: L, C and R buttons (use pan slider instead)
10. Dynamics: Gain reduction meters and knee settings
11. Delay: Default temperature button
12. Meter Bar: All meters
13. Fader Control Input: Log/linear buttons
14. Preset Trigger: Override Recall button (use Load Preset command instead)
15. Taper Control: Log Range slider

Getting Started

Protocol

The RS-232 Accessory Remote Controller Protocol is a text-based (ASCII string) protocol. Commands are sent with simple character strings with terms separated by spaces and completed with a carriage return character <CR> (ASCII decimal 13 or hex \$0D). There are only a few commands that most applications will need to use, and they are described in the following pages. The general form for commands is:

<COMMAND> <PARAMETER> <PARAMETER> ... <CR>

A white space character (space, tab, etc.) **must** be included between the command and each parameter. Extra white space characters can be sent for readability if desired. In this document a single space will be used. If a command is accepted, the Studio Matrix™ unit will respond to each command with an acknowledgement string whose syntax varies with each command.

All commands are addressed to a particular Studio Matrix™ unit and in most cases affect only that unit. The currently addressed unit is chosen using the **Set Unit** command (see page 13). If addressed to the master unit, some commands affect all connected units. These commands, known as “global” commands, are described individually in the following pages.

Notes On Redundancy

- 1) Your RS-232 controller must be connected to the active master in order to send commands to all units. If that master unit fails and the secondary takes over, the RS-232 controller’s serial cable must be physically moved to the secondary to allow RS-232 control to continue.
- 2) With the exception of the “global” commands, all commands affect only the unit which is active, not both primary and secondary. This might require users to issue two commands in a redundant system, one to the primary and another to the secondary in order to maintain the proper settings in both units in the event that the secondary unit is switched in.

Control Commands

(CS) Control RS-232/485

Use this command to move a controller position on the currently addressed unit to a new *absolute* value. This command is equivalent to the receipt of a controller position change from the RS-232/485 port. The command must specify the RS-232/485 controller number and the new controller position. The syntax of the command is:

“CS <CONTROLLER NUMBER> <CONTROLLER POSITION><CR>”

Where <CONTROLLER NUMBER> is the decimal RS-232/485 controller number (1-10000) assigned in Studio Matrix™ Designer, and <CONTROLLER POSITION> is a 16-bit number in decimal (0-65535).

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

A typical reason for failure is that the specified controller number is not controlling anything in the current design or that the specified controller number does not exist on the unit currently being addressed.

(CSG) Control RS-232/485 Global

This command is similar to the **(CS) Control RS-232/485** command except that it affects all units, not just the unit currently addressed. This can greatly simplify things when controlling a multi-unit system. This command should be issued to the master Studio Matrix™ unit (device address 1). It may be necessary to precede this command with a Set Unit command to ensure that you are talking to the master unit. If you design your Site File so that each unit has its own unique range of RS-232/485 controller numbers, you can use this command to issue **CSG** commands to the master unit only and the other slave units will respond accordingly to commands issued to the controller numbers they host. This eliminates the need to use the **Set Unit** command in order to talk to the unit that hosts the controller number to be addressed. The syntax of the command is:

“CSG <CONTROLLER NUMBER> <CONTROLLER POSITION><CR>”

Where <CONTROLLER NUMBER> is the decimal RS-232/485 controller number (1-10000) assigned in Studio Matrix™ Designer, and <CONTROLLER POSITION> is a 16-bit number in decimal (0-65535).

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

(CC) Change RS-232/485 Controller

Use this command to move a controller to a new *relative* value. This command will increment or decrement a controller by a specified amount. The command must specify the RS-232/485 controller number, whether it should be incremented or decremented, and the amount to change by. The syntax of the command is:

“CC <CONTROLLER NUMBER> <DEC/INC> <AMOUNT><CR>”

Where <CONTROLLER NUMBER> is the decimal RS-232/485 controller number (1-10000) assigned in Studio Matrix™ Designer, <DEC/INC> is 0 to decrement and 1 to increment, and <AMOUNT> is the amount to increment or decrement (a decimal number, 0-65535). If the amount to be decremented or incremented causes the parameter to exceed its minimum or maximum value, the value will be limited to its minimum or maximum value. For example, if you increment a parameter by 10 and its current value is 65530, the new value will be limited to 65535.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

A typical reason for failure is that the specified controller number is not controlling anything in the current design.

(GS) Get RS-232/485

This command will return the controller position (value) associated with a specific controller number. The command must specify the RS-232/485 controller number. The syntax of the command is:

"GS <CONTROLLER NUMBER><CR>"

Where <CONTROLLER NUMBER> is the decimal RS-232/485 controller number (1-10000) assigned in Studio Matrix™ Designer.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"<CONTROLLER POSITION><CR>"

Where controller position is a 16-bit number in decimal (0-65535)

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

A typical reason for failure is that the specified controller number is not controlling anything in the current design.

If the value being requested is a button that only has two states, the returned values will be either 0 or 65535, regardless of the actual value sent to the controller. For example, assume controller number 1 controls a mute button. If you send "CS <1> <754>", and then "GS <1>", it will return 0, not 754. More generally, if the parameter you are controlling has granularity coarser than the 16-bit values used, the returned values will be quantized to the granularity of the parameter. Example controls where you might observe this effect are buttons as mentioned above, selector sliders and the 0-2ms delay slider. Note that for selectors, reading back the values of the input buttons does not work correctly.

If the same controller number is controlling multiple parameters in Studio Matrix™, the value returned is the first one assigned by the user. Because of the confusion that may arise from this, it is recommended that every parameter controlled be given a unique controller number. If you would like a single user object (e.g. single slider) to control several different parameters (e.g. three different faders), then the combining of the controls should be done in the control system software or by using control logic modules.

(GS2) Get RS-232/485 Controller With Position

This command will return the controller number with controller position (value) associated with it together in the same string. This command is provided at the request of AMX/Crestron programmers to make it easier to interpret and parse returned controller positions. The command must specify the RS-232/485 controller number. The syntax of the command is:

"GS <CONTROLLER NUMBER><CR>"

Where <CONTROLLER NUMBER> is the decimal RS-232/485 controller number (1-10000) assigned in SymNet™ Designer.

If the command is accepted, the SymNet™ unit will respond with the string:

"<CONTROLLER NUMBER> <CONTROLLER POSITION><CR>"

Where controller position is a 16-bit number in decimal (0-65535)

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

A typical reason for failure is that the specified controller number is not controlling anything in the current design.

(SV) Set Volume

This command will set the analog input or output volume of one or all inputs/outputs to the specified value. This command only applies to Icarus and Ulysses hardware devices. The syntax of the command is:

`"SV <I/O NUMBER> <VOLUME><CR>"`

Where <I/O NUMBER> = 1-16 for inputs (1-16), 101-116 for the outputs (1-16), 0 for all inputs, 100 for all outputs or 1000 for all inputs and outputs. <VOLUME> is a decimal gain value in dB ranging from -96.0 to 31.5. A value of -96.0 is equivalent to mute or OFF.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

`"ACK<CR>"`

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

`"NAK<CR>"`

Example: "SV 104 -12.5<CR>" sets the volume of output #4 to -12.5dB.

(GC) Get Configuration

This command will return the number of the currently running configuration. The syntax of the command is:

`"GC<CR>"`

If the command is accepted, the Studio Matrix™ unit will respond with the string:

`"<CONFIG NUMBER><CR>"`

Studio Matrix™ only has one configuration, the <CONFIG NUMBER> return value will be either -1, 0 or 1. A return value of -1 indicates that no configuration is currently running (dancing lights). A return value of 0 indicates a configuration downloaded by the host is currently running (from an F5 download). A return value of 1 indicates the configuration stored in flash is currently running (from an F4 download).

If the command is interpreted but fails for any reason or no configuration has been downloaded or triggered, the Studio Matrix™ unit will respond with the string:

`"NAK<CR>"`

(LC) Load Configuration

This command will load and start running the specified configuration on the currently addressed unit. The syntax of the command is:

`"LC <CONFIG NUMBER><CR>"`

Where <CONFIG NUMBER> = 1.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

`"ACK<CR>"`

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

`"NAK<CR>"`

Note: this command affects the currently addressed unit only. If the intent is to "globally" load a configuration across multiple units, see the **Load Configuration Global** command below.

(LCG) Load Configuration Global

This command will load and start running the specified configuration on all Studio Matrix™ units. This command should be issued to the master Studio Matrix™ unit (device address 1). It may be necessary to precede this command with a Set Unit command to ensure that you are talking to the master unit. The syntax of the command is:

"LCG <CONFIG NUMBER><CR>"

Where <CONFIG NUMBER> = 1.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"ACK<CR>"

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

(GPR) Get Preset

This command will return the last preset that was loaded. The syntax of the command is:

"GPR<CR>"

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"<PRESET NUMBER><CR>"

If a configuration is running, the <PRESET NUMBER> return value will be 0-1000. A return value of 0 indicates that no preset has been recalled.

If the command is interpreted but fails for any reason or no configuration has been downloaded or triggered, the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

(LP) Load Preset

This command will load the specified preset (1-1000) on the currently addressed unit. The syntax of the command is:

"LP <PRESET NUMBER><CR>"

Where <PRESET NUMBER> = 1-1000.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"ACK<CR>"

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

A typical reason for failure is that no configuration has been downloaded.

Note: this command affects the currently addressed unit only. If the intent is to "globally" load a preset across multiple units, see the **Load Preset Global** command below.

(LPG) Load Preset Global

This command will load the specified preset (1-1000) on all Studio Matrix™ units. This command should be issued to the master Studio Matrix™ unit (device address 1). It may be necessary to precede this command with a **Set Unit** command to ensure that you are talking to the master unit. The syntax of the command is:

“LPG <PRESET NUMBER><CR>”

Where <PRESET NUMBER> = 1-1000.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

A typical reason for failure is that no configuration has been downloaded.

(GN) Get Redundancy

This command will query the currently selected unit (via the **Set Unit** command) to determine whether it is active or not in a redundant pair. The syntax of the command is:

“GN <CR>”

If the unit is active, it will respond with the string:

“ACK<CR>”

If the unit is not active, it will respond with the string:

“NAK<CR>”

(SU) Set Unit

This command will cause all future commands to be redirected to the unit at the specified SymLink™ address. This redirection will persist until power cycling or issuing the next **Set Unit** command. The **Set Unit** command can only be sent if you are physically connected to the RS-232 Controller Port of a SymLink™ Master Unit (Device Address of 1). **NOTE:** This is the only command that includes a hex value number. The syntax of the command is:

“SU <\$UNIT ID><CR>”

Where <\$UNIT ID> is a unique identifier for each hardware device in a Studio Matrix™ system. The UNIT ID combines the ring number and the device address as set by the rear panel DIP switches.

Combining the ring number and device address is done according to the formula:

$$\langle \$UNIT ID \rangle = (\langle \$RING NUMBER \rangle - 1) * \$100 + \langle \$DEVICE ADDRESS \rangle$$

If only one ring is present, then the ring number is 1.

Example Formulas:

Ring 1, Address 1 Primary, <\$UNIT ID> = \$001
Ring 2, Address 3 Primary, <\$UNIT ID> = \$103
Ring 2, Address 3 Secondary, <\$UNIT ID> = \$113
Ring 5, Address 7 Primary, <\$UNIT ID> = \$407
Ring 5, Address 7 Secondary, <\$UNIT ID> = \$417

Actual Commands to Send:

SU 1<CR>
SU 103<CR>
SU 113<CR>
SU 407<CR>
SU 417<CR>

NOTE: Even though a (\$) is used in the above example formulas to indicate a hex value, you do not actually use the (\$) in the actual command sent, just the hex value as a decimal number.

NOTE 2: To address a secondary unit in a redundant system, add \$10 to the address.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

If you do not use the **Set Unit** command, changes to RS-232/485 controller positions will only be sent to the unit that you are physically connected to (with the exception of the commands designated as “global” which are sent to the master unit and broadcasted on to the other units).

(FU) Flash Unit

This command momentarily flashes the front panel LEDs of the unit being addressed. This command can be used as a quick test to verify communications. The syntax of the command is:

“FU<CR>”

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

LEDs on units other than the one to which you are physically connected can be flashed by using the **Set Unit** command, as previously described.

Setup Commands

NOTE: If you ever find yourself in a situation where you are not sure of the accessory controller port settings, you can use Studio Matrix™ Designer to return the unit to default values. Simply open the Hardware->Upgrade Firmware dialog and click on the Erase Memory button. You can then select to erase the Accessory Serial Port Settings. Doing this will set the baud rate, port number, echo mode and quiet mode settings to the factory default values.

(SB) Set Baud

The **Set Baud** command controls the accessory controller port's baud rate.

The syntax of the command is:

"SB <BAUD><CR>"

Where <BAUD> is 9600, 19200, 38400, 57600 or 115200.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"ACK<CR>"

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

The baud rate will be saved in non-volatile memory. It does not need to be continually set. It will not hurt the unit to be repeatedly set with the same value as it is only written if a different value is set. The new state will not be used until the next time power is cycled. **NOTE:** New units default to a baud rate of 38400.

(SQ) Set Quiet Mode

The **Set Quiet Mode** command controls the text output of the control port during responses. When quiet mode is turned on, it restricts the output to just ACK, NAK or a single value. All command descriptions above assume that quiet mode is turned on. Quiet mode ON should be used when using a controller with RS-232.

When quiet mode is set to OFF, lengthy strings intended to be read by humans are sent in response to commands. This mode is useful when using a terminal program for testing or debugging.

The syntax of the command is:

"SQ <ON/OFF><CR>"

Where <ON/OFF> is 0 = OFF, 1 = ON.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

"ACK<CR>"

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

"NAK<CR>"

The quiet mode state will be saved in non-volatile memory. It does not need to be continually set. It will not hurt the unit to be repeatedly set with the same value as it is only written if a different value is set. Quiet Mode is hardware device dependent. That is, Quiet Mode, if desired or not desired, needs to be set on each individual unit in the system. **NOTE:** New units default to quiet mode ON.

(EH) Set Echo Mode

The **Set Echo Mode** command controls the text output of the control port during commands. When echo mode is turned on, all characters that are received on the RS-232 port are sent or “echoed” back. This mode is useful when using a terminal program for testing or debugging.

When quiet mode is turned off, the characters received are not echoed back. All command descriptions above assume that echo mode is turned off. Echo mode **OFF** should be used when using a controller with RS-232.

The syntax of the command is:

“EH <ON/OFF><CR>”

Where <ON/OFF> is 0 = OFF, 1 = ON.

If the command is accepted, the Studio Matrix™ unit will respond with the string:

“ACK<CR>”

If the command is interpreted but fails for any reason the Studio Matrix™ unit will respond with the string:

“NAK<CR>”

The echo mode state will be saved in non-volatile memory. It does not need to be continually set. It will not hurt the unit to be repeatedly set with the same value as it is only written if a different value is set. Echo Mode only needs to be set on the hardware unit to which the serial cable is currently connected as that unit determines how echo mode is handled regardless of which unit you are currently addressing. **NOTE:** New units default to echo mode **OFF**.

End of Document