

Matrix Switch Corporation Serial Control Protocol

Physical connection

RS-232, 9600 baud, 8 data bits, 1 stop bit, parity = NONE, flow control = NONE.

Protocol Properties

The protocol is an ASCII protocol, which means that commands can be sent to the router from a terminal or keyboard, as well as from an external control or automation system. The protocol is compact and concise. The protocol is human readable and writable.

The Prompt '>'

The control port uses a prompt that makes the terminal screen easier to read (similar to a dos command line). If the last command was understood and executed properly, the prompt is a greater than '>' symbol. If the last command returned an error, the command prompt will show an 'E', the error code, then the prompt (ex. E06>).

If the last command was a query the prompt will show the response followed by a greater than symbol (ex. 1,2,3>)

Command Format:

Commands are entered using a simple command format.

- Command Character.
- Up to 6 numeric arguments separated by commas.
- Carriage Return <CR> **OR** Command Delimiter <#> **OR** Query Operator "?"

(ex. "X1,2,3<CR>" sets output 1 to input 2 on level 3)

If there are less than 2 arguments, the command does not require a comma. For example "X1<CR>" and "C<CR>" are valid. If a comma is entered after the command character but before any arguments, it will be discarded.

The Query Operator '?'

Adding a question mark to the end of a command will act like entering <CR> except it will process the command as a query and print the data requested before returning a prompt. For example "X1?" returns the status of output 1 on all levels, while "X1,2?" returns the status of output 1 on level 2.

Escape Key [ESC]

The escape key will clear the command buffer and any stacked commands and return to the prompt.

Other Characters

All characters that are not a valid command characters, argument value, argument delimiter, command delimiter, query operator, or any other character not specifically listed in this documents will be ignored by the command processor.

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LEGAL ARGUMENT VALUES:

Argument	Valid Range	Meaning
[out]	1..32	Output number
[in]	1..32	Input number
[lev]	0..4	Level number (0=ALL)
[cfg]	156	Configuration password to configure the router. Factory use only.
[flags1]	Any	8 bit configuration value (like dips) which can be used to configure the system at the Factory.
[flags2]	Any	8 bit configuration value (like dips) which can be used to configure the system at the Factory.
[out-ct]	1..32	Total number of outputs in the system
[in-ct]	1..32	Total number of inputs in the system
[lev-ct]	1..4	Total number of levels in the system
[ena]	0..1	0=DISABLED 1=ENABLED

ERROR CODES:

Error Response	
E01	Invalid Command
E02	Invalid Input Number
E03	Invalid Output Number
E04	Invalid Level Number
E05	Invalid Configuration Password
E06

GENERAL COMMAND DESCRIPTIONS:

Command*	Description
X	Crosspoint command
A	Command to set audio gain
D	RGB switch through black delay
P	Recall a preset
W	Copy the current status of the system to a preset
E	Enables or disables diagnostic printing
S	Status command
C	Configuration command (for factory use)

* Upper or lower case

DETAILED COMMAND DESCRIPTIONS:

X Command (Crosspoint command)

Purpose: The X command is used to make changes to and retrieve status from router crosspoints. Setting

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router crosspoints with the X command is simple and direct. Use as many of the optional parameters that are needed to achieve the desired result.

X[out]<CR>

A X command with one argument will always act as a query and is identical to X[out]?. This command will return the status of [out] on all levels.

EX: "X1<CR>" may return a response of "1,1,2,2>" (4 level router) indicating that output 1 is set to input 1 on levels 1 & 2, and input 2 on levels 3 & 4.

X[out],[in]<CR>

A X command that has two arguments will switch [out] to [in] on all levels.

EX: "X1,2<CR>" sets output 1 to input 2 on all levels.

X[out],[in],[lev]<CR>

A X command that has three arguments will switch [out] to [in] on [lev].

EX: "X1,2,3<CR>" will switch output 1 to input 2 on level 3.

X[out],[in],[lev-a],[lev-b]<CR>

A X command that has four arguments will switch [out] to [in] on [lev-a] and on [lev-b].

EX: "X1,2,3,4<CR>" will switch output 1 to input 2 on level 3 and level 4.

Up to 4 levels can be listed in an X command for a total of 6 arguments.

EX: "X1,6,1,2,3,4<CR>" will switch output 1 to input 6 on levels 1,2,3 and 4. This command is identical to "X1,6<CR>".

X Command Stacking

X commands can be stacked, enabling multiple crosspoints to be changed simultaneously.

Entering a command delimiter <#> at the end of a command, rather than <CR> will cause that command to be stacked until the next <CR> is received.

EX: "X1,1#X2,2#X3,3<CR>" will switch output 1 to input 1, output 2 to input 2, and output 3 to input 3 when the <CR> is entered.

X Queries

X queries are similar to X commands but they are terminated with the Query operator "?" and have a maximum of 2 arguments.

X[out]?

Returns the status of [out] on all levels separated by commas and ending with a prompt. The format is [lev-a],[lev-b],[lev-c],[lev-d]>.

EX: "X1?" may return a 2,2,2,2> indicating that output 1 is set to input 2 on all 4 levels.

X[out][lev]?

Returns the status of [out] on [lev] ending with a prompt.

EX: "X1,2?" may return a 3> indicating that output 1 is set to input 3 on level 1.

A Command (Audio Gain)

Purpose: The "A" commands are used to change the audio input or output gain values. The values can be set to an absolute value, incremented up or down.

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In and A Command the A must be followed by an I or O to designate input or output the number of that input or output. Than a L or R to designate left or right. This combination is then either followed by a U to indicate increment up one step, a D to indicate increment down one step or a number between 0 and 255 indicating the absolute value of the gain. Where 127 is unity gain, 0 in mute or minimum gain and 255 maximum gain. The A command can end with a <CR> or it can be strung in a multiple command string, which may include multiple gain setting to be executed in a 'stack-and-load' sequence. The A command can also be ended with a "?" query to receive the current audio gain values (left and right) for a given audio input or output.

Example:

AI2,L150<CR> means Input 2, left channel set gain to 150.

Or:

AO4LD<CR> means decrease the gain of output 4 left by $1/256^{\text{th}}$.

Changes in audio gain caused by either remote control panels, a local control panel, the Ethernet TCP/IP port or any other means are not reported out of the RS232 as they occur. To determine the current setting of an audio gain the query format of the audio command must be used.

Example:

AI2L? will return the string: 150>.

This protocol and the corresponding hardware only supports one stereo audio level with control of audio input and output gain values. Thus gain setting commands and queries do not require the level being controlled to be identified.

D Command (RGB delay switching)

Purpose: Depending on the characteristics of a particular display device an RGBHV switch between sources that are either not the same resolution or not locked to each other may cause an undesirable picture for a brief interval. The D command switches the RGB signals for the desired output to black and then after the selected delay time has elapsed completes the switch of the RGB signals to the new source. The H and V channels switch immediately at the beginning of this cycle.

The D command format is:

D[out],[dly]<CR>

"dly can is a single digit value from 0 to 9. 0 equals no RGB delay and 9 equals a delay of 4.5 seconds.

Example:

D5,6<CR> will cause any switching or sources to output 5 to have 3 seconds of black before switching to the new RG source.

If a new command that affects the selected output occurs while the delay cycle is in progress, the new

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command overrides the cycle in process. The D command can be used dynamically. Meaning if the external control system knows that certain sources are either the same resolution or are in fact 'locked' together, the D command can be changed as needed before each new source is selected. The D command can be mixed with other commands in a 'stack-and-load' (by using the "#" character as described above in the "X" command) string.

P Command (Recall a preset)

Purpose: The control system has ten 'preset registers' (numbered 0 through 9). Each of these registers can store the entire setup of all parameters (X, A and D commands) for the entire system. A short "P" command will recall these settings from memory.

Example:

P0<CR> will recall the values in preset register 0.

W Command (Write to a preset) *See note 1 below*

Purpose: The "W" command is used to write the current status of the system to a selected preset memory for later recall with the "P" command.

Example:

W5<CR> will write the current status of the system to preset memory number 5 and overwrite any data previously stored in that preset memory register.

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E Command (Enable print command)

Purpose: The E command enables or disables printing of updates to the serial port. Printing is for diagnostic purposes only.

E[ena]<CR>

The E command will set the diagnostic printing mode to [ena].

EX: "E1<CR>" sets diagnostic printing to ENABLED.

EX: "E0<CR>" sets diagnostic printing to DISABLED.

When printing is enabled, any router crosspoint updated from the control panel network will cause the new status of the crosspoint(s) to be printed to the serial port. The format of this printing is as follows.

O[out],[in],[lev],[lev],[lev],[lev]<CR>

EX: "O1,2,2,2,2<CR>" is printed to the serial port when a control panel changes the status of output 1 and the new status of output 1 is input 2 on all levels.

The printing feature, when enabled will effect the responsiveness of the router frame to external stimulus from the control panel network and from the control port. The degree of this penalty will vary depending on the size of the router and traffic on the various frame CPU interfaces. For this reason, printing will always be initialized to DISABLED on start-up and the value will not be stored in NV storage. The print messages, when enabled

S Command (Status command)

Purpose: The S command is used to print the router status to the serial port for diagnostic purposes. This report is printed in tabulated format and shows the status of each crosspoint. This command does not require a <CR> to complete the command. As soon as the 'S' is entered the report will be printed.

This command is intended for use by the factory only. The processor will not be able to process stimulus from other interfaces from the time this report begins printing to the time this port finishes this report.

S

Just type 'S'

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C Command (System Configuration command)

Purpose: The C command is used to make changes to and retrieve configuration information from the routing switcher.

This command is intended for use by the factory only and requires a password to change any of the configuration parameters. This will prevent accidental changes to the router's configuration by users. The routers configuration can be displayed without a password.

C<CR>

A C command without an argument will always act as a query. This command will display the router configuration screen on the terminal, followed by a prompt.

EX: "C<CR>".

C[*cfg*],[*out-ct*],[*in-ct*],[*lev-ct*],[*flags-1*],[*flags-2*]<CR>

EX: "C156,16,16,1,0,0<CR>" configures the router for 16 inputs, 16 outputs, 1 level and sets configuration flags 1 & 2 to zero.

A C command must include all 6 arguments, and the correct password, or it will be treated as a query. After each change using the 'C' command the routers new configuration will be printed to the serial port. The new configuration will also be saved to NV storage.

Configuration Screen:

```
### CONFIGURATION ###
```

```
OUTPUTS: 16
```

```
INPUTS: 16
```

```
LEVELS: 1
```

```
FLAGS-1: 0
```

```
FLAGS-2: 0
```