MatrixPRO-II Serial Protocol

3/31/2010

Based on MU Firmware version 2.20

1 Contact and Warranty Information

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Operators Safety Summary

The general safety information in this summary is for operating personnel.

Do Not Remove Covers or Panels

There are no user-serviceable parts within the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

Power Source

This product is intended to operate from a power source that will not apply more than 230 volts rms between the supply conductors or between both supply conductor and ground. A protective ground connection by way of grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals.   A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse having identical type, voltage rating, and current rating characteristics. Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Terms In This Manual and Equipment Marking

WARNING

Highlights an operating procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to or death of personnel.

Note	Highlights an essential operating procedure, condition or statement.

CAUTION

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

AVERTISSEMENT!

Le point d´exclamation dans un triangle equilatŽral signale à alerter l´utilisateur qu´il y a des instructions d´operation et d´entretien tres importantes dans la litŽrature qui accompagne l´appareil.

VORSICHT

Ein Ausrufungszeichen innerhalb eines gleichwinkeligen Dreiecks dient dazu,   den Benutzer auf wichtige Bedienungs-und Wartungsanweisungen in der Dem   Great beiliegenden Literatur aufmerksam zu machen.

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Change History

Rev	Date	ECP #	Description	Approved By
00.00	4/1/10	577375	Initial Release	R. Pellicano

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2 General Notes

2.1 Output Level Range:
Output level range -45 dB to +5dB in one dB steps.

2.2 Input Trim Range:
Input trim range –10 to +10 dB in one dB steps.

2.3 Serial Port Settings:
The serial protocol is 38400 baud, 8 bits, 1 stop, no parity, no flow control. Only TX, RX, and GND pins are used on the female 9-pin D-Sub connector. The MatrixPRO-II is a DCE device (receiving from a PC) and will receive on pin 3, and send on pin 2, pin 5 (GND) is the only other pin used on the 9-pin D-Sub connector.

2.4 Referencing Video Cards:
The MatrixPRO-II   will be able to split the video cards into different signal types. When this occurs the following method will be used to reference the video cards:

If the matrix is configured as an RGB matrix:
    The red video card will be referred to as the "A" video port.
    The green video card will be referred to as the "B" video port.
    The blue video card will be referred to as the "C" video port.

If the matrix is configured as a Component matrix:
    The Y video card will be referred to as the "A" video port.
    The U(Pr) video card will be referred to as the "B" video port.
    The V(Pb) video card will be referred to as the "C" video port.

If the matrix is configured as an S-Video matrix:
    The Y video card will be referred to as the "A" video port.
    The C video card will be referred to as the "B" video port.

Audio will always be referred to as the "F" card.

2.5 Matrix Types
An ASCII number will reference the four types of matrices. The reference numbers are as follows:
    "1" = RGB
    "2" = S-Video
    "3" = Composite
    "4" = Component

3 <u>Updating MatrixPRO-II Software</u>

The user will be able to update the MatrixPRO-II software, which will be done via a proprietary Visual Basic program. This function is not programmable by the user and will not be defined in this document.

4 Request/Response Format

All requests and responses are entirely in ASCII. This makes the MatrixPRO-II easy to use with other control systems from AMX, Crestron, etc. The requests can be in either upper or lower case.

All requests/responses have a three character type field followed by the data required for that specific request/response. All requests are terminated with either a carriage return (0Dh), which are referred to in this document as *<cr>* or with a semi-colon character (;). The semi-colon permits the user to enter multiple commands in a single line of ASCII text. All responses are terminated with a carriage return *<cr>* and a line feed (0Ah) which will be referred as *<lf>*.

4.1 Field Separators

Fields are separated by *white* space, that is any number of spaces or tabs as long as the entire command is less than 256 characters. A *<cr>* terminates the command. Below is an example describing a command.

EX	05	*<cr>*

So the actual message would look like this:

EX 05*<cr>*

4.2 Command Request Syntax:

This document uses the following notation when describing the syntax of a command request:

BOLD – identifies the command

lower case – identifies data to be entered which is described in the text following the syntax description

" "   - entry defined within double quotes is to be entered exactly as shown

< >   - entry defined within these brackets is required

[ ]   - entry defined within these brackets is optional

{ }   - entry defined within curly brackets must be entered at least once

| - a vertical bar denotes a logical choice of entry

*   - an asterisk following either [ ] brackets or curly brackets { } above denotes that data within either brackets or curly brackets may be entered multiple times.

number sequence – this refers to a single number or a sequence of numbers, each number separated from the next by a comma and may also include a range of numbers (e.g. 1,3,5,7-11, 12, 16)

4.3 Command Request Comment Fields

The ASCII syntax of the request protocol accommodates the ability to optionally insert comments into the Command Request. Comments must be enclosed within the **#** character. This feature was intended to facilitate user descriptions of the audio and video which they are configuring but may, of course, be used however the user sees fit. The

comments are ignored by the MatrixPRO-II but, of course, add to serial transmission overhead.

Example:

Below is an example of uncommented connection commands.

CON 1 (1) 2 (2-4) 1F(1)*<cr>*
VOL L 1 –45*<cr>*

The above could have comments added as follows:

CON 1 # Sony DVD # (1) 2 (2-4)   # Configures training rooms A,B, and C #*<cr>*
VOL L 1 –45   # Initialize output 1 to floor of –45 dB #*<cr>*

5 Acknowledging Receipt of Commands

Each request sent to the MatrixPRO-II have by default two possible responses, an acknowledgement of a correct request or an error response. The acknowledge response will be:

Ok*<cr><lf>.*

The MatrixPRO-II may also be configured via command (see below) to suppress all responses. The user should exercise care when configuring no response as the user will obviously have no feedback as to the success of the command.

The user may also wish to receive an echo of the command that was sent along with the acknowledgement. This is configurable via the ECH command (see below). Echoing of commands may be of use to serial users attempting to distinguish the original command to which an acknowledgement has been sent. An example appears below of a command and the echoed response.

Command:
CON 1 (1) 2 (3-5)<cr>

Response with echo:
CON 1 (1) 2(3-5)<cr><lf>
Ok<cr><lf>

6 Error Response

In the event an invalid *command* is sent to the MatrixPRO-II, it will respond with the message "**ERR: unknown command**". If an invalid parameter is sent to the MatrixPRO-II, the unit will respond with the message "**ERR:** " followed by the valid syntax for the errored entry.

Example:
A connect request with an incorrect input number:
CON 0 (8)*<cr>*
The error response would be:
ERR: CON {<input>[card specifier] <"("numberSequence")">}*<cr>

Note that the returned error response may be expanded to a more detailed version by entering *verbose mode.* This mode may be turned on by issuing a VRB Y command. The expected syntax for the command will be returned, as above, and a description of each parameter.

For example, if verbose mode were turned on and the above command issued, the response would be:

ERR: CON {<input>[card specifier] <"("numberSequence")">}*<cr>
CON {<input>[card specifier] <"("numberSequence")">}*<cr>
        Connect the specified input to specified output.

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input	Input number in the range 1 – max inputs
card specifier	optional indicator of the card type with "A","B"or"C" (applicable to split mode) designating video and "F" designating audio.
numberSequence	Outputs as number sequence in range 1 - max outputs.

7 <u>MatrixPRO-II Configuration</u>

During production the unit will be configured with a configuration file that will contain matrix type, total inputs, total outputs, volume calibration, and serial number. This eliminates the need for jumpers or dipswitches.

8 Split Mode

The video cards on the MatrixPRO-II contain inputs and outputs. Signals that enter through an input can only be switched to outputs on the same physical card. The design of the video boards does not allow switching signals between video cards.

The majority of users will use the unit for the flavor it was built for. That is, all RGB, all S-Video, all Component or all Composite. There is no special setup required to describe the inputs and outputs in their native signal types as each input and output default type is its native type.   However, some users might wish to use unallocated constituent video signals, say for RGB for other signal types such as S-Video or Composite. This is known as *split mode.*

The user will be able to split the inputs/outputs of a RGB, Component or S-Video matrix. The inputs/outputs on a RGB matrix will default to Red, Green, and Blue components, but they may be defined as representing combinations of composite and/or the two S-Video signals.

One basic recommendation is that if you assign the two S-Video components ("Y" and "C") to the green and blue cards on an RGB matrix, then any other S-Video inputs or outputs should also be assigned to the green and blue video cards. The user can still use the red card for composite. This will take some of the complication out of the setup process.

It is important that the user realize one very hard and fast rule; that inputs defined as residing on a video card can **ONLY** be connected to an output residing on that same card. This is because the representative A, B, and C input signals are only physically connected to their respective output card type. For example; if input 14 is defined as a composite video on the red video card it can only be connected to an output that is also a composite video residing on the red video card. The same goes for S-Video, if input 16 is defined as a S-Video on the green/blue video cards it can only be connected to an S-Video output on the green/blue video card. Failure to follow this rule will result in unexpected results.

8.1   RGB matrix used in Split Mode

The user can define the three video cards as Component video

The user can also define one card for composite video, and the remaining two for S-Video. If the user uses the red card for composite video it would make sense that all subsequent composite video inputs or outputs should reside on the red card. The user has the same rule with S-Video, if the user defines green/blue card input for S-Video, then all S-Video inputs or outputs should be on the green/blue boards. If green/blue is used for S-Video, the red card may be used for composite video.

The only definition that is not allowed on a RGB matrix is S-Video on the red and blue video cards.

9 MatrixPRO-II REQUEST LIST QUICK REFERENCE

REQUEST	DESCRIPTION
AVT	Audio type selection
CBL	Cable length configuration
CFG	Configuration Request
CON	Connection Request
DEL	Delay Request
DIS	Disconnect Request
ECH	Echo Commands Request
FPL/FPU	Front Panel Lock/Unlock Request
HLP	Help
INP	Input port Setup
MOD	Model request
MUT	Mute
NAM	Assign names to inputs and outputs
OUT	Output port setup
PST	Preset Requests
RFD	Return to Factory Defaults Request
RSP	Response
RGB	RGB Delay Request
STA	Status Requests
STD	Set time/date
SYN	Sync Equalization
VER	Request version numbers
VOL	Volume request
VRB	Verbose

10 Audio Type

The user will be able to select the type of audio input, Professional or Consumer, with the AVT request. Factory default setting is Consumer for all inputs. The format of the AVT request is as follows:

AVT	"P"|"C"	inputSequence	*<cr>*

Syntax: AVT <"P"|"C"> <inputSequence><cr>
Where:
AVT   Audio type request
"P"|"C"   P for professional, C for Consumer
inputSequence   Input *number sequence* in range of number of inputs

Example:
AVT P 1, 4-8
Sets inputs 1 and 4 thru 8 to professional.

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11 <u>Cable Length Request</u>

The cable length request gives the user the ability to set the length of cable from the unit to the display for outputs or the length of cable from the source to the unit. The settings are from 0 to 150 feet in increments of 10 feet represented by the values 0-15. Zero feet is off. Factory default setting is a length of 0 for all inputs and outputs.The format of the cable length request is as follows:

CBL	"I"|"O"	length|"?"	numberSequence	*<cr>*

Syntax: CBL <"I"|"O"> <length|"?"> <numberSequence><cr>
Where:
CBL   Cable length request header
"I" | "O"   I=Input, O=Output
length   0 (off) to 15 representing 10' increments, or "?" for inquiry
numberSequence   The input or output *number sequence* being assigned a length.

Example:
CBL I 5 2,4-6*<cr>*
Sets inputs 2, 4, 5, and 6 to a cable length of 50 feet.

12 Configuration Request

The Configuration request is used to obtain the unit's model number. The model number describes the number of inputs and outputs, the type of the matrix, audio functionality, and equalization functionality.

The format for the configuration request is as follows:

CFG	*<cr>*

Syntax: CFG<cr>
Where:
CFG　　　　　Configuration request

Example:
　　CFG<cr>

For a 16x16 RGB matrix with audio and equalization functionality the response will be:

　　MSRF-1616

The returned text will be one of the following:

```
MSR-1208
MSRC-1208
MSRD-1208
MSRF-1208
MSR-1616
MSRC-1616
MSRD-1616
MSRF-1616
MSR-3232
MSRD-3232
```

13 Connection Request

The connection request is used to connect an input to one or more outputs. The unit checks the signal type of the input and output and if they are compatible then the unit connects them. (By default, the signal inputs and outputs are compatible as they represent their native matrix type.   Only when inputs and outputs are designated as *split* using the INP/OUT request does this present a concern.) Connections may be disconnected by using the **DIS** command (see later in document).

CON	input[card specifier]	"("numberSequence")"	*<cr>*

Syntax:
CON {<input>[card specifier] <"("numberSequence")">}*<cr>
Where:
CON   Connection request header
input   Input number in the range 1 – max inputs.
card specifier   Optional indicator of the card type with "A","B"or"C" (applicable to *split mode*) designating video, and "F" designating audio.
numberSequence   Outputs as a *number sequence.*

Split Video Connections

The connection request can be used to connect split inputs and outputs. For split video connection requests the user needs to specify "A","B", or "C" following the input number followed by the output number being connected. The output number need not contain the card specifier since if the output has been previously identified as split using the OUT command and is of the same card type then the card specifier is understood to be the same as that designated with the input number. Audio connections may be thought of as 'split' and always residing on the "F" card, so audio connection inputs need to designate an F along with the input.

For example, if the user wanted to connect input 14A to output 14A and both have been previously defined as S-Video for instance then the user need only designate the "A" specifier on the input since the association to ouput on the A card is understood. If the user wanted to connect audio of input 10 then an "F" would have to be included for the input. If the requested input type is not compatible with any of the specified output types then the request will be rejected and an incompatibility error reported (see below).

To connect an input to multiple outputs separate the outputs with a comma. The last output is followed by a carriage return.   Partially compatible connection requests will result in the entire request being rejected and an incompatibility error reported (see below).

Single Connection Example:

To connect input 5 audio to output 4 the connection request would look like this:
CON 5F (4)*<cr>*

Multiple Connection Example:

To connect input 10 video defined as its native matrix type to outputs 2, 4, 8 defined as the native matrix type the connection request would look like this:

CON 10 (2,4,8)<cr>

To connect audio input 3 to audio outputs 3, 4 and 11 send the following request:

CON 3F (3,4,11)<cr>

Multiple Connection Example (with multiple input designations):

To connect input 1 to output 3, input 4 to outputs 2,4, and 7, input 10 to outputs 8,9, and 10, the connection request would be as follows:

CON 1 (3) 4 (2,4,7) 10 (8,9,10)<cr>

Error Example:

The user attempts to connect input 1, previously defined as split, to outputs 8 and 9. with the following request:

CON 1 (8,9)<cr>

Since input 1 was previously defined as split then a card specifier is required to completely characterize the type of split connection being connected. The above command will result in the error response:

CON ERR: One or more incorrect connection specifications detected.

Split Video Examples

The following are examples of how to connect split video on the matrix. Note that prior to attempting split connections, the prospective split inputs and outputs to be connected must have been defined as split with the **INP** and **OUT** commands respectively.

Split Single Connection Example:

To connect input 5B video to output 4B the connection request would look like this:

CON 5B (4)<cr>

Note that the card specifier for output 4 is not designated since card B for output 4 has already been previously defined as the same type as that of 5B.

Split Multiple Connection Examples:

To connect input 5B previously defined as split S-Video to outputs 12B, 13B, and 16B previously defined as split S-Video, the user would issue this request:

CON 5B (12,13,16)<cr>

**Split Multiple Connection Example (with multiple input designations):**

To connect input 5B previously defined as split S-Video to outputs 12B, 13B, and 16B previously defined as split S-Video, input 7A previously defined as Composite to outputs 13A, 16A, and 17A previously defined as Composite, and input 6 audio to output 6 and 7 audio the user would issue this request:

CON 5B (12,13,16) 7A (13,16,17) 6F (6,7)<cr>

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14 <u>Delay Request</u>

　　　　Some devices require a delay when switching RGB. The delay request enables or disables the delay for the output. Since this is a RGB function it will not be available on S-Video or composite ports.

NOT CURRENTLY IMPLEMENTED

DEL	"E"|"D"|"?"	outputSequence	*<cr>*
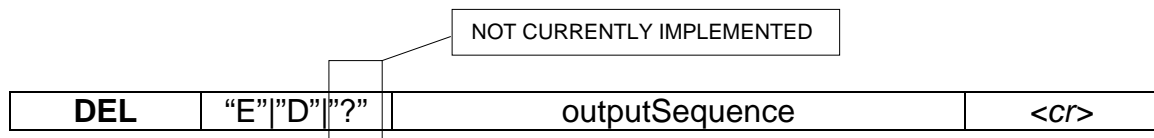
Syntax: DEL <"E"\|"D"\|"?"> <outputSequence><cr>
Where:
DEL　　　　　　　　Delay request header
"E"\|"D"　　　　　　　E=Enable, D=Disable
outputSequence　　　Output as a *number sequence.*
"?"　　　　　　　　　Inquiry for the specified output number(s)

Example:
　　　　To enable RBG delay for outputs 2, 4, 10, 12-15, and 24 the user would send the following message:
　　　　　　DEL E 2,4,10,12-15,24*<cr>*

The matrix would respond to this message with an OK response.

　　　　The matrix will respond with this message to an inquiry of output 12 if output 12 was enabled.

　　　　　　DEL ? 12*<cr>*
　　　　　　DEL E 12

　　　　To get the current status of all the output delays on a 16X8 matrix the user would send the following message:

　　　　　　DEL ? 1-8*<cr>*

　　　　The response would be the following if an output delay on outputs 1-4 are currently enabled and outputs 5-8 currently disabled.

　　　　　　DEL E 1,2,3,4 D 5,6,7,8

15 Disconnect Request

The Disconnect request is used to disconnect a specified output from its input. The unit checks the specified signal type of the output to ensure that it is indeed of that type before attempting to disconnect.

DIS	output[cardSpecifier][","output[cardSpecifier]	*<cr>*

Syntax: DIS <output[cardSpecifier][","output[cardSpecifier]]*<cr>
Where:
DIS   Disconnect request header
output   Output being disconnected.
cardSpecifier   Optional card specifier "A", "B", or "C" for split mode disconnects or "F" for audio disconnects.

Example:

To disconnect video outputs 1, 3, 5-9, all defined as non-split the user would send the following message:
DIS 1,3,5,6,7,8,9*<cr>*

To disconnect video outputs 1B, 3A, 4C (all defined as split), video outputs 2 and 5 (non-split), and audio output of 1 and 10, the user would send the following message:
DIS 1B,3A,4C,2,5,1F,10F*<cr>*

If the user attempted to disconnect a video output defined as split without the proper card specifier then an error would be reported. In the example below, the user attempts to disconnect output 10, defined as split with Composite on A card and S-Video on B and C cards.
DIS 10*<cr>*

DIS ERR: Ambiguous disconnect specification

If the user attempted to disconnect a video output defined as non-split with an optional card specifier, which in this case would be improper, then an error would be reported. In the example below, the user attempts to disconnect output 10B. Since output 10 is defined as non-split this generates an error response.
DIS 10B*<cr>*

DIS ERR: Improper disconnect specification

16 Echo Commands Request

This request allows the user the configure whether an echo of the originally received serial command is output back to the sender. Echoing of commands may be of use to serial users attempting to distinguish the original command to which an acknowledgement has been sent. Echo of commands defaults to OFF and is reset to OFF on a power cycle.
The format for this request is as follows:

ECH[O]	"ON"|"OFF"	*<cr>*

Syntax: ECH[O] <"ON"\|"OFF"><cr>
Where:
ECH   Echo request header.
"ON"\|"OFF"   ON to enable echo, OFF to disable.

Example:

To enable echoing of commands the user would send the following message:
ECH ON*<cr>*

The matrix will respond with an Ok message.

To disable echoing of commands:
ECH OFF*<cr>*

17 Front Panel Lock/Unlock Request

This request is used to disable/enable configuration of the MatrixPRO-II via the Front Panel interface. When the Front Panel is locked a message will be displayed on the FP interface screen indicating such and all button action will be disabled. It may only be unlocked via the appropriate serial request. Front Panel use defaults to unlocked and is reset to unlocked on a power cycle.

The format for this request is as follows:

FPL	**FPU**	*<cr>*

Syntax: FPL | FPU<cr>
Where:
FPL   Lock the Front Panel interface.
FPU   Unlock the Front Panel interface.

Example:
To lock the Front Panel interface the user would send the following message:
FPL*<cr>*

The matrix will respond with an Ok message.

To unlock the Front Panel Interface:
FPU*<cr>*

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18 <u>Help Request</u>

The user will be able to request a list of the valid commands with descriptions and formats. The format for this request is as follows:

HLP	[cmd]	*<cr>*

Syntax: HLP [cmd]<cr>
Where:
HLP   Help Request header
cmd   optional command identifier

If the optional **cmd** is omitted, the matrix will respond with the following text message:

AVT   Audio type selection
CBL   Configures cable length
CFG   Configuration request
CON   Connection request
DEL   Delay enable/disable request
DIS   Disconnect request
ECH   Echo request
FPL   Front Panel lock-out request
FPU   Front Panel unlock request
HLP   Help
INP   Input setup request
MUT   Mute output volume
NAM   Assign names to inputs and outputs
OUT   Output setup request
PST   Preset requests
RFD   Return to Factory Default Request
RGB   RGB Delay request
RSP   Response from Matrix request
STA   Status requests
STD   Set time/date
SYN   Sync equalization request
VER   Version Numbers
VOL   Volume request
VRB   Verbose

Entering **HLP <cmd><cr>,** where cmd is any valid Matrix command in the above list, will return specific help syntax for the command requested. If the user would like more detailed help for a specific command then it is necessary to turn on *verbose mode* using the **VRB Y** command syntax. This will enable returning a description of the parameters of any specific command. The user may return to *non-verbose mode* by issuing the **VRB N** command.

Specific command help is listed below:

AVT <"P"|"C"> <inputSequence><cr>

Select the type of audio for the specified input.
"P"|"C"   P for professional, C for Consumer
inputSequence   Input *number sequence* in range of number of inputs

CBL <"I"|"O"> <length|"?"> <numberSequence> <cr>
Configure cable lengths.
"I" | "O"   I=Input, O=Output
length   0 (off) to 15 in 10' increments, or "?" for inquiry
numberSequence   The input or output *number sequence* being assigned a length.

CFG <cr>
Returns formatted text describing the matrix configuration.

CON {<input>[card specifier] <"("numberSequence")">}*<cr>
Connect the specified input to specified output.
input   Input number in the range 1 – max inputs
card specifier   optional indicator of the card type with "A","B"or"C" (applicable to
                             split mode) designating video and "F" designating audio.
numberSequence   Outputs as number sequence in range 1 - max outputs.

DEL <"E"|"D"|"?"> <outputSequence><cr>
Enable/Disable delays for specified outputs.
"E"|"D"   E=Enable, D=Disable
outputSequence   Output as a *number sequence.*
"?"   Inquiry for the specified output number(s)

DIS <output[cardSpecifier][","output[cardSpecifier]]*<cr>
Disconnect specified outputs.
output   Output being disconnected.
cardSpecifier   Optional card specifier "A", "B", or "C" for split mode disconnects or "F"
                     for audio disconnects.

ECH[O] <"ON"|"OFF"><cr>
Enable/disable echoing of commands.
"ON"|"OFF"   ON to enable echo, OFF to disable.

FPL | FPU<cr>
Front Panel Lock/Unlock command.

HLP [cmd]<cr>
Provides help for MatrixPRO-II command set.
cmd   optional command identifier

INP | OUT <number> {<"A"|"B"|"C"><":"><type>}*<cr>
Specifies input or output configuration applicable to split mode.
number   Input or output number.
"A"|"B"|"C"   A=R card, B=G card, C=B card for RGB matrix
                     A=Y card, B=U card, C=V card for Component matrix

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A=Y card, B=C card for S-Video matrix

type   1=RGB, 2=S-Video, 3=Composite, 4=Component

MOD <""”modelType"”"><cr>
       Specifies the model type of the matrix.
       ""”modelType"”"   The model type string per pre-specified allowed values.

MUT <"M"|"U"> <outputSequence><cr>
       Mutes or unmutes the specified output.
       "M"|"U"   M=mute, U=unmute
       outputSequence   Output as *number sequence* to be muted/unmuted.

NAM <"I"|"O"> <number> <name|"?"><cr>
       Assigns an ASCII string to the specified input/output.
       "I"|"O"   I for input, O for output
       number   Input or output number
       name   Optionally (i.e. no ?) assign alphanumeric name12 ASCII characters or
                       less to specified input or output number enclosed with double quotes.
       "?"   Optionally inquire a previously specified assignment.

PST <"S"> <presetNumber>
<outputNumber[cardSpecifier]>[<","outputNumber[cardSpecifier]>]*<cr>
       Sets and saves the specified preset to memory.
       "S"   S=Save preset request
       presetNumber   Preset in range of 1 to 32.
       outputNumber   Output number 1 – max number of outputs.
       cardSpecifier   Optional card specifier if output is split.

PST <"R"> <number><cr>
       Recalls a previously specified preset.
       "R"   R=Recall and execute preset request.
       number   Preset to recall.

RFD <"Y"|"N"><cr>
       Return to factory default settings.
       "Y"|"N" Y=return to factory defaults, N=don't return

RGB <time><cr>
       Specify an RGB delay.
       time   Amount of time in tenths of seconds from 1 to 100 in ASCII.

RSP <"Y"|"N"><cr>
       Allows suppression of serial responses from matrix.
       "Y"|"N"   Y = response enabled, N = response disabled

STA <"I"|"O"> <number | "A"><cr>
       Returns status for specified inputs or outputs.

"I"|"O" I input, O output
number Input or output number.
"A" A to designate all respective input or output.

Status returns the following if Input requested:

STA { <MatrixType> <InputNumber> <TrimValue> <SplitStatus> [CardSpecifier":"CardType]
}*

MatrixType 1=RGB, 2=S-Video, 3=Composite, 4=Component
InputNumber The requested input.
TrimValue The trim value in range –10dB to +10dB for the specified
SplitStatus Y if split, N otherwise
CardSpecifier If split : A, B, or C specifying split signal type.
CardType If split: 2 designating S-Video or 3 designating Composite.

Status returns the following if Output requested:

STA { <MatrixType> <OutputNumber> <DelayStatus> <MuteStatus> <AudioLevel>
<AudioInputConn> <SplitStatus> [<VideoInputConn> |
[<CardSpecifier":"CardType","VideoInputConn>]*] }*

MatrixType 1=RGB, 2=S-Video, 3=Composite, 4=Component
OutputNumber The requested output.
DelayStatus RGB delay, E=enabled, D=disabled.
MuteStatus M=Muted, U=Unmuted.
AudioLevel The audio output level for the specified output in range –45dB to +5dB.
AudioInputConn The audio input that the specified output is connected to, "255" if unconnected.
SplitStatus Y if split, N otherwise
VideoInputConn The video input that the specified output is connected to, "255" if unconnected.
CardSpecifier If split : A, B, or C specifying split signal type.
CardType If split: 2 designating S-Video or 3 designating Composite.

STD <time> <date><cr>
Sets the time and date.
time Time in format *hh:mm*a|p
date Date in *mm/dd/yy* format

SYN <status> <outputSequence><cr>
Configure Sync equalization
status "0" for OFF, "1" for ON and "2" for AUTO.
outputSequence Output as a *number sequence.*

VER<cr>
Version request returns the following:
VER Matrix Test/Loader = <XX.xx>, Matrix App = <XX.xx>, FP Test/Loader = <XX.xx>, FP
App = <XX.xx>
XX.xx XX = Major version number, xx = Minor version number.

VOL <"L"|"T"> <numberSequence> <value|"?"><cr>
Configures the audio output level or trim for the specified output or input.
"L" | "T"   output Level or Trim
numberSequence   The output *number sequence* if L specified or the input *number sequence* if T specified.
value   Volume value -10 to +10 for trims, -45 to +5 for level (in 1 dB increments) or "+" to increment volume in 1 dB increments, or "-" to decrement volume in 1 dB decrements.
"?"   Inquiry for the specified level or trim

VRB <"Y"|"N"><cr>
Enables or disables verbose mode.
"Y"|"N"   Y turns verbose on, N turns verbose off.

19 <u>Input/Output Request Format</u>

This command allows configuration of the card type for inputs and outputs in preparation for making *split* connections. If the user doesn't intend to ever make split connections then this command may be ignored. The format of the request is as follows:

INP|OUT	number	"A"|"B"|"C"	":"	type	*<cr>*

Syntax: INP | OUT <number> {<"A"|"B"|"C"><":"><type>}*<cr>
Where:
INP   Specifies input configuration
OUT   Specifies output configuration.
number   The input/output number being configured, the range of which is
                        dependent on the number of inputs and outputs of the matrix.
"A"|"B"|"C"   A = R card, B = G card, C = B card for RGB matrix
                        A = Y card, B = U card, C = V card for Component matrix
                        A = Y card, B = C card for S-Video matrix
":"   colon character ties the card type to the virtual matrix type
type   1 = RGB, 2 = S-Video, 3 = Composite, 4 = Component

Definitions of multiple cards in the same input or output will be separated by a space. A semicolon will separate multiple input and outputs definitions in the same request.

Example:

To assign input 14 green to S-Video the following command would be used.
INP 14 B:2*<cr>*

To assign output 15 red to composite the following command would be used:
 OUT15 A:3*<cr>*

To assign input 15 red to composite, and green/blue to S-Video the following request would be sent:
 INP 15 A:3 B:2*<cr>*
Since S-Video uses two video signals (luminance and chroma), defining the B (green) in the request above as S-Video means that the luminance will be on the green card and the chroma on the blue.

To assign output 15 red, green, and blue to composite the following request would be sent:
 INP 15 A:3 B:3 C:3*<cr>*

Although the cards default to RGB on an RGB matrix, the user can still issue this request to return output 2 to its native RGB.

 OUT 2 A:1 B:1 C:1*<cr>*

Multiple Example:

To assign input 15 red to composite, and green/blue to S-Video and output15 the same way the following request would be sent:

 INP 15 A:3 B:2; OUT 15 A:3 B:2 *<cr>*

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20 Model Request

The MOD Model request allows configuration of the model type of the MatrixPRO-II . This command is normally reserved for use by factory personnel and as such the user must have logged in correctly with the PSW command. The format for the model request is as follows:

MOD	"""*modelType*""" |"?"	*<cr>*

Syntax: MOD <"""modelType*"""*|"?"><cr>
Where:
MOD   Model request header.
"?"   Inquire the MatrixPRO-II model number. Return string is in
                        format as described below.
 """modelType"""   The model type in a format defining the number of inputs and outputs, the
                        video type, audio card presence, and/or equalization present. The
                        modelType must be enclosed within single or double quotes. The
                        modelType must be *exactly* one of the following:

                        MSR-1208
                        MSRC-1208
                        MSRD-1208
                        MSRF-1208
                        MSR-1616
                        MSRC-1616
                        MSRD-1616
                        MSRF-1616
                        MSR-3232
                        MSRD-3232

Example:
To configure the matrix model type as 12x8, RGB with audio present and equalization present the user would issue the following string from the list above.
MOD "MSRF-1208"*<cr>*

To obtain the model number the user would issue the following command:

MOD ?*<cr>*

For a 16x8 RGB matrix with audio and equalization functionality the response will be:

MSRF-1608

21 Mute Request

The user will be able to mute any audio output by sending the mute request: The format for the mute request is as follows:

MUT	"M" | "U"	outputSequence	*<cr>*

Syntax: MUT <"M"\|"U"> <outputSequence><cr>
Where:
MUT   Start of mute message
"M"\|"U"   M=mute, U=unmute
outputSequence   Output as *number sequence* to be muted/unmuted.

Example:
MUT M 4*<cr>* – Mutes the audio output of output 4.
MUT U 8*<cr>* – Unmutes the audio output of output 8
MUT M 2,6,9,10*<cr>* Mutes audio outputs 2, 6, 9, and 10.

22 Set Input/Output Name Request

The user will be able to set a name for inputs, outputs, and groups. The name can be up to 12 ASCII characters long. All ASCII characters available on a typical keyboard are allowed *except the double quote character*. The name must be enclosed within double quotes. The set name request is formatted as follows:

NAM	"I"|"O"	number	name|"?"	*<cr>*

Syntax: NAM <"I"|"O"> <number> <name><cr>
Where:
NAM   Name request header
"I"|"O"   I for input, O for output
number   Input or output number
name   Optionally (i.e. no "?") assign as many as 12 ASCII characters to specified input or output number. *The name must be enclosed within double quotes.*
"?"   Optionally inquire a previously specified assignment.

Example:
To name Input 2 "DVD1" the user would send the following message:

NAM I 2 "DVD1"*<cr>*
The matrix will respond with an OK response.

Example:
If the user needed the name for input 2 (from example above) the following request would be sent:

NAM I 2 ?*<cr>*

To which the matrix would respond:

NAM I 2 "DVD1"*<cr>*

23 Preset Request

There are times when the user will want to specify connections and audio output levels that can be recalled at a later time. These connections, stored in non-volatile memory, are called presets. There are 32 presets that may be defined.

Presets are specified using the PST S command using the syntax defined below. A Preset is composed by selecting a set of outputs, video and/or audio, (and thus their associated inputs) from the set of existing output connections. It is therefore a subset of the currently existing output connections from which it was selected. Audio levels for each selected audio output are captured as part of the preset. Once configured from the existing output connections, the preset is saved for later execution (using the PST X command below) and the user is free to modify the existing output connections to accommodate another preset definition as they like.

It is an error to attempt to include outputs as split that haven't been defined as split (via a previous OUT command) or to include outputs as non-split that have been split.

The format for the Preset Save message is as follows:

PST	"S"	presetNumber	outputNumber[cardSpecifier][","outputNumber[cardSpecifier]	*<cr>*

Syntax:
PST <"S"> <presetNumber>
<outputNumber[cardSpecifier]>[<","outputNumber[cardSpecifier]>]*<cr>
Where:

PST	Preset request header
"S"	S=Save preset request
presetNumber	Preset in range of 1 to 32.
outputNumber	Output number 1 – max number of outputs.
cardSpecifier	Optional card specifier if output is split.

Example:
If a user wanted to set preset 1 to include outputs 1, 3, 5F, 7A, 7C, 8B, 12A, and 15 then the user would issue the following message:

PST S 1 1,3,5F,7A,7C,8B,12A,15*<cr>*

NOTE: Each preset has each of its outputs initialized to disconnected. When a preset is defined using the PST S command only those outputs represented in the PST S command are retained for execution. All previously disconnected outputs in that preset are redefined as excluded from the preset. The initial disconnected state of an undefined preset allows the user to execute those presets with the PST G command below to disconnect all outputs.

A previously defined preset may be executed using the PST X command, the syntax of which appears below. The execute command results in the matrix output to input connections and audio levels being configured as defined in the preset.

PST	"X"|"G"	Number	*<cr>*

Syntax: PST <"X"|"G"> <number><cr>
Where:
PST   Preset request header
"X"|"G"   X=Execute preset request for the specified number.
                               G=Get preset settings request for the specified number **(Not currently implemented)**.
number   Preset to recall in the range of 1 to 32.

Response for Preset Get request:
PST G *<PresetNumber>* [*<InputNumber>*[*CardSpecifier*]
"("*<OutputNumber>*[*","<OutputNumber>*]*")"*]*<cr>

Where:
PresetNumber   1 to 32 as originally identified by Number entry in request.
InputNumber   Input number which was part of original connection when preset
                               originally set.
CardSpecifier   Card specifier indicating A,B,C if input split or F if audio.
OutputNumber   Output number to which the specified input is connected.

Note that the [ ]* syntax in the response describes zero or more occurrences of the data enclosed within the curly brackets.

Note also that the output to the "G" message is presented in a format similar to that specified by the CON command.

Example: if the user previously made connections using the CON command to connect video input 3 to outputs 2,4,6,8, video input 2 to 1,3,5,7 and audio input 9 to 1-8 and defined preset 1 using the PST S command as below:

CON 3 (2,4,6,8) 2 (1,3,5,7) 9F (1-8)
PST S 1 1,2,3,4,5,6,7,8,1F,2F,3F,4F,5F,6F,7F,8F

Then issuing a PST G 1 command would return the following:

PST G 1 2 (1,3,5,7) 3(2,4,6,8) 9F (1,2,3,4,5,6,7,8)

24 RGB Delay Request

The RGB Delay request sets the amount of time to delay when switching RGB outputs.

RGB	time|"?"	*<cr>*

Syntax: RGB <time\|"?"><cr>
Where:
RGB   RGB Delay request header
time   Amount of time in tenths of seconds from 0 to 100 in ASCII.
"?"   Inquiry of the currently specified RGB delay.

Example:
To set the RGB delay time to 7.5 seconds, the user would send the following message:
RGB 75*<cr>*

The matrix will respond with an OK message.

To get the RGB delay time the user would send the following request:

RGB ?<cr>

The matrix will respond with the following for a RGB time of 7.5 seconds:

RGB 75

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25 <u>Response Request</u>

The user will be able to suppress all responses from the MatrixPRO-II if they like. The user should ensure that all subsequent requests to the MatrixPRO-II are properly formatted as it would be difficult to ascertain their correctness without a response. The format for the Response request is as follows:

RSP	"Y"|"N"	*<cr>*

Syntax: RSP <"Y"|"N"><cr>
Where:
RSP   Response Request header.
 "Y"|"N"   Y = response enabled, N = response disabled

Example:
      RSP Y*<cr>* – Response requested.
      RSP N*<cr>* – Response suppressed.

26 Return to Factory Defaults Request

The user can return the unit to factory defaults by issuing this command. The unit settings affected include cable lengths, RGB delay, Sync equalization, video and audio connections, audio output and trim levels, mute status, and IP address. After having issued this command, the user may query the unit settings via the Status Request command.   *This command should be exercised with care.* The format for the Return-to-Factory-Defaults request is as follows:

RFD	"Y"|"N"	*<CR>*

Syntax: RFD <"Y"\|"N"><cr>
Where:
RFD   Return-to-Factory-Defaults Request header.
 "Y"\|"N"   Y = return to factory defaults, N = do not return to factory defaults

Example:
RFD Y*<CR>* – Return to factory defaults requested.

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27 <u>Status Request</u>

The user will be able to request status of individual inputs and outputs, all inputs or all outputs.

STA	"I"|"O"	number|"A"	*<cr>*

Syntax: STA <"I"|"O"> <number | "A"><cr>
Where:
STA   Status request header
"I"|"O"   I input, O output
number   Input or output number.
"A"   A to designate all respective input or output.

Response for Input Status request:
STA   *<MatrixType>* {*<InputNumber>* "("*<CableLength>*","*<AudioType>*","
<TrimValue>","*<SplitStatus>*","* [*CardSpecifier*":"*CardType*] ")"}*

Where:
MatrixType   1 = RGB, 2 = S-Video, 3 = Composite, 4 = Component
InputNumber   The requested input or the enumerated input if "**A**" specified.
CableLength   Cable length in 10' lengths from 00 to 150
AudioType   P for Professional or C for Consumer
TrimValue   The trim value in range –10dB to +10dB for the specified *InputNumber.*
SplitStatus   Y if split, N otherwise
CardSpecifier   If split : A, B, or C specifying split signal type.
CardType   If split: 2 designating S-Video or 3 designating Composite. (Note that these are the only valid designations into which a signal may be split.)

Note that the { }* syntax in the response describes one or more occurrences of the data enclosed within the curly brackets. This captures multiple inputs in the response if an "A" for All was specified in the request. Each successive input will appear on a separate line.

Response for Output Status request:
STA *<MatrixType>* {*<OutputNumber>* "("*<DelayStatus>*"," *<MuteStatus>*"," *<CableLength>*","
<SyncEqu>"," *<AudioLevel>*"," *<AudioInputConn>*"," *<SplitStatus>* [<","*VideoInputConn>* |
[<","*CardSpecifier*":"*CardType*","*VideoInputConn>*]*] }*

Where:
MatrixType   1 = RGB, 2 = S-Video, 3 = Composite, 4 = Component
OutputNumber   The requested output or the enumerated output if "**A**" specified.
DelayStatus   RGB delay, E=enabled, D=disabled.
MuteStatus   M=Muted, U=Unmuted.
CableLength   Cable length in 10' lengths from 00 to 150
SyncEqu   Output sync equalization setting, 0= off, 1=On, 2= auto.
AudioLevel   The audio output level for the specified output in range –45dB to +5dB.

AudioInputConn	The audio input that the specified output is connected to, "255" if unconnected.
SplitStatus	Y if split, N otherwise
VideoInputConn	The video input the specified output is connected to, "255" if unconnected.
CardSpecifier	If split : A, B, or C specifying split signal type.
CardType	If split: 2 designating S-Video or 3 designating Composite. (Note that these are the only valid designations into which a signal may be split.)

Note that the { }* syntax in the response describes one or more occurrences of the data enclosed within the curly brackets. This captures multiple inputs in the response if an "A" for All was specified in the request. Each successive output will appear on a separate line.

Example:
　　　　To get the status of RGB matrix unsplit input 22 the user would send the following request:
　　　　　　STA I 22*<cr>*

　　　　The matrix would then respond with:
　　　　STA 1 22(80,C,-5,N)*<cr>*

　　　　This means input 22 has a cable length of 80, configured to Consumer audio, an audio trim value of –5 dB and isn't split.

Example Split RGB:
　　　　To get the status of a split input 12 on a RGB matrix the user would send the following request:
　　　　　　STA I 12*<cr>*

　　　　The matrix would then respond with:
　　　　STA 1 12 (70,C,-5,Y,A:3,B:2)*<cr>*

　　　　This response tells the user that the input is split, cable length is 70, configured to Consumer audio, audio trim value of –5 dB, and that red is defined as a composite, and that green & blue are S-Video.

Example Output not split RGB
　　　　To get the status of non-split output 22 on a RGB matrix the user would send the following message:
　　　　　　STA O 22*<cr>*

The matrix will respond with the following
　　　　　　STA 1 22 (D,U, 60,1,–30,2,N,2)*<cr>*

This response means that the matrix type is RGB, output 22 is delay disabled, unmuted, output cable length of 60', sync equalization is On, audio level is –30dB, audio connected to input 2, not split, and video from input 2 is connected.

Example Output Split RGB

To get the status of split output 12 on a RGB matrix the user would request the following:

STA O 12*<cr>*

The matrix will then respond with the following:

STA 1 12 (E,M,60,2,-10,12,Y,A:3,14, B:2,10)*<cr>*

Output 12 is on a RGB matrix, delay is enabled, audio is muted, output cable length of 60', sync equalization is Auto, audio level is –10 dB, connected audio input 12, Split A is Composite and connected to input 14A, B&C are S-Video and connected to input 10B&C.

28 Set Time and Date Request

The time and date will be required for scheduled tasks on the matrix. The format to set time and date is as follows:

STD	time	date	*<cr>*

Syntax: STD <<time> <date>>|<"?"> <cr>
Where:
STD   Set time and date request header
time   Time in format *hh:mm*a|p
                  Where:
                  hh=hour(1-12)
                  ":" colon
                  mm=minute (00-59)
                  a|p "a" for am, "p" for pm
date   Date in *mm/dd/yy* format
"?"   Inquires the current time and date and returns the same in format above.

Example:
To set the time and date to noon, June 2, 2006 the user would send the following message:
STD 12:00p 06/02/06*<cr>*

To inquire the current time and data:

STD ?<cr>

The unit will respond with:

STD 12:00p 06/02/06

29 Output Sync Equ Request

The output sync equ request is only available on RGB units and sets the Sync equ to ON, OFF, or AUTO. The format of the output sync equ request is as follows:

SYN	status	outputSequence	*<cr>*

Syntax: SYN <status> <outputSequence><cr>
Where:
SYN   Output Sync Equ request header
status   "0" for OFF, "1" for ON and "2" for AUTO.
outputSequence   Output as a *number sequence.*

Example:
SYN 2 1,3*<cr>*
Sets outputs 1 and 3 to AUTO.

30 <u>Version Request</u>

The user may request the firmware version numbers. These version numbers will be for the matrix test/loader, matrix application, front panel test/loader, and front panel application. The format for the request will be as follows:

VER	*<cr>*

Syntax: VER<cr>
Where:
VER　　　　　Version Request header.

Response: VER Matrix Test/Loader = <XX.xx>, Matrix App = <XX.xx>, FP Test/Loader = <XX.xx>, FP App = <XX.xx>

Where:
XX.xx　　　　XX = Major version number, xx = Minor version number.

Example:
　　　VER<cr>

　　　To which the Matrix will respond:

　　　VER Matrix Test/Loader = xx.xx, Matrix App = xx.xx, FP Test/Loader = xx.xx, FP App = xx.xx<cr>

31 <u>Volume Request</u>

The Volume request is used to adjust input trims or output level. It can also be used to inquire about the current value of an input trim or output level. The trims and levels can be set as a value, or adjusted up or down with "+" or "-". Multiple consecutive "+" or "-" characters may be entered, with each representing a 1 dB increment or decrement respectively.

VOL	"L"|"T"	number	val|"?"	*<cr>*

Syntax: VOL <"L"|"T"> < number > <value|"?"><cr>
Where:
VOL   Volume request Header
"L" | "T"   output Level or Trim
number   The output number if L specified or the input number if T specified.
value   Volume value -10 to +10 for trims, -45 to +5 for level (in 1 dB increments)
                            or "+" to increment volume in 1 dB increments, or "-" to decrement volume
                            in 1 dB decrements.
"?"   inquiry for the specified level or trim

Example:
> VOL L 4 -5*<cr>*
> Instructs the matrix to set output 4 audio level to -5dB.
>
> VOL L 4 +++*<cr>*
> Instructs the matrix to increase output 4 audio level +3dB.

32 Verbose Request

The user can, during debugging, turn on verbose mode to expand the standard error message describing the syntax to include a description of the command parameters.

VRB	"Y'|"N"	*<cr>*

Syntax: VRB <"Y"|"N"><cr>
Where:
VRB   Verbose request header
"Y"|"N"   Y turns verbose on, N turns verbose off.

Example:
If the user tries to connect and invalid input or output, the standard error message would look something like this:

ERR: CON {<input>[card specifier] <"("numberSequence")">}*<cr>

If the user enabled verbose mode then the response would be as follows:

ERR: CON {<input>[card specifier] <"("numberSequence")">}*<cr>
        Connect the specified input to specified output.
        input   Input number in the range 1 – max inputs
        card specifier   optional indicator of the card type with "A","B"or"C" (applicable to
                                split mode) designating video, "D" and "E" designating Horizontal
                                and Vertical sync respectively and "F" designating audio.
        numberSequence   Outputs as number sequence in range 1 - max outputs.

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